

INDEPENDENT DESIGN REVIEW
of the
PALO VERDE NUCLEAR GENERATING STATION
CONTAINMENT SYSTEMS

Before the
CONTAINMENT SYSTEMS REVIEW BOARD

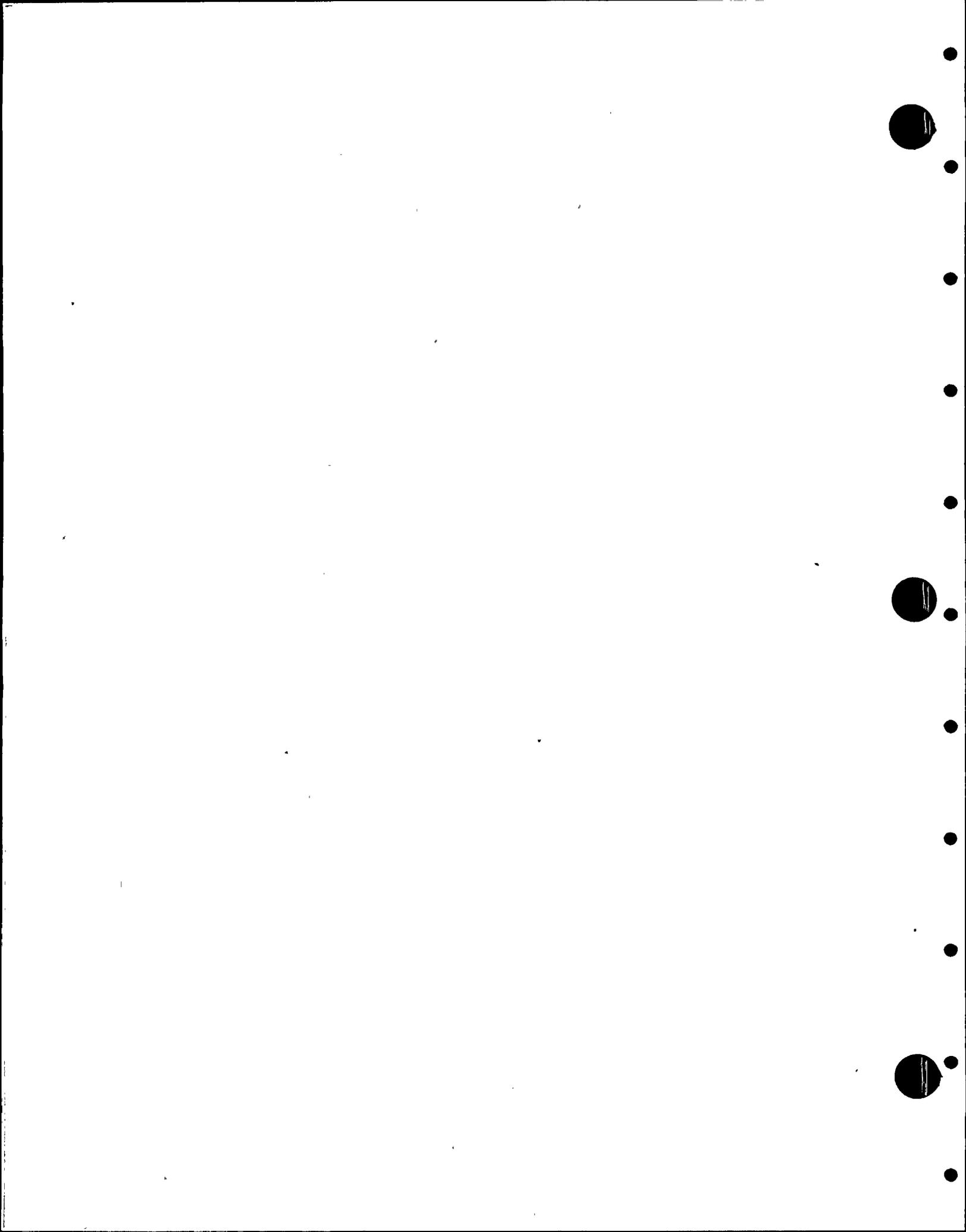
VOLUME I of II

Pages 1 - 214

Phoenix, Arizona
May 21, 1981.

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PHOENIX, ARIZONA

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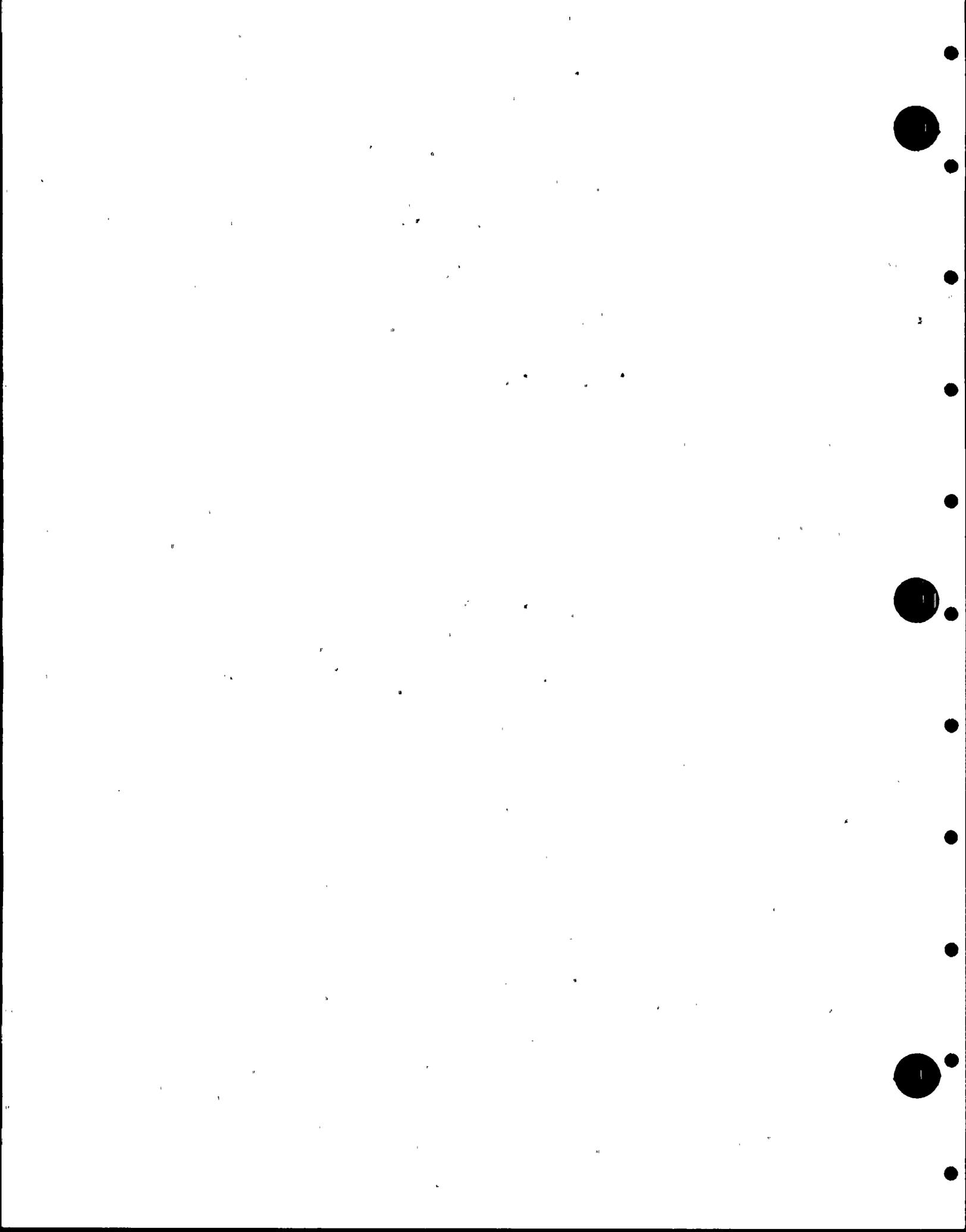
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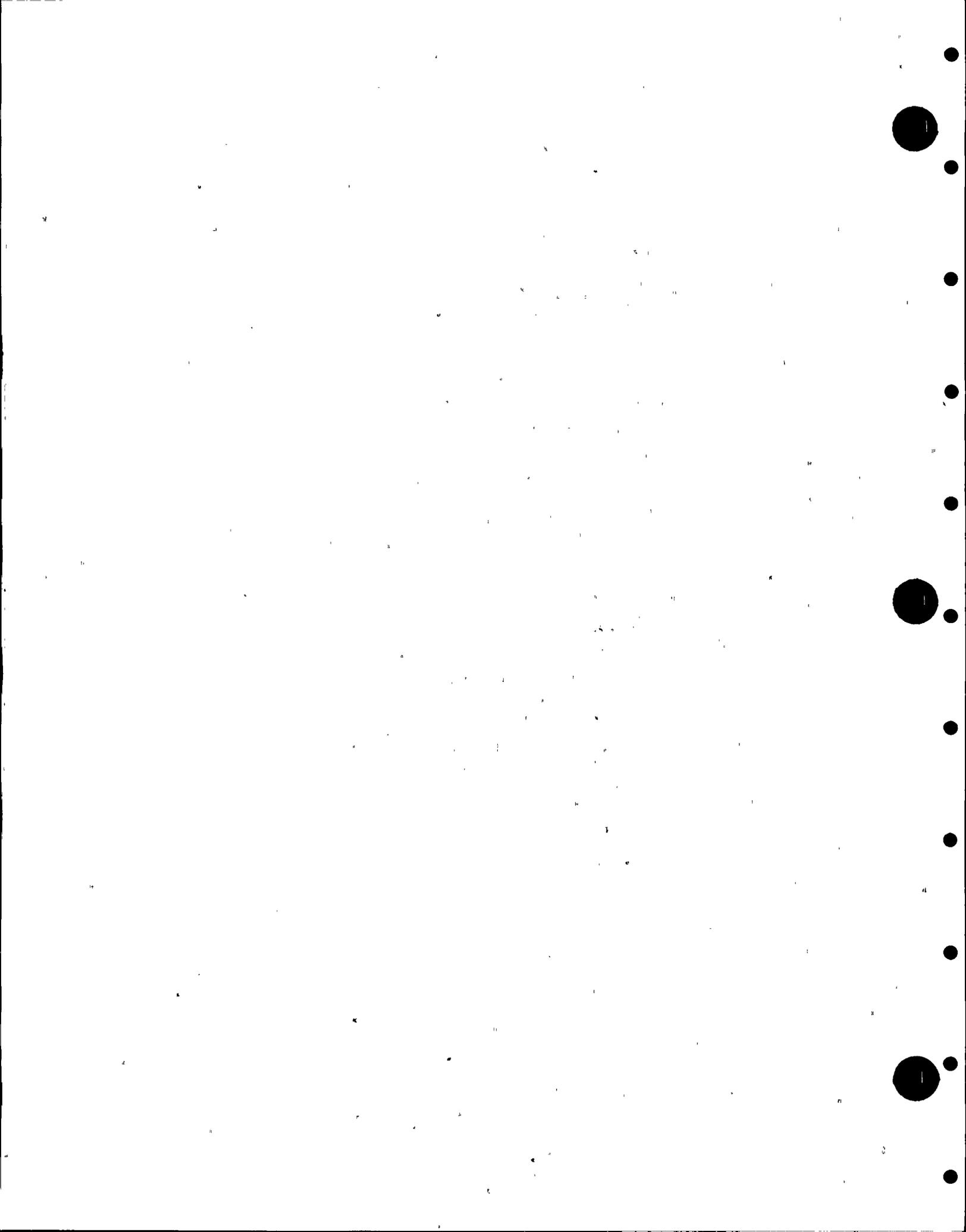
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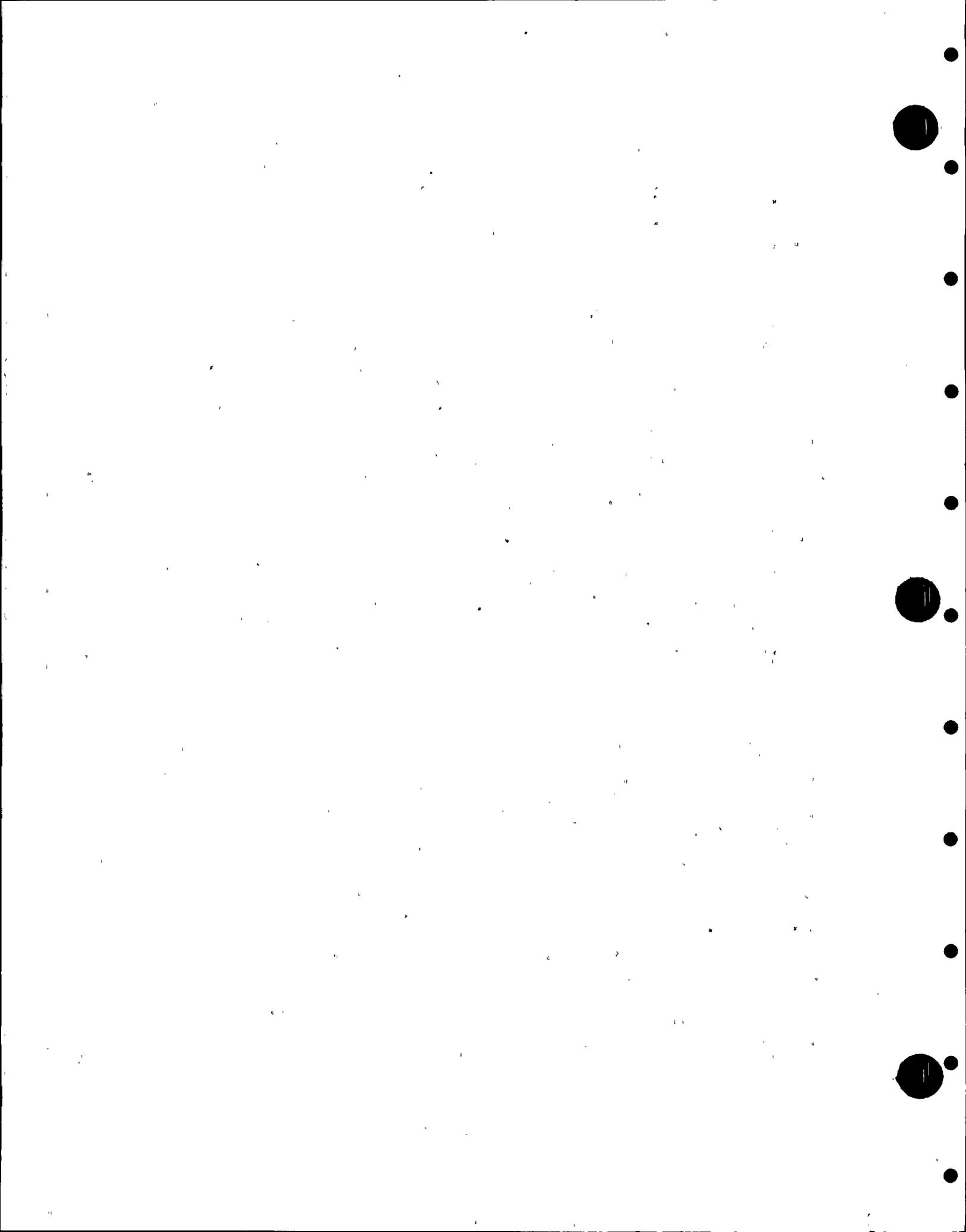
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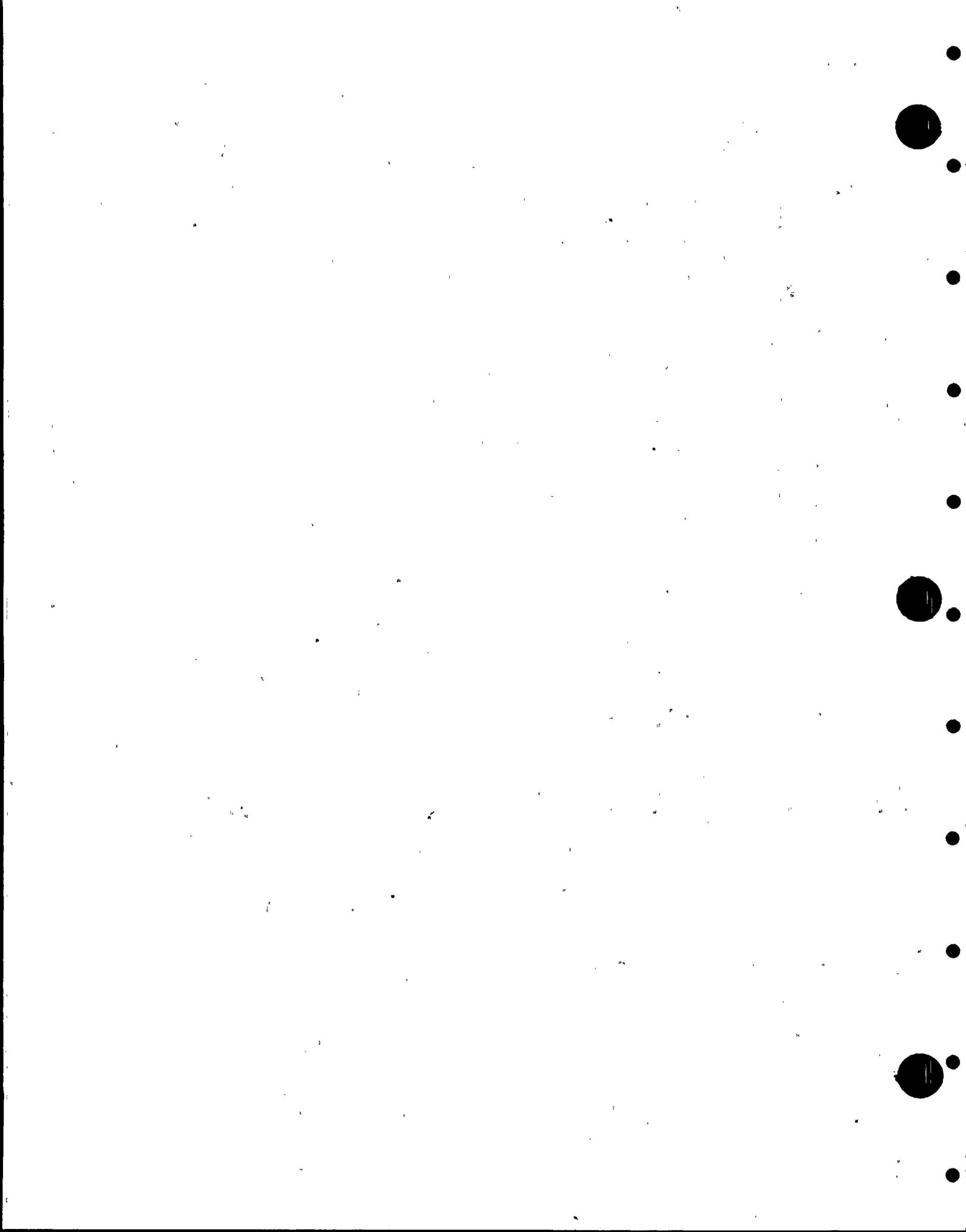
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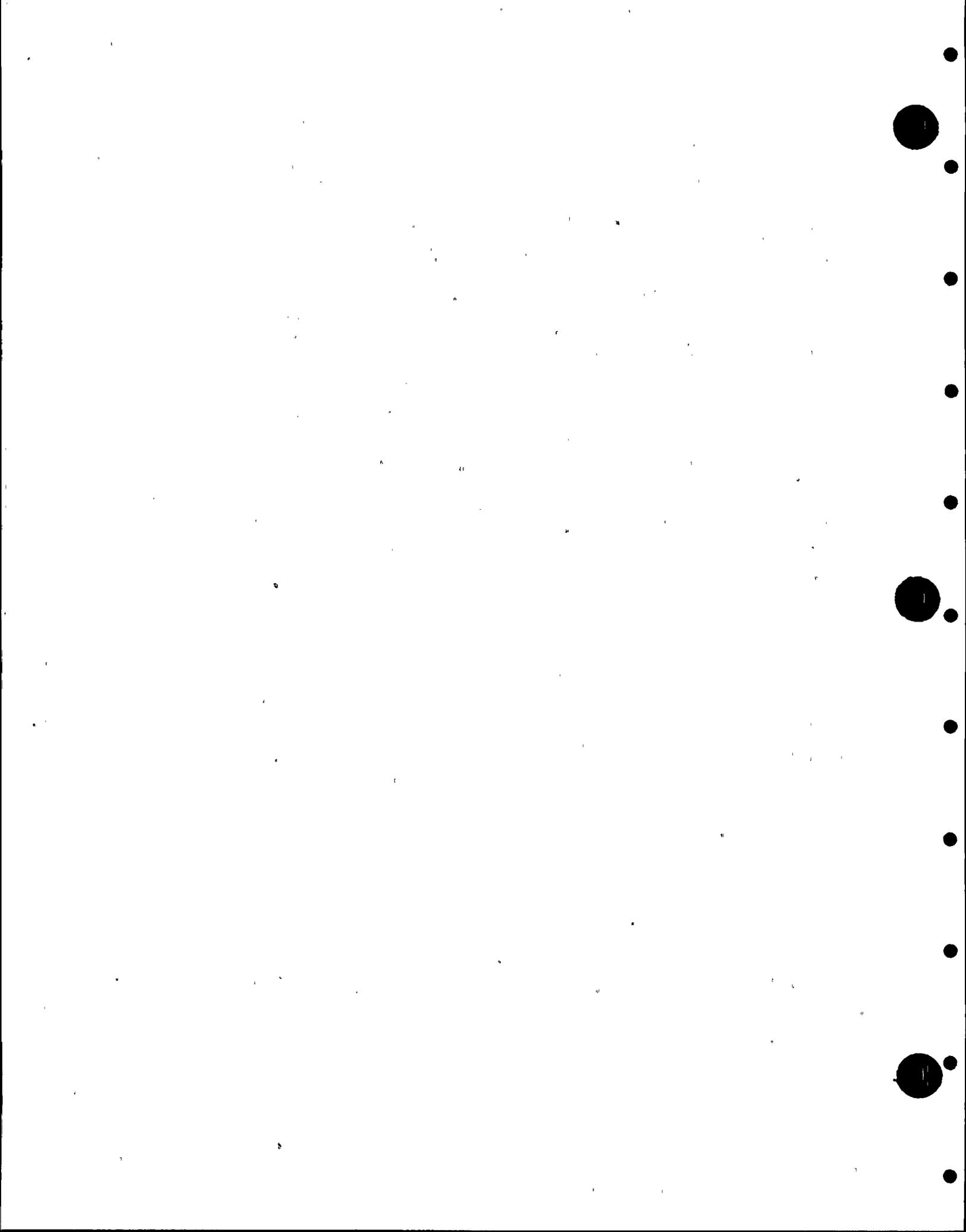
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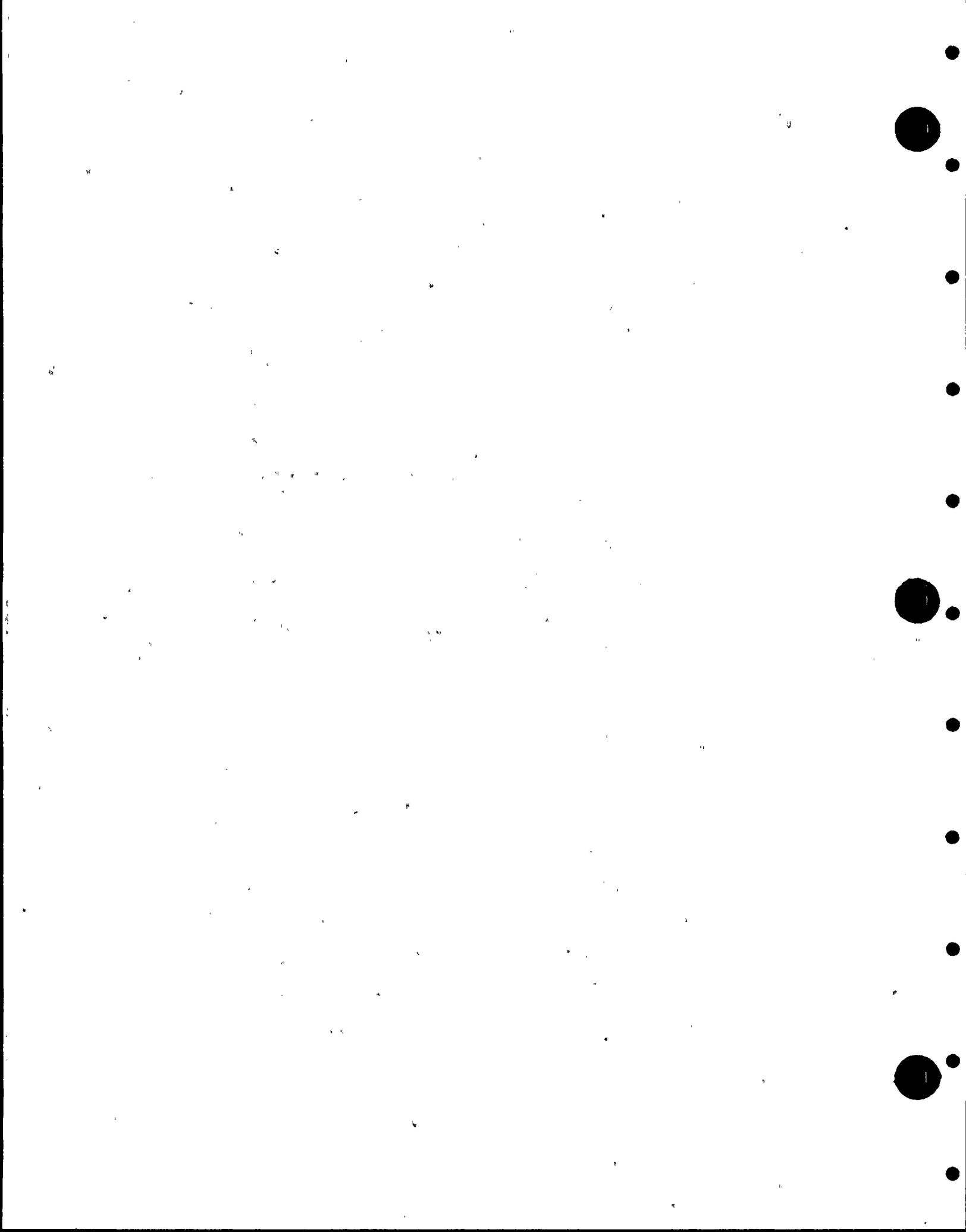


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The Containment Systems Independent Design Review Board of the Palo Verde Nuclear Generating Station convened in Navajo Room A, Adams Hilton Hotel, Phoenix, Arizona, on the 21st day of May, 1981, Mr. Edwin E. Van Brunt, Jr., Vice-President, Nuclear Projects Management, Arizona Public Service Company, presiding.

MR. VAN BRUNT: My name is Ed Van Brunt. I am Vice-President, Nuclear Projects Management, for Arizona Public Service Company and the officer responsible for the engineering, design, construction, and quality assurance for the Palo Verde Nuclear Generating Station.

The purpose of today's meeting is to perform an Independent Design Review of the Palo Verde Nuclear Generating Station's Containment Systems. For those of you who have not attended a previous IDR, basically what we do is take the design of a specific plant system, structure or a specific program and review it for adequacy of design and compliance with regulations. This presentation is made by Bechtel personnel involved in that system, structure or program. This formal presentation by Bechtel to a review board consisting of experts from APS, other utilities, our Nuclear Steam Supply System vendor, Combustion Engineering, and the Nuclear Regulatory Commission aids in the understanding of the design basis, construction, and operation of those systems,

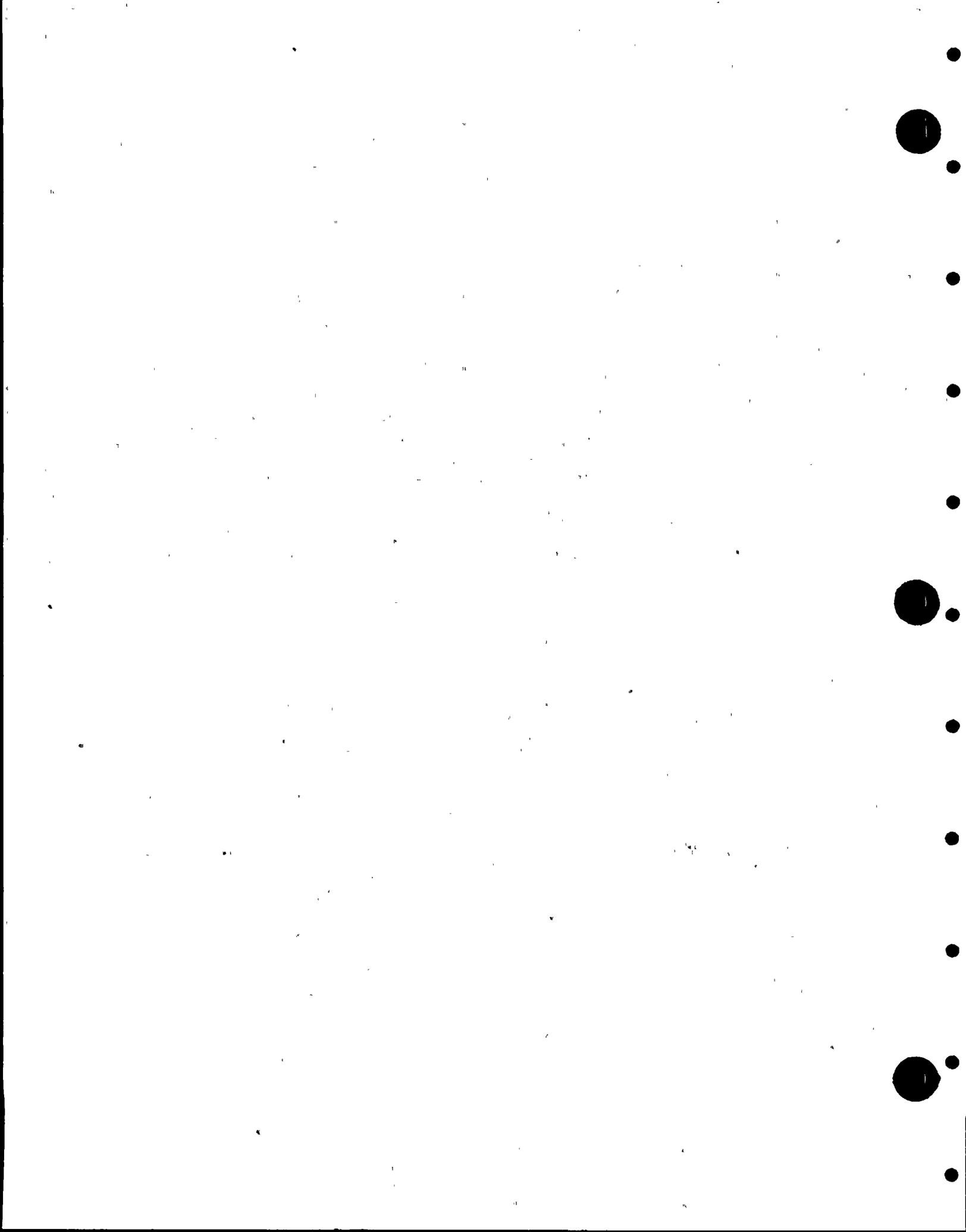


1 structures or programs under review. This in turn minimizes,
2 if not eliminates, the time required for the NRC to review
3 that portion of our Final Safety Analysis Report

4 For today, the Bechtel project staff will present
5 a review of the Containment Systems. They will cover the
6 following specific areas: Containment Heat Removal System,
7 Containment Isolation System, and Combustible Gas Control.
8 Bechtel will present a system overview for each area
9 including conformance to regulatory requirements.

10 Bechtel or other organizations, as designated,
11 will prepare formal responses to any open issues defined by
12 the Review Board during this review. These responses will be
13 reviewed by the Review Board for concurrence. When final
14 satisfactory resolution of these items is accomplished, they
15 will be provided to the Nuclear Regulatory Commission.

16 For today's review, we have assembled a review
17 board with a varied background. Since the responsibility for
18 an adequate review lies with the applicant, that is, Arizona
19 Public Service Company, the Board's basic formation starts
20 with APS personnel, complemented with personnel from other
21 groups who have expertise and experience on the system or
22 program being reviewed not necessarily available within
23 Arizona Public Service Company. Board members were provided
24 with appropriate sections of several documents to familiarize
25 them with the Palo Verde Containment Systems in question.



1 These included sections from the Palo Verde Final Safety
2 Analysis Report, the appropriate Standard Review Plans, along
3 with sections from the Palo Verde Systems Description Manual.

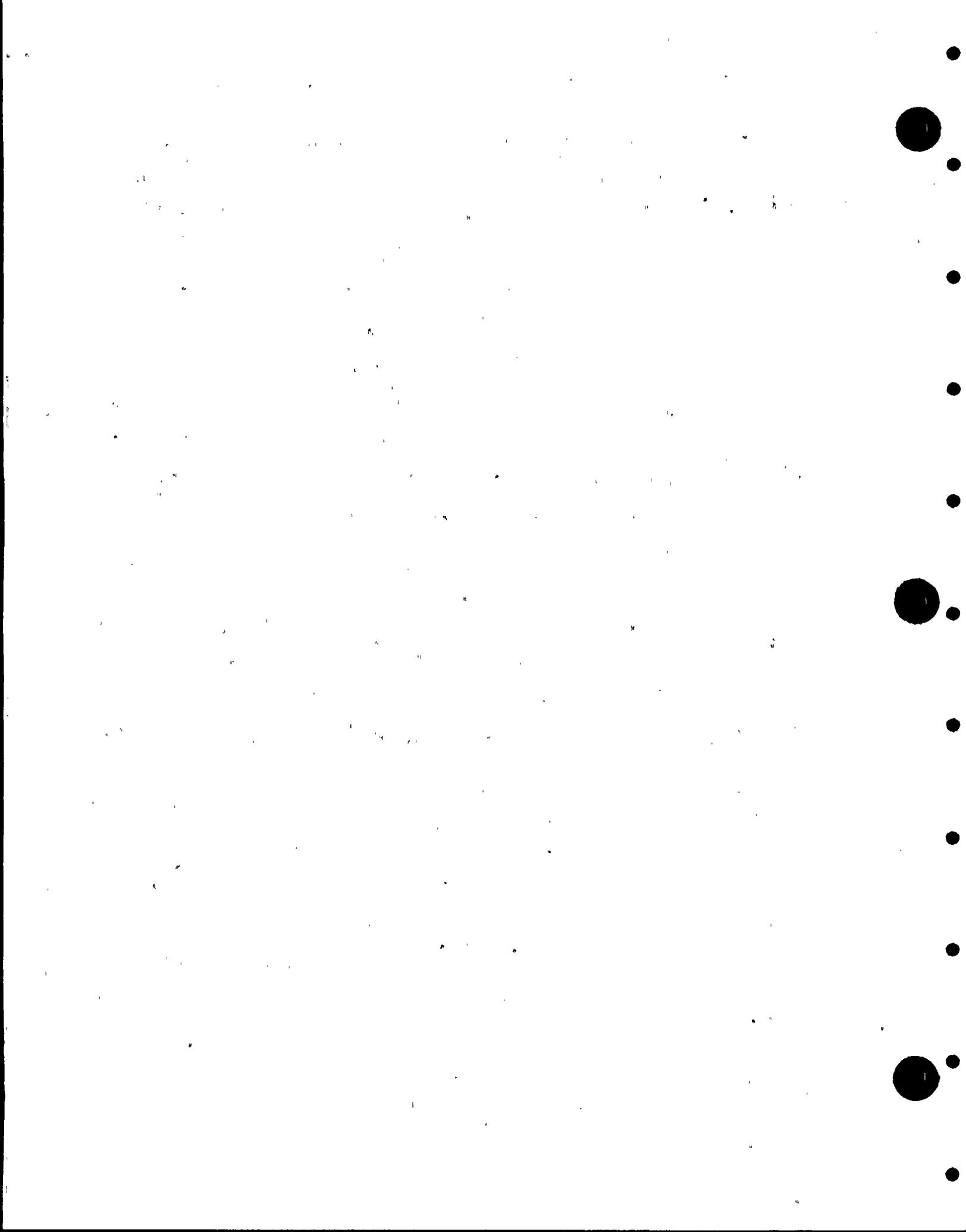
4 At this time, I would like to introduce the members
5 of the Board and then I will have Dennis Keith, Assistant
6 Project Engineer for Bechtel, introduce the Bechtel project
7 representatives who are here today.

8 John Allen, sitting here on my right, is one of
9 the two APS Nuclear Engineering Managers and reports directly
10 to me. John is responsible for the areas of electrical
11 engineering, instrumentation and control, licensing and
12 health physics. He is also responsible for our records
13 management section.

14 Carter Rogers, here on my left, is the other APS
15 Nuclear Engineering Manager, who also reports directly to me.
16 Carter has responsibilities for mechanical engineering,
17 chemical engineering, civil engineering, nuclear fuel, and
18 other nuclear-related items.

19 Mike Hodge, sitting down here a little bit, is an
20 APS Nuclear Engineering Department Supervising Mechanical
21 Engineer and reports directly to Carter. Mike is responsible
22 for the review of the Palo Verde Mechanical Systems and the
23 day-to-day interface with Bechtel and Combustion personnel
24 for these systems.

25 Ed Sterling, down here at the end of the table, is

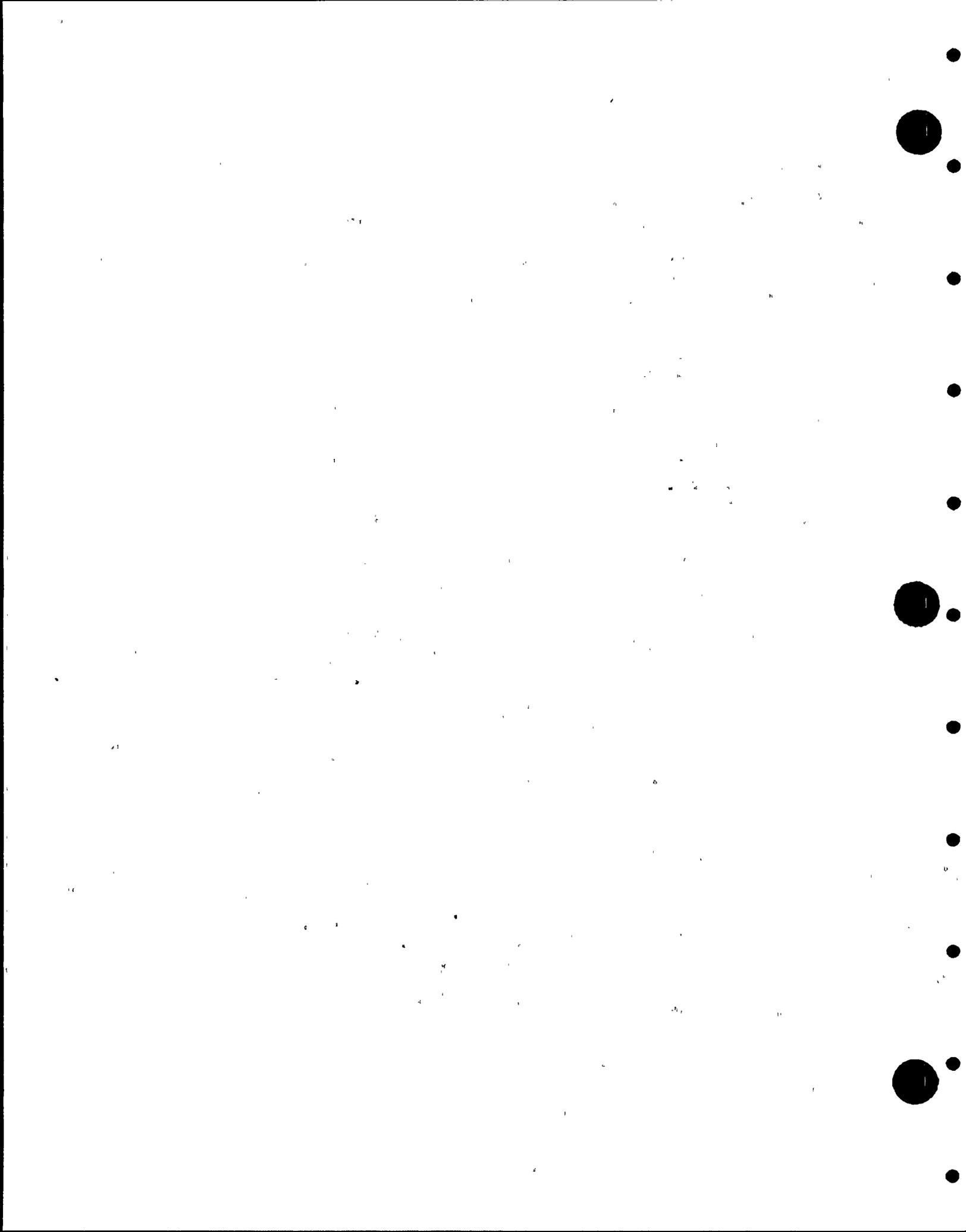


1 an APS Nuclear Engineering Department Supervising Instrumen-
2 tation and Controls Engineer and reports to John Allen. Ed
3 is responsible for the review of the electrical and
4 instrument and controls portion of the auxiliary systems.

5 Marty Raines is an APS Electrical Engineer who
6 reports to John Allen. He is responsible for the review of
7 the Palo Verde electrical systems, including those electrical
8 systems related to containment systems, and the day-to-day
9 interface with Bechtel and Combustion Engineering personnel
10 for those systems.

11 Bill Simko, across the table, is a Palo Verde
12 Senior Mechanical Engineer in the Operations Engineering Section.
13 Bill reports to the Operations Engineering Supervisor for
14 Mechanical Engineering Support. His responsibilities include
15 review of plant systems for operability and balance of plant
16 performance calculations.

17 Two Board members are from Bechtel and have not
18 been directly involved in the detailed design and engineering
19 of Palo Verde. However, they may have from time to time
20 consulted with the project team on various specific issues.
21 These representatives are Feng Ku, Engineering Supervisor,
22 Los Angeles Power Division, and Mr. Richard Tosetti, Chief
23 Nuclear Engineer, Nuclear Fuel Operations, Bechtel National,
24 Inc. Mr. Ku has worked as a technical member of the Bechtel
25 Mechanical Engineering staff for 18 years. As a staff member,

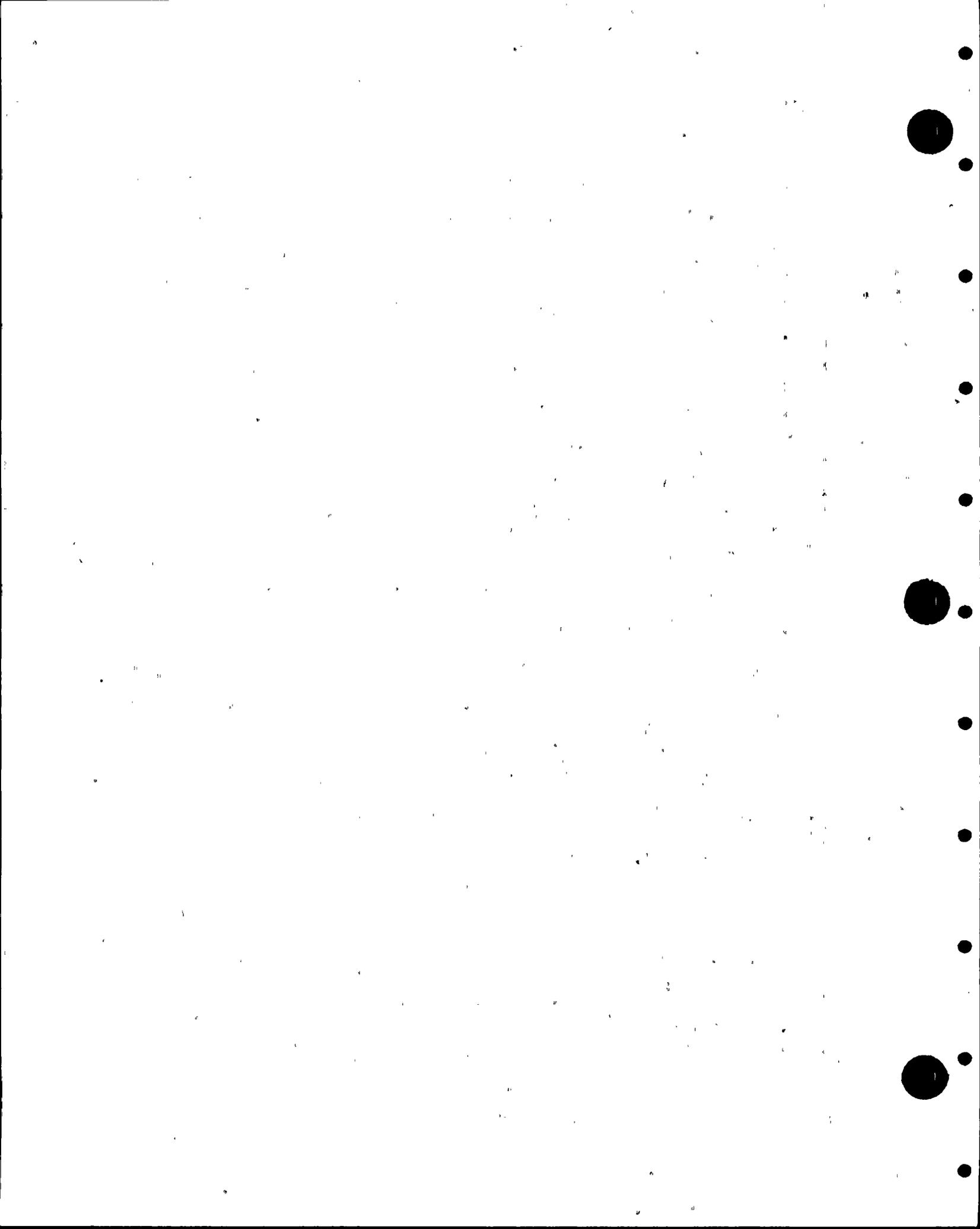


1 he has assisted various nuclear projects in the design and
 2 analysis of containment and balance of plant related systems.
 3 Mr. Tosetti has been responsible for analyses for hydrogen
 4 generation rates and for hydrogen explosion pressures and
 5 temperatures following a loss of coolant accident for the
 6 Bechtel staff.

7 Representing Combustion Engineering, the Nuclear
 8 Steam Supply System supplier for Palo Verde, is Phil Hepner,
 9 Supervisor, Safeguard Systems. Phil is across the table
 10 here. He is responsible for directing the Combustion
 11 safeguard systems group in the development of safety injection
 12 systems, residual heat removal systems, containment spray
 13 systems and iodine removal systems for nuclear power plants.

14 From Southern California Edison, we have asked
 15 Pete Penseyres to participate in this review as a Board
 16 member. Pete is a Supervising Engineer at San Onofre Units
 17 2 and 3, and is responsible for supervising the reactor
 18 engineering group in charge of physics testing, core analysis,
 19 and fuel handling. He is also responsible for mechanical
 20 and electrical engineering groups involved in review of
 21 system designs and in-service inspection.

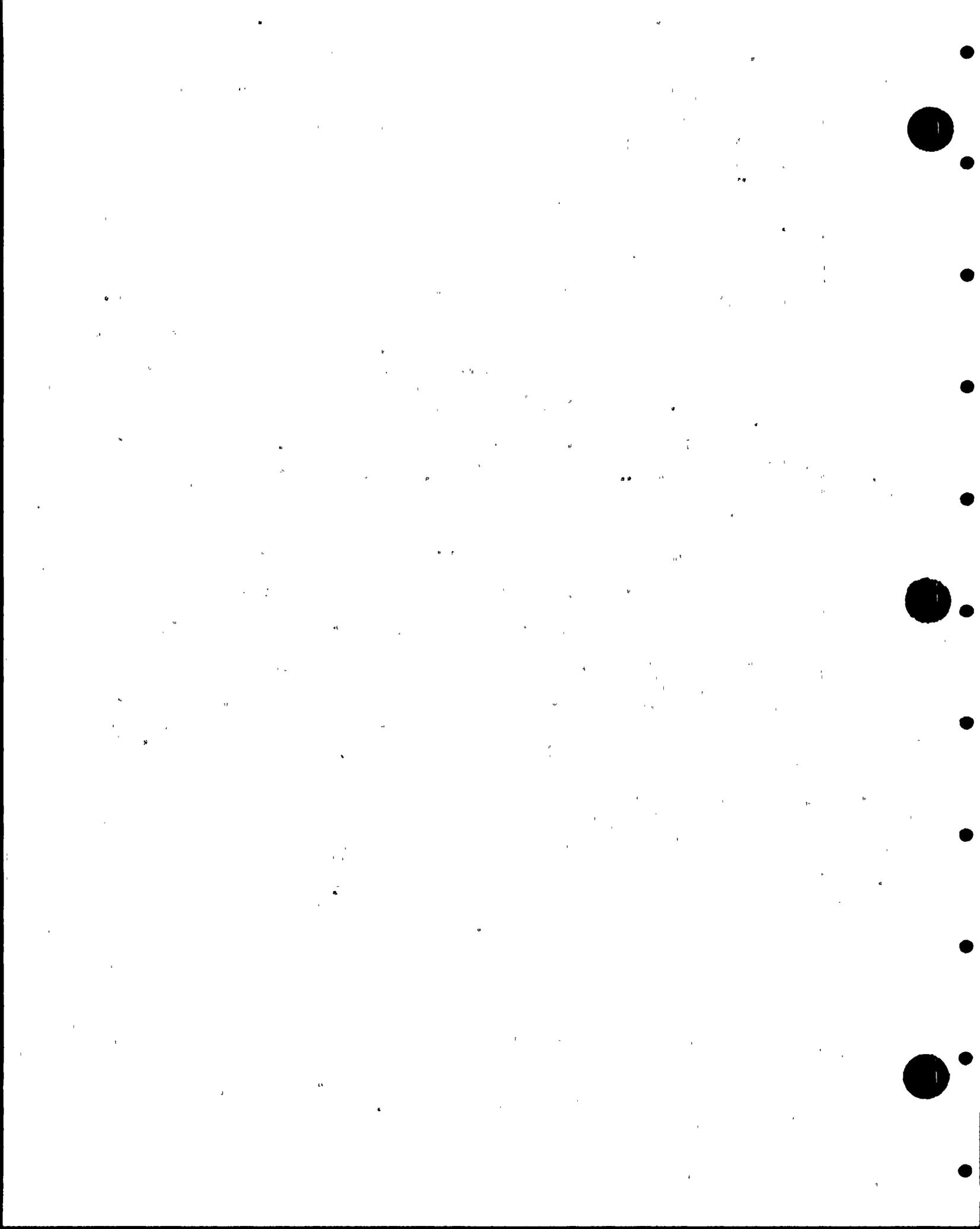
22 The Nuclear Regulatory Commission has sent
 23 representatives to observe and participate in this system
 24 review as well. They are sitting across the table here.
 25 They are John Huang and John Held. We appreciate your



1 appearance here and we invite you to take active participation
2 in this review.

3 In the last few days, we have received a set of
4 informal questions, or two sets of informal questions, I
5 guess, from the Nuclear Regulatory Commission. The Bechtel
6 staff has not had the opportunity to build those questions
7 directly into their presentation. However, at the end of
8 each section of the presentation, we will attempt to deal
9 with as many of these questions as we can. We will reference
10 the specific question and then Dennis will have some of his
11 people answer the question. That way we will be able to get
12 those answers into the record. Additionally, we will append
13 to the transcript of the record a copy of the questions
14 that we have received from NRC so that whoever reads the
15 record will have a copy of the questions and then can look
16 at the answer. We will try and deal with as many of those
17 as we can. Those that we cannot deal with, we will deal
18 with in a supplementary letter to the review so we will have
19 a nice, clean package for the whole works.

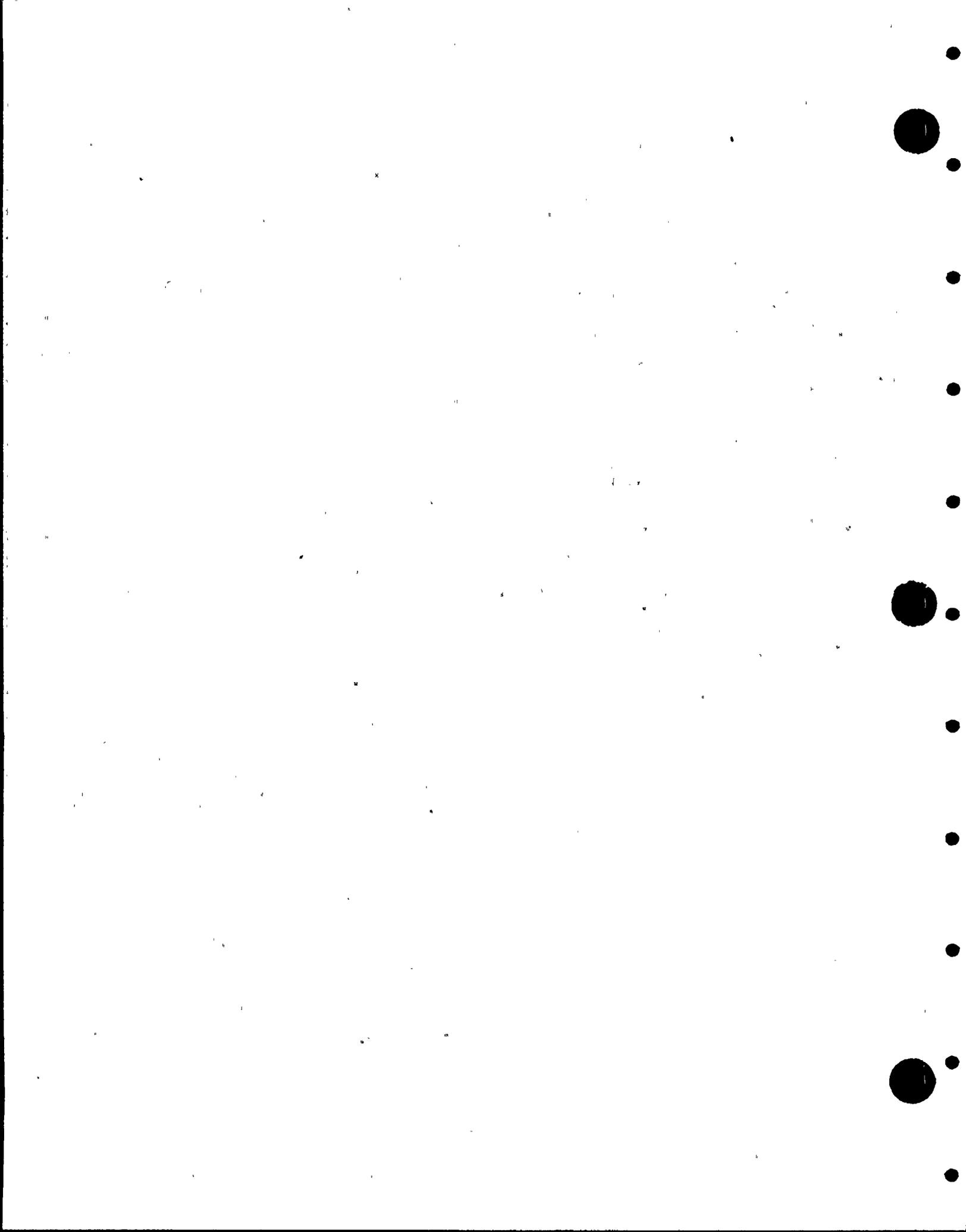
20 We will provide a transcript of this review to the
21 Nuclear Regulatory Commission as soon as we have received it
22 from the court report and proofed it. I have designated
23 Bill Quinn from my staff and Gerry Kopchinski from Bechtel
24 to review the transcript and develop a joint list of the
25 open items for the court reporter to append to the transcript



1 of the meeting. We found at the last meeting this works a
2 little better than trying to read them all into the record
3 and it gives my friend here a break. He doesn't have to
4 type so much.

5 The Board is instructed to review the open items
6 to ensure they reflect the issues that were raised upon
7 receipt of the transcript. For the benefit of the court
8 reporter, I ask that the Review Board members or anyone else
9 who makes a statement to please clearly identify himself
10 before making any statement and state the specific exhibit
11 number or figure number, if you are referring to one, so that
12 we can get it into the record so that somebody that reads it
13 has a better way of knowing what the question is and what
14 the response is.

15 To assure that these independent design reviews are
16 completed in a timely manner that will not impact the
17 Palo Verde licensing review, we have prepared in conjunction
18 with Bechtel a schedule that calls for completion of this
19 review in ten weeks. We have put the schedule up here on the
20 board and, as you can see, it is a rather ambitious schedule.
21 In Week 9, the Board will comment on the Bechtel responses
22 and will reconvene, if necessary, with the objective of
23 resolving all comments and finalize the responses. Now,
24 when I say reconvene, we may just have a conference phone
25 call or I may call you individually and resolve some issue,



1 but any issues that the Board members have open will be
2 specifically resolved with them and we will have some
3 documentation that these items are complete as far as the
4 Board is concerned.

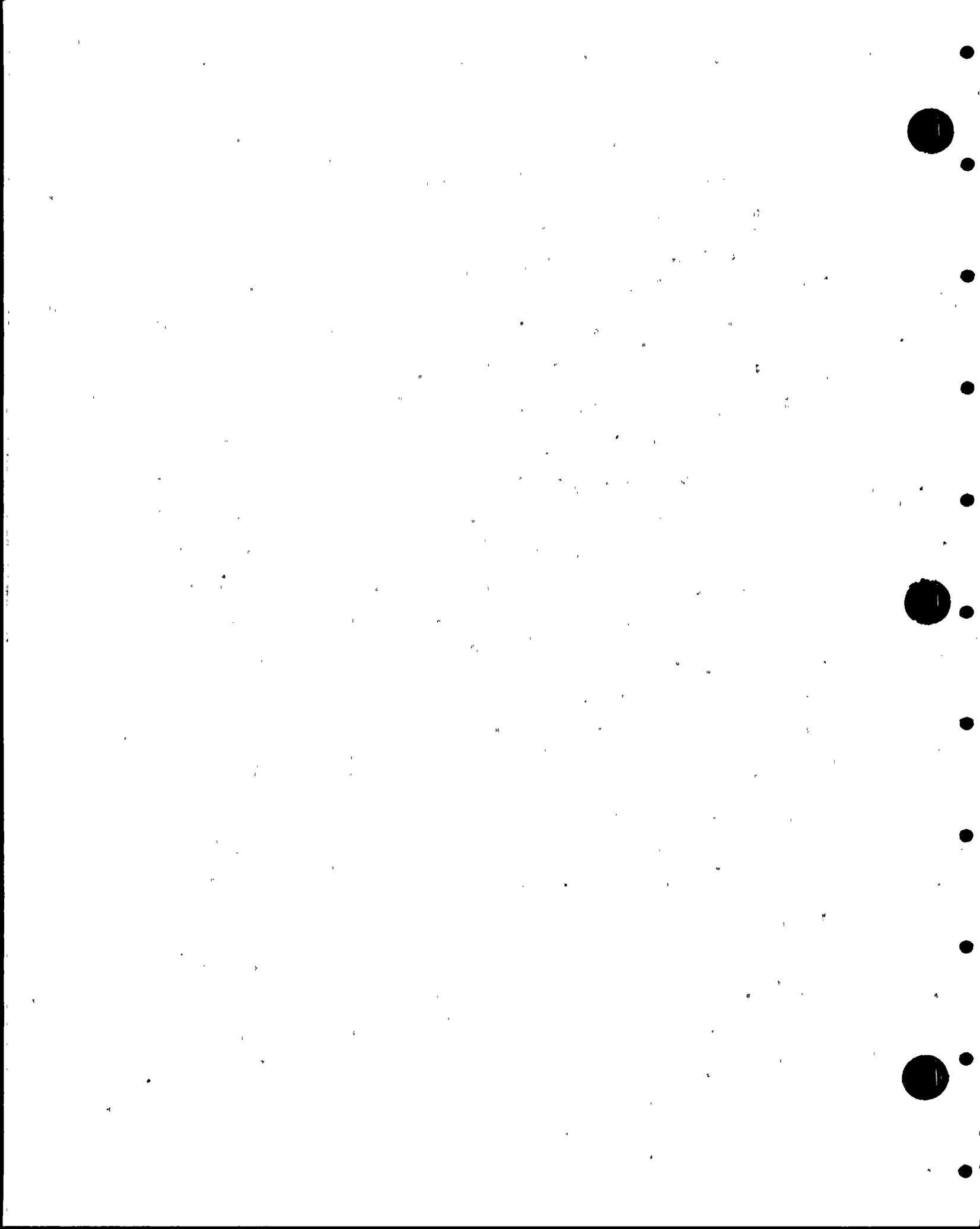
5 Do any of the Board members have any questions
6 before we proceed? I am going to turn the meeting over to
7 Dennis here in just a minute.

8 Seeing no questions, Dennis, if you would introduce
9 the fellows that are going to participate today and get on
10 with your presentation.

11 MR. KEITH: Thank you, Ed.

12 My name is Dennis Keith. I am an Assistant Project
13 Engineer for Bechtel Power Corporation assigned to the
14 Palo Verde project. As Ed Van Brunt indicated, we are here
15 today to present a review of the Containment Systems at the
16 Palo Verde Nuclear Generating Station facility. This is the
17 seventh in a series of Independent Design Reviews for the
18 Palo Verde Project. I have the following people with me
19 today to assist in the presentation: Gerry Kopchinski,
20 Nuclear Group Supervisor; John Schuh, Mechanical Group
21 Supervisor; Nick Baldasari, Nuclear Engineer; Bill Boles,
22 Mechanical Engineering Group Leader; Paul Biba, Senior
23 Mechanical Engineer; Dan Jensen, Nuclear Engineer; and Mary
24 Moreton, Controls Systems Group Leader.

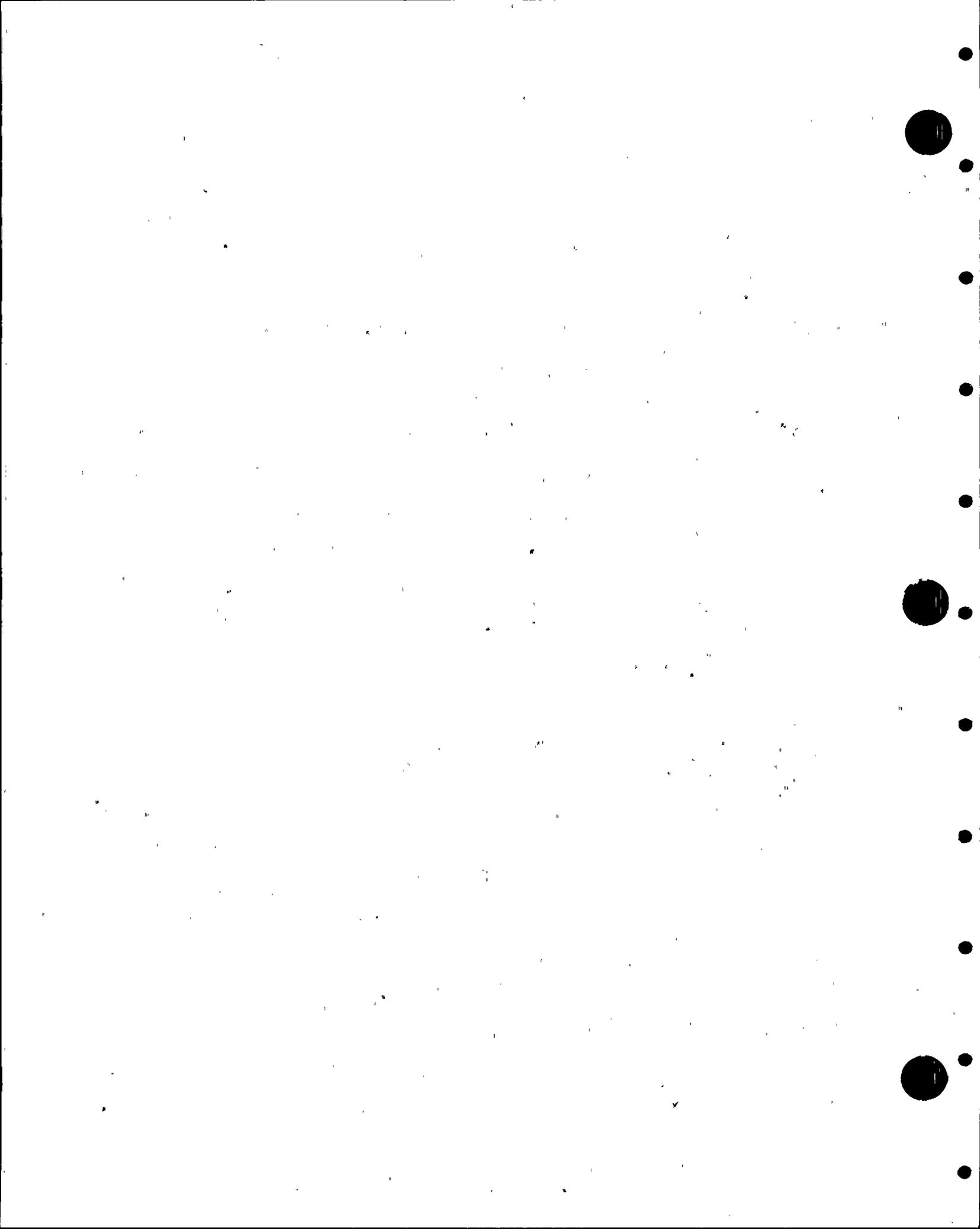
25 Containment Systems include the Containment Spray



1 System, referred to as the Containment Heat Removal System
2 in Standard Review Plan 6.2.2.; Containment Isolation System,
3 discussed in Standard Review Plan 6.2.4; and Combustible
4 Gas Control in Containment, as discussed in Standard Review
5 Plan 6.2.5.

6 In previous System Review Board meetings, we have
7 discussed how the Design Criteria which are approved by APS
8 and are the basis of the plant design are dealt with. In
9 particular, we discussed how the final design was achieved
10 using the Design Criteria as the starting point and, as part
11 of these discussions, we reviewed the various project
12 procedures which guide the design process and the documenta-
13 tion of the design process. In addition, we have discussed
14 our procedures for assuring interface data are properly
15 included in the design and procurement for the various
16 components. Since this material has been discussed at
17 previous System Review Boards, we propose to refer the Board
18 to Section V of the handout package for a more detailed
19 presentation of the design method, and I would ask, Ed, at
20 this time if that is an acceptable way to cover these issues.

21 MR. VAN BRUNT: As far as I am concerned and I think
22 as far as most of the Board members are concerned, also.
23 If someone has a question about it, that's satisfactory.
24 I believe it was in the first two Independent Design Reviews,
25 if someone wants to refer to it, and we can provide a

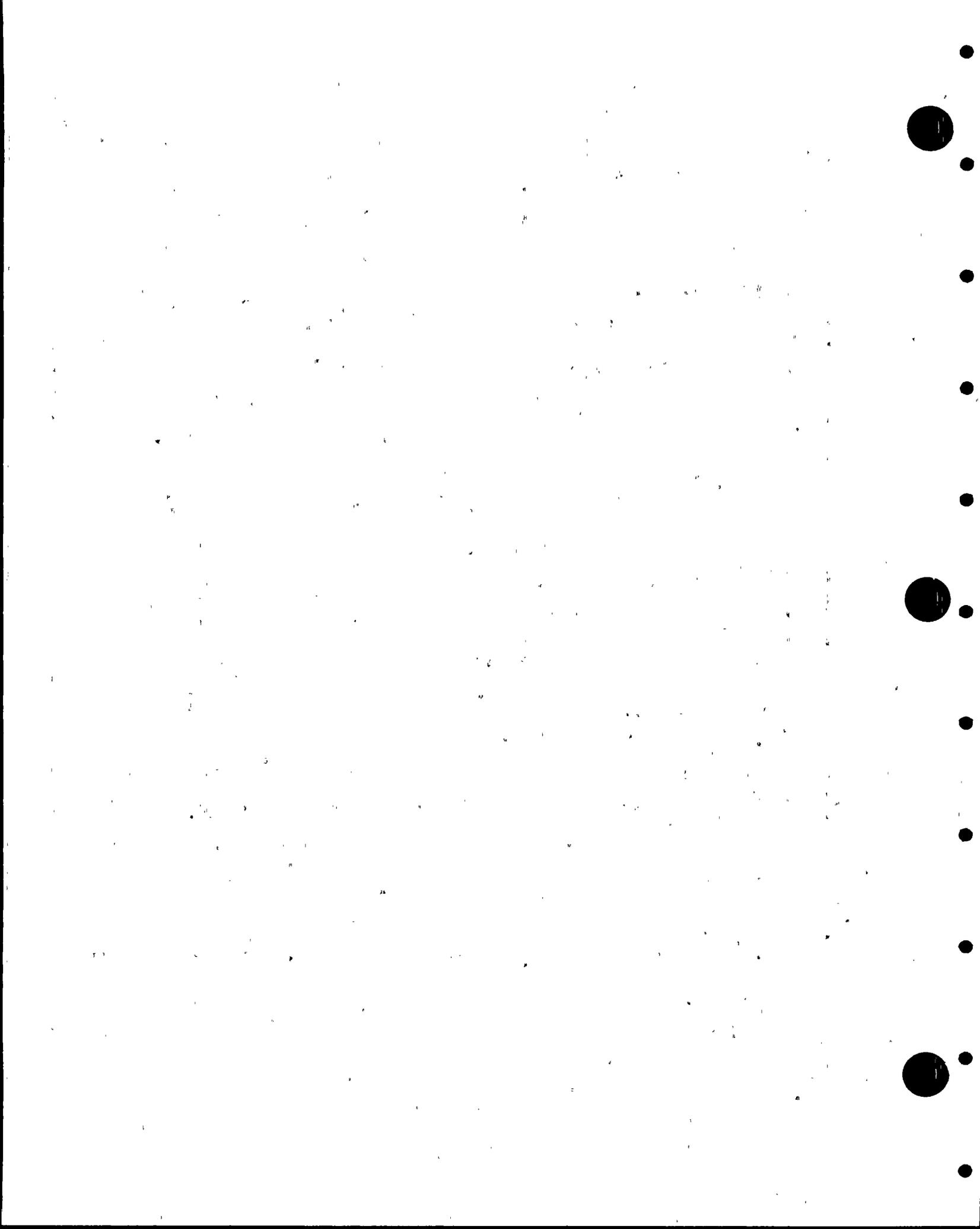


1 transcript of that if necessary, that these items that
2 Dennis talked about were dealt with in significant detail,
3 the whole matter of quality assurance, how we transfer
4 information, and this sort of thing. If during your presen-
5 tation, some specific issue comes to somebody's mind and
6 you want to check it out, certainly feel free to, but as a
7 general matter, I think we will not include that unless
8 somebody has a problem.

9 MR. KEITH: Section V does present a condensation of
10 our earlier discussions.

11 Our presentation today will follow the agenda
12 shown in Exhibit i. For each of the systems described, we
13 will provide an introduction, system overview, and summary
14 of conformance with regulatory requirements to familiarize
15 the Board with our design.

16 I plan to ask for questions at the following
17 points: first following the General Introduction; then
18 following CESSAR Interfaces in the System Overview; then
19 following Operation in the System Overview, which is in the
20 Containment Spray System section; then following Conformance
21 With Regulatory Requirements for the Containment Spray System.
22 At that point, we will try to address as many of the NRC
23 questions on the Containment Spray System as we can. We will
24 then have questions on the Containment Isolation Systems
25 following the System Overview, then following Conformance

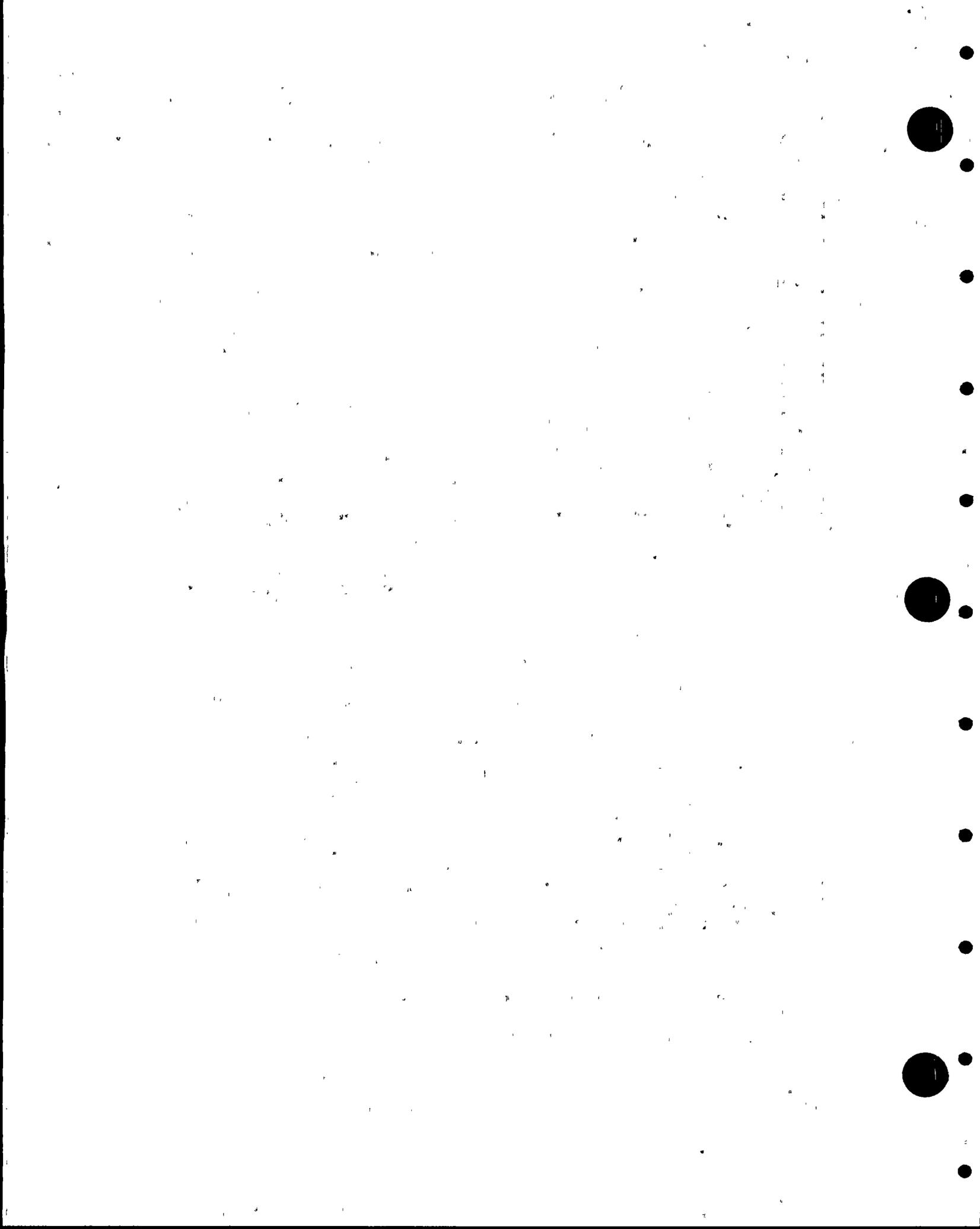


1 With Regulatory Requirements, and then once again we will
2 address the NRC questions on Containment Isolation Systems.
3 Then for the Combustible Gas Control System, we will ask
4 for questions following the System Overview and following
5 the Conformance With Regulatory Requirements, and then once
6 again we will address the NRC questions on Combustible Gas
7 Control.

8 With that, we will get into the General Introduc-
9 tion.

10 As we stated, the systems we will be talking about
11 are the Containment Spray System, the Containment Isolation
12 Systems, and the Combustible Gas Control System. We have
13 Figure 1-1 shown here to show the basic components of each
14 of these systems. First let's acquaint you with the slide.
15 This is a plan view showing the containment here (indicating)
16 the auxiliary building at this point (indicating),
17 the fuel building here (indicating), and the refueling water
18 tank, which is in the outside area.

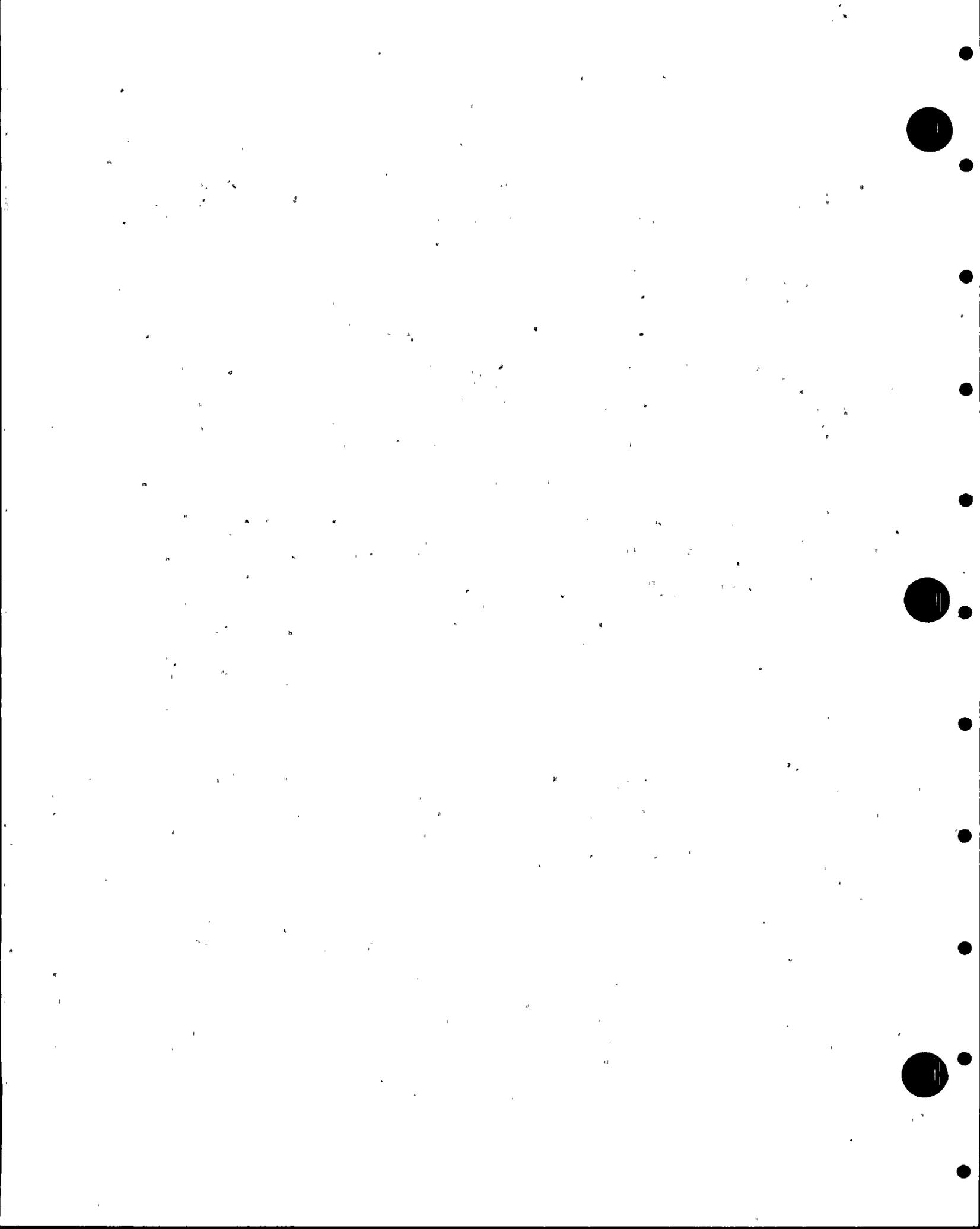
19 Let me take just a second to talk about Palo Verde.
20 At Palo Verde, we have three units which are all identical.
21 Since we have one set of drawings for all the units and the
22 units are not at precisely the same elevation, we have a
23 reference elevation of grade for each unit at 100 feet, so
24 when you see a designation on here of 120 feet, that, for
25 example, is 20 feet above grade for that unit.



1 Getting to the Containment Spray System, we have
2 the containment spray pumps located in the bottom level of
3 the auxiliary building at elevation 40 feet. That is 60 feet
4 below grade. Those pumps pump water through the shutdown
5 cooling heat exchangers located here (indicating) in the
6 auxiliary building at elevation 70 feet. They pump into
7 the containment through penetrations located in this area
8 (indicating) and up into the dome of the containment, and
9 this shows the three rings of the containment spray headers.
10 There are three rings per train located up in the dome. The
11 spray pumps initially following an accident take suction from
12 the refueling water tank, and that is shown here (indicating)
13 as I stated, in the outside areas.

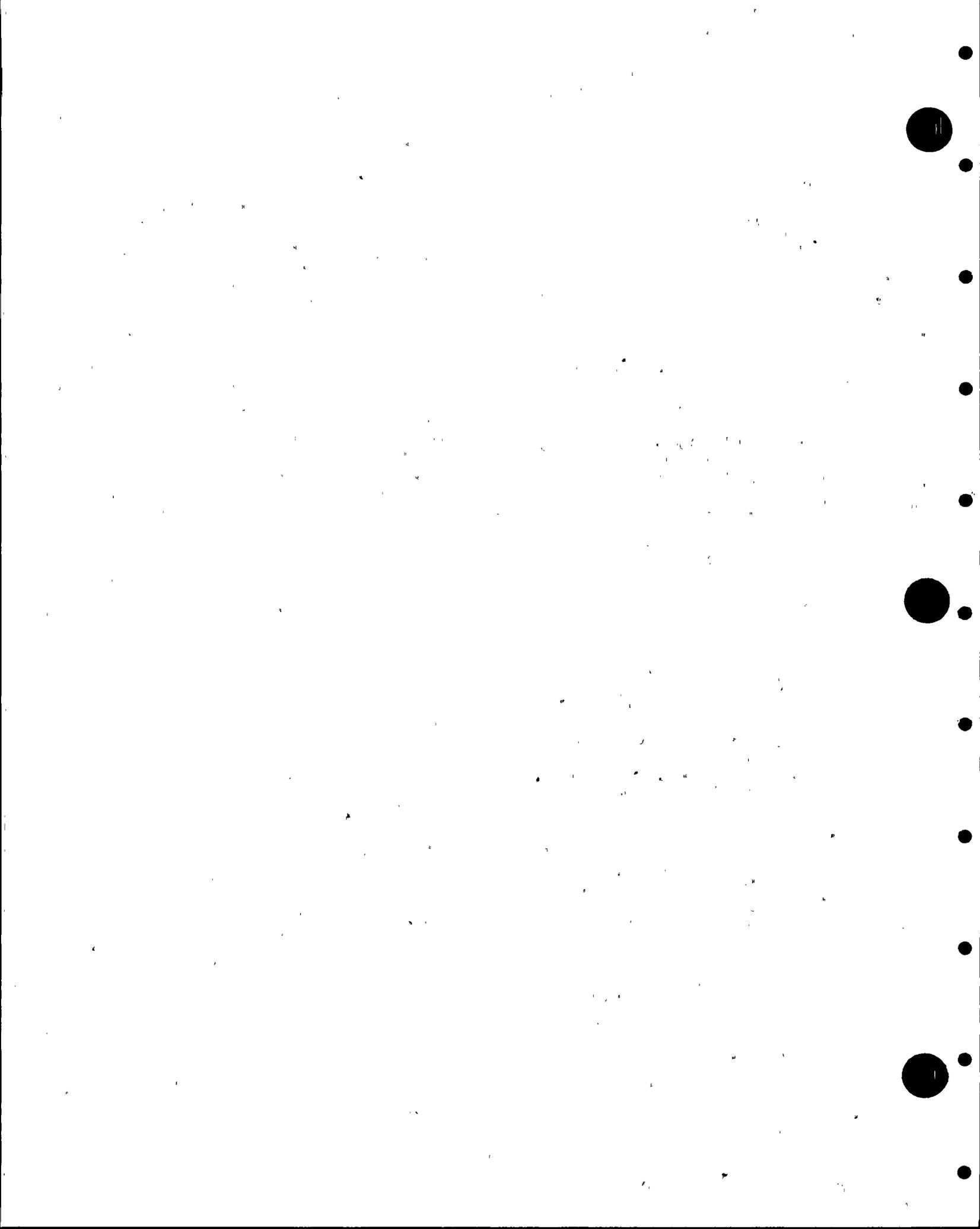
14 The Containment Isolation System consists of a
15 number of valves and penetrations, and for our mechanical
16 and electrical penetrations, they are all located in this
17 area (indicating). As we say, the piping penetrations, most
18 of them, are in the elevation 88 to 95 feet inside contain-
19 ment, and then, of course, outside containment in these two
20 areas (indicating).

21 Our Combustible Gas Control System consists of
22 two hydrogen recombiners for the site. For all three units,
23 we have two recombiners, which, of course, are portable, and
24 we have one hydrogen purge exhaust unit, which, of course,
25 is also portable. The recombiners are Seismic Category I,



1 Quality Class Q. These terms I will define later in the
2 presentation. The hydrogen purge exhaust unit is not a
3 safety grade component. In each of the units, the hydrogen
4 recombiners will be located at these points (indicating),
5 and these are at the 100-foot level in the auxiliary
6 building. The recombiner control panels are located right
7 here (indicating) in the auxiliary building. The hydrogen
8 purge exhaust unit is located at this point (indicating)
9 once again on the 100-foot level, and then we have two post-
10 LOCA hydrogen analyzers. We have two in each unit. These
11 are permanently installed. These are located here (indicating)
12 and here (indicating), the second one being at the 120-foot
13 level.

14 Figure 1-2 shows these same components in elevation,
15 once again the containment spray pump down at the bottom
16 level of the auxiliary building, the shutdown cooling heat
17 exchanger at the 70-foot level, the containment spray risers
18 and spray headers in the dome of the containment. We also
19 have some auxiliary spray nozzles underneath slabs at these
20 levels (indicating) inside containment. The containment
21 isolation valves, of course, are located, the bulk of them,
22 at about this level (indicating) in the containment and
23 auxiliary building. The only component of the Combustible
24 Gas Control System which shows on this is one of the hydrogen
25 analyzers.

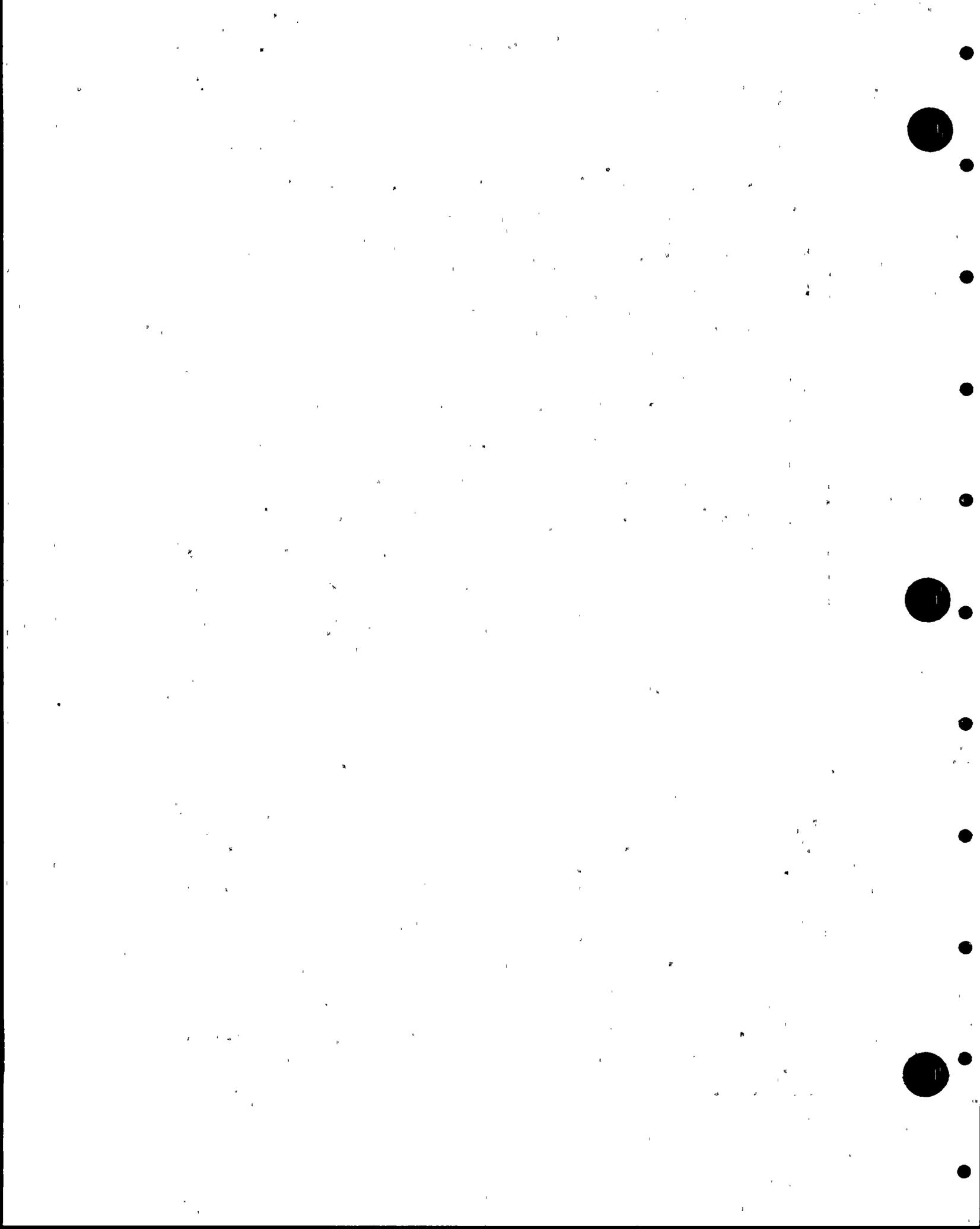


1 Exhibit 1-1 shows the PVNGS Classifications. We
2 wanted to give you a brief introduction to this. I have
3 already used a couple of terms which we use to describe our
4 components. All components which are safety-related, such
5 as all Engineered Safety Features components, are all ASME
6 Section III components and all Class IE components, are all
7 classified as Quality Class Q, and this means we provide a
8 quality assurance program for these components which meets
9 all the requirements of 10CFR50, Appendix B.

10 On the Palo Verde project, we also have another
11 formal quality assurance program, and this we have designated
12 Quality Class R. The quality assurance program we apply is
13 similar to the requirements of 10CFR50, Appendix B, but with
14 less documentation, particularly in the area of material
15 traceability. The equipment we designate as Quality Class R
16 is all equipment required for power generation and any
17 equipment required for personnel safety which is not already
18 designated Q.

19 The remainder of the equipment in the plant is
20 industry standard equipment, off-the-shelf items, if you
21 will, and that we have designated as Quality Class S.

22 In the area of seismic design, corresponding to
23 all of our equipment which we have designated Quality Class
24 Q, all of that equipment will be designed as Seismic
25 Category I, which means that it will remain functional during



1 a Safe Shutdown Earthquake and remain in the elastic range,
2 this is for mechanical equipment, during an Operating Basis
3 Earthquake.

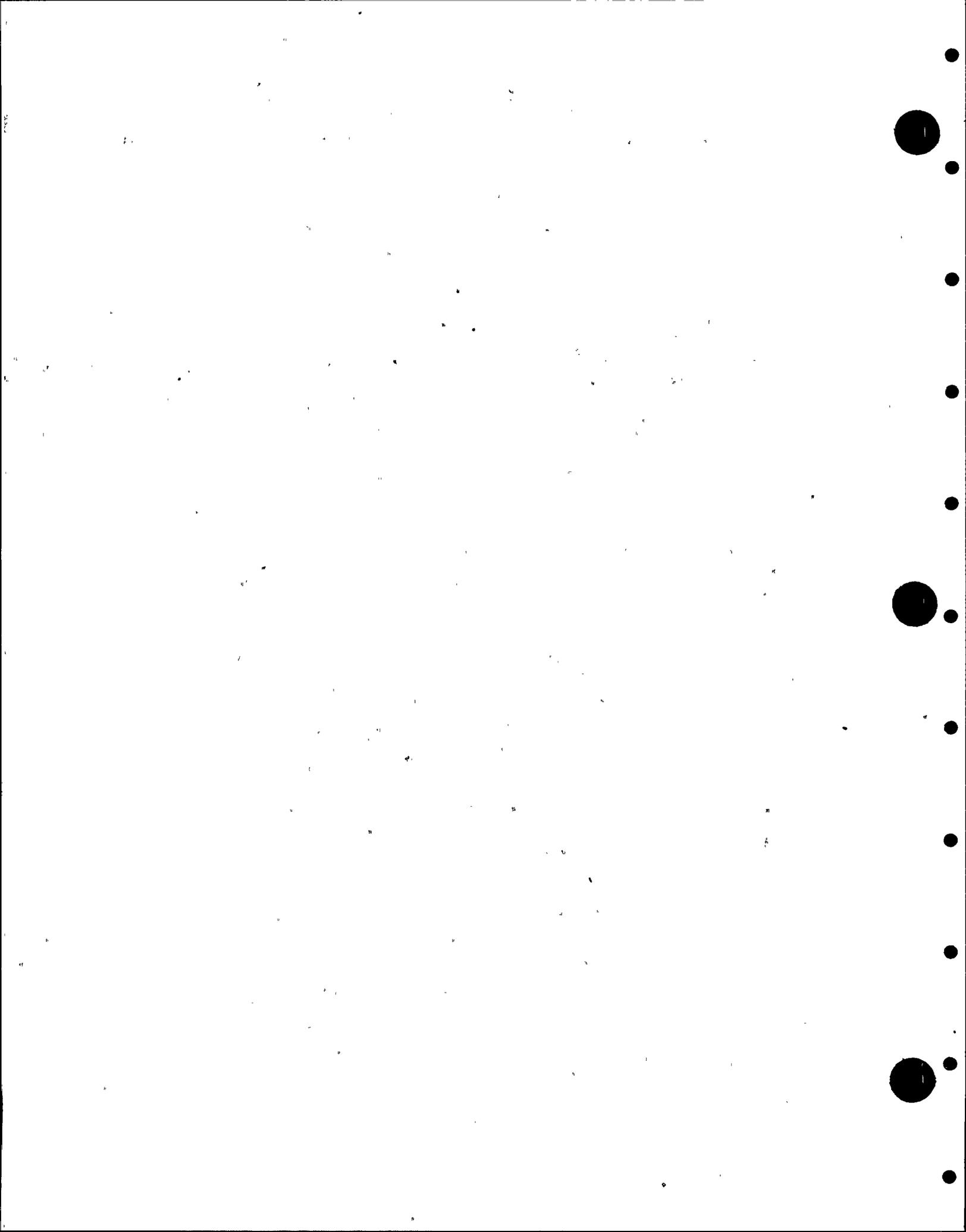
4 Corresponding to Quality Class R equipment, we have
5 designated that those equipments which are Quality Class R
6 will be designed to Seismic Category II, and this design
7 will assure that they will not malfunction given an equiva-
8 lent static load of 0.13G horizontal and 0.09G vertical
9 accelerations.

10 The Quality Class S equipment we have designated
11 Seismic Category III and designed for an equivalent static
12 load of 0.05G or UBC Seismic Zone 2.

13 Some of the R and S equipment may be located in
14 areas such that in the event of a Safe Shutdown Earthquake,
15 it could collapse or fall down such that it could damage
16 Quality Class Q equipment. If we have any equipment that
17 falls into that category, it will be designated Seismic
18 Category IX rather than Seismic Category II or III and they
19 will then be designed such that it does not collapse in the
20 event of a Safe Shutdown Earthquake.

21 This concludes the General Introduction. Are there
22 any questions at this point in time?

23 MR. VAN BRUNT: Dennis, I've got one just for
24 clarification. When you were presenting Figure 1-1, I think
25 you mentioned there were three containment spray headers.



1 Both this drawing and 1-2 show four. I just wanted for the
2 record to clarify which one, three or four, is correct?

3 MR. KEITH: Four is correct.

4 MR. VAN BRUNT: Carter.

5 MR. ROGERS: Figure 1-1, also. I think for the
6 record it might be good to point out on Figure 1-1 where
7 the safeguard sumps are located inside the containment and
8 what elevation they are.

9 MR. KEITH: We will be getting into this in some
10 detail later. They are located roughly in these two areas
11 (indicating) and the top of the sump is elevation 80.

12 MR. ROGERS: Thank you.

13 MR. HELD: I am wondering where the NRC Quality Group
14 B fits into your definition of Quality Groups Q, R, and S?

15 MR. KEITH: All ASME Section III components are
16 Quality Class Q, so A, B, and C are all Quality Q and
17 Seismic Category I.

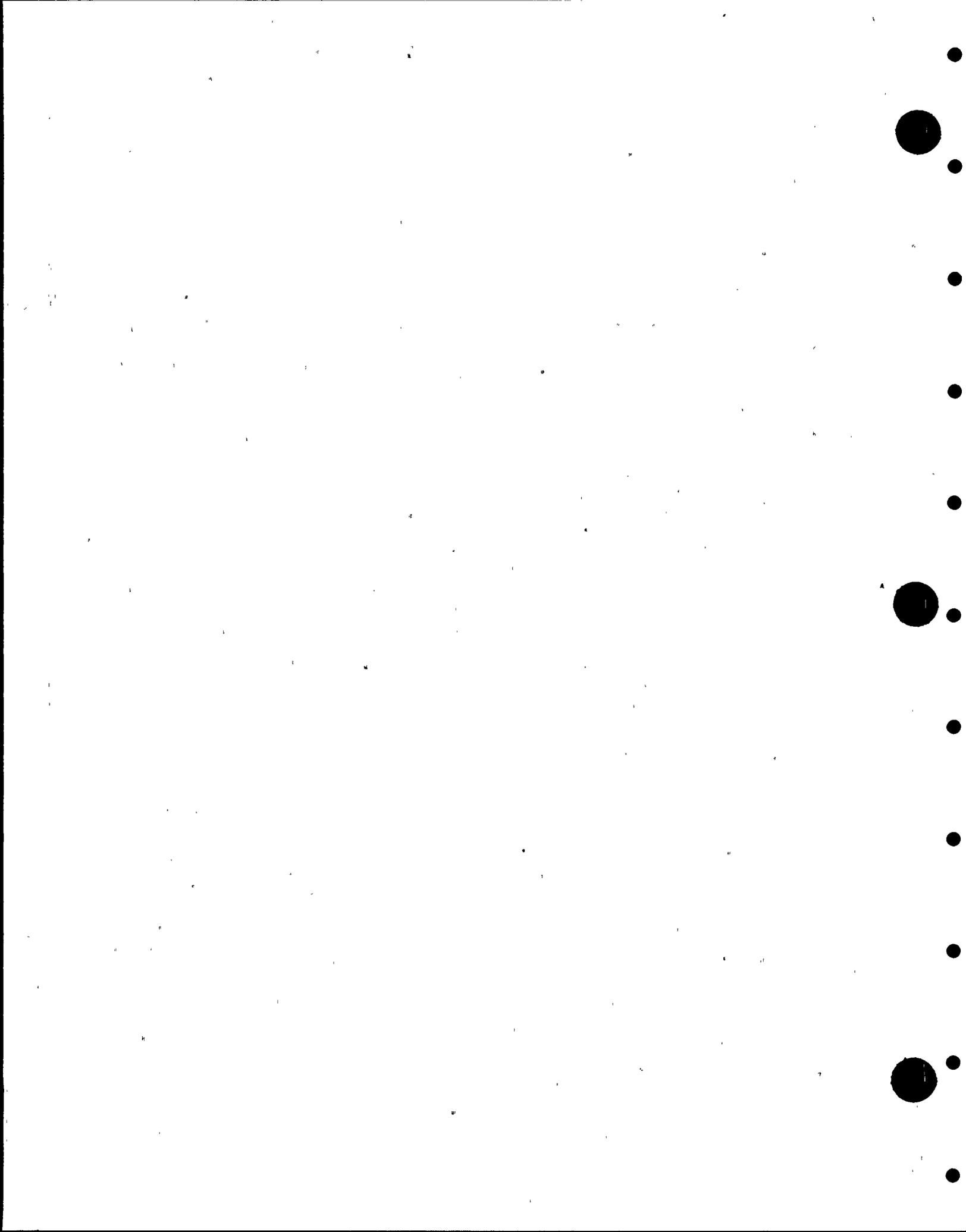
18 MR. HELD: Thank you.

19 MR. VAN BRUNT: Any other questions at this point?

20 Dennis, continue.

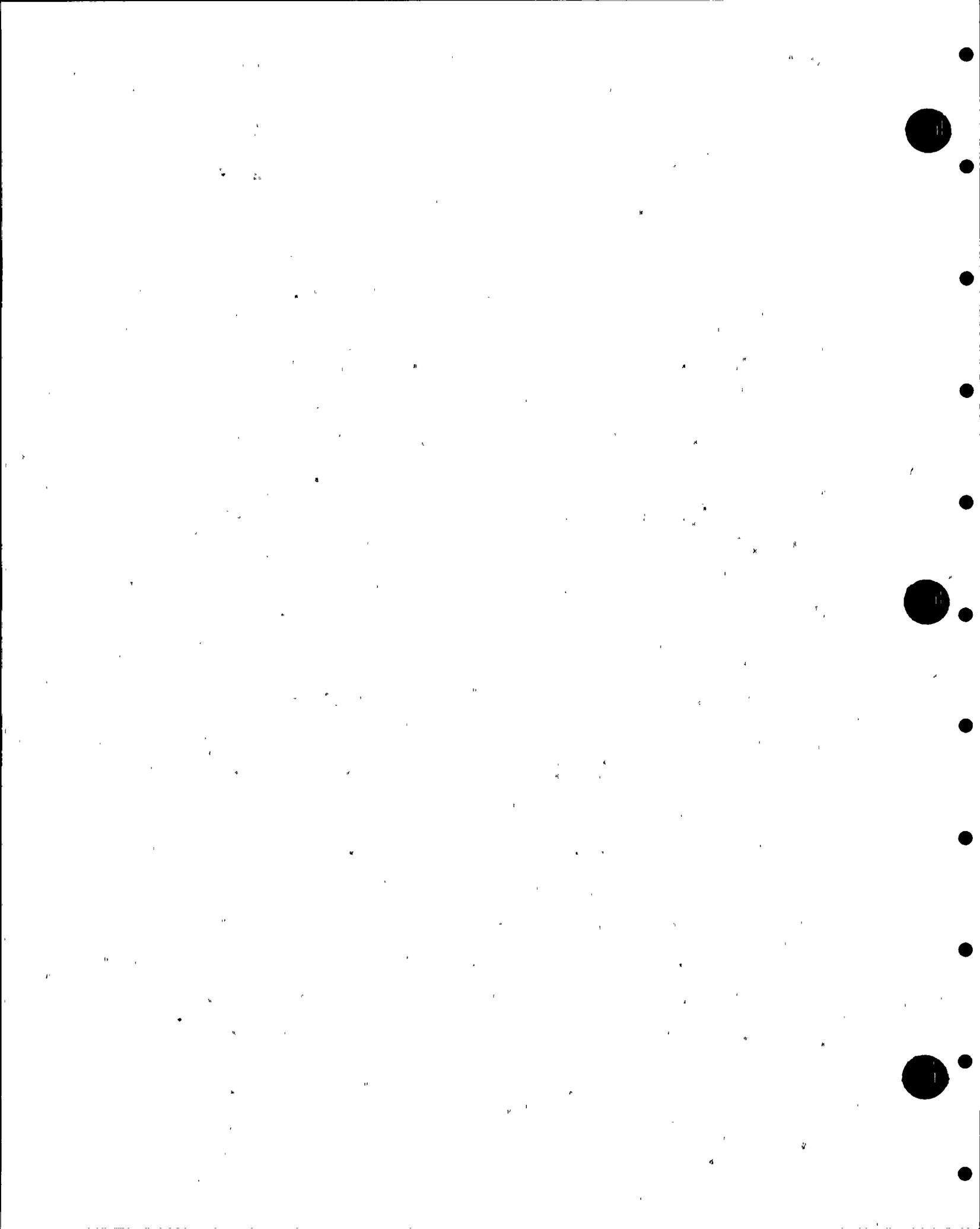
21 MR. KEITH: With that, I will turn the presentation
22 over to Paul Biba, who will present the Containment Spray
23 System.

24 MR. BIBA: Figure 2-1 shows a schematic of the
25 Containment Spray System and the main components of the



1 system: The containment recirculation pumps, which are
2 located in the containment building; the refueling water
3 tank, which is located in the yard area; the containment
4 spray pumps, which are located in the auxiliary building;
5 the shutdown cooling heat exchangers, which are in the
6 auxiliary building, also; and two trains of spray headers,
7 which are in the containment building. The basic function
8 of the system is that the water is transferred from the
9 refueling water tank during the injection part of the
10 operation, which is the initial mode of the operation of
11 the system, and is pumped by the containment spray pumps to
12 the shutdown cooling heat exchangers and into the containment.
13 Later on, the suction is transferred to the recirculation
14 sumps in the containment and the water is transferred to the
15 shutdown cooling heat exchangers where the heat load is
16 removed and discharged into the containment spray headers.
17 The alignment of the valves which will be necessary for
18 aligning the suction will be explained later on in the
19 presentation.

20 Exhibit 2-1 shows the design criteria that are
21 used for designing the system. Basically, the Containment
22 Spray System is designed to reduce the pressure and tempera-
23 ture in the containment following a loss of coolant accident
24 or main steam line break and maintain these parameters at
25 acceptably low levels as required by General Design Criteria



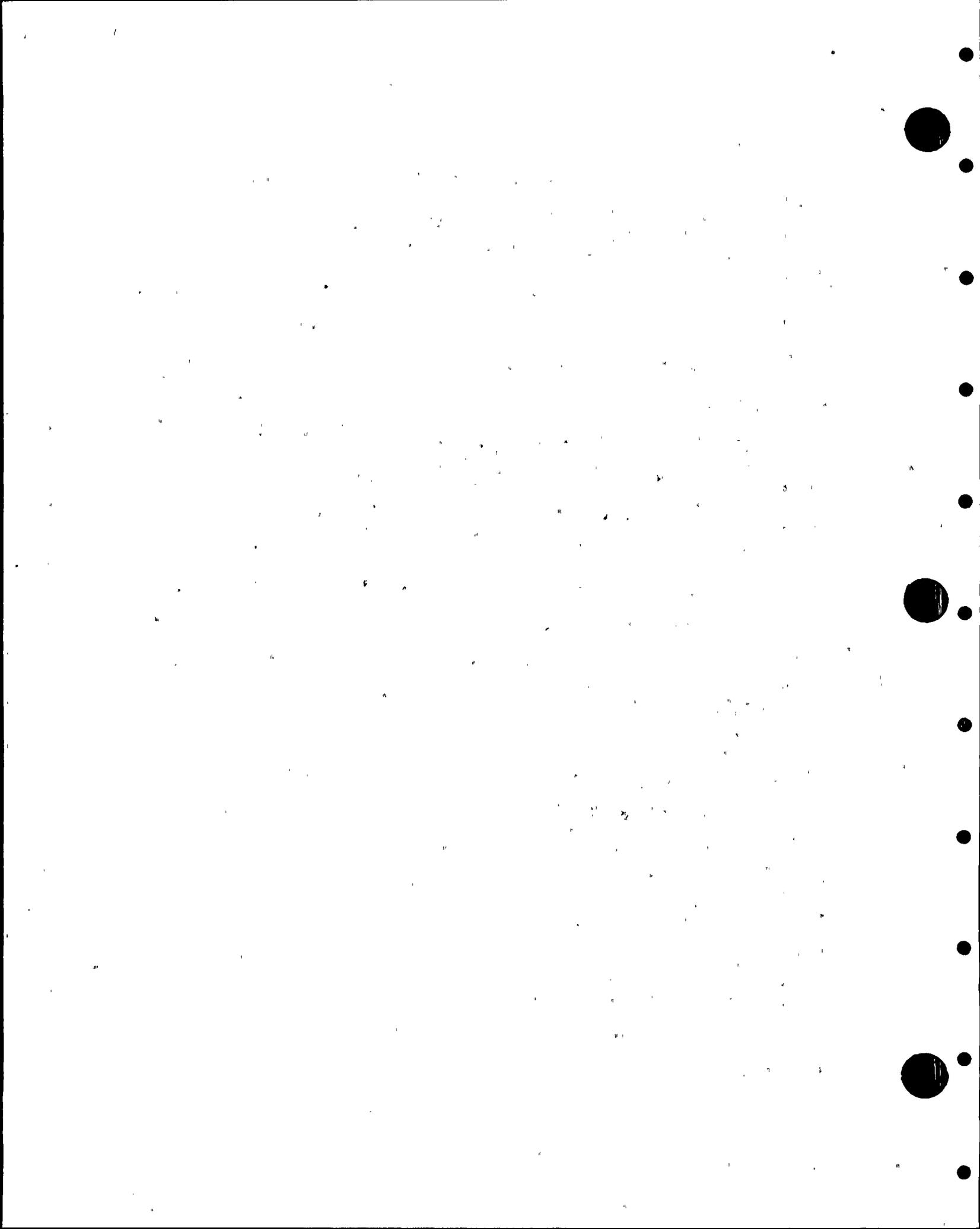
1 38.

2 The Containment Spray System consists of two
3 redundant and independent trains each of which will provide
4 100% of the required heat removal capability.

5 The heat removal capacity is such to keep the
6 pressure and temperature in the containment below design
7 conditions for any size break in the reactor coolant system
8 piping up to and including a double-ended break of the
9 largest reactor coolant pipe. The system is also designed
10 for mitigating the consequences of any size break in the
11 main steam line piping up to and including a double-ended
12 break of the main steam line from a single steam generator.
13 During the recirculation mode of the operation, the system
14 will continue to recirculate the water through the shutdown
15 cooling heat exchangers and remove the heat and therefore
16 maintain the pressure and temperature in the containment
17 at acceptable levels. For the containment design basis
18 accident, the containment spray system shall be designed to
19 reduce containment pressure from the peak value to one-half
20 of the peak value in less than 24 hours.

21 Exhibit 2-2. The portions of the Containment
22 Spray System that are located in the containment building
23 shall be designed to remain operable in the containment
24 accident environment.

25 The system shall be designed such that a single



1 failure of any active component will not degrade the system
2 ability to function.

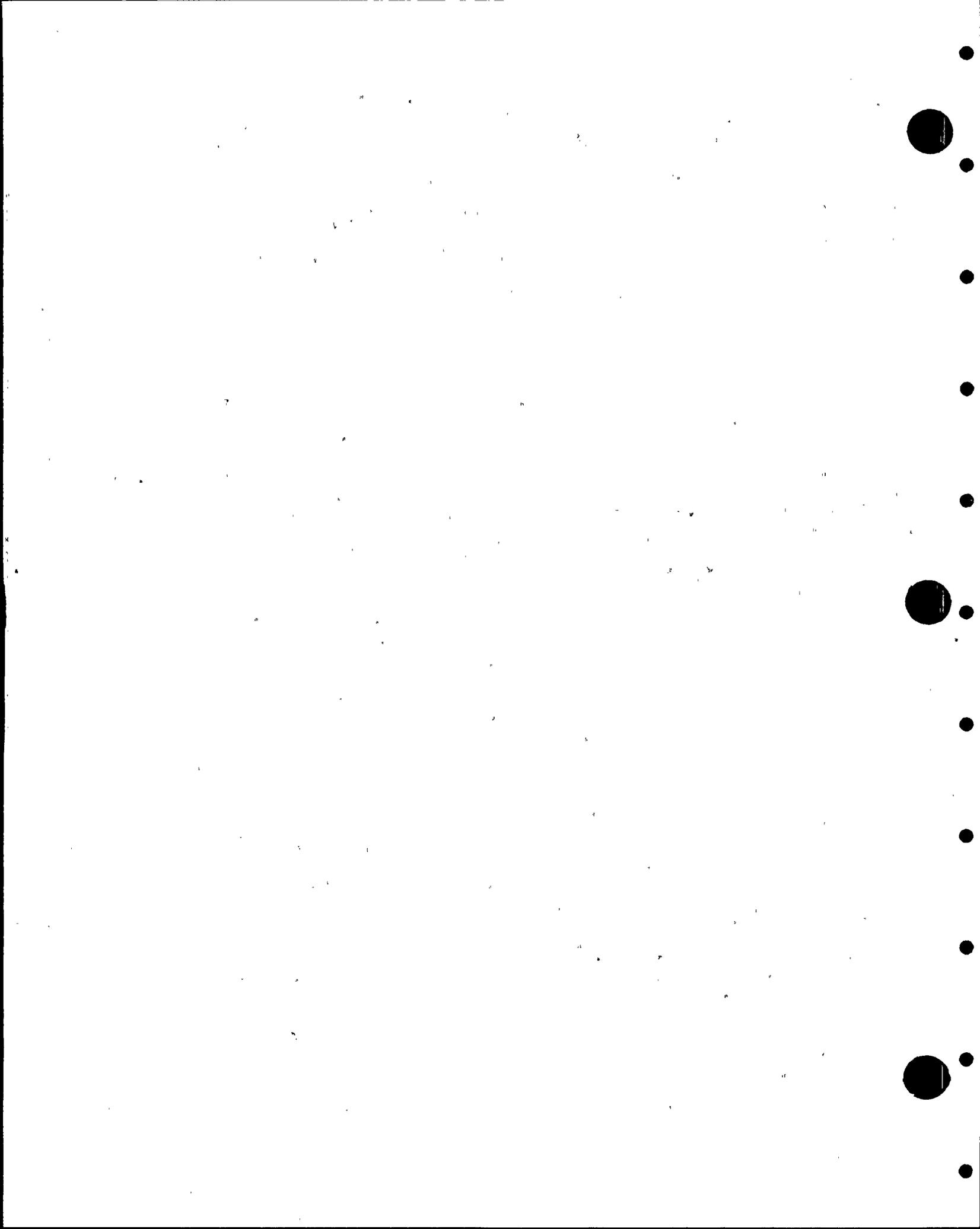
3 Each train of the Containment Spray System shall
4 receive power from a separate emergency diesel generator
5 in the event of offsite power failure, and the two trains
6 shall be physically separated from each other so that a
7 failure in one train will not result in a failure of the
8 other train due to fire, flooding, jet impingement, or
9 missiles.

10 Each train receives separate actuation signals.
11 Critical parameters are monitored and actuation signals
12 are produced in the engineered safety features actuation
13 system.

14 The Containment Spray System shall be designed
15 to Seismic Category I requirements.

16 The Containment Spray System shall be protected
17 against the dynamic effects associated with the postulated
18 rupture of piping.

19 Exhibit 2-3 shows the remaining design criteria
20 that are used. The Containment Spray System shall be designed
21 to permit periodic inspection and testing, it shall be
22 designed to accommodate the addition of hydrazine to the
23 spray water to rapidly reduce fission product iodine concen-
24 tration in the containment building, and the system sizing
25 shall be based on the long-term heat rejection function of



1 the system. For that purpose, the shutdown cooling heat
2 exchangers of the shutdown cooling system are equalized to
3 reject heat from the containment.

4 Exhibit 2-4 shows the design codes and standards
5 which are used for designing the piping and valves, the
6 pumps, and the heat exchangers.

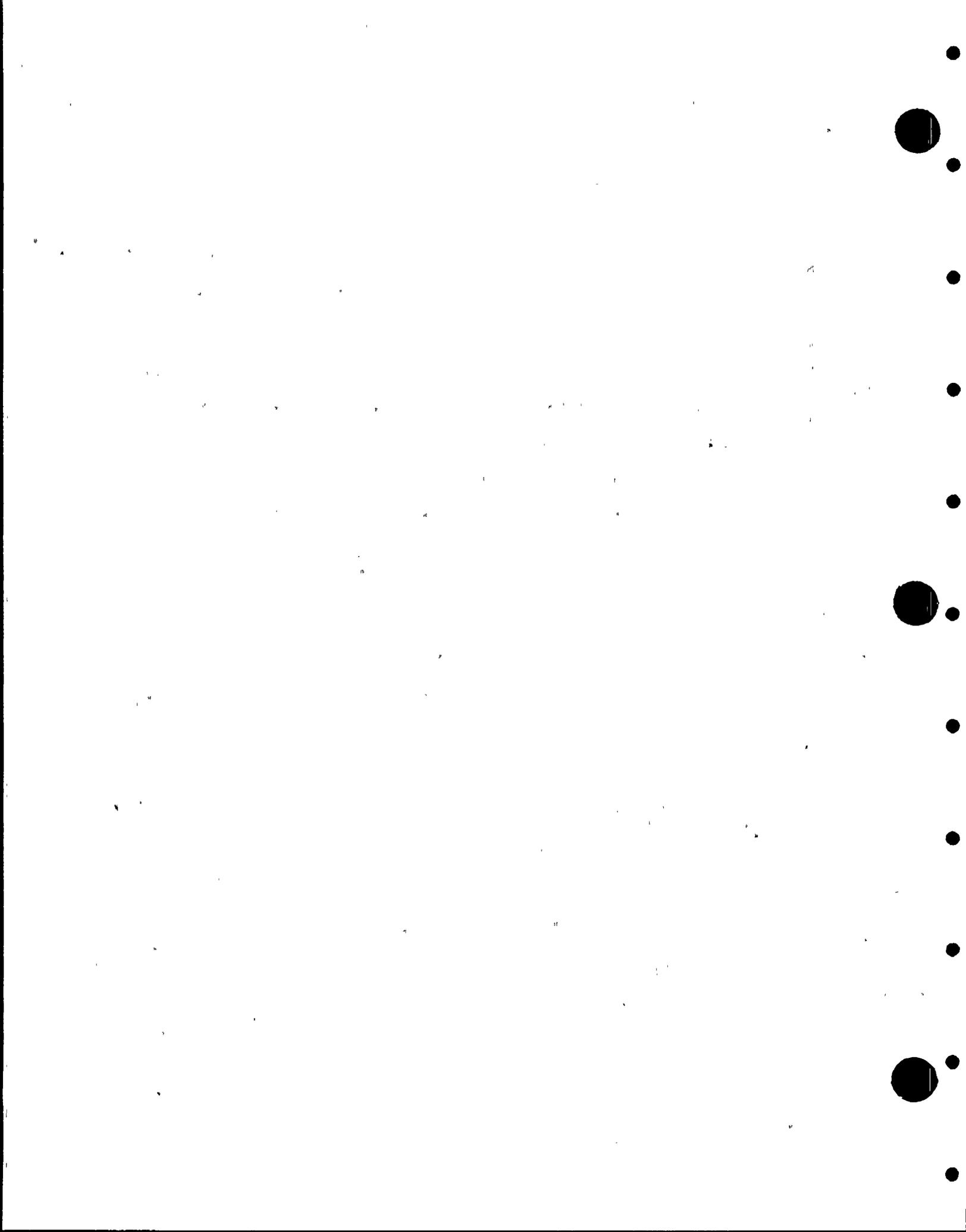
7 Exhibit 2-5 shows the interface requirements from
8 CESSAR Appendix 6A, Section 7, that relate to this Containment
9 Spray System.

10 On the requirement for power, the Containment
11 Spray System pumps, valves, and instrumentation shall be
12 capable of being powered from three power sources: the plant
13 turbine generator, the plant startup power source, which is
14 the offsite power, and the emergency generators. PVNGS is
15 in compliance with that.

16 Requirement that the power connections shall be
17 through a minimum of two independent buses so that in the
18 event of a LOCA in conjunction with a single failure in the
19 electrical supply, the flow from one containment spray train
20 shall be available. PVNGS is in compliance.

21 Exhibit 2-6 continues with the power requirements
22 of CESSAR that each electrical bus shall be connected to one
23 containment spray pump and associated valves and instrumenta-
24 tion. In compliance.

25 Each emergency generator and automatic sequencers



1 necessary for generator loading shall be designed such that
2 flow to the containment atmosphere is attained within a
3 maximum of 58 seconds after a containment spray actuation
4 signal. The full containment spray flow will be attained
5 within 90 seconds after a containment spray actuation signal.
6 Calculations verify the containment heat removal requirements
7 are met.

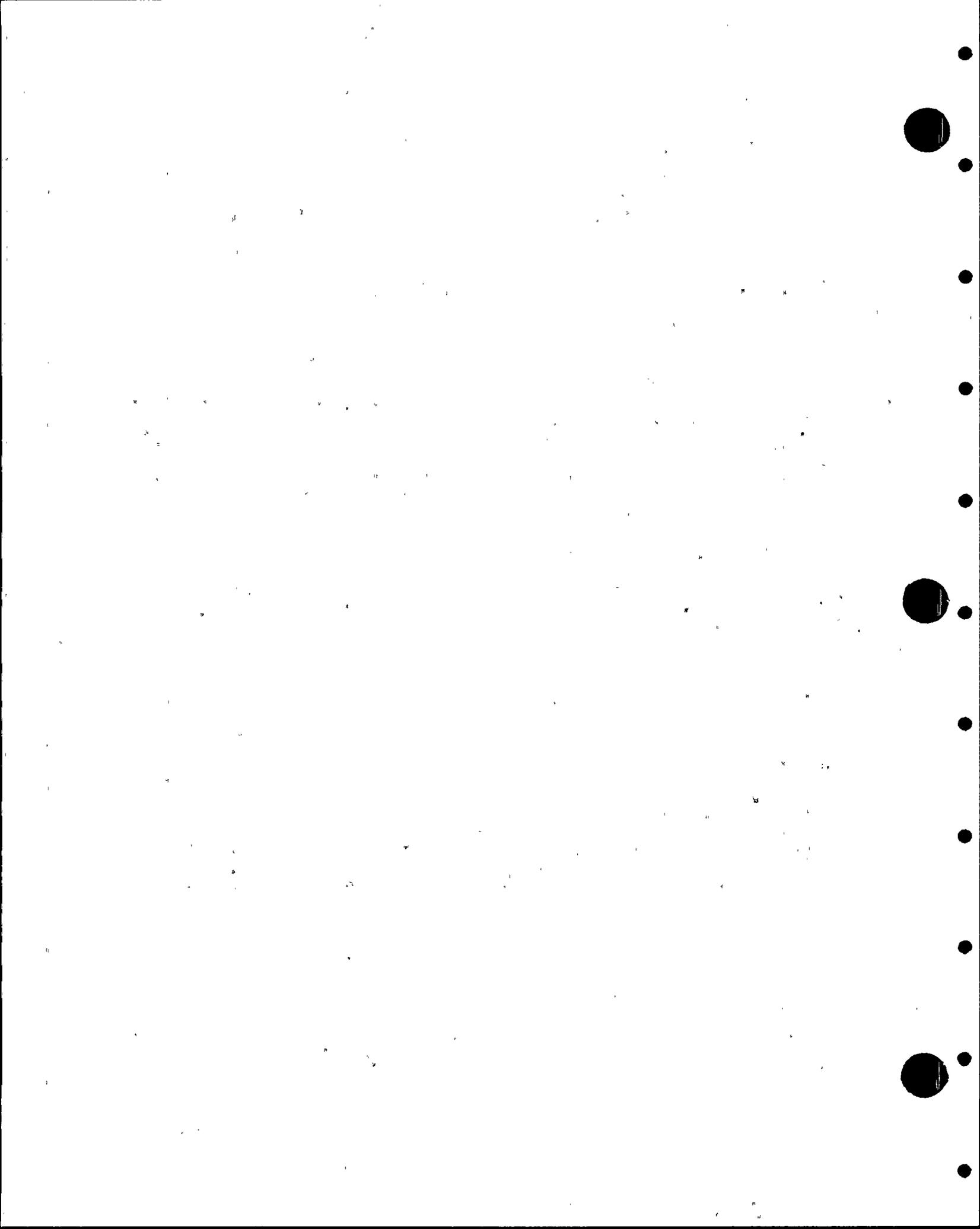
8 The requirement for instrument power supplies to
9 be provided as stated in CESSAR Section 8.3.1. In compliance.

10 Exhibit 2-7 shows requirements for the protection
11 from natural phenomena, specifically that Containment Spray
12 System components shall be capable of functioning in the
13 event of maximum probable flood or other natural phenomena
14 as defined in GDC 2. In compliance.

15 Protection from pipe failure. The maximum expected
16 leakage from a moderate energy pipe rupture postulated during
17 normal plant conditions in the Containment Spray System shall
18 be as defined by the methods of CESSAR Section 3.6.1. In
19 compliance.

20 Exhibit 2-8, the requirement that no limited
21 leakage passive failure or the effects thereof shall preclude
22 the availability of at least one CSS train to the operation.
23 In compliance.

24 The Containment Spray System shall be protected from
25 the effects of pipe whip or pipe rupture. In compliance.



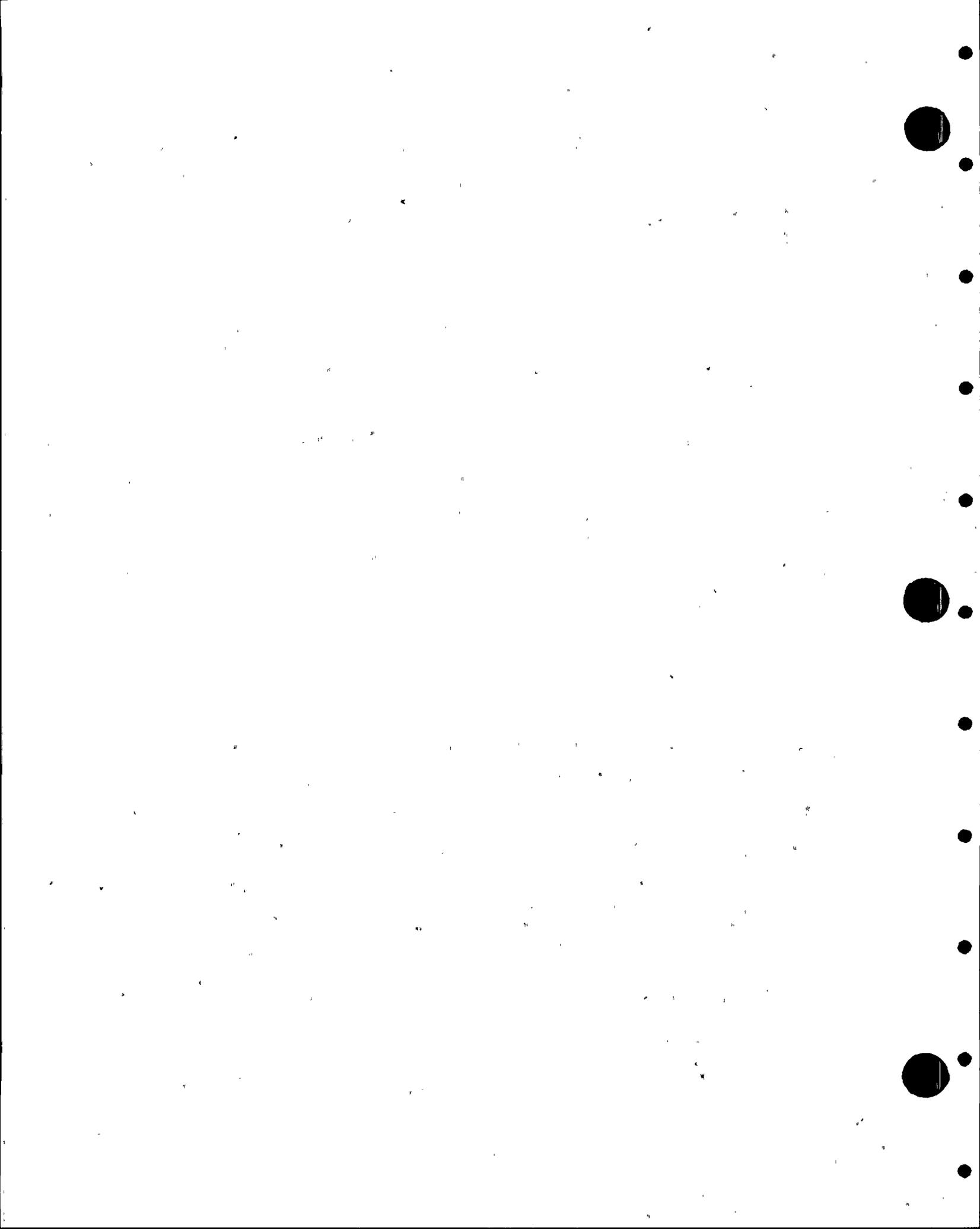
1 Exhibit 2-9, the requirement for protection from
2 missiles. The Containment Spray System shall be protected
3 from effects of missiles. In compliance.

4 Requirements for separation. Adequate physical
5 separation shall be maintained between redundant piping
6 paths and containment penetrations of the Containment
7 Spray System such that the Containment Spray System will
8 meet its functional requirements during a single active
9 failure during the injection mode, or with a single active
10 failure or limited leakage passive failure during the
11 recirculation mode. In compliance.

12 Exhibit 2-10, requirement that the cabling which
13 is associated with the Containment Spray System will be
14 physically separated to preserve redundancy and prevent a
15 single event from causing multiple channel malfunctions.
16 In compliance.

17 Exhibit 2-11, requirement that in the routing of
18 the Containment Spray System Class IE circuits and additional
19 equipment that these circuits are serving, consideration
20 shall be given to their exposure to potential hazards such
21 as postulated ruptures of piping, flammable material, flood-
22 ing, and so on. In compliance.

23 The failures of nonsafety grade systems shall not
24 compromise redundancy of the Containment Spray System.
25 In compliance.



1 Exhibit 2-12, requirement that each Containment
2 Spray System train shall be provided with an independent
3 environmental control system. In compliance.

4 The power connections for Containment Spray System
5 components shall be from a minimum of two independent
6 electrical buses. In compliance.

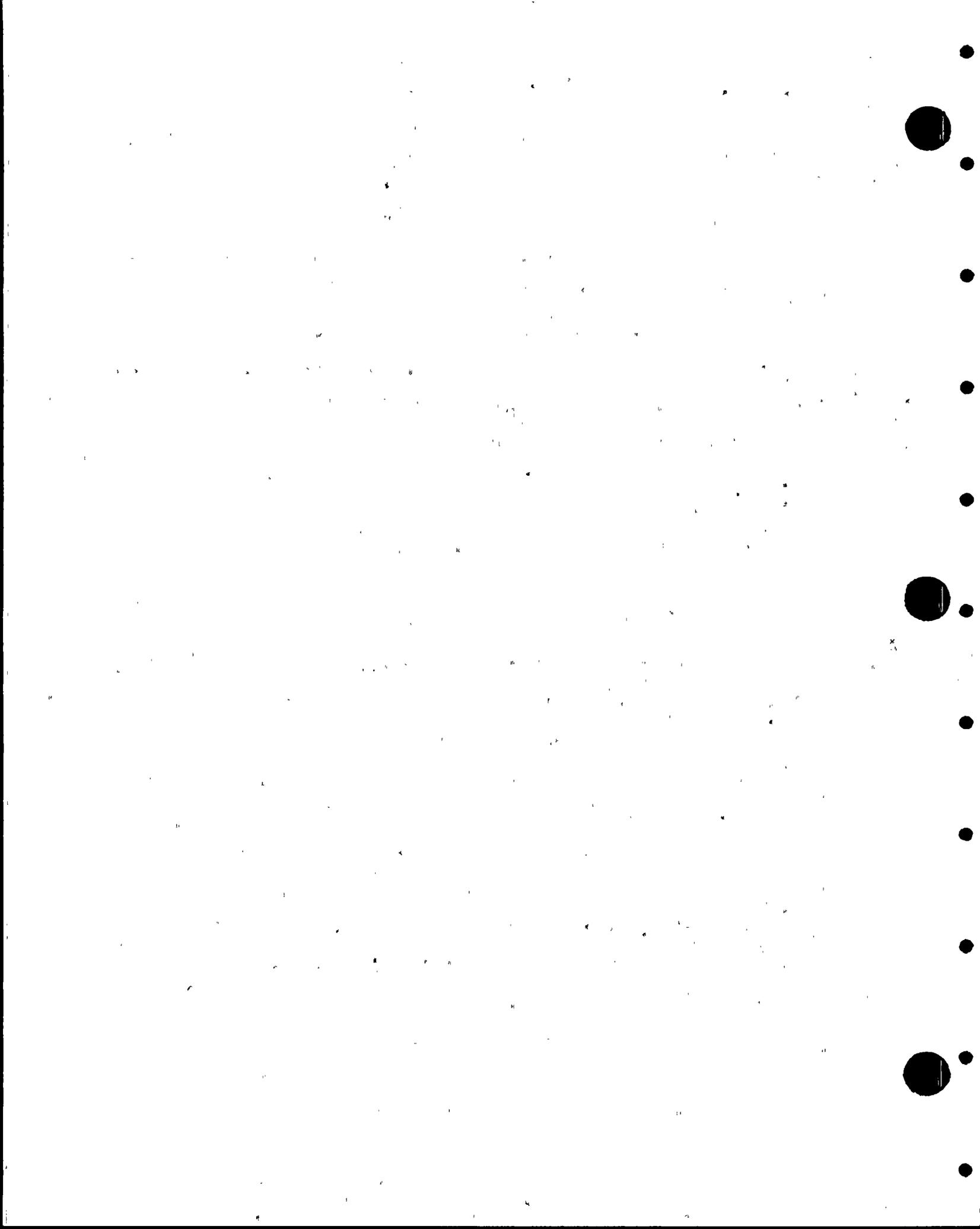
7 There shall be two independent vital instrument
8 power sources available for the Containment Spray System
9 instrumentation. In compliance.

10 Exhibit 2-13, Thermal Limitations. Each Contain -
11 ment Spray System train shall be provided with an independent
12 environmental control system that is specified in CESSAR
13 Section 3.11. In compliance.

14 Requirement for monitoring. Provisions shall be
15 made for the detection, containment, and isolation of the
16 maximum expected leakage from a moderate energy pipe rupture
17 in one train. In compliance.

18 Exhibit 2-14, requirement for inspection and
19 testing, relates to the inspection and testing of the
20 Containment Spray System which is described in CESSAR
21 Appendix 6A, Section 8, CESSAR Section 16, and CESSAR
22 Appendix 6A, Section 9. In compliance.

23 Exhibit 2-15 shows the requirement for the
24 chemistry and sampling. The chemistry of the water shall be
25 as shown on Paragraph 1). In compliance. Requirement for



1 sampling, the sampling system shall provide means to obtain
2 remote liquid samples for laboratory analysis. In compliance

3 Exhibit 2-16 is a continuation of the sampling
4 requirements. The sample lines in contact with the reactor
5 coolant shall be austenitic stainless steel. In compliance.

6 The fluid velocity in the sample lines should be
7 selected to obtain representative samples. In compliance.

8 The sample taps should be located on vertical runs
9 of pipe whenever possible. In compliance.

10 Exhibit 2-17, requirements for materials. The
11 Containment Spray System piping and fittings shall be
12 Seismic Category I. In compliance.

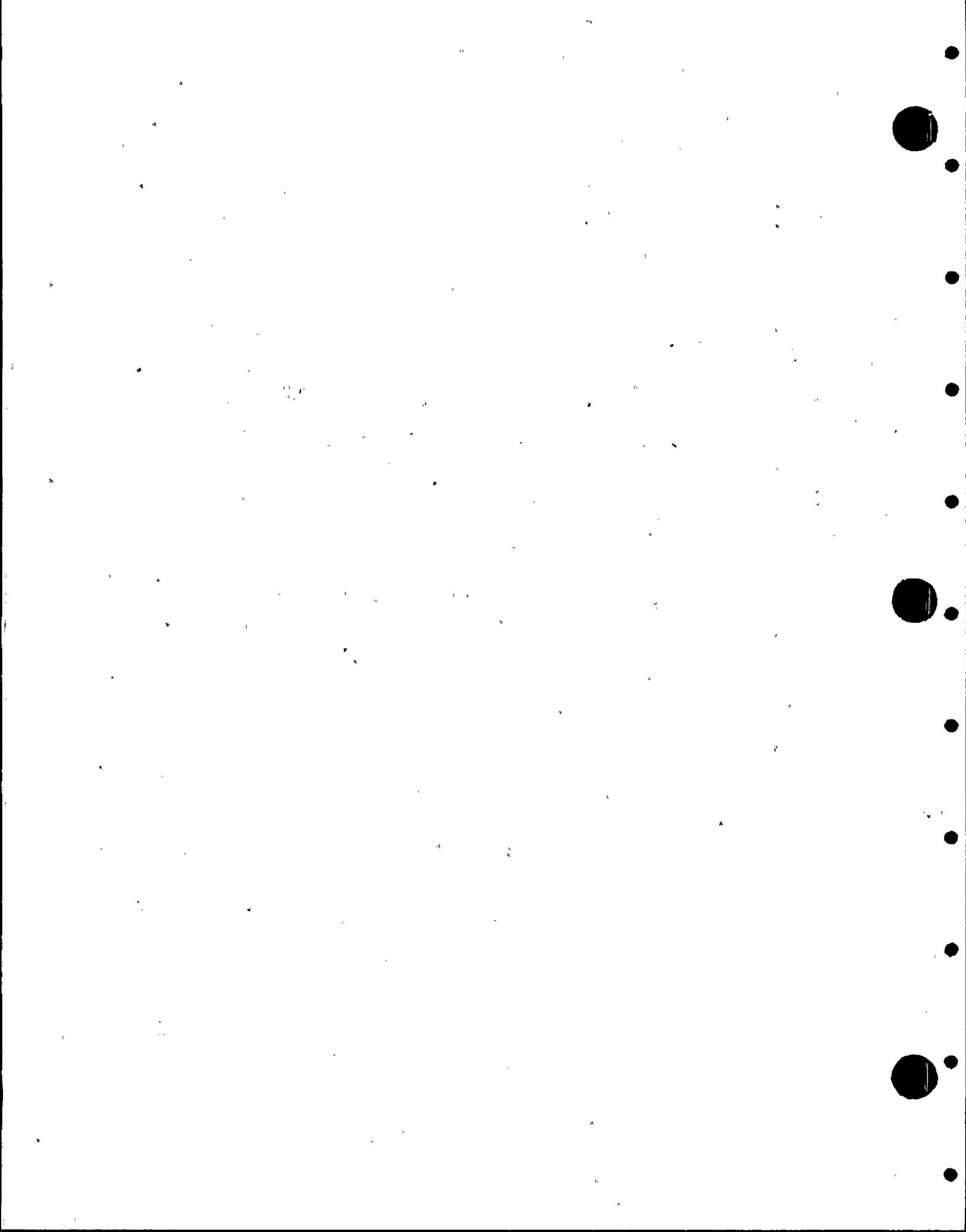
13 The design and fabrication of the Containment Spray
14 System piping and fittings shall conform to ASME Section III,
15 Class 2. In compliance.

16 Pipes and all parts in contact with the system
17 fluid shall be of austenitic stainless steel. In compliance.

18 Exhibit 2-18 continues with the requirements for
19 materials. Care shall be taken to prevent sensitization of
20 stainless steel and to control the delta ferrite content of
21 the welds. In compliance.

22 Controls shall be exercised to assure that
23 contaminants do not significantly contribute to stress
24 corrosion of stainless steel. In compliance.

25 Materials used for the containment and its internal



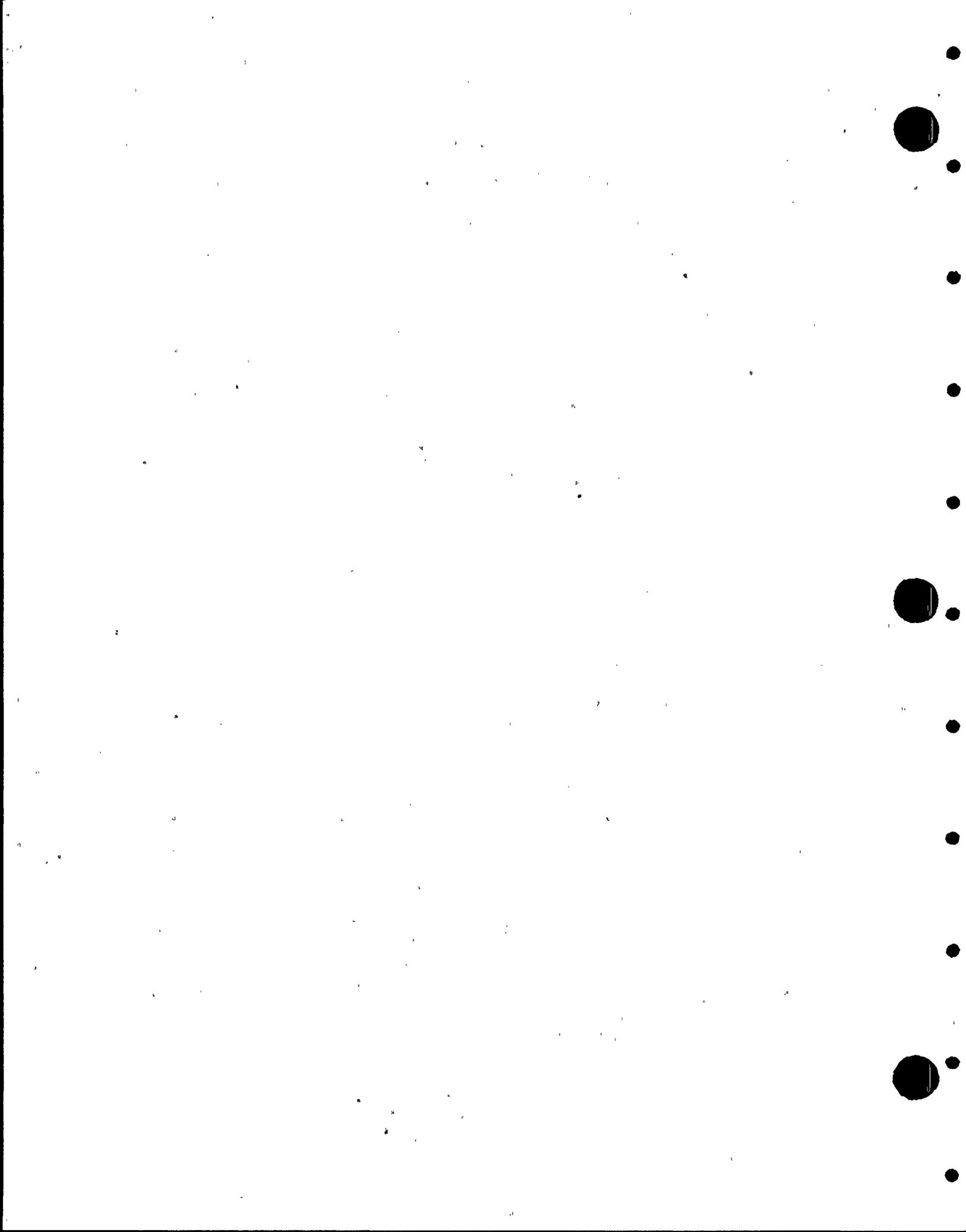
1 structures shall withstand exposure to all post-accident
2 conditions without causing undesirable reactions or
3 significantly altering the recirculating water chemistry.
4 In compliance.

5 Exhibit 2-19 continues with the requirements for
6 the materials. If the Containment Spray System utilizes a
7 common suction with the safety injection system, then the
8 materials used for the piping and fittings shall be austenitic
9 stainless steel. In compliance.

10 Exhibit 2-20, requirements for physical arrangement.
11 To assure that Containment Spray System flow requirements
12 are met, maximum and minimum acceptable head losses for the
13 piping and fittings as they are given in CESSAR Appendix 6A,
14 Table 7-13, should be met. PVNGS is in compliance inasmuch
15 as the Containment Spray System is designed to meet the
16 flow and pressure requirements of the containment spray
17 nozzles.

18 Requirement for flow measurement devices to be
19 provided on the containment spray pump discharge lines, and
20 the piping on the upstream and downstream side of the orifices
21 shall meet the recommendations of "ASME Fluid Meters: Their
22 Theory and Application, Parts 1 and 2." In compliance.

23 Exhibit 2-21, continuation of the requirements for
24 physical arrangement. For each spray train, there shall be
25 a distance of 16 feet between the minimum water level in the

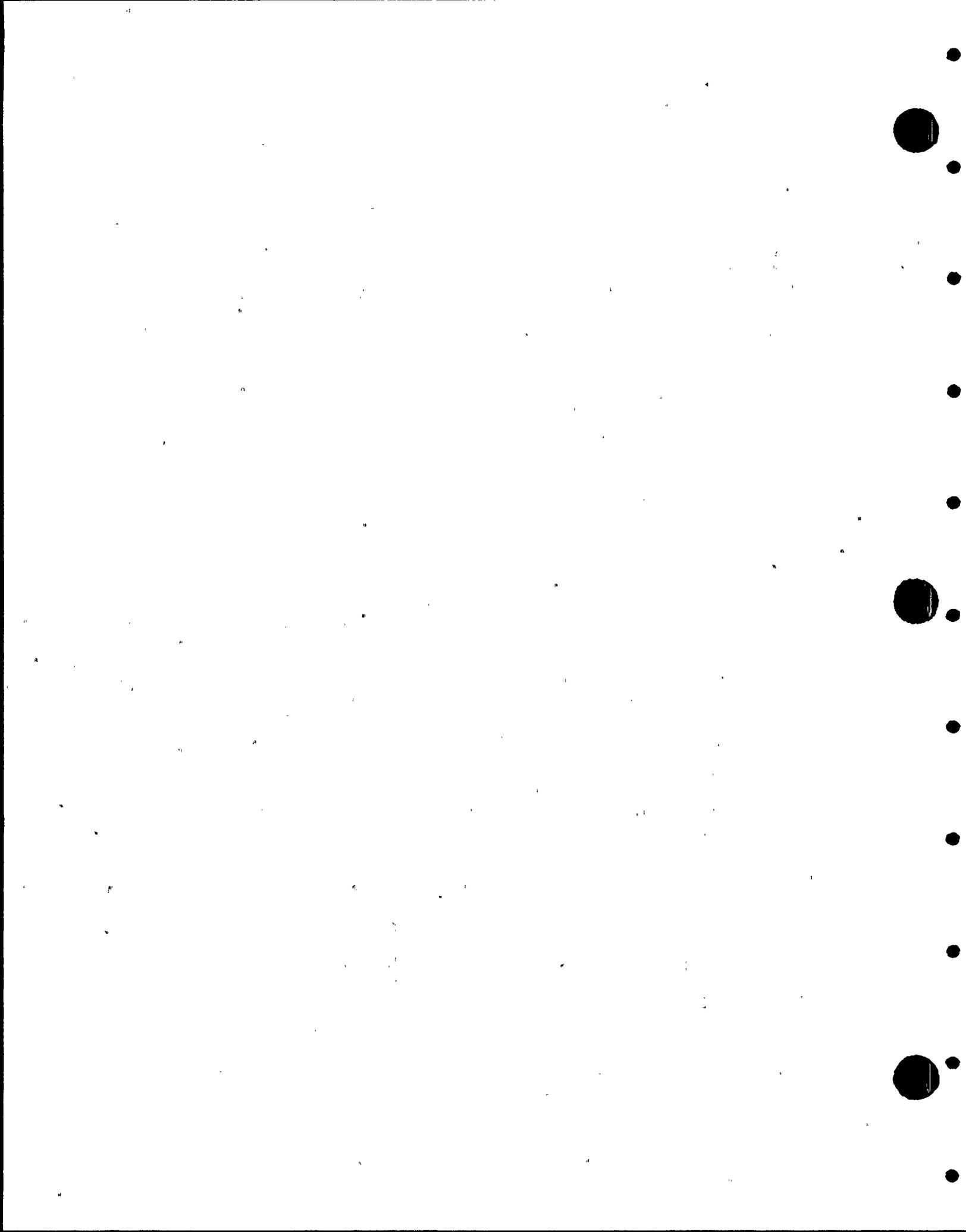


1 containment and the junction point from the refueling water
2 tank discharge piping and the containment sump suction
3 piping. That junction point will be shown here on Figure
4 2-1. The 16-foot requirement is associated with the normal
5 pressure in the containment. If the containment should go
6 sub-atmospheric by values greater than 3 psig below the
7 atmospheric pressure, there shall be an additional 2.31 feet
8 additional submergence for the minimum water level in the
9 containment for every one foot of sub-atmospheric pressure.
10 In compliance.

11 Exhibit 2-22, requirement for frictional losses
12 in the Containment Spray System piping. The suction between
13 the containment sump and the junction point that was discussed
14 a little earlier should not exceed 7 feet unless the
15 elevation of the top of the junction is lowered an additional
16 foot for each foot of head loss. PVNGS is in compliance.
17 The frictional losses are approximately 10 feet. However,
18 the junction point is 22 feet lower than the minimum
19 required distance of 16 feet, and that leads to an acceptable
20 head loss.

21 Requirement for the Containment Spray System pumps
22 to be located in the auxiliary building as close as possible
23 to the containment structure. This is met by PVNGS and
24 PVNGS is in compliance.

25 The elevation of these pumps shall be low enough



1 to provide adequate NPSH to the containment spray pumps. In
2 compliance.

3 Exhibit 2-23, continuation of the physical
4 arrangement. The available NPSH shall be calculated at the
5 pump impeller eye. In compliance.

6 The calculation of NPSH shall consider the
7 concurrent operation of the high pressure safety injection
8 pump, the low pressure safety injection pump, and the
9 containment spray pump. In compliance.

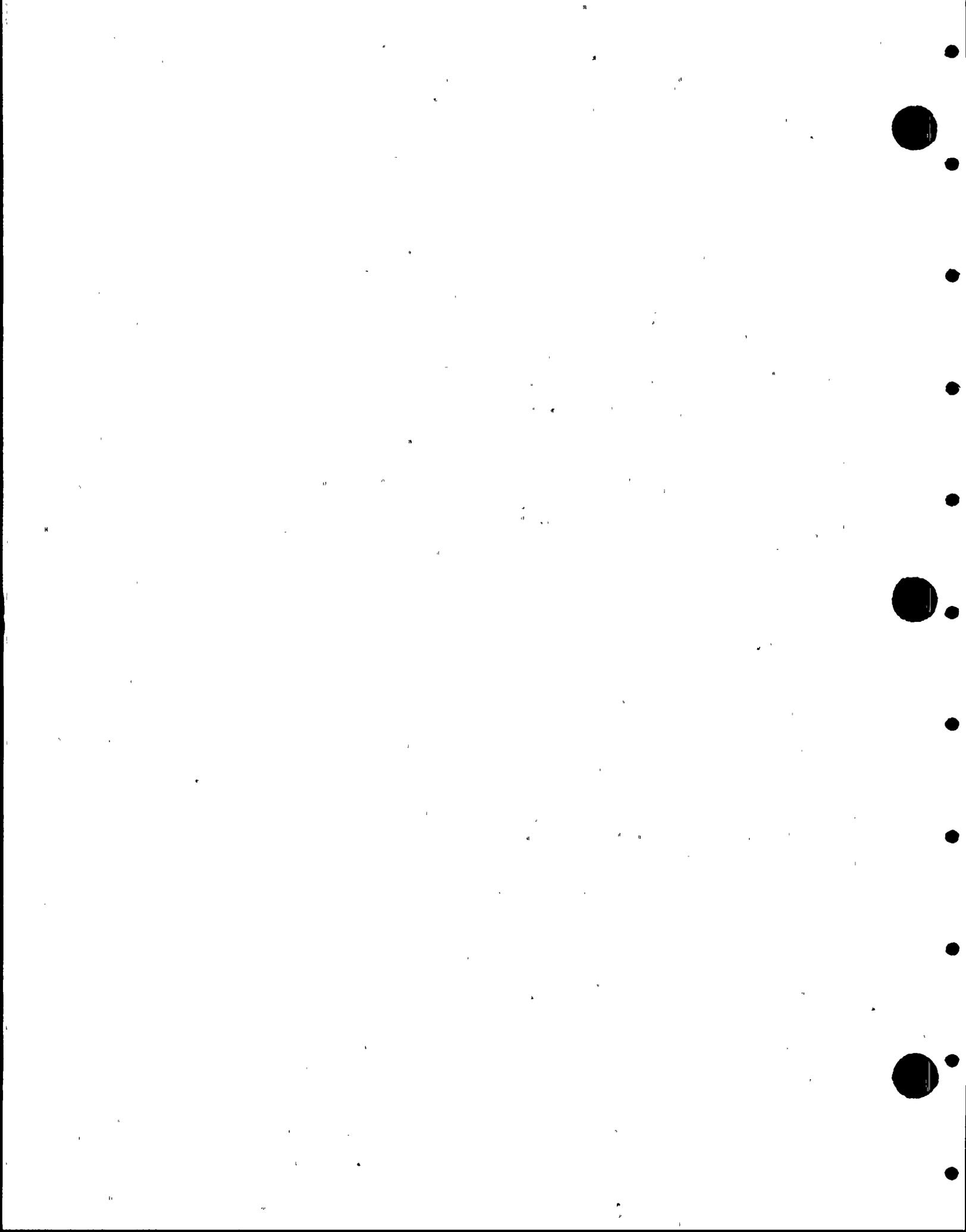
10 Requirement that in the event of a limited leakage
11 passive failure in one Containment Spray System train during
12 recirculation, there shall be personnel access available to
13 the intact train. In compliance.

14 Exhibit 2-24, continuation of the physical arrange-
15 ment requirements. There are two Containment Spray System
16 check valves in each of the spray header lines and they shall
17 be located as close to the containment penetration as possible.
18 In compliance.

19 Allowance shall be made for valve accessibility
20 for maintenance. In compliance.

21 The total volume of the spray header piping shall
22 be kept to a minimum to minimize the spray delay time. In
23 compliance.

24 Requirement for manually operated valves to be
25 provided with locking provisions. In compliance.



1 Exhibit 2-25, continuation of physical arrangement
2 requirements. Physical identification of safety-related
3 equipment and cabling for safety status shall be recognized
4 by the plant personnel. In compliance.

5 In routing of the Containment Spray System
6 Class IE circuits and location of the equipment which is
7 served by these circuits, consideration shall be given to
8 their exposure to potential hazards. In compliance.

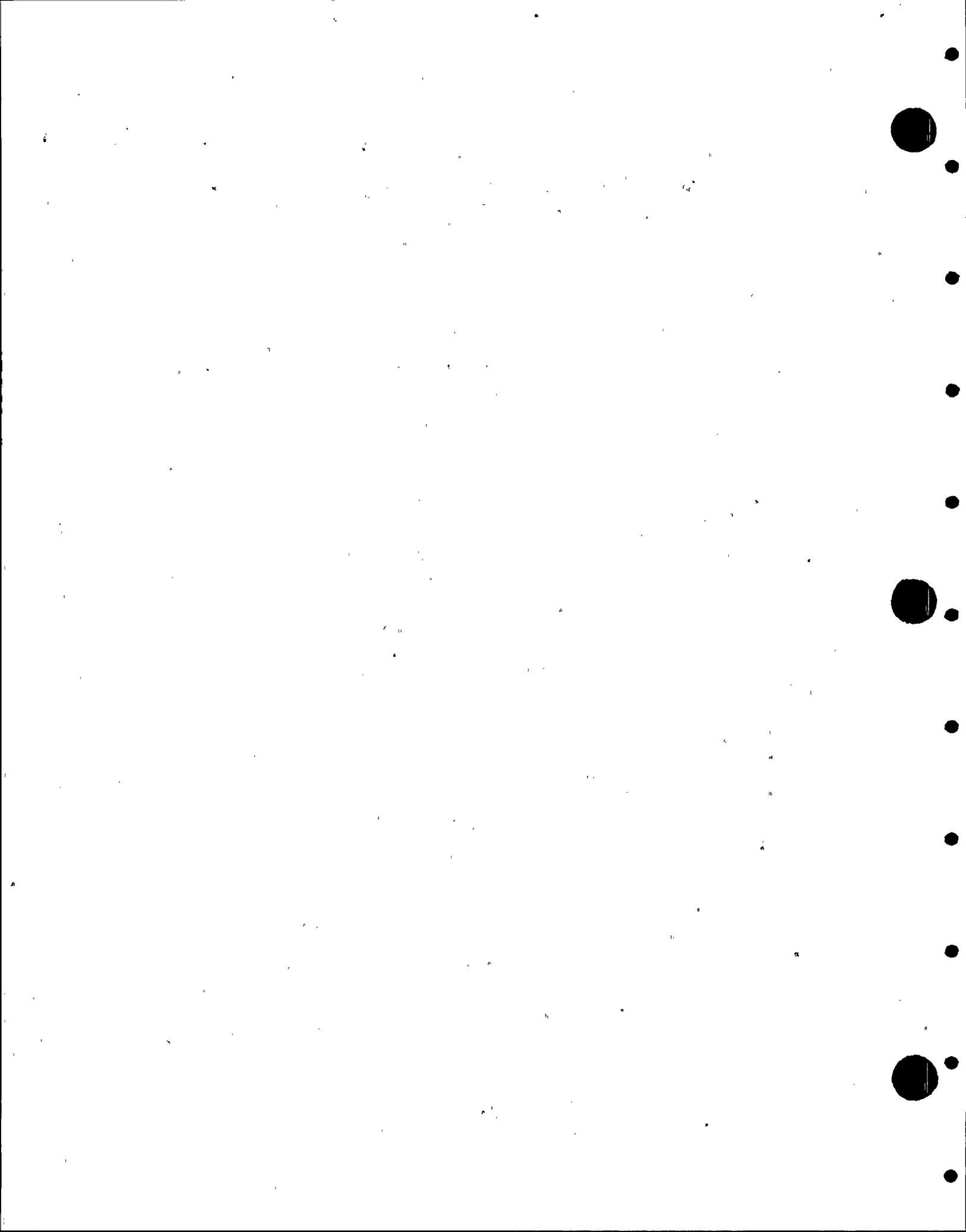
9 Requirement that the Containment Spray System
10 penetrations not to be subject to loss of function from
11 dynamic effects such as missiles, pipe reactions, fluid
12 reaction forces. In compliance.

13 Exhibit 2-26, continuation of the physical
14 arrangement requirements. Bellows will be required between
15 the piping and the containment wall to prevent excessive
16 forces on the piping. Those shall be utilized. In
17 compliance.

18 Each Containment Spray System pump bypass line
19 shall be capable of passing 150 gallons per minute during the
20 pump's operating at design operating conditions. In
21 compliance.

22 The design of the Containment Spray System piping
23 and spray headers shall consider the effects of water hammer.
24 In compliance.

25 Exhibit 2-27, continuation of the physical



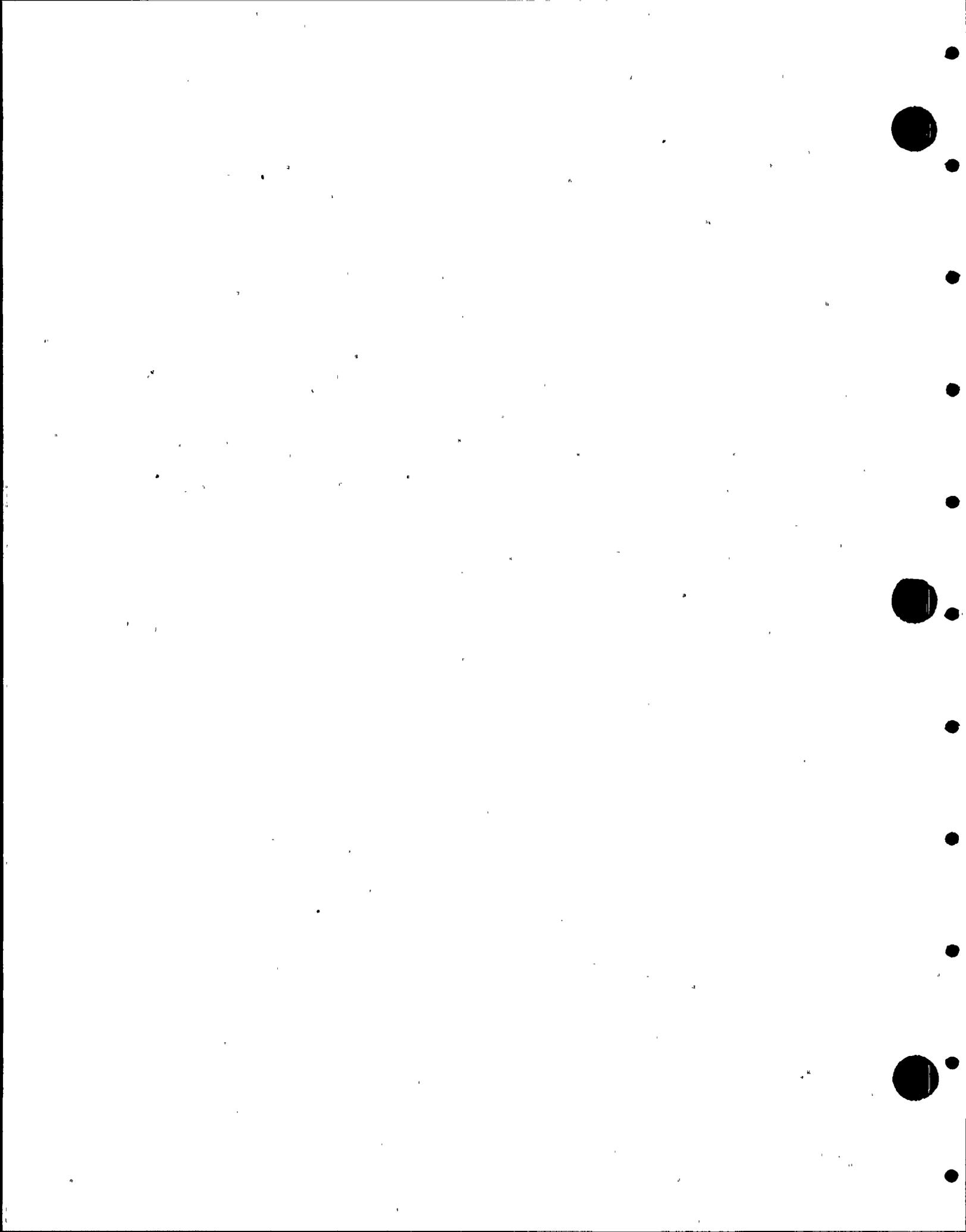
1 arrangement requirements. The maximum spray header elevation
2 above the refueling water tank outlet nozzles shall not
3 exceed 185 feet. There is a partial compliance here. The
4 maximum spray header elevation above the refueling water tank
5 outlet nozzles is 192 feet. However, the Containment Spray
6 System analysis has shown that the system performs adequately
7 with this 192 feet.

8 Requirement for the refueling water tank lines to
9 be resistance tested periodically for each pump at near
10 the design conditions, and also a requirement for pre-
11 operational testing of the system should be provided at full
12 flow. There is partial compliance. Provision is made for
13 approximately one-half of the normal flow to be recirculated
14 to the refueling water tank during preoperational and periodic
15 testing.

16 Exhibit 2-28, continuation of the physical
17 arrangement requirements. Access to system components that
18 are not designed to ASME Section III shall be provided to
19 permit visual inspection. In compliance.

20 There shall be a minimum free fall height of 90
21 feet between the nozzle headers in the upper part of the
22 containment and the operating deck. In compliance.

23 Exhibit 2-29 shows the CESSAR interface require-
24 ments from CESSAR Appendix 6B, Section 7, which actually is
25 an appendix relating to the iodine removal capability as it



1 relates to the physical arrangement of the Containment
2 Spray System.

3 Requirement for the spray nozzle headers to be
4 located as high as practical in the containment dome. In
5 compliance.

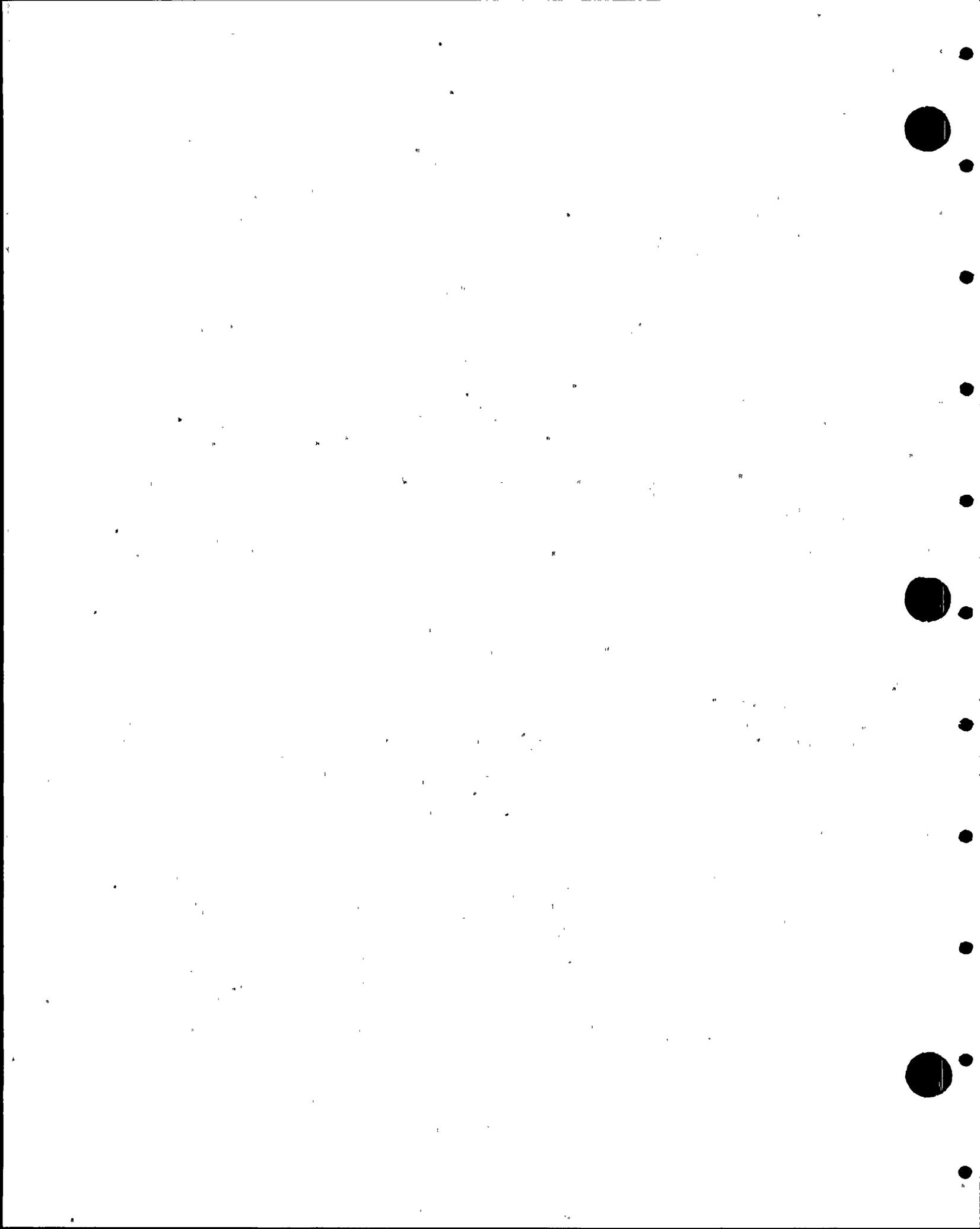
6 Requirement for the region defined as the sprayed
7 volume to be at more than 90% spray area coverage at the
8 operating deck level. In compliance.

9 The spray nozzles shall be selected on the basis
10 of droplet size. They shall be of non-clogging design, have
11 a nominal diameter of 3/8 inch, with a pressure differential
12 of 40 psid, and there shall be 230 nozzles per train to
13 achieve the required containment coverage and drop size
14 distribution. In compliance.

15 Exhibit 2-30. We are going back into the CESSAR
16 Appendix 6A, Section 7.

17 Requirement for radiological waste collection.
18 The exhibit shows the leakages for pump seals, valves,
19 across the valve seats, and requirements to have these
20 leakages drained to the sump in the room and to have them
21 treated as radioactive waste with a low dissolved solids and
22 organic content. In compliance.

23 Exhibit 2-31, requirement for overpressure
24 protection. There shall be relief valves provided for
25 overpressure protection. In compliance.



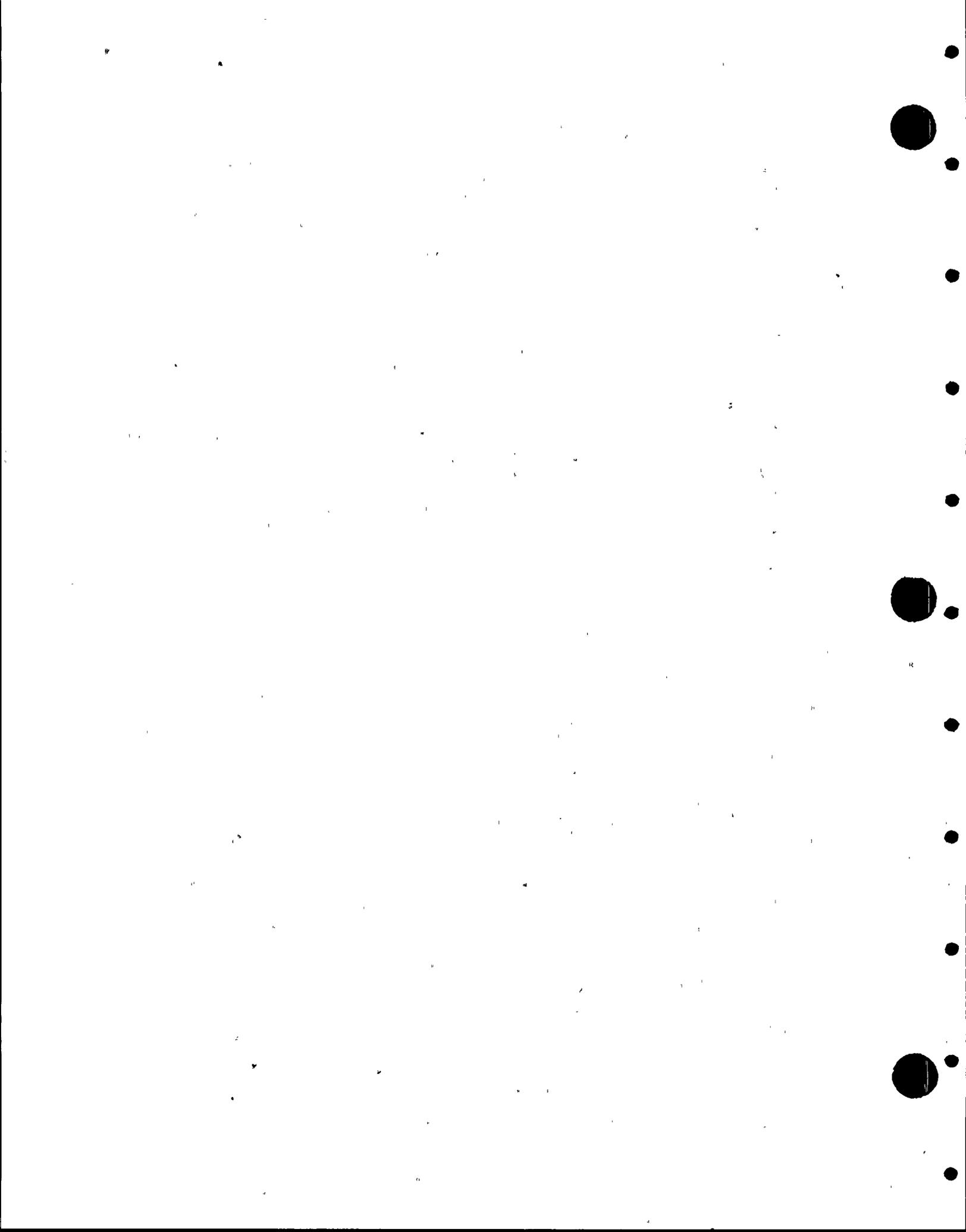
1 Requirements for related services. The refueling
2 water tank shall have 100% of the capacity required to
3 operate the Containment Spray System pumps at 4,400 gallons
4 per minute with the other pumps operating at the runout
5 flows in the same time for a minimum injection period of.
6 20 minutes. In compliance.

7 Requirement that the maximum particle size in the
8 water exiting from the refueling water tank shall be 0.09
9 inches in diameter to preclude flow blockage in the ESF
10 components. In compliance.

11 Requirement that the contents of the refueling
12 water tank and piping which is associated with the Contain-
13 ment Spray System to be kept at a minimum of 60 degrees
14 Fahrenheit to preclude possible boron precipitation. In
15 compliance.

16 Exhibit 2-32, continuation of the requirements
17 for related services.

18 Requirement for the design of the containment
19 spray sump to meet Regulatory Guide 1.82, to meet the
20 particle size of 0.09 inches in diameter, to preclude the
21 entrainment of air into the sump suction lines, and to have
22 the pressure drop across the screen adequately low to provide
23 adequate NPSH, and also to be able to work in the post-
24 accident environment with a pH of 7.0 within four hours
25 post-accident, and a maximum pH of 8.5. PVNGS is in



1 compliance. Screening to 0.09 inches diameter is used.
2 The sump is built to Reg. Guide 1.82 requirements, and the
3 pH of the sump water will be between 7 and 7.5.

4 Exhibit 2-33, continuation of the requirements
5 for related services.

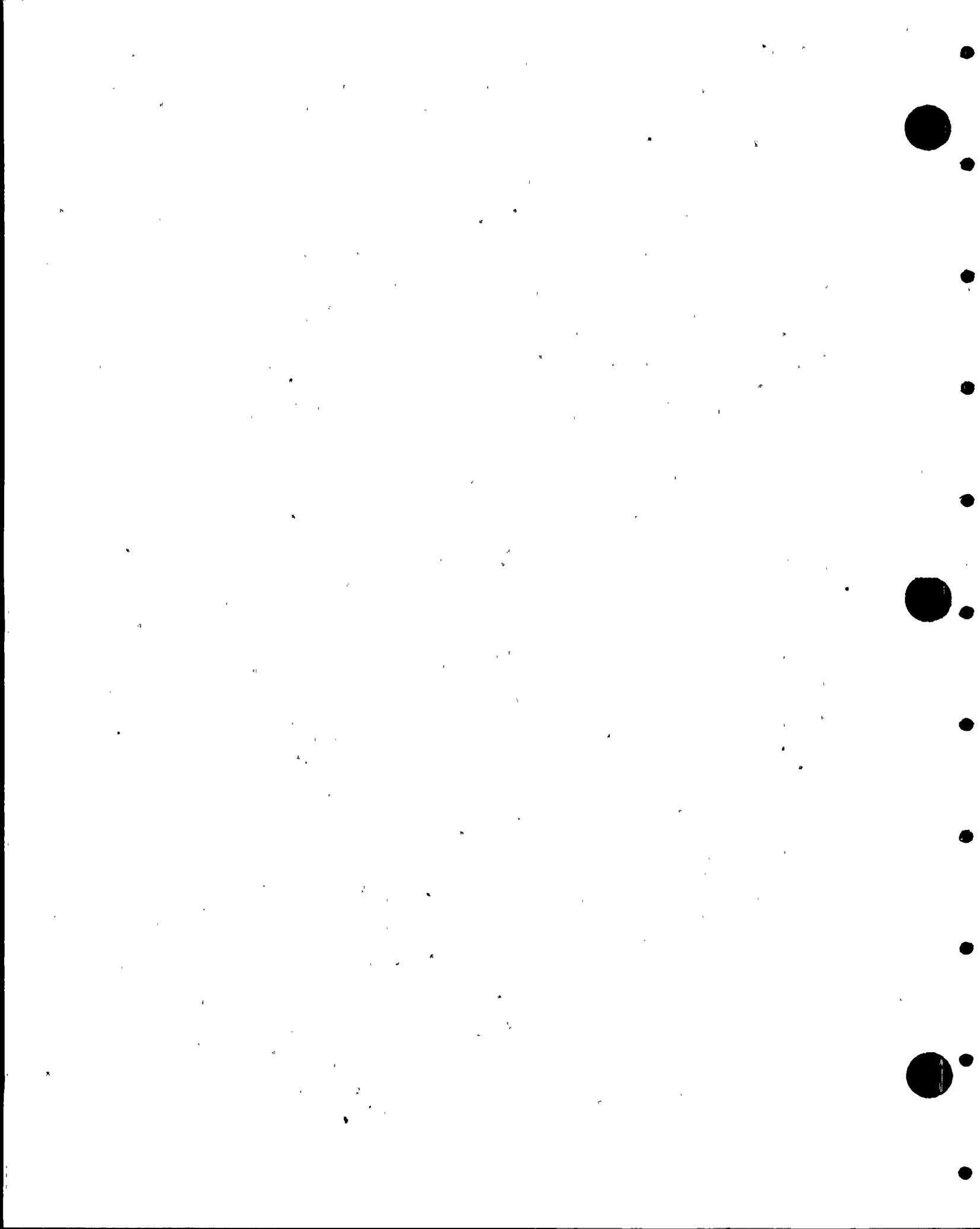
6 Requirement for shutdown cooling heat exchanger.
7 Cooling water to be provided to transfer the heat from the
8 sump during the recirculation mode. In compliance.

9 Requirement for the cooling water to be provided
10 at 11,000 gallons per minute flow rate. In compliance.
11 The PVNGS flow rate is 14,000 gallons per minute because
12 of the larger shutdown cooling heat exchangers that are
13 employed at PVNGS.

14 Requirement for the cooling water to be established
15 to the shutdown cooling heat exchanger prior to or simultan-
16 eously with the start of recirculation. In compliance.

17 Requirement for the cooling water temperature to
18 the inlet of the shutdown cooling heat exchanger to be
19 between 65 and 120 degrees Fahrenheit during LOCA. In
20 compliance.

21 Exhibit 2-34 shows the requirement for fire
22 protection. A fire protection system shall be provided for
23 the Containment Spray System consistent with the require-
24 ments of GDC 3 and include as a minimum facilities for fire
25 detection and alarming, facilities or methods to minimize the



1 probability of fire, facilities for fire extinguishment,
2 and methods of fire prevention. All of these are in
3 compliance.

4 Exhibit 2-35 is a continuation of the fire
5 protection requirements. Assurance that fire protection
6 systems do not adversely affect the functional and structural
7 integrity of safety-related structures. In compliance.

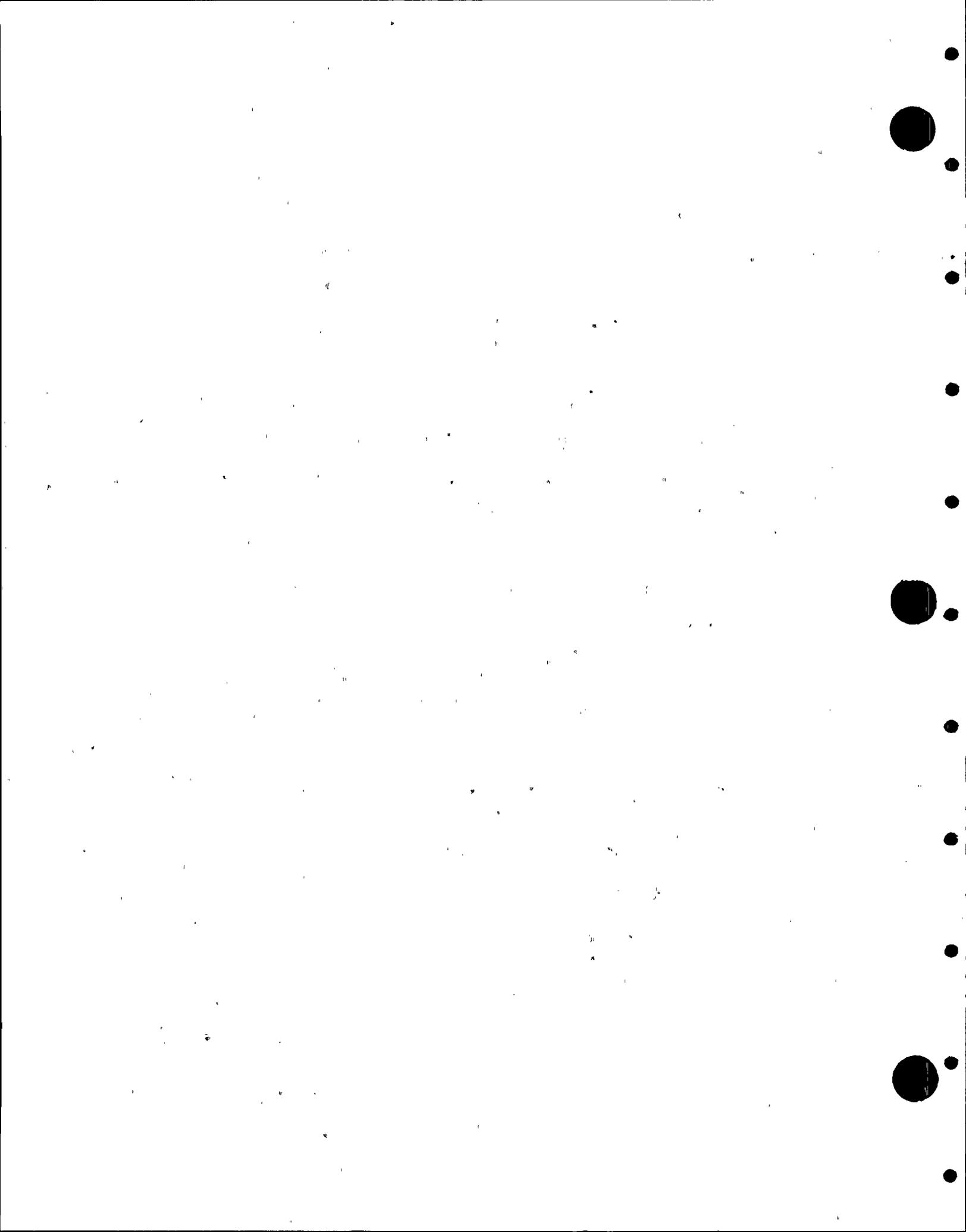
8 Care should be exercised to ensure that rupture
9 or inadvertent operation of the system would not impair the
10 capability of safety-related systems and components. In
11 compliance.

12 Exhibit 2-36, requirement for mechanical inter-
13 action. The Containment Spray System components shall be
14 properly supported such that pipe stresses and support
15 reactions are within allowable limits as defined in CESSAR
16 Section 3.9.2. In compliance.

17 MR. KEITH: That concludes that section. Let me just
18 state for the record, I don't know if everybody is aware of
19 it, CESSAR is the Combustion Engineering Safety Analysis
20 Report, which is incorporated by reference in the Palo Verde
21 FSAR. CESSAR has many interface requirements, and that is
22 what we have been going through for the last half hour.

23 Are there any questions on that section?

24 MR. HEPNER: I would like to make a comment about
25 Figure 2-1 that there is a bypass around the shutdown cooling



1 heat exchangers which primarily serves a spray function.
2 Perhaps that should be included on the figure. I think it
3 is discussed in the functional aspects later on.

4 MR. KEITH: Yes. This is a simplified drawing.
5 Paul, if you want to show everybody where it is, but this
6 is a simplified drawing.

7 MR. BIBA: This is a simplified drawing. During the
8 shutdown cooling, the Containment Spray System will be
9 aligned around the shutdown cooling heat exchangers by using
10 a bypass line around the shutdown cooling heat exchangers.

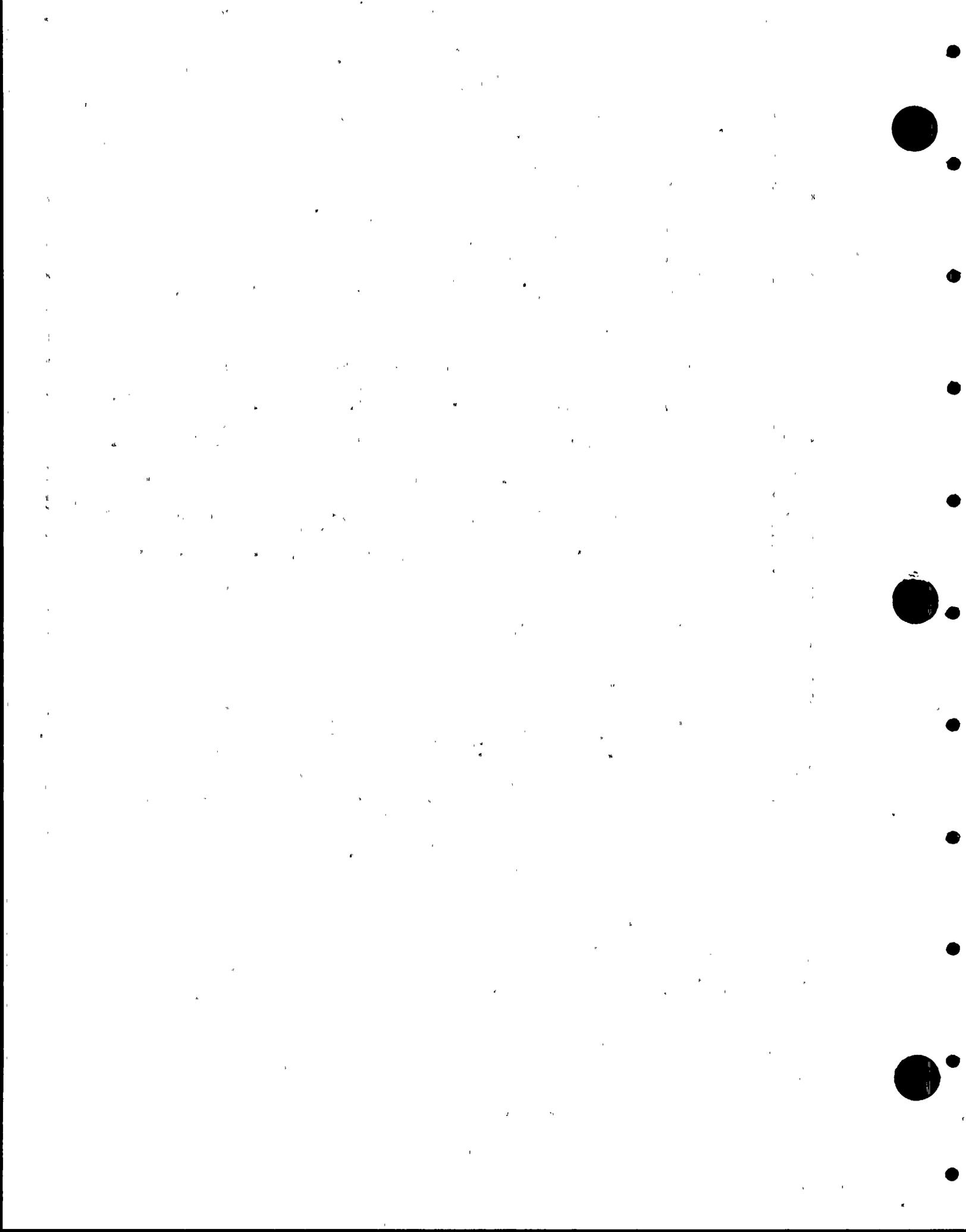
11 MR. VAN BRUNT: Dennis, I think if I understand the
12 figure right, that later on you utilize this in an explana-
13 tion. If that is the case, even though I recognize this is
14 a simplified drawing, I think probably you ought to add it
15 to the drawing.

16 MR. KEITH: Fine. We will correct that and include
17 it in the documents that get included with the transcript.
18 We will revise that plan.

19 MR. VAN BRUNT: Simplified drawings are fine, but
20 they at least ought to show the functional aspects you are
21 trying to explain.

22 Some other questions? I've got a bunch myself.
23 You go ahead, Ed.

24 MR. STERLING: On Exhibit 2-19, I had a couple of
25 clarifications on some of these exhibits, but in some of the



1 cases, the CESSAR requirements are an if/and type of thing
2 and I guess on this one, you say, "In compliance," but is it
3 a common suction or is it a separate suction? I think this
4 type of clarification might be needed. If it is common, you
5 are using that particular type of steel, but is it common or
6 is it separate? On the drawing, it is shown separate.

7 MR. KEITH: It is common. There is one suction line
8 for each train from the refueling water tank.

9 MR. STERLING: On Exhibit 2-26, Item No. 15), do we
10 use bellows?

11 MR. KEITH: Your point is well taken. We do not use
12 bellows. It does say where required, and in our stress
13 analyses that we have done on the piping and all, it is not
14 required and we do not use bellows.

15 MR. STERLING: Then on 17), do you use a fill and drain
16 connection for the riser piping inside?

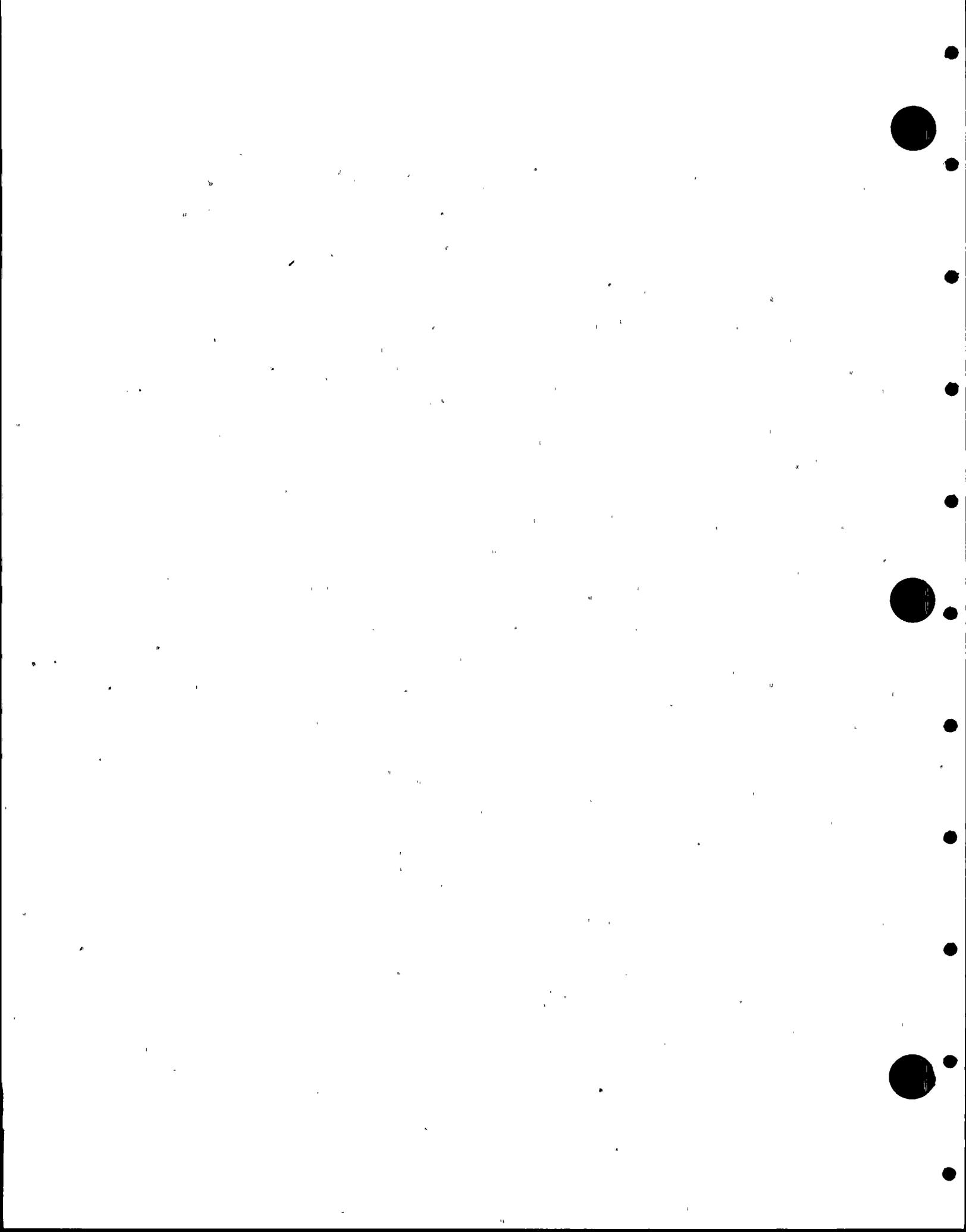
17 MR. KEITH: Yes, we do.

18 MR. VAN BRUNT: Any other questions?

19 MR. STERLING: No, go ahead.

20 MR. KEITH: I think we ought to maybe take that down,
21 Bill and Gerry, as an item to clarify.

22 MR. VAN BRUNT: Well, I think, Dennis, as long as it
23 is in the record, that is probably clarification enough. I
24 am not sure that you need to modify the slides in these two
25 cases as long as there is explanation.



1 MR. KEITH: Fine.

2 MR. VAN BRUNT: Rich, I think you had your hand up.

3 MR. TOSETTI: Yes, a question on Exhibit 2-15. It
4 is regarding the sampling system, and you indicate that the
5 sampling system shall provide means of obtaining remote
6 liquid samples for a laboratory analysis. As that system
7 was designed, did it have the post-TMI requirements?

8 MR. KEITH: Rich, we are in the process of procuring
9 a sampling system which meets the post-TMI requirements. I
10 don't think it samples the Containment Spray System is why I
11 am hesitating.

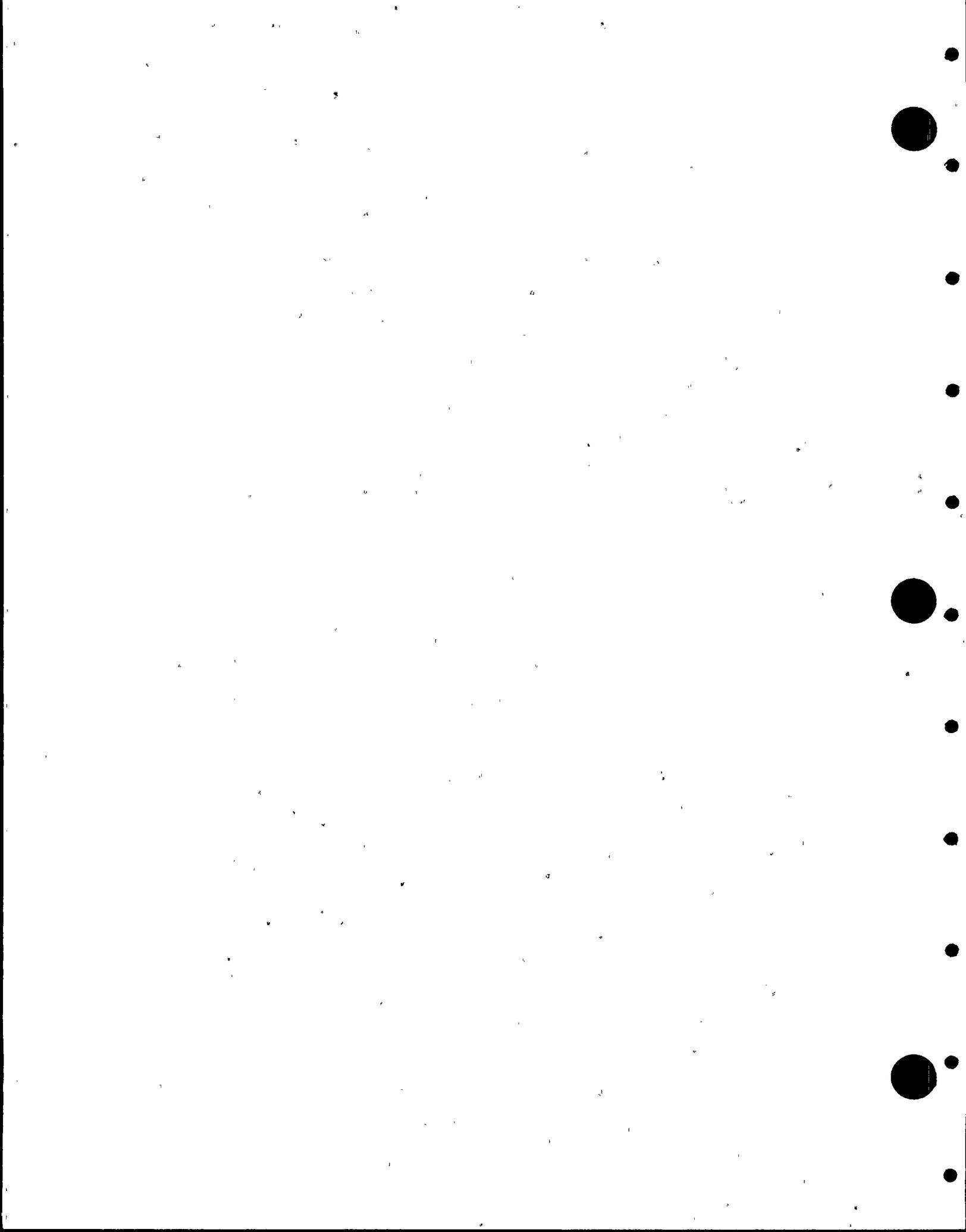
12 MR. TOSETTI: This is just on the spray system itself,
13 then?

14 MR. KEITH: Yes. This is referring just to the
15 spray system itself, yes, this requirement here.

16 MR. TOSETTI: The intent then is to just sample
17 during normal operation or testing?

18 MR. KEITH: When we are in normal operation and the
19 system is not operating, we can just take a grab sample at
20 some periodic basis, but the system we are going to have
21 for post-TMI will as part of the requirements for it, have
22 the capability of taking a sample from the containment sump.
23 That is, of course, the fluid that will be going through the
24 system.

25 MR. TOSETTI: A question on Exhibit 2-23, Item 9).



1 There is an indication there that in the event of a limited
2 leakage passive failure, personnel access to the intact
3 train shall be possible. I guess again is that during normal
4 operation conditions and operation or is that proposed
5 during post-LOCA?

6 MR. KEITH: That is referring to post-LOCA. We have --
7 Well, I am getting ahead of myself, because we are going to
8 show the compartments where the containment spray pumps are,
9 and there is sufficient shielding between the two trains
10 for somebody to get down there for a limited period of time
11 even post-LOCA and do some maintenance work.

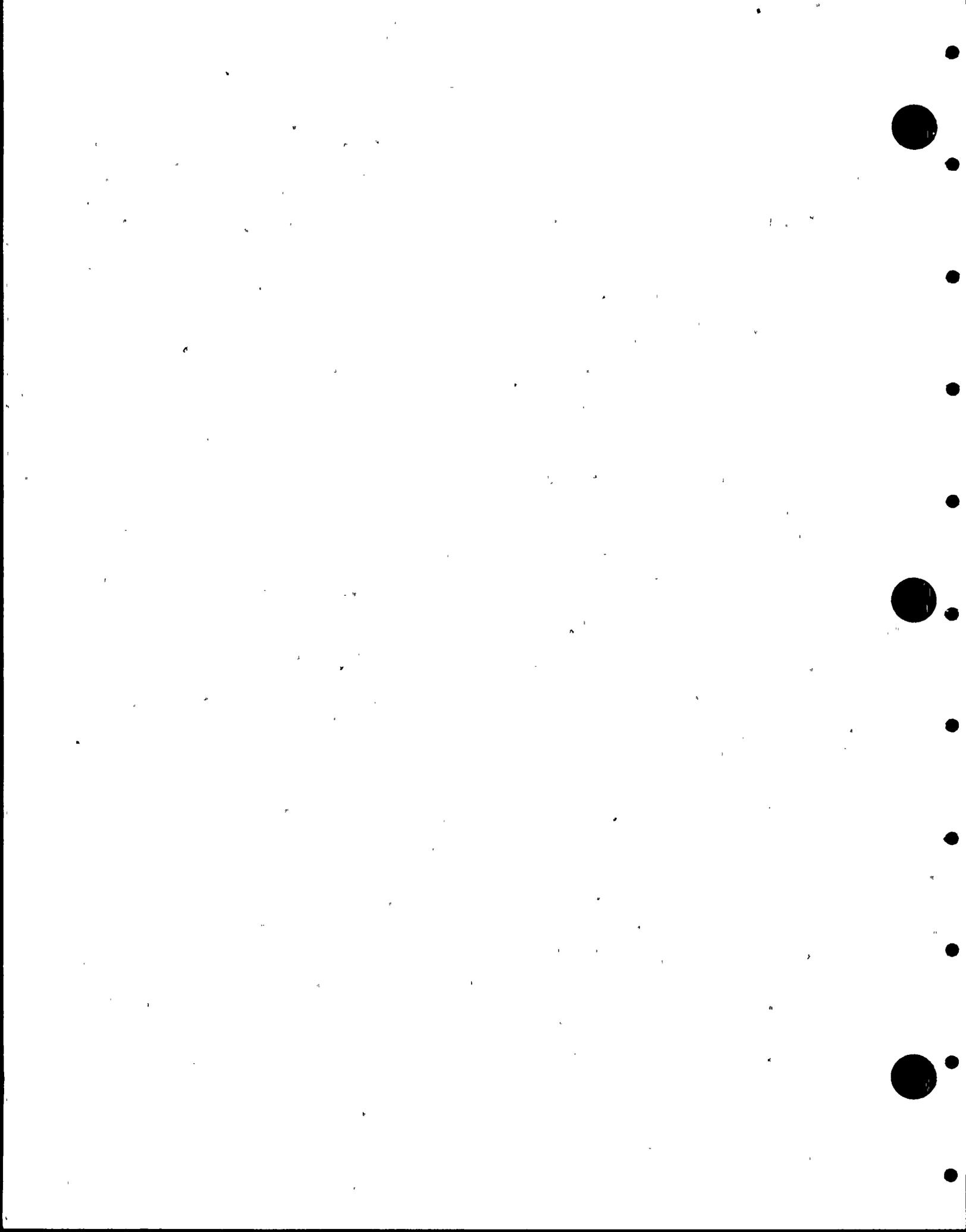
12 MR. VAN BRUNT: Dennis, I would suggest that when you
13 get to that point of your presentation that you point that
14 out for Rich's benefit. Then if he has any further questions
15 on it, he can raise them at that point.

16 MR. TOSETTI: I guess my main concern, and we can
17 probably discuss that later, is the activity level that may
18 be in the intact system.

19 MR. VAN BRUNT: Do you have any other questions, Rich?

20 MR. TOSETTI: Yes, just one more on Exhibit 2-30. In
21 looking at the radiological waste collection, is there a
22 consideration in there for a pump seal failure?

23 MR. KEITH: Yes, the sumps which collect leakage from
24 our ESF pumps are designed for a 50 gpm leak, so, although
25 we don't really expect leakage more than this -- Well, this



1 is the CESSAR interface, but actually the radwaste system is
2 designed for a 50 gpm leak.

3 MR. TOSETTI: The radwaste system or the sump
4 collection?

5 MR. KEITH: The collection system; yes.

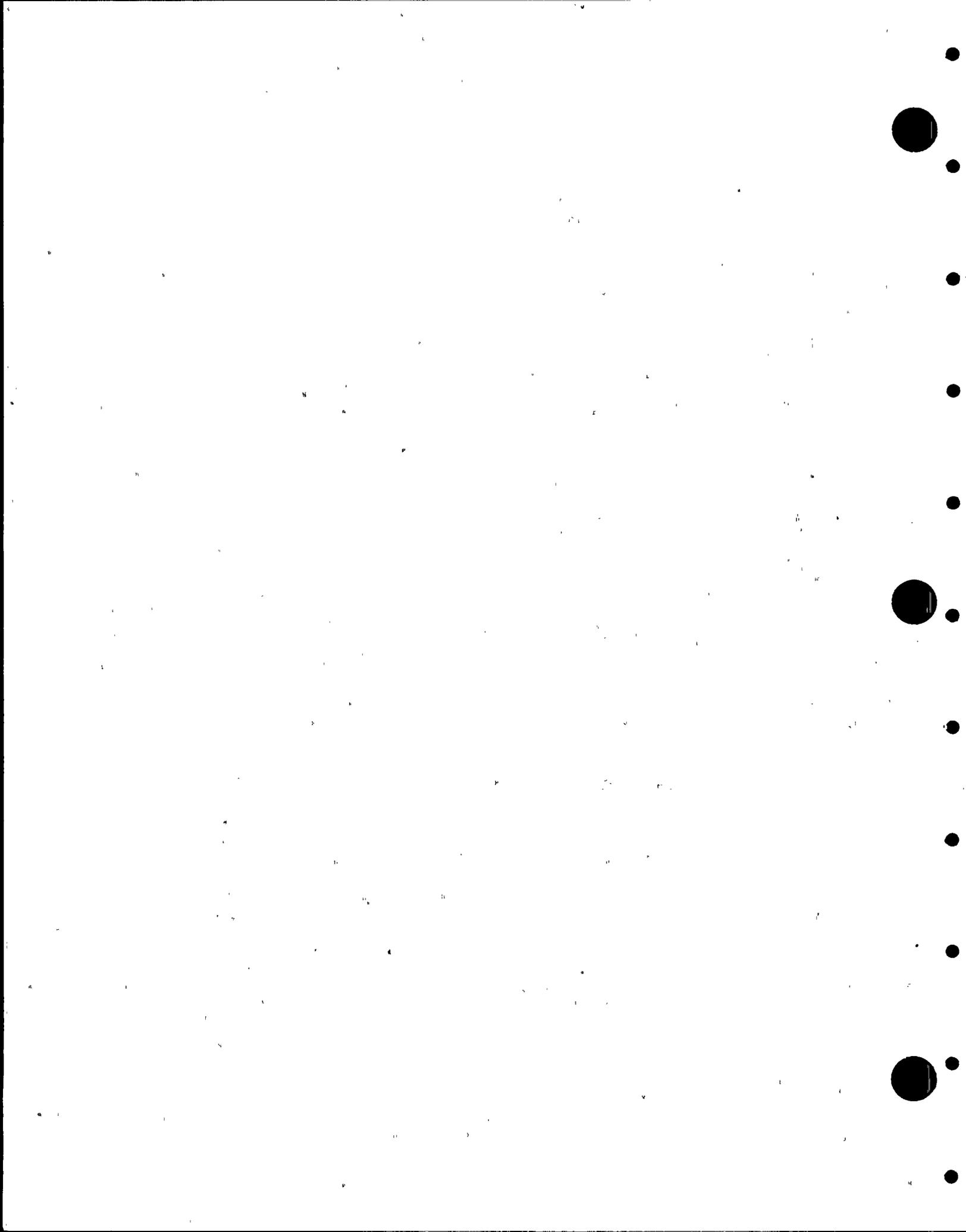
6 MR. TOSETTI: Thank you.

7 MR. VAN BRUNT: Mr. Ku, you had a question.

8 MR. KU: I have a question in relation to the term
9 "requirement." I am wondering whether you can tell me about
10 the pump material. You said quite a bit about the pipe
11 material and valves and things of this nature, but how about
12 consideration of the pump material?

13 MR. KEITH: The reason you don't see anything on here
14 for the pump material is because the pumps are provided by
15 Combustion Engineering and these are interface requirements
16 for the balance of plant. The pump is stainless steel, it
17 is the same as the piping, but the reason you don't see
18 anything here and we don't talk about it is because that is
19 all in the Combustion Engineering document.

20 MR. VAN BRUNT: I think further on that, Mr. Ku, the
21 regulatory aspects of those pump materials are covered in
22 CESSAR. In other words, Combustion covers the details of
23 these particular pumps in the CESSAR application, and if you
24 wanted to find out about the materials or whatever, you would
25 go to CESSAR and could find that out. These are only the



1 interfaces that CE provides to us and we reference CESSAR.
2 That is being reviewed under their separate documents.

3 Do you have further questions, sir?

4 MR. KU: No.

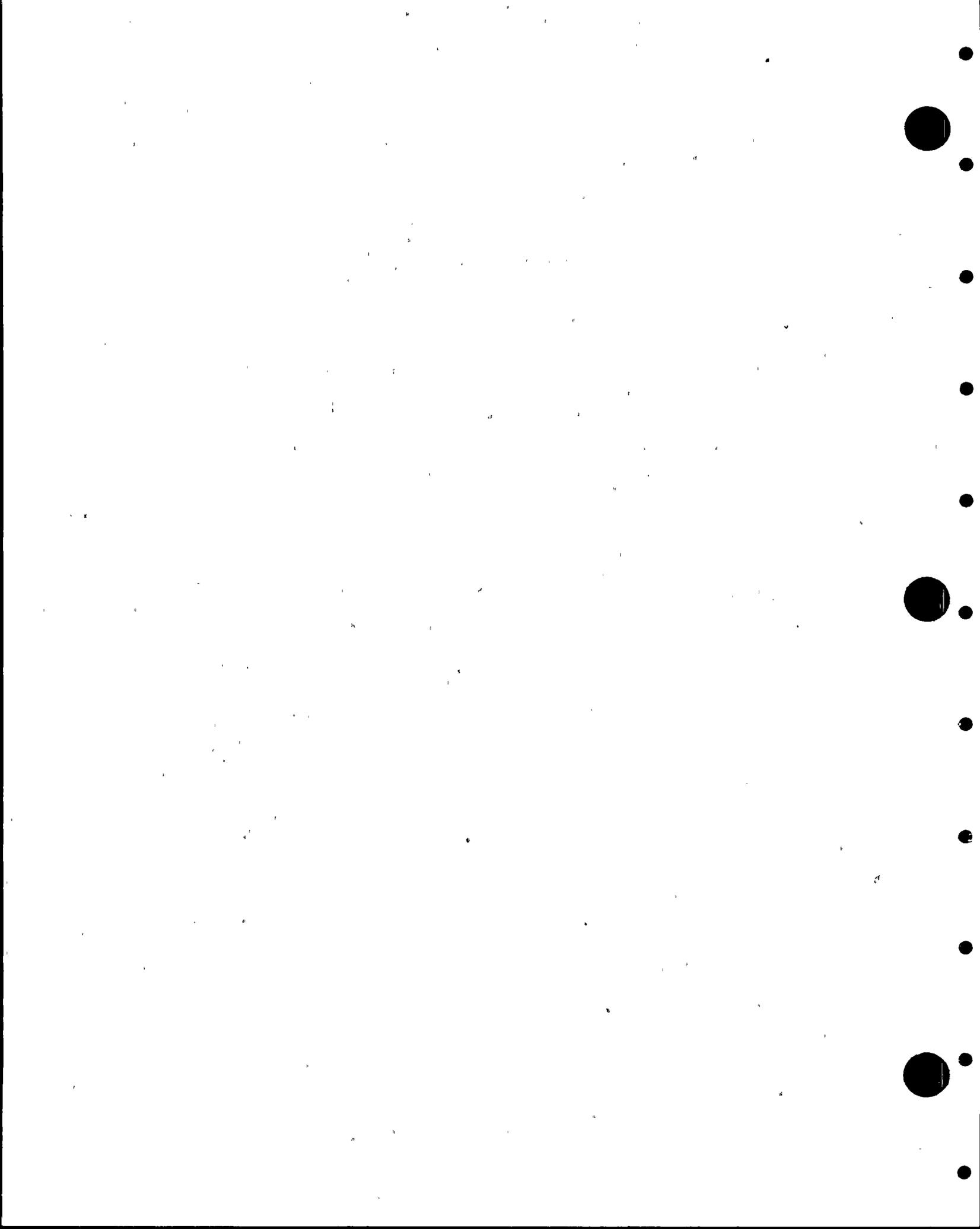
5 MR. VAN BRUNT: Marty.

6 MR. RAINES: Exhibit 2-5. On Item No. 1), we are
7 talking about the Containment Spray System pumps being
8 capable of being powered from the turbine generator, start-
9 up transformer, or the diesels. Offhand, it seems like it
10 is misleading, because I think if the operator, in the
11 absence of the diesel generators or the startup transformers,
12 I don't think he would be able to power the containment
13 spray pumps for their intended purpose off the turbine
14 generator. You seem to imply that the turbine generator
15 exists as a viable source of power as the diesels and the
16 startup transformers.

17 MR. KEITH: Let us check on that, Marty, and get
18 back to you.

19 MR. VAN BRUNT: I think your problem, Dennis, with
20 this may be that the CESSAR interface may be not quite
21 properly stated. I am sure it is quoted from CESSAR, but
22 that would infer that there is a direct tie from the turbine
23 generator to those pumps. At least, that is what I have
24 inferred, and I do think that is what they intended with that.

25 MR. KEITH: Wait a minute. No, but we can provide



1 power from the turbine generator to the 13.6 kV buses.

2 MR. VAN BRUNT: Yes, but you've got to come around
3 through your transformers to get there.

4 MR. KEITH: But we don't need offsite power. I guess
5 that --

6 MR. ALLEN: Marty is saying you can't power them
7 from the aux transformers. Right, Marty?

8 MR. RAINES: Right. They have already listed the
9 startup transformers as one option, the diesel generator is
10 another option, and the turbine generator is a third option.

11 MR. KEITH: They say startup power source (offsite
12 power), and I guess that is how we had interpreted it, that
13 they are really just talking about offsite power, not the
14 startup transformer as such.

15 MR. VAN BRUNT: I think what you need to do, Dennis,
16 is get a clarification from CE on that particular item.

17 Marty, let me butt in here. Let me ask a general
18 question, which may help with this. All the way through
19 here, you talk about in compliance with the CESSAR require-
20 ments. Is there specific documentation from Combustion that
21 they concur with you that you are in compliance? I am not
22 talking about the procedure to get there, but either through
23 the vendor prints that you get or the drawings review that
24 they do or through their criteria review or whatever, do they
25 in fact in this particular case, as an example, indicate that

1 the design you have meets that criteria? Somewhere is that
2 documented?

3 MR. KEITH: Yes, that is documented in our four-party
4 reviews that we do for the FSAR where we go through all the
5 CESSAR interfaces. There is always a Combustion Engineering
6 representative there who signs off on the four-party review
7 sign-off form, so that "In compliance" does have documentation.

8 MR. VAN BRUNT: I think, therefore, they probably
9 agree with the way you have interpreted this, but I think
10 we ought to get that clarified.

11 MR. KEITH: We will clarify that particular point;
12 namely, that they are referring to offsite power and not to
13 the startup transformers as such.

14 MR. VAN BRUNT: Marty, do you have anything more?

15 MR. RAINES: That was the only one.

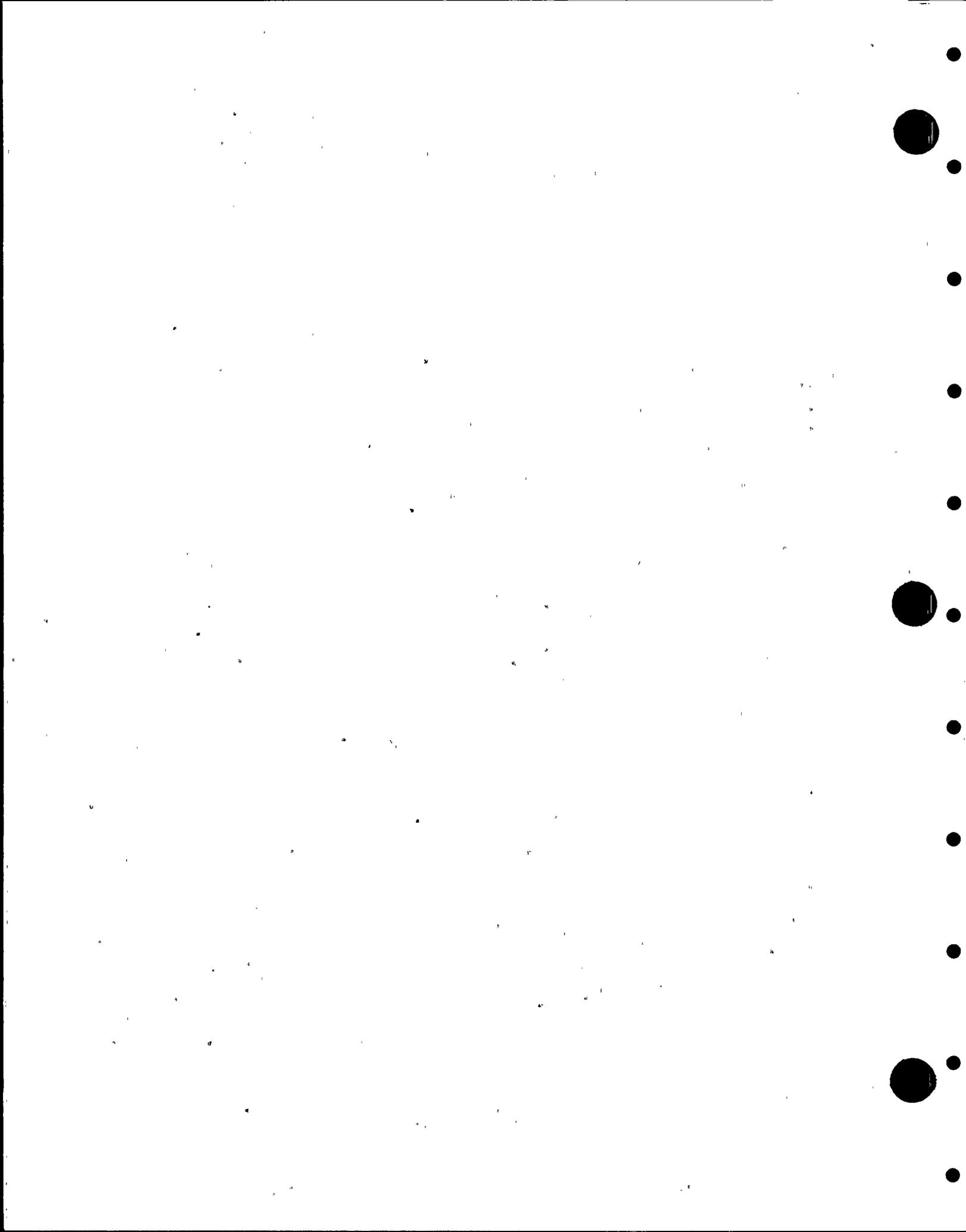
16 MR. VAN BRUNT: Mike.

17 MR. HODGE: I have a couple of questions, Dennis.
18 On 2-19, how has your design criteria taken care of galvanic
19 corrosion for the piping from the refueling water tank to
20 the containment spray pumps?

21 MR. BIBA: Can you repeat the question, please?

22 MR. HODGE: How have you allowed for preventing
23 galvanic corrosion? Is it adequately protected? Is it
24 removed from the soil in a tunnel?

25 MR. KEITH: The piping from the refueling water tank



1 is all in a pipe tunnel. It is not buried.

2 MR. HODGE: I have a question on 2-31. You say you
3 have a relief valve for overpressure protection. Where do
4 those relief valves discharge to?

5 MR. KEITH: We'll check that, Mike.

6 MR. HODGE: Then I have one last question that we may
7 want to handle under the Operation section. I wanted to
8 have a little discussion on how trisodium phosphates are
9 dispersed into the sumps, but maybe we can handle that under
10 the Operation section.

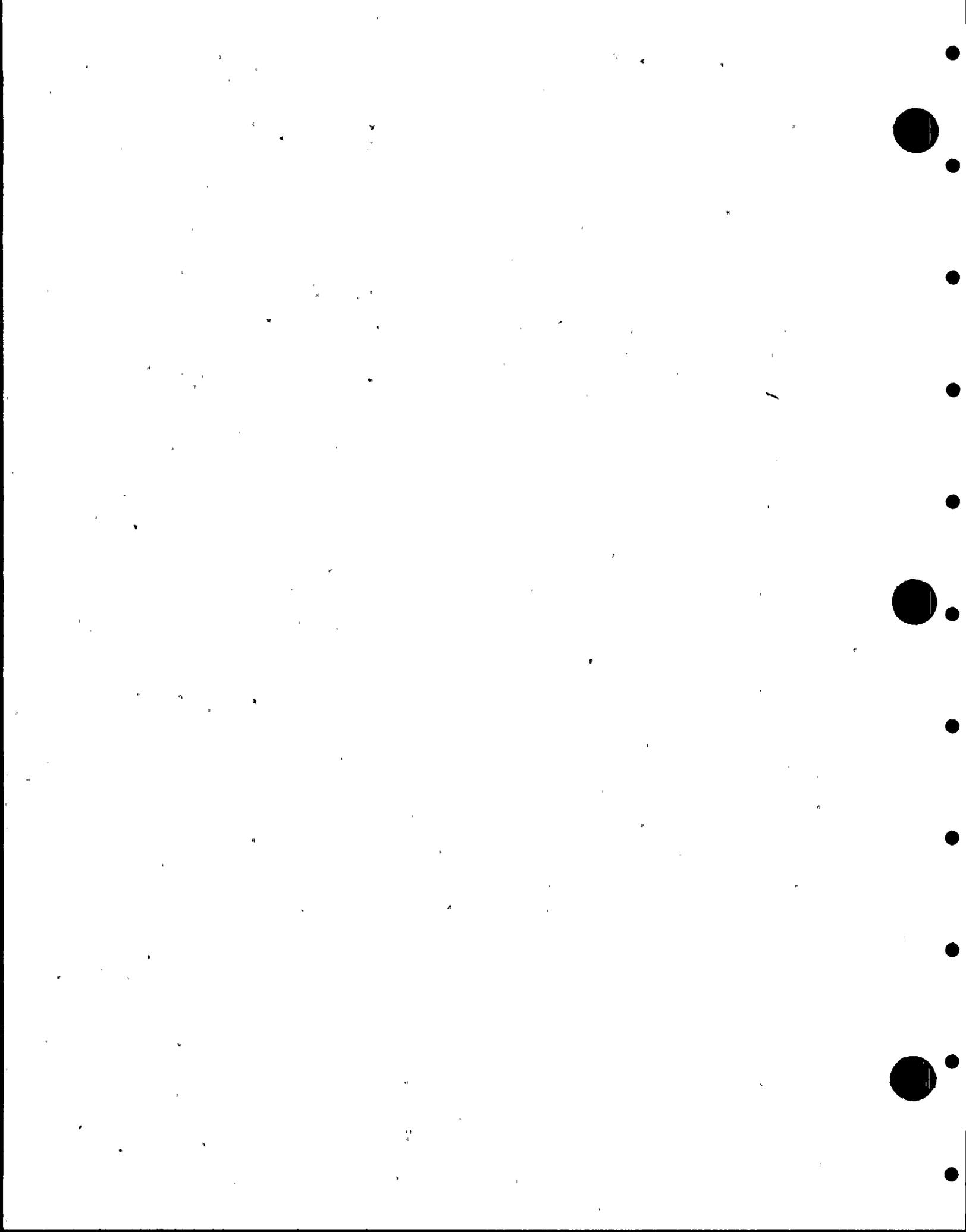
11 MR. KEITH: Yes, why don't you ask that in that
12 section. We did check the P&ID.

13 MR. BIBA: The relief valves discharge into the
14 radioactive collection system or to the equipment drain tank
15 depending on the location of the relief valve.

16 MR. VAN BRUNT: Are they piped directly or do they
17 go through some system?

18 MR. BIBA: In some cases, they are going through the
19 sumps and in some cases they are going directly into the
20 piping.

21 MR. HODGE: The one that goes to the radioactive
22 system, is that isolated by any chance? Is it isolated
23 during containment isolation? In other words, does that
24 relief valve path become locked on the one that goes to the
25 radioactive system?



1 MR. KEITH: Any relief valves which relieve inside
2 containment will be isolated on a containment isolation
3 signal.

4 MR. HODGE: They do relieve into containment. They
5 don't relieve to the outside. They will be isolated.

6 MR. KEITH: That's right.

7 MR. VAN BRUNT: Do they go into the sump in the
8 containment?

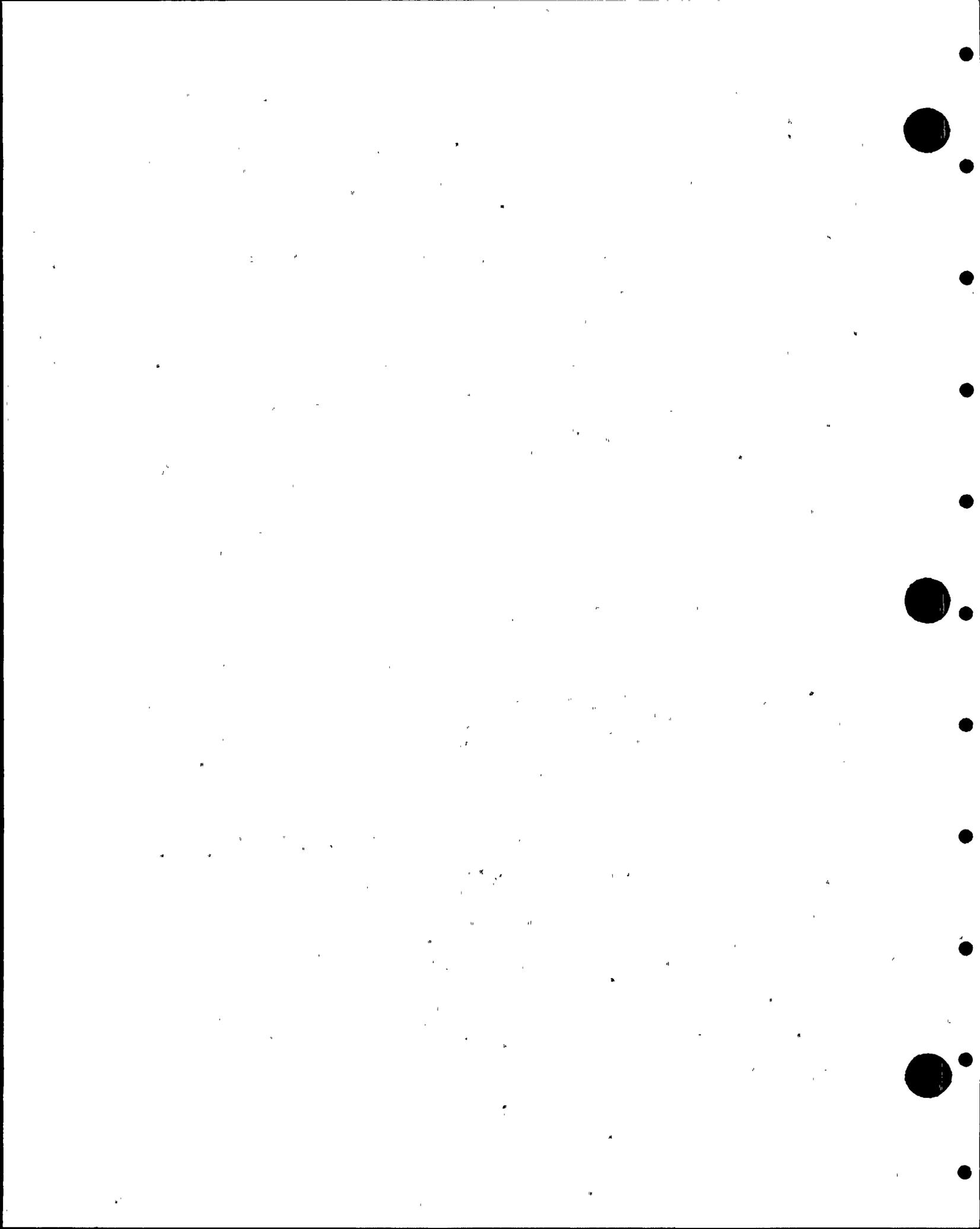
9 MR. KEITH: Yes.

10 MR. HODGE: The ones that are outside relieve into
11 the drain tank radioactive material?

12 MR. KEITH: Well, there is at least one outside on
13 the suction line from the sump that relieves to a sump in
14 the auxiliary building.

15 MR. HODGE: Then, in summary, there aren't any relief
16 valves that are required to reject pressure that relieve
17 outside containment that are isolated. In other words, they
18 wouldn't provide their own protection, because they get
19 isolated from overpressure.

20 MR. KEITH: There is one relief valve in the suction
21 line that relieves to the sump. That relief valve is there
22 just to protect from thermal expansion when you have the
23 two containment isolation valves shut, so during system
24 operation, that relief valve should not lift, but that relief
25 valve does go to a sump in the auxiliary building.



1 MR. VAN BRUNT: And it is located outside of contain-
2 ment?

3 MR. KEITH: It is located outside the containment.

4 MR. HODGE: I can clarify that with a question, but --

5 MR. VAN BRUNT: Are you satisfied with the answer?

6 MR. HODGE: Yes.

7 MR. VAN BRUNT: Pete, you had a question.

8 MR. PENSEYRES: The system description Section 2.2.1.3
9 states that the containment spray pump mechanical fields are
10 cooled by the pumped water. Exhibits 2-31 and 2-32 state
11 that the suction screening is provided to limit the particle
12 size to .09 inches. Is the screening adequate to prevent
13 pluggage of the pump seal throttle bushing and the mechanical
14 fuel passages?

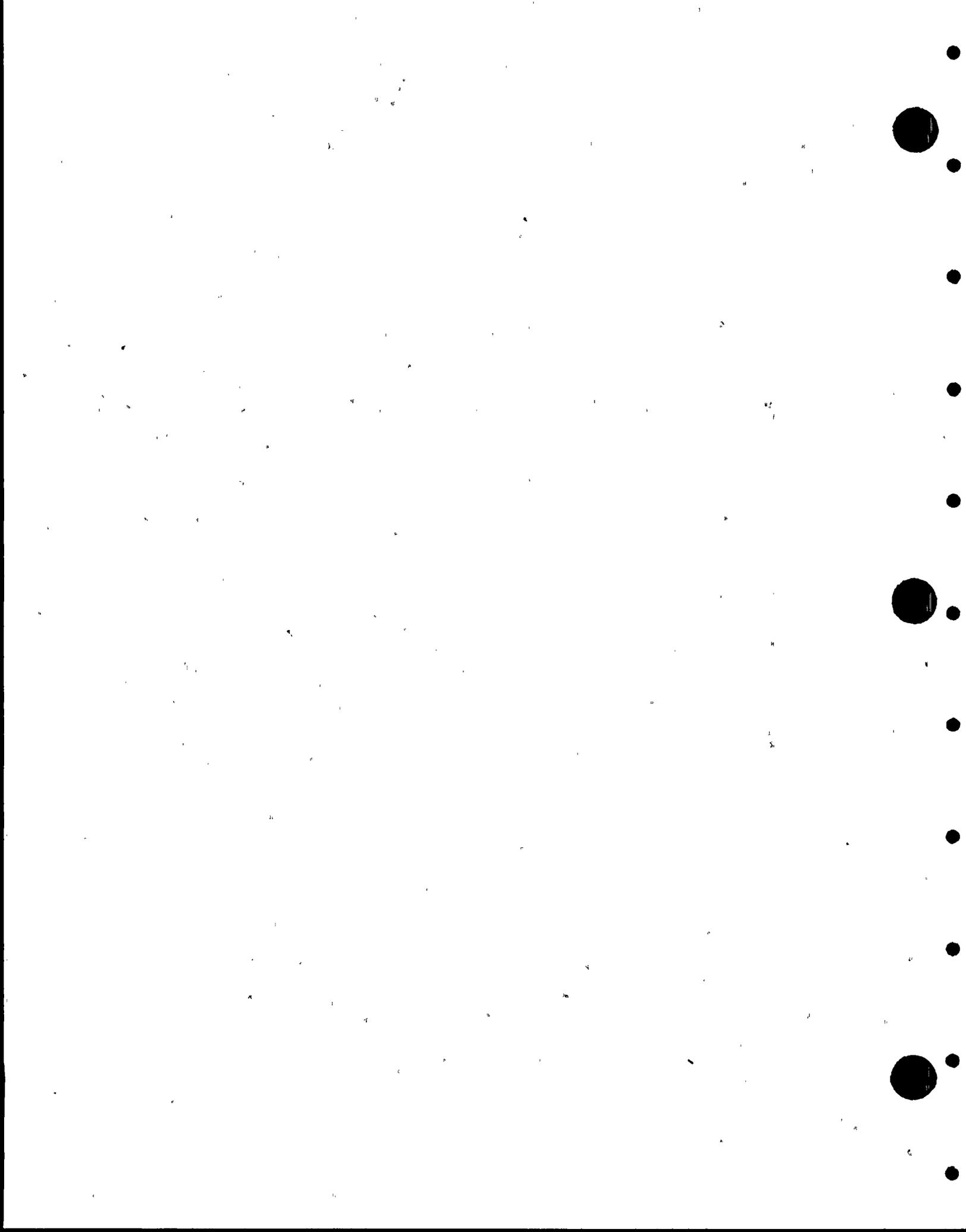
15 MR. BIBA: There is an additional screen in the
16 filter provided on the cooling water pumping within the
17 pump itself that is satisfying the requirements for the
18 cooling water.

19 MR. VAN BRUNT: Do you have any other questions,
20 Pete?

21 MR. PENSEYRES: No.

22 MR. VAN BRUNT: John.

23 MR. ALLEN: Dennis, on Exhibit 2-6, there is some
24 question regarding the time it takes to bring up the
25 containment spray. Are the containment spray pumps



1 immediately sequenced on or are they sequenced on in twenty
2 seconds? Thirty seconds?

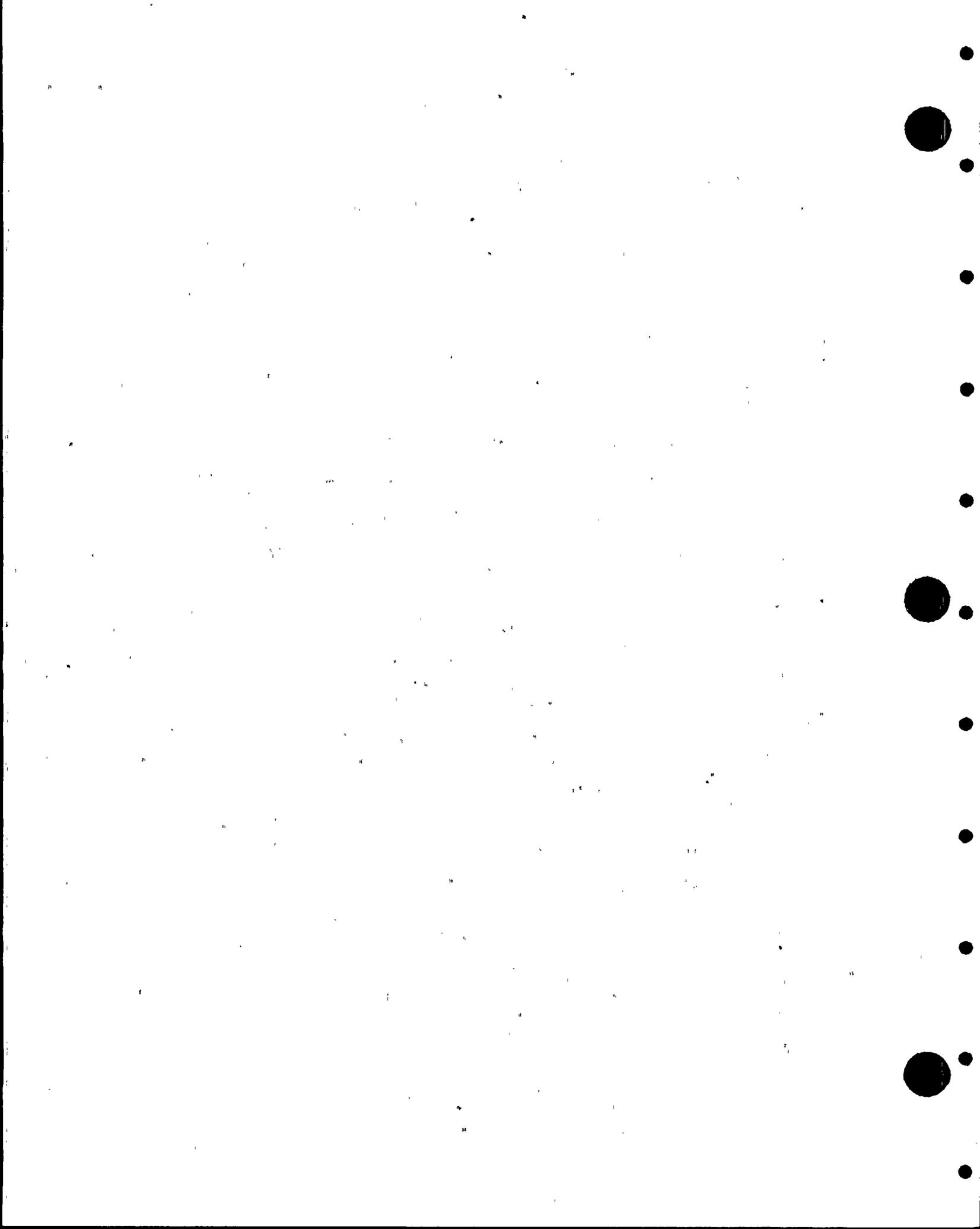
3 MR. KEITH: They sequenced on at 15 seconds.

4 MR. ALLEN: At the same time, does your chemical
5 addition come on or is there delay on chemical addition?
6 I guess my point is with inadvertent actuation, does the
7 operator have time to turn it off before he floods the whole
8 containment down with chemical?

9 MR. KEITH: John, the chemical we add, hydrazine,
10 is a rather benign chemical, but the hydrazine pumps come on
11 immediately, so when the spray pumps come on, you will be
12 injecting hydrazine as well as the boric acid into the spray
13 system.

14 MR. ALLEN: What is the time differential between a
15 containment spray actuation signal and the time he would get
16 discharge out of the spray headers? Is there ample time for
17 the operator to take action and turn it off if it is an
18 inadvertent actuation?

19 MR. KEITH: No. All he has is the 15 seconds on the
20 sequencer, so he has that 15-second period if he can
21 determine it is inadvertent. We do have the set point of the
22 spray system set up at 10 pounds to avoid inadvertent
23 actuations to any kind of pressure transient you might have.
24 Also, of course, in the logic in the system, it is a two-out-
25 four system and you need to have two signals in order to



1 actuate the signal. So in these ways, we hope to avoid
2 an inadvertent actuation.

3 MR. VAN BRUNT: John's got some other questions.
4 Let me ask a follow-on question on this 2-6. The CESSAR
5 requirement indicates a 58-second requirement. You indicate
6 that you have 90 seconds. Then you go on to say calculations
7 verify containment heat removal requirements are met.
8 Specifically, what requirements are you talking about? In
9 other words, I am not sure I understand what that last
10 statement infers or what additional requirement that is
11 supposed to be satisfying.

12 MR. KOPCHINSKI: Ed, that is covered in our CESSAR
13 deviation and is discussed in Section 1.9. We had reviewed
14 that with CE and their concern in setting that time was for
15 equipment qualification purposes, the peak temperature you
16 would get in the containment. Our analyses with the 90
17 seconds, which were more a main steam line break, which was
18 the worst case, gave a peak temperature of 370 degrees,
19 which CE said was acceptable to them.

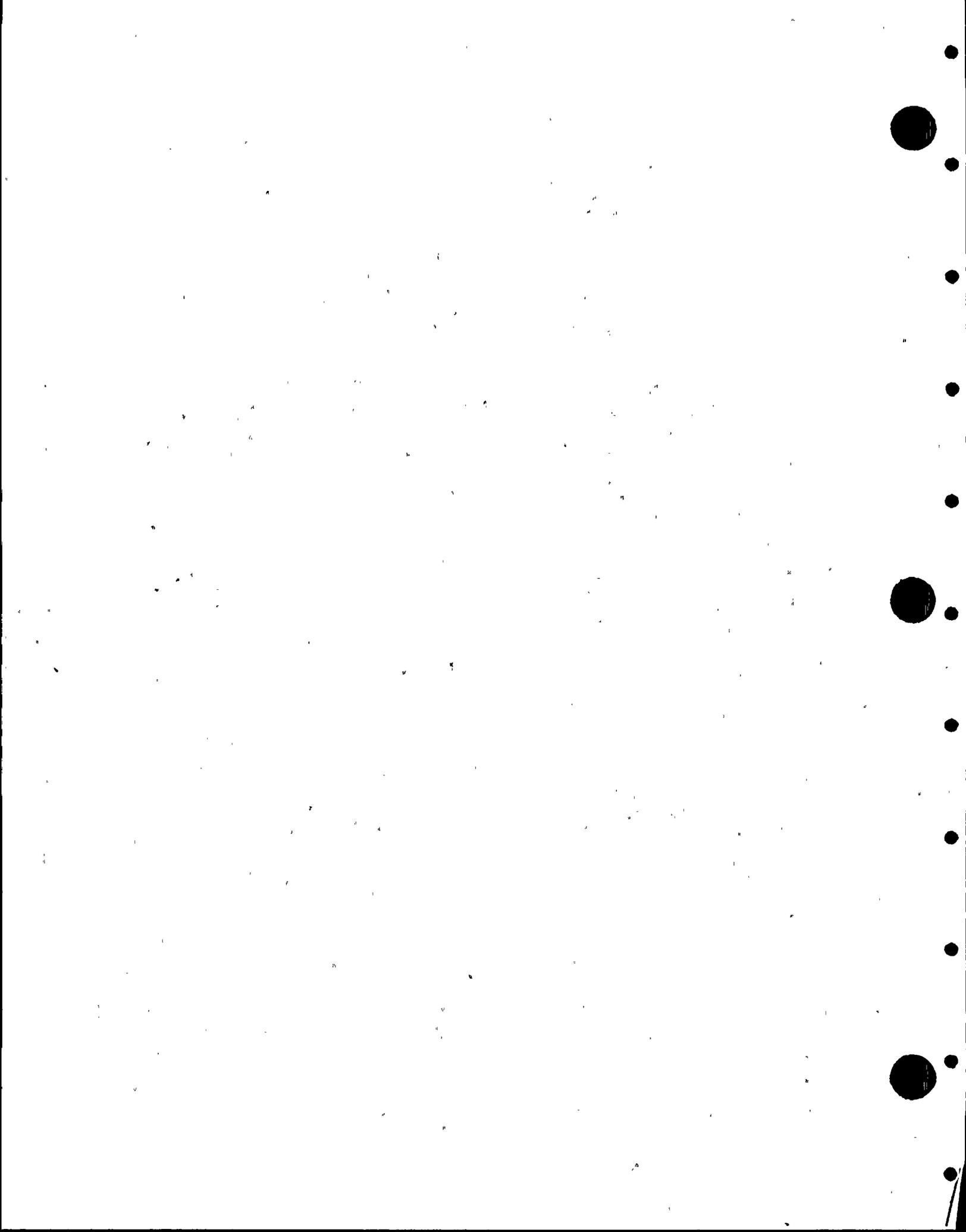
20 MR. VAN BRUNT: John.

21 MR. ALLEN: Dennis, are you going to get into any
22 testing and operation of the Containment Spray System?

23 MR. KEITH: We will get into operation of the system.

24 MR. ALLEN: How you check your headers out?

25 MR. KEITH: Let us do that portion. If you still



1 have a question at that point, then we can answer it.

2 MR. VAN BRUNT: Carter, you've got some questions.

3 MR. ROGERS: Exhibit 2-23. The three items on that
4 exhibit discuss NPSH. At least, two of them do. I have
5 some questions pertaining to the NPSH calculations. In
6 particular, in 8), the CESSAR requirement is that the
7 calculation of the NPSH shall consider concurrent high
8 pressure safety injection, low pressure safety injection,
9 and containment spray pump operation. Did Combustion
10 Engineering specifically identify the conditions of those
11 pump operations as to whether those pumps are operating at
12 their design head or runout head?

13 MR. KEITH: Our calculations assumed runout head.

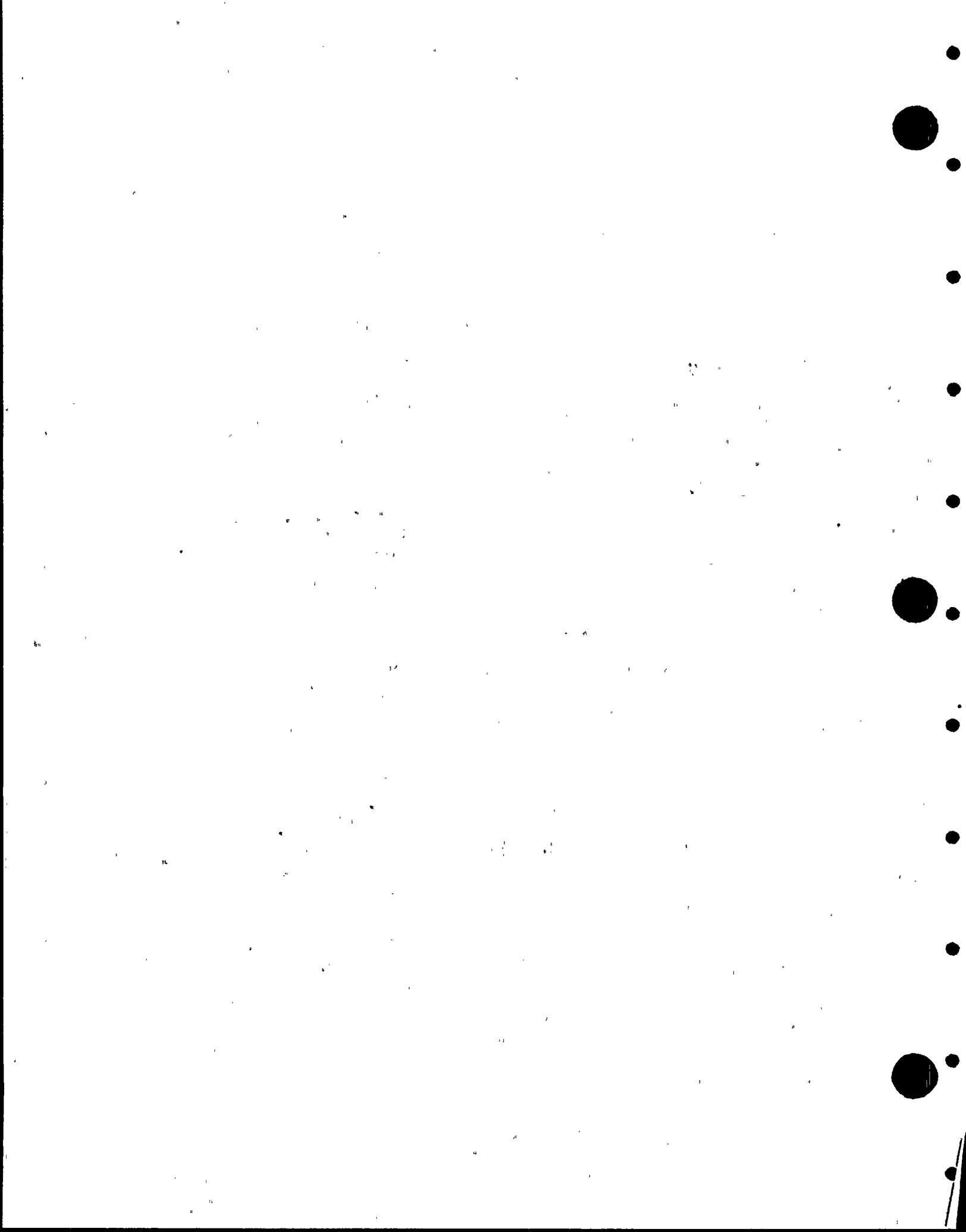
14 MR. ROGERS: As a correlation of that particular
15 thing, will you address in your presentation the possible
16 vortexing of water in the sump later on?

17 MR. KEITH: Yes.

18 MR. ROGERS: Another question on Exhibit 2-26. Item
19 16) talks about the bypass flow line and its capability of
20 passing 150 gallons per minute with the pump operating at
21 design operating conditions. Is it true that there is an
22 orifice in that line to limit the flow rate?

23 MR. KEITH: Yes.

24 MR. ROGERS: Who sized the orifice? Is that Bechtel-
25 supplied or Combustion-supplied?



1 MR. KEITH: CE provided the orifice size.

2 MR. ROGERS: So there is a sufficient discussion
3 between Bechtel and Combustion Engineering to assure that
4 with the orifice sizing by Combustion Engineering and the
5 pipe line sizing and routing by Bechtel that that particular
6 requirement is met?

7 MR. KEITH: That's correct.

8 MR. ROGERS: Exhibit 2-33, Item 3) B). There is also
9 a previous reference that talks about a flow rate of
10 4,400 gpm. Here we are talking about quite a bit higher
11 flow rates through the shutdown cooling heat exchanger. What
12 is the size of the containment spray pumps? There are two
13 pumps, and what are they sized at?

14 MR. BIBA: The containment spray pumps are sized to
15 operate at a flow rate of 3,890 gallons per minute. The
16 flow rate of 4,400 gallons per minute includes the runout
17 conditions. The 11,000 gallons per minute flow rate on
18 Exhibit 2-33 is the cooling water flow rate in the shutdown
19 cooling heat exchangers.

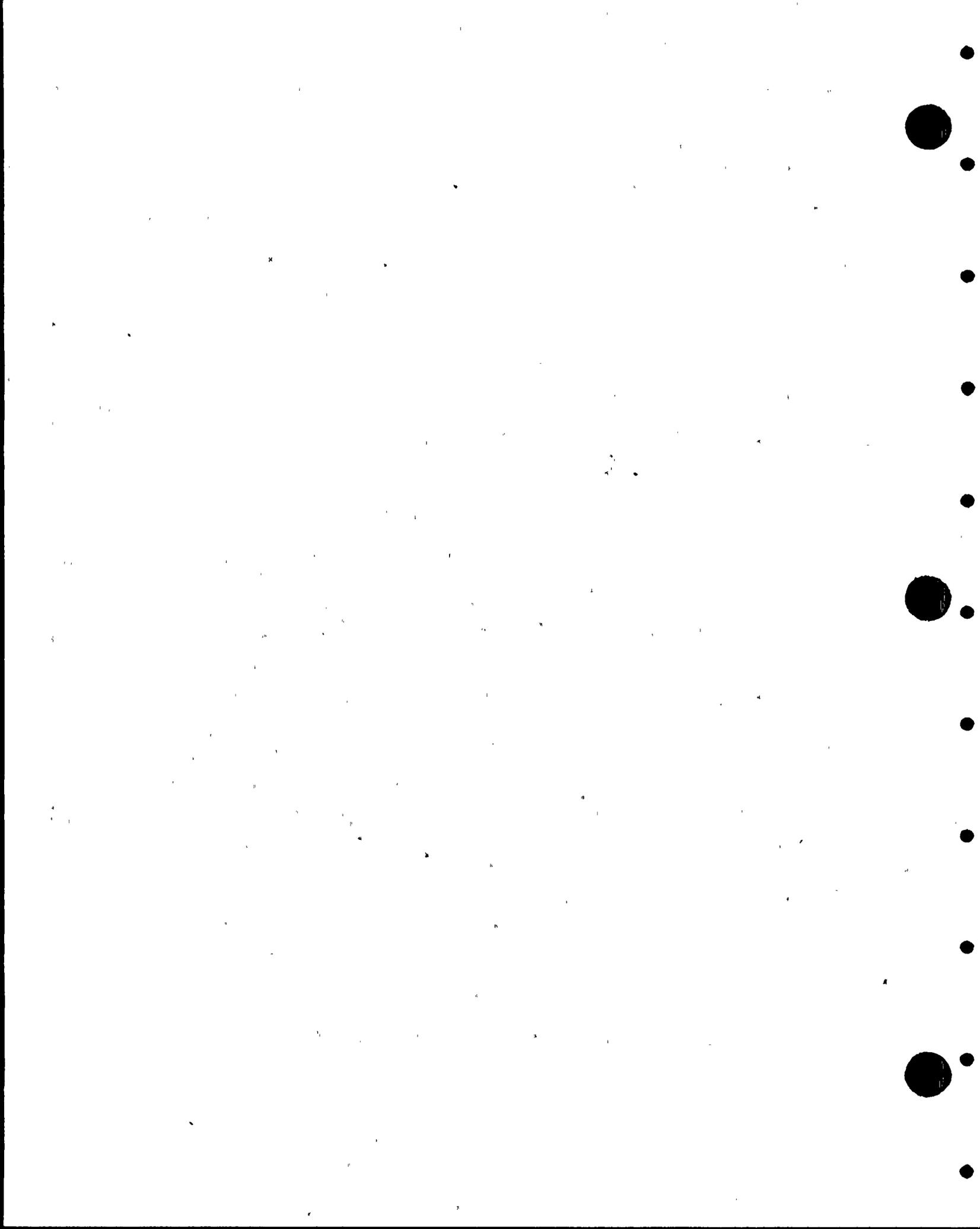
20 MR. ROGERS: On the cooling water side?

21 MR. BIBA: Yes.

22 MR. ROGERS: I see that. I'm sorry, I missed it.

23 MR. VAN BRUNT: Rich, you had a question.

24 MR. TOSETTI: Yes, I wanted to ask regarding the
25 leakage relief valve which discharges into the auxiliary



1 building. Those are routed to some sump, I assume, in the
2 auxiliary building. How is the pump on the sump controlled,
3 is it a manual or automatic actuation, and where does it
4 route to?

5 MR. KEITH: It is automatic operation which goes to
6 the liquid radwaste system.

7 MR. TOSETTI: Have you looked into the potential
8 transfer of the activity in those sumps to the radwaste
9 systems post-LOCA?

10 MR. KEITH: Once again, because of what that relief
11 valve is set for, the one we are talking about, we don't
12 expect that to relieve, so as far as where the pipe is
13 routed, we could transfer that water to the liquid
14 radwaste system, but we are not planning on having post-LOCA
15 fluids go through the liquid radwaste system.

16 MR. VAN BRUNT: Rich, is your concern the activity
17 in the area or what is in the pipe?

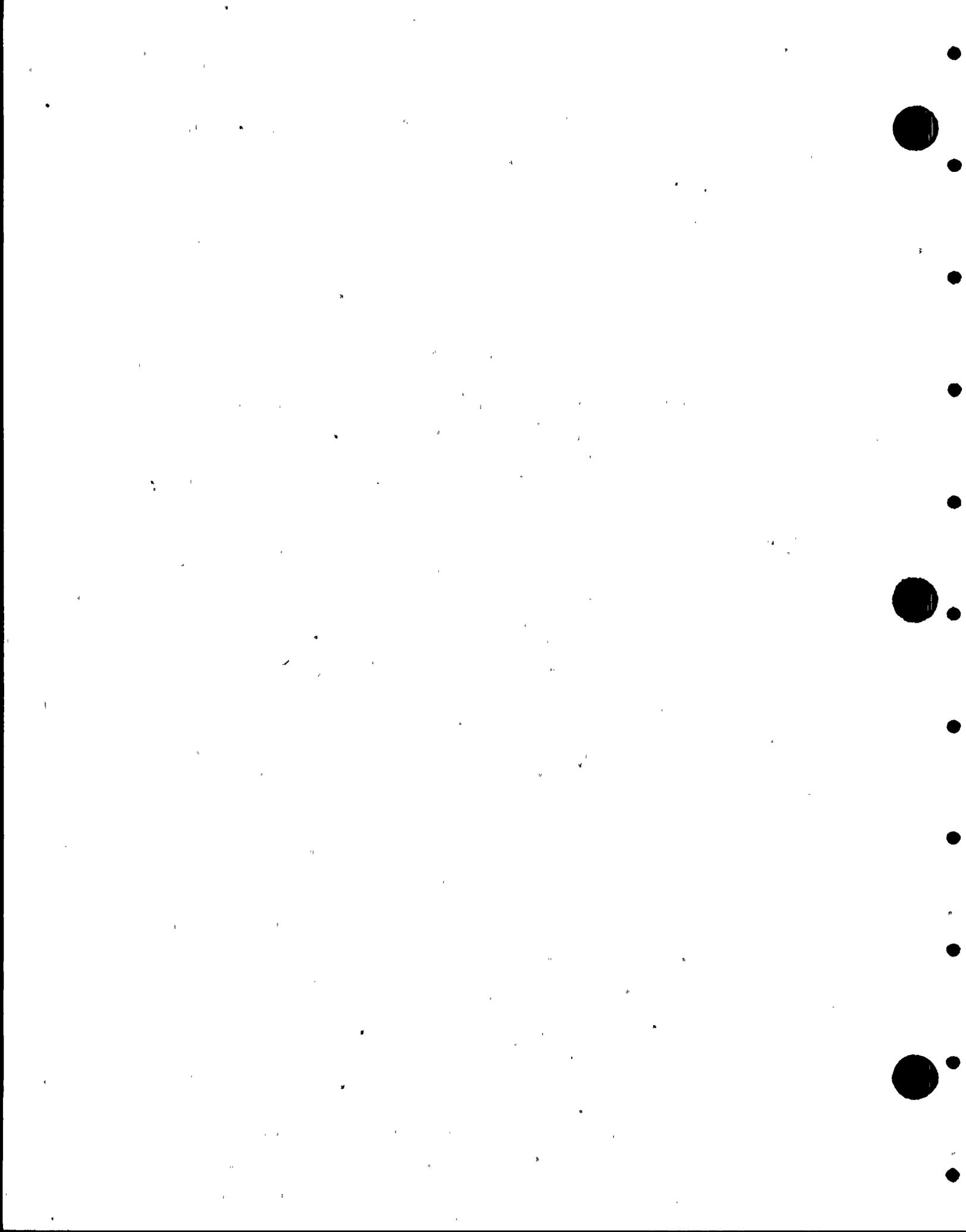
18 MR. TOSETTI: It is more the activity in the pipe
19 as it leaks, either seal leakage or passive failure, pump
20 seal failure, and then transferring that into other buildings
21 at the plant.

22 MR. KEITH: We will leave that question open, Ed.

23 MR. VAN BRUNT: Do you want to come back to it later?

24 MR. KEITH: If we can.

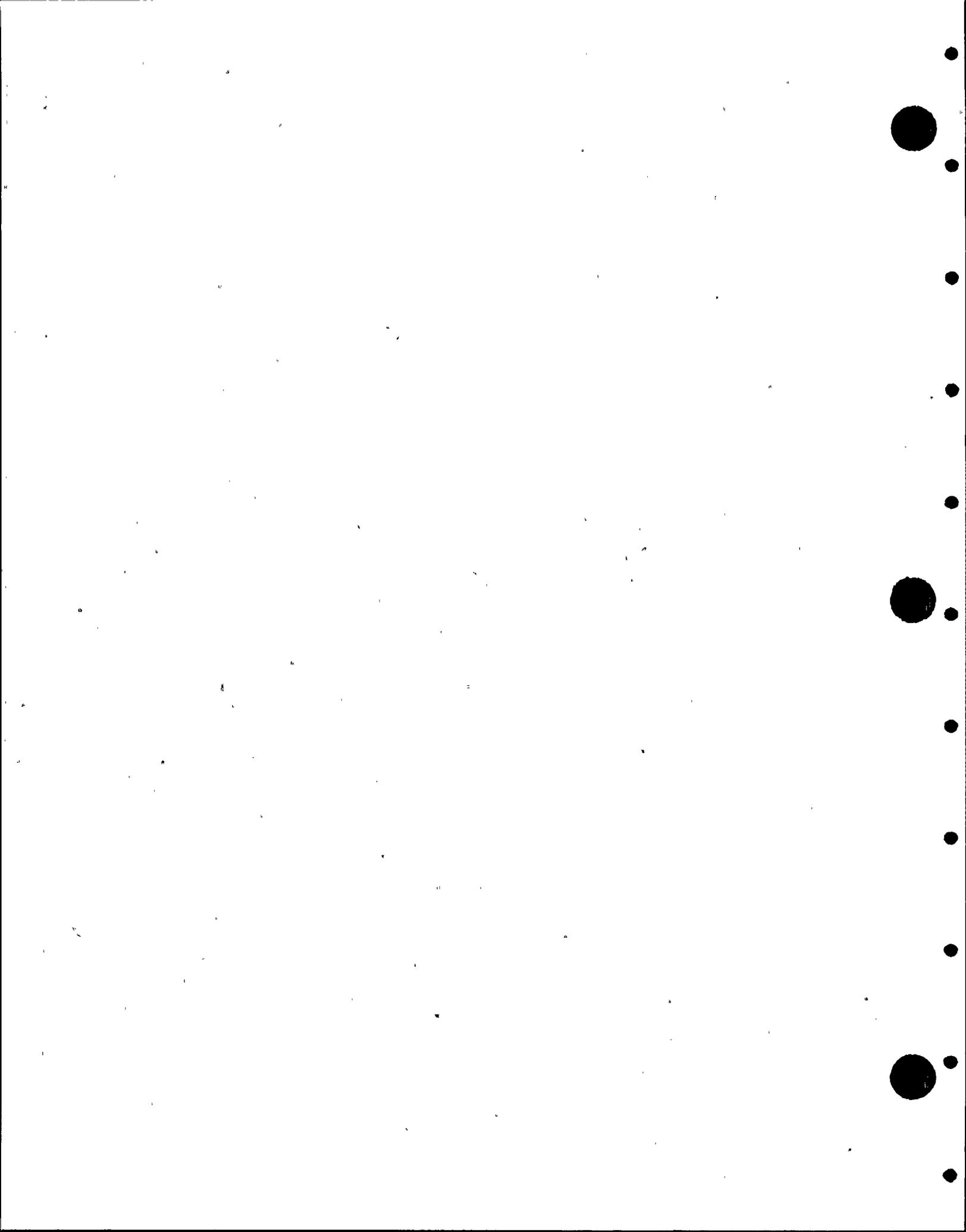
25 MR. VAN BRUNT: Okay, very good.



1 MR. TOSETTI: That's all I had.

2 MR. VAN BRUNT: I've got a couple of questions I
3 would like to pursue. One is just kind of general. We have
4 covered it previously, but in this whole area of the contain-
5 ment related systems, of which the Containment Spray System
6 is one, there is very integrated design activity between
7 Bechtel and Combustion. I don't want to get into the QA
8 aspects, that is not my intention, but would you explain to
9 me in a general way how you go about the iterations necessary
10 to transfer transient data back and forth between your
11 design engineering organizations to come up with a final
12 design that is satisfactory? It is not a cut and dried
13 activity. I understand that. I would like to understand
14 a little bit how the heat transfer data gets converted into
15 flow data, and so forth, the iteration that occurs.

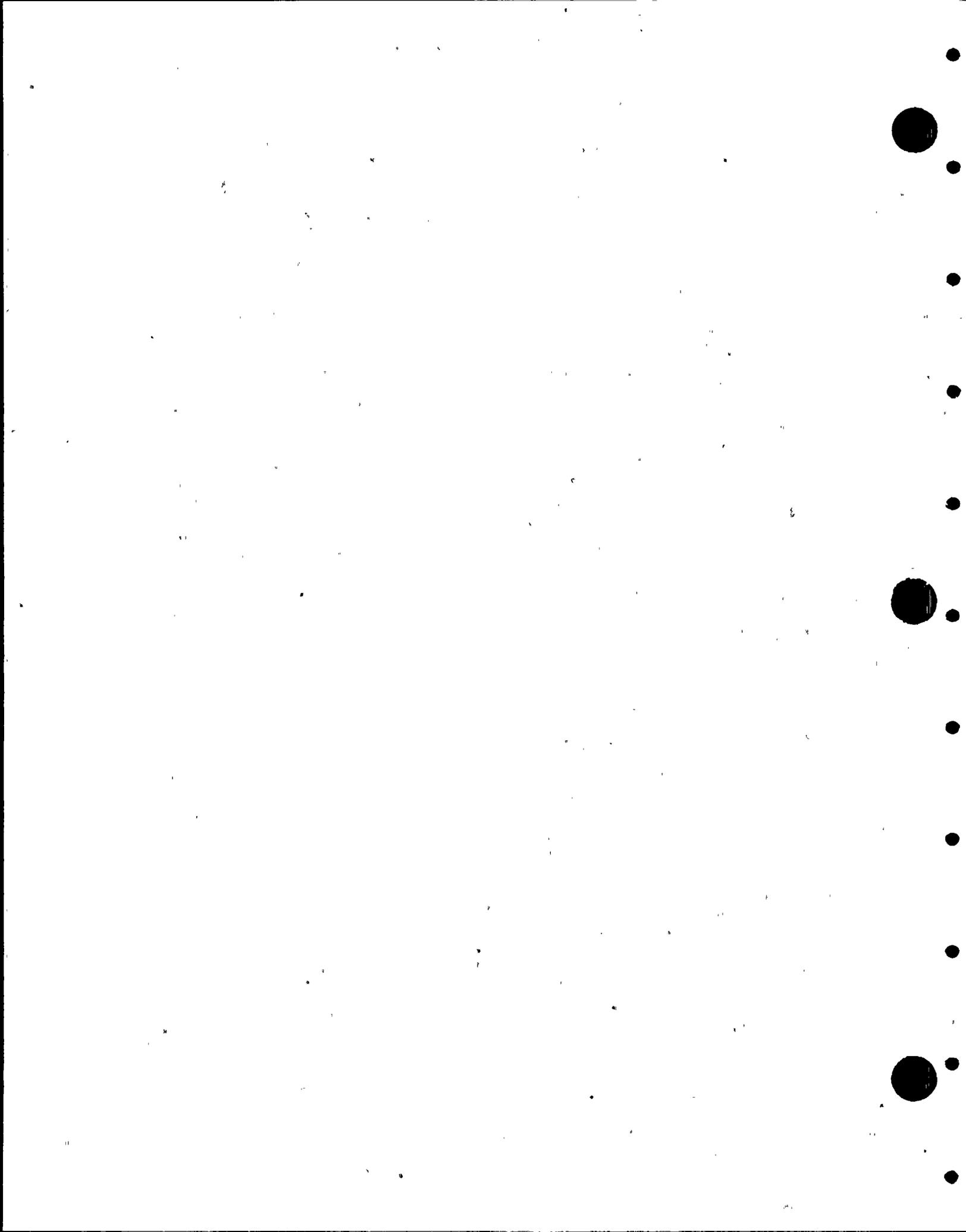
16 MR. KEITH: Basically, when we started off the project
17 we received a great quantity of data from Combustion
18 Engineering explaining their design and giving us numerous
19 interface requirements that our design had to meet in order
20 for Combustion Engineering's design to function properly.
21 Our engineers then converted all these interface requirements
22 into our design, and our basic design documents, in particular
23 our piping and instrumentation diagrams, which show various
24 materials, line sizes, and all, have all been transmitted to
25 Combustion Engineering and they have reviewed them and given



1 us comments back to us. That is the basic process. Any of
2 our design documents, I am sure there are a number in
3 addition to the piping and instrumentation diagrams, have
4 gone to Combustion Engineering for their review and comments.

5 MR. VAN BRUNT: I would like to go to Exhibit 2-2.
6 You may deal with this later. Under Item 6) there, it says
7 that two trains shall be physically separated from each
8 other so that failure of one train will not result in
9 failure of the other train due to fire, flooding, jet
10 impingement, or missiles. As I say, you may be going to
11 cover this later, but I would like as you go through the
12 presentation of the system layout to indicate how you are
13 separating both mechanical and electrical and control aspects
14 of Train A and Train B within those buildings. Because the
15 containment is on the west side of the auxiliary building
16 more or less, the spray ponds, which are the ultimate heat
17 sink for discharge of this heat, are to the south, you've got
18 to transfer mechanical systems across electrical systems by
19 train. I would like to understand how you physically
20 separate those to ensure you don't have any interactions
21 between them. I am looking ahead. It looks like you've got
22 some drawings where you do that. I would like you to do that
23 as you go along, if you could.

24 MR. HODGE: Ed, I had a question in this same light
25 as to the plumbing systems or drain systems, which is how



1 you prevent those two from communicating.

2 MR. VAN BRUNT: The whole matter of physical
3 separation.

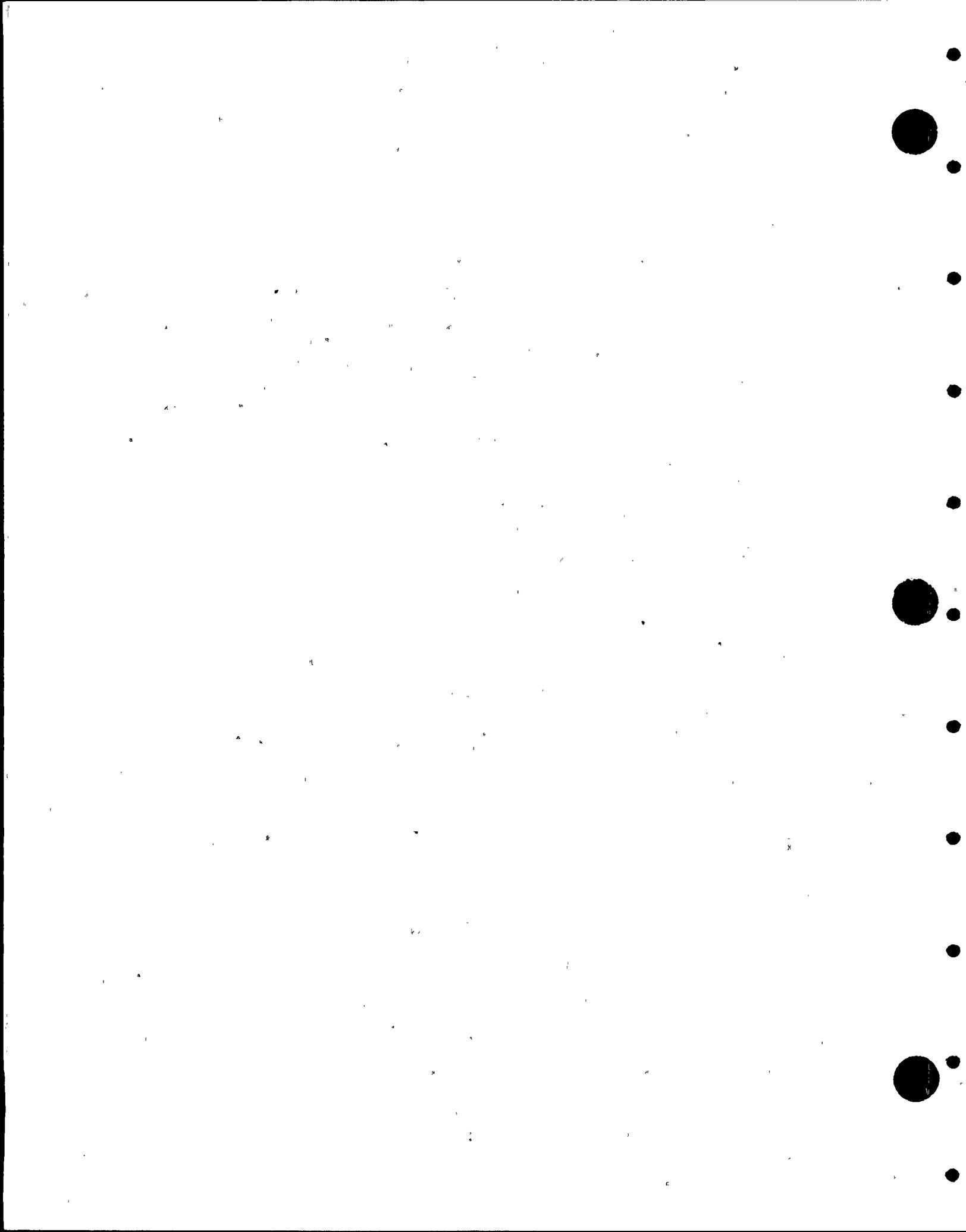
4 MR. KEITH: Let's go through that portion of the
5 presentation and see if that doesn't respond to the question.

6 MR. VAN BRUNT: I would like to go to Exhibit 2-20.

7 With regard to Item 1) here, it says to assure
8 that Containment Spray System flow requirements are met,
9 maximum and minimum acceptable head losses for the piping
10 and fittings are given, and along with that, the required
11 NPSH shall be met. Then you say you are in compliance. Also
12 the Containment Spray System is designed to meet the flow/
13 pressure requirements of the containment spray nozzles. It
14 wasn't clear to me what that was implying relative to the
15 compliance set down there with regard to NPSH.

16 MR. KEITH: Ed, because our spray pumps are larger
17 than the standard System 80 spray pumps and due to the fact
18 that we have auxiliary spray nozzles underneath some of the
19 slabs in the containment building, the maximum head losses
20 given in that table are exceeded. However, we still meet
21 the NPSH requirements and, as important, we meet the design
22 flow and pressure at the spray nozzles inside containment.

23 MR. VAN BRUNT: I would like to go to Exhibit 2-27.
24 It says the maximum spray header elevation above the RWT
25 outlet nozzles shall not exceed 185 feet. You indicated



1 partial compliance, that the nozzles don't exceed 192 feet,
2 and you go on to say, "However, the system analysis has
3 shown the system performs adequately." I am not quite sure
4 what the inference of that last statement is.

5 MR. KEITH: It is the same calculation I was referring
6 to in response to the last question.

7 MR. VAN BRUNT: Oh, I see. Then, lastly, Exhibit
8 2-31; Item 1) C. under Related Services. You have a
9 requirement there that a minimum temperature of 60 degrees
10 will be established to preclude possible boron precipitation.
11 I was interested in how that compliance was accomplished.
12 Are those lines heat traced or exactly what is the situation
13 and how is the tank handled?

14 MR. KEITH: All the lines outside, which are in a
15 pipe tunnel, as we discussed earlier, are heat traced. The
16 tank itself is a concrete tank with a stainless steel liner
17 and an insulated top. The concrete is on the sides and then
18 it has a metal top that is insulated. We do have a heater
19 in that tank, also, to maintain 60 degrees.

20 MR. VAN BRUNT: I don't have any more questions.
21 Does anybody else have a question? Ed.

22 MR. STERLING: Figure 1-1. Earlier, in response to a
23 question Mike Hodge had, you indicated that the piping from
24 the refueling water tank to the main structure is in a pipe
25 tunnel. Is that pipe tunnel exposed to heavy ground loads?

1 If so, is there a maximum load above that pipe tunnel that
2 is allowed and how are you restricting heavy loads?

3 MR. VAN BRUNT: Are you worried about future loads
4 or buildings over the area?

5 MR. STERLING: Cranes or dump trucks or whatever.

6 MR. KEITH: That is designed to take construction
7 loads.

8 MR. STERLING: Is there a load that we could possibly
9 put on that that would cause some problem with a normal type
10 of vehicle that you operate in a plant of this type?

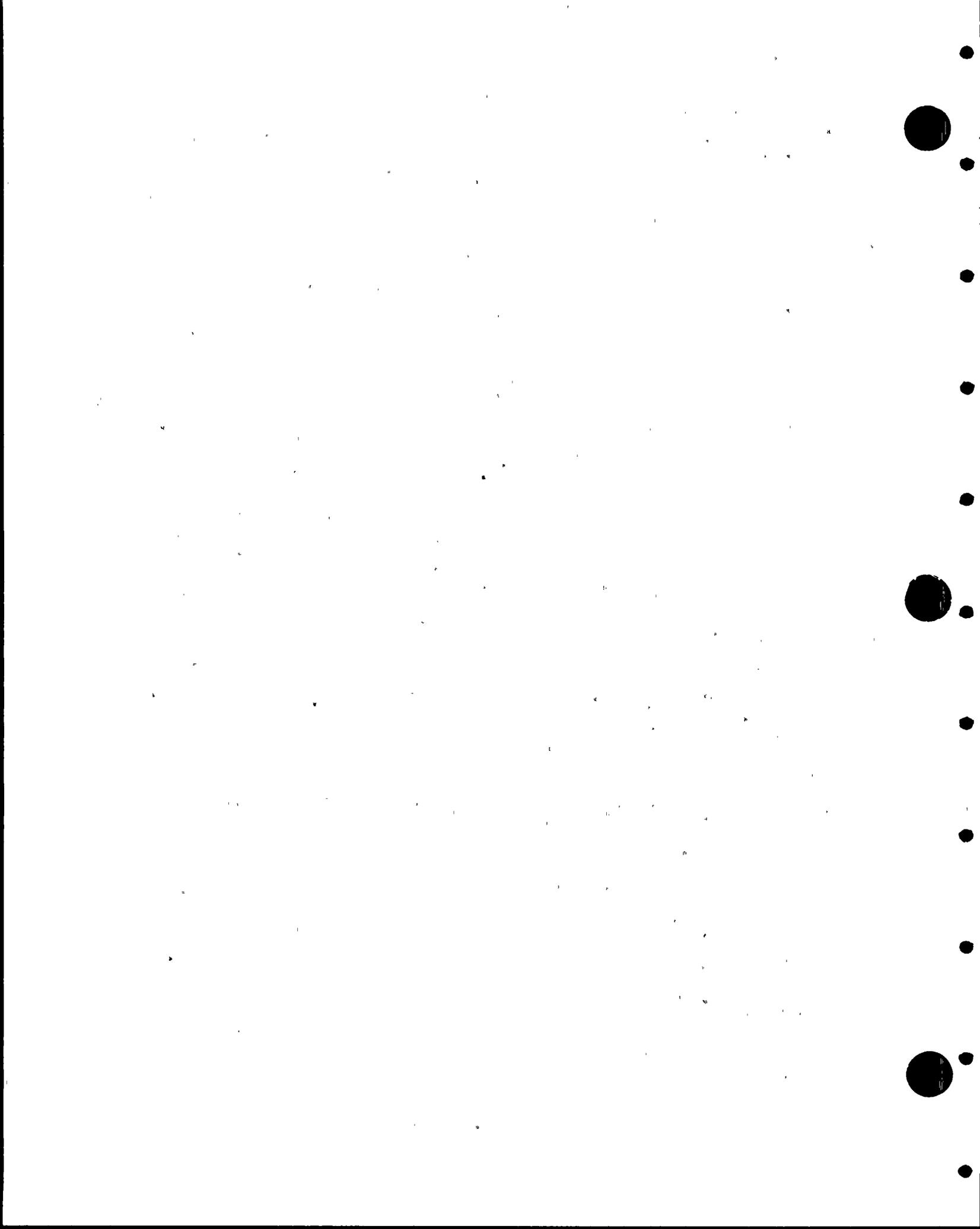
11 MR. KEITH: Not normally. It is designed to take
12 all the normal loads you could expect.

13 MR. STERLING: Should there be a restriction in that
14 area as to the type of load that is there like, I don't
15 know what size vehicle it might be, would there be a
16 restriction there we might want?

17 MR. KEITH: We will check into that, Ed. Let's hold
18 that as an open item and we will check and see if there is
19 anything that you could reasonably expect at the power plant
20 that you would want to restrict access to that area.

21 MR. STERLING: One additional to that. You show the
22 two hydrogen recombiners. I was going to ask this earlier.
23 Is that the operating location or is that the storage
24 location?

25 MR. KEITH: Both, except, of course, you are not going



1 to have them stored in all three units.

2 MR. VAN BRUNT: Ed, are you finished?

3 MR. STERLING: Yes.

4 MR. VAN BRUNT: John, do you have another question?

5 MR. ALLEN: I've got a couple. What did we finally
6 arrive at on total unsprayed volume in the containment?

7 MR. KEITH: Unsprayed volume of 4%.

8 MR. ALLEN: Then along the same lines, what was our
9 maximum temperature for transients?

10 MR. KEITH: In the containment?

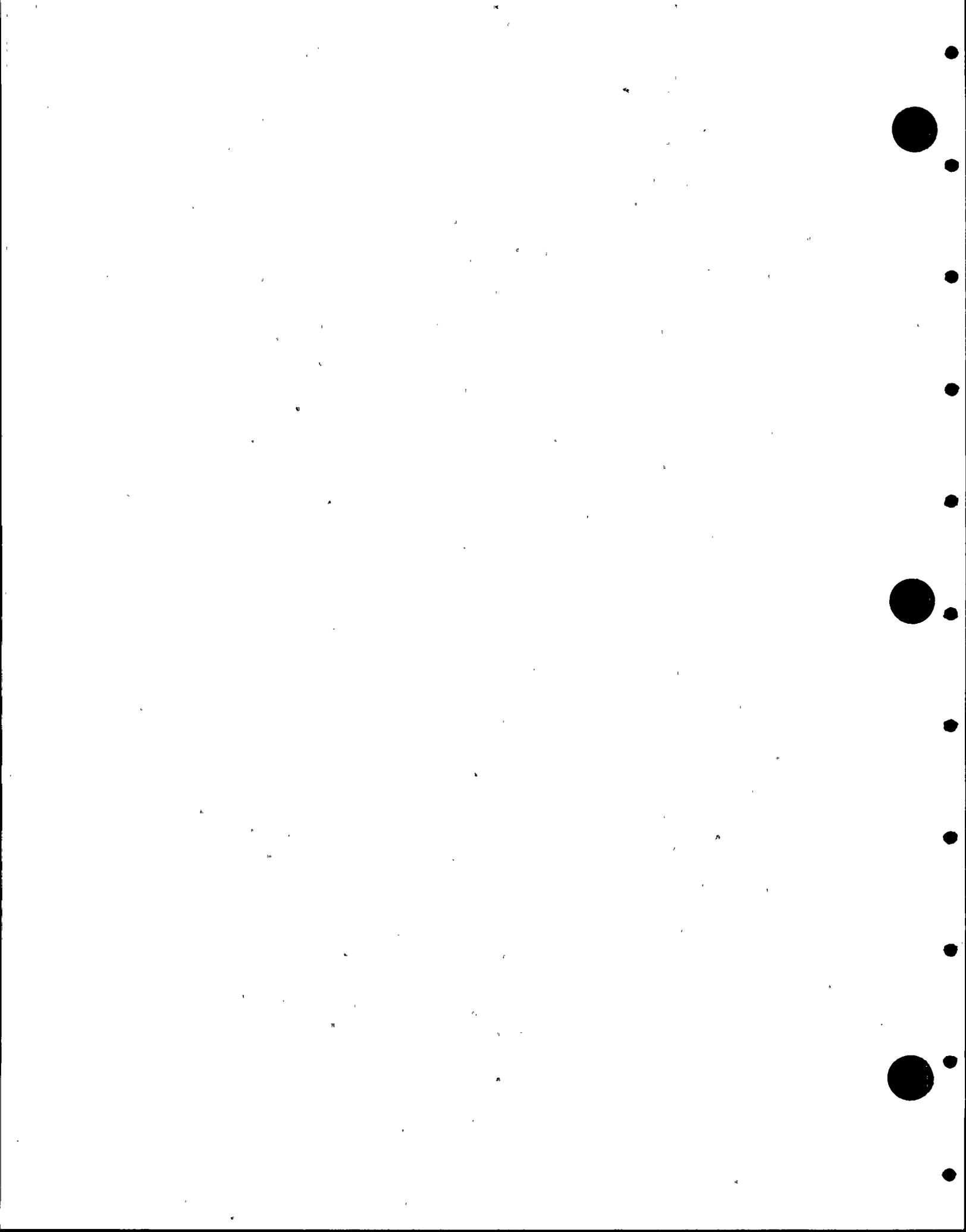
11 MR. ALLEN: Yes.

12 MR. KOPCHINSKI: The maximum pressure is 49 pounds,
13 and that is unless due to a LOCA. The maximum temperature
14 for a main steam line break is about 401 degrees. However,
15 for equipment qualification, you do a different type of
16 calculation. The NRC asks you to take a count of reevapora-
17 tion, and then that is when you get the 370 degrees I
18 mentioned earlier.

19 MR. ALLEN: Just one more. You may cover it when you
20 get into design of the sumps. That one interface criterion
21 up there that you had was .09 inches diameter particle, and
22 my concern there is plugging up of those screens. Are you
23 going to touch on that?

24 MR. KEITH: Yes, the sump design will.

25 MR. VAN BRUNT: Any other questions anybody has



1 before we go on? Bill.

2 MR. SIMKO: Back on Exhibit 2-31, Ed asked a question
3 about the minimum 60-degree temperature for the refueling
4 water tank. Is there any requirement for the heat tracing
5 itself to be powered by two separate buses in case you lose
6 one?

7 MR. KEITH: The heat tracing is redundant.

8 MR. VAN BRUNT: Is that all? Anybody else have any
9 questions?

10 MR. VREELAND: Is the 90-second spray time the time
11 used for a full spray, full flow?

12 MR. KEITH: Yes.

13 MR. VREELAND: And do you assume an initial flow or
14 just take zero and then full flow it in 90 seconds?

15 MR. KEITH: It is a step function. In the 90 seconds,
16 we don't take credit for the ramping up of the flow.

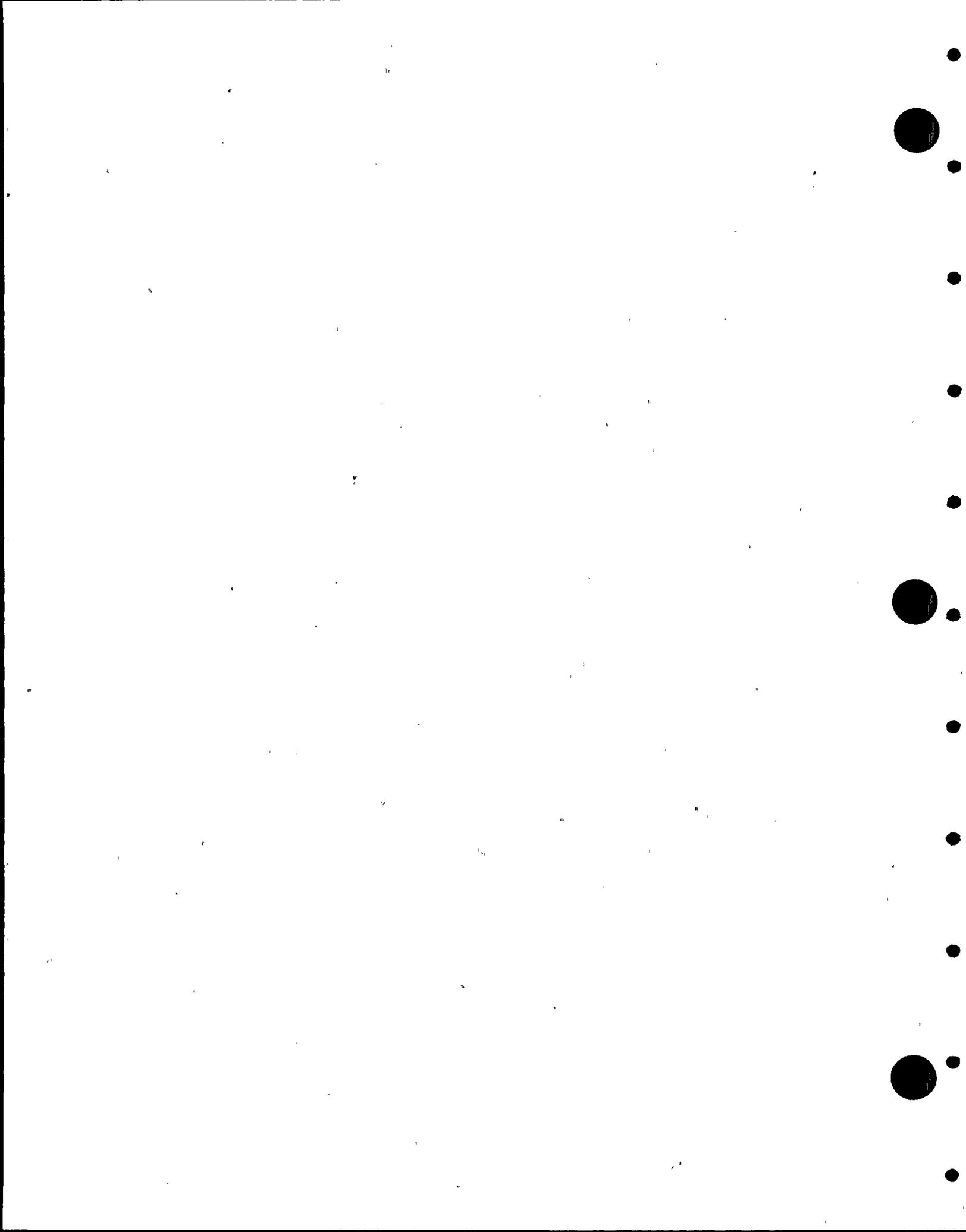
17 MR. COOK: Is that also considering loss of offsite
18 power? That is using the diesels?

19 MR. KEITH: Yes, that 90-second number is our loss of
20 offsite power number, which has an additional 10 seconds due
21 to diesel startup.

22 MR. VAN BRUNT: Any other questions?

23 Seeing none, Dennis, go ahead.

24 Let me ask you a question. Excuse me. Go off the
25 record.



1 (Thereupon a brief recess was taken, after which
2 proceedings were resumed as follows:)

3 MR. VAN BRUNT: Okay, you are on.

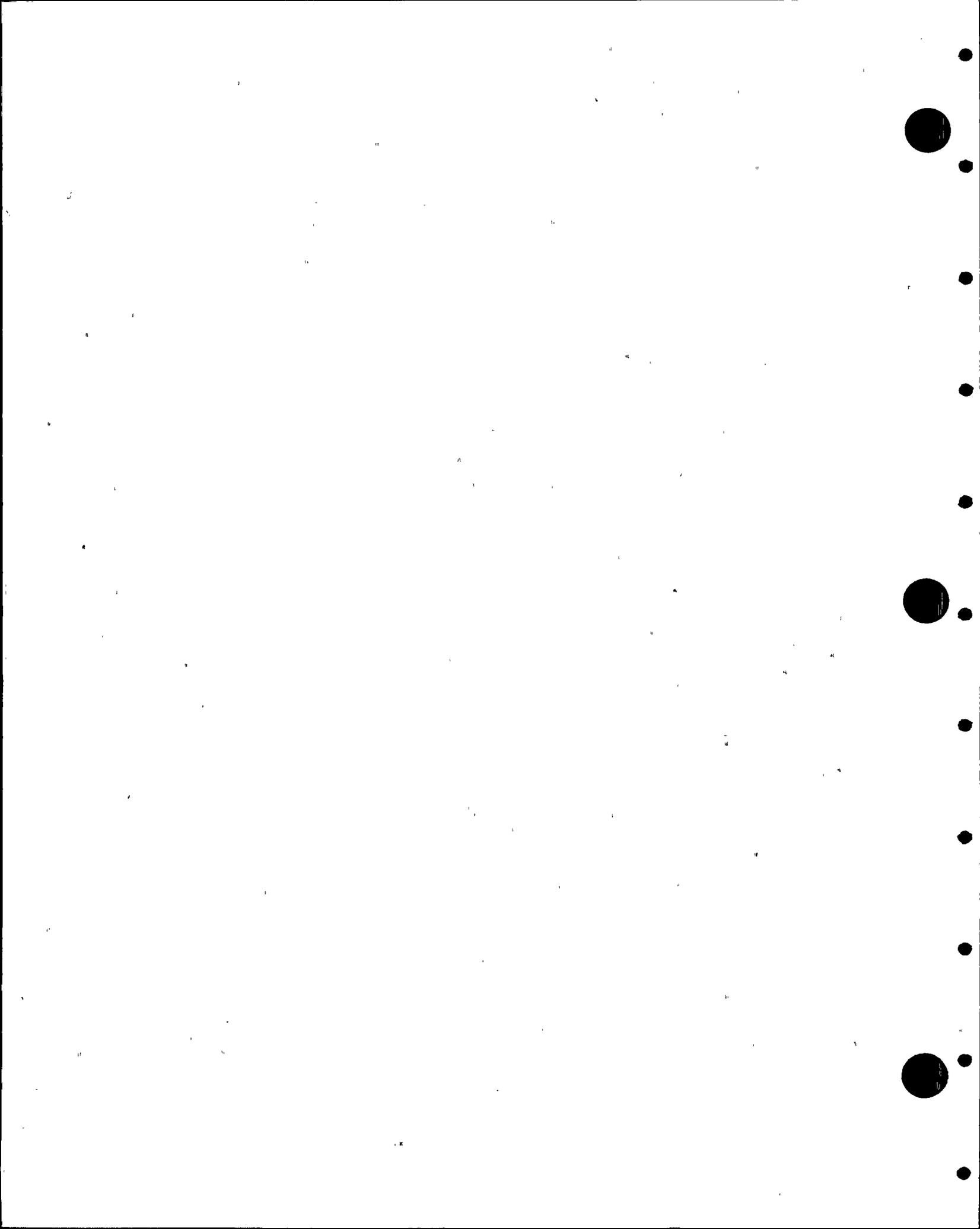
4 MR. KEITH: We will continue with System Description
5 and Operation.

6 MR. BIBA: Exhibit 2-37 shows the system description
7 for the Containment Spray System in conjunction with
8 Figure 2-1, which shows the basic components.

9 The Containment Spray System makes use of the
10 refueling water tank, two containment recirculation sumps,
11 two containment spray pumps, two shutdown cooling heat
12 exchangers, and two sets of spray headers in containment,
13 and associated valves, piping and instrumentation necessary
14 for making a complete system.

15 The Containment Spray System provides cooling
16 sprays of borated cooled water from the upper regions of the
17 containment to reduce containment pressure and temperature
18 in the containment after either a major LOCA or major steam
19 line break incident inside containment. The spray flow is
20 provided by the containment spray pumps, which take suction
21 initially from the refueling water tank and, after a minimum
22 of about 20 minutes, which is the minimum duration of the
23 safe injection mode of the operation, the suction is trans-
24 ferred to the recirculation sumps.

25 The pumps discharge into the containment

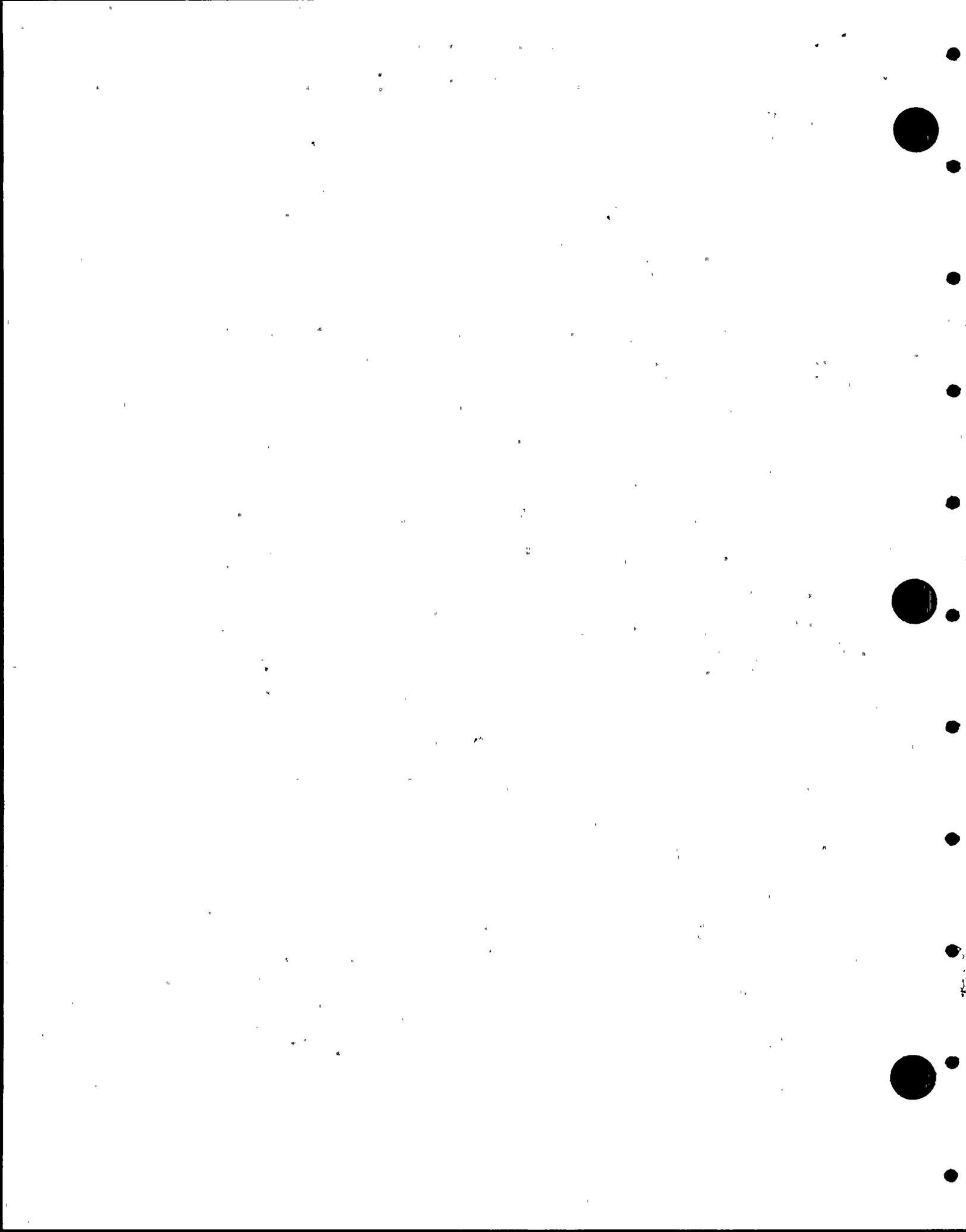


1 atmosphere through two shutdown cooling heat exchangers,
2 where the heat is removed. During the first mode of
3 operation, the injection mode, there is no heat transfer
4 taking place in the heat exchangers, because the temperature
5 of the refueling water tank water is ambient temperature.
6 During the recirculation mode of the operation, there is
7 actually a heat transfer through the essential cooling water
8 system and then through the shutdown heat exchangers into
9 the ultimate heat sink. At PVNGS, there are additional
10 spray headers that are located underneath the concrete decks
11 at elevation 140 and 120 and those spray headers provide
12 additional spray coverage to facilitate the more than 90%
13 spray coverage in the containment.

14 In the main headers, there are 230 nozzles per
15 train. They are hollow cone ramp bottom, Spraco No. 17071417.
16 That is the model number of the model. Those are one-inch
17 connection size, three-eighths inch orifice nozzles that
18 work at 14 psid pressure across the nozzle, flow rate
19 14.2 gallons per minute at that pressure, and they provide
20 the coverage in the main spray headers.

21 The auxiliary spray headers utilize 80 spray
22 nozzles that are also hollow cone ramp bottom, Spraco No.
23 17651308, and, as we said, they are located underneath the
24 concrete levels 140 and 120.

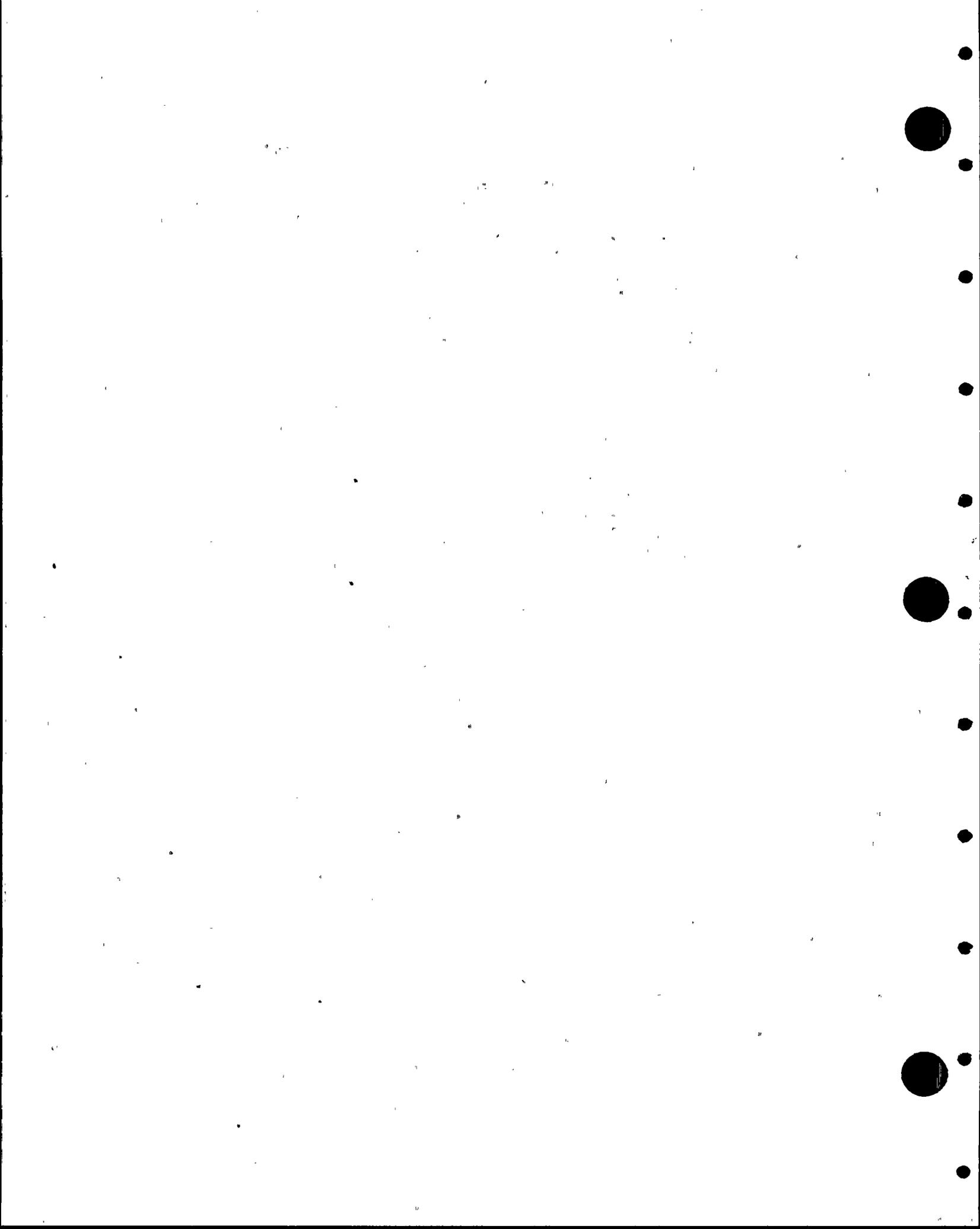
25 Exhibit 2-38. The Containment Spray System is



1 initiated by a containment spray actuation signal that is
2 10 psig in the containment. This signal starts the contain-
3 ment spray pumps and opens the containment spray control
4 valves, and if offsite power is not available or is lost,
5 the shutdown cooling system is shed from the normal power
6 supply and it is then connected to the diesel generator
7 emergency power supply in accordance with the ESF actuation
8 system load sequencing. One pump and its spray control valve
9 is connected to each diesel generator.

10 When a low level is reached in the refueling water
11 tank, a recirculation actuation signal is generated and the
12 suction of the pumps is transferred from the refueling water
13 tank into the containment sumps. This transfer is an
14 automatic transfer by means of automatic opening of these
15 valves on the recirculation actuation signal. The operator
16 manually remotely from the control room has to close the
17 isolation valves on the refueling water tank. When the
18 system is aligned in that manner, the recirculation spray
19 continues indefinitely until it is modified by the operator.

20 Figure 2-2 shows a schematic of the Containment
21 Spray System. It should be noted that this is only a
22 schematic. It does not show the actual physical locations
23 of these components, the refueling tank being in the yard,
24 the shutdown cooling heat exchangers and containment spray
25 pumps being in the auxiliary building, and recirculation

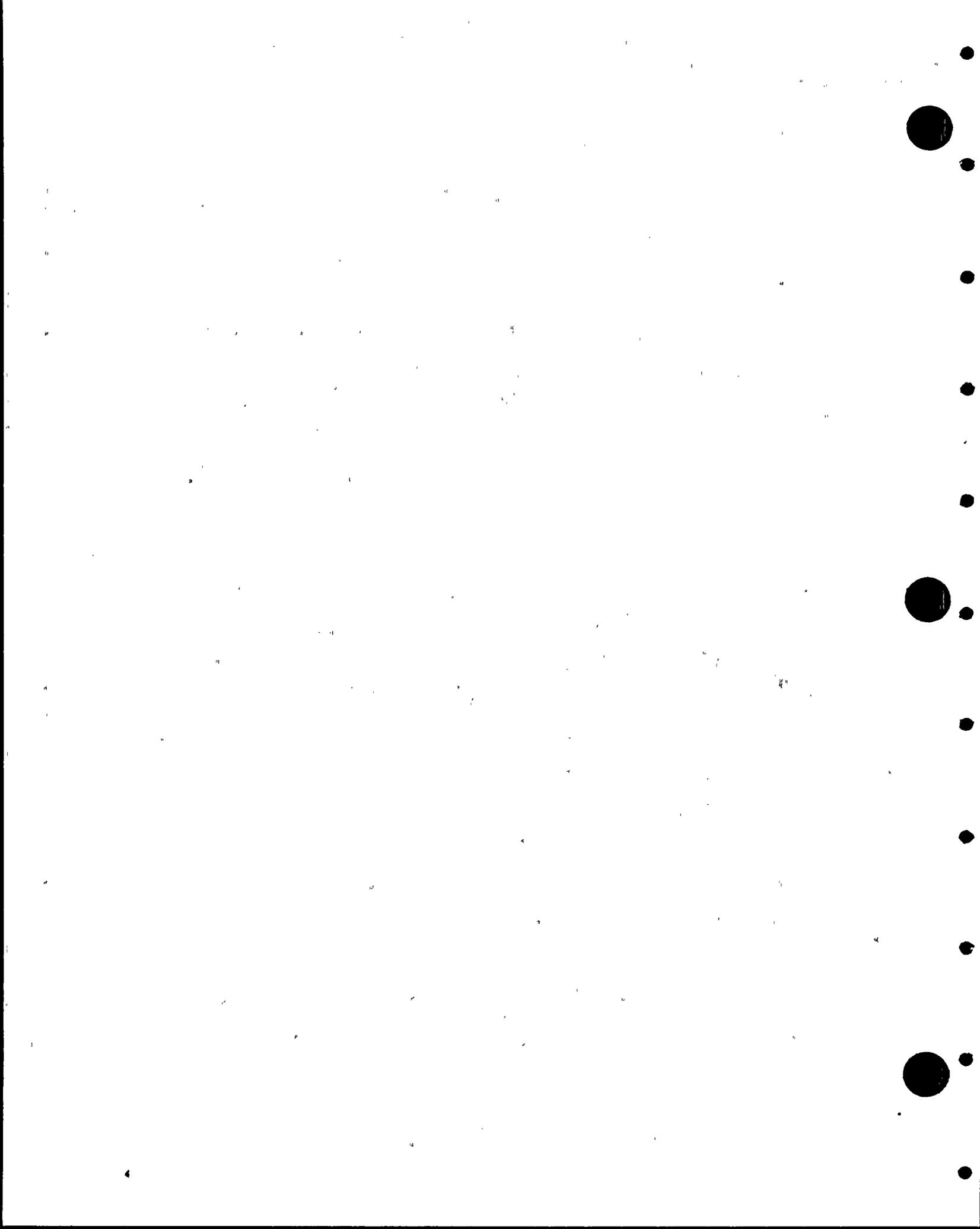


1 sumps and the spray headers are in the containment building.
2 There are four main spray headers in the upper portion of
3 the containment and each train has two auxiliary headers
4 below elevation 140 and 120.

5 Figure 2-3 shows the plan of the auxiliary building
6 elevation 40 and, as was mentioned before, there should be
7 pointed out the physical separation by concrete compartments
8 and distance of the containment spray pumps for Train A and
9 for Train B. Also, the piping which is associated with these
10 trains is separated by distance as they are coming into
11 these compartments from completely different opposite
12 directions.

13 Figure 2-4 shows the elevation of the auxiliary
14 building elevation 70 showing the location of the shutdown
15 cooling heat exchangers, the separation of them by concrete
16 walls and distance, and also the location of the piping
17 penetration for Train A and for Train B and their separations.
18 In addition to that, on elevation 100 above these piping
19 penetrations, there are electrical penetrations that are
20 also separated by concrete walls and by distance.

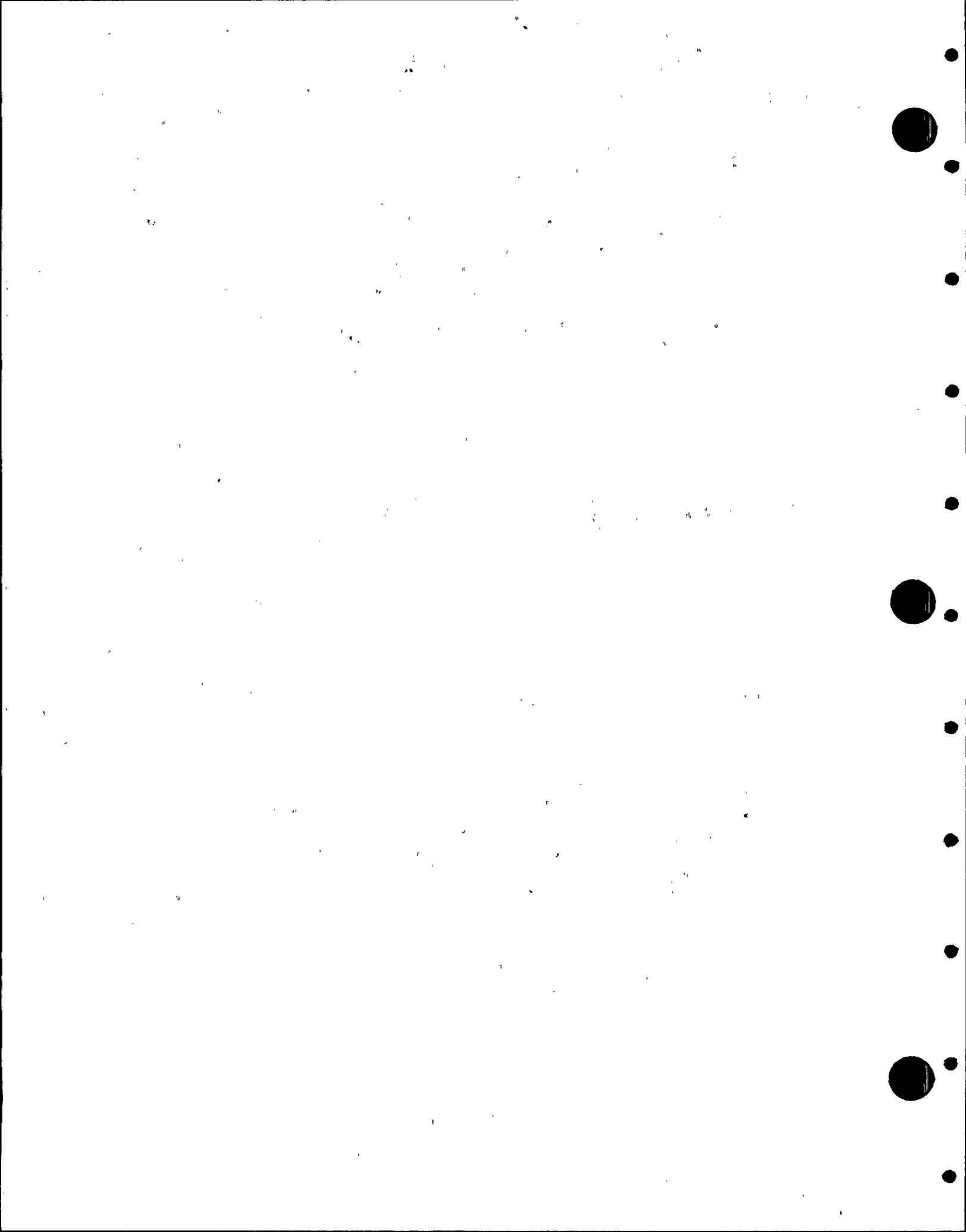
21 Figure 2-5 shows a plan of the containment
22 building at elevation 80 showing the two recirculation sumps
23 for Train A and Train B, their separation by distance, and
24 their location relative to the containment internal walls and
25 showing the suction piping in these sumps.



1 Figure 2-6 shows the elevation of the recirculation
2 sump screens. As is shown here, the screen is composed of
3 three layers. The first layer is acting like a trash rack.
4 It is composed of stainless steel 2-1/4 inch by 3/16 inch
5 grating. The second layer is a coarse screen which is
6 composed of half inch openings of stainless steel wire cloth.
7 The third layer is the fine screen, which is made of .09 inch
8 opening stainless steel wire cloth. The top deck of the
9 containment sumps is a solid top deck that does have 2-inch
10 diameter openings only to facilitate the removal or venting
11 of the air during the filling of the containment sumps. The
12 structural members are specifically to seismically support
13 the screens.

14 Figure 2.7 shows the plan of the sump and some of
15 the screen, also. The screen is located on a 3-inch high
16 curb and the structural members of the screen are shown here.
17 The sump dimensions are smaller than the screen, 7 feet 4 inches
18 by 18 feet 4 inches. This is the sump.

19 Figure 2-8 shows the detail of the vortex-breaking
20 unit that has been added on the pump suction piping to
21 facilitate adequate hydraulic performance of this suction
22 pipe. The vortex-breaker unit was suggested during the
23 model testing of the containment spray sump and there was a
24 one-to-one model test made on this sump and screen, and one
25 of the results of this model testing was addition of this



1 water vortex-breaking unit.

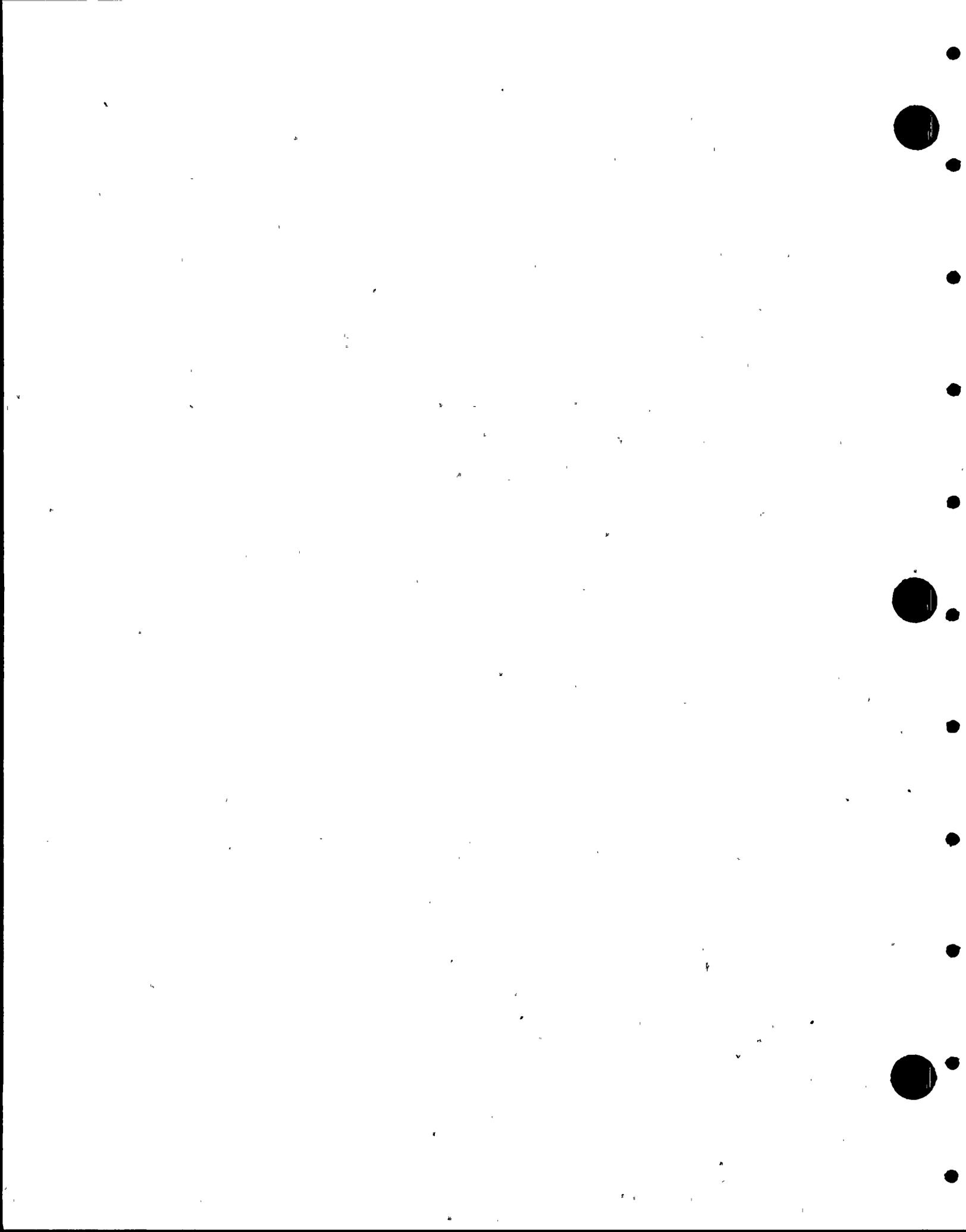
2 Figure 2-9 shows the elevation of the vortex-
3 breaking unit. What it is is like a hexagon composed of
4 stainless steel grating. It is the same grating as is used
5 for the trash rack on this containment sump. The grating is
6 all around and there is only a opening to interface with
7 the suction pipe.

8 Exhibit 2-39, the operation of the Containment
9 Spray System.

10 During plant startup, prior to reaching the maximum
11 allowable shutdown cooling temperature and pressure, the
12 shutdown cooling system is secured and then realigned to the
13 automatic Containment Spray System initiation configuration.
14 The containment spray actuation signal block is removed, and
15 from that point on, the Containment Spray System is ready
16 for normal operation, the normal operation being a condition
17 to be in standby alignment for possible emergency operation.
18 Therefore, during normal operation, the Containment Spray
19 System is not operating except for testing of the system.

20 Exhibit 2-40, system operation during plant shut-
21 down.

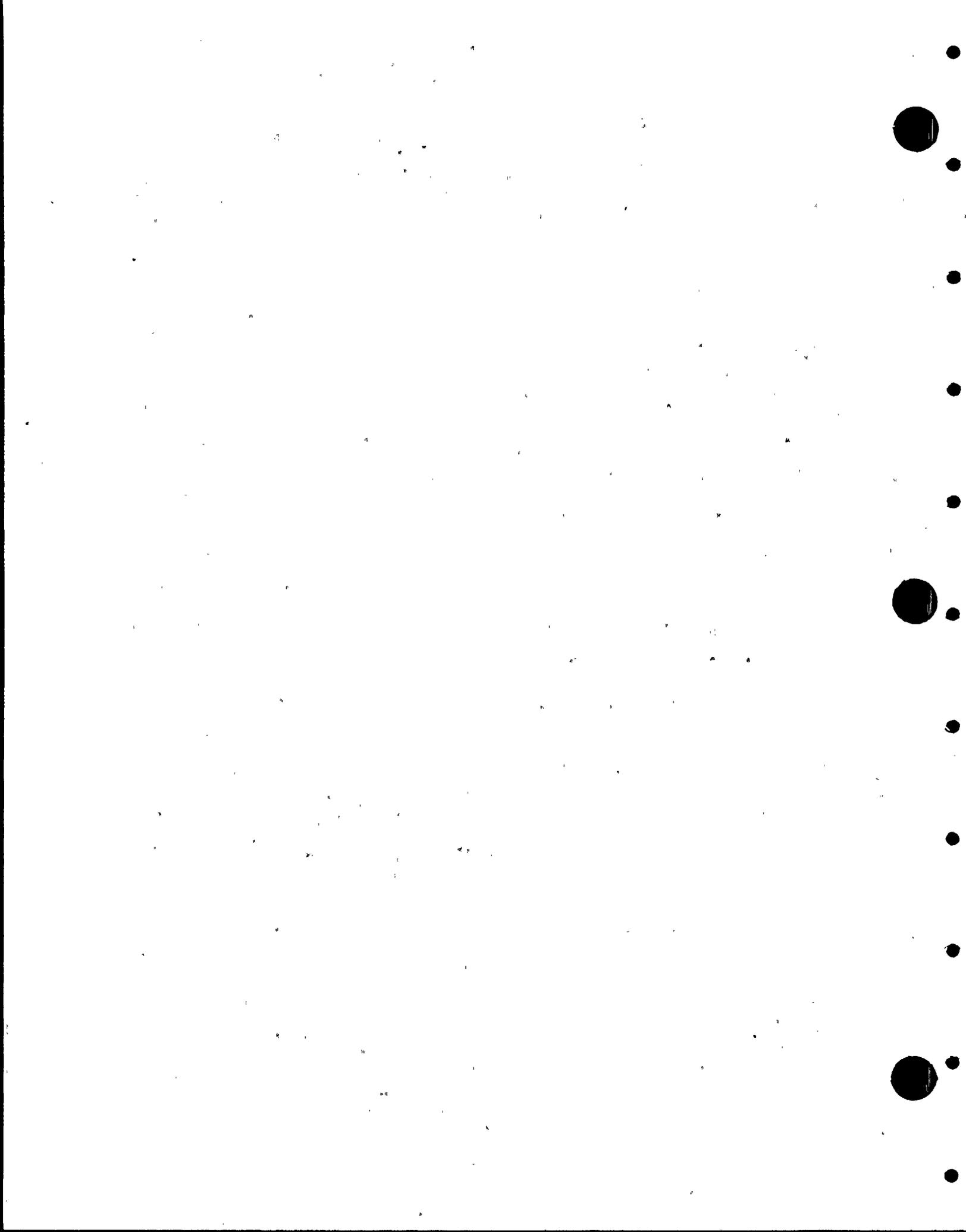
22 During plant shutdown, the Containment Spray System
23 remains aligned for spraying through the shutdown cooling
24 heat exchangers, which is the normal alignment of the
25 Containment Spray System, until the shutdown cooling pressure



1 and temperature is reached. When the shutdown cooling
2 pressure and temperature is reached, the Containment Spray
3 System is realigned to bypass the shutdown cooling heat
4 exchangers by using the bypass pipe shown on Figure 2-1
5 around the shutdown cooling heat exchanger and therefore
6 can be actuated automatically by the containment spray
7 actuation signal as it would be needed.

8 During the shutdown cooling mode of operation, the
9 low pressure safety injection pumps are pumping through the
10 shutdown cooling heat exchanger and the reactor core. This
11 mode of operation that I have just described is the first
12 mode of the shutdown cooling, and that occurs typically from
13 the onset of shutdown cooling when the temperature of the
14 system is typically between 200 degrees and 350 degrees
15 Fahrenheit.

16 During the second phase of shutdown cooling, which
17 is in the later stage of shutdown cooling when the pressure
18 is about 350 psia and the reactor coolant system temperature
19 is below 200 degrees, typically 170 degrees, at that point,
20 the Containment Spray System is aligned through the shutdown
21 cooling heat exchanger to work in conjunction with the
22 low pressure safety injection pumps to remove the decay heat
23 from the core, and the shutdown cooling is then continued
24 under the low pressure safety injection and containment spray
25 pumps until the refueling temperature of 125 degrees is



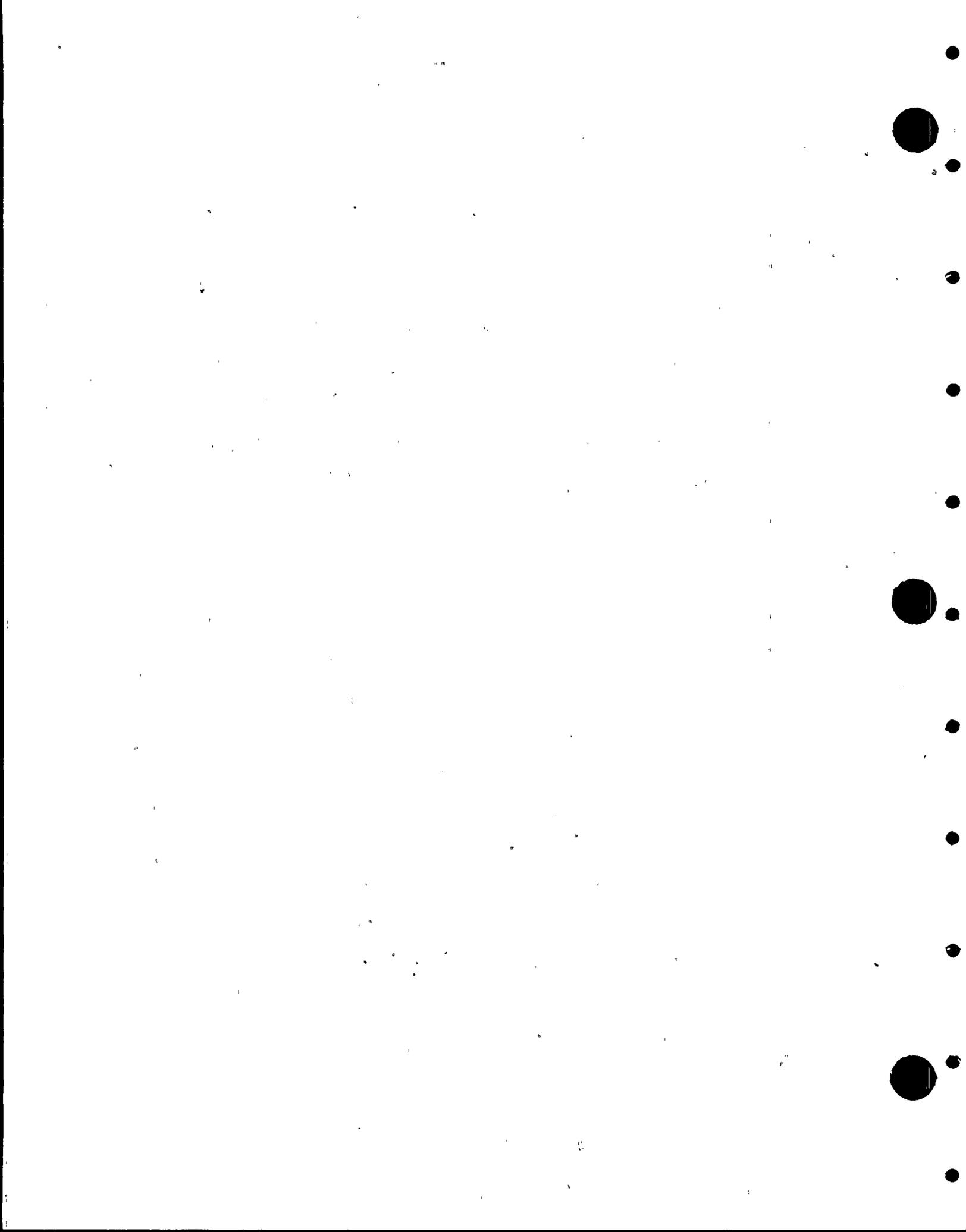
1 reached. For the record, the plant shutdown operation is
2 on Exhibit 2-40.

3 Exhibit 2-41 shows the emergency operation, which
4 is the operation for which the system is designed. The
5 containment spray is automatically initiated by the high-
6 high containment pressure signal of 10 psig. The contain-
7 ment spray actuation signal is generated, which starts the
8 containment spray pumps and opens the spray isolation valves.
9 Containment spray can also be initiated manually from the
10 control room. Initially, the spray pumps take suction from
11 the refueling water tank, and when a low level is reached
12 in the refueling water tank, the recirculation actuation
13 signal automatically transfers the suction into the contain-
14 ment sump. The operator manually from the control room
15 remotely closes the valves at the outlet of the refueling
16 water tank. During the recirculation mode, the spray water
17 is cooled by the shutdown cooling heat exchangers prior to
18 discharge into the containment.

19 MR. KEITH: This completes this section of the
20 presentation, Ed. Any questions?

21 MR. VAN BRUNT: Any questions? Ed.

22 MR. STERLING: In your previous set of exhibits when
23 you were talking about the interface between the CESSAR
24 interfaces, in Exhibit 2-33, "Cooling water flow shall be
25 established to the shutdown cooling heat exchanger prior to



1 or simultaneously with the start of recirculation," then my
2 understanding is that you are running your initial sprays
3 through the shutdown cooling heat exchangers without cooling
4 water flow, is that correct?

5 MR. KEITH: It all starts automatically, Ed. In the
6 initial part of an accident when you are taking water from
7 the refueling water tank, it is not necessary that you have
8 flow through the heat exchanger, but we are all aligned and
9 in the event of a safety injection actuation signal, we will
10 be getting flow through those heat exchangers.

11 MR. STERLING: I wondered if the heat exchanger was
12 empty and you were flowing through that with your spray and
13 you didn't have any cooling water going through that you
14 might damage your heat exchangers.

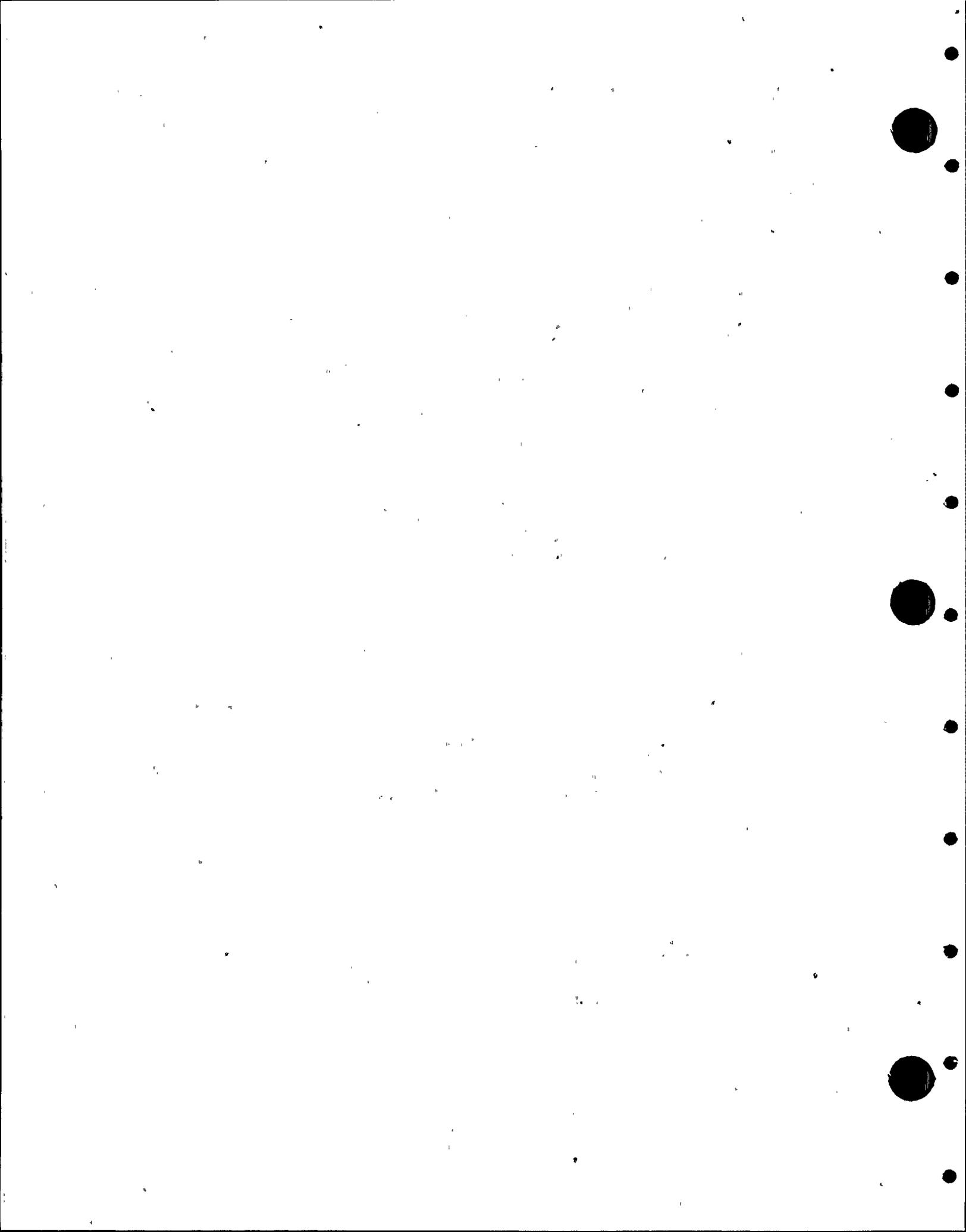
15 MR. KEITH: That is not the case, and it would not be
16 empty in any event. It could have no flow, but that is
17 not the way it operates. We will have flow through that
18 heat exchanger within the first minute.

19 MR. STERLING: And the same signal that initiates
20 the containment spray initiates the cooling water, then?

21 MR. KEITH: Yes.

22 MR. VAN BRUNT: John Held, you had a question.

23 MR. HELD: With reference to Figure 2-9, which shows
24 the vortex-breaking unit, does the circle in the center
25 represent that?



1 MR. KEITH: This opening (indicating) goes to
2 interface with the suction pump. That is grated on the
3 opposite side of this vortex-breaking unit. This is a
4 completely enclosed unit with stainless steel grating except
5 for this one opening which interfaces with the suction pump.

6 MR. VAN BRUNT: Where is that suction pipe on 2-8?

7 MR. KEITH: The suction is right through here
8 (indicating). You would have grating on this face along
9 there (indicating), so all the water flow does go through
10 grating.

11 MR. VAN BRUNT: The suction is looking toward the
12 bottom of that slide, is that right, Dennis?

13 MR. KEITH: Yes.

14 MR. VAN BRUNT: I would suggest you put a suction on
15 it then to clarify that point.

16 Do you have any other questions, John?

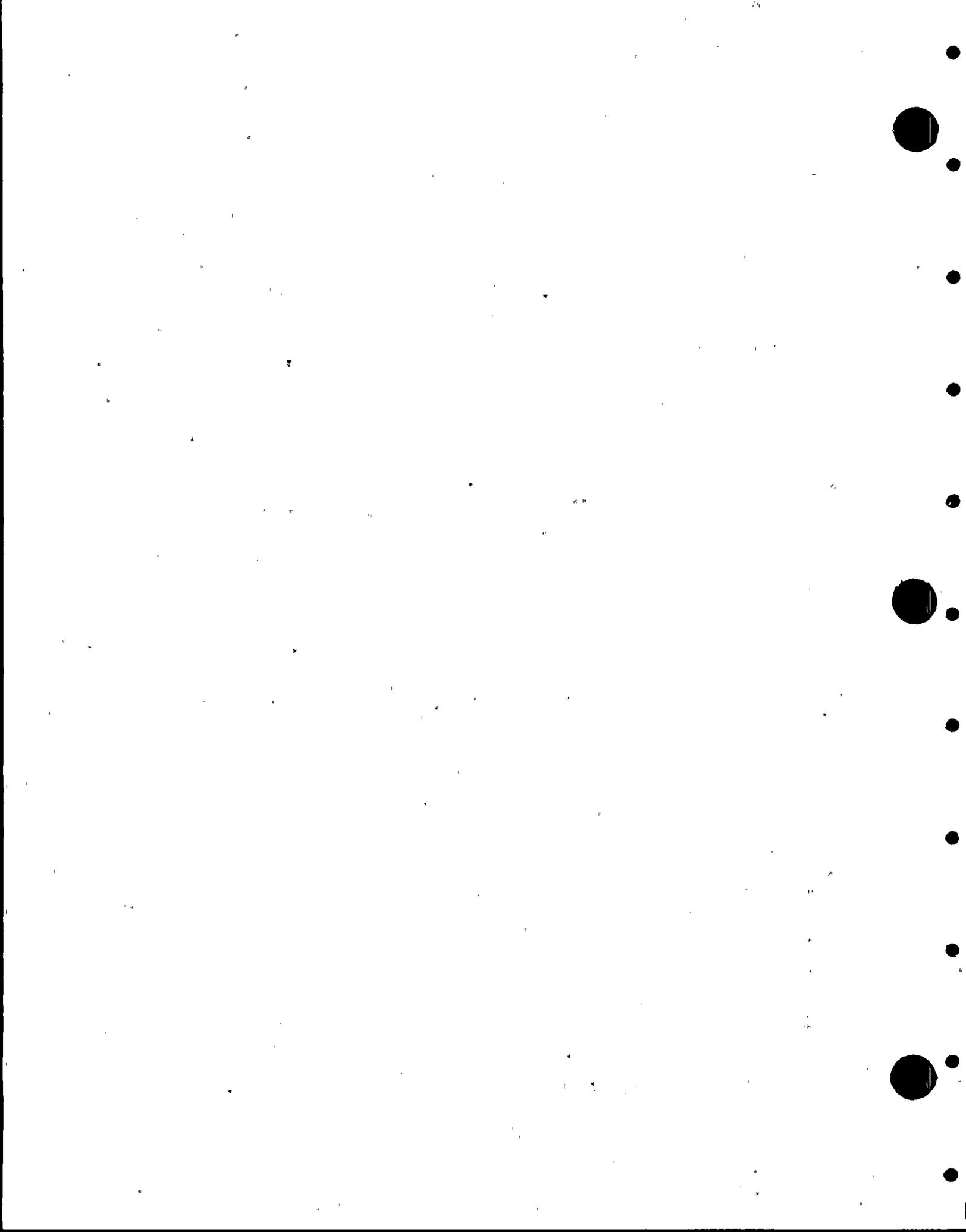
17 MR. HELD: No.

18 MR. VAN BRUNT: Some other questions?

19 MR. HEPNER: I would like to have some verification on
20 the flows that we have used on the testing. Did it include
21 all the safeguard pumps or was it just the high pressure
22 and containment spray?

23 MR. BIBA: All of them.

24 MR. KEITH: The low pressure, high pressure, and
25 containment spray.



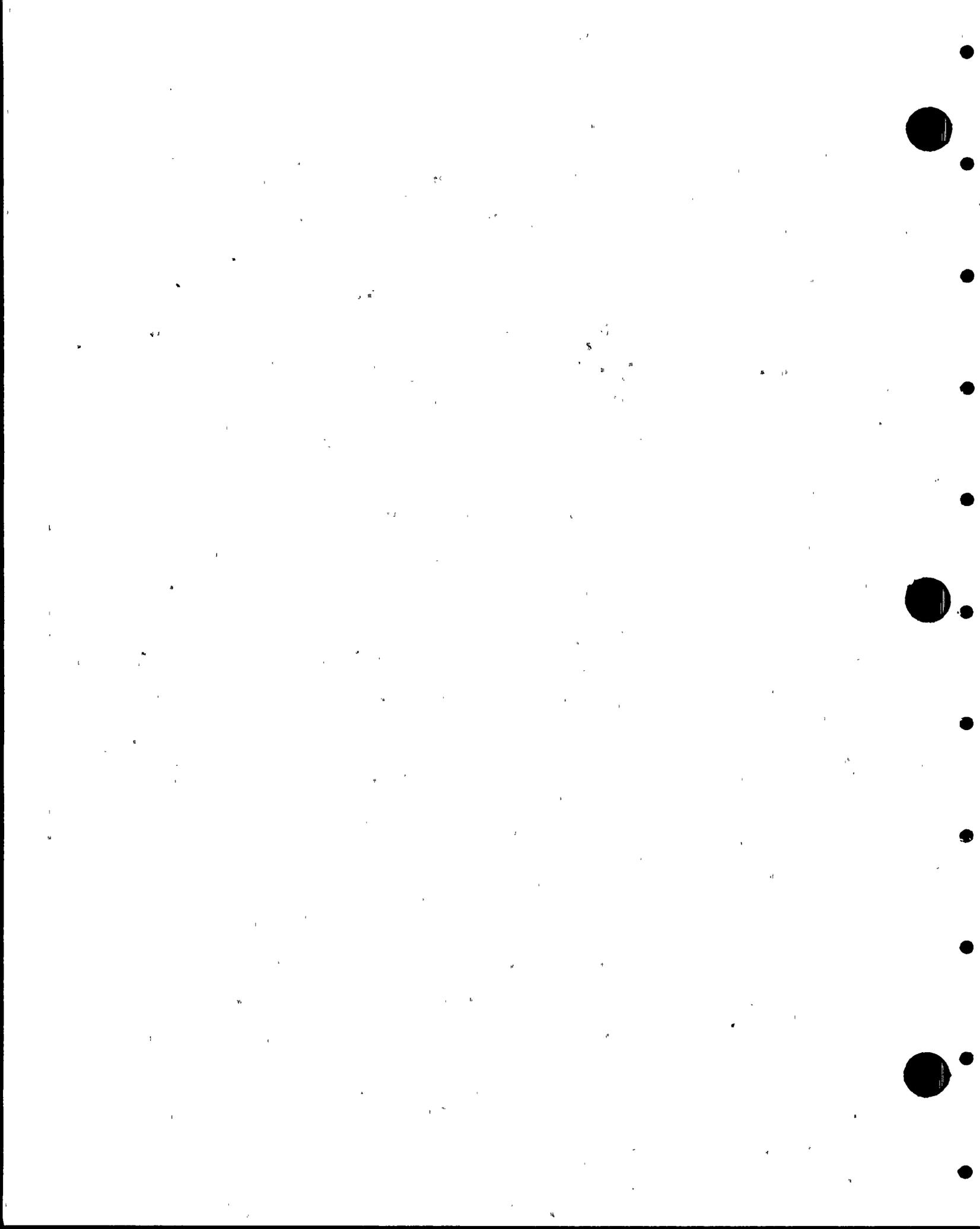
1 MR. HEPNER: I would just like to point out that the
2 low pressures are indeed secured in the automatic mode of
3 operation and there is really no plan for usage of the low
4 pressure pumps coming from the sumps, so there is a very
5 substantial margin in there from that regard as well.

6 MR. KEITH: Thank you.

7 MR. VAN BRUNT: Other questions? Mike.

8 MR. HODGE: I have several. The first one may reflect
9 back to the design criteria area, also. Looking at your
10 P&ID, it appears that the containment spray pipe which is
11 up in the upper reaches of the containment is designed in
12 two half circles, a pipe inlet and two half circles that
13 come around. You appear to have two caps on those pipes.
14 Would we get better performance by joining those two pipes
15 together? Is there a criteria why you didn't join those two
16 pipes together? Would it be better redundancy for flow
17 blockage such as flow being able to come around three-quarters
18 of the way to each other's pipes if there was a leakage or
19 break or anything?

20 MR. KEITH: Mike, those caps on the end provide a
21 positive air cushion to reduce the effects of water hammer
22 when we have the water flowing up and filling up the headers.
23 We do have kind of an air piston, if you will, to reduce the
24 water hammer effects. If you connected them, you couldn't
25 be positive that you would still have that. You might lose



1 it out an open nozzle.

2 MR. HODGE: Earlier I asked a little bit about
3 trisodium phosphate. I think the method we have of controlling
4 pH in the sumps is baskets of trisodium phosphate.

5 MR. KEITH: That's correct.

6 MR. HODGE: I wonder how that is going to be mixed
7 with the water. I have some concerns in that area. I
8 believe that question has been asked by the NRC, how that is
9 going to be done.

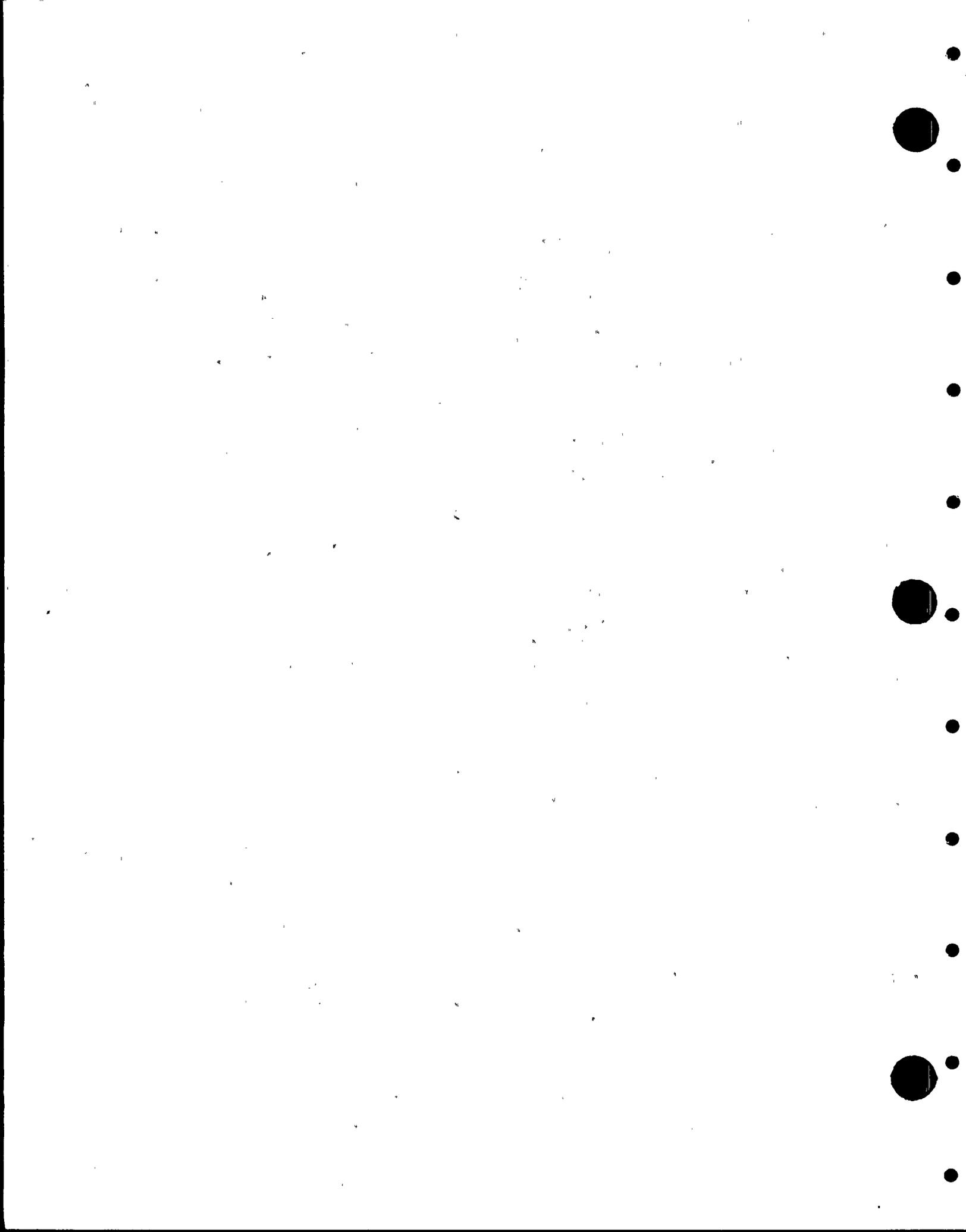
10 MR. KEITH: Mike, the baskets of trisodium phosphate
11 are all located on the floor of the containment at elevation
12 80, so the flow going to the sumps flows through these
13 baskets and that is what dissolves the trisodium phosphate.

14 MR. HODGE: Will the trisodium phosphate dissolve
15 if it gets in clumps or such due to humidity? Would that
16 affect the dissolving of it?

17 MR. KEITH: It would not dissolve as fast. There will
18 be some sort of periodic inspection programmed to assure
19 that the doesn't become a solid cake.

20 MR. VAN BRUNT: Dennis, as a followup to that, on one
21 of the slides could you show me where the baskets are
22 located relative to the sumps? Maybe Figure 2-5 would be a
23 good one.

24 MR. BIBA: The baskets are located throughout the
25 containment building at elevation 80 and they are located at



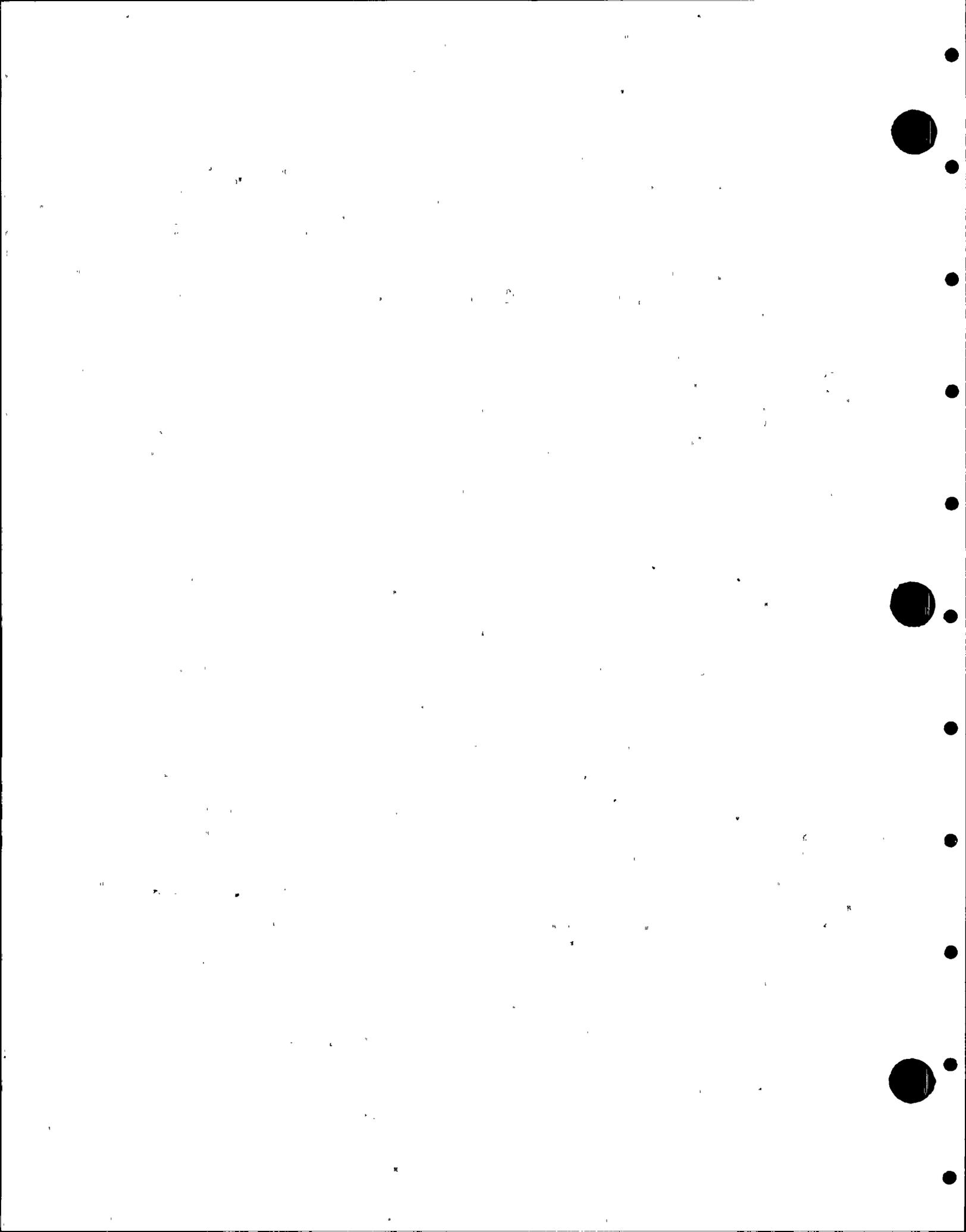
1 the place where there is space available. Also, there are
2 inlets at the floor for connecting these baskets. We secure
3 them to the floor. The number of trisodium baskets is
4 indicated on P&ID 13-M-SIP-001. We have about 14 baskets
5 which are 4-by-4-by-4 and I believe there are about eight or
6 nine baskets 2-by-2-by-2.

7 MR. HODGE: Just to follow up on that point you just
8 made, in your latest P&ID that I looked at, you have a
9 different quantity specified for Unit 1 versus Units 2 and 3.
10 Is that still true?

11 MR. BIBA: That is correct. The Unit 1 assumes a
12 plutonium recycle. That will be the amount of trisodium
13 phosphate necessary for maintaining the pH of above 7.0 with
14 the boron concentration of 6,200 ppm.

15 MR. VAN BRUNT: Dennis, again I don't want to belabor
16 the point, but with these baskets scattered around on that
17 floor area, I was thinking in my mind is there some way that
18 you get a bypass flow or are you assured that there is a
19 majority of flow that goes through the baskets? That's what
20 I was really trying to get at.

21 MR. KEITH: Ed, first, as Paul mentioned, the highest
22 basket is four feet, our minimum water level is four and
23 one-half feet, so all the baskets will be submerged. We
24 have also located them in open areas such that they are not
25 in areas where you could possibly have flow stagnation or



1 something.

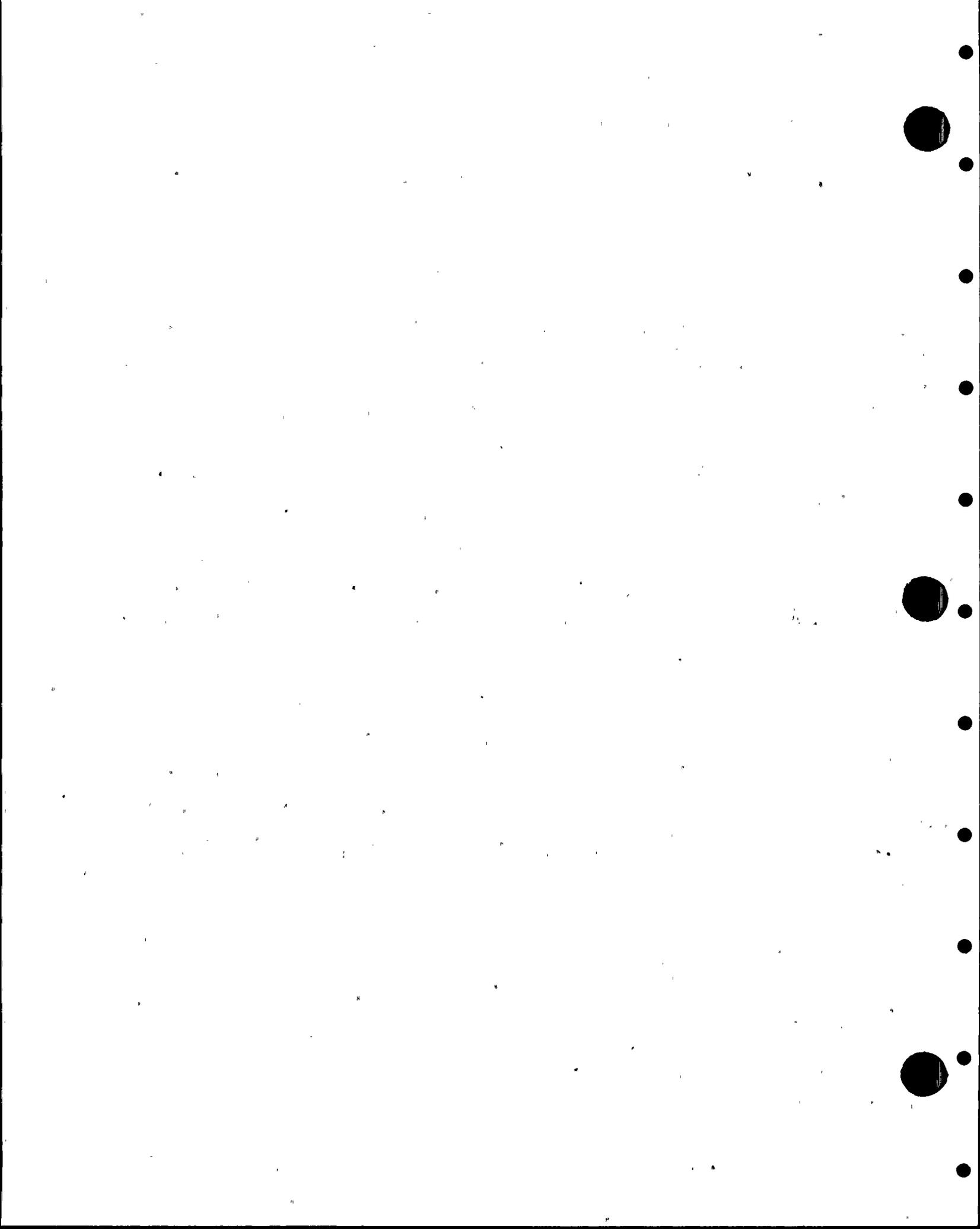
2 MR. VAN BRUNT: Mike, go ahead.

3 MR. HODGE: Figure 2-5. When you did your one-to-one
4 sump test, did you take into effect or did you model cable
5 trays, piping, valves, and platforms, the effect that would
6 have in your one-to-one flow test you did or have you
7 restricted those type of installations around the sump?
8 Did you take into effect the flow interruptions that cable
9 trays and such would have in your model, or have you
10 prevented installation of those items so you have a true
11 model of load characteristics in the sump?

12 MR. KEITH: Mike, basically we modeled a section of
13 the containment. We'll tell you how much. We modeled
14 everything that is in containment around the sump in this
15 area (indicating).

16 MR. BIBA: The area that was modeled was limited to
17 the capability of the operator and the size of the tank
18 available, and it was approximately modeling everything
19 within about this area (indicating) and also for Train B.
20 So all equipment, piping, structural steel and whatever
21 instrumentation that was in that vicinity of the sumps, this
22 area was modeled.

23 MR. VAN BRUNT: Dennis, for the record, first off,
24 it is Figure 2-5 that Paul is referring to. Secondly, I
25 think for the reader of the transcript, it would be helpful



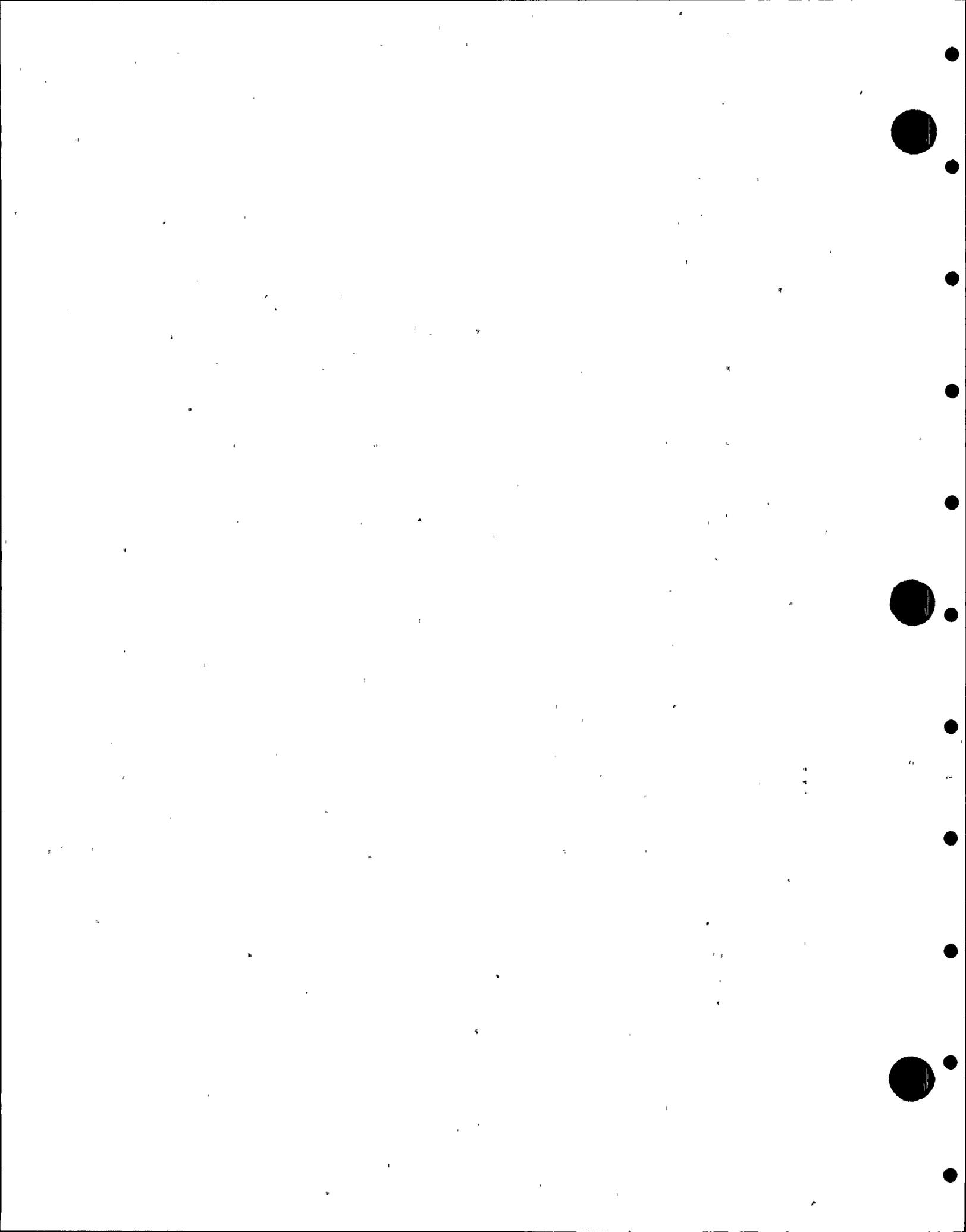
1 if you could put a dotted line around that on this particular
2 drawing that indicates the extent of the modeling that was
3 done. That will then I think support your answer to Mike's
4 question.

5 MR. KEITH: Fine. We'll do that, Ed.

6 MR. HODGE: Another question. On your spray nozzles,
7 how do we get up there to inspect those things? I have
8 seen how you are installing them now. You've got all this
9 scaffolding running up on the crane to install them. How
10 are you going to get up there to test these things? I
11 understand you are going to test them with air I believe I
12 read somewhere. How do you get up there to tell the air is
13 going out in the right amount and all that?

14 MR. SIMKO: I would like to ask a question right on
15 top of that. We have to do a five-year Tech. Spec. require-
16 ment by performing an air or smoke flow test to each grade
17 header and verify that each spray nozzle is unobstructed.
18 It goes right along with that question.

19 MR. KEITH: B says preoperational tests. We have
20 that stuff out there, so we can test that things are flowing
21 when that scaffolding is there, so we can perform that test.
22 I think as far as the five-year test that is required, with
23 smoke you could with binoculars or something -- I don't
24 think you have to get that close. From the top of the polar
25 crane, you would be able to see each nozzle as long as you



1 had sufficient smoke.

2 MR. HODGE: This would probably be done during a
3 refueling operation.

4 MR. KEITH: Definitely.

5 MR. HODGE: Would that smoke and stuff like that
6 bother the refueling operation?

7 MR. KEITH: I think you would have to control it so
8 you didn't cloud up the whole containment.

9 MR. HODGE: I'll yield to Bill if he wants to pursue
10 this further.

11 MR. SIMKO: If you use hot air, there are infrared
12 techniques to test each one of those nozzles.

13 MR. KEITH: That may be a better technique.

14 MR. SIMKO: I don't think we have any problem.

15 MR. VAN BRUNT: Bill, do you want any more information
16 on that at this point or shall we leave this for a mainten-
17 ance discussion on it?

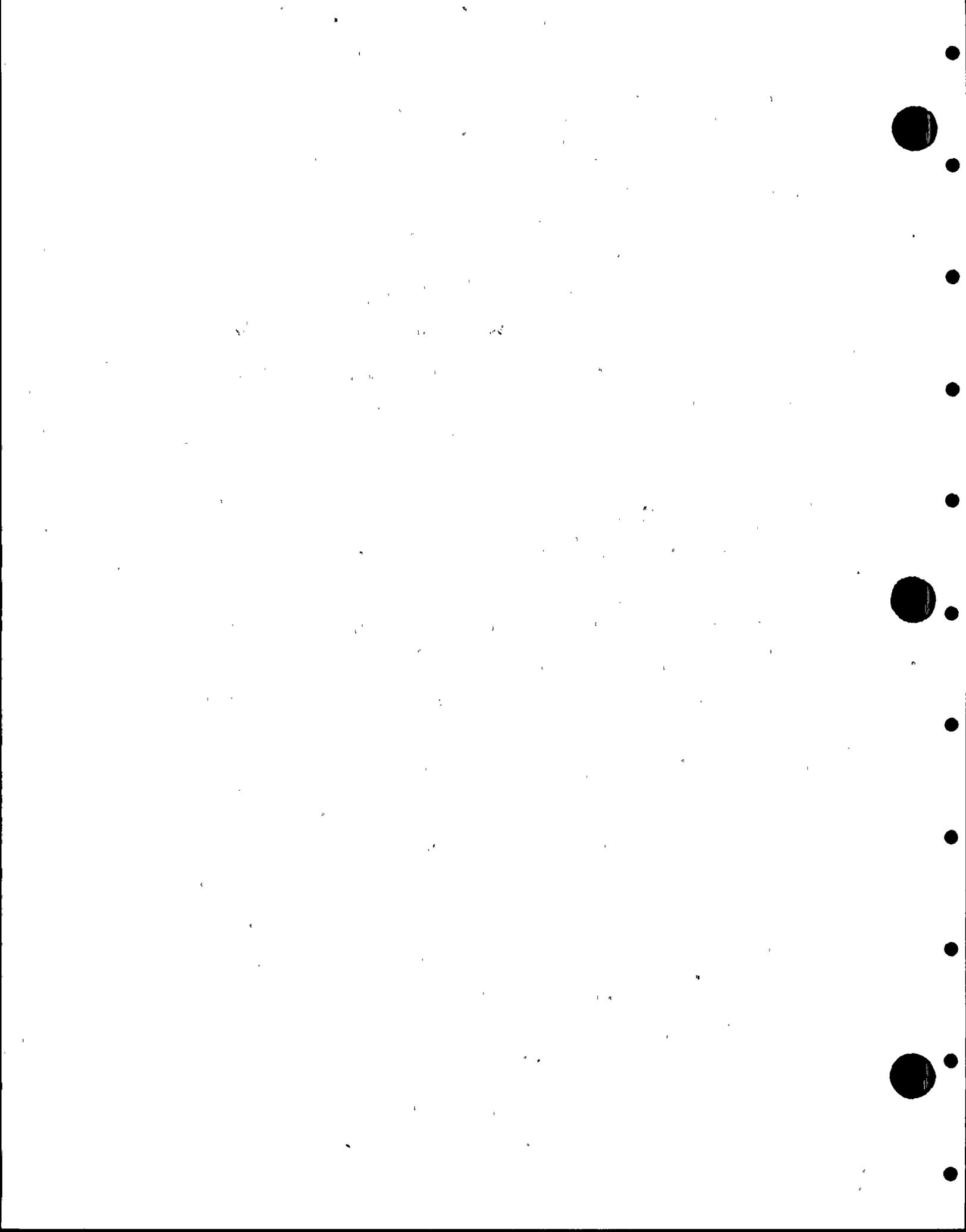
18 MR. SIMKO: Yes, we'll leave it.

19 MR. HODGE: I have no further questions.

20 MR. VAN BRUNT: Who else? Bill.

21 MR. SIMKO: I have a few of them here. On Figure
22 2-6, do you have the height of the screens in relation to
23 what the water level is going to be? I see the length. I
24 don't see the height.

25 MR. KEITH: The requirement of Regulatory Guide 1.82



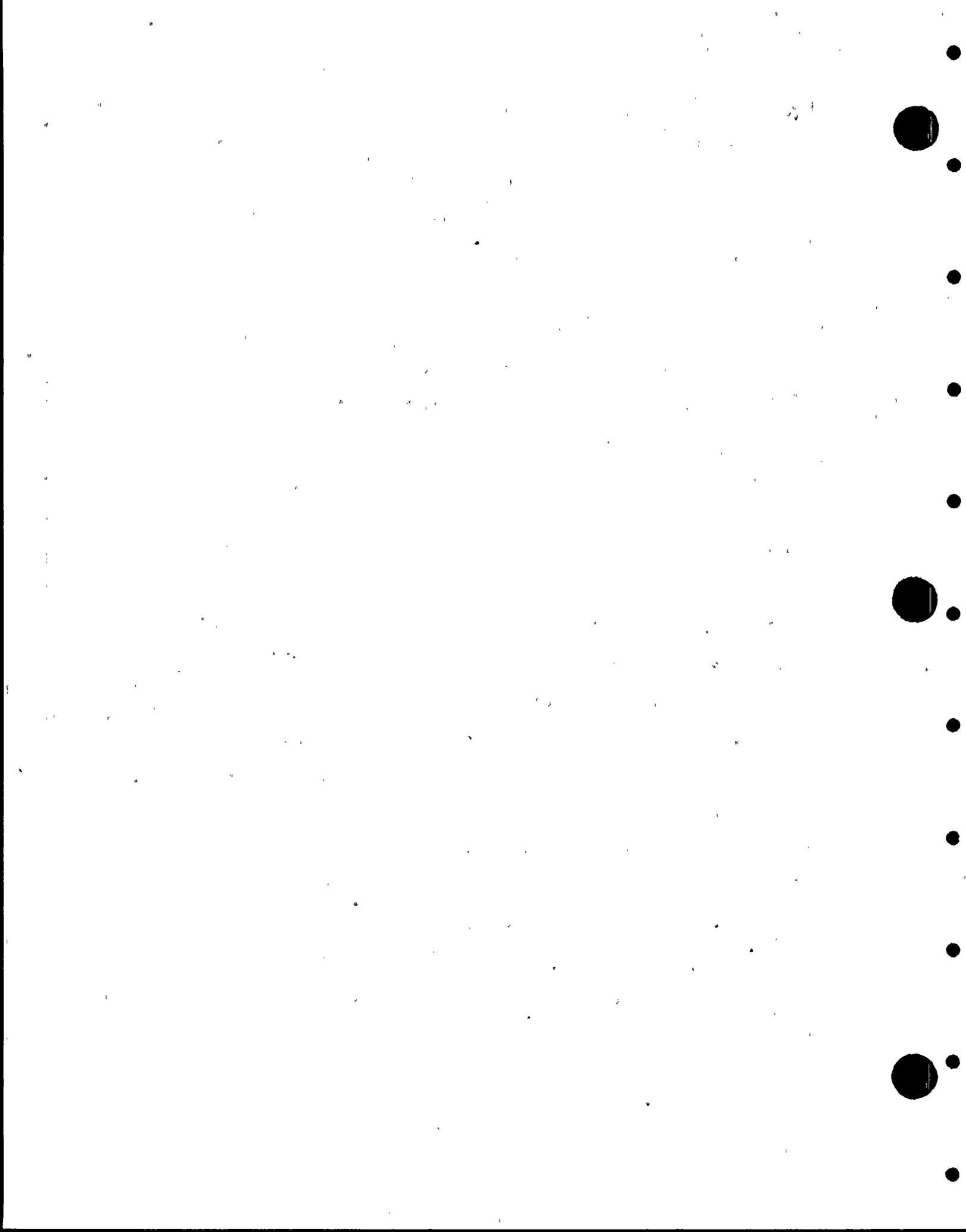
1 is that the screen is completely submerged during the
2 recirculation mode, and as the minimum water level in the
3 containment is four and one-half feet, which is four feet
4 six, I believe the height of it is something like four feet
5 five inches. I would have to doublecheck.

6 MR. SIMKO: I am just wondering, because there is
7 grating about four and one-half -- let's see. No, about
8 six feet up from the floor level, there is grating, so it
9 would be under that grating.

10 MR. KEITH: It would be positively under the grating.
11 The grating is elevation 88 and there are enough structural
12 members that the platform is approximately 10 inches below
13 the eighty-eighth level and this elevation is approximately
14 84-1/2, so the height of this screen is less than four and
15 one-half feet.

16 MR. VAN BRUNT: Bill, excuse me, while he's got that
17 slide up there, let me ask a question about it. First off,
18 I think if you could, Dennis, maybe you ought to put the
19 height of this on the slide. Secondly, I believe, Paul, in
20 your presentation, you mentioned that there are some two-inch
21 holes in the top of that screen. I just heard that the screen
22 will be submerged. Under that top grating, is there
23 screening under there as well?

24 MR. BIBA: Yes, those two-inch holes have the same
25 three layers of screening. That means there is a fine screen,



1 coarse screen, and the grating.

2 MR. VAN BRUNT: Is that continuous or just over the
3 hole?

4 MR. BIBA: Just over the hole.

5 MR. HEPNER: I have seen some test results for other
6 plants that did not require the air to be vented. They
7 showed satisfactory performance with a layer of trapped air
8 under a solid plate. Did the test program investigate this
9 at all?

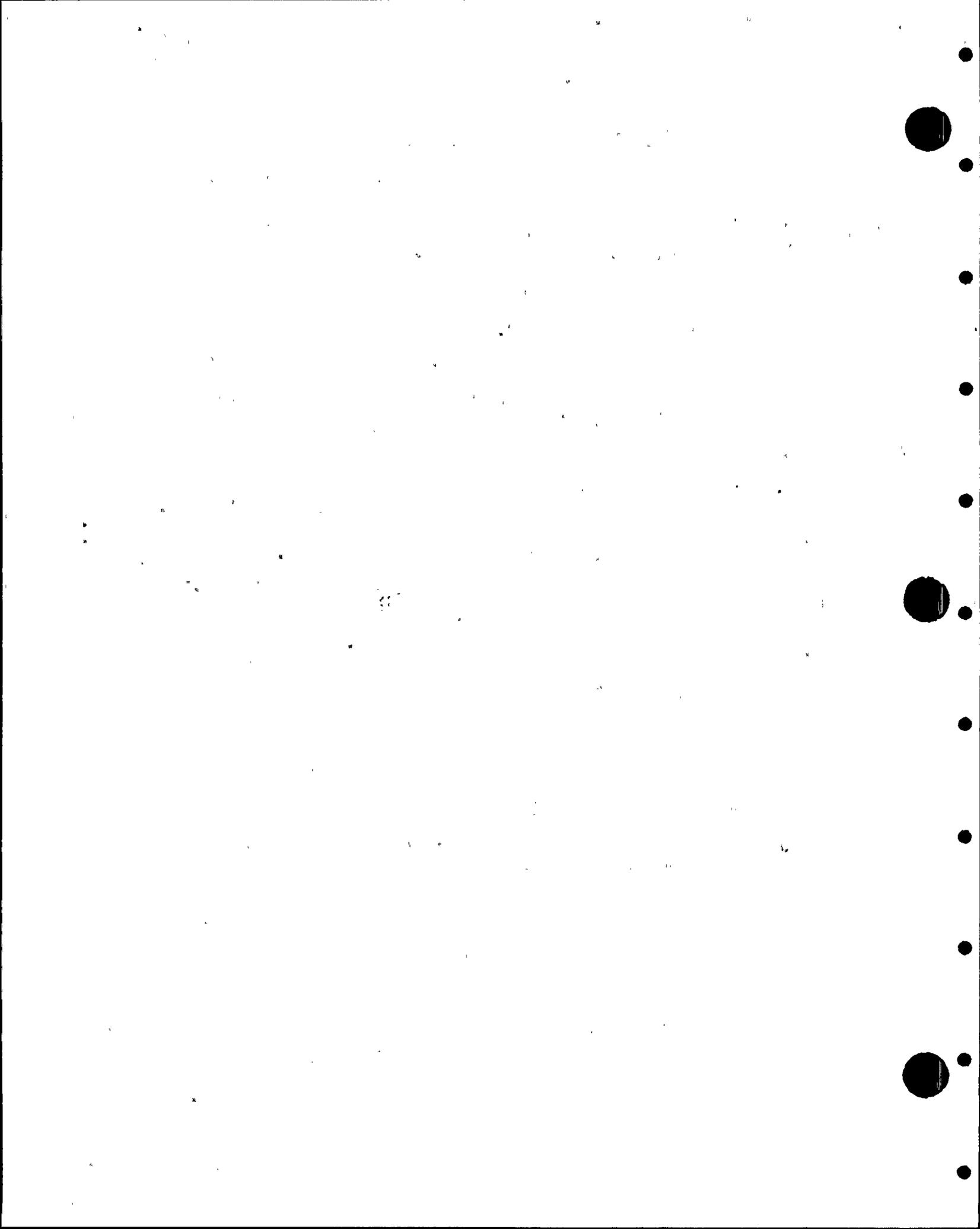
10 MR. BIBA: Our test program included evaporating the
11 air from the upper portion of the screen, and the main reason
12 for that was that this solid top deck, so to speak, is acting
13 as an additional vortex-breaking device. Then there would
14 be an air cushion submerged under the water level and the
15 vortex-breaking capabilities could be perhaps somewhat less,
16 could be smaller.

17 MR. HEPNER: Well, I guess the question is was it
18 checked one way and the other or did we just jump in and
19 include the vents right from the start?

20 MR. BIBA: It was tested with the holes in place only.

21 MR. VAN BRUNT: Bill, go ahead. You had some more
22 questions.

23 MR. SIMKO: On Figure 2-2, I was also looking at
24 P&ID 13-M-SIP-001. It has the same type of configuration
25 for the suction sizing in the containment spray pump. In



1 relation to filling the suction side piping along with there
2 is no water in the sump unless you have an accident, you have
3 your two motor-operated valves on the suction piping and
4 that check valve. Can you tell me in relation to your
5 venting and draining and spilling of this line how you are
6 going to guarantee that there is no air slug in this line when
7 you have an accident, you want to start taking suction,
8 opening these valves up and taking suction through the pump.

9 MR. BIBA: The suction line is going to be completely
10 filled with water up to this check valve (indicating). It
11 will be filled by pressure in the refueling water tank.
12 Between the isolation valves, it will be filled, because
13 there are connections on the pipe that can facilitate filling
14 that portion of the pipe. There are two test and drain
15 connections that can facilitate filling the piping.

16 MR. SIMKO: It will be filled, then?

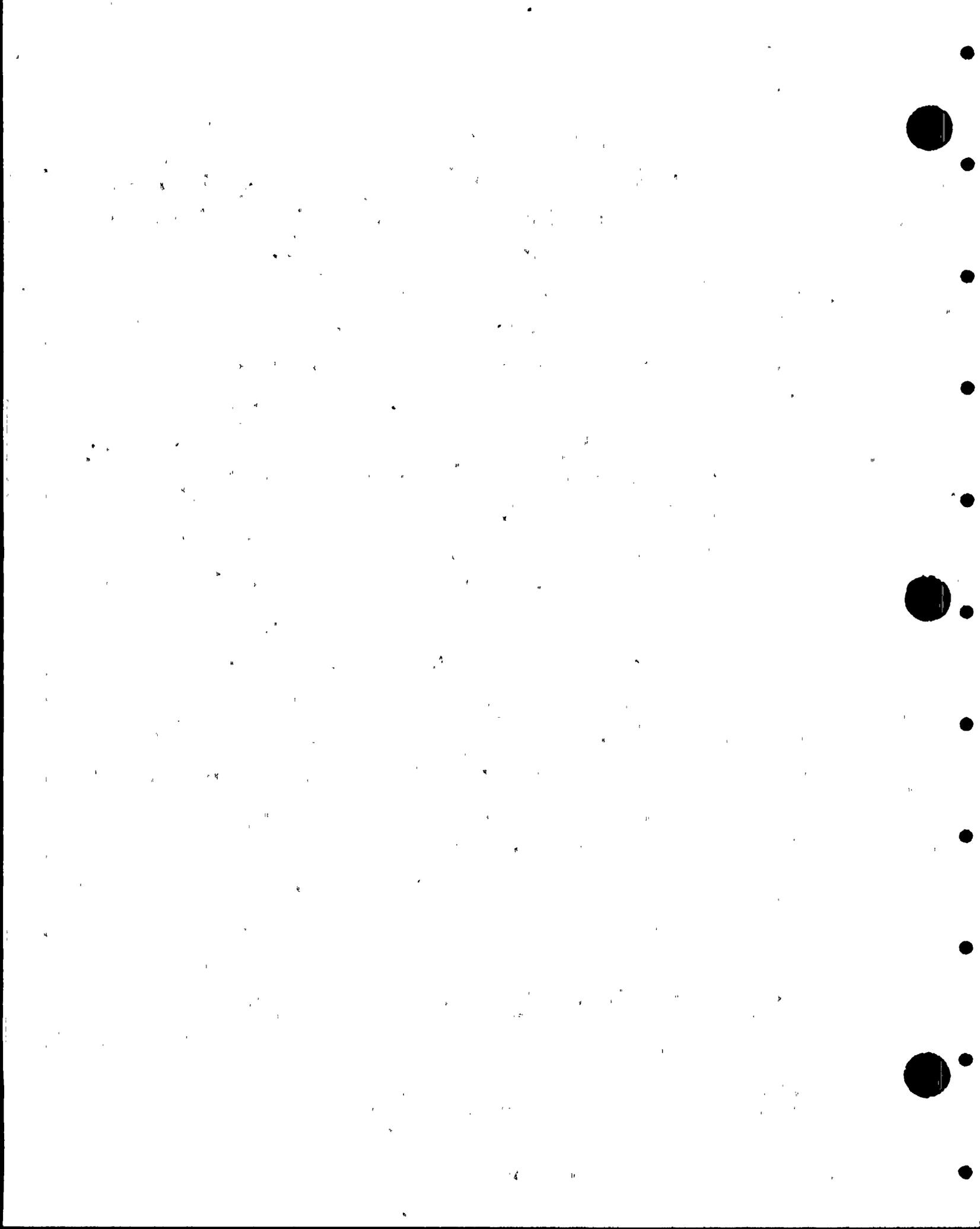
17 MR. BIBA: Completely filled with water, yes.

18 MR. VAN BRUNT: I take it filling that pipe is part
19 of the startup procedure to be sure it is full at all times.

20 MR. KEITH: Yes.

21 MR. VAN BRUNT: Bill, have you got some more questions?

22 MR. SIMKO: Yes, a couple more. Someone was talking
23 about the trisodium phosphate baskets. It sounded like
24 there was some commitment made that we will check these
25 things periodically. Is that going to be a requirement?



1 MR. KEITH: Yes. We haven't worked out the details,
2 Bill, on that, but I think there is going to be some require-
3 ment at least every refueling that you check the trisodium
4 phosphate to assure that it hasn't caked up.

5 MR. SELF: Will there be a Tech. Spec. on that
6 requirement?

7 MR. KEITH: Yes.

8 MR. HEPNER: I could address that a little bit. I'd
9 like to tell you a little bit about what we have seen on
10 some other plants. Calvert Cliffs and Fort Calhoun are
11 using trisodium phosphate baskets and they started out with
12 a weekly inspection, and at this point, it has evolved into
13 a six-month inspection for Calvert Cliffs and an 18-month
14 inspection for Fort Calhoun once they have developed some
15 operating experience. Your program probably would be similar
16 to Fort Calhoun, although you might have some more frequent --

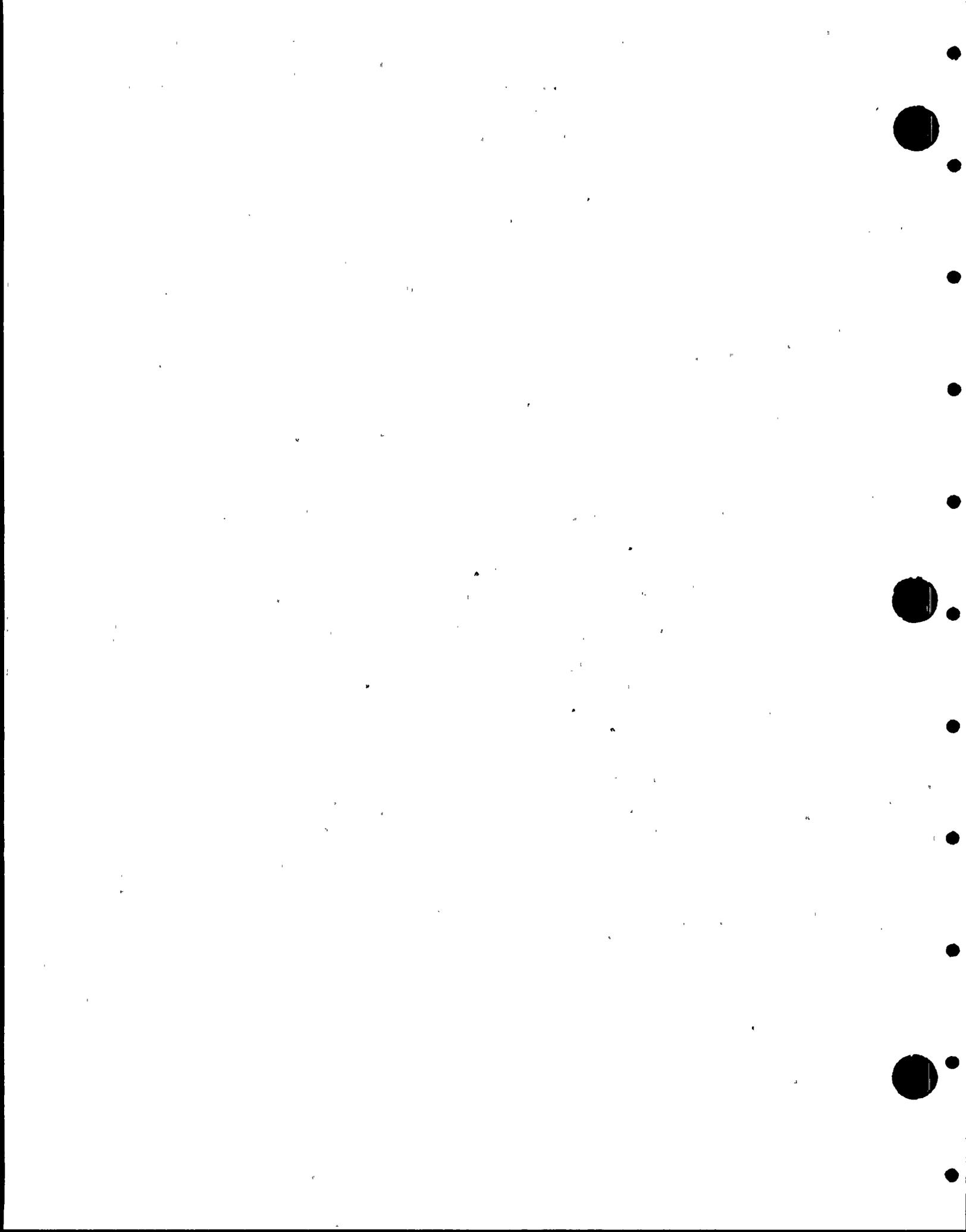
17 MR. VAN BRUNT: The humidity.

18 MR. HEPNER: Basically, it is the humidity that is
19 the criterion.

20 MR. VAN BRUNT: Have you got some more questions?

21 MR. SIMKO: Yes. One was on P&ID 13-M-SIP-003. There
22 are some level transmitter instruments right before you get
23 to the distribution header. What are those things for?

24 MR. KEITH: We have that level indication there so
25 that we can assure ourselves that the pipe is filled to that



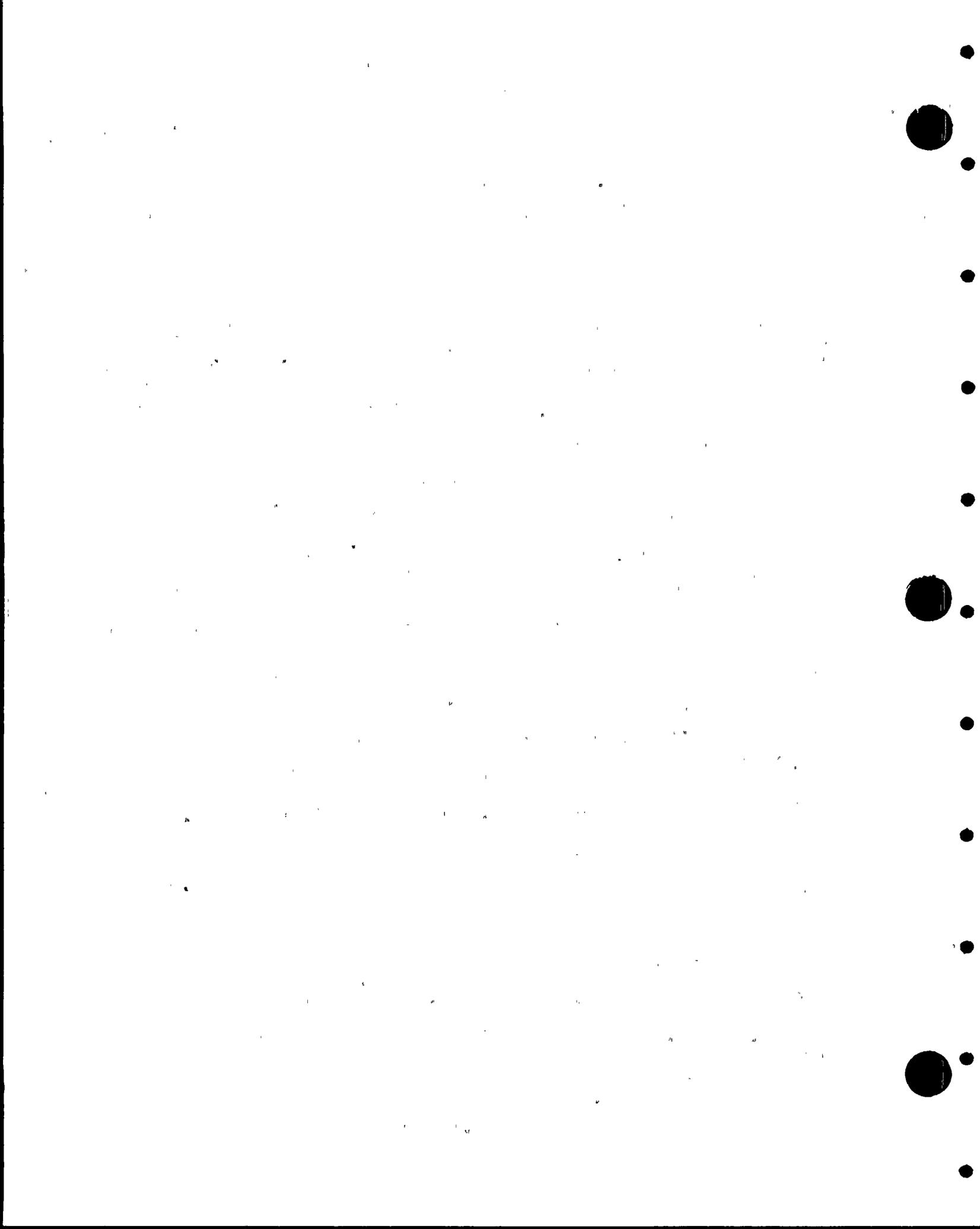
1 point. You may recall on an earlier slide, we talked about
2 having the piping partially filled to prevent water hammer.
3 Our main reason for having that pipe filled is to reduce
4 the containment spray delay time.

5 MR. SIMKO: So that guarantees it to that point?

6 MR. KEITH: Yes.

7 MR. SIMKO: One more question and I think that will
8 do it. You talked about the use of the containment spray
9 pumps during shutdown cooling mode in parallel with the
10 LPSI pumps. We have been trying to get an answer to this
11 question for a long time and still haven't gotten a response.
12 Relating to P&ID 13-M-SIP-002, on the shutdown cooling line
13 RC Loop 1, there are three motorized valves, two outside of
14 containment and one inside containment. One of these valves,
15 I can't remember which one, I think it is 651, the control
16 logic for that is fully open/fully closed on the switch. I
17 think the other two have a jog open/jog closed capability,
18 and we are trying to figure out when in the world you would
19 want to have these valves throttled. We can't figure out
20 why you would want a throttling position on the control logic.
21 If there is a reason, fine. If there isn't, our operators
22 don't like the possibility of putting these things into
23 throttling position on the pumps.

24 MR. KEITH: Bill, I guess we have responded to your
25 concern, but I am afraid it won't be to your satisfaction,



1 so we'll do some more homework. That valve is shown that
2 way to meet a CE requirement, but what we will find out is
3 why CE thinks we have to have that valve in an intermediate
4 position.

5 MR. SIMKO: I know they were CE valves or CE --

6 MR. KEITH: That is a CE requirement that we have that
7 jog feature, so we'll follow up and find out why they want
8 it. I gather you would prefer not to have it at all.

9 MR. SIMKO: No, because the operators may make a
10 mistake and move it into throttle position or whatever. If
11 there is no reason to have the jog capability, then we don't
12 want it.

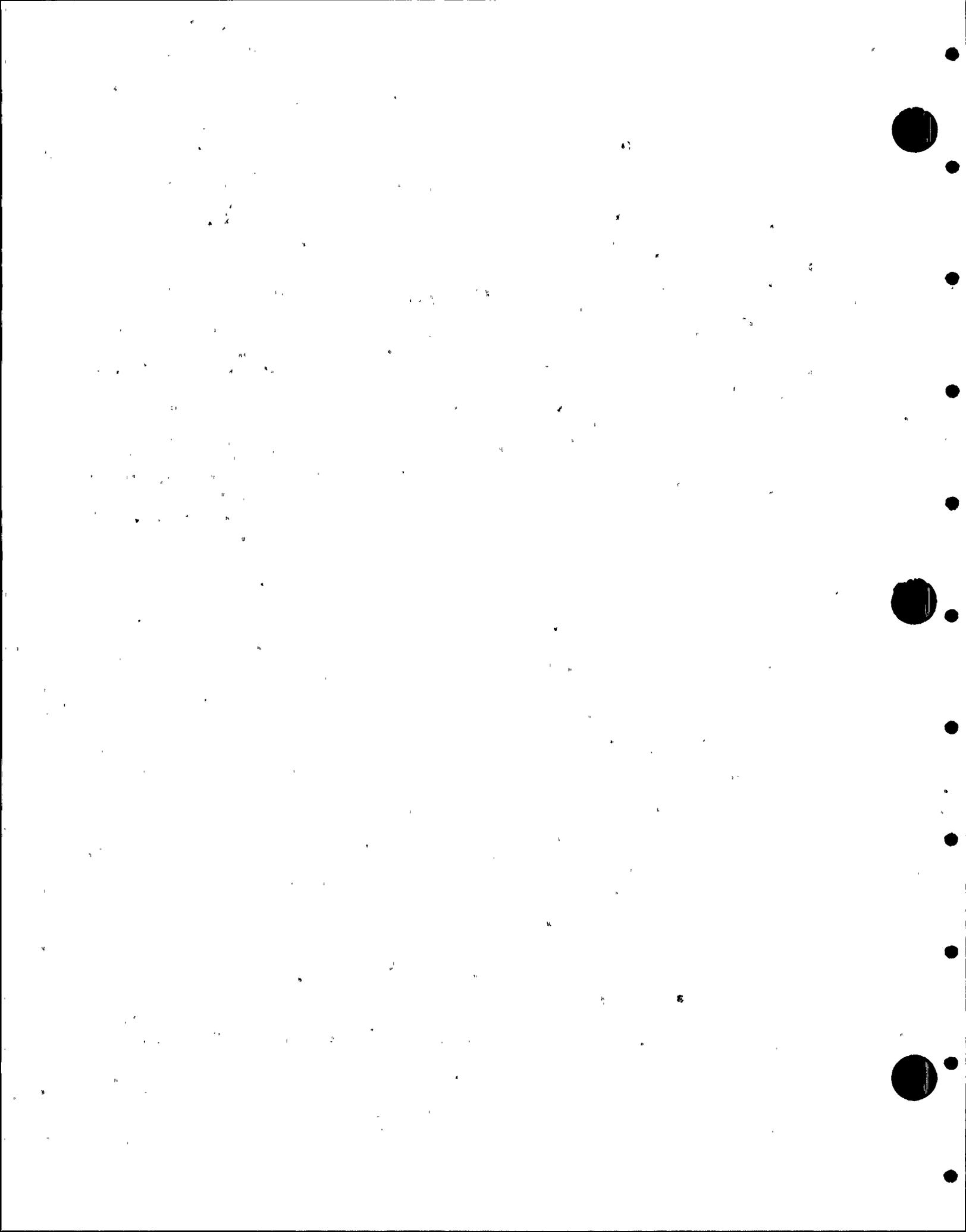
13 MR. KEITH: Fine.

14 MR. VAN BRUNT: Ed, you had a question?

15 MR. STERLING: To offer a clarification, that has
16 currently been addressed with Combustion and they are looking
17 at it. We are in the process of getting an agreement of
18 what their intent was and we just haven't heard back from
19 them.

20 MR. SIMKO: I knew it wasn't within Bechtel's scope
21 as far as supply.

22 MR. STERLING: These were a Combustion-provided item.
23 It was their requirement that they be that way and it is on
24 their P&ID that way, and when that question was raised, we
25 sent back for a clarification from Combustion and they are



1 currently reviewing that material.

2 MR. KEITH: Thank you, Ed.

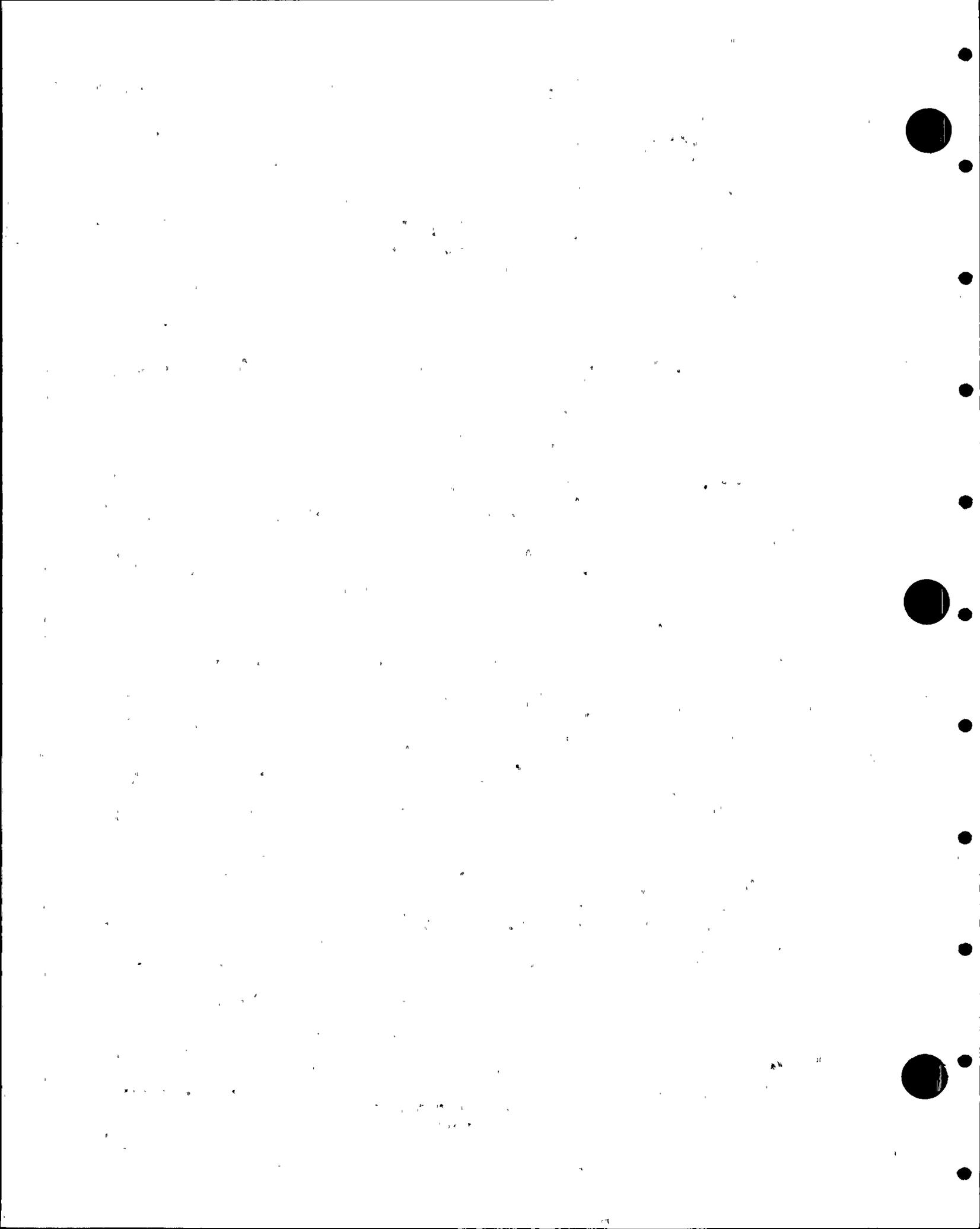
3 MR. VAN BRUNT: Any other questions? Carter.

4 MR. ROGERS: Exhibit 2-40, Paragraph 2), discusses
5 shutdown cooling operations when the reactor coolant system
6 temperature is between approximately 200 degrees Fahrenheit
7 and 350 degrees Fahrenheit and it talks about the safety
8 capability of the Containment Spray System during that time.
9 If a loss of coolant accident should occur under these
10 conditions and if that loss of coolant accident resulted in
11 a containment spray actuation signal, what manual actions
12 would be necessary on the Containment Spray System first
13 during the injection mode and secondly during the recircula-
14 tion mode.

15 MR. KEITH: No manual action would be required during
16 the injection period when you are taking suction from the
17 refueling water tank. However, prior to receiving the
18 recirculation actuation signal, you would manually have to
19 realign the containment spray system shutdown cooling system
20 such that the containment spray flow went through the shutdown
21 heat exchanger.

22 MR. ROGERS: Then a follow-on question to that, what
23 guidelines have been given to the APS Operating Department
24 to ensure that procedures cover that mode of operation?

25 MR. KEITH: I am not sure at this point, Carter, where



1 we stand on operating guidelines. Those are in the process
2 of being developed by Combustion Engineering.

3 MR. ROGERS: I wonder if we might take that as an
4 open item and respond to that later either today or whenever.

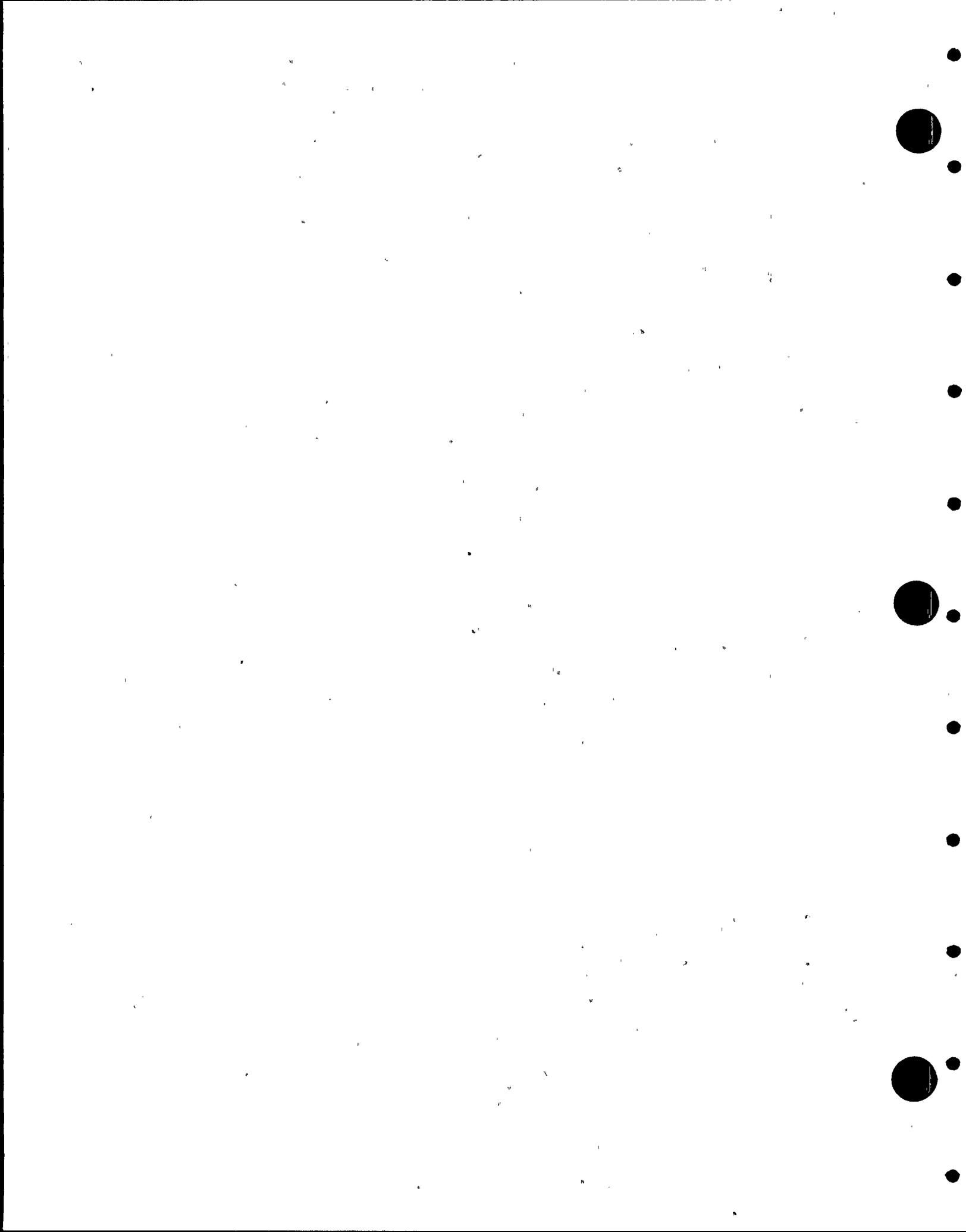
5 MR. VAN BRUNT: Either that or, as a response to that
6 open item, either get Combustion's assurance or yours that
7 they will be covered in some guideline somewhere.

8 MR. HEPNER: Could I add a clarification on that last
9 question? I don't believe there has been a real need to
10 take any manual action even prior to the recirculation
11 signal. With the low energy in the loop and the shutdown
12 cooling system performing properly, an immediate action to
13 have the spray functioning completely is probably going to be
14 unnecessary. It will be very chancey whether we will even
15 actuate the spray system in a break like that, so immediate
16 or urgent operator action will not be necessary. Some
17 general guidelines would be appropriate on initiating and
18 realigning.

19 MR. VAN BRUNT: We want to be assured that those
20 guidelines are transmitted. That is the basic point.

21 Jim Cook, you had a question.

22 MR. COOK: Bill Simko mentioned the level transmitters
23 on the risers going to the containment spray headers. A few
24 other power plants have had difficulties with valves leaking
25 through and inadvertently spraying water into the containment



1 building. Are these transmitters located such that normal
2 water level will be in a position that can be monitored? Do
3 you locate these transmitters so that they could indicate
4 valve leakage into that header?

5 MR. KEITH: Yes.

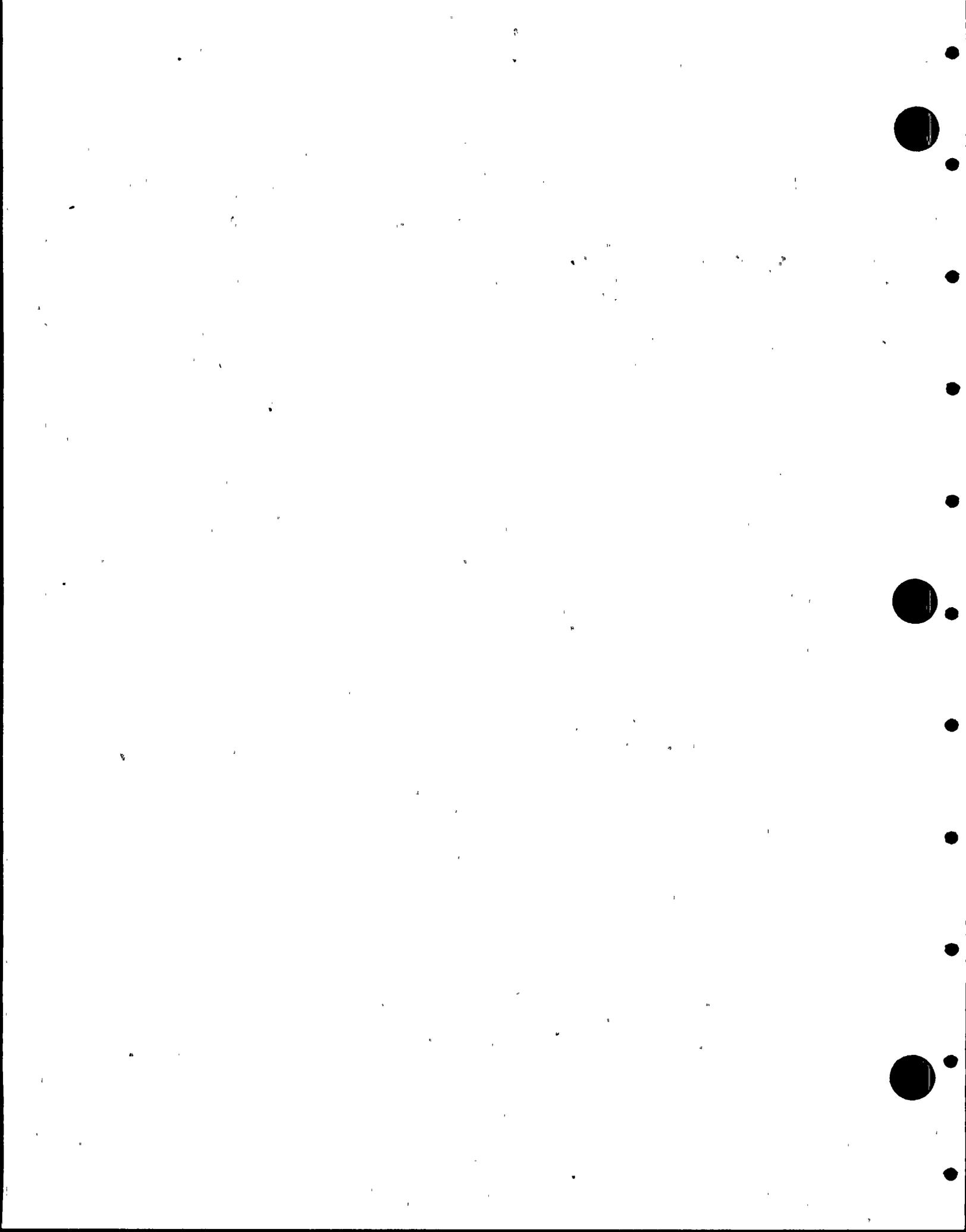
6 MR. COOK: Very good. Thank you.

7 MR. VAN BRUNT: I have a couple of questions. Any-
8 body else have any questions?

9 I would like to go to Figure 2-2 just out of
10 curiosity more than anything else. On the main reactor
11 floor there, you show a couple of what looked like nozzles
12 coming through the floor. I was wondering what the purpose
13 of those was. It is just curiosity more than anything else.

14 MR. KEITH: Ed, we have some flanges and piping so
15 that in the event we do have a LOCA, we don't fill up the
16 refueling canal with the spray water. We will fill up the
17 reactor cavity area, but we will not fill up the refueling
18 canal, because prior to startup following refueling, you
19 remove these flanges and then you have a drain path open from
20 the refueling canal to the sumps.

21 MR. VAN BRUNT: I would like to go to 2-3. This kind
22 of follows up on my previous question about separation. I
23 think Paul in his presentation talked about the piping coming
24 out of the containment spray pumps and he indicated that
25 there was distance separation. I believe that there is a



1 physical separation of that piping.

2 MR. KEITH: Yes. Well, you see this barrier here
3 (indicating) and the piping for one train is on one side and
4 piping for the other on the other.

5 MR. VAN BRUNT: So there is physical separation. The
6 inference I got was that it was distance, and I didn't think
7 that was correct.

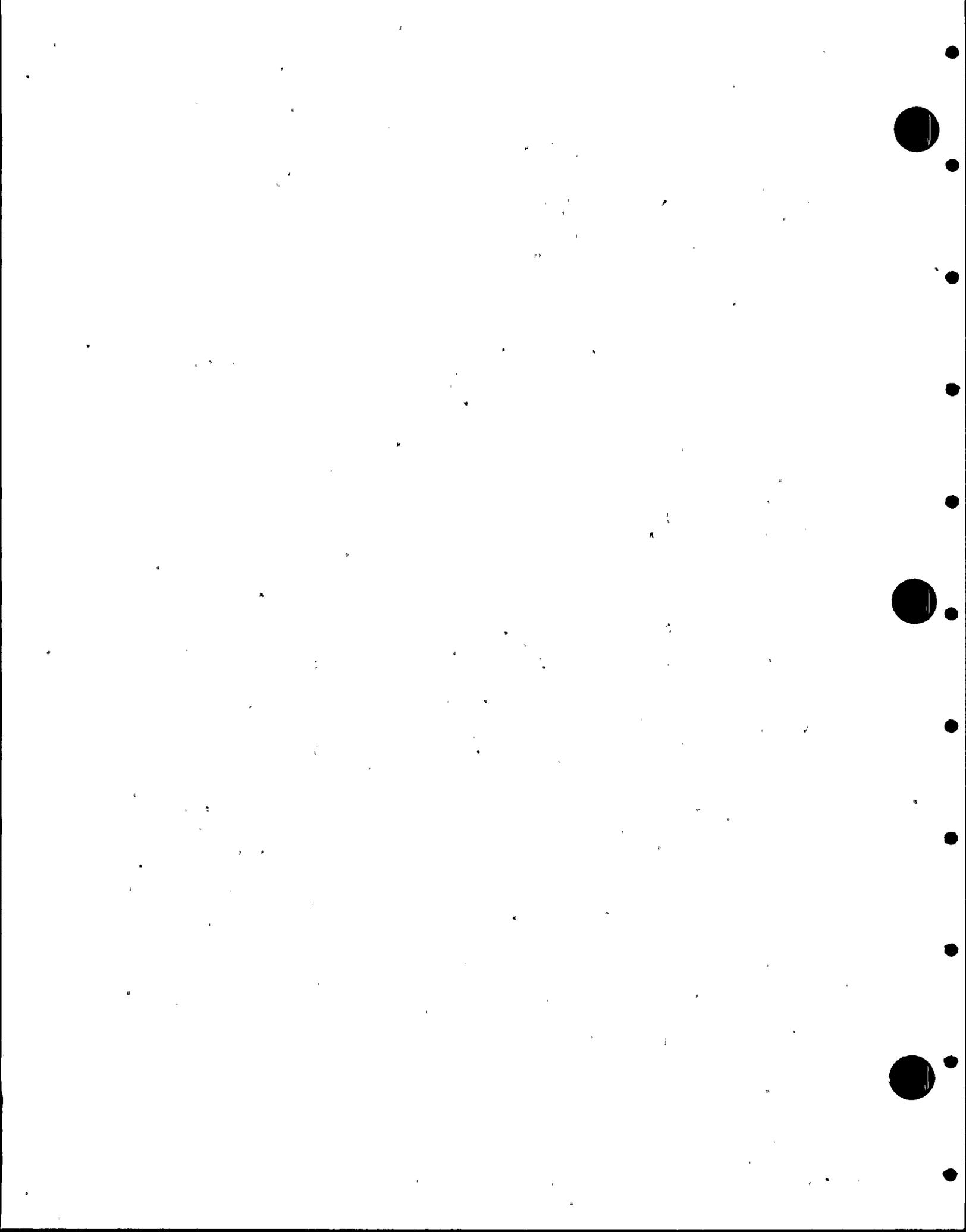
8 MR. KEITH: Distance plus physical separation.

9 MR. VAN BRUNT: Additionally, and this was the point
10 I was trying to make earlier, there are both piping and
11 electrical needs to go into the containment from there.
12 There are also piping needs to go out to the spray ponds,
13 which are located to the left on this figure. How do you
14 get piping that has to go to the spray ponds across the
15 electrical and piping that has to go into the containment,
16 which is running toward the top of that figure, and provide
17 physical separation while you are doing that?

18 MR. KEITH: There is no piping to the spray pond from
19 this level.

20 MR. VAN BRUNT: From this level. I agree.

21 MR. KEITH: The only spray pond water we have coming
22 into the auxiliary building is not at this level. It is at
23 the essential cooling water heat exchangers, which are up at
24 another level, and we don't really have those shown on any of
25 the drawings that we have here today.



1 MR. VAN BRUNT: What I am really getting around to is
2 that you have a pipe tunnel that traverses the buildings
3 that is split, and that doesn't show on any of these drawings
4 What I was trying to get at is that there is physical
5 separation of that piping from the A and B piping that goes
6 into the containment and that is provided by that set of
7 pipe tunnels that go through the piping corridor.

8 MR. KEITH: That's correct.

9 MR. VAN BRUNT: I don't have any other questions.
10 Are there any other questions on this part of the presenta-
11 tion? Ed.

12 MR. STERLING: On Figure 2-2, at the top you show the
13 spray nozzles arrangement and you have your containment spray
14 Train A and containment spray Train B, and in the analysis
15 that was done for the droplet pattern, the pattern for the
16 sprays, you say either train is adequate.

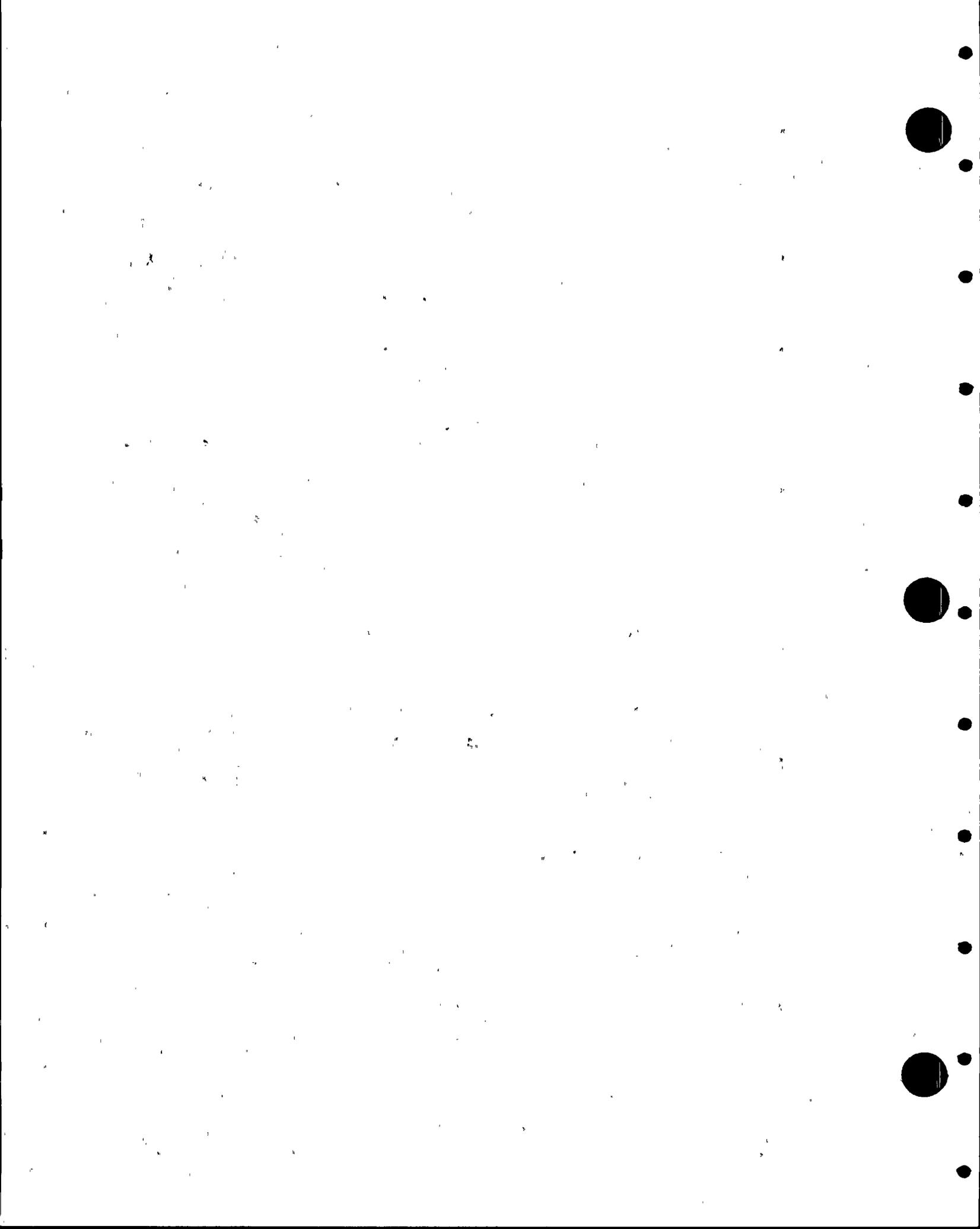
17 MR. KEITH: That's correct.

18 MR. STERLING: If both trains are running, is there
19 interference? Is that taken into account, too, or is there
20 just so much coming out that it doesn't matter?

21 MR. KEITH: I think there is so much coming out that
22 it doesn't matter.

23 MR. HEPNER: That's what it amounts to. There is so
24 much coming out at that point.

25 MR. STERLING: At that point, you don't have to worry



1 about a spray pattern.

2 MR. HEPNER: Yes.

3 MR. VAN BRUNT: Are there any other questions?

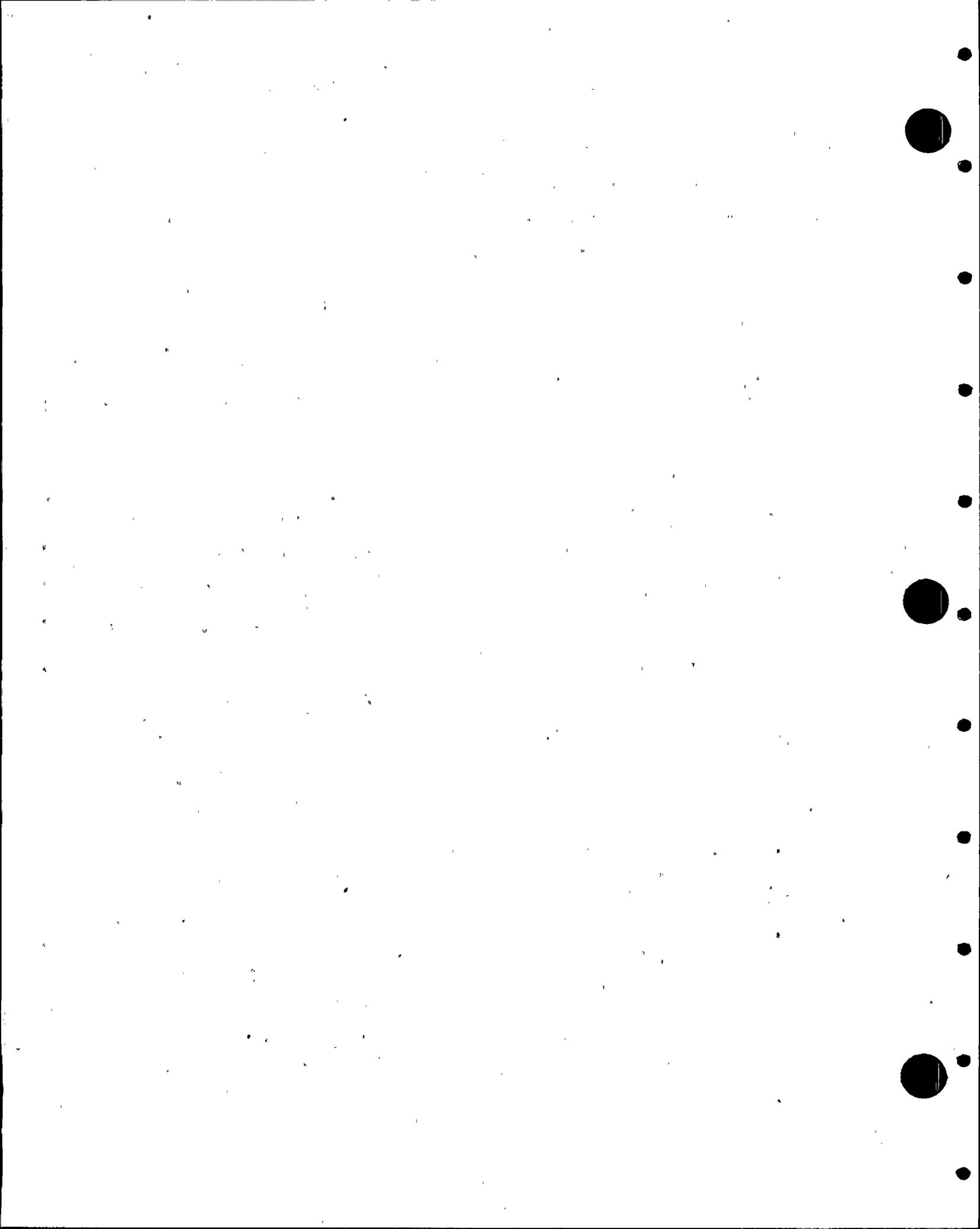
4 Dennis, go ahead.

5 MR. KEITH: We will now continue with Conformance to
6 Regulatory Requirements.

7 MR. BIBA: Figure 2-10 shows the requirements of
8 Standard Review Plan 6.2.2. Revision 2 for General Design
9 Criteria and Regulatory Guides that are relevant to the
10 system.

11 Exhibit 2-42, SRP 6.2.2, requirement for the
12 Containment Spray System to meet the redundancy and power
13 source requirements for an essential safety feature and
14 that the systems should be designed to accommodate a single
15 active failure without loss of function. In compliance.

16 Exhibit 2-43 shows the requirement that the
17 recirculation spray system that circulates the water from
18 the containment sump during the long-term recirculation and
19 after a LOCA shall do so without cavitation. Also, there
20 should be adequate NPSH available to the recirculation pumps.
21 PVNGS is in compliance inasmuch as the NPSH calculations
22 were based on the containment pressure equal to the vapor
23 pressure at the sump water, and there is adequate NPSH
24 available. The effect of the sump screen on the hydraulics
25 of the pump suction was modeled on a one-to-one model and it



1 was found that vortexing or air entrainment will not occur
2 when a vortex-breaking grating cage is installed on the
3 suction pipe.

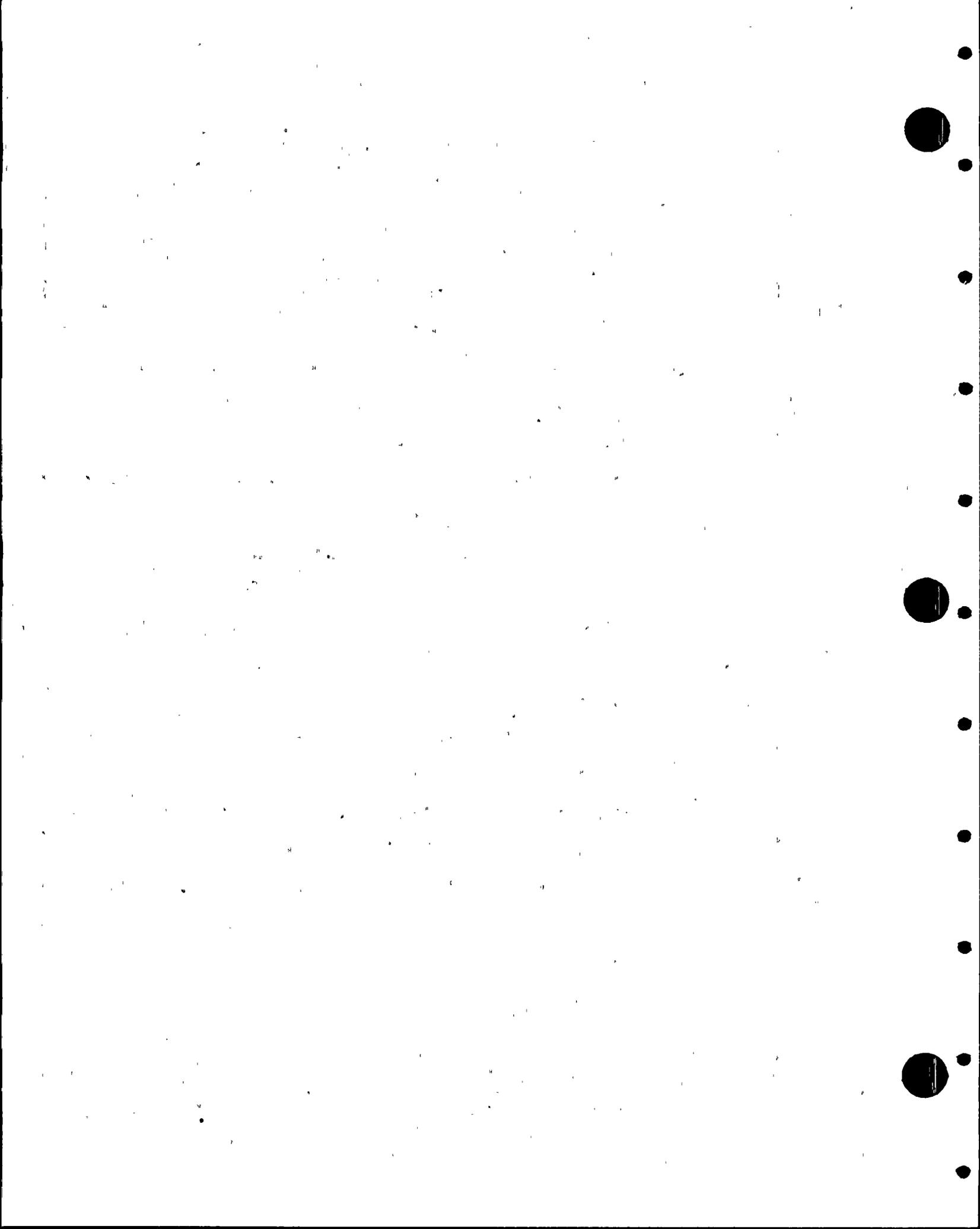
4 Exhibit 2-44, requirement that analyses of the
5 heat removal capability be made of the Containment Spray
6 System. The heat removal capability of the Containment
7 Spray System was performed by Combustion Engineering.

8 Exhibit 2-45 shows additional requirements
9 connected with the heat removal capability of the system,
10 and the response would be that the heat removal capability
11 was designed by Combustion Engineering.

12 Exhibit 2-46, requirement that fan coolers be used
13 for the heat removal capability and that the heat removal
14 capability of the fan coolers should be justified. This
15 requirement is not applicable, since at PVNGS, a fan cooling
16 system is not used.

17 Exhibit 2-47, requirement that the potential for
18 surface fouling of the heat exchangers that are involved and
19 transmit the heat from the containment be considered. PVNGS
20 is in compliance. Surface fouling of the shutdown cooling
21 heat exchangers and, for that matter, also the essential
22 cooling water heat exchangers, was considered. In addition
23 to that, the water within these systems is controlled by
24 chemical systems.

25 Exhibit 2-48, requirement that the Containment



1 Spray System should be designed to Quality Group B per
2 Reg. Guide 1.26. In compliance.

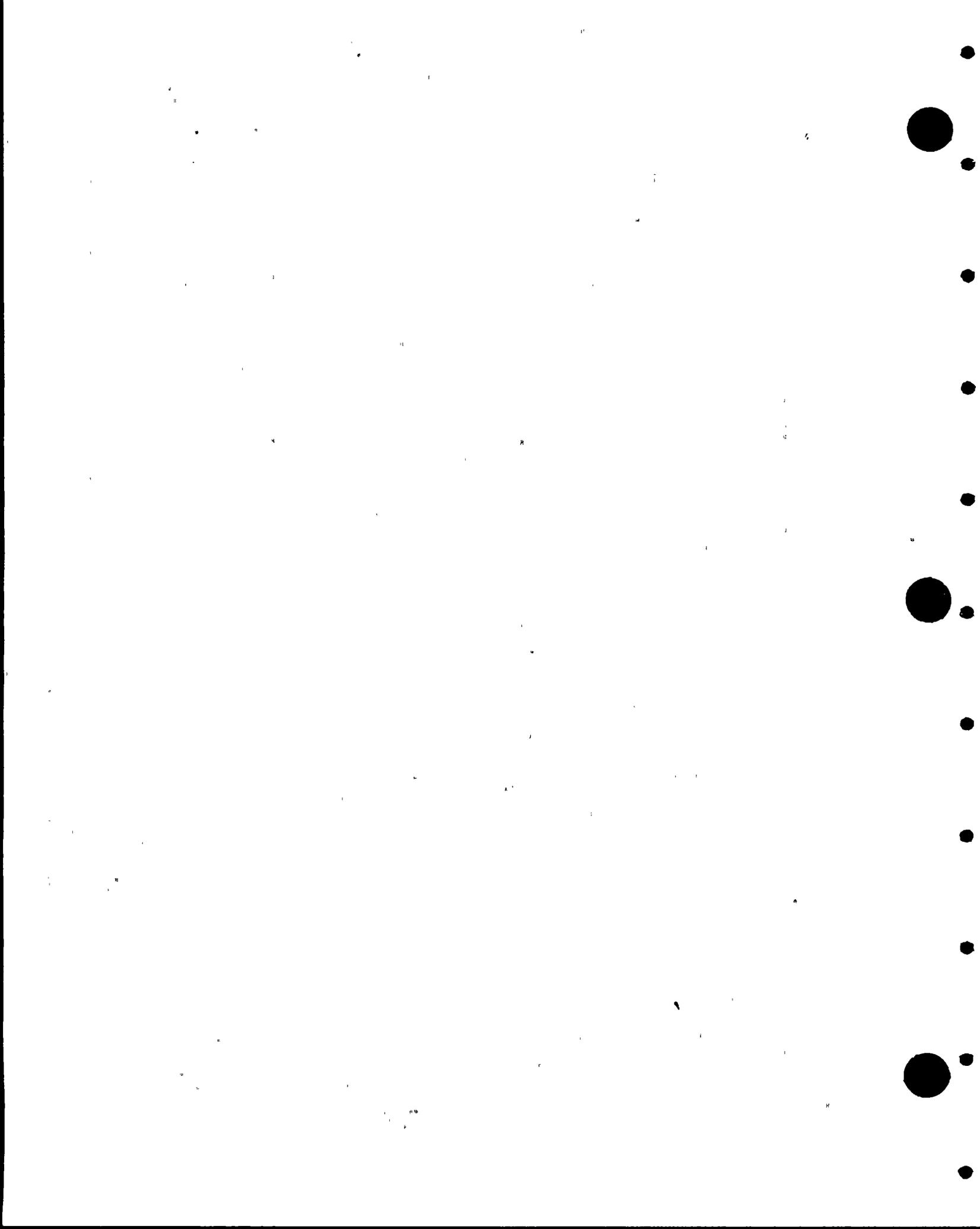
3 The spray system should be designed as Seismic
4 Category I per Reg. Guide 1.29. In compliance.

5 Provisions shall be made in the design to allow
6 periodic inspection and testing of the systems. In compliance.
7 Periodic inspection and testing is in accordance with ASME
8 Section XI.

9 Exhibit 2-49, requirement that the instrumentation
10 should be provided to monitor the Containment Spray System
11 performance under normal and accident conditions. In
12 compliance.

13 Exhibit 2-50, requirement that drainage from the
14 containment spray pumps during the recirculation will be
15 provided and that the screen assemblies around the recircula-
16 tion piping will be acceptable to prevent debris from
17 entering the recirculating piping. PVNGS is in compliance
18 inasmuch as the containment recirculation sump was designed
19 in conformance with Reg. Guide 1.82 and the screening to
20 0.09 inches is performed.

21 Exhibit 2-51, requirement that a system be provided
22 to remove heat from the reactor containment and the system
23 function will be to reduce rapidly the pressure and tempera-
24 ture following a LOCA; also that there is suitable redundancy
25 in components and features and suitable interconnections and



1 isolation shall be provided to assure that for onsite power
2 system operation and for offsite electric power system
3 operation, the system will function properly. In compliance.

4 Exhibit 2-52, GDC 39, Inspection. In compliance.

5 Exhibit 2-53, GDC 40, Testing. In compliance.

6 Exhibit 2-54, GDC 50, Containment Design. In
7 compliance.

8 Exhibit 2-55, Reg. Guide 1.1, Net Positive Suction
9 Head for Emergency Core Cooling and Containment Heat Removal
10 System Pumps. In compliance.

11 Exhibit 2-56, Reg. Guide 1.26, Quality Group
12 Classifications. In compliance.

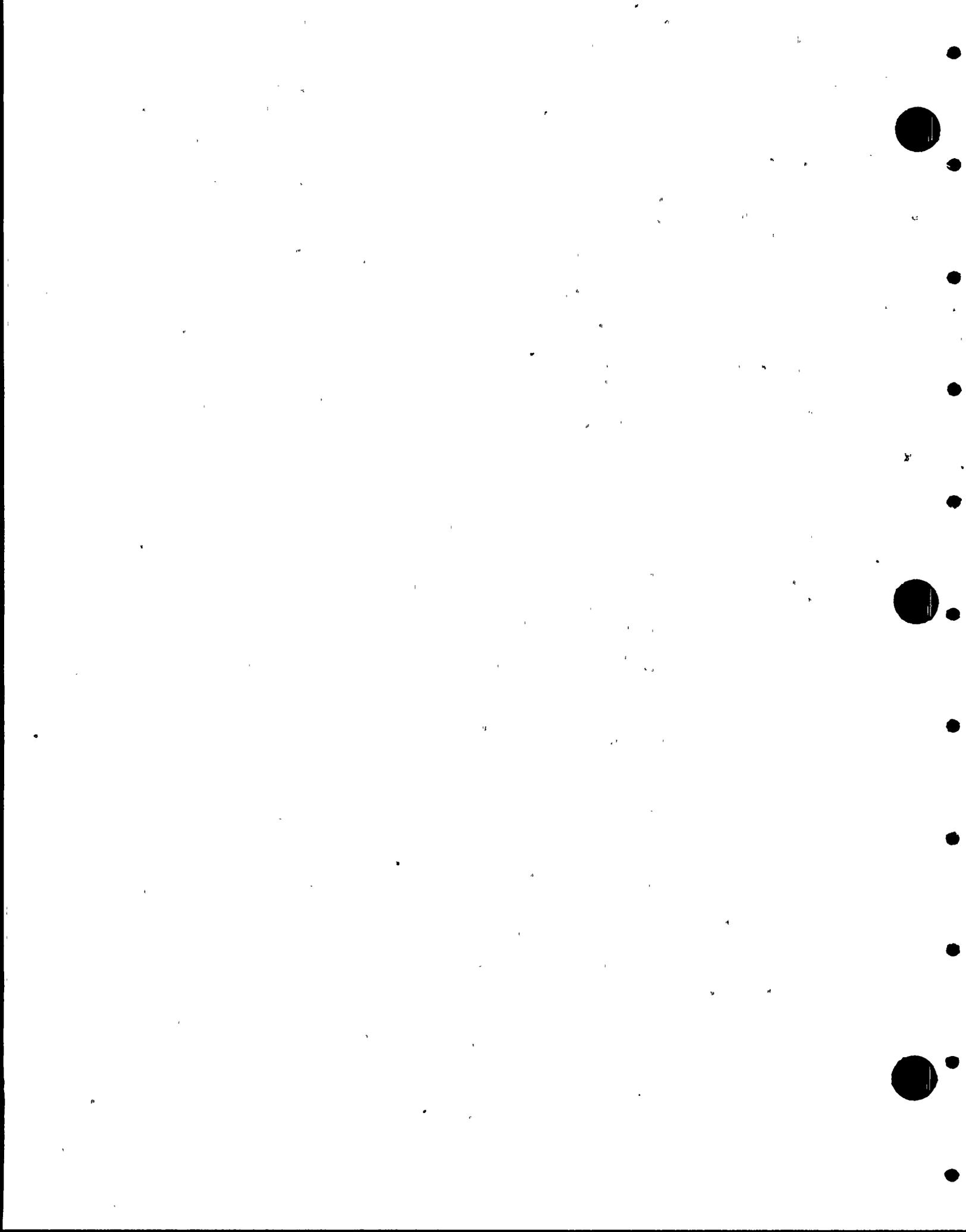
13 Exhibit 2-57, Reg. Guide 1.29, Seismic Classifica-
14 tions. In compliance.

15 Exhibit 2-58, Reg. Guide 1.82, Sumps for Emergency
16 Core Cooling and Containment Spray Systems. Requirement for
17 a minimum of two sumps to be provided. In compliance.

18 Redundant sumps should be physically separated
19 from each other. In compliance.

20 Exhibit 2-59, continuation of Reg. Guide 1.82,
21 requirement that the sumps should be located on the lowest
22 floor elevation in the containment and that, at a minimum,
23 there are two screens provided, an outer trash rack and
24 a fine inner screen. In compliance.

25 Requirement for the floor level in the vicinity



1 of the sump to slope away from the sump. In compliance.

2 Exhibit 2-60, requirement that all drains from the
3 upper region of the reactor building should terminate in
4 such a manner that it would not impinge directly with the
5 screen. In compliance.

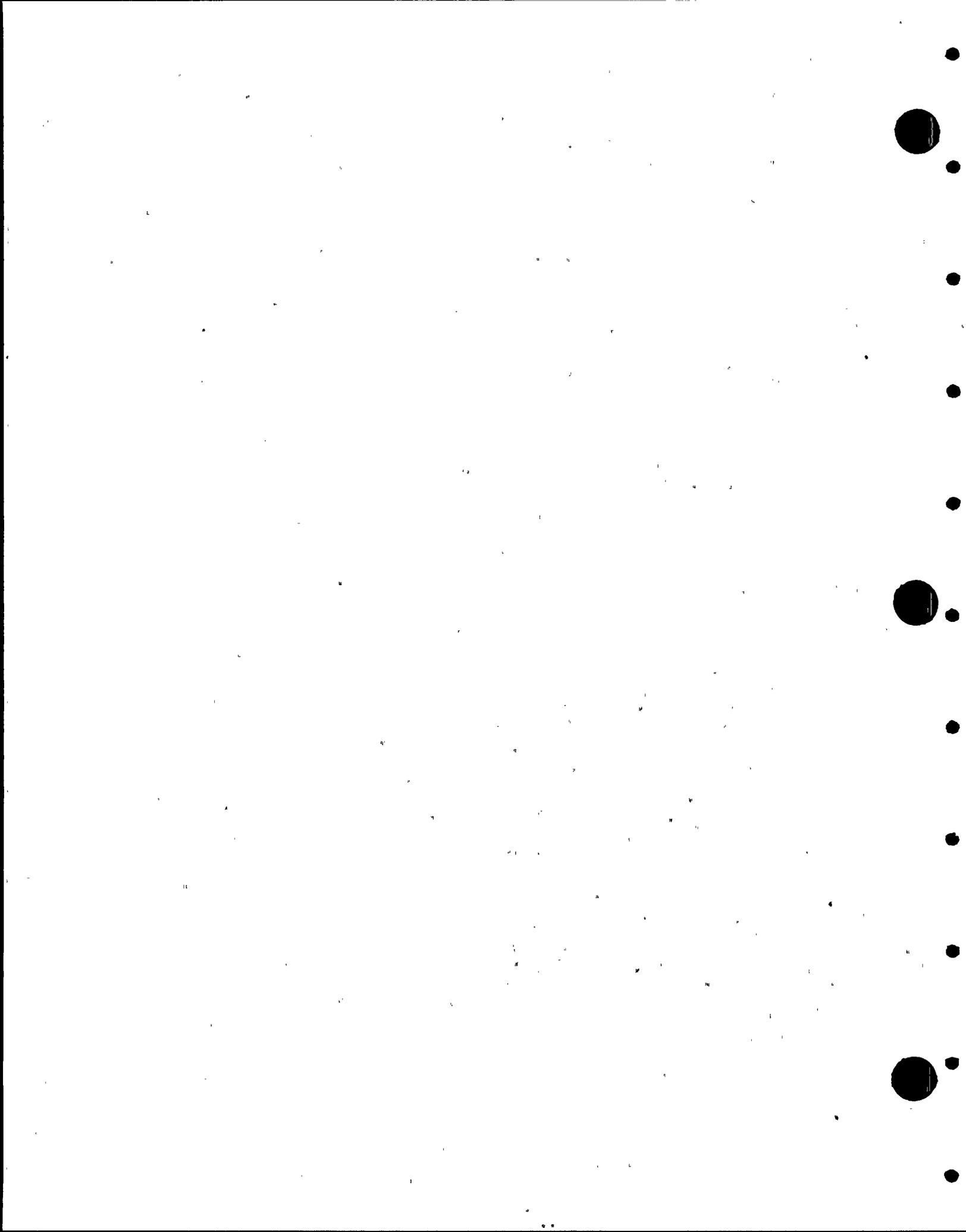
6 Requirement for a vertically mounted outer trash
7 rack to be provided. In compliance.

8 Exhibit 2-61, requirement that a vertically mounted
9 fine inner screen should be provided, and the design coolant
10 velocity at the inner screen should be approximately 0.2 feet
11 per second; also the available surface area used in determin-
12 ing the design coolant velocity should be based on one-half
13 of the free surface area of the fine inner screen. In
14 compliance. The design velocity for a 50% plugged fine inner
15 screen is 0.18 feet per second. The design velocity at a
16 50% plugged outer coarse screen is 0.18 feet per second.
17 The velocity at a 50% plugged trash rack is 0.17 feet per
18 second.

19 There is a requirement that a solid top deck should
20 be provided. In compliance.

21 Exhibit 2-62, continuation of Reg. Guide 1.82,
22 a requirement that the trash rack and screens should be
23 designed to withstand the vibratory motion of seismic events.
24 In compliance.

25 Requirement that the size of openings in the fine



1 screen should be based on the minimum restrictions found in
2 systems served by the sump. In compliance.

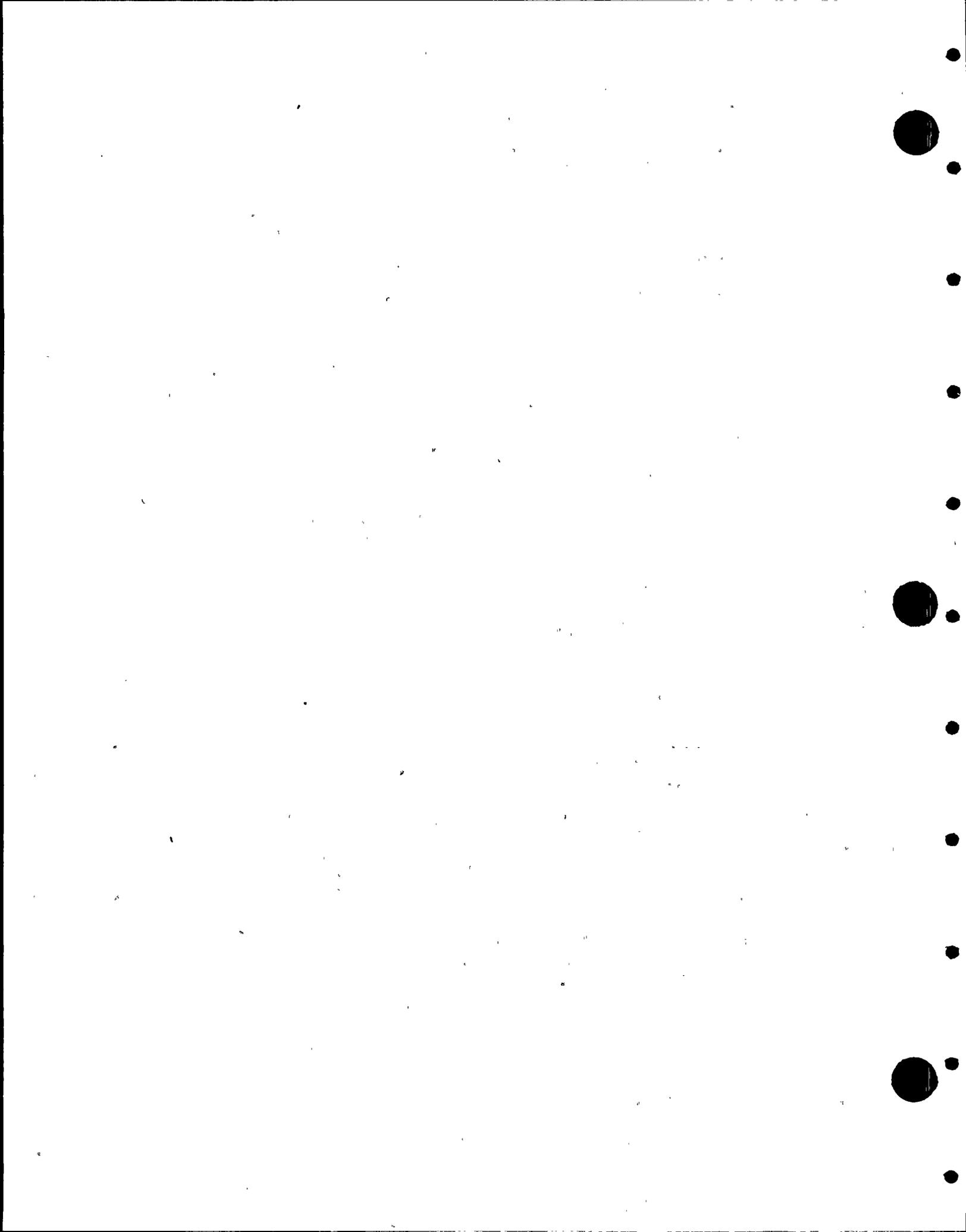
3 Requirement that pump intake locations in the
4 sump should be carefully considered to prevent degrading
5 effects of vortexing. In compliance.

6 Exhibit 2-63, continuation of Reg. Guide 1.62,
7 requirement for the materials for trash racks and screens
8 should be selected to avoid degradation during periods of
9 inactivity. In compliance. The screen material is
10 austenitic stainless steel.

11 Requirement for the trash rack and screen structure
12 to include access openings to facilitate inspection of the
13 structure. In compliance. There is a manhole provided in
14 the top deck to facilitate access into the sump and suction
15 intake structures.

16 Exhibit 2-64, continuation of Reg. Guide 1.82,
17 requirement for inservice inspection for reactor coolant
18 pump components such as trash racks and screens, and the
19 coolant pump components should be inspected during every
20 refueling period down time and there should be a visual
21 examination of the components for evidence of structural
22 distress or corrosion. In compliance.

23 Exhibit 2-65, NUREG-0737, Item II.F.1, Subpart 4.
24 There is a requirement for continuous indication of contain-
25 ment pressure to be provided in the control room, and

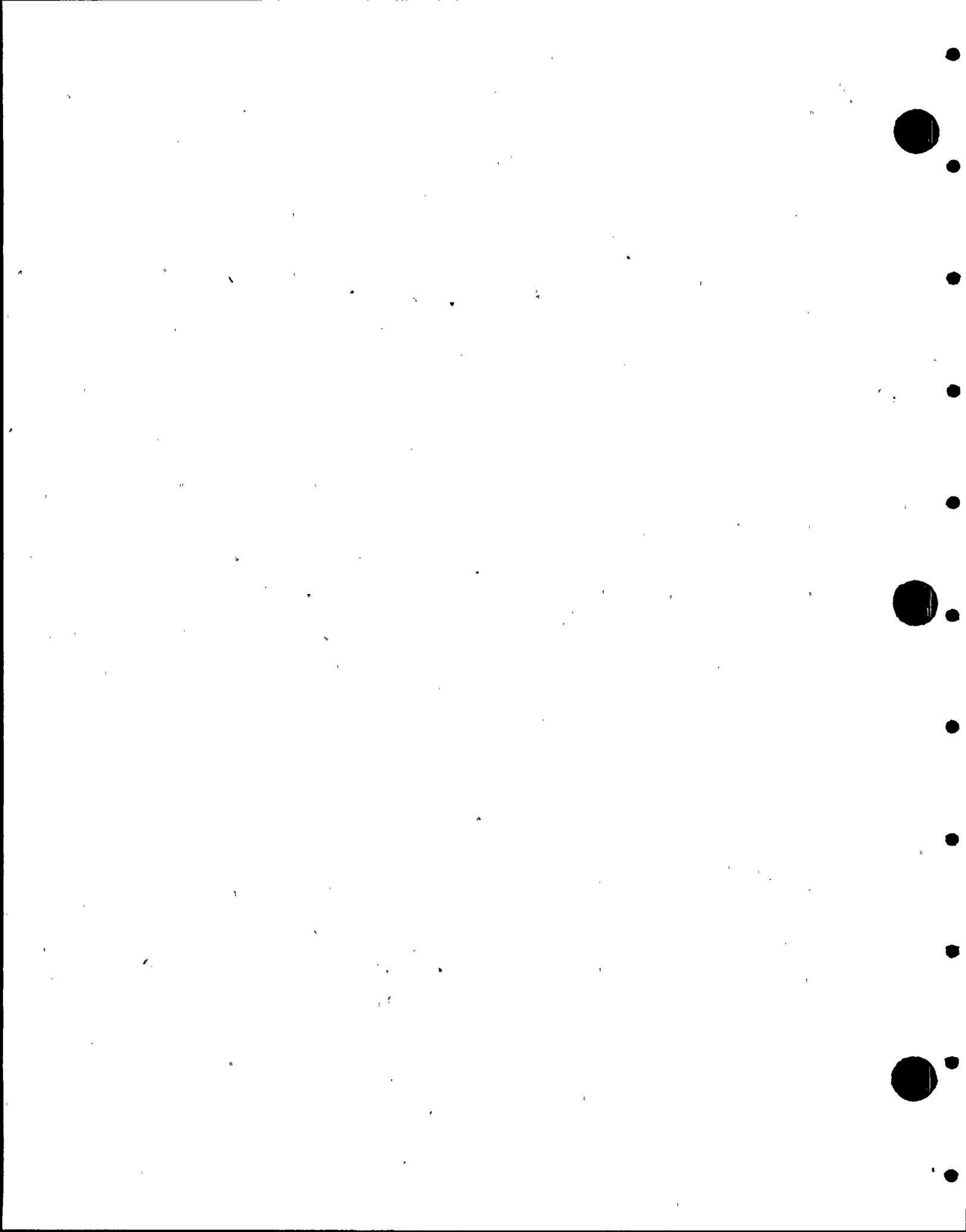


1 measurement and indication capability to include three times
2 the design pressure of the containment for concrete, four
3 times the design pressure for steel, and minus 5 psig for
4 all containments. In compliance. The containment pressure
5 is monitored over the range of minus 5 to 180 psig and it is
6 provided with Class IE power with recording on Channel A.

7 Exhibit 2-66, NUREG-0737, Item II.F.1, Subpart 5,
8 a requirement for continuous indication of containment water
9 level to be provided in the control room for all plants.
10 PVNGS is in compliance. A narrow range instrument reading
11 from the bottom to six inches above the sump is provided
12 for each containment radwaste sump. These narrow range
13 instruments are non-IE, but they have a reliable power source
14 and are qualified to a post-LOCA environment. There is a
15 redundant wide-range instrument which reads from 80 feet
16 6 inches to 91 feet 6 inches provided with Class IE power
17 with recording on Channel A. The maximum expected water
18 level in the containment is 91 feet, so this wide-range
19 instrument is reading within the expected water level in the
20 containment.

21 MR. KEITH: This concludes the Containment Spray
22 System.

23 MR. VAN BRUNT: Before we go to the informal NRC
24 questions that we've got, are there some questions on the
25 presentation? Ed.



1 MR. STERLING: On Exhibit 2-66, on the containment
2 water level, it indicates that you have to run from the
3 bottom of the containment to the elevation equivalent to
4 600,000 gallons. As I understand the orientation of the
5 instruments, is it from the bottom of the containment,
6 because there is an overlap between the narrow range that
7 is in those sumps and the wide range. What is the lowest
8 elevation in the containment?

9 MR. KEITH: Eighty feet is the floor level and then
10 the sumps go down below that.

11 MR. STERLING: The reactor cavity does not go below
12 that point?

13 MR. KEITH: The reactor cavity does.

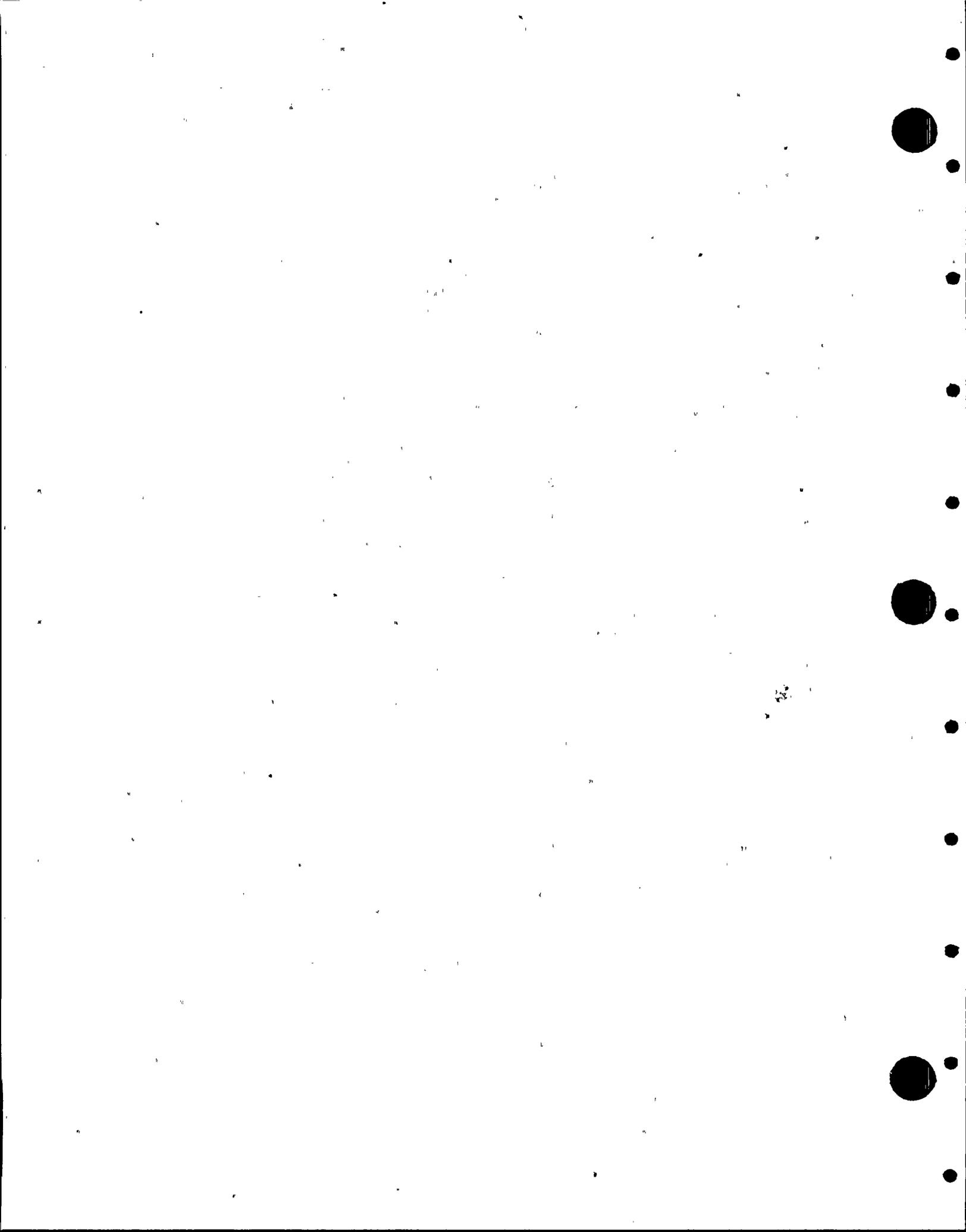
14 MR. STERLING: How do we address the water level that
15 might be in that cavity versus where we are reading on these
16 instruments that you say in the design feature?

17 MR. KEITH: There are curbs to prevent water from
18 going into the reactor cavity such that we will fill the
19 radwaste sumps first, so you will have that as indication
20 before the reactor cavity sump will fill.

21 MR. STERLING: For any water that gets in there other
22 than a direct leak from the vessel then those sumps would
23 fill prior to any water going into the reactor cavity?

24 MR. KEITH: That's correct.

25 MR. STERLING: Is the volume of water underneath the



1 reactor in that cavity such that the lag time between the
2 reading on the sump level indicator and the wide-range
3 indicator on the wall would be a minimal amount of lag?

4 I don't know what the volume of that cavity is
5 under there, but it is my understanding it isn't great
6 compared to the overall volume.

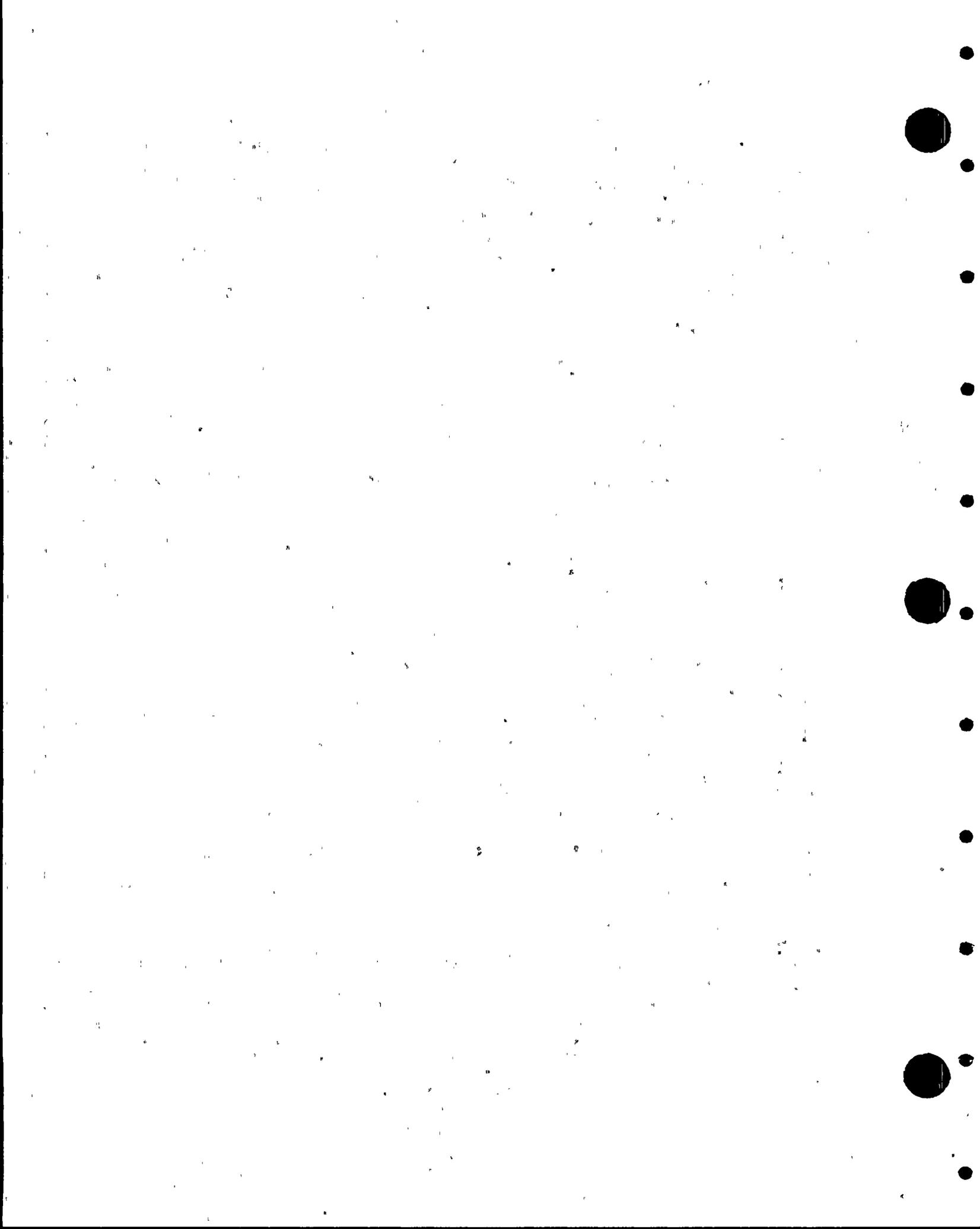
7 MR. KEITH: Ed, the curb is such that we will be on
8 our wide-range indication before we start to fill up that
9 reactor cavity sump.

10 MR. STERLING: Well, my question is is the volume of
11 that area underneath the vessel, that cavity area, such that
12 it would cause a lag on the increasing rising water level in
13 the containment building while that cavity fills? In other
14 words, you have filled your sumps, the water is starting to
15 rise in the containment, you now go above the level of the
16 curb and the water starts going down into the cavity and will
17 start to fill that cavity prior to the rest of the water level
18 going up.

19 MR. KEITH: That's correct.

20 MR. STERLING: Is that volume there such that there
21 will be a significant lag in being able to tell where your
22 water level is.

23 MR. KEITH: Well, no. See, you will know where you
24 are, because you will be on the wide-range indication, so
25 what you read on the wide-range indication will not increase



1 while you are filling up that reactor cavity sump, but you
2 will have the indicator so you will know where you stand
3 as far as water level in the containment.

4 MR. STERLING: Let me try it one more time. Is there
5 a significant volume in that cavity? Let me ask it that way.

6 MR. KEITH: The volume is not significant. We have
7 considered it as far as determining our maximum and minimum
8 water levels in containment, so it has been included.

9 MR. STERLING: It is not a significant amount?

10 MR. KEITH: It is included in the calculation.

11 MR. STERLING: Thank you.

12 MR. VAN BRUNT: Do you have any other questions, Ed?

13 MR. STERLING: No.

14 MR. VAN BRUNT: John Held.

15 MR. HELD: Exhibit 2-66. Please provide the accuracy
16 specification of the containment water level monitors.

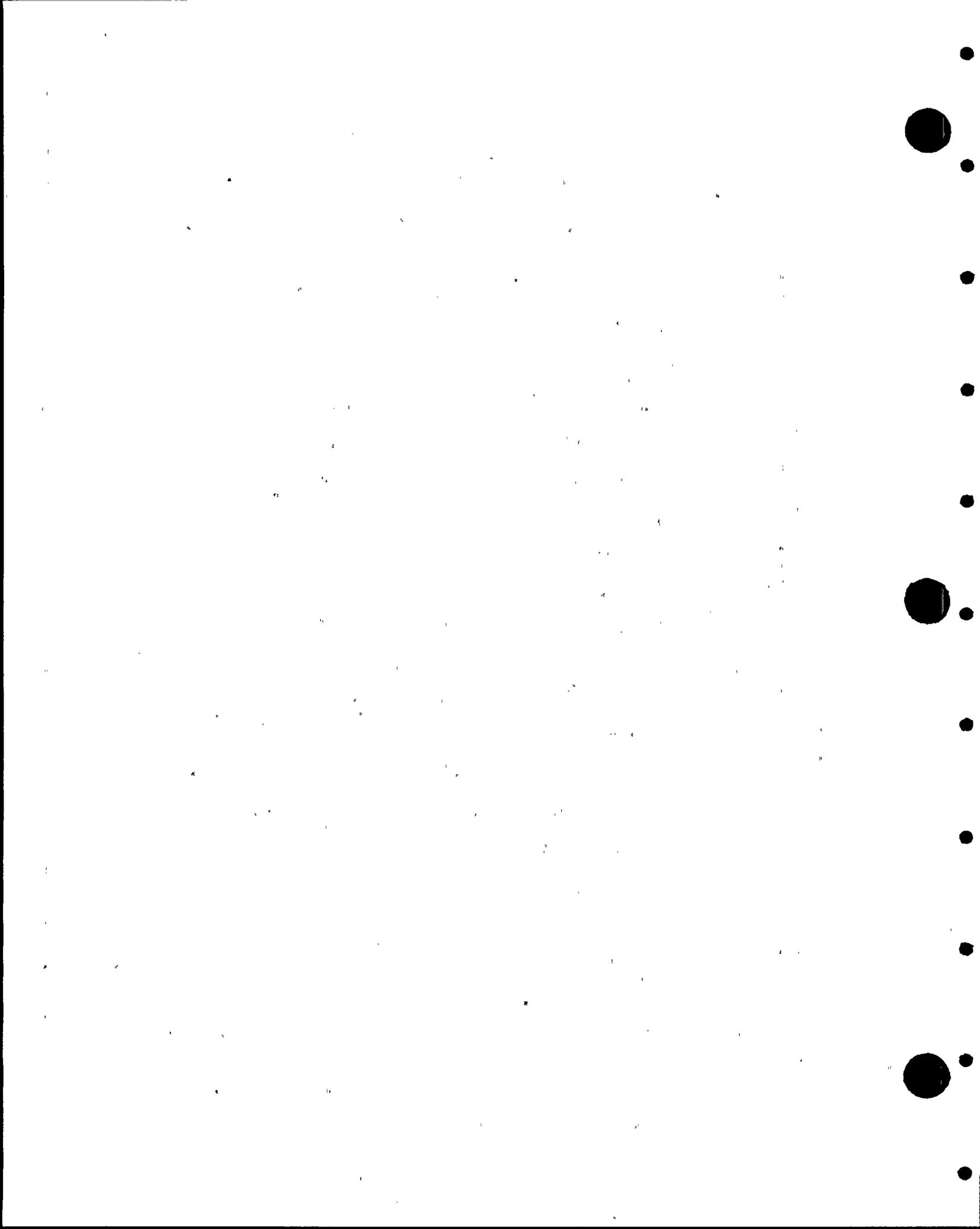
17 MR. KEITH: We are in the process of procuring those
18 indicators, so we will provide those when we have the data.

19 MR. VAN BRUNT: Do you have any other questions, John?

20 MR. HELD: No.

21 MR. VAN BRUNT: Carter, I think you have a question to
22 follow up.

23 MR. ROGERS: Exhibit 2-49 as it applies to Exhibit
24 2-66. Exhibit 2-49 refers to Standard Review Plan 6.2.2 and
25 specifically Requirement No. 9) of the Standard Review Plan.



1 Regulatory Guide 1.97, "Instrumentation for Water Cooled
2 Nuclear Power Plants to Assess Plant Conditions During and
3 Following an Accident," states that the instrumentation should
4 have adequate range, accuracy, and response to ensure that
5 the parameters can be tracked and recorded. You do not
6 address Regulatory Guide 1.97, although you do in Exhibit
7 2-66 refer to NUREG-0737. Are those requirements similar?

8 MR. KEITH: Yes.

9 MR. ROGERS: Do you indeed meet Regulatory Guide 1.97?

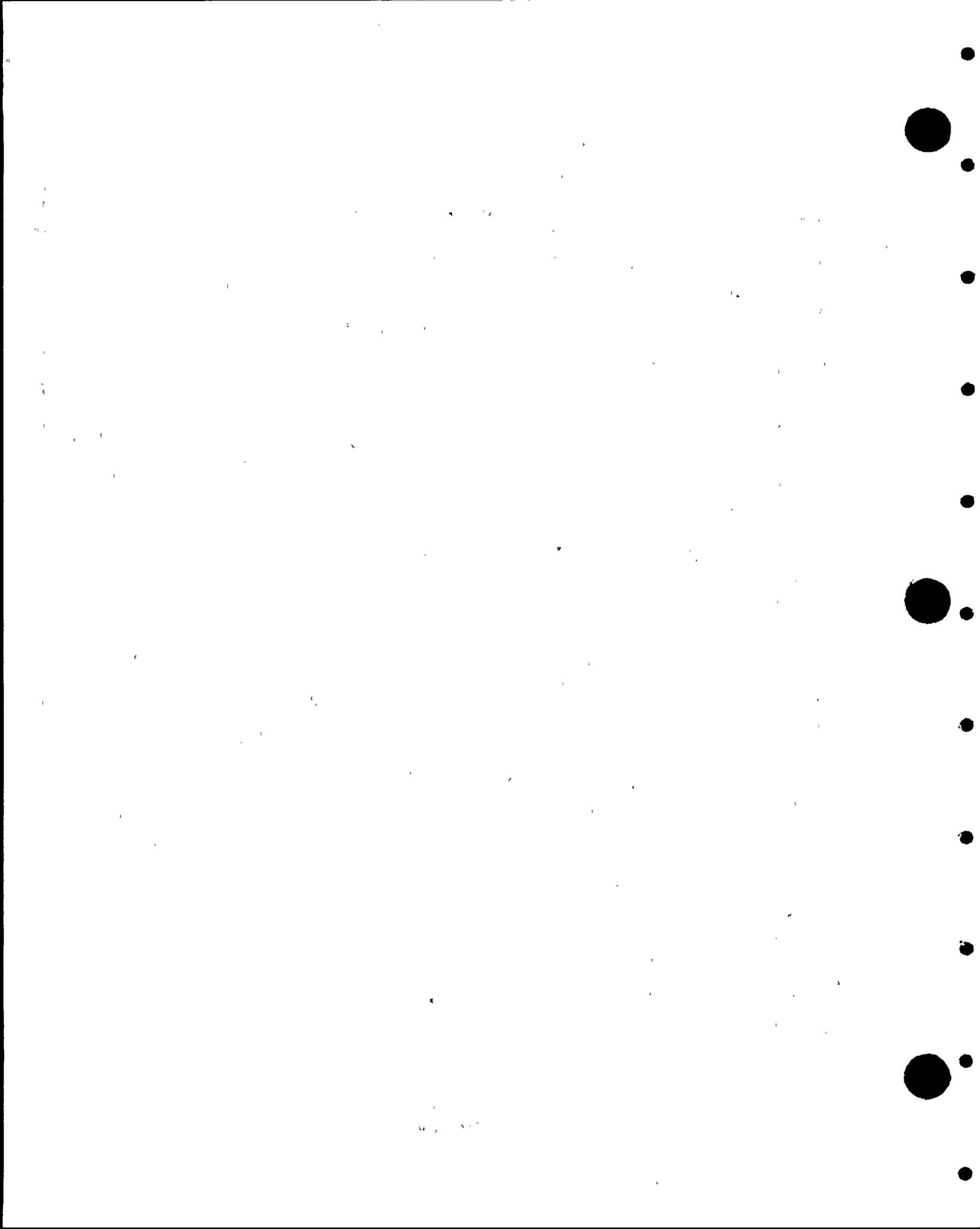
10 MR. KEITH: Yes, we are in the process of procuring
11 instrumentation so that we will meet those requirements.

12 MR. VAN BRUNT: Any other questions from anybody else?
13 Bill.

14 MR. HEPNER: On Exhibits 2-44 and 2-45 where you are
15 talking about nozzles and the analyses of heat removal
16 capability, you have attributed this to CE. I would like to
17 point out that it is Bechtel that is doing the actual
18 containment analyses and there is an interaction on some of
19 these subjects.

20 MR. KEITH: That's correct. CE has specified the
21 nozzles, but Bechtel does the pressure/temperature analyses
22 for containment using the data for the containment spray
23 system.

24 MR. VAN BRUNT: Any others? Carter, you've got some
25 more questions.



1 MR. ROGERS: Exhibit 2-42 refers to Standard Review
2 Plan 6.2.2. Requirement No. 1) in my copy of that Standard
3 Review Plan indicates that the results of the failure mode
4 in an effective analysis for each system should ensure that
5 the system will be capable of withstanding a single failure
6 without loss of function. I'm sorry, I missed the right-
7 hand side of it. You do address that. Good.

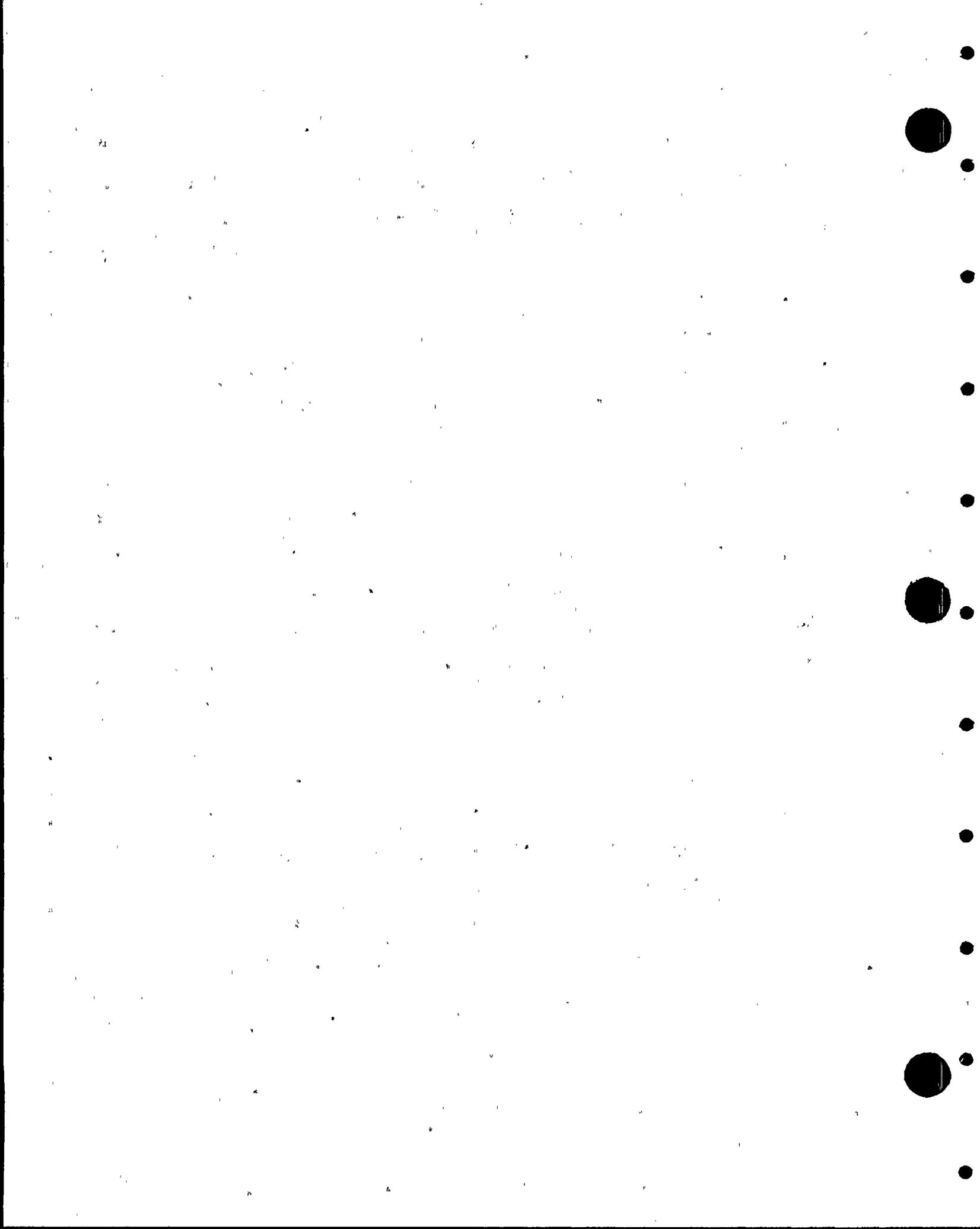
8 MR. VAN BRUNT: Are there any other questions on this
9 section?

10 MR. KU: I have one. In Exhibit 2-43, we talk about
11 a one-to-one model test and I am wondering when you run the
12 test whether it is a closed environment in which you could
13 control the actual contaminant conditions. I'm just wondering.

14 MR. BIBA: The model test was made to the conditions.
15 That means the temperature of the water was simulated. And
16 the model was corresponding to the contaminant conditions.
17 The test was run I believe at 180 degrees Fahrenheit, which
18 was the limit of the heaters and the hydraulic velocity there.
19 However, the results were corrected by appropriate correlations
20 to correspond to the actual contaminant temperatures and
21 conditions.

22 MR. VAN BRUNT: Any other questions?

23 I think everybody has been handed a copy of the
24 informal questions that we received from the NRC. I think
25 Dennis is going to deal with these. He will give you the



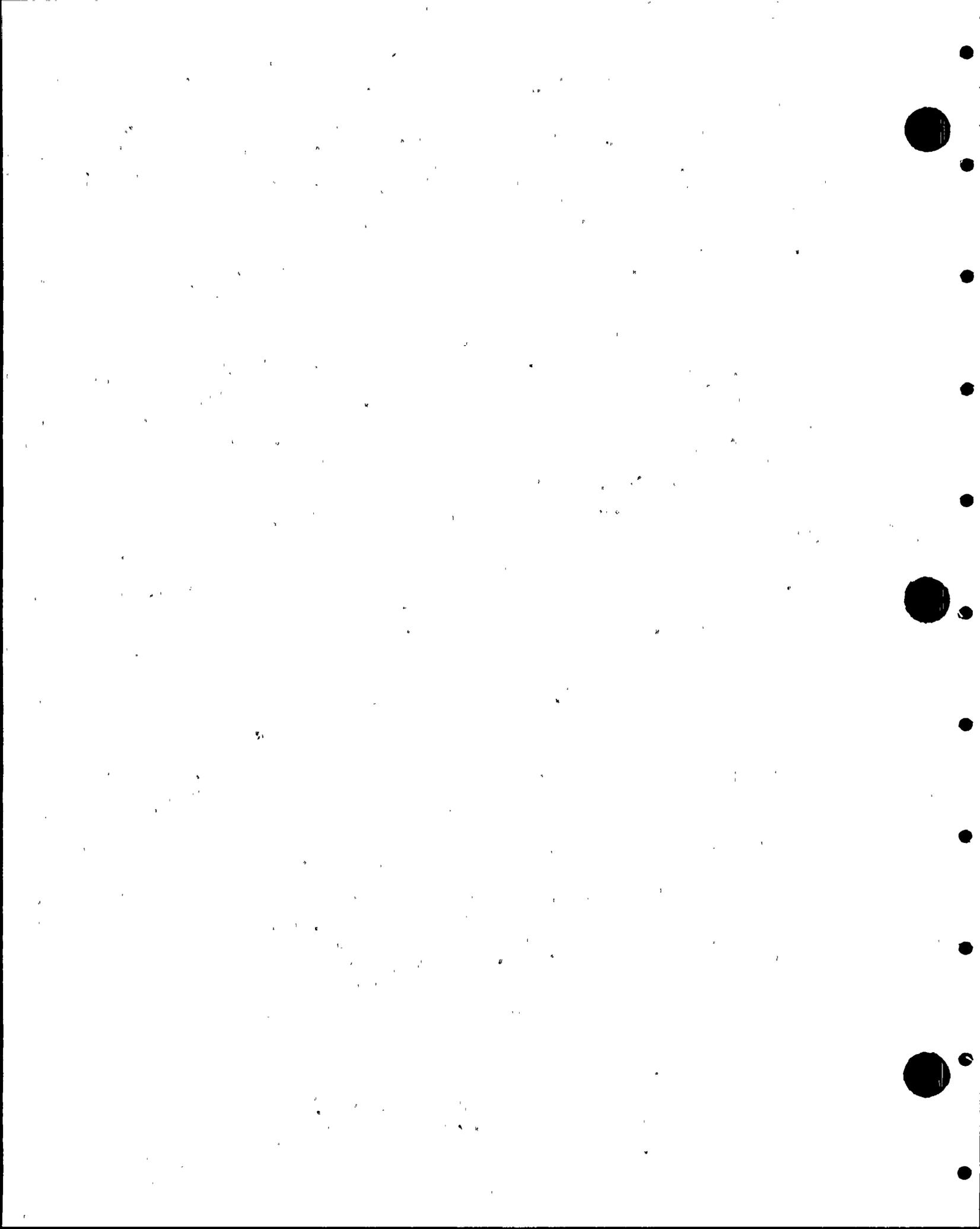
1 question number, you can read the question yourself, and
2 he will respond to those. That way we will get them on the
3 record. We have given the Court Reporter a copy of these
4 questions and he will append that to the transcript so
5 anybody that is reading it can get the whole picture.

6 Dennis, go ahead.

7 MR. KEITH: Question 6.2.1.1.A-4. This CESSAR
8 interface deviation is discussed in FSAR Section 1.9.2.4.1,
9 and it has already been discussed in the presentation today.
10 Is that sufficient?

11 MR. HELD: Let me bring up one point before we
12 proceed. If you don't feel like answering the questions
13 that pertain to sections other than those covered by the
14 agenda today, feel free just to address those in a letter
15 later.

16 MR. VAN BRUNT: That was our intention, that we would
17 like to try and deal with these and dispose of as many of
18 them as we can right now to save an interchange of letters.
19 It makes it easier for you and us both. If there are items
20 that we have not been able to prepare an answer for at this time
21 or for whatever reason, we will just hold those as an open
22 item and we will address those separately. That was our
23 intention. We will be very interested in any interaction
24 that you have with the responses as to whether they appear
25 to satisfy your needs or not.



1 MR. HELD: I don't see any problem with the response
2 you gave to the first question at this time.

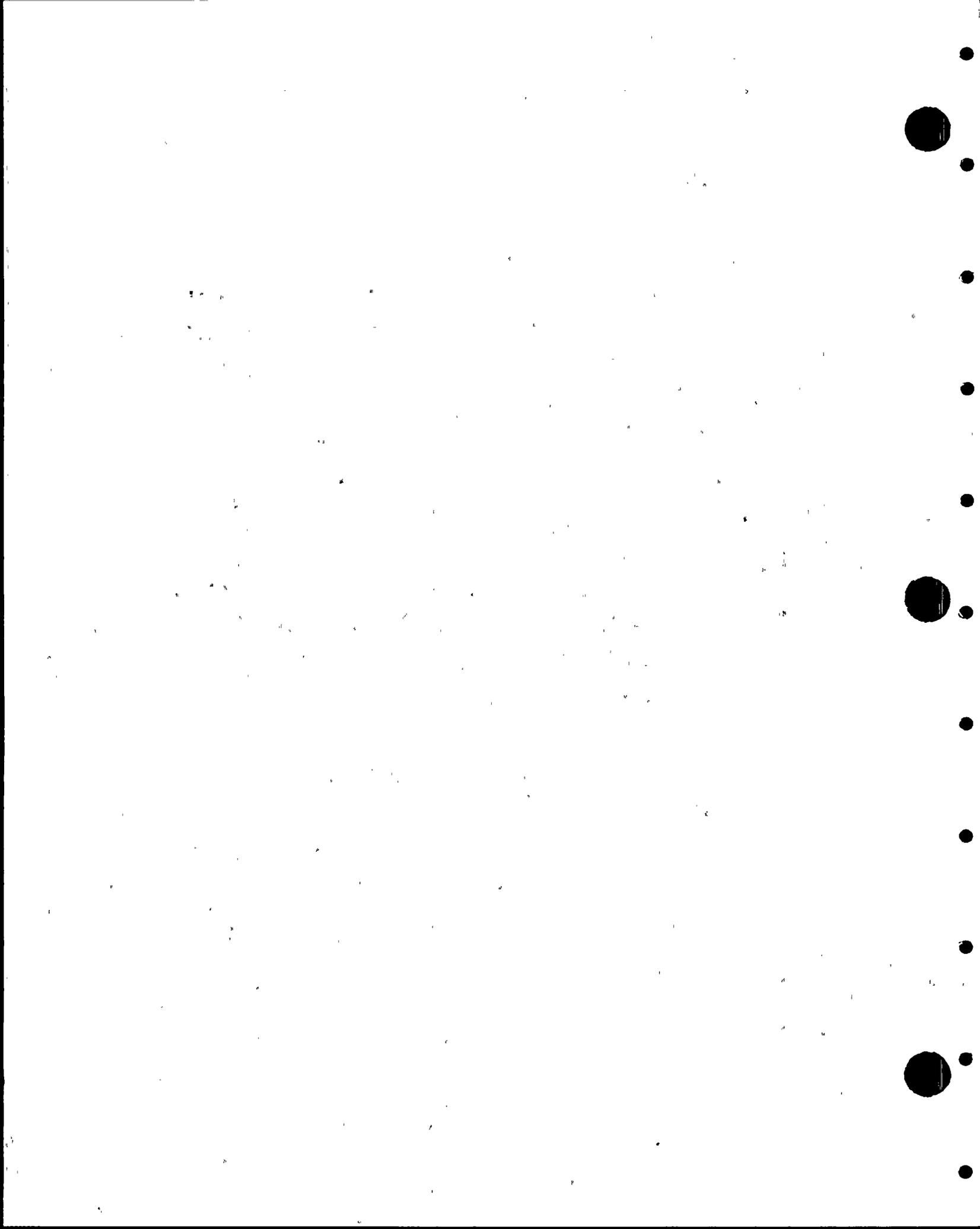
3 MR. KEITH: Question 6.2.1.1.A-5. We do have
4 additional nozzles under the deck under a couple of slabs,
5 as we discussed in the presentation already. Just as
6 background, the rationale for those was during the PSAR
7 stage, the containment offsite dose analysis was showing
8 that we had to reduce the dose and the way to do that was to
9 increase the amount of spray volume inside containment for
10 iodine removal. That is why those auxiliary sprays were
11 added.

12 MR. HELD: All right.

13 MR. KEITH: Question 6.2.2-1. The frictional losses
14 in the containment spray pump suction piping were calculated
15 using standard industry practices, the Crane Handbook,
16 Flow of Fluids, Paper #410. These calculations show an
17 available net positive suction head margin during the
18 injection mode of about 140% and during recirculation mode
19 of about 25%, assuming that the vapor pressure in the sump
20 water equals containment pressure. Also, the effect of the
21 recirculation sump screen was modeled on a one-to-one model
22 and hydraulic performance and head losses through the screen
23 were identified in these tests.

24 MR. HELD: Fine.

25 MR. KEITH: Question 6.2.2-2. The spray patterns



1 inside the containment dome were developed and numerically
2 analyzed by CE to minimize the extent of overlapping of the
3 sprays. We don't have an overall drawing showing the dome
4 sprays. However, we do have drawings showing the spray
5 pattern from those spray nozzles. The spray patterns of the
6 auxiliary sprays below elevations 140 feet and 120 feet
7 were developed by Bechtel and reviewed and approved by CE.
8 We have drawings which we will give you today showing the
9 auxiliary spray patterns and the extent of overlapping of
10 the auxiliary sprays.

11 MR. VAN BRUNT: Dennis, will you give a copy of those
12 drawings to the court reporter to add to the transcript as
13 well?

14 MR. KEITH: Okay.

15 MR. HELD: On that question, is there a number in
16 terms of percent specified for maximum allowable overlap of
17 the sprays?

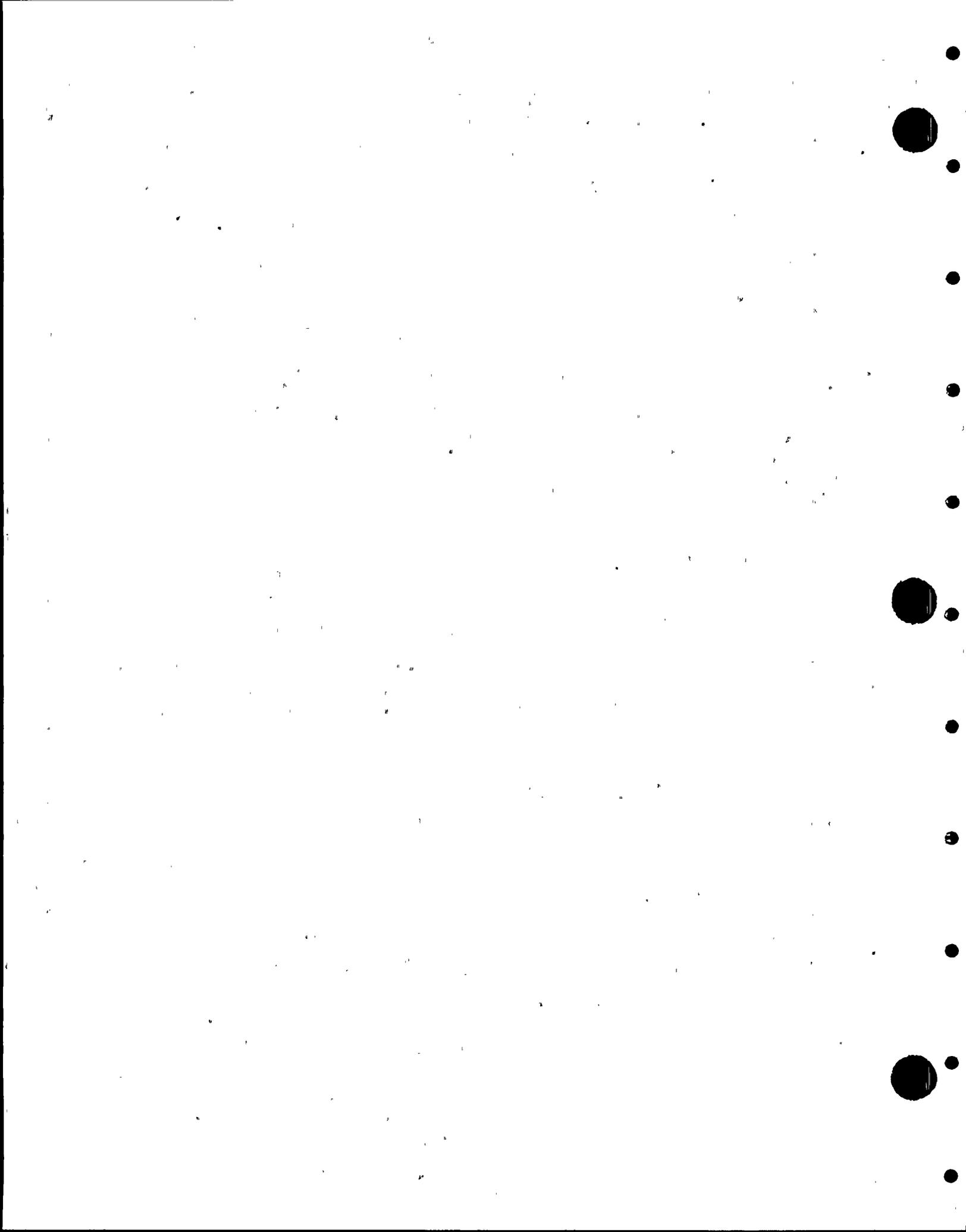
18 MR. KEITH: Phil, can you respond to that?

19 MR. HEPNER: I believe we have 90% coverage. I am
20 not sure of a specific overlap number. I can't give it
21 off the top of my head on that.

22 MR. VAN BRUNT: Why don't we take that as an open
23 item and we will respond to that aspect of the question.

24 MR. HELD: That's fine.

25 MR. KEITH: Question 6.2.2-3. CE's analysis of the



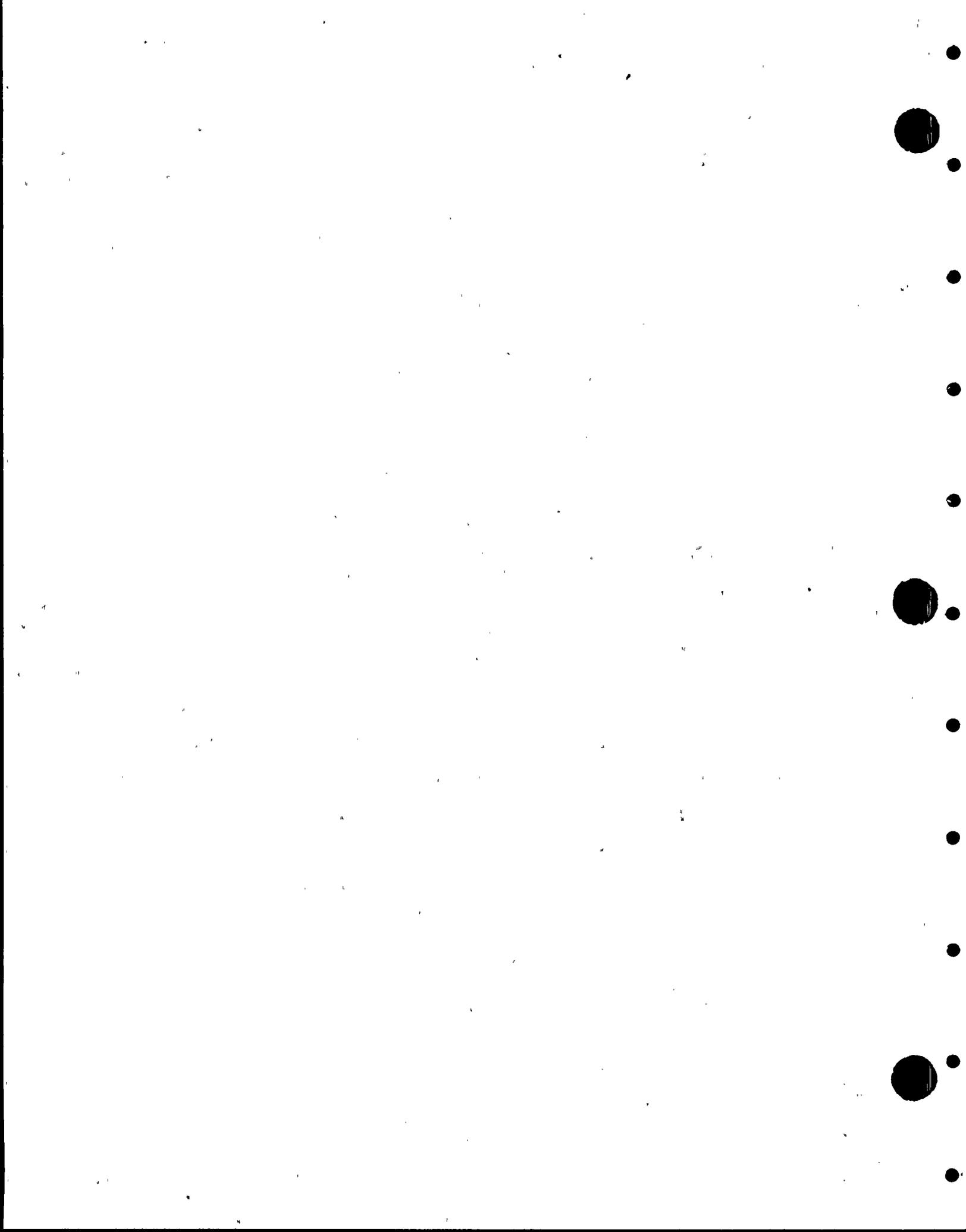
1 heat removal capability of the Containment Spray System
2 indicates that thermal equilibrium is reached in the spray
3 droplets within 10 feet from the spray nozzle. Item 22 of
4 Exhibit 2-28 states that a minimum free fall height of 90
5 feet is provided for the containment dome sprays. FSAR
6 Section 1.2 provides general arrangement drawings which show
7 that for the auxiliary spray areas, a free fall height of
8 about 16 feet is available. Thus, for both spray areas,
9 thermal equilibrium is attained.

10 Question 6.2.2-4. During both the injection and
11 recirculation modes of operation, the containment spray is
12 aligned through the shutdown cooling heat exchangers.
13 Therefore, the recirculation actuation signal does not alter
14 the alignment of the system.

15 Addressing Part b), the design heat removal rate
16 for the shutdown cooling heat exchangers includes fouling
17 factors on the shell and tube sides of 0.0005 and 0.00025,
18 respectively. The Section 6.2.1 analyses presented in the
19 FSAR utilized this design heat removal rate.

20 MR. HELD: Good.

21 MR. KEITH: Question 6.2.2-5. We discussed conformance
22 with Regulatory Guide 1.1 and we do assume that the contain-
23 ment pressure is equal to the vapor pressure of the sump
24 water. Our understanding of the Regulatory Guide is that that
25 is in conformance with the Regulatory Guide.



1 MR. HELD: Assuming that the containment pressure is
2 equal to the vapor pressure of the sump water is not
3 necessarily the same as assuming no increase in containment
4 pressure from that present prior to the postulated loss of
5 coolant accidents. We will have to look at that to see if
6 adequate conservatism has been used, so let's leave it at
7 that for now.

8 MR. KEITH: Fine.

9 MR. HEPNER: I think the SRP uses the words that you
10 have used in contrast to the words that are in Regulatory
11 Guide 1.1.

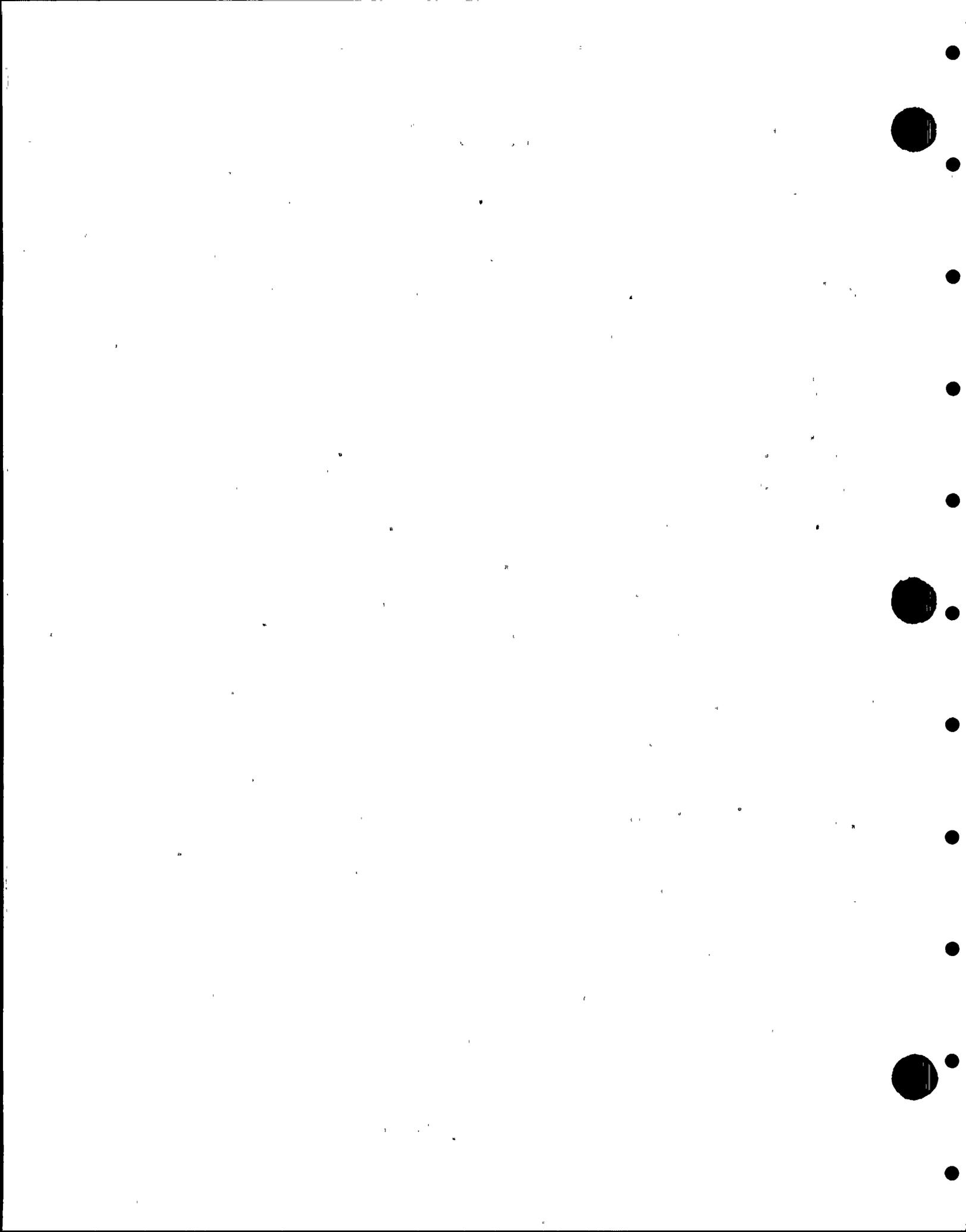
12 MR. KEITH: John, on Page 6.2.2-2 at the bottom of
13 the page of the SRP, Revision 2, it says: "For clarification
14 the analysis should be based on the assumption that the
15 containment pressure equals the vapor pressure at the sump
16 water."

17 MR. HELD: You're right.

18 MR.. KEITH: Thank you. Question 6.2.2-6. The 0.09
19 inches is based on a clearance within the reactor core. One
20 of the grid spacings within the reactor core is the basis
21 for that.

22 Question 6.2.2-7. Do you require any information
23 other than what has been presented?

24 MR. HELD: You have answered this already in the
25 presentation.



1 MR. KEITH: Thank you. Question 6.2.2-8. The trash
2 rack material is stainless steel. I have forgotten whether
3 we stated that earlier or not.

4 MR. HELD: The point of confusion for me was the
5 statement that all screens are fabricated of austenitic
6 stainless steel and I wasn't sure if that referred to the
7 two inner screens or to all three layers including the trash
8 rack.

9 MR. KEITH: It does refer to all three.

10 MR. HELD: Fine.

11 MR. KEITH: On the next page, that would be Question
12 6.2.2-9, our P&ID does show those valves as locked
13 closed, and what that indicates is that there is a chain
14 for the manual operator so that you can't manually operate
15 the valve, but that does not affect automatic operation of
16 the valve. That is the point of confusion.

17 MR. VAN BRUNT: Does that finish the questions on
18 this?

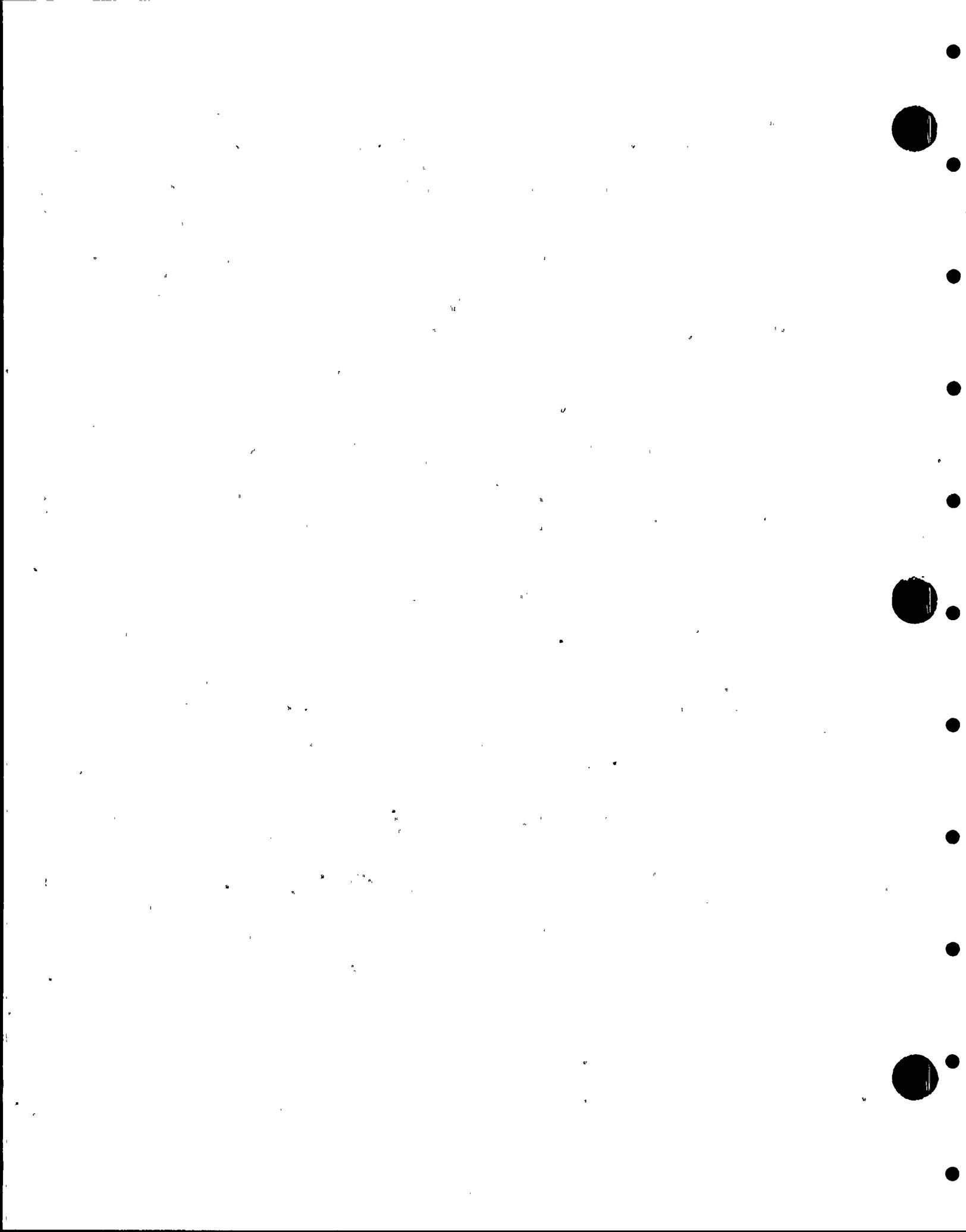
19 MR. KEITH: I believe so.

20 MR. HELD: Yes.

21 MR. VAN BRUNT: We will pick up the rest of them
22 later on.

23 MR. KEITH: Can we just confirm then that the only
24 open question we have is on the overlap of the sprays?

25 MR. HELD: As far as I know, that is the only one



1 that is definitely an open item.

2 MR. VAN BRUNT: Certainly if after he reviews the
3 transcript he has additional questions, he can raise them.

4 MR. KEITH: We just wanted to clarify what we need
5 to work on.

6 MR. VAN BRUNT: Are there any other questions from
7 any of the Board members on this section before we go over
8 to the Containment Isolation Systems?

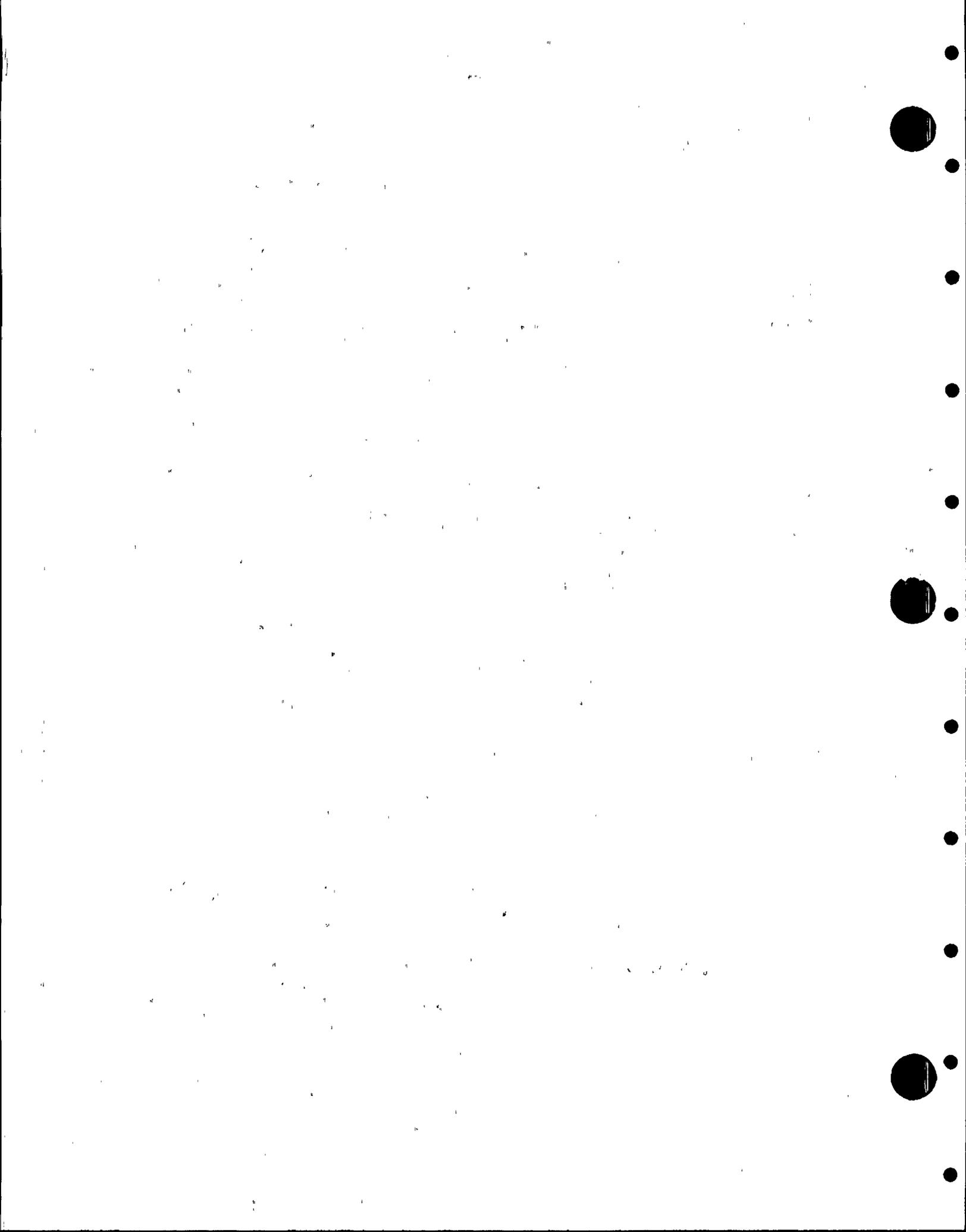
9 Okay, Dennis. You've got about 25 minutes until
10 noon, so you can judge as to where you want to stop. Maybe
11 you want to go through the introduction portion. I don't
12 know how far down the next section we'll go.

13 MR. KEITH: We will go through the Introduction and
14 System Overview and see where we stand, whether we want to
15 take questions at that point in time or break for lunch.
16 We are right now in Containment Isolation Systems and Bill
17 Boles will present that.

18 MR. BOLES: Thank you, Dennis.

19 The next part of the presentation is the
20 Containment Isolation System.

21 Exhibit 3-1. The design objective of the
22 Containment Isolation System or CIS is to allow normal
23 or emergency passage of fluids through the containment
24 boundary while preserving the ability of the boundary to
25 prevent or limit the escape of fission products that may



1 result from postulated accidents.

2 The CIS is not a specific engineered system, as
3 we saw in the case of the containment spray system. Each
4 piping system which penetrates the containment incorporates
5 requirements of the integrity of the containment pressure
6 boundary in the penetration design.

7 Exhibit 3-2, Design Criteria. Two isolation
8 valves shall be provided, one inside and one outside of the
9 containment. As we shall see, there are some other design
10 criteria which apply for different piping penetration
11 assemblies.

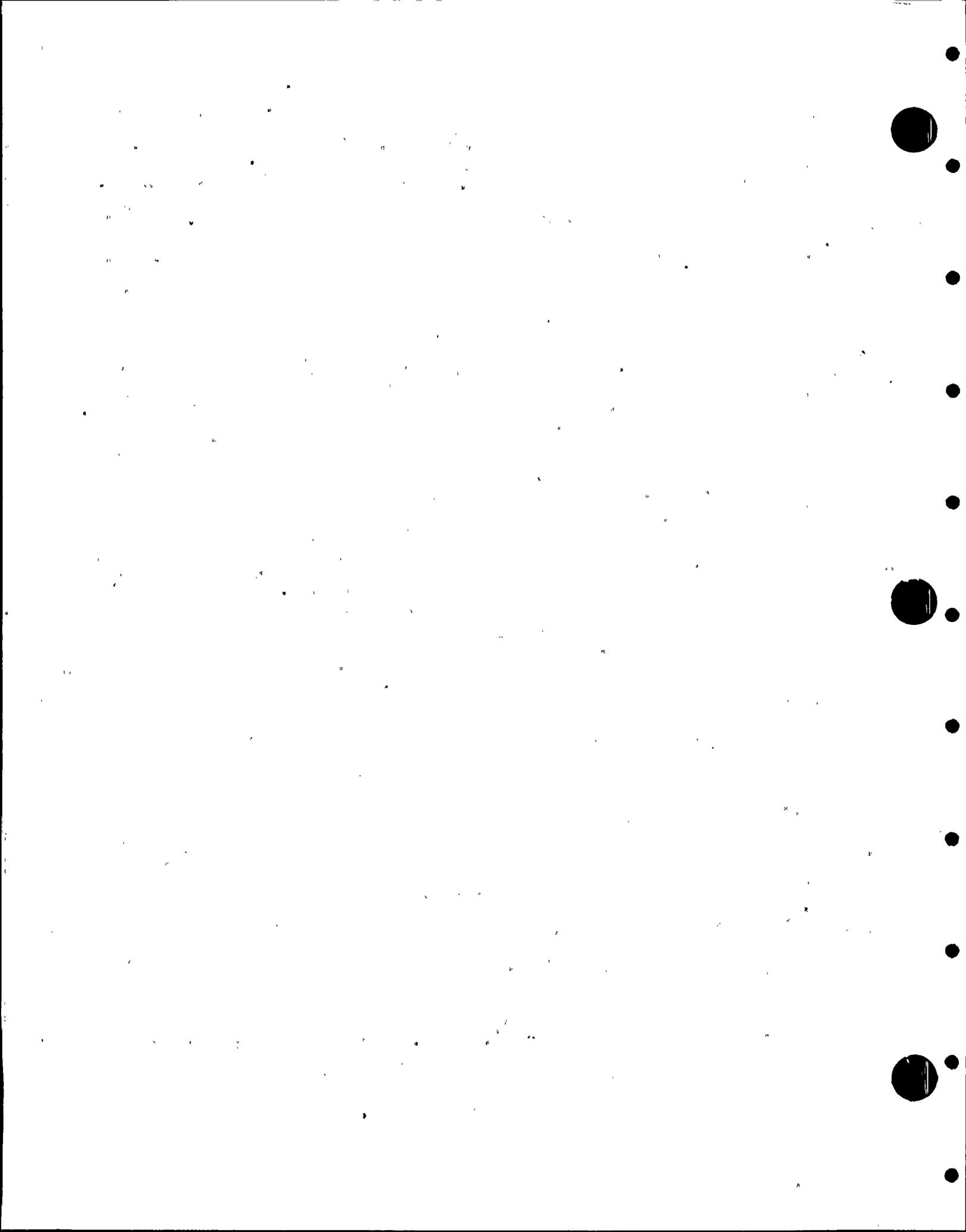
12 Penetration lines and valves shall be constructed
13 to ASME III, Class 2, Seismic Category I.

14 The design pressure and temperatures of the contain-
15 ment penetration lines and their associated isolation valves
16 shall meet or exceed containment design conditions. Valve
17 operators shall be designed to the prevailing environmental
18 conditions, depending on whether the valve is inside the
19 containment or outside.

20 Exhibit 3-3 begins the CESSAR interface require-
21 ments, CESSAR Section 6.2.4.1.2.

22 The isolation valves and piping shall be designed
23 to Safety Class 2 and Seismic Category I. They are in
24 compliance.

25 The isolation valves and interconnecting piping



1 are protected against missiles. They are in compliance.
2 Valves and piping inside the containment are located between
3 the containment wall and the secondary shield wall, and the
4 containment wall also serves as a missile barrier. Outside
5 the containment, there are valves which are protected by
6 steel and concrete walls and floors of adjacent buildings.

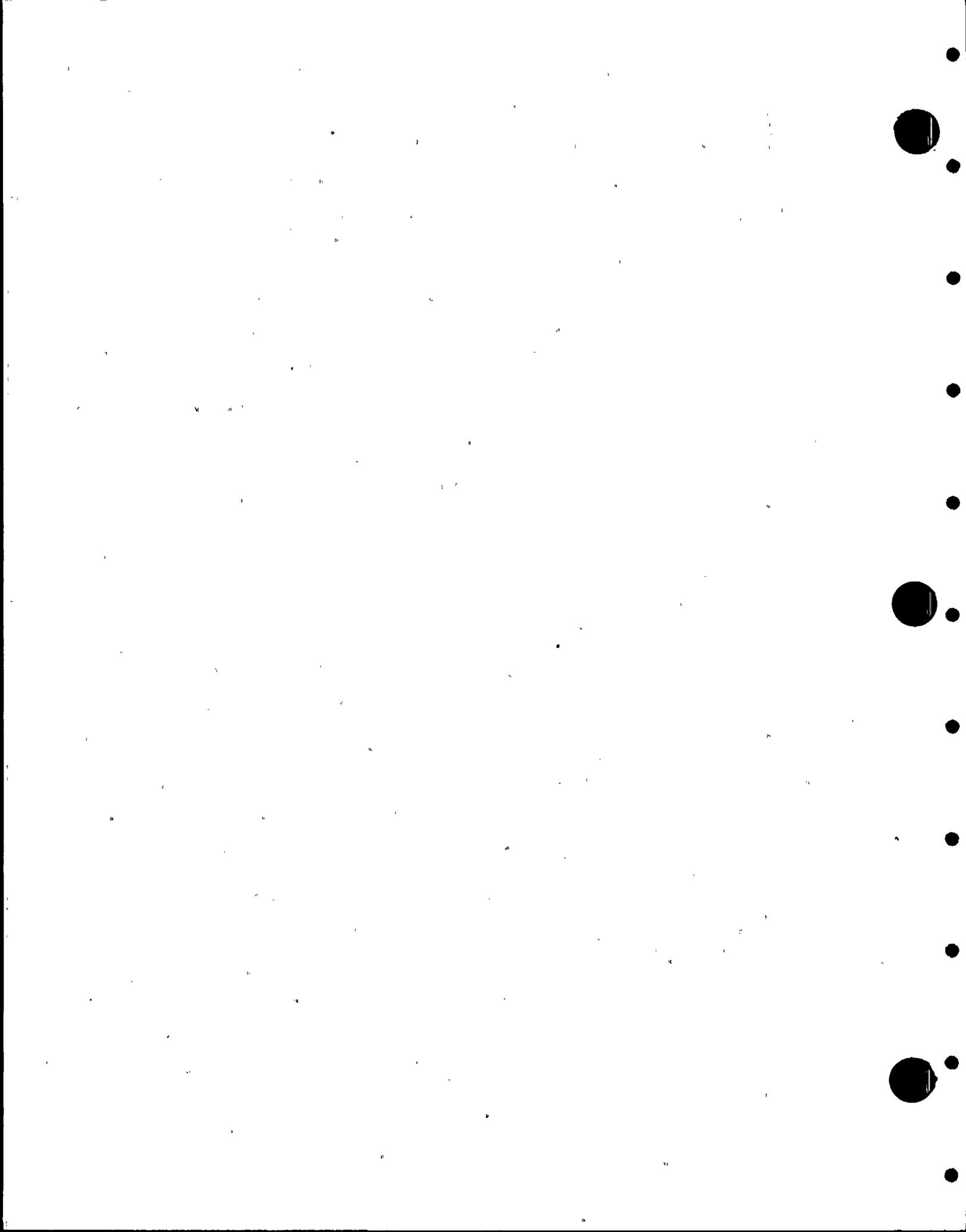
7 Exhibit 3-4. The isolation valves and piping
8 shall be protected against the effects of pipe whip and jet
9 impingement. We are in compliance. They are provided
10 separation from high energy lines, pipe whip restraints, and
11 barriers are provided where appropriate.

12 The maximum allowable particle size in the water
13 from the containment sump shall be limited, and, as we have
14 seen, we are in compliance.

15 Isolation valves shall be designed to operate
16 under environmental conditions and to fulfill their safety-
17 related function under post-accident environmental conditions.
18 We are in compliance.

19 Exhibit 3-5. Isolation valves and piping shall be
20 qualified to ASME III, Class 2. We are in compliance.

21 The valve operators and power sources shall be
22 selected for CESSAR scope isolation valves consistent with
23 their required safety function. We are in compliance. The
24 operators are provided by Combustion Engineering. The
25 interface requirements for power sources are satisfied.

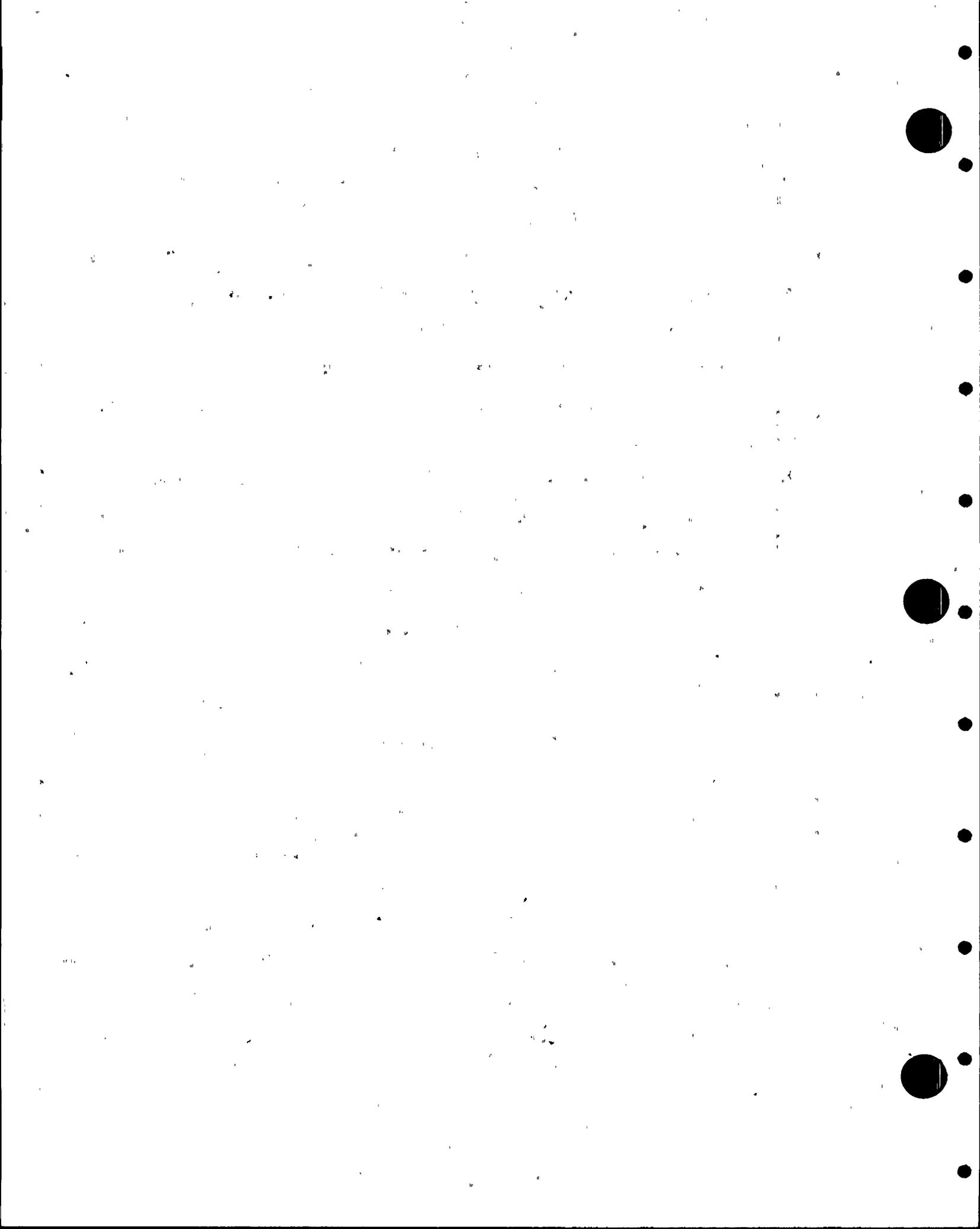


1 Controls for isolation valves shall be designed
2 to actuate remote manual, automatically, or manually locally.
3 We are in compliance.

4 Exhibit 3-6, System Description. The CIS consists
5 of piping penetrations, pipe, valves, and test connections
6 to control the passage of fluids through the containment
7 boundary and to test the boundary leakage.

8 At Palo Verde, we use six different basic types
9 of arrangement. The first type, Type A, are normally closed
10 or isolated valves. Type B, or type number two, are
11 normally operating wise closed upon a containment isolation
12 actuation signal (CIAS), main steam isolation signal (MSIS),
13 auxiliary feedwater actuation signal (AFAS), safety injection
14 actuation signal (SIAS), or remote manual. The third type
15 is normally closed, open on an SIAS, AFAS, containment spray
16 actuation signal (CSAS), or recirculation actuation signal
17 (RAS). The fourth type is part of the closed secondary side
18 of the steam generators within the containment. The fifth
19 type are instrument connections for containment pressure.
20 The sixth type are flanged connections and personnel locks.

21 Let's stay on this slide for just one minute.
22 CE defines the systems and positions and isolation valves
23 for their scope of supply. Penetrations for support systems
24 fall into one of the above categories. Our Final Safety
25 Analysis Report, Section 6.2.4, describes each penetration



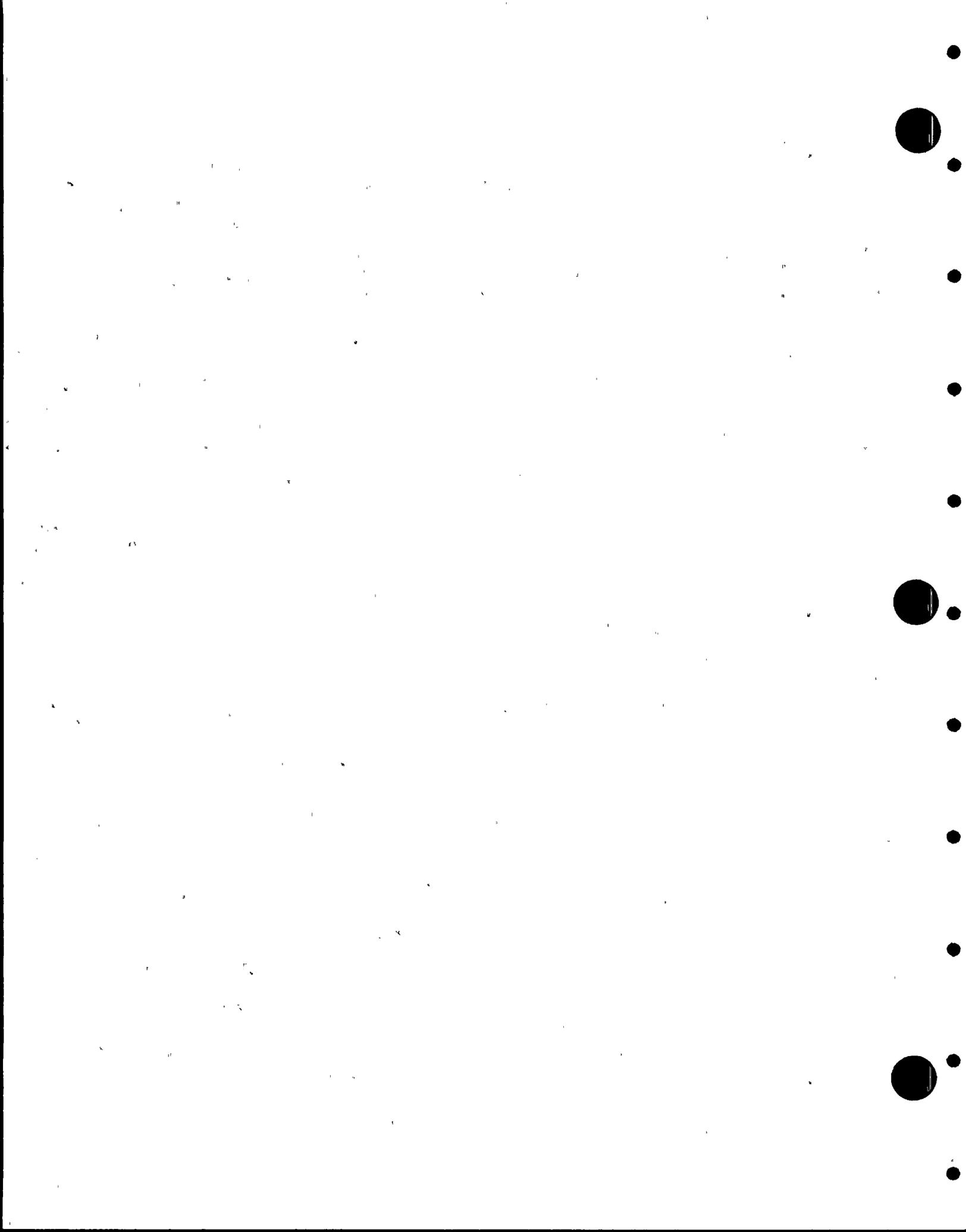
1 in detail.

2 I have some schematics of some typical penetrations.
3 Figure 3-1 is the Type A penetration, as we see there,
4 which is typical for service air, fire protection, and
5 demineralized water, a closed valve outside, automatic
6 valve inside or closed valve on the inside of the containment
7 with a drain and/or test connection as appropriate to test
8 the valves.

9 Figure 3-2 is the Type B penetration typical
10 for cooling water, letdown line, reactor drain tank vent,
11 containment purge, which uses butterfly valves, and the
12 radwaste sump discharge, a motor operated valve inside, a
13 motor operated valve outside closed on a CIAS, drain and
14 test connections for testing.

15 Figure 3-3 is the Type C penetration typical for
16 safety injection, containment spray, and recirculation
17 sump piping. There are valves outside the containment that
18 open on appropriate signals, valves inside the containment
19 and on the recirculation sump open on the appropriate signal.

20 Figure 3-4 is the Type D penetration arrangement
21 for the main steam lines. I only show one, although there
22 are two main steam lines off of each steam generator. The
23 main steam line comes off, goes through the containment.
24 We have our main steam relief valves and we have our check
25 valves, main steam isolation valve, the line in this case



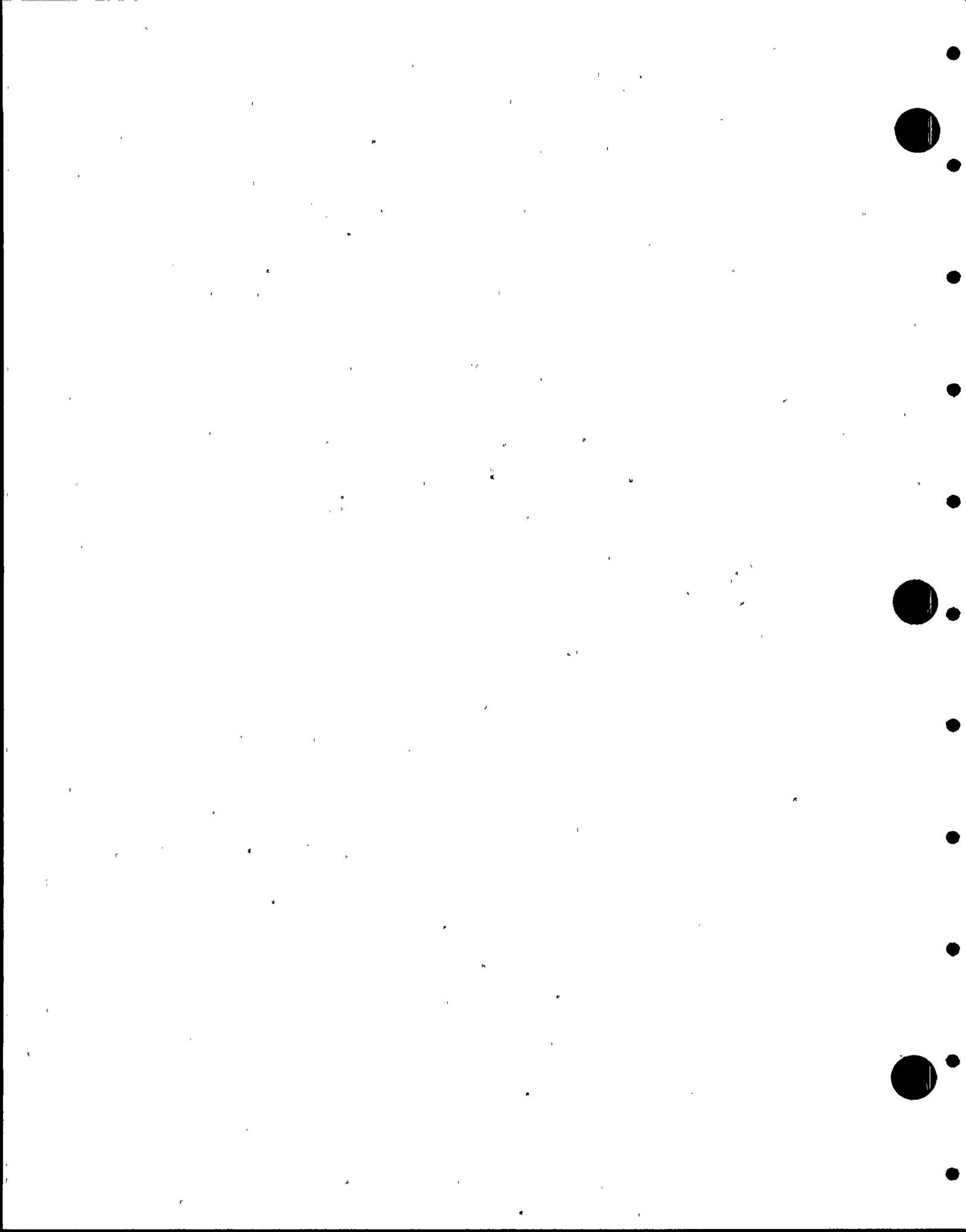
1 going through the steam-driven auxiliary feedwater pump
2 turbine.

3 Figure 3-5 shows again a Type D penetration. This
4 is a feedwater supply side showing the main feedwater line,
5 the main feedwater isolation valves. Within the containment,
6 there are also valves for the CE steam generator. The
7 downcomer feedwater line is shown up here with isolation
8 valves, and the auxiliary feedwater pumps tie into a
9 containment penetration to the downcomer and it also meets
10 our CE interface requirement.

11 Figure 3-6 shows the Type E penetration for the
12 containment building pressure monitors. Inside containment,
13 there is a small open pipe. Outside the containment, there
14 is a remote-operated isolation valve with a pressure
15 transmitter. From the pressure transmitter all the way
16 through, that is an ASME III, Class 2 system.

17 Figure 3-7 is the Type F penetration arrangement
18 typical here for the personnel hatch or equipment hatch.
19 The detail, as you can see here, shows a double "O" ring seal
20 and a test connection. This double "O" ring seal is also
21 used on the penetrations used for the containment integrated
22 leak rate test. Those are seals with flanges with a double
23 "O" ring seal. Those other connections just have a flange
24 on the outside.

25 Exhibit 3-7, System Operation. Containment



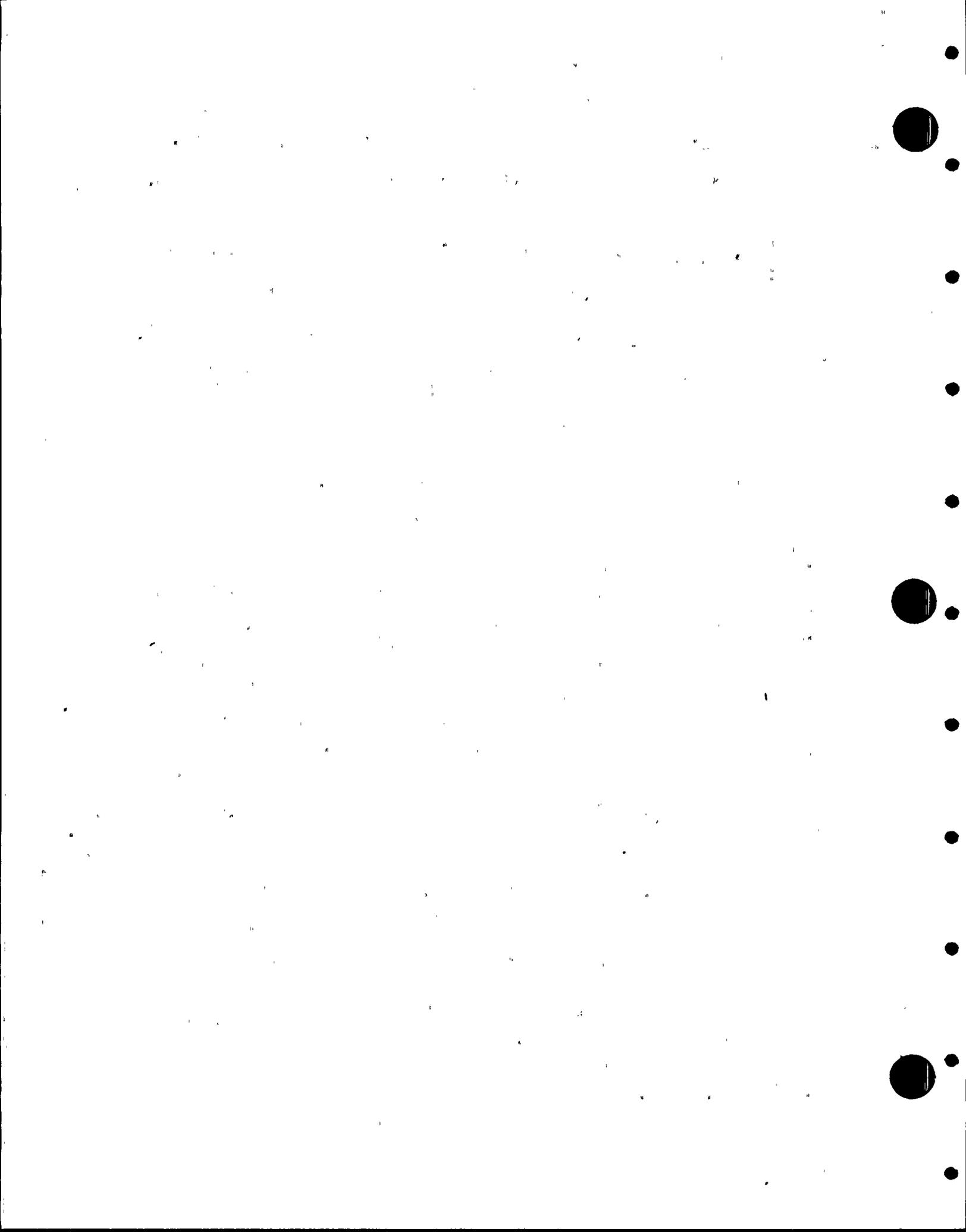
1 pressure is monitored by four different pressure instruments.
2 Upon detection of high containment pressure, a set point of
3 5 psig, by any two instruments or upon pressurizer low
4 pressure, less than 1,685 psig, a CIAS is generated.

5 A CIAS will then close the appropriate valves,
6 and the following valves have penetration valves actuated by
7 a CIAS: containment HVAC, the radiation monitors;
8 containment purge, which is also closed by a containment
9 purge isolation actuation signal on high radiation; service
10 gas; chilled water system; instrument air; nuclear cooling
11 water; hydrogen control; chemical and volume control; and
12 secondary sampling.

13 Exhibit 3-8. Other systems which have penetration
14 valves closed by an SIAS, AFAS, or MSIS are main steam, the
15 main feedwater, steam generator blowdown and blowdown
16 sampling, and safety injection tank drain. The parameters
17 which generate an SIAS also generate a CIAS.

18 Exhibit 3-9. There are some penetrations which we
19 do not isolate following an accident. It is desirable to
20 leave reactor coolant pump seal injection and chemical and
21 volume control system charging paths open to prevent
22 additional core protection after an accident in which
23 offsite power is available.

24 Charging pumps can be transferred to the emergency
25 bus off the diesel generator at the discretion of the

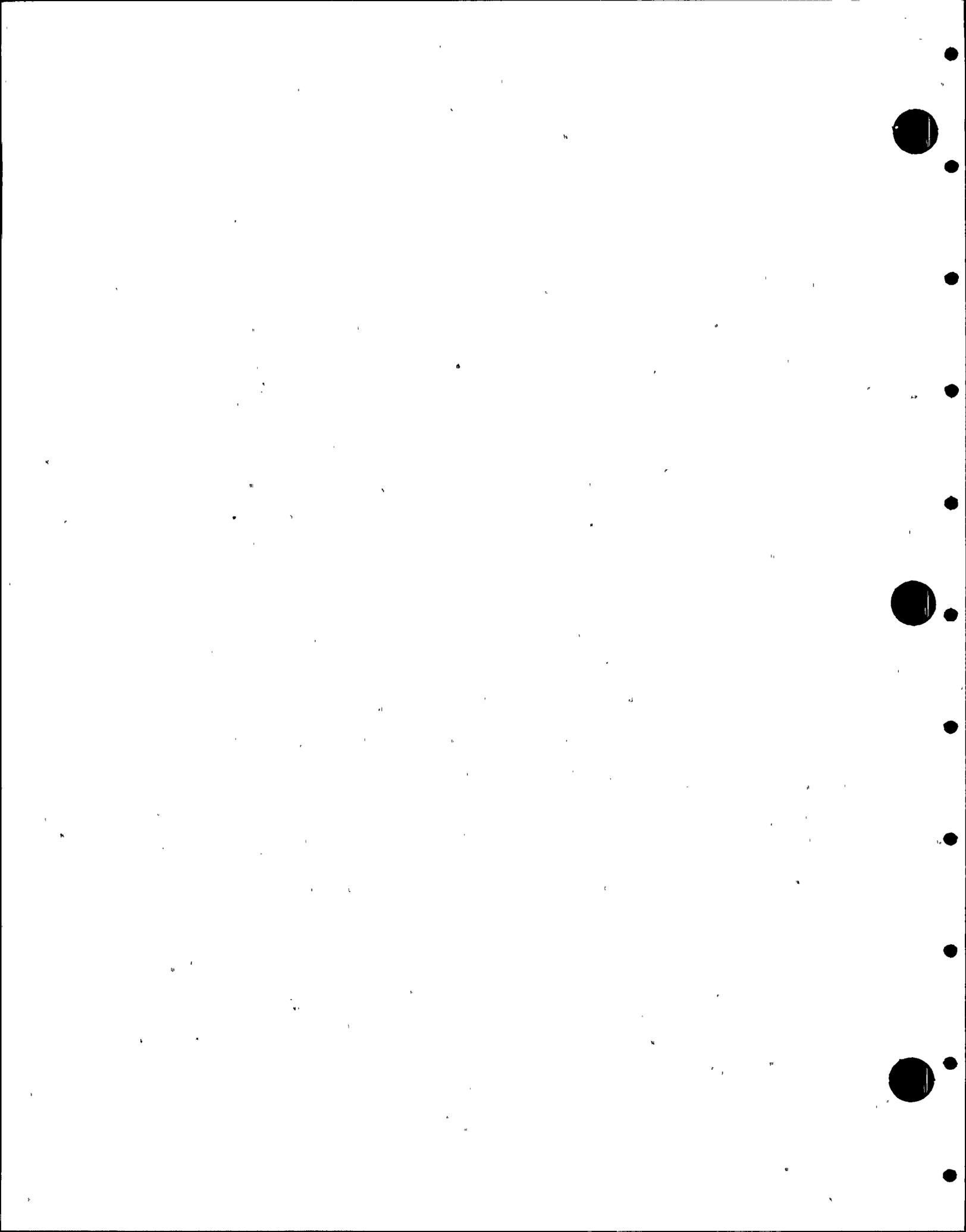


1 operator in the event that offsite power is lost.

2 It is also undesirable to lose charging or seal
3 injection capability during normal operation due to an
4 inadvertent CIAS. The potential release of fission products
5 through the penetration is not a concern for the following
6 reasons: First, the flow is into the containment and the
7 reactor coolant system; second, we provide check valves inside
8 the containment to prevent backflow out of the containment
9 if the charging pumps should stop; the connecting portions
10 of the chemical volume control system outside containment
11 are designed to Safety Class 2, Seismic Category I, standards
12 and have a design pressure well in excess of containment
13 building design pressure; and, four, the operator has the
14 capability of isolating these lines if necessary.

15 Exhibit 3-10. The main steam and feedwater
16 systems, while not essential, aid in heat removal during a
17 small LOCA, and these systems are not isolated by a CIAS
18 generated on low pressurizer pressure. The steam and
19 feedwater systems are isolated for a main steam line break
20 by a main steam isolation signal on high containment
21 pressure or low steam generator pressure.

22 Override of a CIAS signal is available for each
23 containment isolation valve by the control switch for that
24 valve. The resetting of a CIAS does not result in the
25 automatic opening of containment isolation valves. Reopening



1 requires operator action for each valve and does not
2 compromise the containment isolation signal.

3 MR. KEITH: Any questions?

4 MR. VAN BRUNT: Ed.

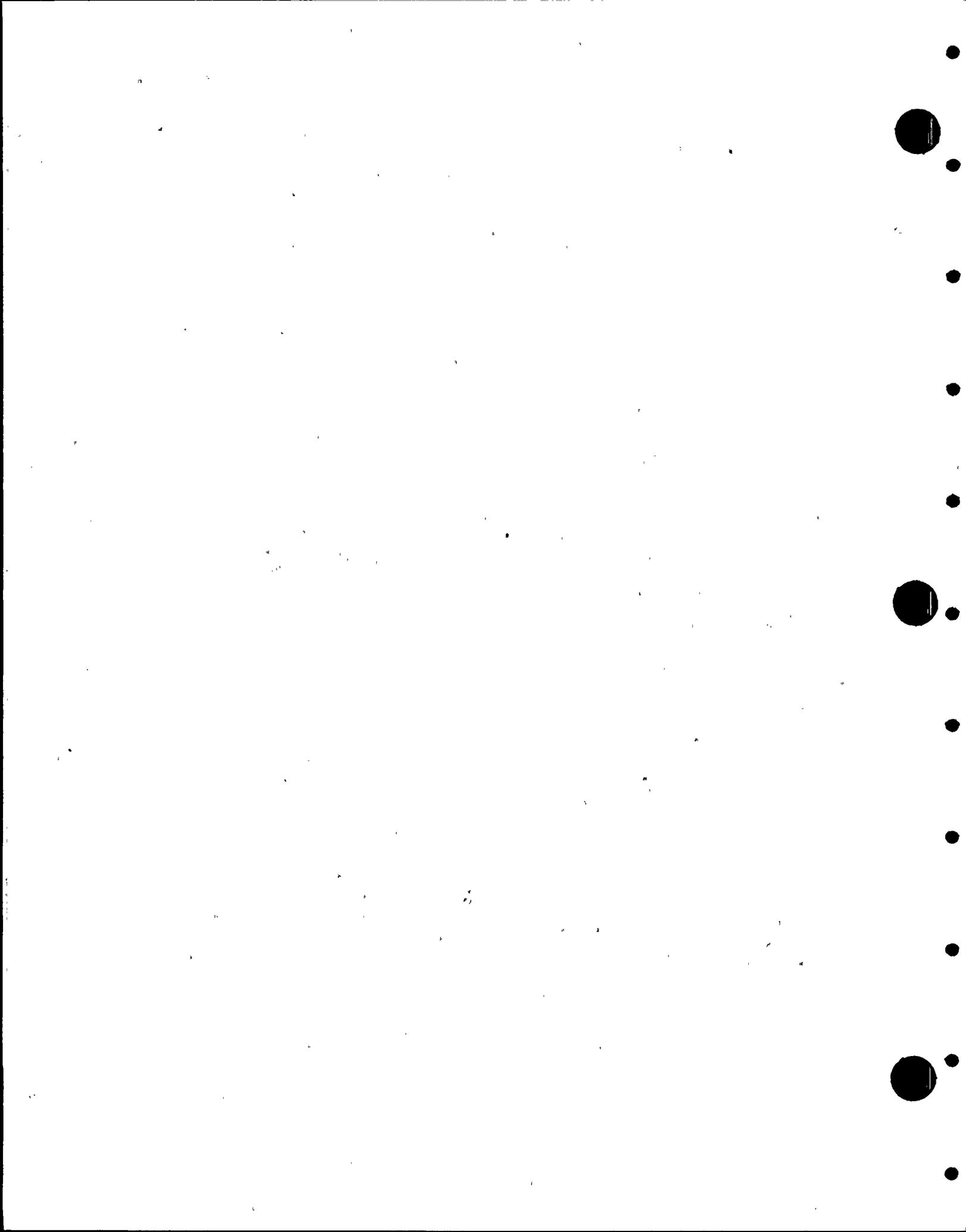
5 MR. STERLING: Would you detail on Exhibit 3-10 what
6 action the operator does have to take for that control
7 switch such that he doesn't inadvertently operate the valve?
8 Can somebody just run through a sample?

9 MRS. MORETON: To override the containment isolation
10 signal, the operator has to perform two actions. He has
11 to turn the control switch on the main control board to the
12 closed position or the actuated position, which arms the
13 override, and then turn the control switch to the open
14 position, which would then open the valve. Does that answer
15 your question?

16 MR. STERLING: Yes.

17 MR. ALLEN: I've got a followup on that. I notice
18 some of the systems can be isolated by two different signals.
19 Which of the isolation valves is the longer? If you are in
20 one of the modes, you went to override on it, you got
21 another signal in from -- maybe you were in a CIAS mode,
22 you went to override on it, opened it up, and then got an
23 SIAS, would you still close that valve then?

24 MRS. MORETON: The containment isolation signal
25 initiating parameters for the CIAS are the same as the



1 initiating parameters for an SIAS and the override effectively
2 blocks both signals, so once the operator overrides the
3 containment isolation signal, the SIAS is overridden. However
4 for the containment purge valve, we are in the process of
5 implementing separate overrides so that once the containment
6 isolation signal is overridden, the containment purge signal
7 would still automatically close the purge valve.

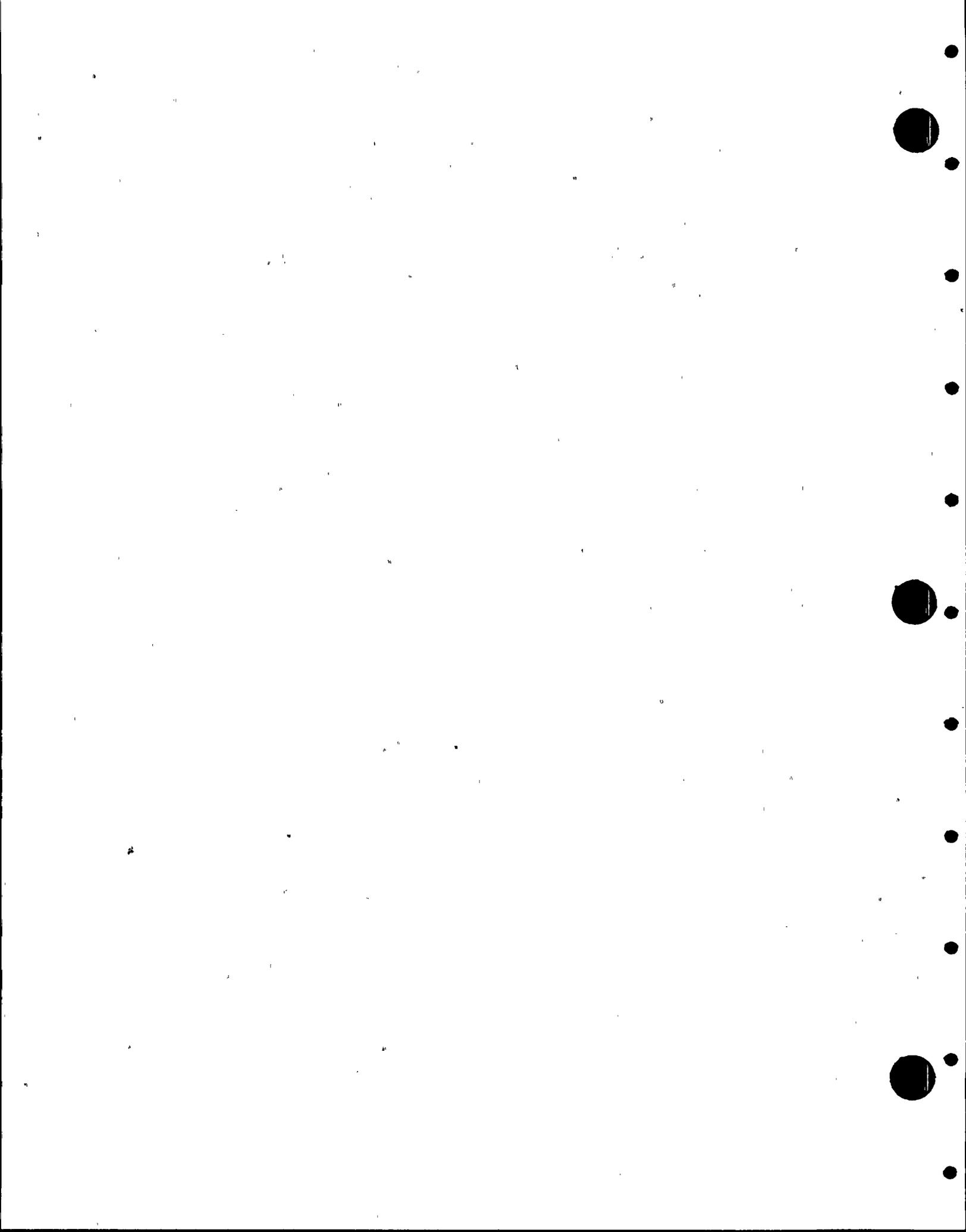
8 MR. VAN BRUNT: Some other questions? Pete, go
9 ahead.

10 MR. PENSEYRES: Figures 3-3 and 3-1. Let's take
11 them one at a time. On Figure 3-1, the lower drawing
12 indicates a drain and a test connection in the left-hand
13 side. How would that inside isolation valve be tested if
14 there is no lock valve to the left of the drain and test
15 valve?

16 MR. BOLES: There are valves outside, but we just
17 haven't shown them. I believe this is one typical for the
18 demineralized water, and that has piping all throughout the
19 containment building. There are valves out here (indicating)
20 All of those would have to be closed.

21 MR. PENSEYRES: I assume the same is true then on
22 Figure 3-3 at the top. That is the check valve.

23 MR. BOLES: I'll try to answer your question. There
24 is a closed volume valve here (indicating), so that we would
25 pressurize the volume detector at that particular valve. It



1 is just that we haven't shown it. We were just interested
2 in showing isolation valves.

3 MR. VAN BRUNT: As a followup to that, is there some
4 way for the record -- I think on a previous drawing, you
5 could do it without much trouble by putting a valve and just
6 saying "typical of many valves downstream" or something.
7 Is there some way on this drawing that you could in the same
8 manner maybe just put an arrow that it is a line which will
9 be pressurized or something so that we don't have this same
10 confusion for somebody looking at the slides.

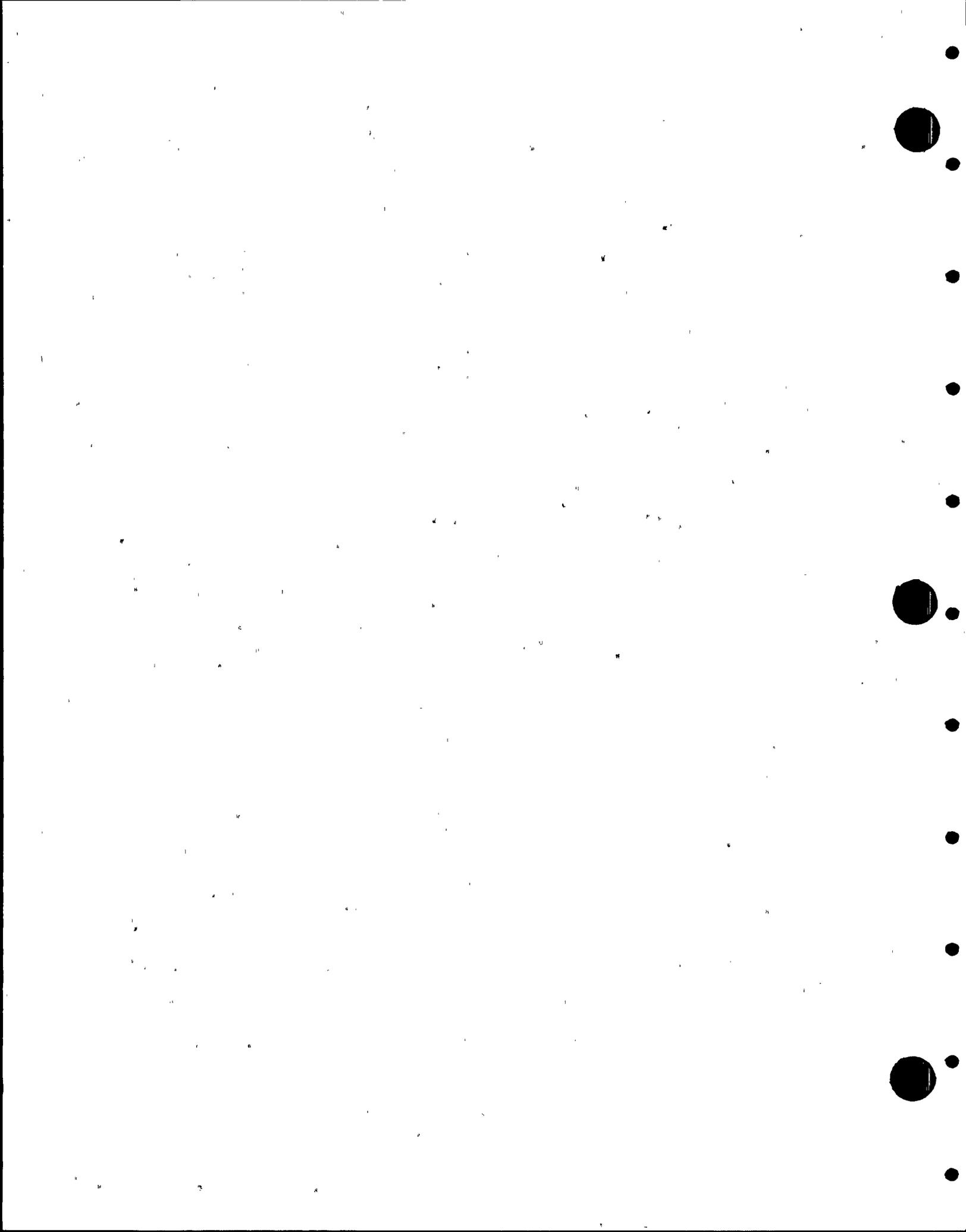
11 MR. BOLES: It does depend somewhat upon the system.
12 For example, for the containment spray system, you go to the
13 other spray nozzles. If it is a safety injection line, then
14 the penetration assembly is the same, but downstream it is
15 different.

16 MR. VAN BRUNT: I understand, but in some typical
17 manner you could show it so that the same question wouldn't
18 come up again.

19 Any other questions? Ed.

20 MR. STERLING: Figure 3-7. On the personnel lock, you
21 have a detail showing your sealing for the inside
22 containment. On the outside, what do you do to assure that
23 you have a seal and is there a monitor on that continually
24 while that is sealed?

25 MR. KEITH: Ed, we are not sure of the detail on the



1 flange on the outside one. However, when using the
2 personnel hatch, you have to periodically pressurize the
3 complete hatch, which, of course, would test that outer seal.

4 MR. STERLING: Well, I think maybe we ought to have
5 that slide doctored. You show your inside -- For example, if
6 that was a pipe, you would have your valve inside and your
7 valve outside. You detail what your inside seal is, but
8 you haven't detailed what your outside is. Maybe we ought
9 to have that slide updated to show what the outside seal is.
10 Or is there only a single level of protection there?

11 MR. BOLES: There are two seals to provide a double
12 level of protection.

13 MR. STERLING: But that is only inside the containment
14 Is there something outside the containment?

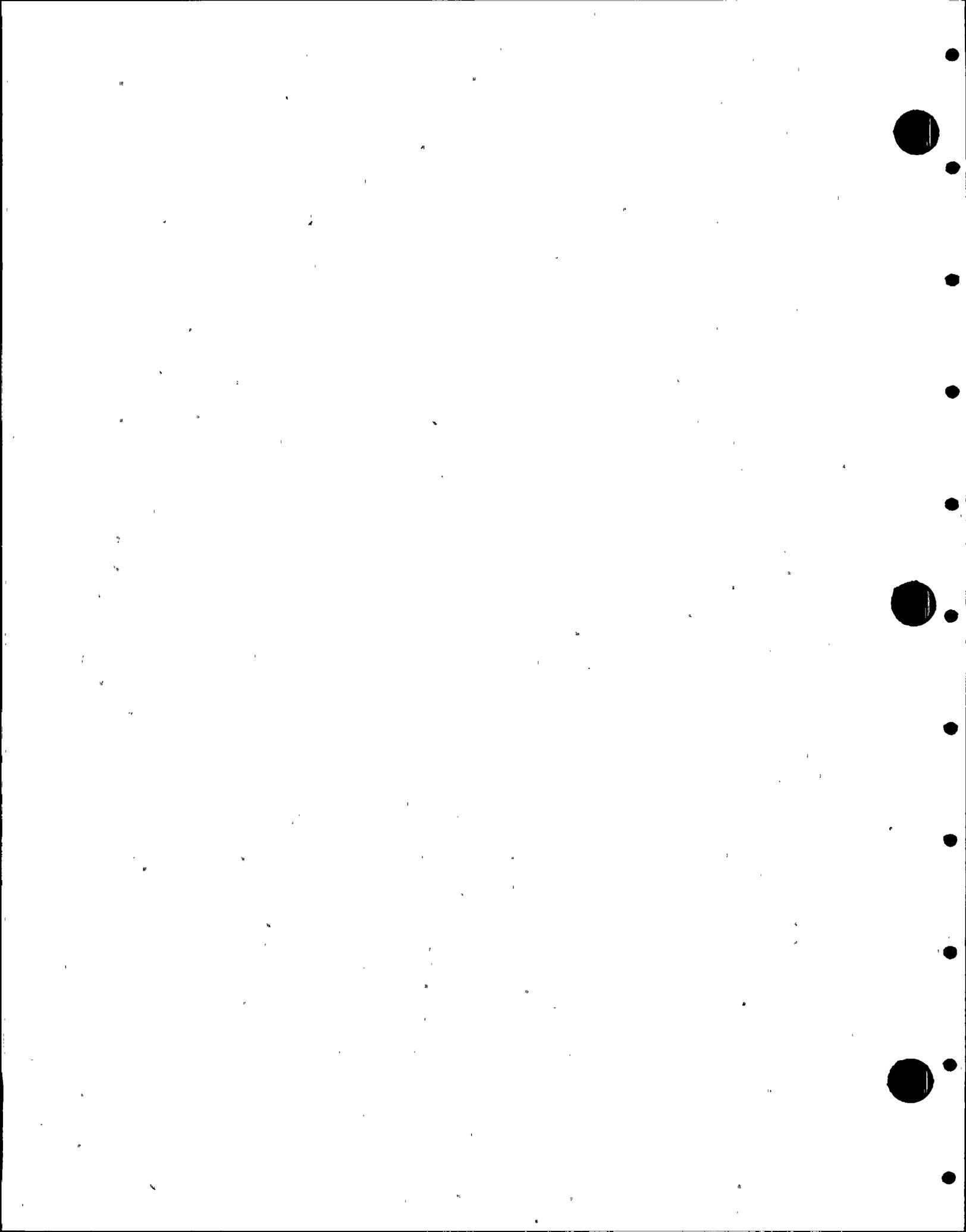
15 MR. KEITH: We'll check and confirm. I am pretty
16 sure that the outer door of the personnel lock has a double
17 "O" ring, but we'll check and confirm and doctor up the slide
18 to show what is appropriate.

19 MR. VAN BRUNT: John, you had a question.

20 MR. ALLEN: Just for verification of something. All
21 your schematic diagrams show motor-operated valves on
22 isolation. Do you have any air-actuated valves?

23 MR. KEITH: John, we do have some.

24 MR. ALLEN: Do you use an accumulator then, because
25 you don't have safety-related air.



1 MR. KEITH: They all fail closed.

2 MR. VAN BRUNT: Carter, you had a question.

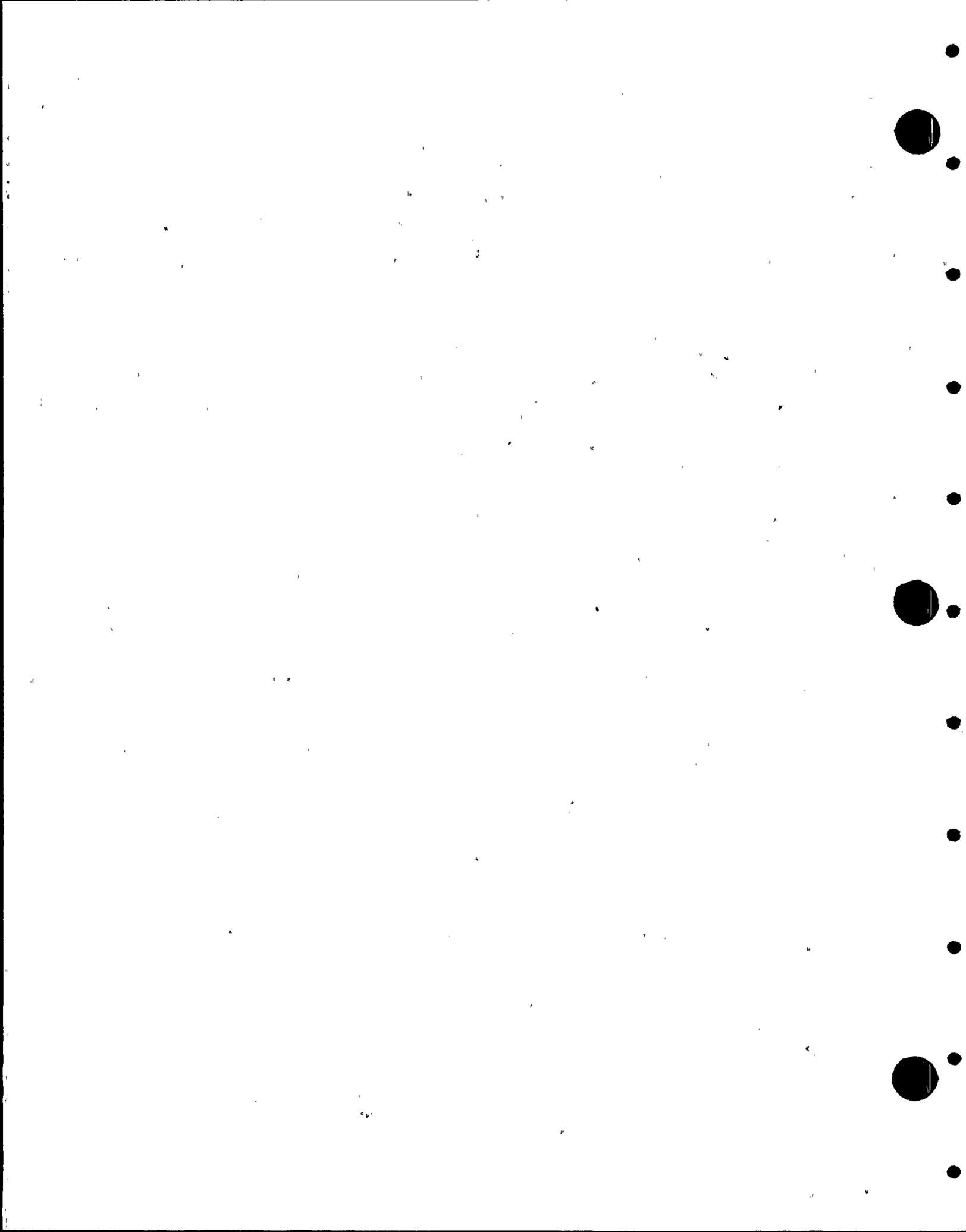
3 MR. ROGERS: I want to go back to Figure 2-1, if we
4 could. It seems to me that when you are in the recirculation
5 mode following a loss of coolant accident, the water in that
6 system becomes fairly highly radioactive or could become
7 fairly highly radioactive. There are several paths to the
8 outside from that system. For instance, if you take a look
9 at the refueling water tank and the connection to the
10 refueling water tank, you will see a check valve and a motor-
11 operated valve. Also, if you take a look at the bypass line
12 or miniflow line from the containment spray pumps, you see
13 a motor-operated valve and solenoid-operated valve going to
14 the refueling water tank. You haven't addressed those as
15 containment isolation. Yet, they have apparently similar
16 requirements. Do those valves indeed meet the same require-
17 ments as your containment isolation valves?

18 MR. KEITH: Yes, they are all Section III, Class 2
19 valves and receive power from the Class IE buses.

20 MR. ROGERS: And those are redundant power as necessary?

21 MR. KEITH: Yes.

22 MR. ROGERS: The recirculation actuation signal is
23 omitted from Exhibit 3-8. I assume that that signal is
24 generated in the same kind of manner and meets the other
25 requirements as the safety injection actuation signal and



1 auxiliary feedwater actuation signal, and so forth, is that
2 correct?

3 MR. KEITH: Yes. That is tied in with our engineered
4 safety feature actuation system. There is no difference
5 there. That wasn't included on that table because none of
6 the containment isolation valves as such receive that signal.

7 MR. VAN BRUNT: Any other questions?

8 Seeing none, I think this is a gratuitous time
9 to break for lunch, so we will take a break for lunch.

10 (Thereupon the meeting was at recess.)

11

12

May 21, 1981
1:00 p.m.

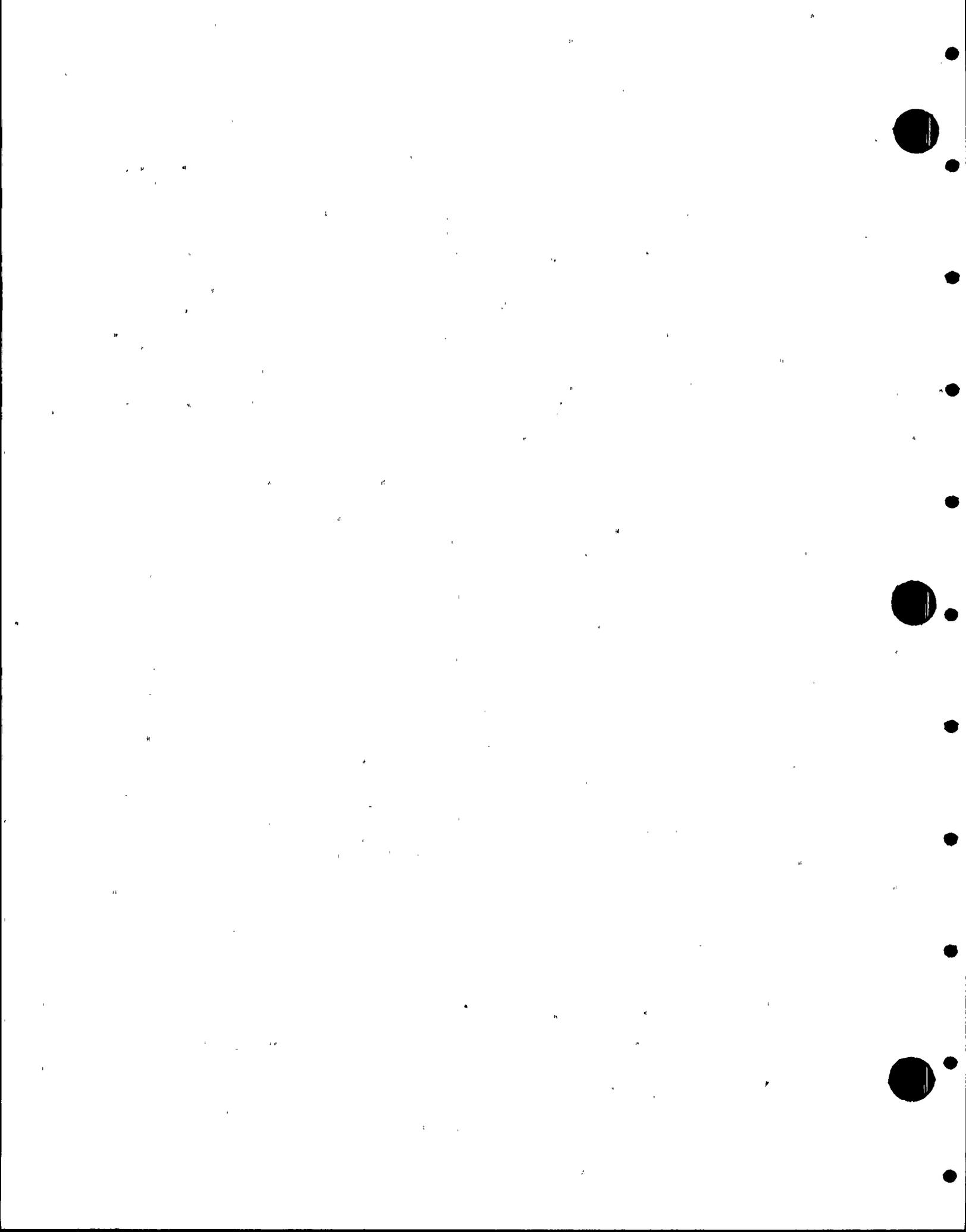
13

14 MR. VAN BRUNT: Bill, go ahead and ask your questions.

15 MR. SIMKO: We were talking about putting isolation
16 valves on these drawings up there.

17 MR. KEITH: Figure 2 --

18 MR. SIMKO: 3-1 or 3-3. Figure 3-3. On the top there
19 that looks like the containment spray system. What is the
20 criterion for not having the isolation valve on the left-hand
21 side of that drawing so that you can't test either the check
22 valve or that motorized valve outside of containment? What
23 is the criterion for systems that have to run continuously
24 during post-accident conditions versus systems that may run --
25 I would really like to know what is the criterion for testing



1 these isolation valves on the containment if we cannot do a
2 leak rate test.

3 MR. BOLES: I want to make sure I understand your
4 question. You are concerned about a local leak rate test of
5 this particular valve arrangement?

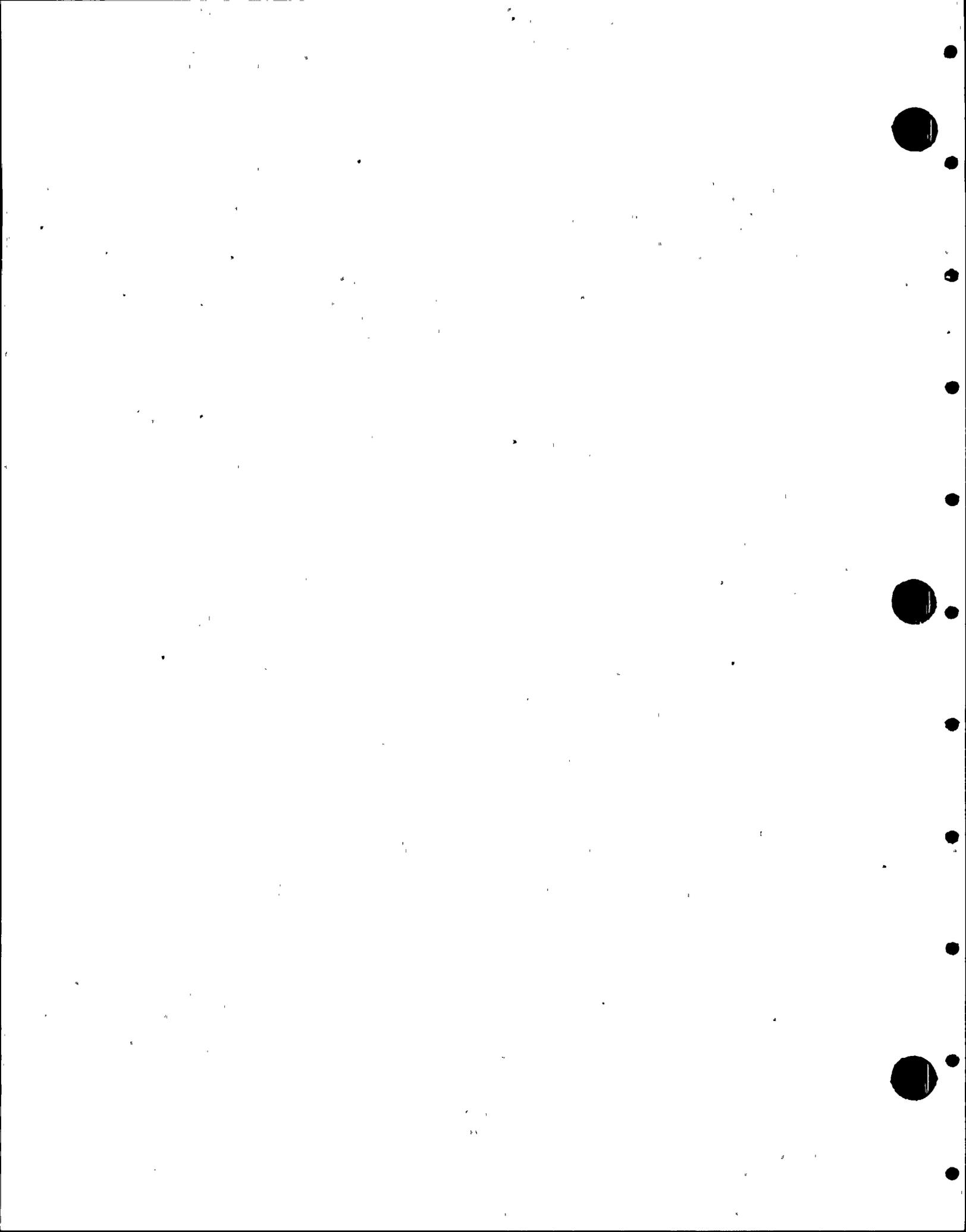
6 MR. SIMKO: Right.

7 MR. BOLES: This particular valve arrangement gets
8 the Type A test with the integrated leak rate test along
9 with some other penetrations like the main steam. Then we
10 come along to those particular penetrations such as this one
11 and do the Type C test, which is a local. That upper
12 penetration does not get a local Type C test.

13 MR. SIMKO: I guess the real question then is what
14 is the criterion for systems or valve alignments that do
15 not need Type C tests, only need Type A tests?

16 MR. BOLES: Bill, the criterion is that systems which
17 are required to operate to mitigate the effects of an
18 accident, those penetration lines are open and in use during
19 that period of time, they don't get the local Type C test.
20 Those that are closed to maintain the containment pressure
21 boundary do get the Type C test.

22 MR. HUONG: In the statement you made there, you just
23 considered single active failure systems. Say you have
24 redundant systems and one system fails to operate. Under
25 post-LOCA conditions, that system may be isolated from the

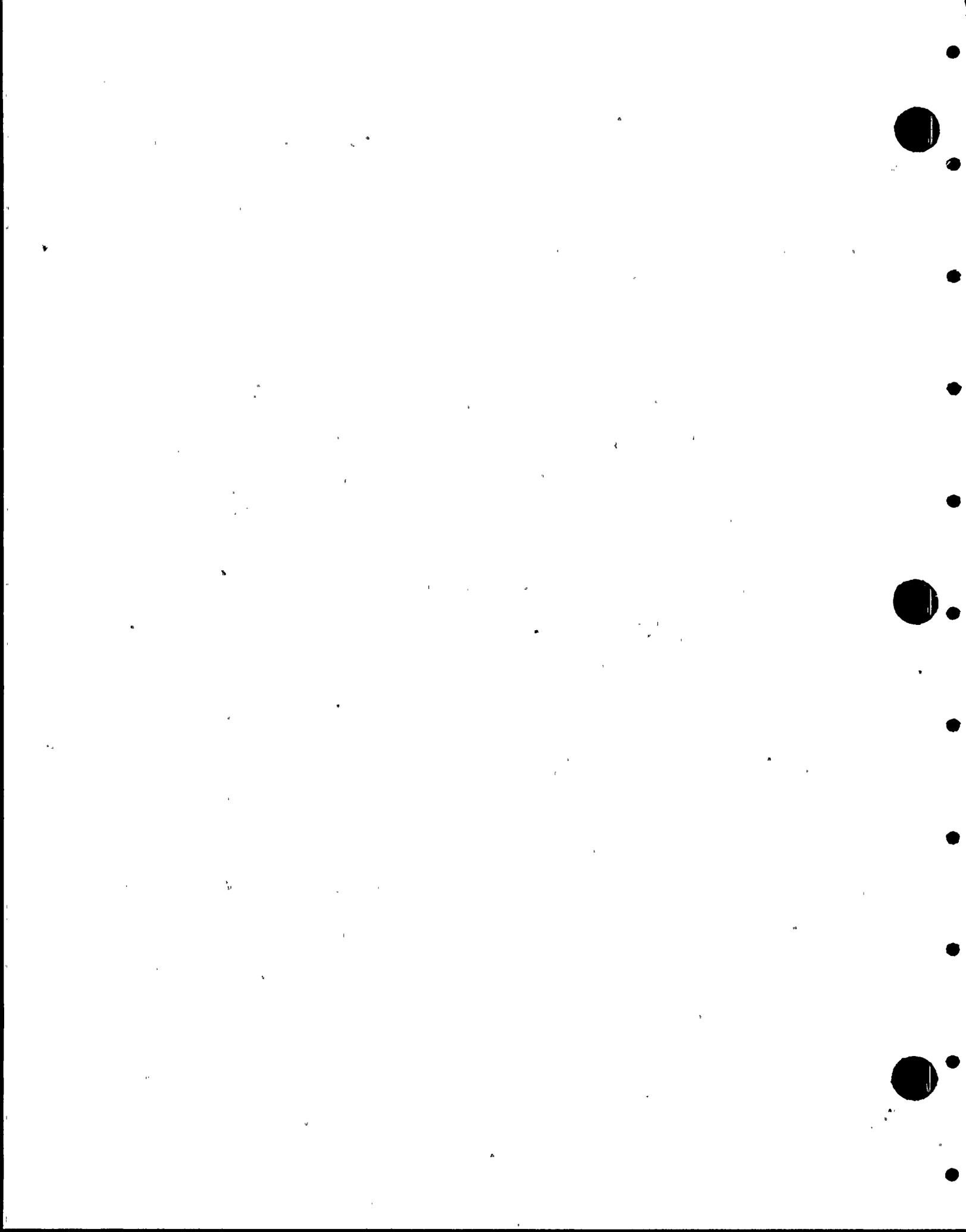


1 containment, and at that particular time, you may have to
2 test them because there is a certain amount of leakage.

3 MR. KEITH: I think what Bill was saying earlier is
4 that all the systems do get tested when you do the Type A
5 test, the integrated leak test for the whole containment.

6 MR. HUONG: I will accept that if I consider a single
7 active failure. In a redundant system, one of the systems
8 may fail that may provide a containment isolation function
9 and that particular valve may be required to be the Type C
10 test, say, for instance, a continuous free line and the
11 check valve may be required to be tested Type C unless you
12 can demonstrate that the system outside would provide a
13 pressure outside always higher than the containment pressure
14 in the loss of coolant accident condition. Then if you would
15 provide a seal in the post-LOCA condition, then you may not
16 have to test them.

17 MR. KEITH: Let's take the Containment Spray System.
18 If the spray pump failed to operate, your single action
19 failure, then what you are saying is that you are relying
20 only on this check valve to prevent isolation. You do have
21 a system back here (indicating) which is ASME Section III,
22 Class 2, and Seismic Category I, and all that, so even were
23 this check valve to fail, the probability of getting any-
24 thing from containment outside containment through this path
25 is very small.



1 MR. HUONG: Let's assume you have a passive pump seal
2 leak. You are going to leak all the water out of the lines,
3 so eventually you have a potential air path there.

4 MR. KEITH: Potentially, you would. Presumably that
5 would take a long time. The operator would shut this valve
6 (indicating) at some time.

7 MR. HUONG: Since you don't test that valve either,
8 there is also a leakage potential there through that valve,
9 so there is a potential for an air leak path through that.

10 MR. KEITH: There is a possibility. All I am saying
11 is it is very remote, I think.

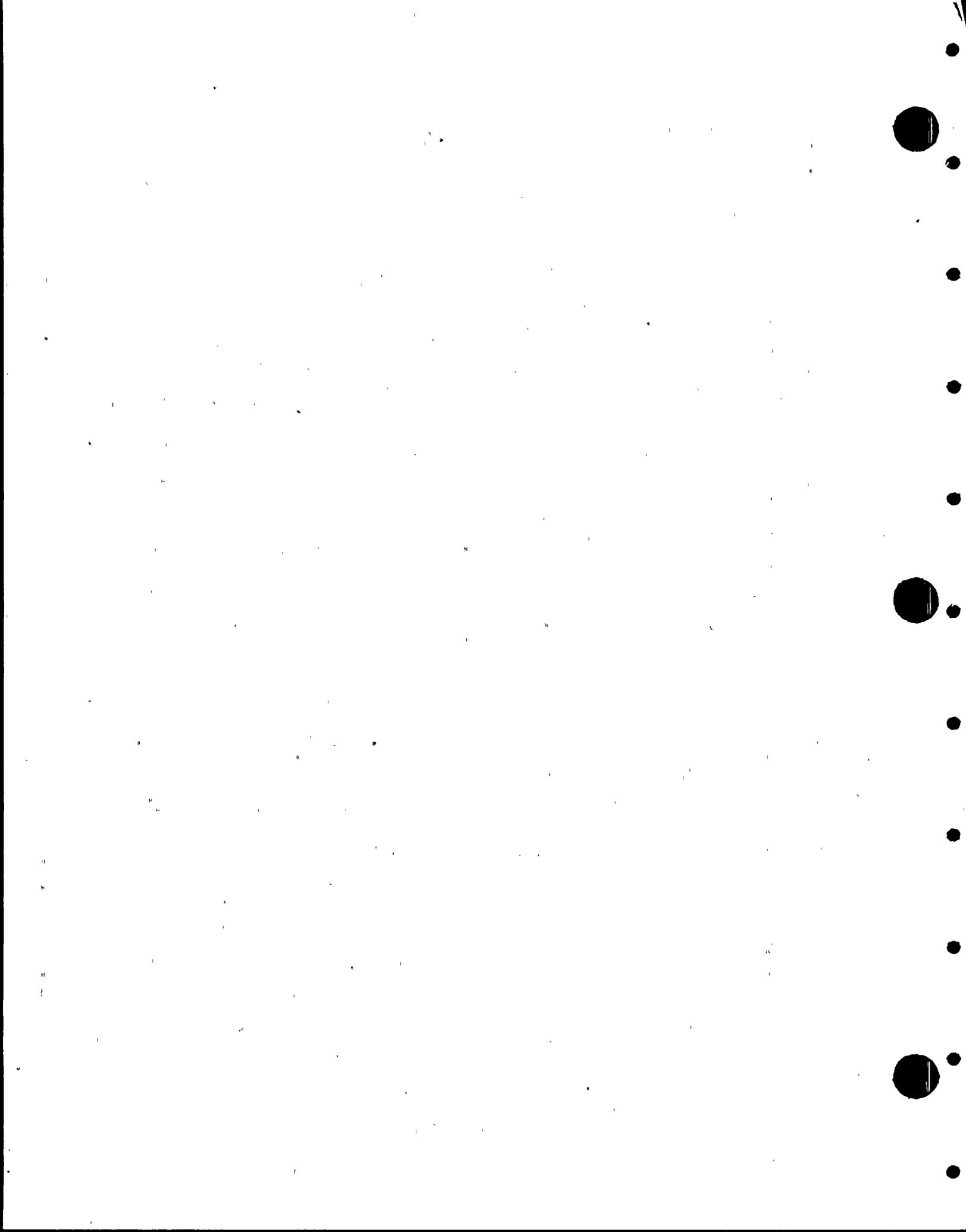
12 MR. HUONG: I don't know the possibility or probability.
13 That's the whole problem. Unless you can demonstrate that
14 the possibility is so small you don't have to consider it --

15 MR. KEITH: I don't know what --

16 MR. VAN BRUNT: I was struggling the same way, Dennis.
17 I think probably what you want to do is, if you understand
18 John's question, maybe we will leave it as an open item and
19 go back and test it against your criteria and respond after
20 you have a little more time to think about it.

21 Bill, did you get the answer to your question? Are
22 you satisfied or not?

23 MR. SIMKO: Well, let me just ask one more question.
24 Is it true that besides the Containment Spray System, the
25 other systems that don't require local leak rate tests for

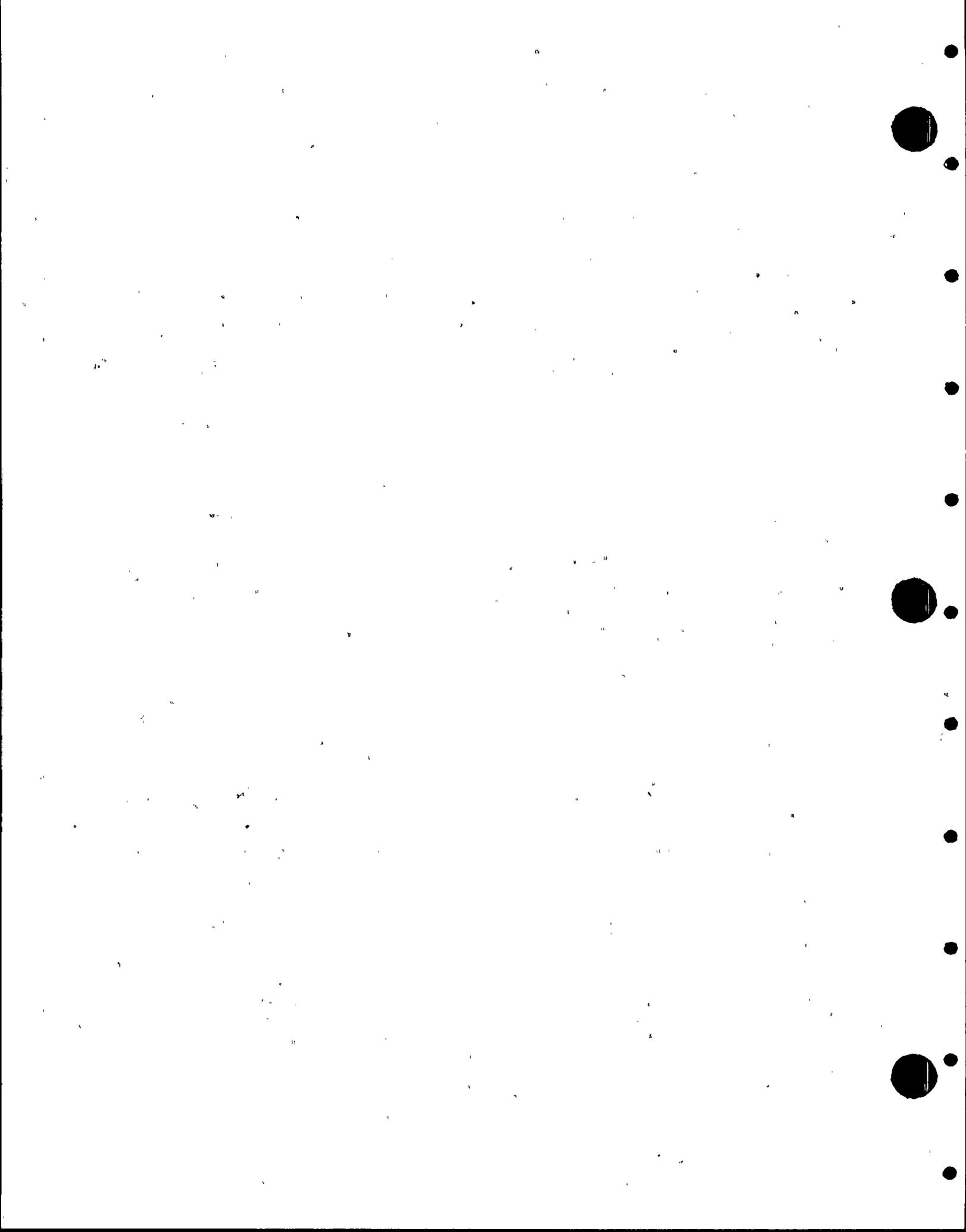


1 the valves are essentially closed loop systems? What I am
2 wondering about is the discharge header for the spray is
3 really open to containment atmosphere, so when we pressurize
4 this thing, we are going to be pressurizing right through
5 that line and if we happen to flunk the ILRT because these
6 valves here are leaking badly, well, we didn't check them in
7 the first place because they didn't require a local leak
8 rate test, so now they flunk the integrated leak rate test
9 and we are not in too good of a position there. I am just
10 concerned that the end of this system is open to containment
11 atmosphere where some of these other systems are really
12 closed loop and once you close all the valves, it is really
13 totally bottled up due to the piping. Here this is open
14 directly to the containment pressure.

15 MR. KEITH: Your concern, Bill, is that we maybe
16 won't pass the integrated leakage rate test because of this
17 system?

18 MR. SIMKO: Yes.

19 MR. BOLES: All I can say is that this valve
20 (indicating) would have to have a seal replaced as necessary
21 until you did pass the ILRT. This connection down here
22 (indicating) is to ensure that you have full differential
23 test pressure versus atmospheric pressure across the valve
24 during an ILRT. San Onofre had some problems. As I
25 understand, during a hydro test, the valves leaked and they



1 had to re-lap them.

2 MR. SIMKO: All right. Well, go on. I won't belabor
3 the point right now.

4 MR. TOSETTI: Also, the systems opening to the
5 containment such as CSF systems, the system itself is tested
6 for leakage, so it becomes an extension of the primary
7 containment. That is really your boundary for your ILRT
8 test.

9 MR. HUONG: I personally accept the hydro test on
10 the check valve if you can demonstrate water leakage through
11 the test valve is so small that you can always maintain
12 water head above the check valve. That's all right, too.
13 In other words, demonstrate you don't have a potential air
14 leak path through there.

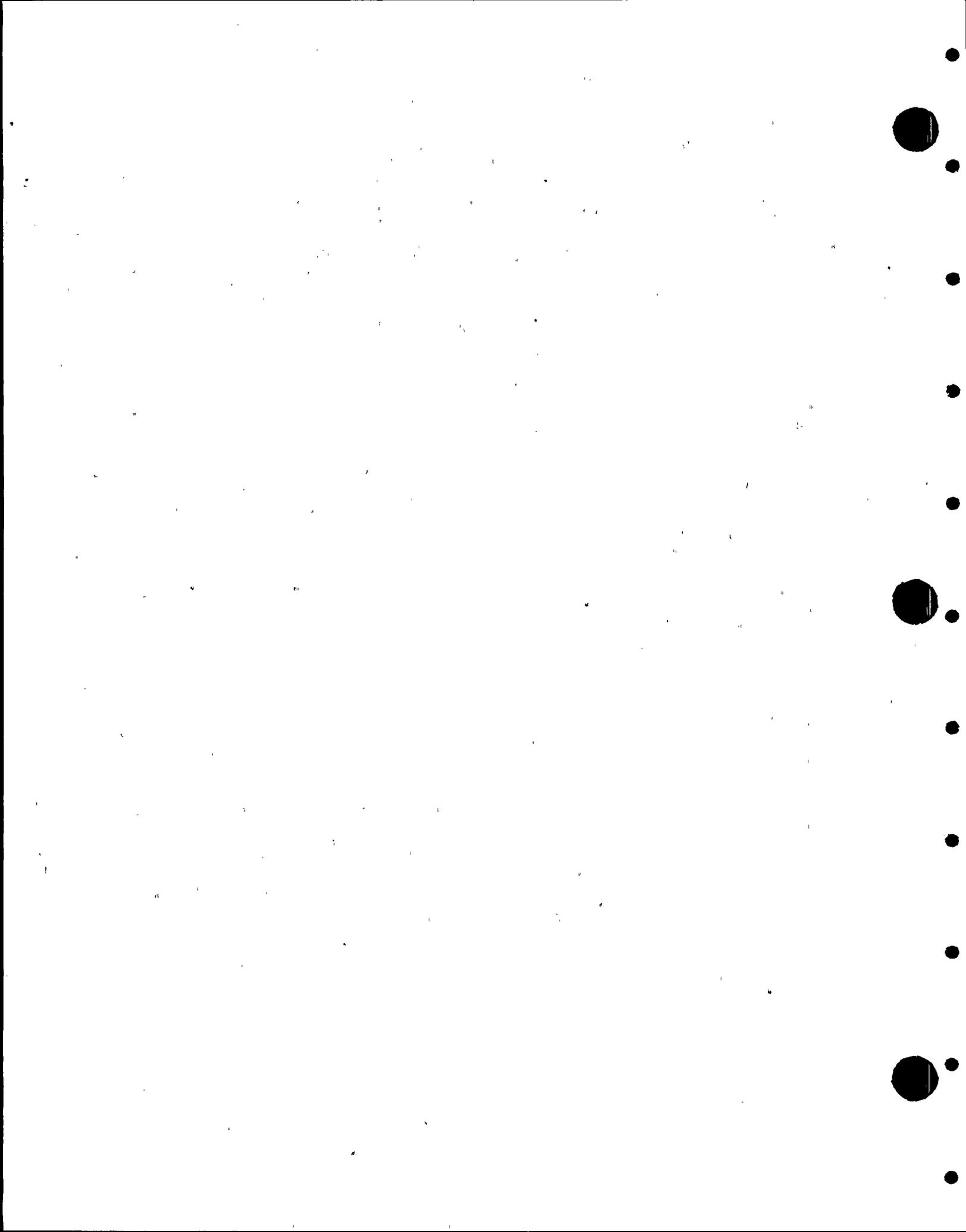
15 MR. VAN BRUNT: Dennis, I think you are going to take
16 this as an item to think about.

17 Any other questions going back to where we were
18 before lunch?

19 Seeing none, why don't you go ahead and finish up
20 this part of the presentation.

21 MR. KEITH: We will proceed with Conformance With
22 Regulatory Requirements.

23 MR. BOLES: Conformance With Regulatory Requirements
24 under Standard Review Plan 6.2.4, Revision 1, showing the
25 General Design Criteria, Regulatory Guides, and Branch



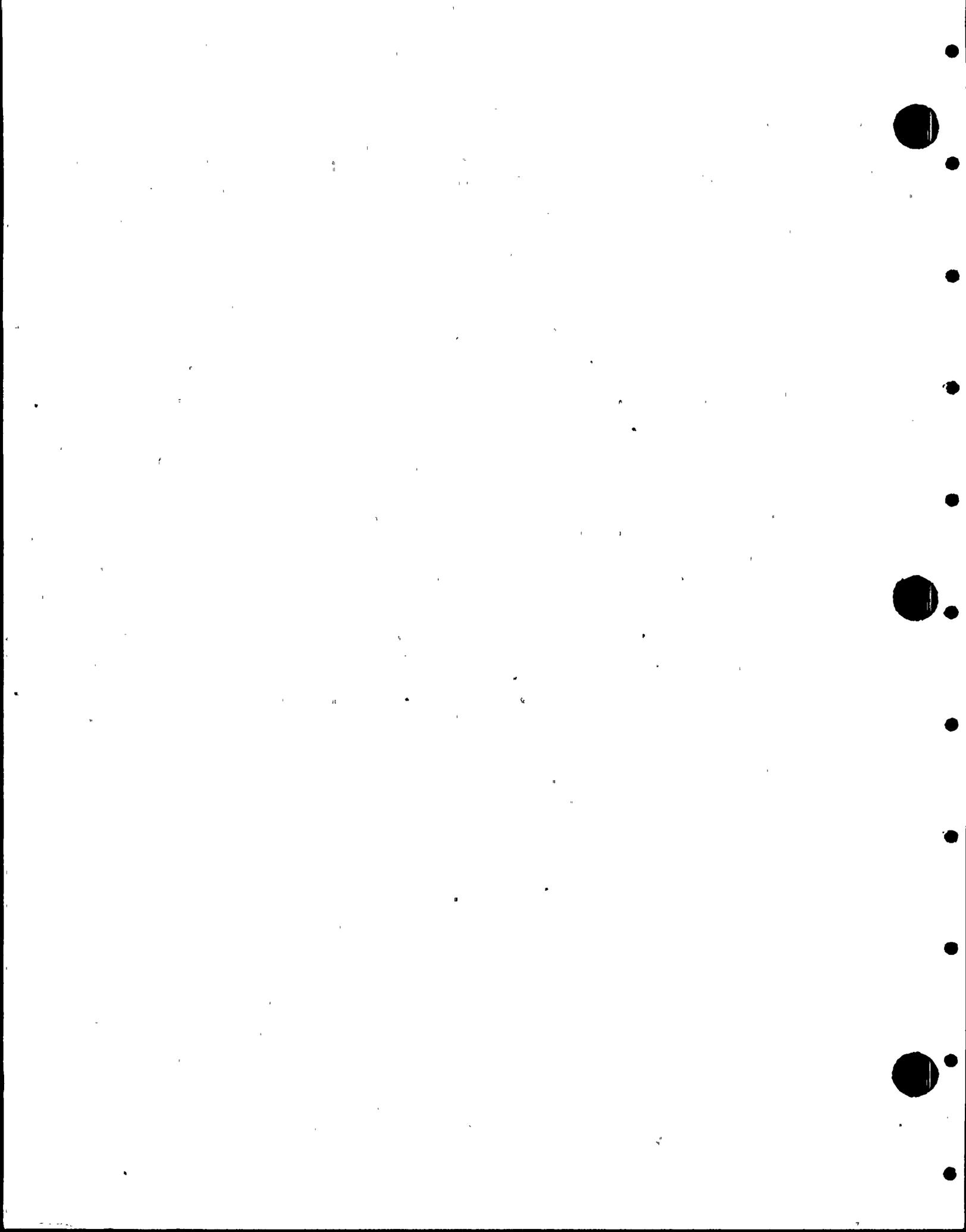
1 Technical Positions. We have added in here GDC-4 and I
2 will talk about that when we get to it.

3 Exhibit 3-11. The Standard Review Plan Acceptance
4 Criteria is Standard Review Plan 6.2.4.

5 General Design Criteria 55 and 56 require that
6 lines that penetrate the primary containment boundary and
7 are part of the reactor coolant pressure boundary or connect
8 directly to the containment atmosphere should be provided
9 with isolation valves as follows, A, B, C, and D, and we
10 are in compliance. The automatic isolation valves outside
11 containment cannot be a simple check valve.

12 Exhibit 3-12. GDC 57 requires that lines that
13 penetrate the primary containment boundary and are neither
14 part of the reactor coolant pressure boundary nor connected
15 directly to the containment atmosphere be provided with at
16 least one locked closed, remote manual, or automatic
17 isolation valve. The main steam and feedwater systems are
18 closed loop systems inside, and outside we provide main
19 steam isolation valves and main feedwater isolation valves.

20 The General Design Criteria permit containment
21 isolation provisions for lines penetrating the primary
22 containment boundary that differ from the explicit require-
23 ments of GDC 55 and 56 if a different basis for acceptability
24 is defined. Reg. Guide 1.11 describes the acceptable
25 containment isolation provisions for instrument lines, and



1 we are in compliance with the requirements of Reg. Guide
2 1.11.

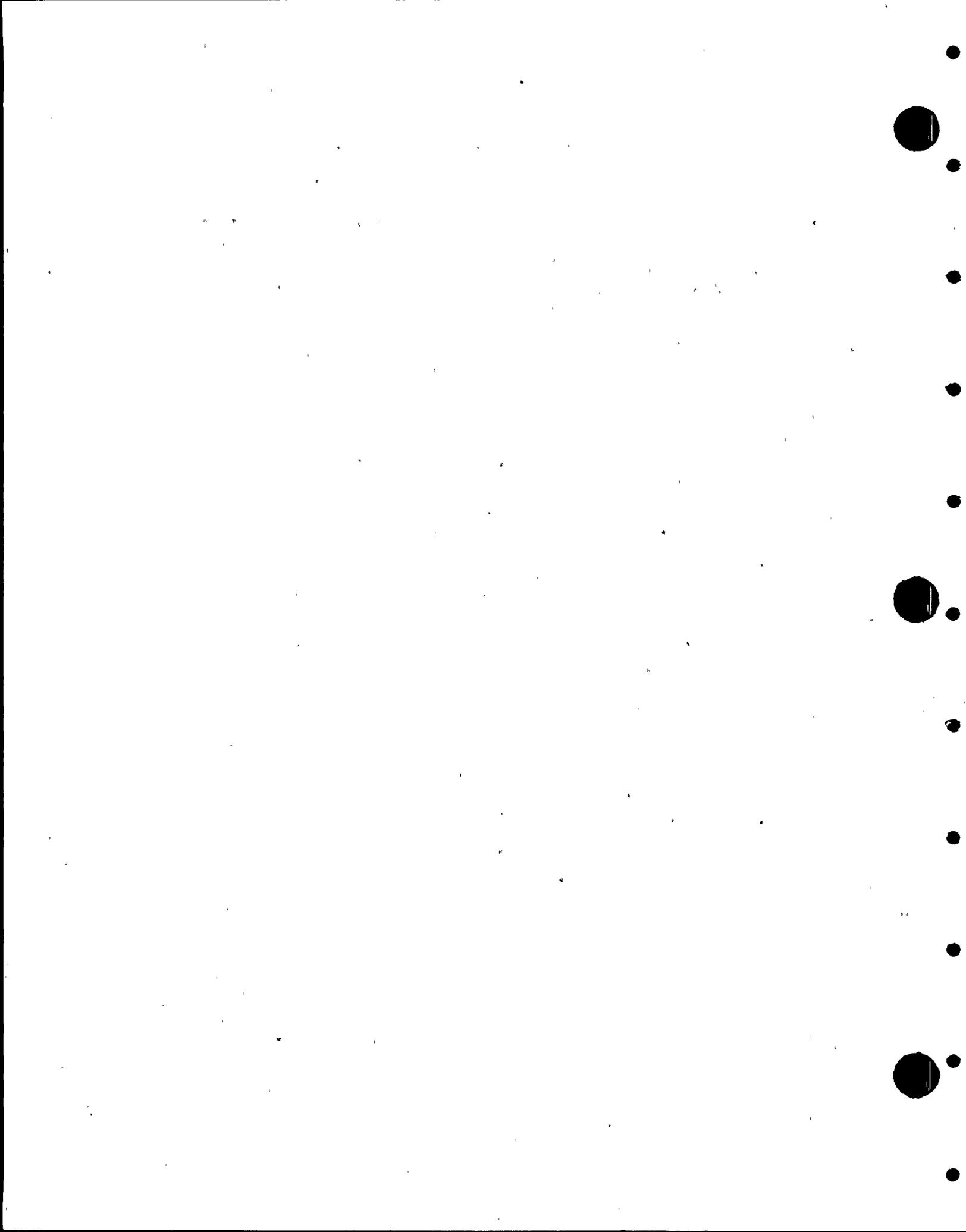
3 Exhibit 3-13. Containment isolation provisions
4 for lines in engineered safety features or engineered safety
5 features-related systems may include remote-manual valves,
6 but provisions should be made to detect possible leakage
7 from these lines outside containment. We are in compliance.

8 Containment isolation provisions for lines in
9 systems needed for safe shutdown may include remote-manual
10 valves, but provision should be made to detect leakage.
11 We are in compliance.

12 Exhibit 3-14. Containment isolation provisions for
13 lines in the systems identified in Items B and C in the
14 previous exhibit may consist of one isolation valve inside
15 and one outside. If it is not practical to locate a valve
16 inside containment (for example, it may be under water),
17 you may locate both valves outside. Palo Verde uses valves
18 inside the containment in these particular cases.

19 Exhibit 3-15. E allows a single isolation valve
20 if it can be shown that the reliability is better. This is
21 not applicable. That type of isolation is not used at
22 Palo Verde.

23 Sealed closed barriers may be used in place of
24 automatic isolation valves. These sealed closed barriers
25 may include blind flanges and sealed closed manual valves,



1 and we are in compliance.

2 Exhibit 3-16. Relief valves may be used as
3 isolation valves provided the relief set point is at least
4 1.5 times the containment design pressure. The only relief
5 valves which could be considered to fall in this category
6 are the main steam relief valves, which do have a set point
7 well above containment building design pressure.

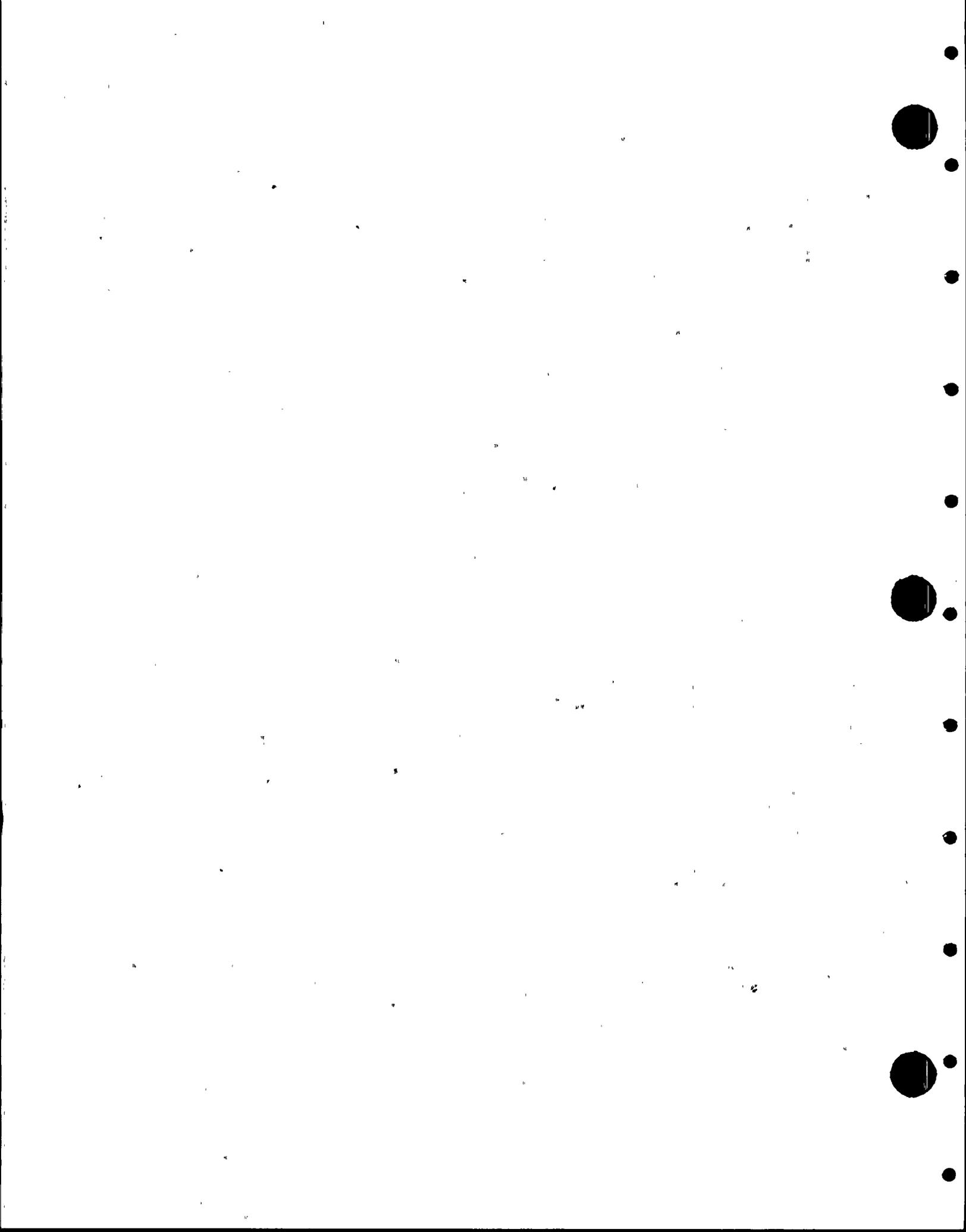
8 Isolation valves outside containment should be
9 located as close to the containment as practical. We are
10 in compliance considering the access for maintenance and
11 interferences.

12 The position of an isolation valve for normal and
13 shutdown plant operating conditions and post-accident
14 conditions depends on the fluid system function. If a fluid
15 system does not have a post-accident function, the isolation
16 valves in the lines should be closed automatically. For
17 engineered safety feature systems, the valves may be open
18 or closed. The position should be indicated and the valve
19 operator should be the "safe" position. We are in compliance.

20 Exhibit 3-17. There should be diversity in the
21 parameters sensed. We are in compliance.

22 System lines which provide an open path from the
23 containment to the environs should be equipped with radiation
24 monitors. We are in compliance.

25 Part 8) here goes on to Exhibit 3-18 and 3-19 and



1 it concerns the valve closure times following postulated
2 accidents and for containment purging during normal operation.
3 We are in compliance with Branch Technical Position CSB 6-4,
4 Section B.1c and B.5a. PVNGS uses an on-line purge system
5 with 8-inch lines and butterfly isolation valves. The
6 system may be operated continuously. The accident analysis
7 is covered in FSAR Sections 15.4.5 and 15.6.6.

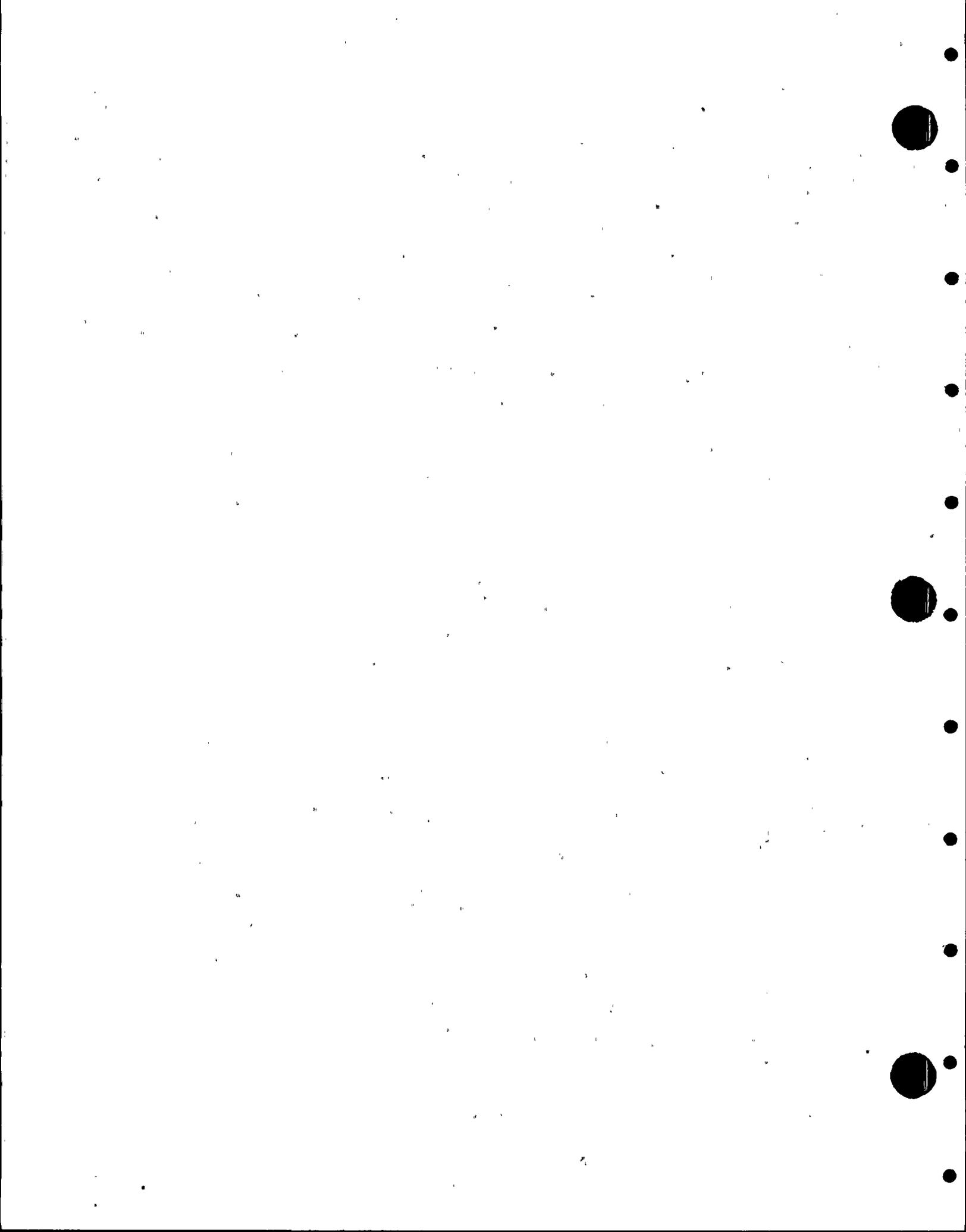
8 Exhibit 3-18 is a continuation of the previous
9 Exhibit 3-17.

10 Exhibit 3-19. The top of the exhibit is a
11 continuation.

12 The next item, the use of a closed system inside
13 containment is acceptable if the following parameters are
14 met, and we meet those parameters for the main steam and
15 feedwater systems.

16 Exhibit 3-20 at the top of the exhibit is a
17 continuation of the parameters from the previous exhibit.

18 Insofar as the Containment Systems Branch is
19 concerned with the structural design of containment internal
20 structures and piping systems, the protection of isolation
21 barriers against loss of function from missiles, pipe whip,
22 and earthquakes will be acceptable if isolation barriers
23 are located behind missile barriers, pipe whip was considered
24 in the design of pipe restraints and location of piping
25 penetration through the containment, and the isolation



1 barriers are designed to withstand the effects of a safe
2 shutdown earthquake. Again, we are in compliance.

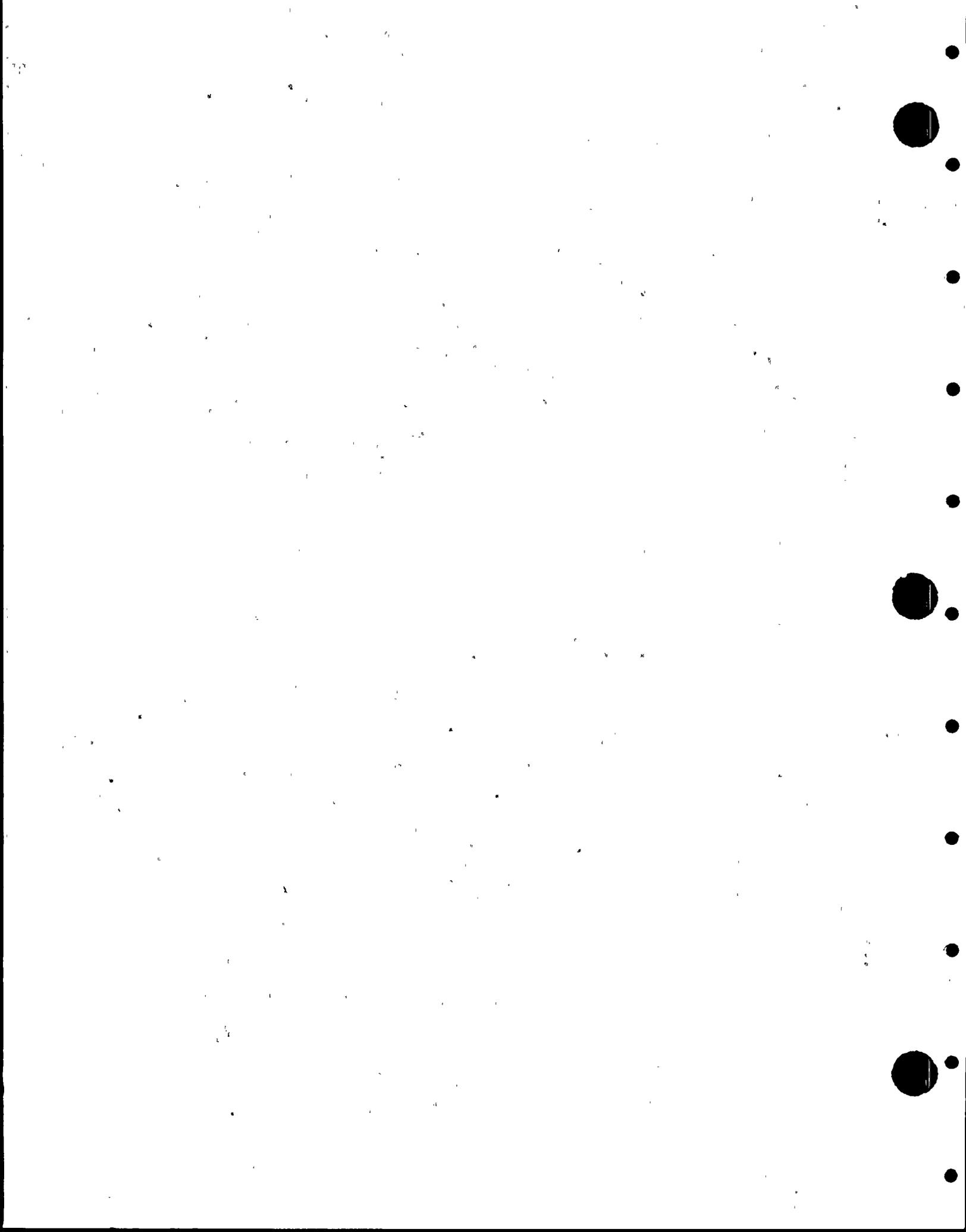
3 Exhibit 3-21. The criteria applied to components
4 performing a containment isolation function, including the
5 isolation barriers, are acceptable if Quality Group B
6 standards are used and the components are designed to
7 Seismic Category I. We are in compliance.

8 The design of the Containment Isolation System is
9 acceptable if provisions are made to allow the operator in
10 the main control room to know when to isolate fluid systems
11 that are equipped with remote-manual isolation valves. Such
12 provisions may include instruments to measure flow rate,
13 sump water level, temperate, pressure, and radiation. We
14 are in compliance.

15 Exhibit 3-22. Provisions should be made in the
16 design of the Containment Isolation System for operability
17 testing of the containment isolation valves and leakage rate
18 testing of the isolation barriers. We are in compliance.

19 Exhibit 3-23, General Design Criteria 4,
20 Environmental and Missile Design, was not specifically
21 addressed in the Standard Review Plan. We have included it
22 because the valve operators will be environmentally designed
23 to appropriate environmental conditions either inside or
24 outside of the containment.

25 Exhibit 3-24, General Design Criteria 54, Piping



1 Systems Penetrating Containment. We are in compliance.

2 Exhibit 3-25, General Design Criteria 55, Reactor
3 Coolant Pressure Boundary Penetrating Containment. We are
4 in compliance.

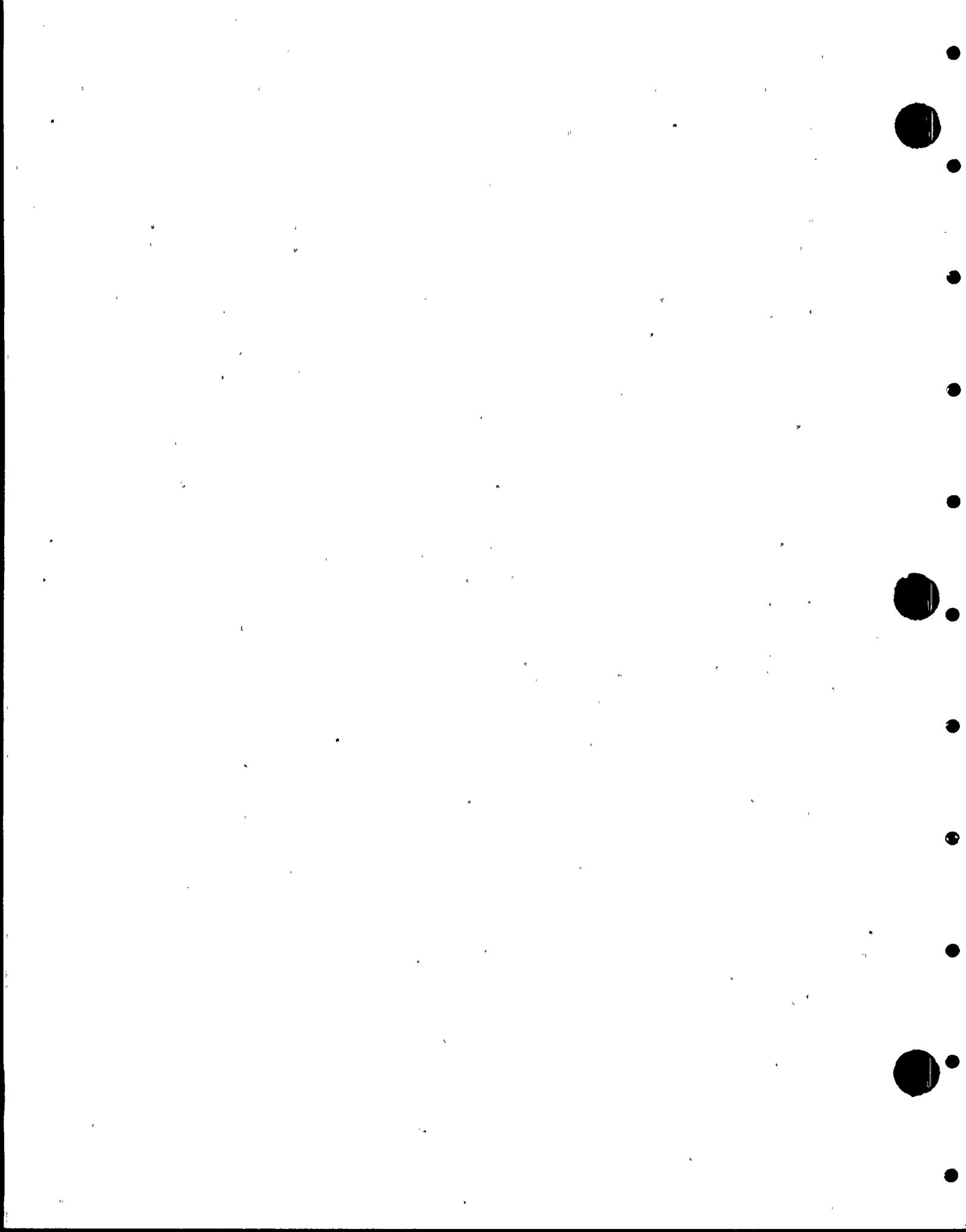
5 Exhibit 3-26 continues with GDC 55. We are in
6 compliance.

7 Exhibit 3-27, General Design Criteria 56, Primary
8 Containment Isolation. We are in compliance. The contain-
9 ment pressure instrument connections are considered part of
10 the containment boundary. As I said earlier, they are
11 designed to ASME Section III, Class 2. The latches, locks,
12 and double-flanged connections are also considered part of
13 the containment boundary.

14 Exhibit 3-28, General Design Criteria 56, continues.
15 The isolation valves should be designed to take the position
16 that provides greater safety, and we are in compliance.

17 Exhibit 3-29, General Design Criteria 57, Closed
18 System Isolation Valves. We have already said the main
19 steam and main feedwater lines fall within this General
20 Design Criteria. Other systems which could fall into it we
21 have designed to more stringent General Design Criteria 56.

22 Exhibit 3-30, Regulatory Guide 1.11, Instrument
23 Lines Penetrating Primary Reactor Containment. The instru-
24 ments which are part of the protection system should satisfy
25 requirements for redundancy, independence, and testability.



1 They are in compliance.

2 They should be sized or orificed to assure that
3 in the event of a piping or component failure the leakage
4 is reduced to the maximum extent possible. The instrument
5 lines we use are three-quarter inch. As I have said, they
6 are considered extensions of the containment boundary.

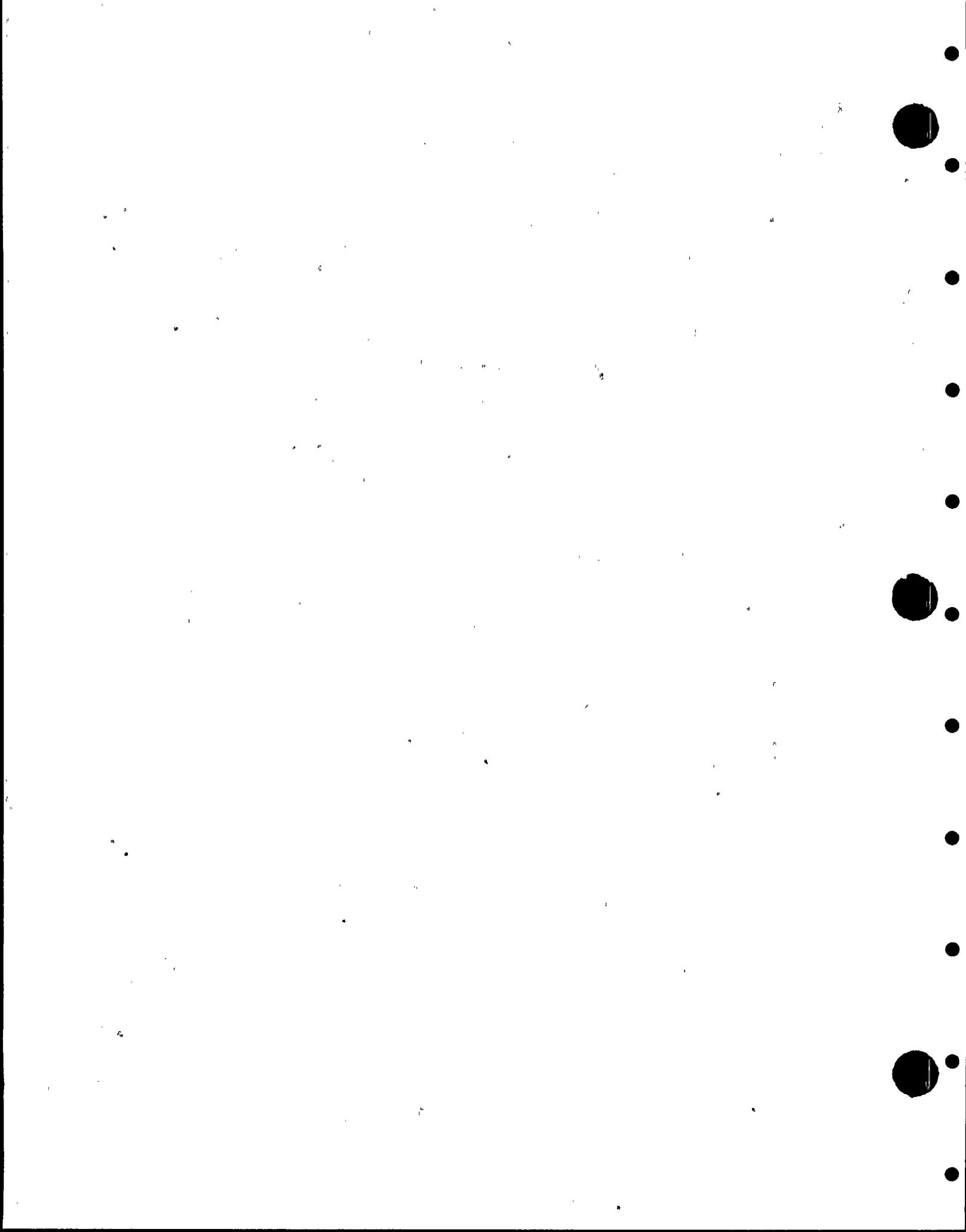
7 They should be provided with an isolation valve
8 outside containment capable of remote operation. They are
9 in compliance. The isolation valve is remote and is manually
10 operated from the control room. Open or closed position is
11 indicated, and the valve fails as open, since this is a
12 part of our essential safety system.

13 The lines should be designed at least to the
14 containment quality and protected from environmental effects.
15 We are in compliance.

16 Exhibit 3-31, Regulatory Guide 1.26, Quality Group
17 Classification. We are in compliance.

18 Exhibit 3-32, Regulatory Guide 1.29, Seismic
19 Design Classification. We are in compliance.

20 Exhibit 3-33, Regulatory Guide 1.141, Containment
21 Isolation Provisions for Fluid Systems. This Regulatory
22 Guide refers to an ANSI standard, ANSI N271-1978, with some
23 comments by the Nuclear Regulatory Commission. This
24 particular ANSI standard is a rather long one and we have
25 reduced the amount of words for this presentation, so it has



1 been abridged rather severely. For those who may be familiar
2 with it, it is not word for word. We are in basic compliance
3 with all the requirements of the ANSI standard and we will
4 go through and compare our design to the requirements.

5 Isolation function, we are in compliance.

6 Isolation valves must meet the requirements of
7 10CFR50, Appendix J. We are in compliance.

8 We use the more stringent GDC 56 for closed systems
9 other than the main steam and feedwater systems.

10 Exhibit 3-34 is the design basis of GDC 55 and 56.
11 We are in compliance.

12 For instrumentation lines, we are in compliance
13 with Regulatory Guide 1.11.

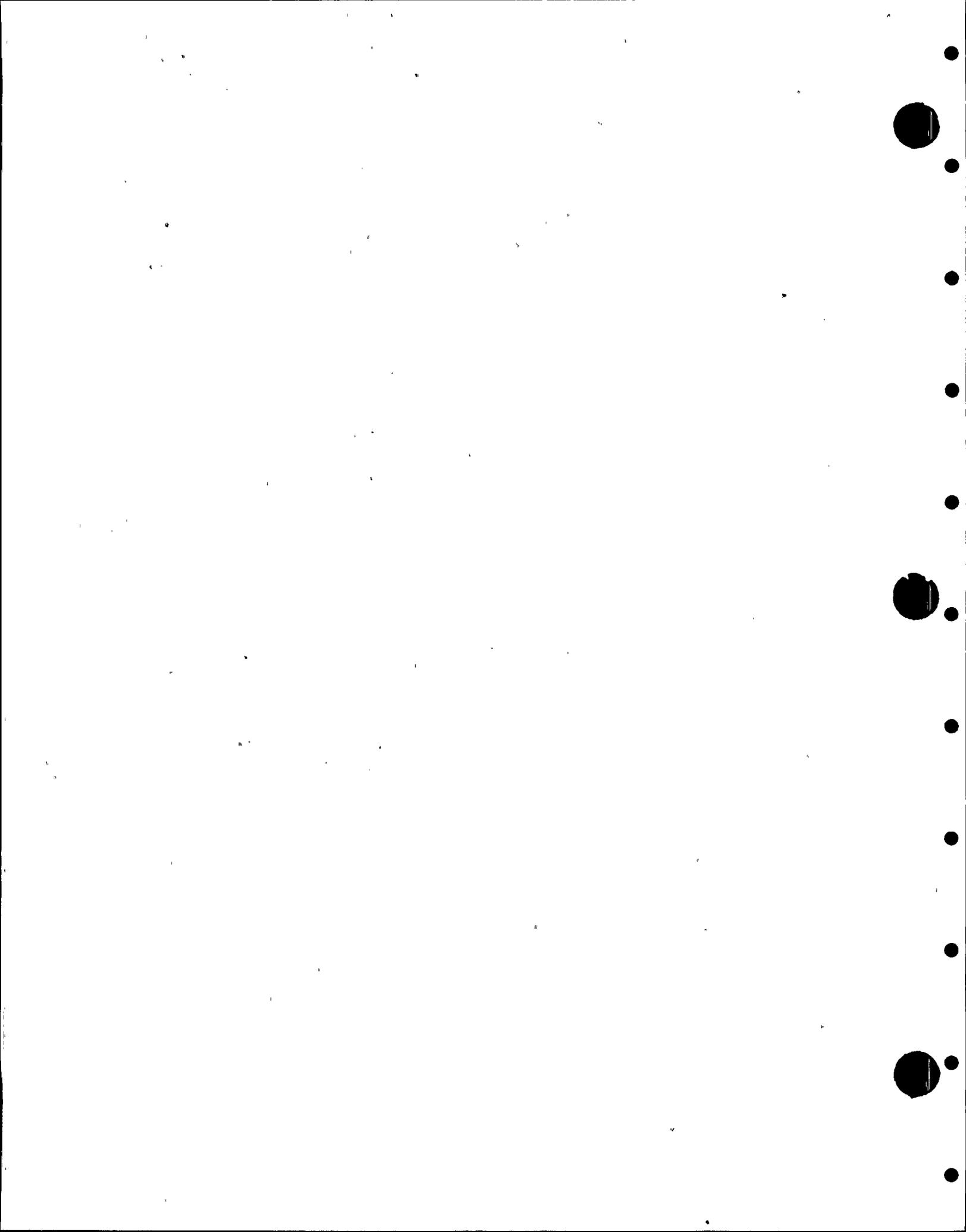
14 Exhibit 3-35. Isolation provisions for remote
15 manual valves. We are in compliance.

16 Relief valves in the backflow direction may be
17 utilized. We are in compliance.

18 Exhibit 3-36 if a closed system outside containment
19 is used for one of the isolation barriers. We are in
20 compliance.

21 Exhibit 3-37, piping outside the containment
22 between the containment and the outside isolation valve.
23 We are in compliance with the requirements.

24 Exhibit 3-38, containment isolation provisions
25 inside the containment shall be designed to withstand the



1 maximum containment temperature and, non-concurrently, the
2 containment pressure. We are in compliance.

3 All power-operated isolation valves shall be
4 capable of remote manual actuation from the main control
5 room. We have indication valves and the valves are not
6 reopened unless there is deliberate operator action.

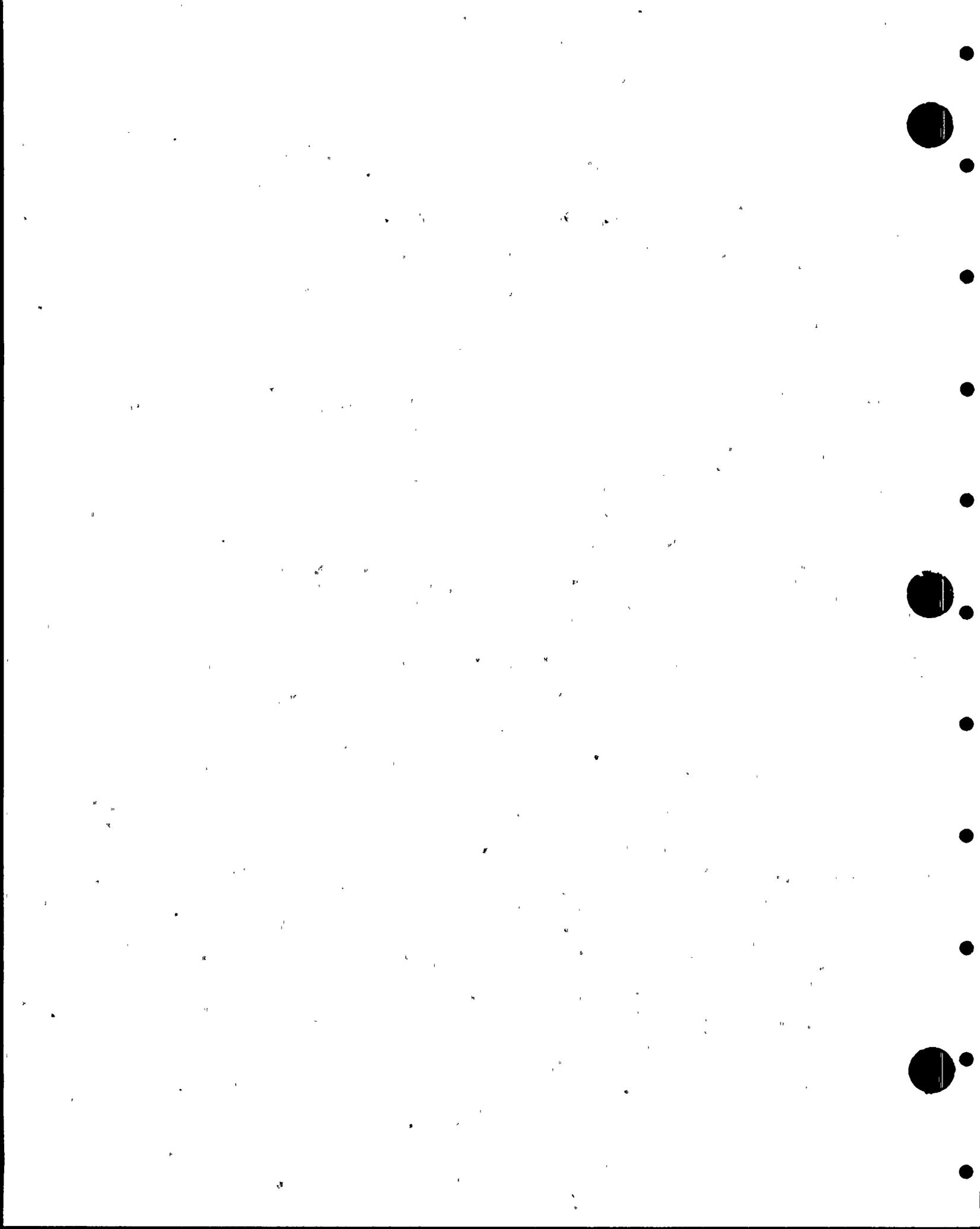
7 Exhibit 3-39. As you can see, we are in compliance
8 with the diversity of actuation, actuation features
9 appropriate to the valve type shall be provided for required
10 closure time, and the position of the valve for normal and
11 shutdown plant operating condition depends on the fluid
12 system requirements.

13 We are in compliance with establishing valve
14 closure times to limit radioactive release, and a containment
15 isolation signal closes the appropriate valves.

16 Exhibit 3-40. We are in compliance and we meet
17 the more stringent requirements of GDC 56 as opposed to
18 GDC 57.

19 Exhibit 3-41. As you can see, we are in compliance.
20 Our isolation barriers are Safety Class 2. They are
21 protected from missiles, pipe whip, protected against loss
22 of function from flooding; from loss of function from
23 earthquakes, loss of function from fire.

24 Exhibit 3-42. As you can see, we are in compliance.
25 Physical separation has been considered, the valves inside



1 the containment are designed to function with appropriate
2 combinations of conditions for normal operations and LOCA
3 and local accidents. Our valves are designed for the most
4 severe environmental conditions outside the containment, and
5 they are designed to the radiation doses.

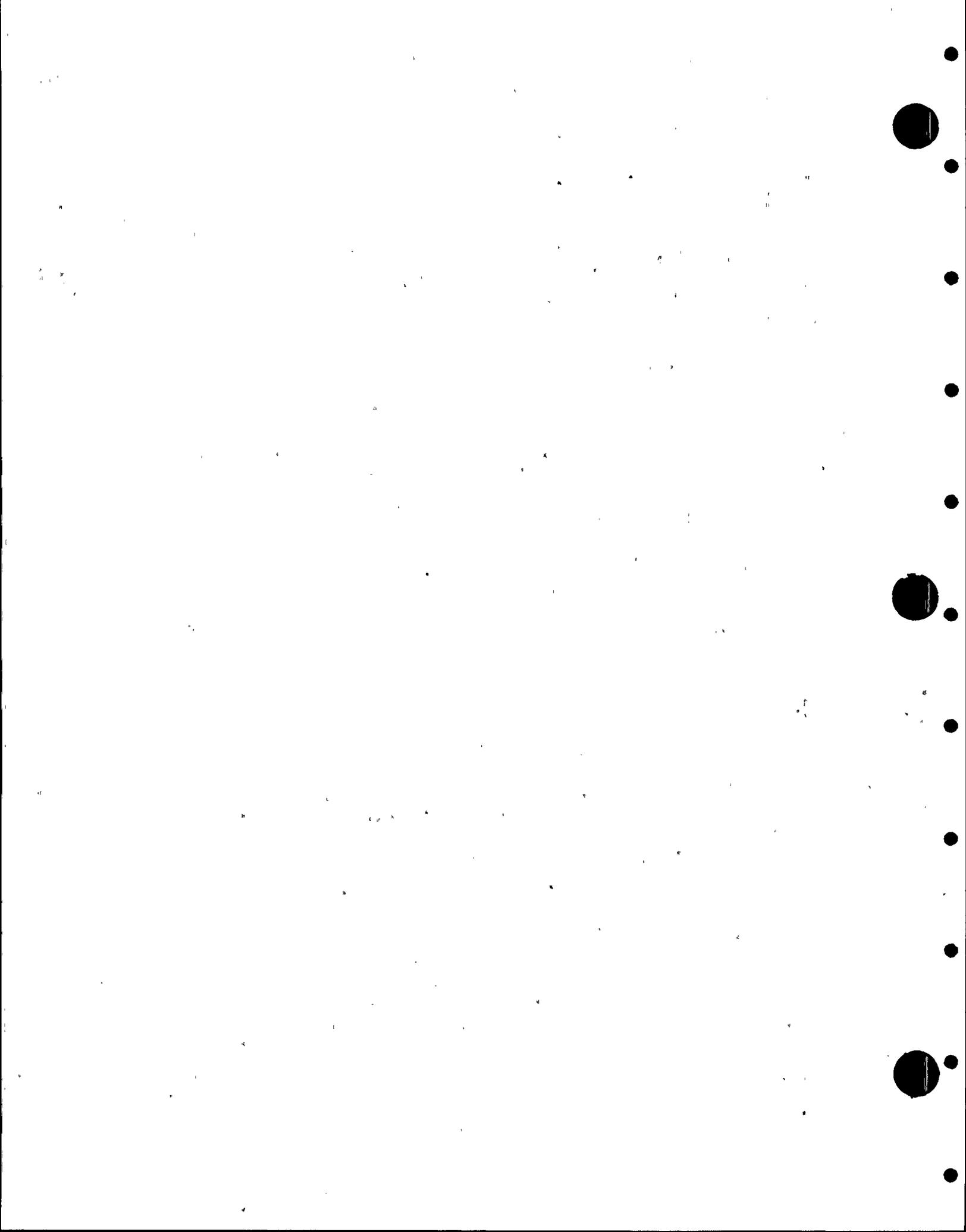
6 Exhibit 3-43. We are in compliance with the type
7 of valves allowed and limiting the valve leakage as low as
8 reasonably achievable. We are in compliance with ANSI
9 Standard N278.1-1975.

10 Exhibit 3-44. We are in compliance. A system
11 providing a sealing fluid or vacuum between isolation valves
12 was not used at Palo Verde.

13 Exhibit 3-45. We meet the requirements of
14 Section 5 of this standard for our piping. We are able to
15 test the valves. 10CFR50, Appendix J, has been followed
16 for testing, and provisions have been made for leakage rate
17 testing of isolation valves.

18 Exhibit 3-46. Maintenance has been considered and
19 procedures and maintenance schedules will be complied with
20 and prepared and a maintenance program will be established
21 which is consistent with the operating requirements of
22 previous operating experience.

23 Exhibit 3-47. We have used materials that meet
24 the requirements of ASME Code Section III, Division 1,
25 Subsection NA.



1 Exhibit 3-48. We now begin the Branch Technical
2 Positions CSB 6-4, Containment Purging During Normal Plant
3 Operations. The on-line purge system at Palo Verde is
4 independent of the purge system used for the reactor
5 operational modes of cold shutdown and refueling.

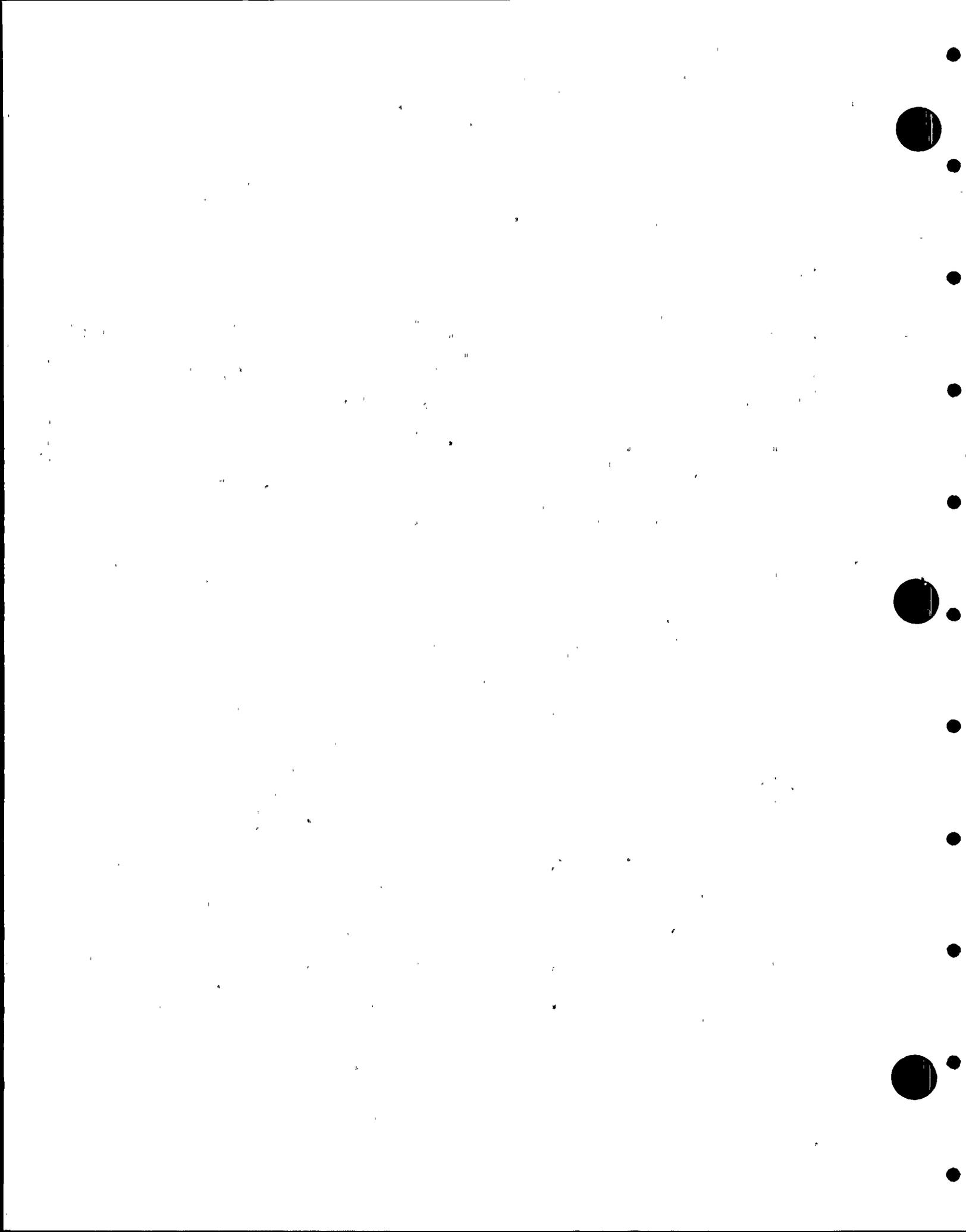
6 The on-line purge system is designed in accordance
7 with the following criteria: The performance and reliability
8 are consistent with Branch Technical Position MEB-2. The
9 design basis for the valves and actuators has included the
10 buildup of containment pressure for the LOCA break spectrum.
11 The number of purge lines that is used is one purge line.

12 Exhibit 3-49. We are in compliance. The purge
13 line is eight inches.

14 The isolation provisions meet the standards
15 appropriate to the engineered safety features.

16 We are in compliance with the diverse parameters
17 required to operate these isolation valves.

18 Exhibit 3-50. Purge system isolation valve
19 closure times, including instrumentation delays, should not
20 exceed five seconds. We are in partial compliance with that
21 requirement. The valve closure time is five seconds or less.
22 The instrumentation delay is one second or less. Calculations
23 in the SAR show that the offsite exposure is within guidelines
24 for six-second closure time on any containment isolation
25 signal.



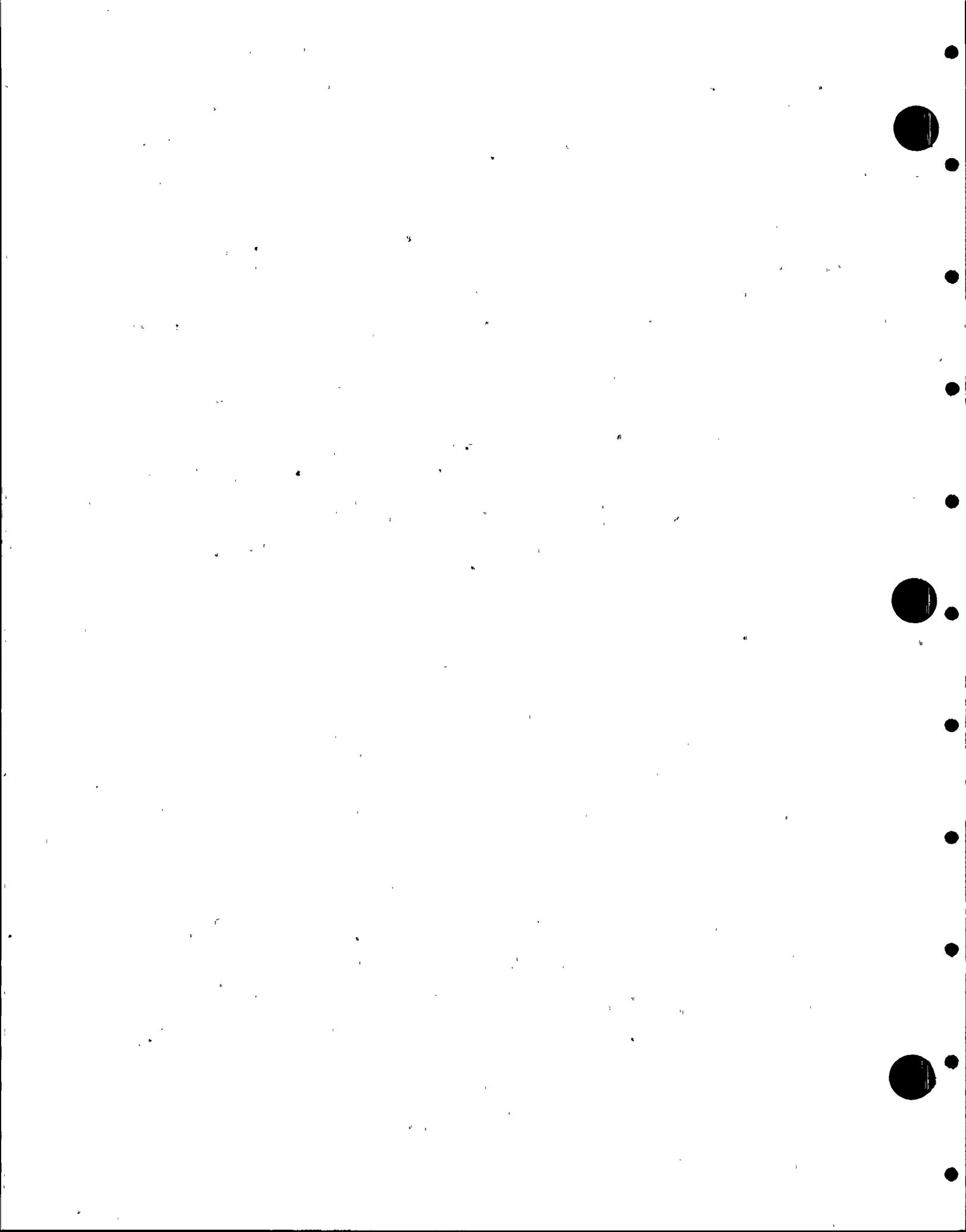
1 We are in compliance and provisions are made to
2 ensure that isolation valve closure will not be obstructed
3 by debris.

4 The purge system should not be relied upon for
5 temperature and humidity control within the containment, and
6 we have provided atmospheric clean-up systems within the
7 containment.

8 Exhibit 3-51. Provisions should be made for test-
9 ing the availability of the isolation function and the
10 leakage rate of the isolation valves individually during
11 reactor operation. We are in compliance. A leakage test
12 connection is provided between the isolation valves outside
13 the containment.

14 The following analyses should be performed to
15 justify the containment purge system design: An analysis
16 of the radiological consequences of a LOCA. We are in
17 compliance. The analyses are discussed in FSAR Sections
18 15.4.5 and 15.6.6.

19 An analysis which demonstrates the acceptability
20 of the provisions made to protect structures and safety-
21 related equipment located beyond the purge system isolation
22 valves against loss of function. We are in compliance. The
23 equipment outside the containment beyond the isolation valves
24 are nonsafety related. A postulated accident during purge
25 operation will not result in a release exceeding 10CFR100



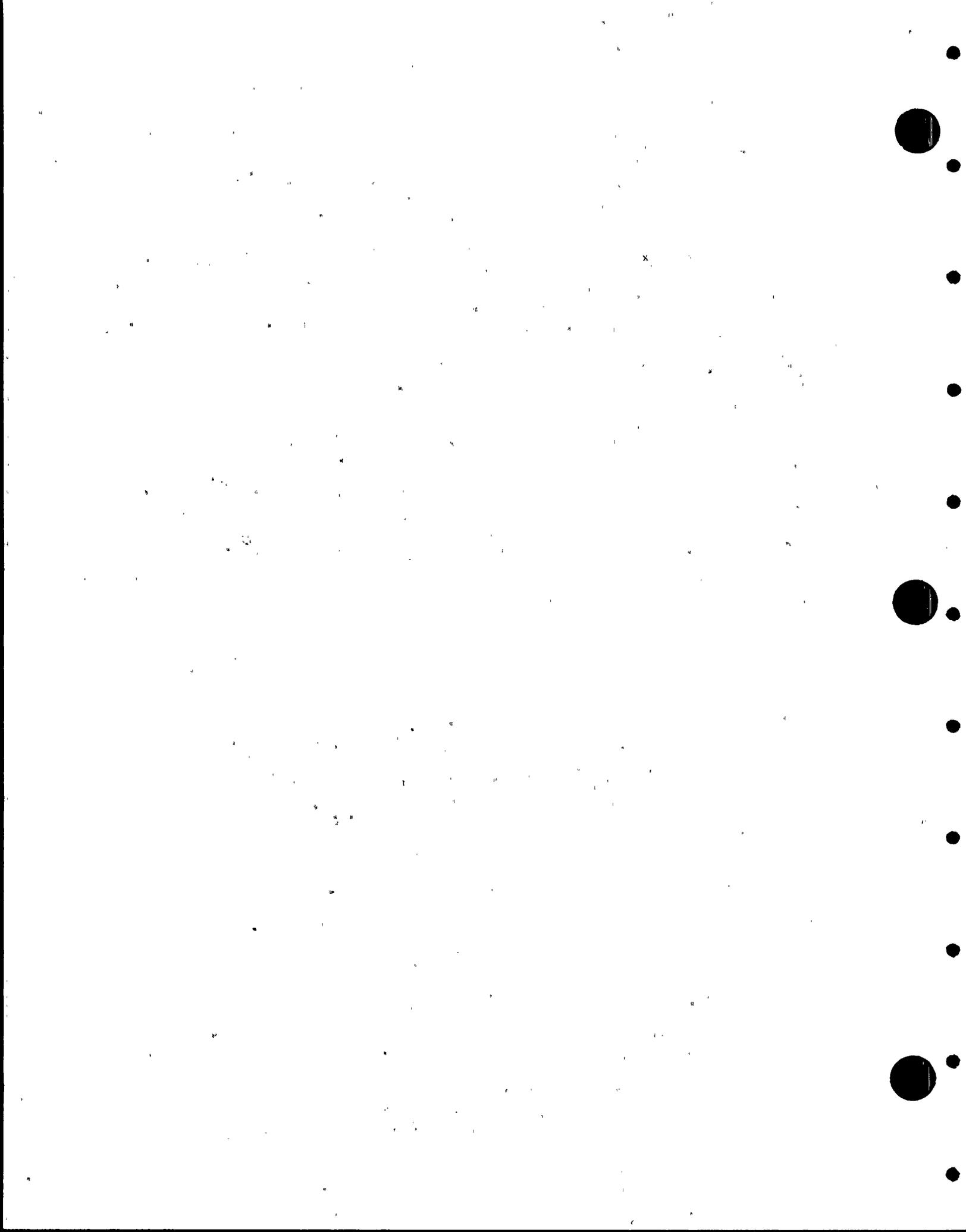
1 guidelines.

2 Exhibit 3-52. Provide an analysis for the
3 reduction in the containment pressure resulting from the
4 partial loss of containment atmosphere during the accident.
5 We have already discussed in the previous section calculations
6 for the safety pumps net positive suction head assume the
7 containment atmosphere is entirely steam, and no credit was
8 taken for air pressure in the containment.

9 The allowable leak rates of the purge and vent
10 isolation valves should be specified for the spectrum of
11 design basis pressures and flows against which the valves
12 must close. We are in compliance. The purge isolation
13 valve leak rates are specified to meet AWWA C-504.

14 Exhibit 3-53, the requirements of NUREG-0737,
15 Item II.E.4.2. The containment isolation system designs
16 shall comply with the recommendations of Standard Review
17 Plan Section 6.2.4 for diversity of parameters. We are in
18 compliance. A containment isolation signal is diversely
19 generated by either a high containment pressure signal or a
20 low pressurizer pressure signal. In addition, the purge
21 valves are closed on high containment purge radioactivity.

22 Exhibit 3-54. All plant personnel shall give
23 careful consideration to the definition of essential and
24 nonessential systems, identify each system determined to be
25 essential, identify each system determined to be

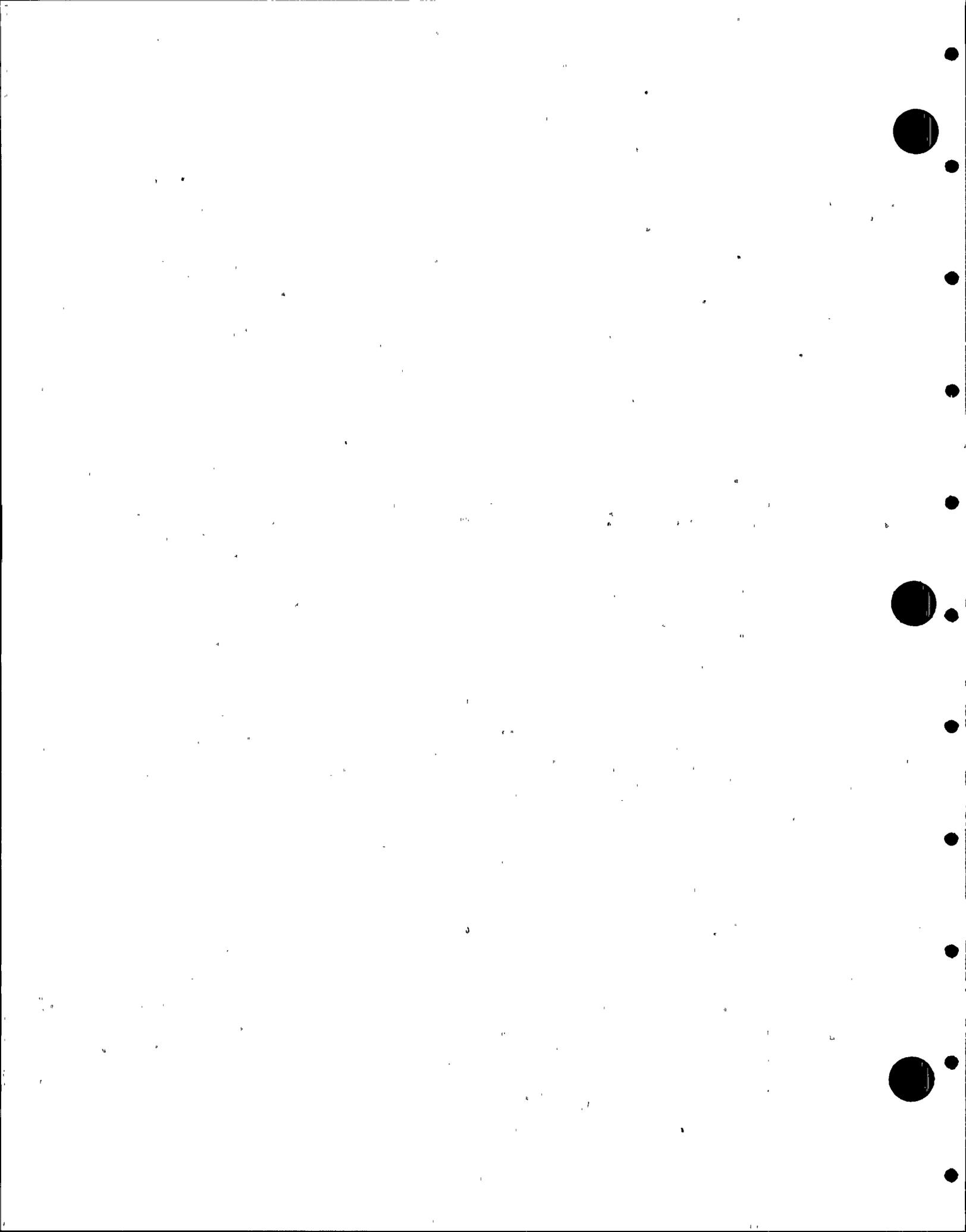


1 nonessential, establish the basis for selection of each
2 essential system, modify their containment isolation designs
3 accordingly, and report the results of the reevaluation to
4 the NRC. The response continues on to the next Exhibit
5 3-55. We are in compliance. A generic review of fluid
6 systems penetrating the containment for CE-designed plants
7 was conducted for the CE Owners Group on Post-TMI Efforts.

8 Essential systems are those systems critical to
9 ensure the capability to mitigate consequences of accidents,
10 to ensure the integrity of the reactor coolant pressure
11 boundary and to ensure the capability to shut down the
12 reactor and maintain it in a safe shutdown condition.

13 Table 3-1 lists essential systems penetrating the contain-
14 ment. No essential systems are functionally isolated by a
15 containment isolation actuation signal with the exception of
16 the hydrogen control system. This system is not immediately
17 required for accident mitigation. The isolation valves can
18 be manually opened from the control room as part of the
19 hydrogen recombiner startup procedures.

20 Exhibit 3-55 shows Table 3-1, the essential
21 systems penetrating the containment. Systems are the
22 High Pressure Safety Injection, Low Pressure Safety Injection,
23 Containment Spray, Recirculation Sump Suction, Long Term
24 Recirculation, Auxiliary Feedwater, Hydrogen Control, and
25 the Containment Pressure Sensor. We show the normal position

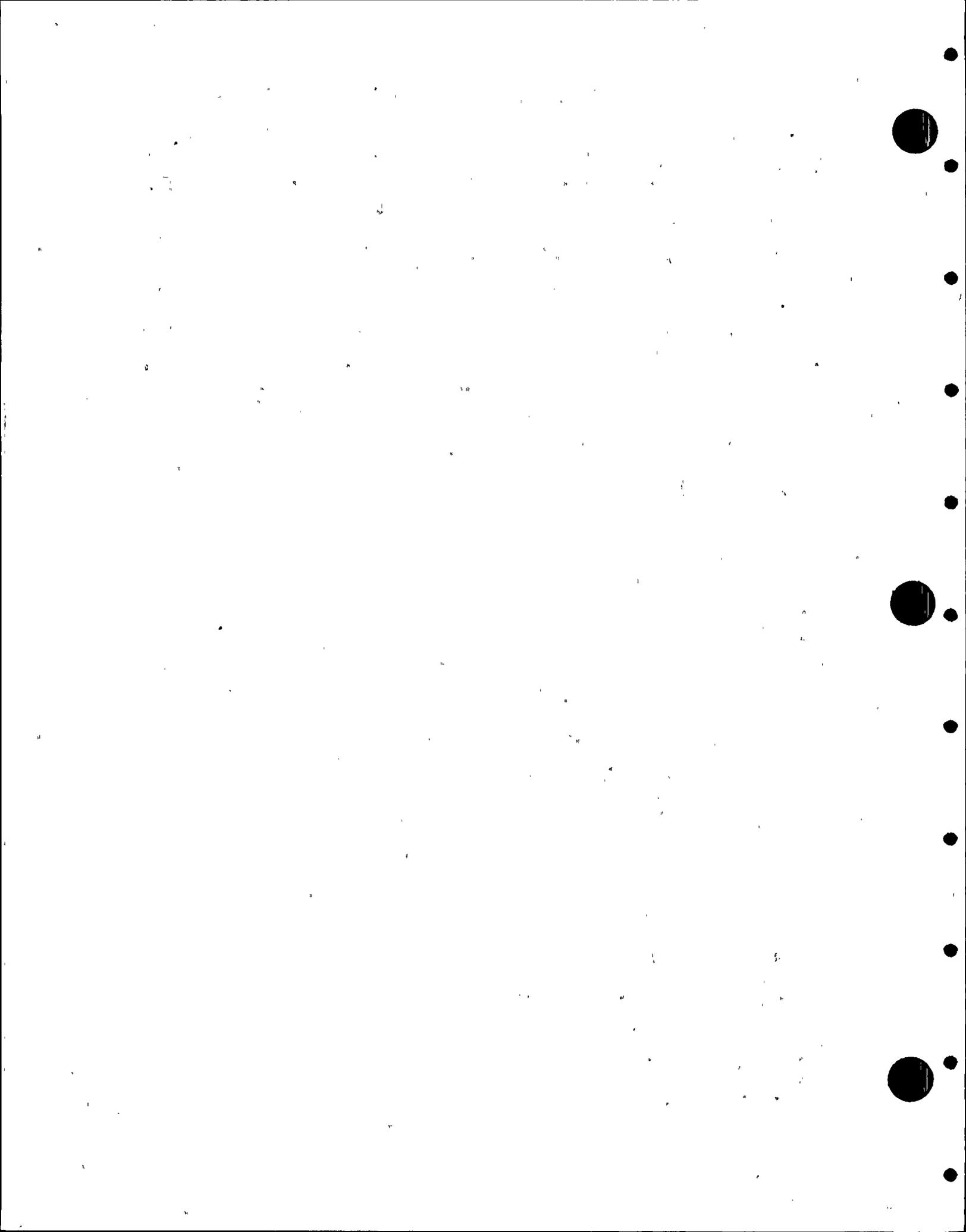


1 of the isolation valve, the post containment isolation
2 actuation signal position, and various notes: opens on
3 certain signals, manually opened, function requires it to
4 stay open, or isolates on CIAS.

5 Exhibit 3-56. All nonessential systems shall be
6 automatically isolated by the containment isolation signal.
7 We are in compliance. Nonessential systems are listed in
8 Table 3-2. Nonessential systems are automatically isolated
9 by a CIAS with the exception of the following systems:
10 Those which contain locked closed valves or flanged closed
11 connections, main steam and feedwater, steam generator
12 blowdown and blowdown sample and safety injection train,
13 reactor coolant pump seal injection and CVCS charging. We
14 have discussed the reasons why those particular systems are
15 not isolated on a CIAS.

16 Exhibit 3-57 shows Table 3-2, the nonessential
17 systems, as you can see, such as Demineralized Water,
18 Pool Cooling, Equipment Air, Equipment Hatch, Pressurizer
19 Samples, Service Gas, Instrument Air, Nuclear Cooling Water.
20 The normal position of the penetration valve is shown, the
21 post-CIAS position, and on the next exhibit, 3-58, the
22 remaining systems, their position and applicable notes to
23 the table.

24 Exhibit 3-59 is a continuation of the words from
25 3-57, which we have already discussed previously on why



1 these systems are not isolated.

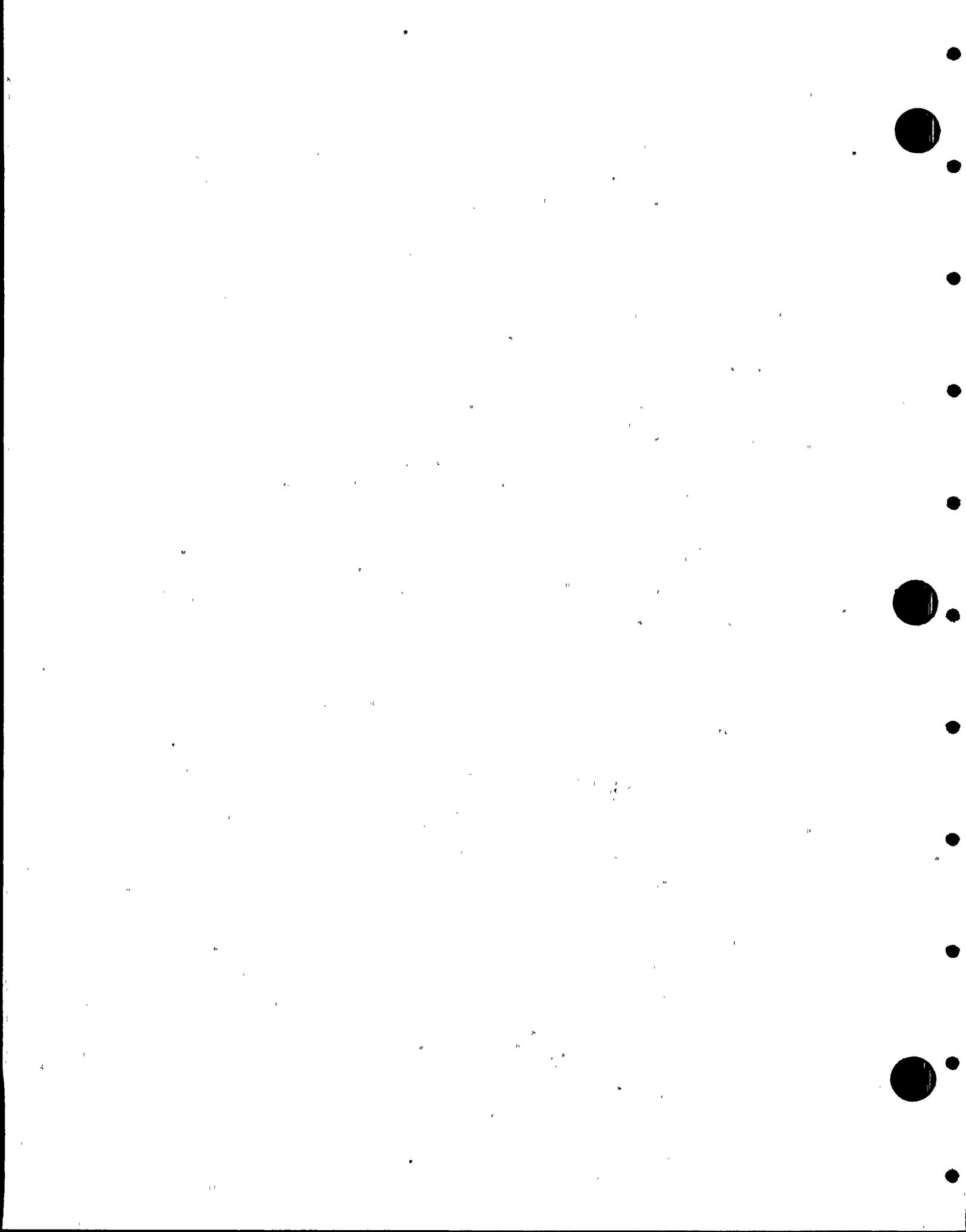
2 Exhibit 3-60 continues from Exhibit 3-59.

3 Exhibit 3-61. The design of control systems for
4 automatic containment isolation valves shall be such that
5 resetting the isolation signal will not result in automatic
6 reopening. Reopening of containment isolation valves shall
7 require deliberate operator action. We are in compliance
8 with it, as we have previously discussed on the override of
9 the CIAS signal and then operator action to reopen the valves.

10 The containment set point pressure that initiates
11 containment isolation for nonessential penetrations must be
12 reduced to the minimum compatible with normal operating
13 conditions. We are in compliance. As previously indicated,
14 the CIAS set point is 5 psig. Calculations are in progress
15 to confirm that the trip set point represents the minimum
16 value, and preliminary figures indicate that we cannot
17 reduce the 5 psig value any lower.

18 Exhibit 3-62. Containment purge valves that do
19 not satisfy the operability criteria set forth in Branch
20 Technical Position CSB 6-4 must be sealed closed. We are
21 in compliance. Containment power access purge isolation
22 valves satisfy the criteria set forth in the Branch Technical
23 Position.

24 Containment purge and vent isolation valves must
25 close on a high radiation signal. We are in compliance.



1 That I believe concludes this part of the presenta-
2 tion.

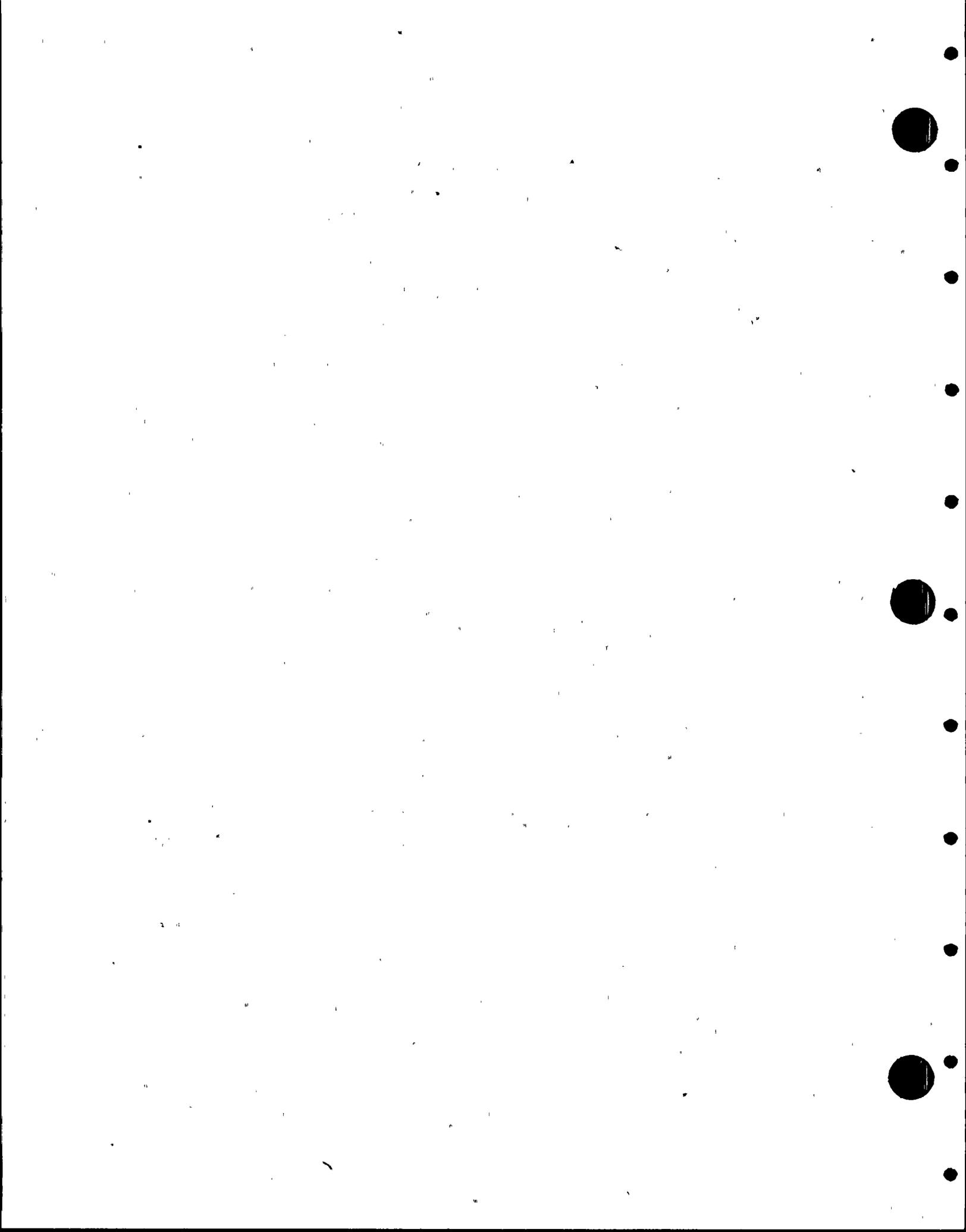
3 MR. VAN BRUNT: Any questions? Ed, I will start with
4 you again.

5 MR. STERLING: On Exhibit 3-38, in that section, you
6 say you are in compliance with Part D when the valves shall
7 not be opened until the signal is removed. When you reset
8 your signal, is it such that the control surface will not
9 cause the valves to change state?

10 MR. KEITH: Yes.

11 MR. STERLING: On Exhibit 3-57, the table with the
12 nonessential systems penetrating the containment, the
13 Instrument Air System, the sixth from the bottom, closes on
14 containment isolation. Is there any instrumentation items
15 that were vented by that system in the containment that
16 could feed back to the operator a false signal or anything
17 of that sort because you have lost air to that instrumenta-
18 tion? I know that is a nonessential system, but is there
19 maybe some feedback that would lead the operator to wrong
20 conclusions?

21 MR. KEITH: I think, as you pointed out, it is a
22 nonessential system, not a safety-grade system. We do not
23 have any instrument feed, we have some valves that are fed
24 off the instrument air, so instrumentwise there would be
25 no false indication.



1 MR. STERLING: And the cutoff of the instrument air
2 to these valves will not cause any type of problem of
3 misoperation?

4 MR. KEITH: That's correct.

5 MR. STERLING: That's all I have.

6 MR. VAN BRUNT: Any other questions?

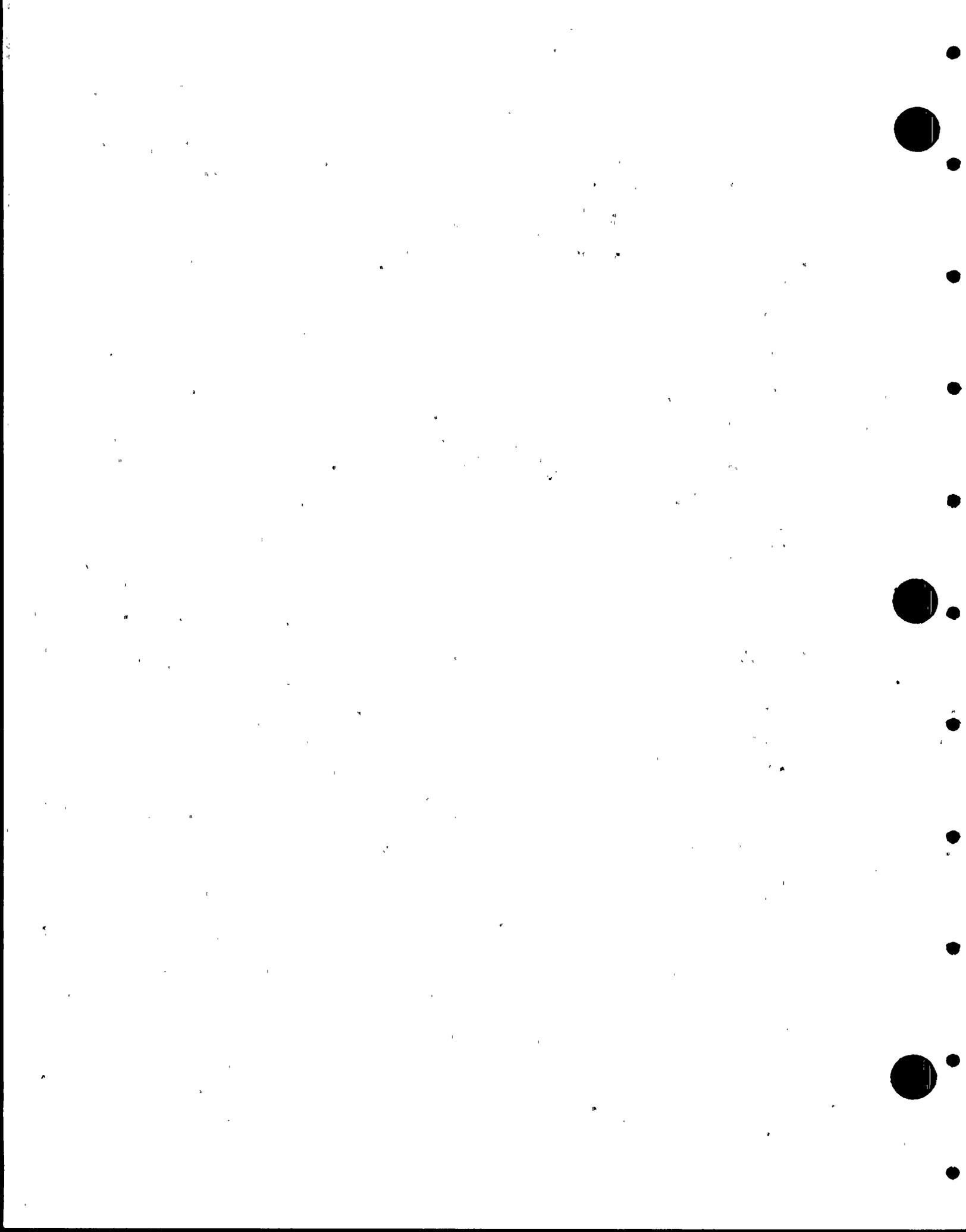
7 MR. HEPNER: On Exhibit 3-57 when you labeled the
8 Shutdown Cooling as nonessential, it seems to me that the
9 shutdown cooling is part of the overall plan for small break
10 LOCA mitigation, so even though where you place it doesn't
11 affect the CIAS characterization, it seems like it should be
12 on the other list.

13 MR. KEITH: As far as I know, at Three Mile Island,
14 they never used the shutdown cooling system. Of course, in
15 the classic LOCA, you don't use it. I have no problem
16 either way, Phil. If you would like to take it off --

17 MR. HEPNER: It is not part of the Three Mile Island
18 scenario, which wasn't the small break LOCA scenario, but
19 in a typical small break LOCA scenario as described in
20 CESSAR, you indeed use the shutdown cooling system.
21 Otherwise all the facts are correct that says the normal
22 positions are closed and after signal do indeed stay closed.

23 MR. KEITH: I think in view of that, then we should
24 remove it from this list.

25 MR. VAN BRUNT: John Held, do you have a question?



1 MR. HELD: Yes. Referring to Exhibit 3-55, there are
2 a number of notes indicating that signals other than the
3 containment isolation actuation signal affect the listed
4 valves. Do all those signals listed in the notes preempt
5 the CIAS?

6 MR. KEITH: We are just verifying the valves that
7 do not receive the CIAS.

8 MR. HELD: So the only one on that table that does
9 receive the CIAS is hydrogen control, is that correct?

10 MR. KEITH: That's correct.

11 MR. HELD: All right. That's all.

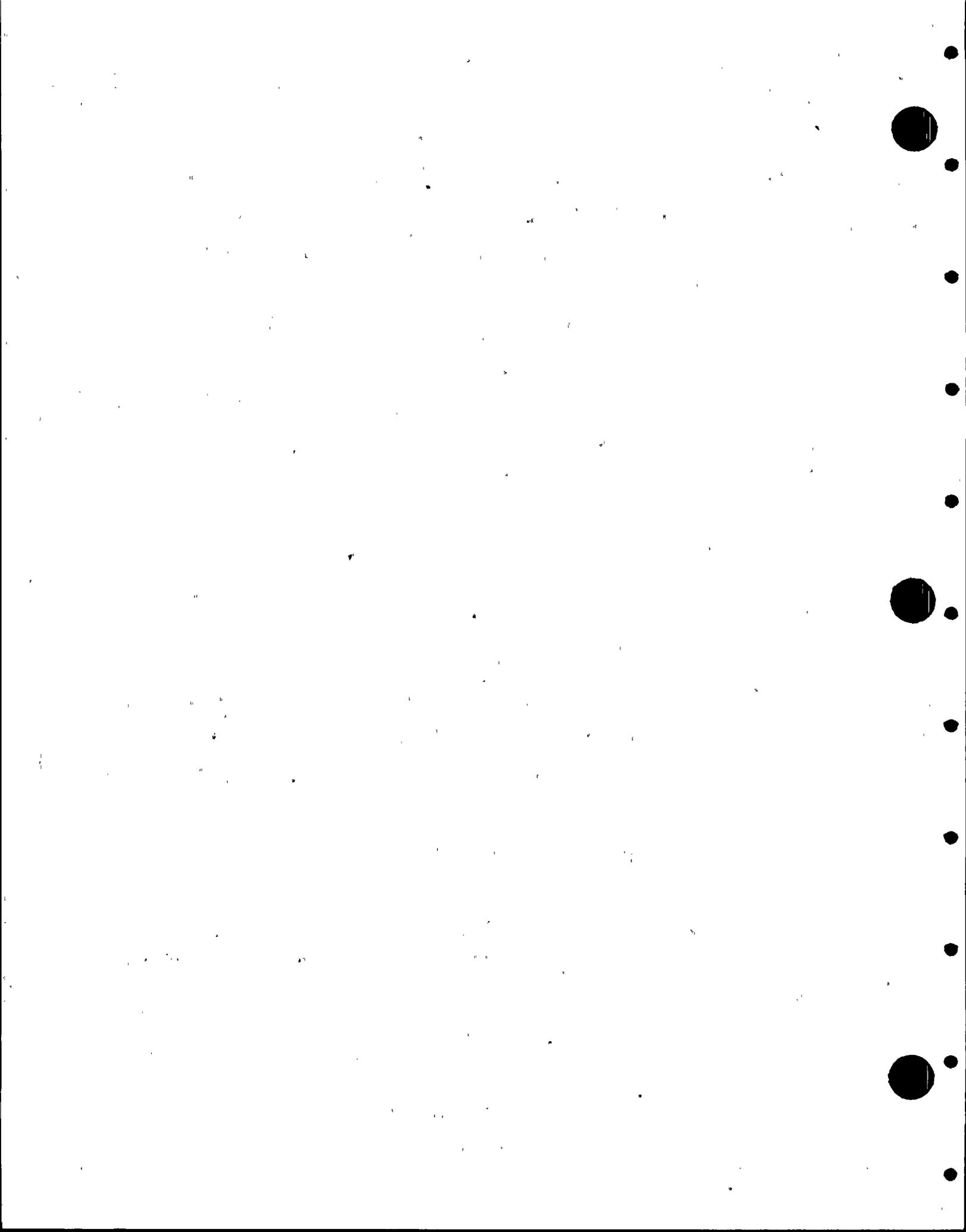
12 MR. VAN BRUNT: Some other questions? Marty.

13 MR. RAINES: On Exhibit 3-59, down in the middle of
14 the paragraph under Design Feature, it states, "In addition,
15 the charging pumps can be transferred to emergency power
16 at the discretion of the operator in the event that offsite
17 power is lost." Unless I miss the boat, any time you lose
18 offsite power, the transfer is made automatically, but with
19 the two-out-four logic sequence from the voltage relays,
20 the operator doesn't have a choice.

21 MR. KEITH: You are correct. It is a little misleading
22 the way it is worded.

23 MR. RAINES: I think the statement also appears on
24 Exhibit 3-9, also.

25 MR. KEITH: You're right.



1 MR. VAN BRUNT: Dennis, could we ask you to maybe
2 fix the slide up a little bit to reflect that?

3 MR. KEITH: We will do that, and 3-9.

4 MR. VAN BRUNT: Any other questions? John.

5 MR. HUONG: Exhibit 3-12. I would like to make a
6 comment on the use of the Regulatory Guide 1.11. I think
7 that Reg. Guide 1.11 should not be applied to those lines
8 that directly open to containment air. I don't know if you
9 understand that position or you don't.

10 MR. KEITH: Would you go through that again?

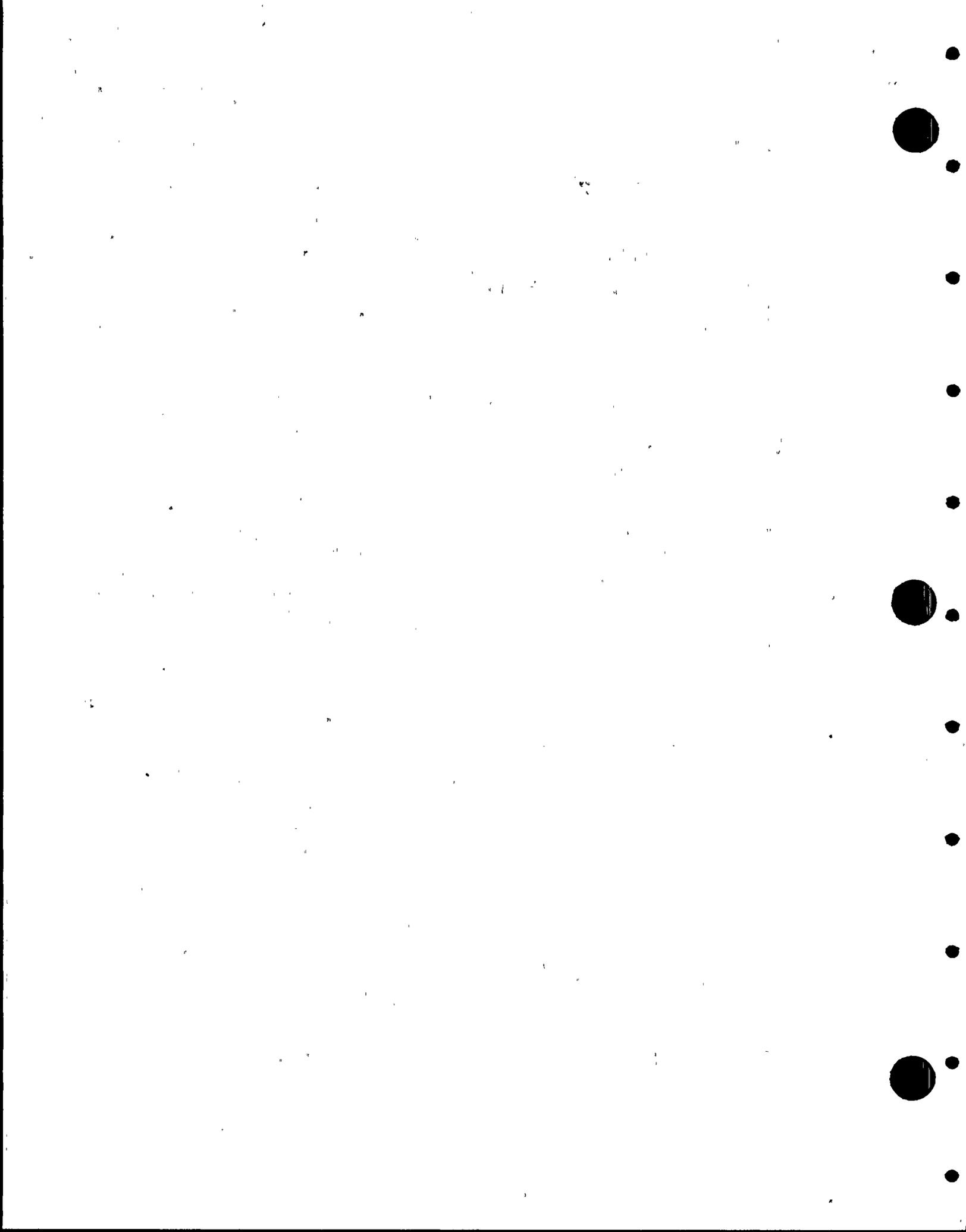
11 MR. HUONG: I think Reg. Guide 1.11 should not be
12 applied to those penetrations of instrument lines that
13 directly open to containment air. I just want to clarify
14 this. This has been our position. We found a couple of
15 other applicants adopted this Reg. Guide 1.11 for the
16 penetration of instrument lines which are open to containment
17 air.

18 MR. KEITH: What criteria apply to those lines?

19 MR. HUONG: Reg. Guide 1.11 in our position only
20 applies to those instrument lines that connect to primary
21 stations.

22 MR. KEITH: As far as the instrument lines that are
23 open to the containment air, what --

24 MR. HUONG: Then you probably should apply GDC 56.
25 I don't know whether you have those penetrations or not. I



1 just wanted to make a point.

2 MR. KEITH: This is our containment pressure monitor
3 and, obviously, we don't meet GDC 56.

4 MR. HUONG: I think we should leave that as an open
5 item, because we don't think Reg. Guide 1.11 should apply to
6 those instrument lines.

7 MR. KEITH: So it is your position that GDC 56 --

8 MR. HUANG: It should be GDC 56.

9 MR. KEITH: This is a special case, because these
10 instruments are required following the accident, so you
11 really don't want to isolate by putting a valve in.

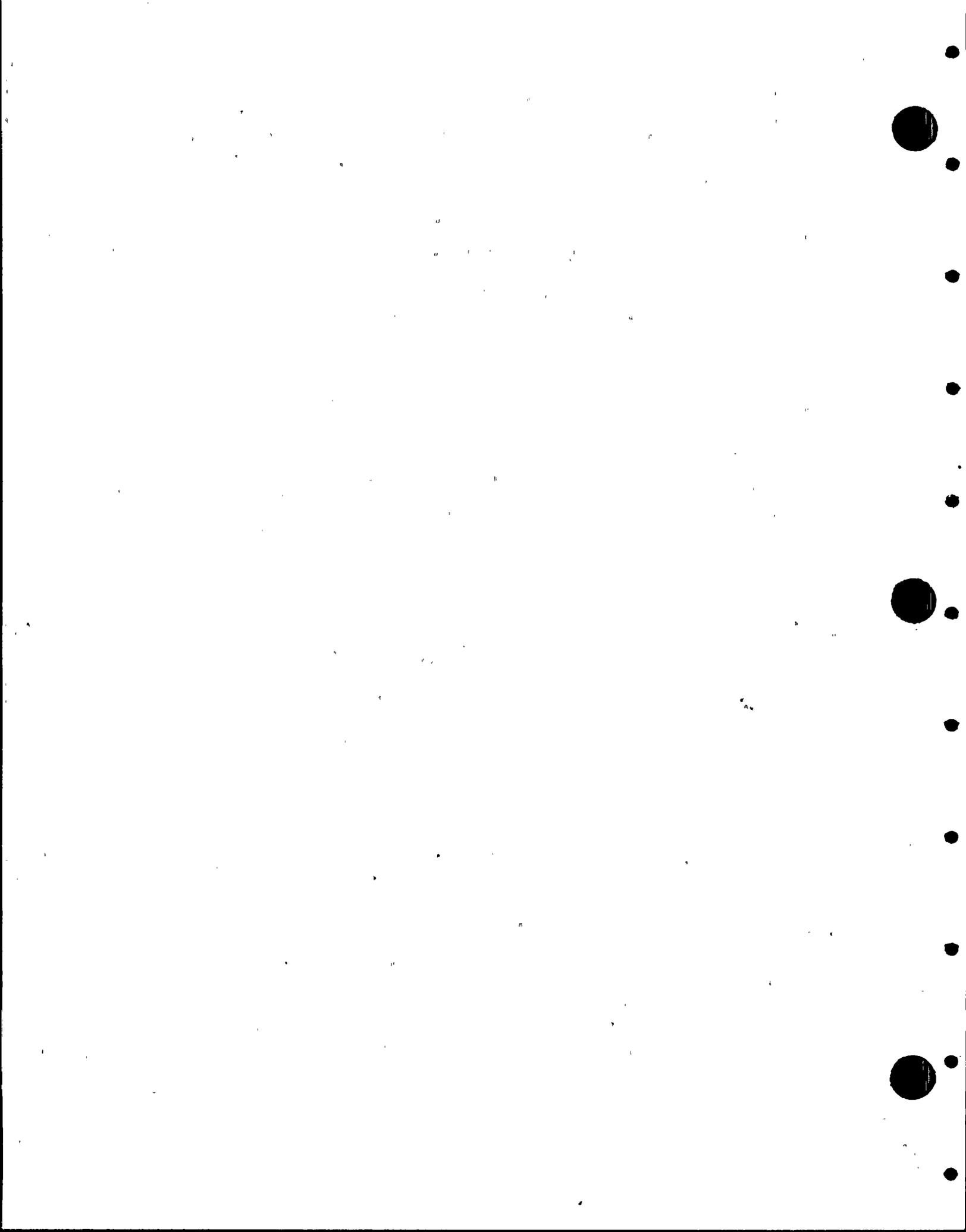
12 MR. HUONG: No. You can reopen it. Right? You want
13 to isolate them, and after that, if you want to reopen them,
14 you can reopen them.

15 MR. KEITH: I am sure your people that want us to
16 follow the course of the accident would have a fit.

17 MR. HELD: Excuse me, I think the problem here is
18 that Reg. Guide 1.11 may be open to some misinterpretation
19 and I think it would be best at this point if we left it as
20 an open issue and had further discussion perhaps over the
21 phone to clear it up later.

22 MR. KEITH: Okay, I think we will have to.

23 MR. VAN BRUNT: We will leave this as an open item,
24 Dennis, and then you can follow up with some discussions
25 with these fellows, and then when you respond to the open



1 items, you can reflect whatever the results of those
2 discussions were.

3 MR. KEITH: Fine.

4 MR. VAN BRUNT: Are there any other questions? John,
5 you had a question.

6 MR. ALLEN: Clarify something for me. By looking at
7 some of the tables and then some of the tests, are the
8 letdown and charging lines isolated on CIAS or not?

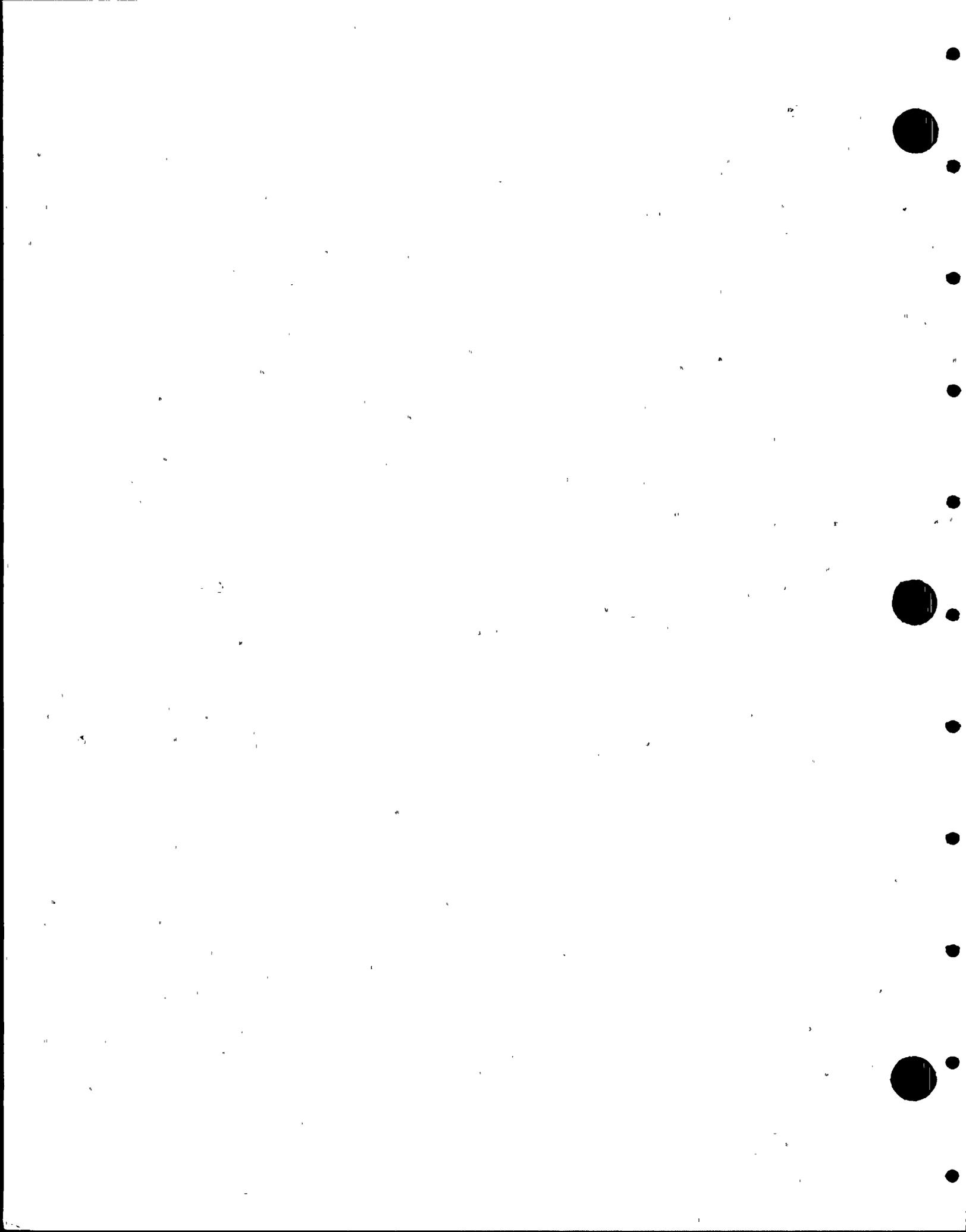
9 MR. KEITH: Where do you see these?

10 MR. ALLEN: On 3-59, it says to leave charging paths
11 open and I thought on one of the tables I saw where you
12 closed it. How about the letdown?

13 MR. KEITH: The letdown is on the previous one.
14 That closes. The letdown closes. The charging we leave
15 open.

16 MR. VAN BRUNT: Any others? Pete.

17 MR. PENSEYRES: On Table 6.2.4-1 of the FSAR, several
18 penetrations normally contain cold water between the
19 isolation valves or the blind flanges; for example, Penetra-
20 tion 53, the fuel transfer tube, and Penetrations 61 and
21 62, which are chilled water. These lines from the inside
22 isolation valve or flange to the containment penetration
23 will be exposed to elevated post-accident temperatures with
24 a fixed volume of cold water trapped between the isolation
25 valves. Will the increased pressure inside these lines as a



1 result of heating cause rupture of the piping?

2 MR. KEITH: We will hold that as an open item.

3 MR. VAN BRUNT: Any other questions, Pete?

4 MR. PENSEYRES: Yes. Also, in Table 6.2.4.1 of
5 the FSAR, there is a statement that one of the steam
6 penetrations will be Type C tested. It is a one-inch line
7 and there is no other identification that I can see on there.
8 Which penetration is that and why is that singled out? It
9 is on Table 6.2.4.3 of the FSAR.

10 MR. KEITH: We will hold that as open for now. We
11 will try and check the P&ID and answer the question before
12 we leave.

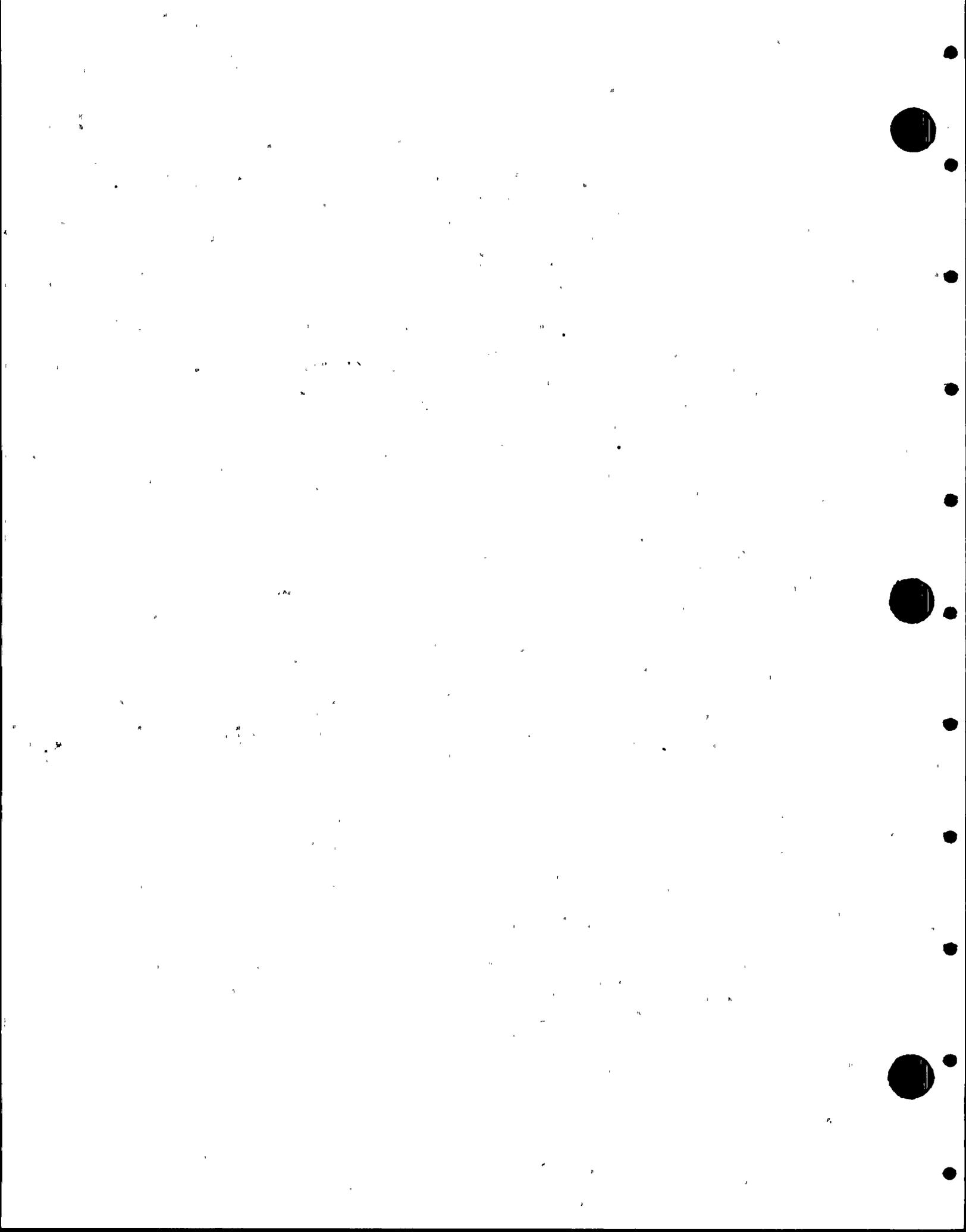
13 MR. VAN BRUNT: Is that all you had, Pete?

14 MR. PENSEYRES: Yes.

15 MR. VAN BRUNT: Rich, you had a question.

16 MR. TOSETTI: On Figure 3-4, you show some traps
17 coming over the main steam lines and I wonder how those
18 satisfy GDC 57 in terms of automatic valves.

19 MR. KEITH: As you know, the presentation today,
20 although we have been getting into leak testing, was not
21 really covering leak testing. Rich is talking about these
22 lines here (indicating), which are one-inch lines going to
23 the steam traps. The position we have been taking on the
24 secondary side of the steam generator -- let me just read
25 from 6.2.6 in the FSAR. 6.2.6 is Containment Boundary



1 Leak Rate Testing. "Isolation valves connected to the
2 secondary side of the steam generator such as main steam
3 isolation valves, main steam relief valves, feedwater valves,
4 blowdown lines, and blowdown sample lines are not considered
5 containment isolation valves and are not subject to Type C
6 tests. If there is leakage from the primary to secondary
7 side, the steam generator may be flooded in the event of a
8 LOCA to effectively seal any tube leakage. If required,
9 filling the steam generators will be performed from the
10 auxiliary feedwater system, which meets the single failure
11 criteria." Basically, the position we have been taking is
12 that the leaks in the secondary side of the steam generator
13 and the piping connected to it, which is all ASME Section
14 III, Class 2, is part of the containment boundary, so those
15 valves outside the boundary are not really part of contain-
16 ment isolation. That is our position on that.

17 MR. TOSETTI: So there is no provision to test these?

18 MR. KEITH: As you can see, there are manual valves
19 that are normally open and we do have a steam trap beyond,
20 which is designed, of course, just to pass water and seals
21 on steam. But that is the position on that.

22 MR. TOSETTI: I guess I am a little unclear, because
23 I know other plants have taken that outside valve as an
24 isolation valve on the main steam line. The main steam
25 valve has been treated on some plants as an isolation valve.

1. The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that every entry should be supported by a valid receipt or invoice.

2. The second part details the various methods used to collect and analyze data. It includes a section on statistical analysis, which is crucial for identifying trends and patterns in the data.

3. The third part focuses on the implementation of quality control measures. It describes how regular audits and checks can help ensure the reliability and accuracy of the information being recorded.

4. The fourth part addresses the challenges faced in data management, such as data loss and corruption. It offers practical solutions and best practices to mitigate these risks.

5. The fifth part discusses the role of technology in modern data management. It highlights the benefits of using specialized software and tools to streamline processes and improve efficiency.

6. The sixth part covers the legal and ethical aspects of data handling. It stresses the need for transparency and compliance with relevant regulations to protect the privacy of individuals.

7. The seventh part provides a comprehensive overview of the entire data management process, from data collection to final reporting and analysis.

8. The eighth part concludes with a summary of the key findings and recommendations. It reiterates the importance of a systematic and disciplined approach to data management.

1 MR. KEITH: I would be surprised if they could pass
2 the leakage rate test on them. I know those are big valves
3 and they have to shut in five seconds and I think the
4 practicality of the thing is that it is difficult to get
5 them to pass the Type C test.

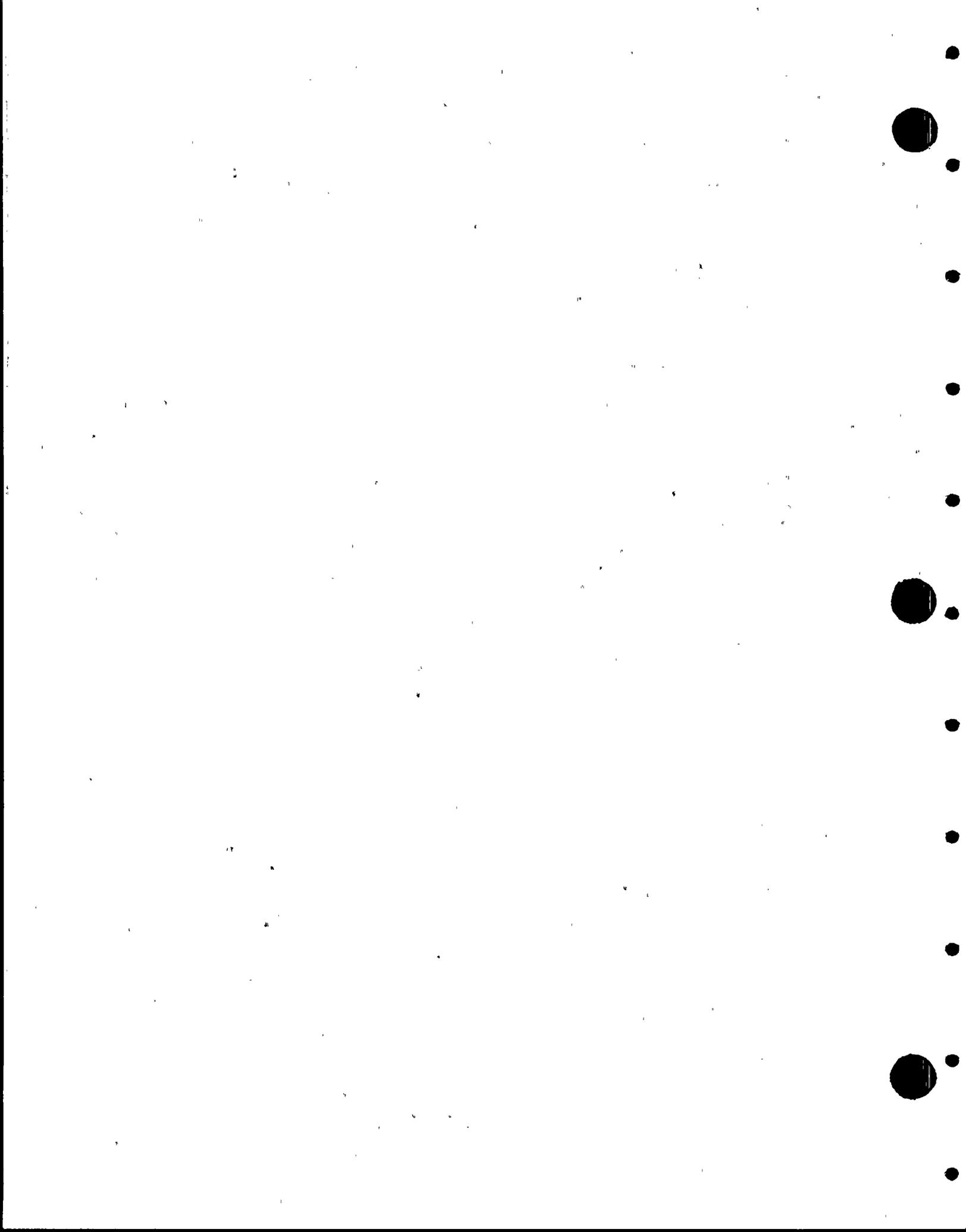
6 MR. TOSETTI: It's not easy. It's like a BWR on a
7 main steam isolation valve.

8 MR. KEITH: Of course, with the BWR, they are directly
9 connected to the reactor coolant, of course, so there is a
10 much different ballgame with a BWR.

11 MR. VAN BRUNT: Are there any other questions? I have
12 one. I want to go to Exhibit 3-33, just a clarification
13 under Item 3) there. It says, "In compliance. PVNGS uses
14 the more stringent GDC 56 for closed systems other than the
15 main steam and feedwater systems." Does that mean that the
16 main steam and feedwater systems just meet GDC 56, or
17 exactly what does it mean?

18 MR. KEITH: Well, in general, what it means is the
19 main steam and feedwater systems meet GDC 57 except that the
20 figure we just put up shows you how in some cases on the
21 main steam and feedwater systems we don't even meet GDC 57.
22 That's why I am saying that our position really is that the
23 secondary side of the steam generator and all the piping
24 inside containment is really part of the containment boundary.

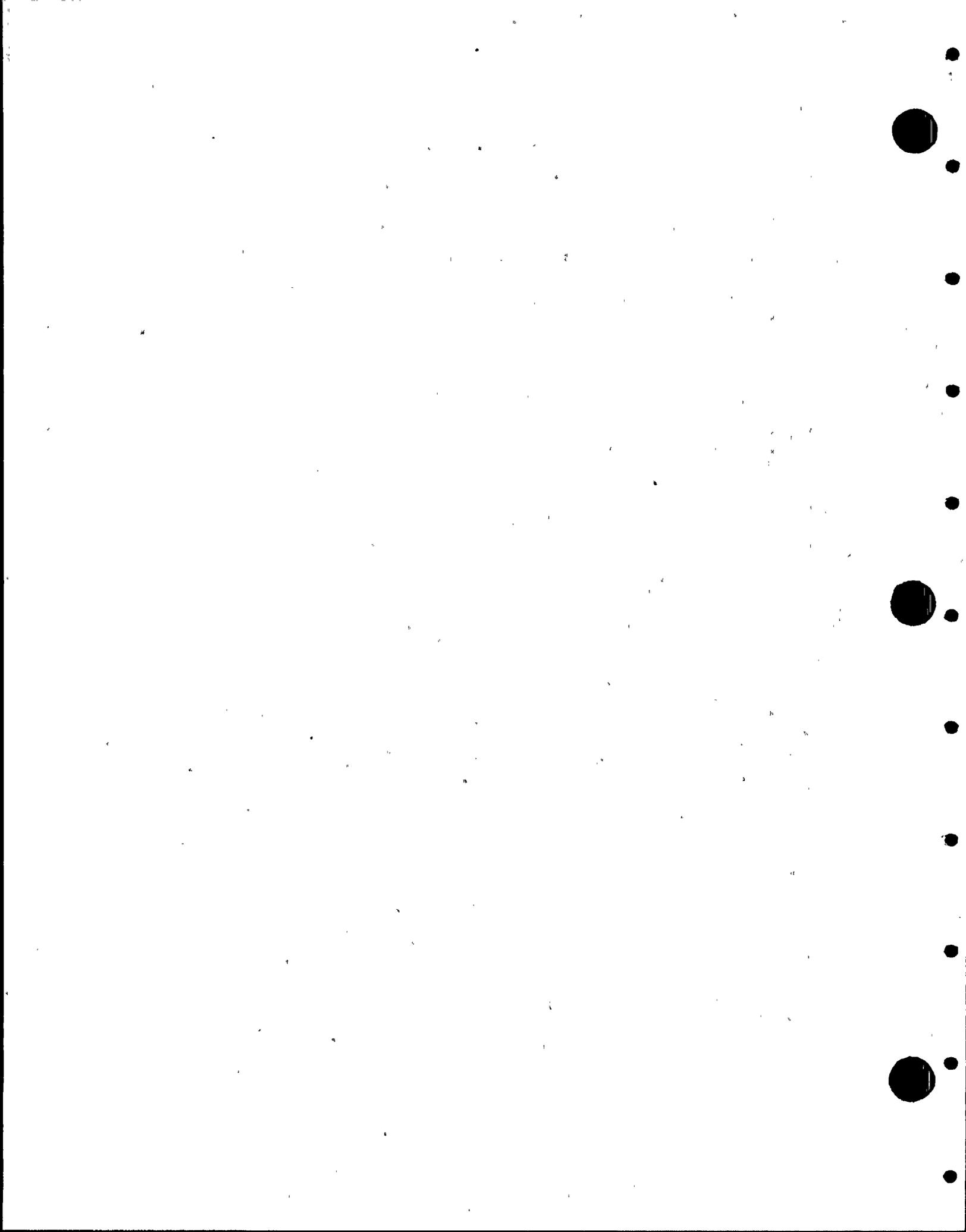
25 MR. VAN BRUNT: It isn't clear to me from this



1 statement here as to what criteria the main steam and
2 feedwater systems do meet. This really doesn't tell you.
3 You say you are in compliance with this other than for those.
4 Where do you cover those, those being the main steam and
5 feedwater systems.

6 MR. KEITH: What we have discovered, Ed, is basically
7 that there has been an inconsistency in the FSAR basically
8 in Chapter 6.2.4. We have been saying that the main steam
9 and feedwater systems meet GDC 57 closed system inside
10 containment, and there is amplification in the SRP about what
11 the closed system has to meet. It has to be Section III,
12 Class 2, it has to be protected from pipe whip, and all that,
13 inside containment. Our main steam and feedwater systems
14 do meet all those criteria. However, outside containment,
15 as we just saw in the slide we just put up, there are some
16 valves there which don't meet the criteria of GDC 57. In
17 Chapter 6.2.6 of the FSAR, we have been taking a different
18 position, not that we meet GDC 57, but that the secondary
19 side of the steam generator is part of the containment
20 boundary basically, and that is what the design currently
21 meets.

22 MR. VAN BRUNT: I guess I understand. The problem I
23 have is I think this statement is a little misleading, or,
24 maybe not misleading, but it is a little bit open-ended, I
25 guess, relative to the main steam and feedwater systems. I



1 am looking for a mechanic's item to fix it, I guess, more
2 than anything else.

3 MR. KEITH: Let me go off the record for a minute.

4 (Thereupon a brief off-the-record discussion ensued,
5 after which proceedings were resumed as follows:)

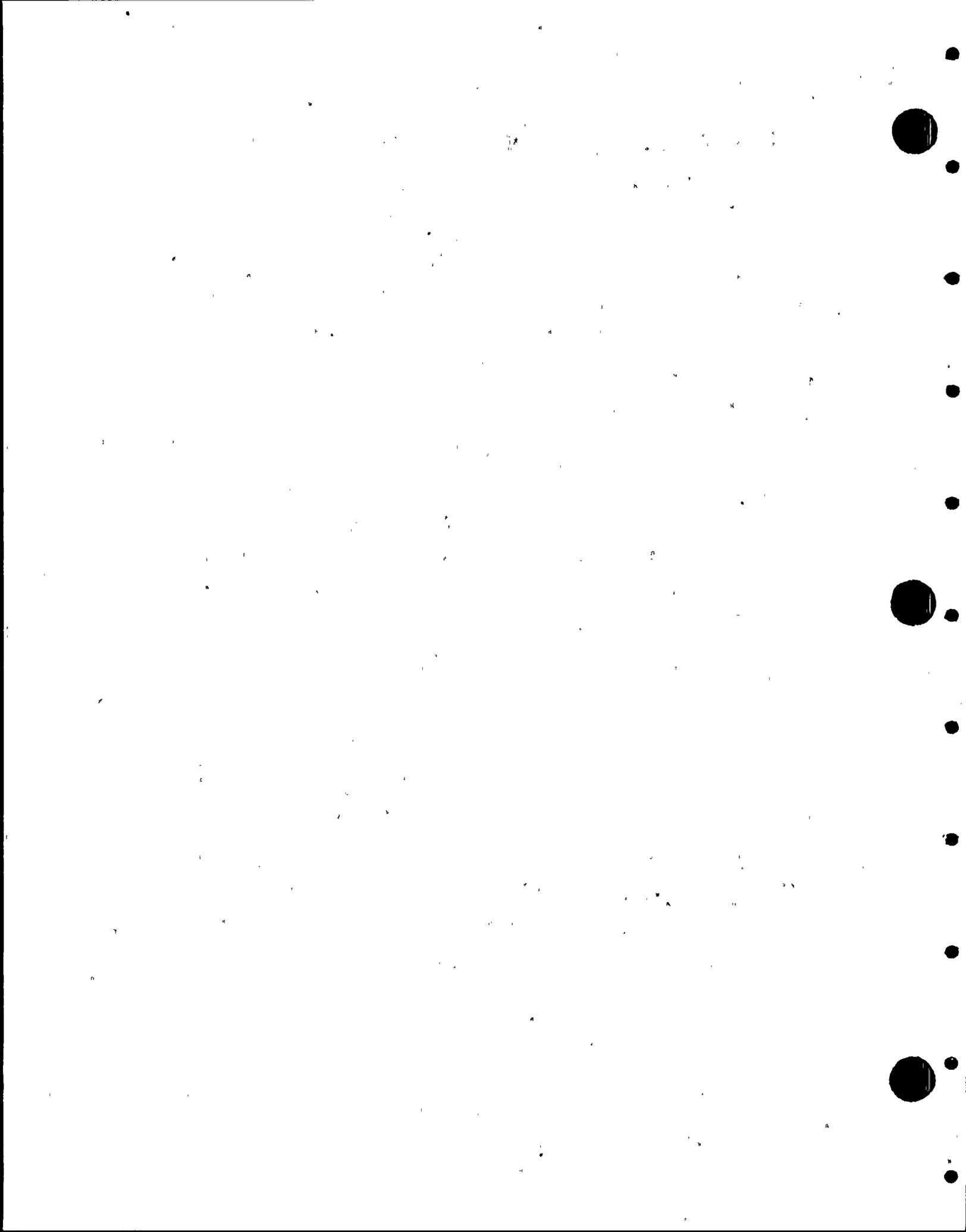
6 MR. VAN BRUNT: Dennis, you are going to have a
7 conversation with the NRC representatives relative to another
8 question. I understand you have a question in your mind
9 about this that you want to discuss with them. Why don't
10 you leave this open pending that discussion and then, if
11 necessary, fix this and any other slides that may be affected
12 by the outcome of your conversations, and then you can
13 document that into the letter that you send on the open items

14 MR. KEITH: That's fine.

15 MR. VAN BRUNT: Any other questions?

16 MR. SIMKO: I have a couple. On Exhibit 3-50, Item
17 G, I was wondering how you are complying with Item G on that
18 exhibit.

19 MR. KEITH: Inside containment, the eight-inch purge
20 line ties in with our 42-inch purge line, which is the
21 refueling purge, but that line ties into the 42, and then
22 at each outlet or inlet on the 42, there is a grille, but
23 even if something were to get through the grille, it would
24 have to follow a rather tortuous path to get to the valve
25 seat and reside there.

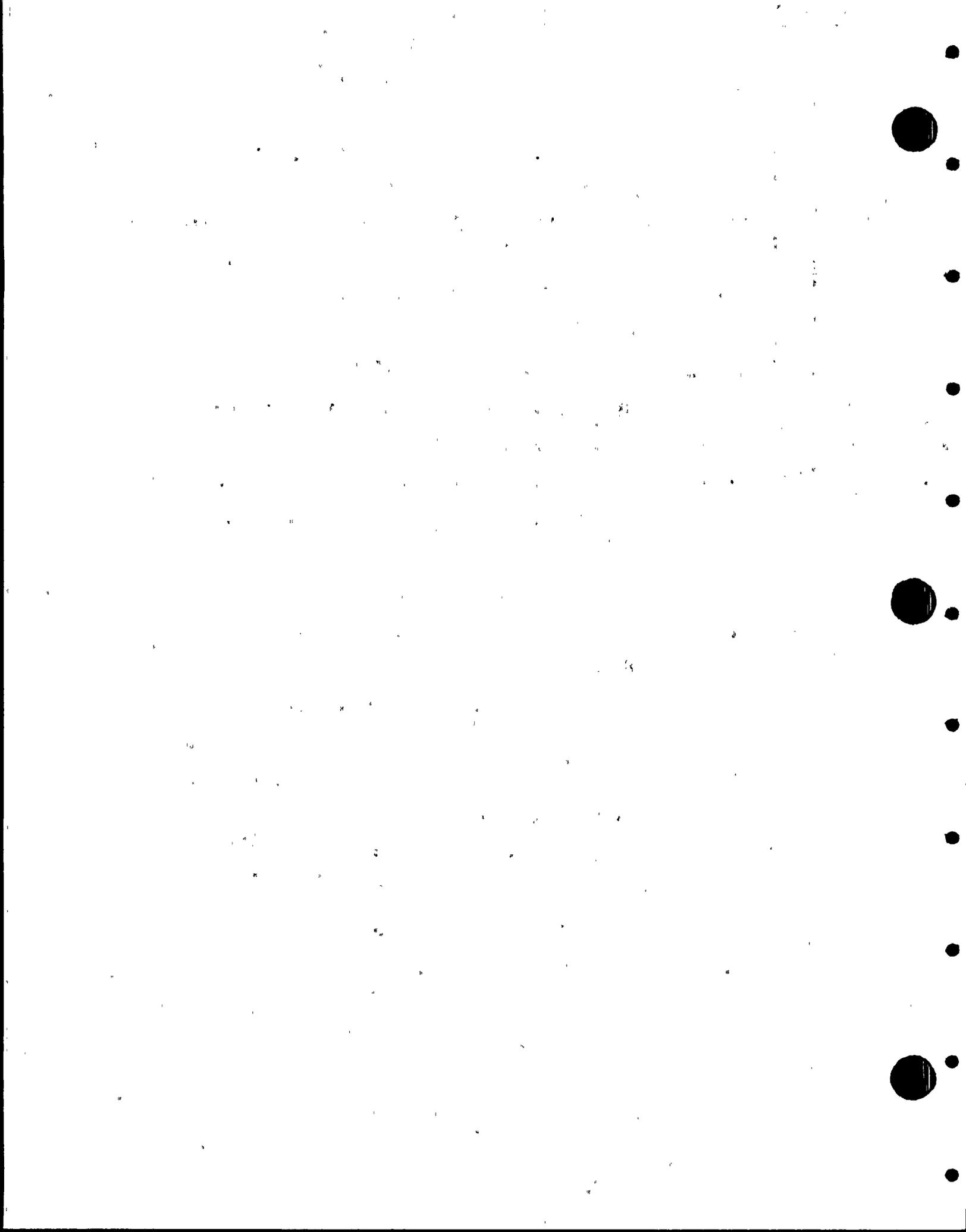


1 MR. SIMKO: I've got one other point here. I won't
2 belabor it, but it is really driving at the NRC position
3 on integrated leak rate testing and documentation. I think
4 in Section 6.2.6 in the FSAR, I have worked with Bill on
5 this, our FSAR states that we are going to use an ANS
6 45.2-1972 document for integrated leak rate testing. That
7 was spelled out in 10CFR50. That is an old document and
8 10CFR50, Appendix J, hasn't been updated for quite a while.
9 People are now using the Workshop ANSI ANS N274 workshop
10 document and we have in our FSAR that we will use that as
11 a Revision 3, November '78. The final workshop document
12 just came out. That is an ANS 56.8 document. Supposedly
13 the NRC does accept these documents as a workable method
14 for the integrated leak rate test, which essentially states
15 absolute methods for doing a mass plot analysis, but this
16 10CFR50 document doesn't say anything about this. Where do
17 we really stand on using this new document and shall we go
18 ahead and revise the FSAR to include this 56.8 document?

19 MR. VAN BRUNT: Bill, if I understand that correctly,
20 you are addressing that to the NRC representatives.

21 MR. SIMKO: Yes, indirectly.

22 MR. VAN BRUNT: John, either John, if you don't want
23 to answer that now, that's fine. One way for us to do is
24 write them a letter and ask them. I don't know if you are
25 in a position to answer that right now or not. Maybe we can



1 ask you unofficially.

2 MR. HUONG: Personally, I can, but not officially.

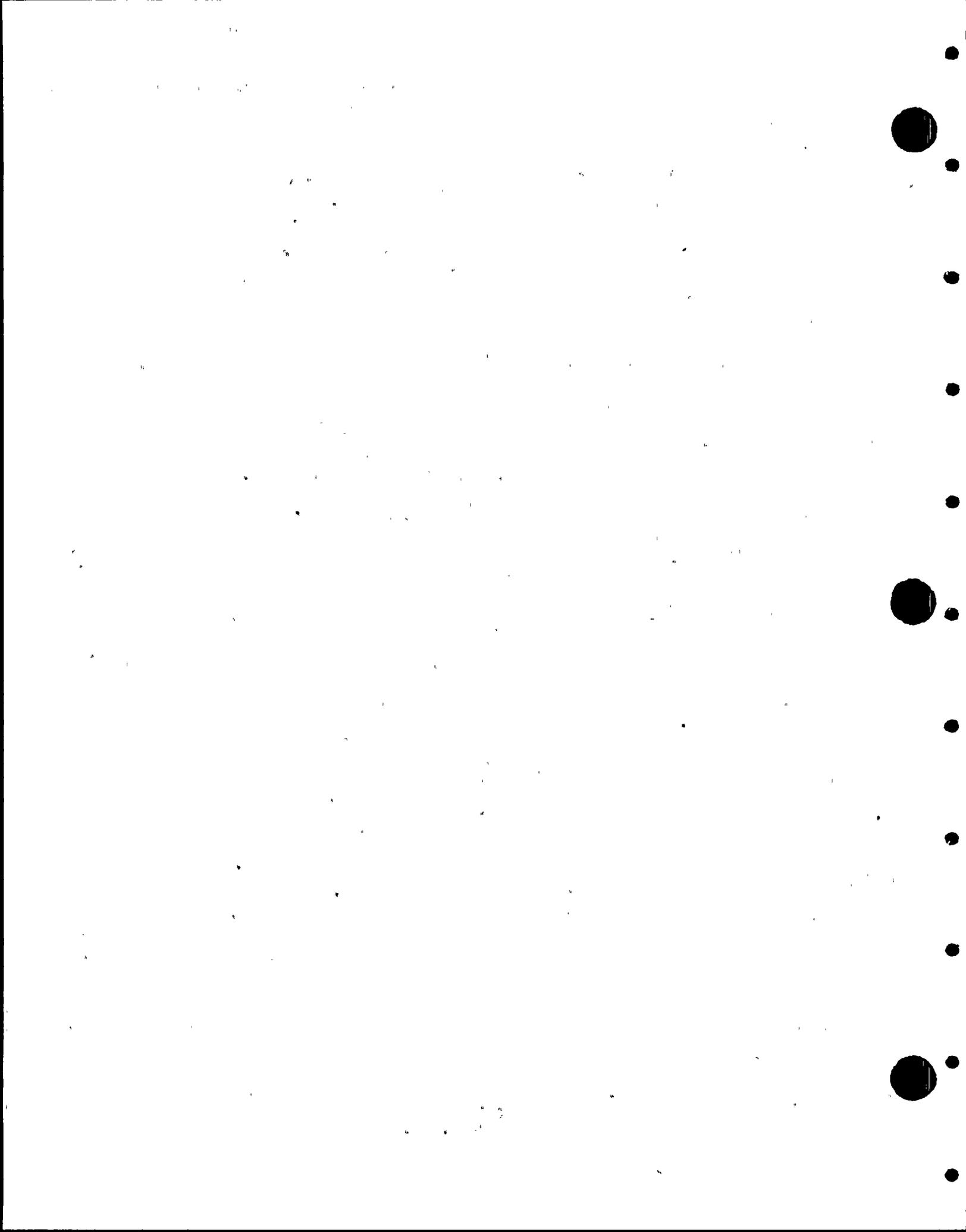
3 MR. VAN BRUNT: Possibly in the interim between now
4 and the time you have this other phone conversation with
5 the fellows, you could check into this and give us some
6 feedback at that time and then we can incorporate that into
7 one of our responses. I think that would be acceptable.

8 MR. SIMKO: Also, this TOP-1 report that talks about
9 total time analyses, that is back in 1972, also, that was
10 accepted. We put that in the FSAR, also, that we may go
11 ahead and use that method as an alternate to these other
12 methods. That seems to be the only document that allows you
13 to do a less than 24-hour test, so along with this conversa-
14 tion, if we go ahead and we do test ourselves and use the
15 56.8 document, which is a brand new document, can we go ahead
16 and do a less than 24-hour test? If everything looks fine
17 after, say, 12 hours and we extrapolate the data out 24
18 hours, can we stop at 12 hours and will the NRC write that
19 off? It seems to be going around in a big circle all the
20 time.

21 MR. VAN BRUNT: Could we ask you fellows if you could
22 look into that and get some feedback.

23 Do you have any other questions, Bill? Anybody
24 else?

25 Dennis, do you want to go to the NRC questions and



1 see if we can dispose of some of those?

2 MR. KEITH: Yes. Question 6.2.4-1. Spare penetra-
3 tions will be sealed by welded caps. These caps are
4 considered part of the containment liner plate. Penetrations
5 62B and 62C are isolated by a flange with double "O" ring
6 seals as shown in Amendment 2 to Figure 6.2.4-1, Assembly 27.

7 MR. HELD: On the same question, will the welded
8 caps provided on the spare penetrations be such that a
9 double barrier will exist?

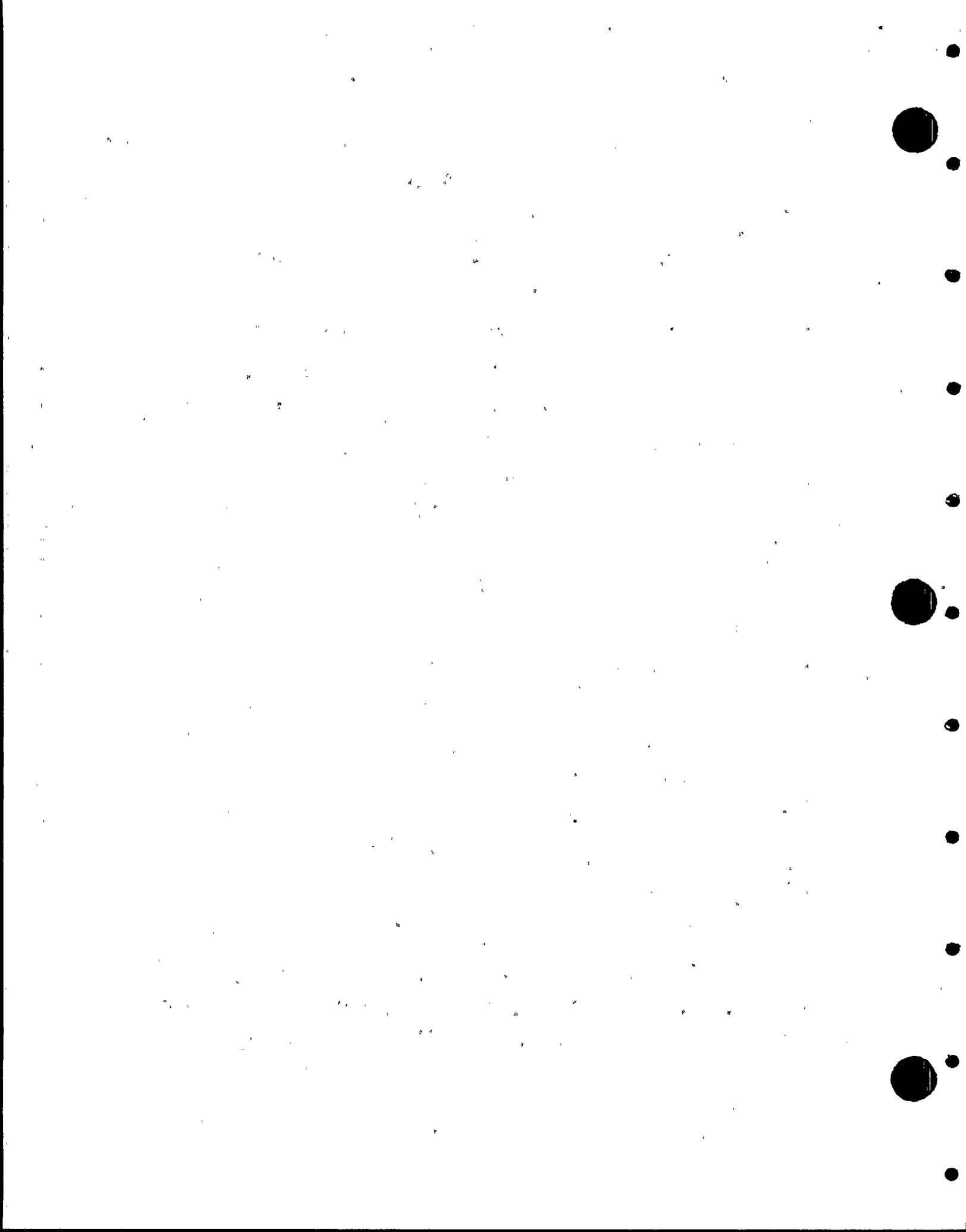
10 MR. KEITH: They would be equivalent to the contain-
11 ment liner plate.

12 MR. HELD: Fine.

13 MR. KEITH: Question 6.2.4-2 will be responded to
14 later.

15 MR. HELD: On 6.2.4-2, I need to make a clarification.
16 I know copies of this were passed around the room. I wish
17 you would all correct your copy. On the seventh line of
18 that question, the last two words are "screwed or." Those
19 two words should be deleted. You have a different typed
20 version than I have, but the words "screwed or" in the last
21 sentence should be deleted. That is our mistake.

22 MR. KEITH: Question 6.2.4-3. We have examined all
23 the containment isolation valves listed in Table 6.2.4-1,
24 and in almost every case, looking at the requirements for
25 accessibility and inspection on these valves, those



1 requirements dictate that we can't move the valves any
2 closer. However, the valves which are on the table which
3 we were just discussing, these are the valves tying into
4 the steam traps -- in fact, that is how we discovered our
5 problem that we were just discussing -- those valves could
6 be moved closer, so that will be a part of the discussion
7 we have with you. If they become designated as containment
8 isolation valves, then those could be closer, but none of
9 the other valves that we have looked at, and, as I have said,
10 we looked at all of them, none of the other valves could
11 reasonably be moved closer.

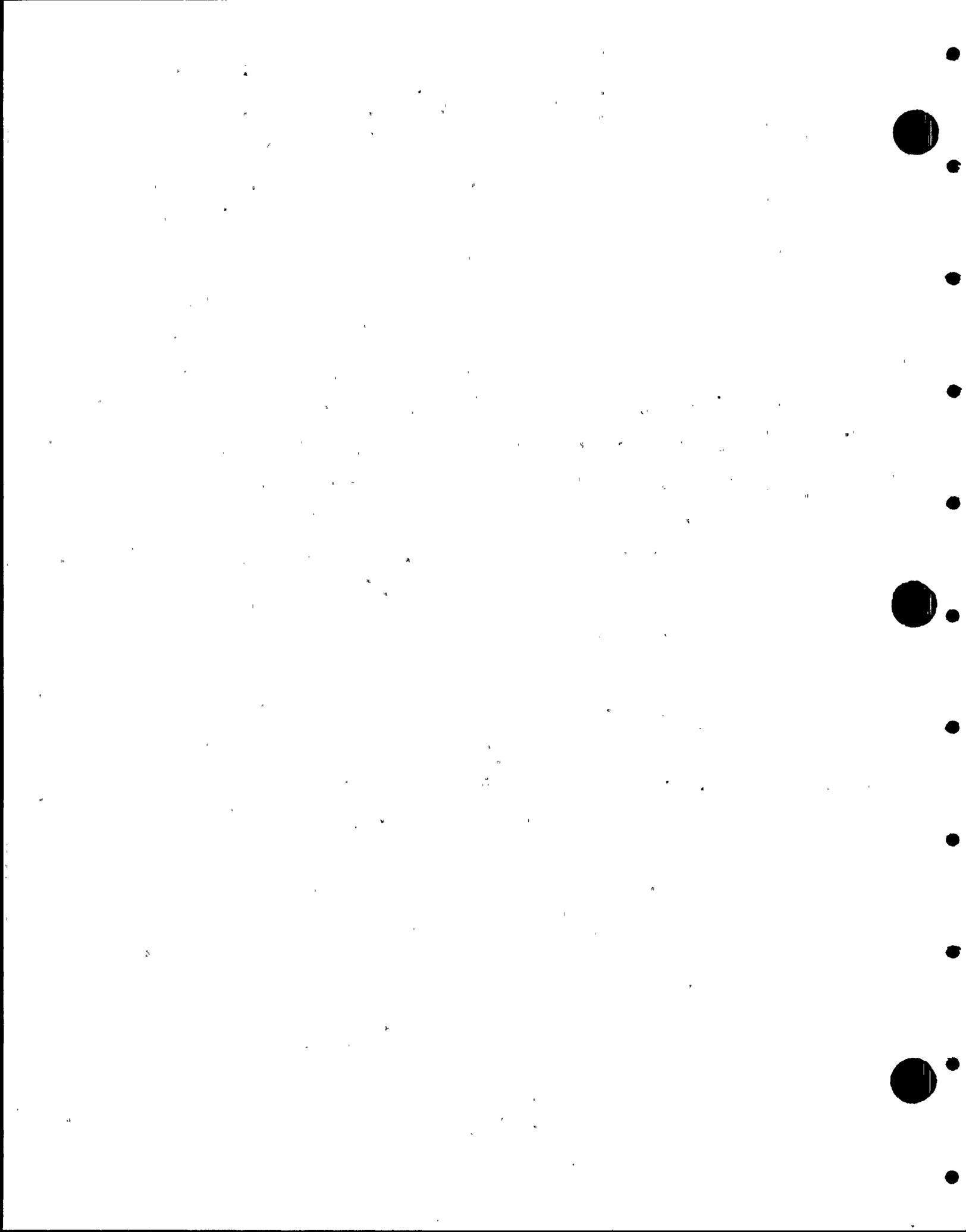
12 Question 6.2.4-4. These valves are the shutdown
13 cooling valves, which are normally closed. The only time
14 they would have to close on a CIAS is if we were in the
15 shutdown cooling mode, between 350 degrees and 200 degrees
16 cooling down to a cold shutdown, and you had a LOCA at that
17 point in time. That is even more improbable than a LOCA up
18 at pressure. In addition, the mass energy release rate is
19 much, much lower, and we feel that the 80-second closing
20 time would be sufficient and not of any concern.

21 MR. HELD: All right.

22 MR. KEITH: Question 6.2.4-5. These valve closure
23 times -- I think this may be an old question.

24 MR. HELD: It is.

25 MR. KEITH: They've got in an amendment.



1 MR. HELD: That question can be deleted.

2 MR. KEITH: Question 6.2.4-6. We believe this
3 information is included in Table 6.2.4-1 in Figure 6.2.4-1.

4 MR. HELD: I believe you're right.

5 MR. KEITH: Question 6.2.4-7. The question refers
6 to a vent line inside containment. If this valve were open,
7 of course, we would have leakage from the reactor coolant
8 system. We don't feel that there is a need to lock it shut.

9 MR. HELD: Is there a direct communication from that
10 valve back to Penetration 41?

11 MR. KEITH: Yes.

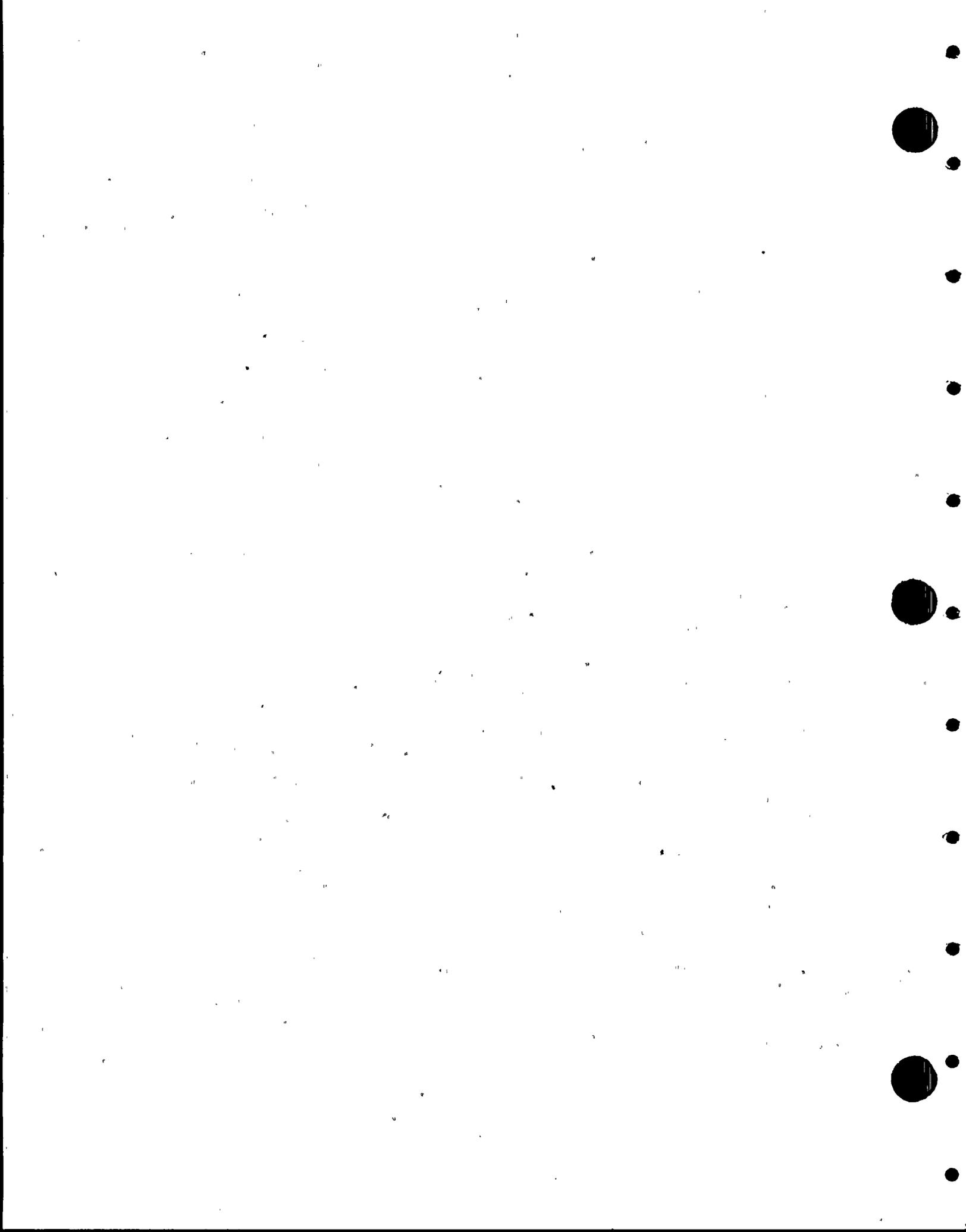
12 MR. HELD: I would say that we need some further
13 resolution on this, then. Can we leave that as an open
14 item?

15 MR. VAN BRUNT: Yes, we will mark that as an open
16 item.

17 MR. KEITH: Question 6.2.4-8. In the penetrations
18 you are referring to, the valves are related to the hydrogen
19 analyzer. It appears that we should either lock those valves
20 shut or provide a CIAS to them, so we will leave that open
21 and get back to you.

22 MR. STERLING: Those valves, are not those wrong, the
23 H₂ control on that one table that you had up there?

24 MR. KEITH: Well, they are tied off that same
25 penetration, but the valves that I was referring to are the



1 valves that go directly to the recombiner, but branching
2 off those lines on the containment side. Branching off
3 from the containment side of those isolation valves are
4 these lines going to the hydrogen analyzers, so that is the
5 concern that has been raised here.

6 Question 6.2.4-9. Let's see if I can just go down
7 the list. On the main steam valves, the first, fourth,
8 fifth, sixth, seventh, and tenth valves are all related to
9 the steam traps, so that is the one we have already discussed
10 and is left as an open item. I understand the third and
11 the --

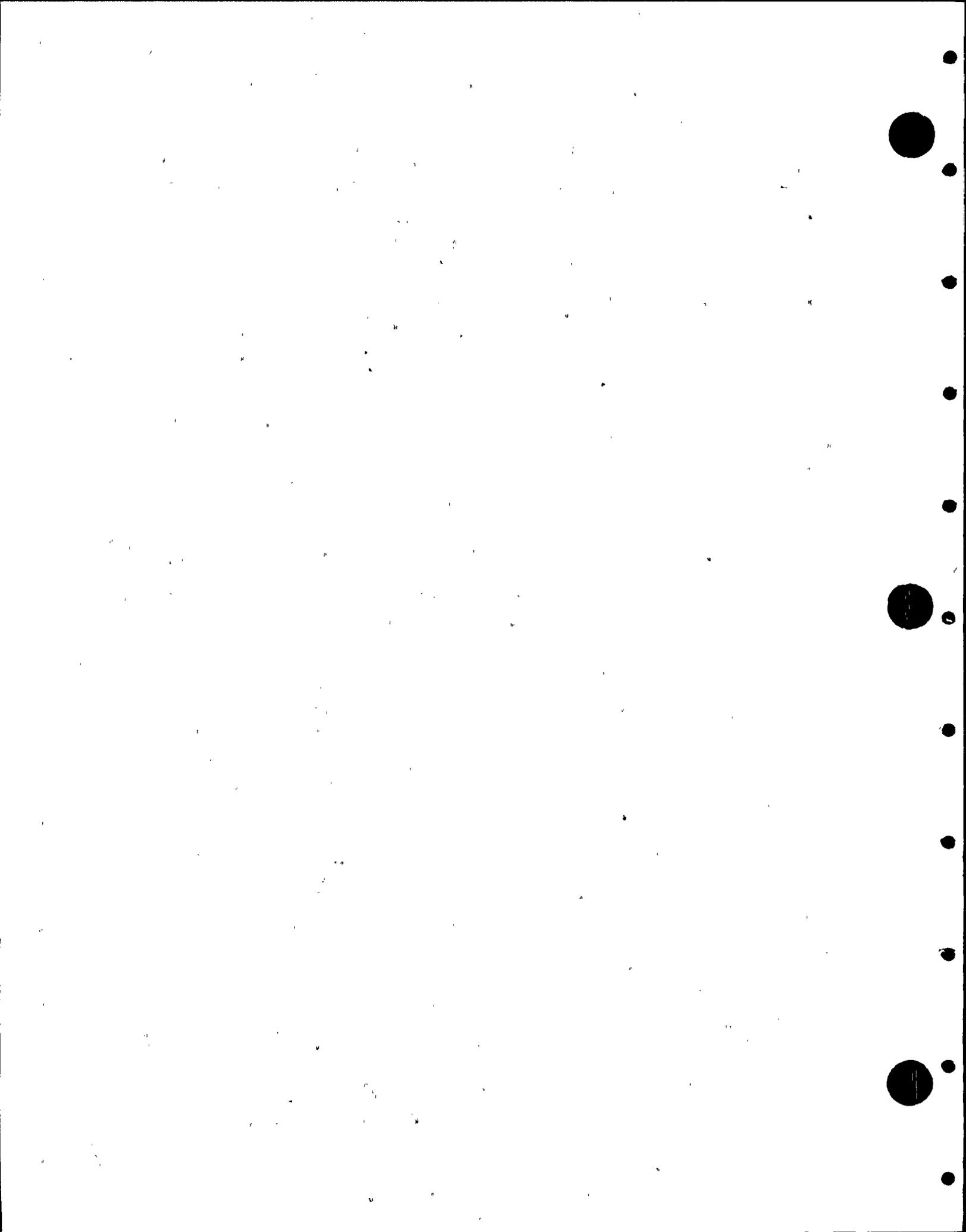
12 MR. BOLES: It is Valve SG-V603, which is the third
13 one, and 611 which are at issue, which we are going to try
14 and resolve here.

15 MR. KEITH: It has already been raised in the
16 question, so we are looking at the P&ID to try to answer
17 that one before we leave today.

18 MR. BOLES: I believe that was Bill Simko's Type C
19 test on those valves.

20 MR. KEITH: The remaining main steam valves are
21 atmospheric dump valves, which are normally closed and are
22 only used in the event we are cooling the plant down and are
23 under close manual control by the operators. We don't feel
24 any other controls are needed on those.

25 MR. HELD: Does this close manual control under the



1 operators meet the definition of administrative controls
2 that is contained in the SRP?

3 MR. KEITH: Yes. When I say close manual controls,
4 the only time they would be open the operator would be
5 directly controlling that valve and auxiliary feedwater
6 valves, so his full attention would be on those valves.

7 MR. HELD: Does that mean that they will stay locked
8 closed during normal operation?

9 MR. KEITH: There is no locking mechanism as such
10 for those valves. There are some solenoids. In order to
11 open the valves, there are two separate manual actions which
12 an operator has to do in order to open the valves. They are
13 air-operated valves and do fail closed on loss of air as
14 well as on loss of power to the solenoids, but they are not
15 tied into the containment isolation actuation system.

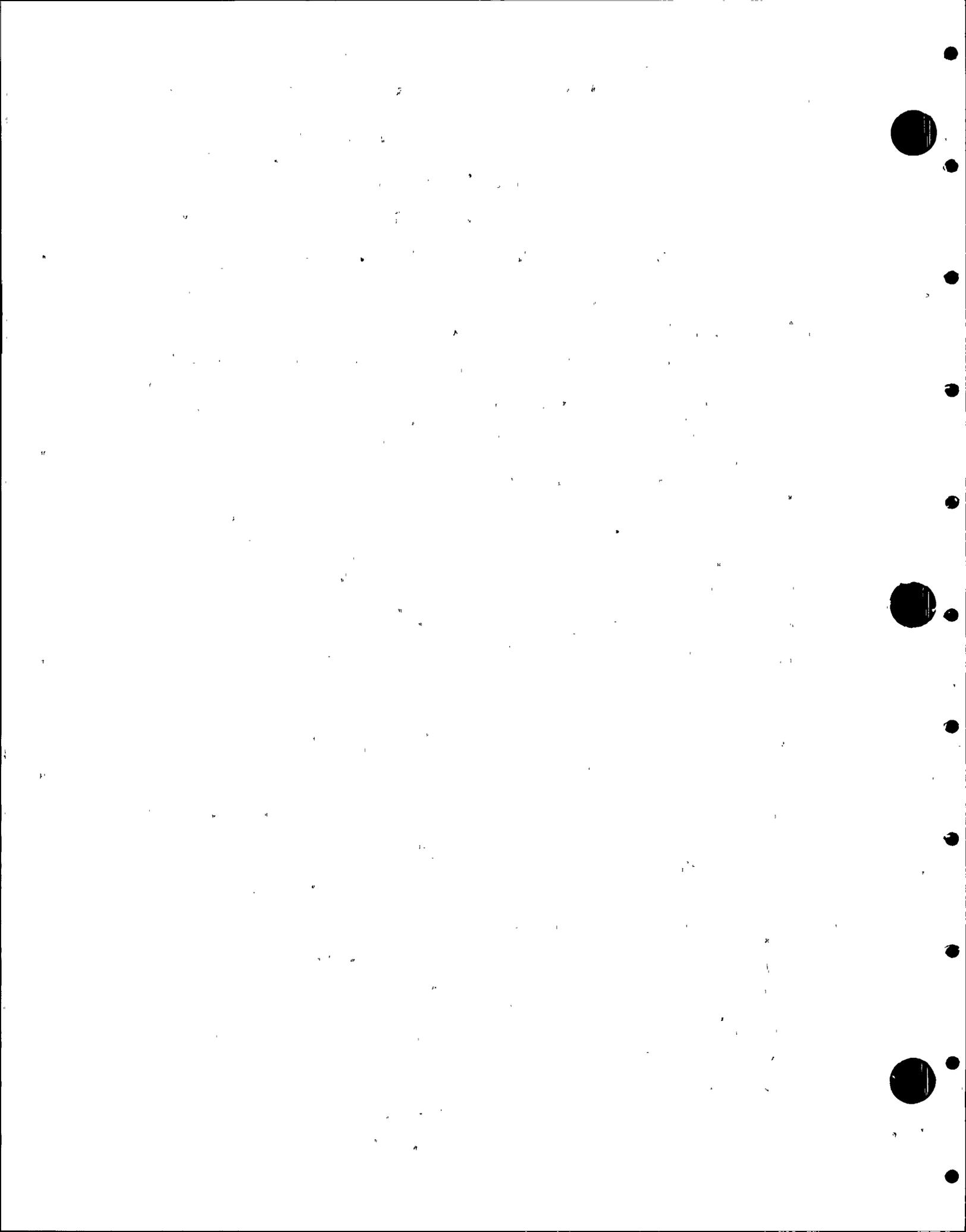
16 MR. HELD: We will have to think about that one.

17 MR. KEITH: The fire protection valve, FP-V089, that
18 should be locked closed, and we will check the P&ID on that.

19 Penetration 9 is a radwaste penetration. That
20 valve does close on CIAS. It is shown in FSAR Figure 9.3-4.

21 The remaining valves, all associated with
22 containment purge, all close on CIAS or CPIAS. Those are
23 shown on Figure 9.4-13.

24 MR. HELD: For that valve FP-V089, I understand that
25 it closes on CIAS, but what I am looking for here is failing



1 closed rather than failing as is.

2 MR. KEITH: Okay, that's your question. That valve
3 is a manual valve is our understanding.

4 MR. HELD: Pardon me?

5 MR. KEITH: Our understanding is that that valve is
6 a manual valve.

7 MR. HELD: I referred to the wrong valve. Excuse me.
8 I was talking Valve RD-UV023.

9 MR. KEITH: That does fail as is. It is a motor-
10 operated valve. They normally fail as is.

11 MR. HELD: Well, I still think it should fail closed,
12 so maybe we should leave this as an open item for further
13 discussion. If that means changing the type of operator,
14 that's something we will have to discuss.

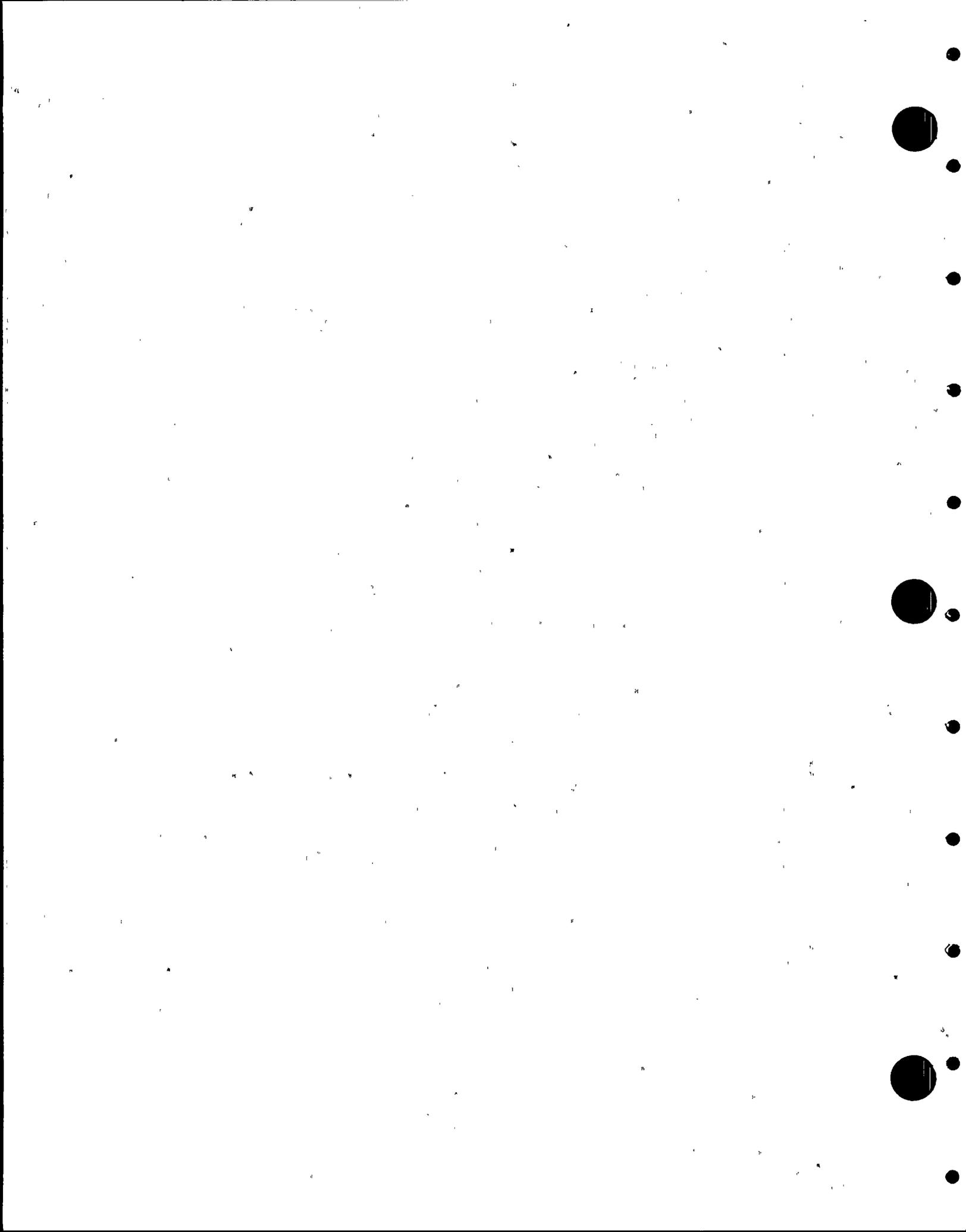
15 MR. KEITH: I gather, John, that your problem with
16 containment purge valves is that they are all motor operators.

17 MR. HELD: Yes.

18 MR. KEITH: Keep in mind that the inside containment
19 valves and the outside containment valves are supplied from
20 different electrical power supplies, so we do take care of a
21 single failure in that way.

22 MR. HELD: That is another thing we are going to have
23 to leave open for now, I think.

24 MR. KEITH: Question 6.2.4-10. Where we have a valve,
25 we can lock it closed. In some of the areas, we just have a



1 plug connection for this test connection, so there is really
2 no practical way to lock it as such.

3 MR. HELD: Well, taking the equipment hatch as an
4 example, the figure in the FSAR which describes that shows
5 a big flange type connection just on one side of the
6 containment, so it appears that your double barrier consists
7 of the two "O" rings in your double "O" ring seal.

8 MR. KEITH: That's correct.

9 MR. HELD: My concern is that that test connection may
10 be inadvertently left open defeating one of your two barriers.

11 MR. KEITH: We will take that as an open item and
12 address all those kinds of connections.

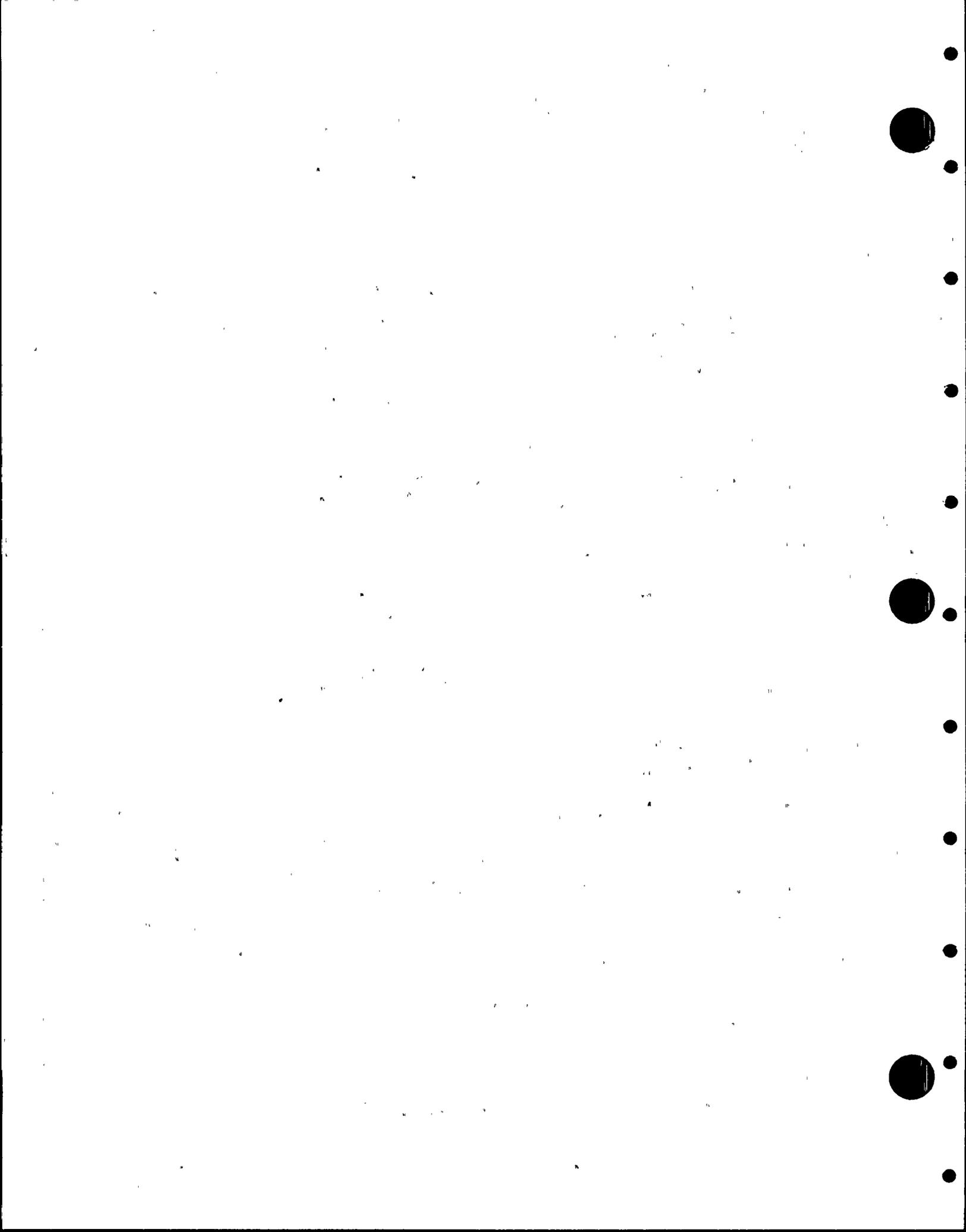
13 MR. VAN BRUNT: Are there any other comments on
14 this section of the presentation?

15 It is just 2:30. Why don't we just take about a
16 five-minute break at this point and then we can finish up
17 the hydrogen and we'll be off.

18 MR. KEITH: Fine.

19 (Thereupon a brief recess was taken, after which
20 proceedings were resumed as follows:)

21 MR. KEITH: Now we will go into the Combustible Gas
22 Control. As all of you know, NRC and industry have been
23 considering the degraded core and large amounts of hydrogen
24 released. This is being studied by the NRC and industry.
25 We will not cover that in the presentation today. In the



1 looks that have been done at large PWR containments, which
2 is what we have at Palo Verde, it appears that excessive
3 amounts of hydrogen are not a problem, but, in any event,
4 we will not be discussing that today.

5 MR. VAN BRUNT: Dennis, what will be the limits of
6 your discussion with regard to generation generally speaking?

7 MR. KEITH: What the current regulations are in the
8 Standard Review Plan and Regulatory Guides and all.

9 With that, Nick Baldasari will present Combustible
10 Gas Control.

11 MR. BALDASARI: Figure 1 is the simplified P&ID for
12 the containment hydrogen control system. The containment
13 penetrations are motor operated, double isolation valves.
14 All of this system is Q Class safety grade. The containment
15 atmosphere is sampled through this line here (indicating)
16 going to the containment hydrogen recombiner system. These
17 (indicating) are two movable units that are installed for
18 the three units. The line returns back to the containment,
19 through the containment, through the other motor-operated
20 valve and check valve. The containment post-accident hydrogen
21 analyzer taps off at this point. Samples here go through
22 the analyzer and come back. There is a nonsafety grade
23 hydrogen purge unit that is installed. It is a nonsafety
24 grade backup. The code break between safety and nonsafety
25 occurs down here (indicating), thus these isolation valves

[The page contains extremely faint and illegible text, likely bleed-through from the reverse side of the document. The text is scattered across the page and cannot be transcribed accurately.]



1 here (indicating). It purges through. The filter unit is
2 over here (indicating) and extends to the plant vent. The
3 cooling for the heat exchanger for the recombiner takes air
4 from the interior of the auxiliary building, goes through,
5 and then discharges back out into the corridor in the
6 auxiliary building.

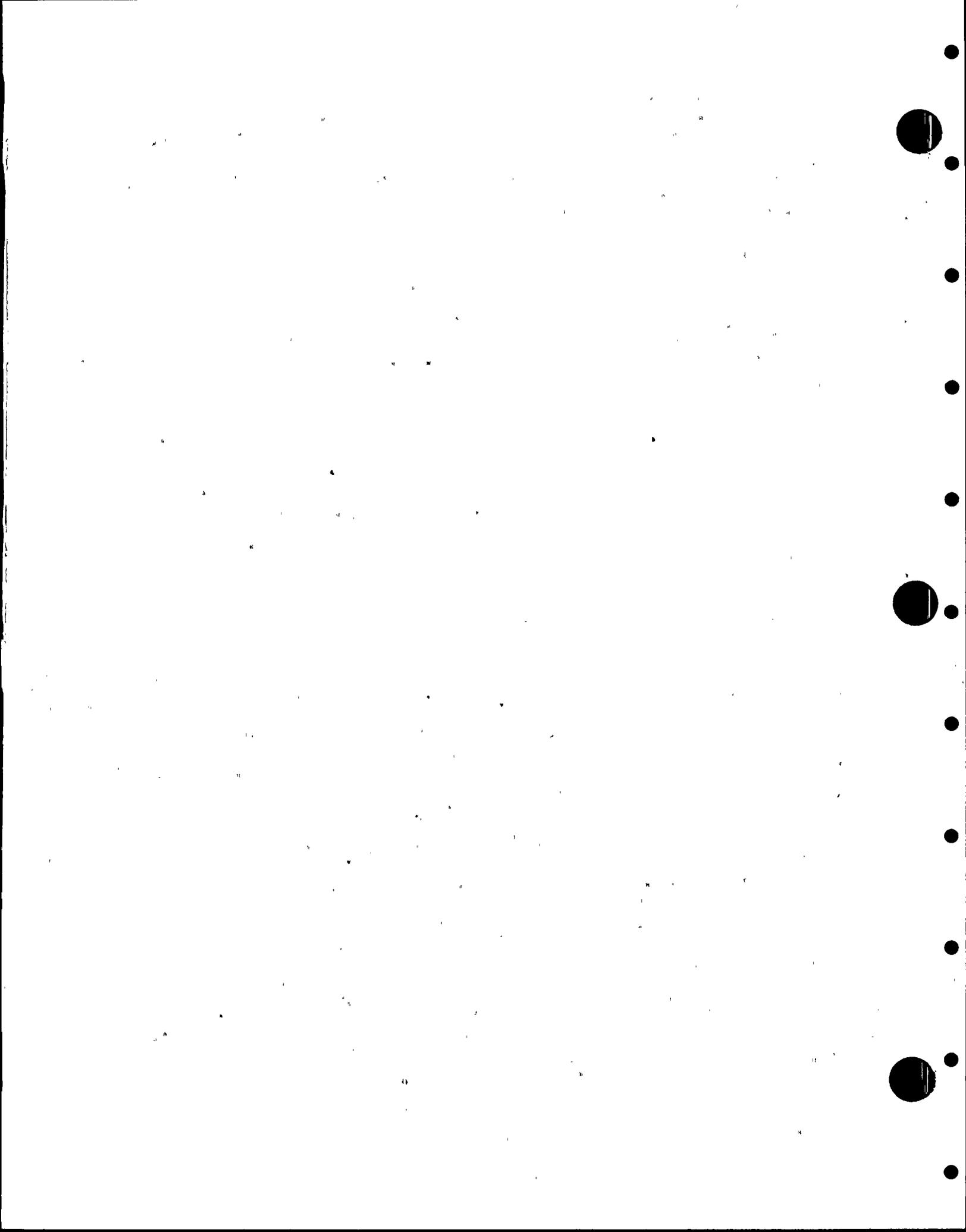
7 Exhibit 4-1, Combustible Gas Control in Containment
8 Design Criteria.

9 1) The containment hydrogen recombiner system
10 should be designed with two external mobile recombiners for
11 the three units, and shall be capable of being connected
12 to the required services within 72 hours and initiated within
13 100 hours following a loss of cooling accident.

14 2) The post-accident hydrogen purge system shall
15 be designed as a backup to the hydrogen recombiner systems.
16 The system shall consist of a mobile filter unit connected
17 to any of the units as needed.

18 3) The containment hydrogen control system shall
19 be designed to be manually initiated prior to the hydrogen
20 concentration reaching 3.5% by volume for the hydrogen
21 recombiners and at 4.0% by volume for the post-accident
22 hydrogen purge system. This is to prevent the concentration
23 of hydrogen from exceeding the lower flammable limit of
24 4.0% by volume.

25 4) The maximum containment temperature and



1 pressure for the components at the system shall be as shown.

2 5) Provision shall be made for continuation of
3 air flow through the filter unit to remove heat generated
4 by radioactivity following use post-LOCA.

5 Exhibit 4-2, continuing Design Criteria.

6 6) Each recombiner and the filter unit shall
7 continue to function after exposure to 1×10^6 rads.

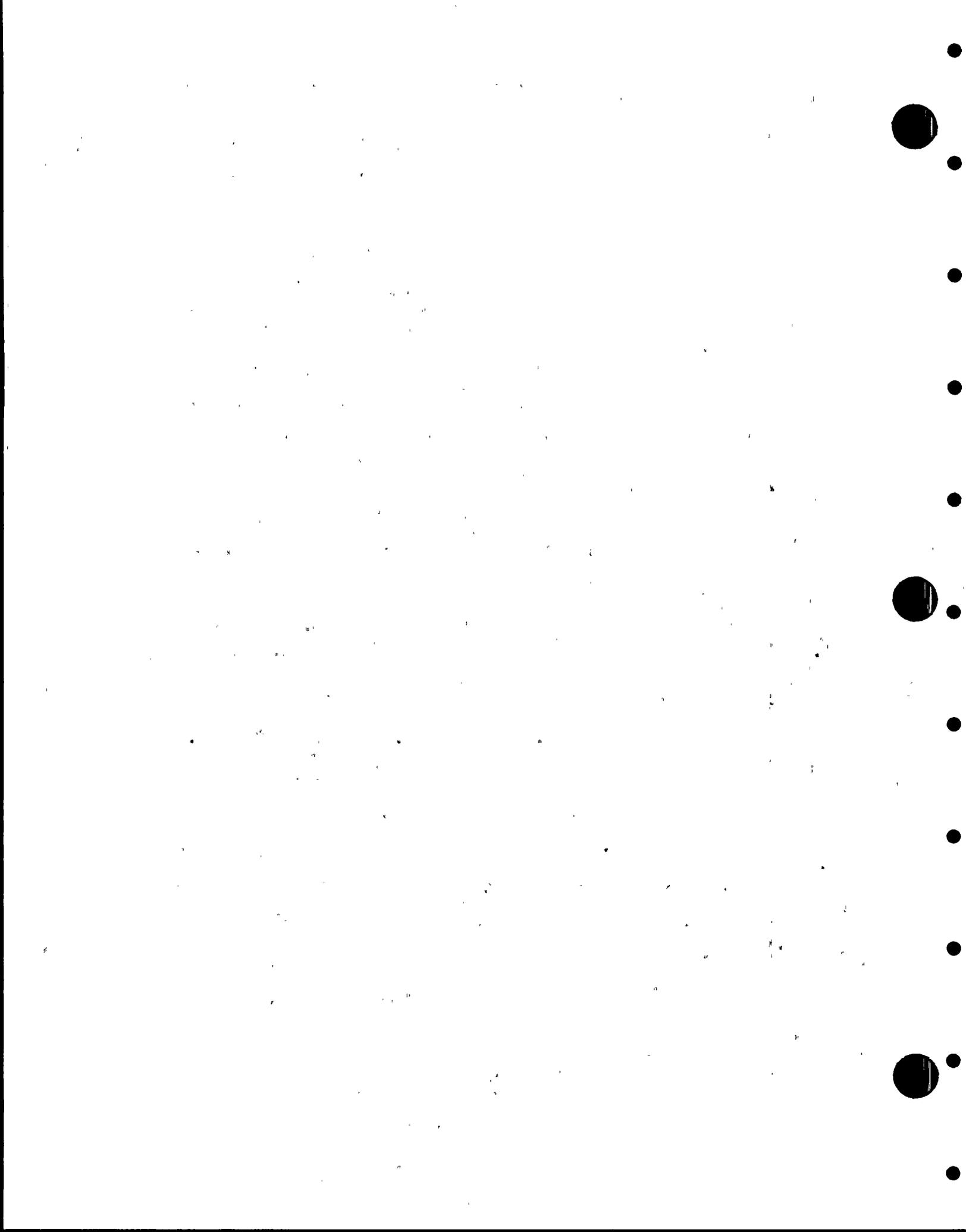
8 7) Hydrogen concentration in the containment
9 and recombiner performance shall be monitored periodically
10 using hydrogen analyzers.

11 8) The Seismic Category I recombiner system shall
12 be designed such that components remain functional after
13 a safe shutdown earthquake with the recombiner shut down.
14 Components of the recombiner system shall remain functional
15 during and after an operating basis earthquake with the
16 recombiner operating.

17 9) Both hydrogen recombiners and the hydrogen
18 analyzers shall be provided with Class IE power.

19 10) Special electrical receptacles fed from the
20 Class IE power system shall be provided at the operating
21 locations of the external mobile recombiners. Power leads
22 on the recombiners shall be provided with mating plugs that
23 will fit no other equipment within the unit.

24 Exhibit 4-3, System Description. The recombiner
25 system consists of two mobile, safety grade, thermal hydrogen



1 recombiners capable of processing 50 standard cubic feet
2 per minute of containment atmosphere gas containing up to
3 5% hydrogen. All equipment is located external to the
4 containment except for the piping, two motor-operated
5 containment isolation valves, and two check valves. These
6 (indicating) are the six motor-operated valves and two
7 check valves on the discharge back into the containment.

8 Exhibit 4-4, System Operation. The post-accident
9 hydrogen analyzers are placed in operation.

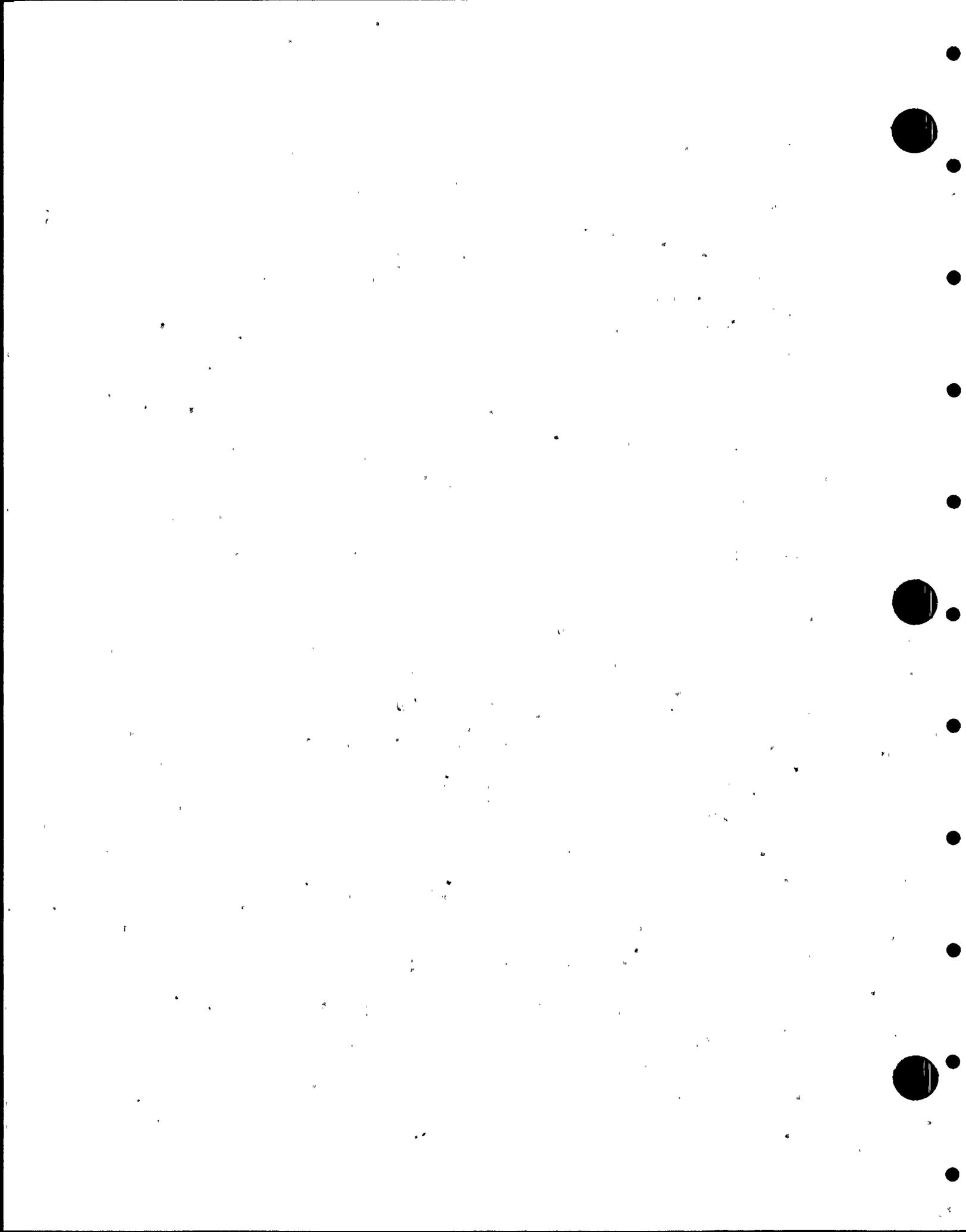
10 The hydrogen recombiners, including the control
11 cabinets, are connected to the containment penetrations and
12 started at or below 3.5 volume percent hydrogen concentra-
13 tion.

14 The inlet gas temperature is raised by the
15 recombiner heaters until the hydrogen-oxygen reaction starts
16 at approximately 1300 degrees Fahrenheit.

17 The recombiner blower creates a differential
18 pressure to return the recombiner exhaust gas to the
19 containment.

20 In the event that both recombiners are inoperable,
21 the purge system may be used to exhaust the containment
22 atmosphere through filters to the outside environment at a
23 rate of 50 standard cubic feet per minute.

24 Exhibit 4-5. The calculations for the containment
25 hydrogen build-up used the following assumptions:



1 Containment temperature maximum is 300 degrees
2 Fahrenheit.

3 Containment net free volume is 2.6×10^6 cubic feet.
4 Zirconium-water reaction fraction is 5%. This is
5 based on 5 times the 1% required by 10CFR50.

6 The operating power level was assumed at 3,817
7 megawatts.

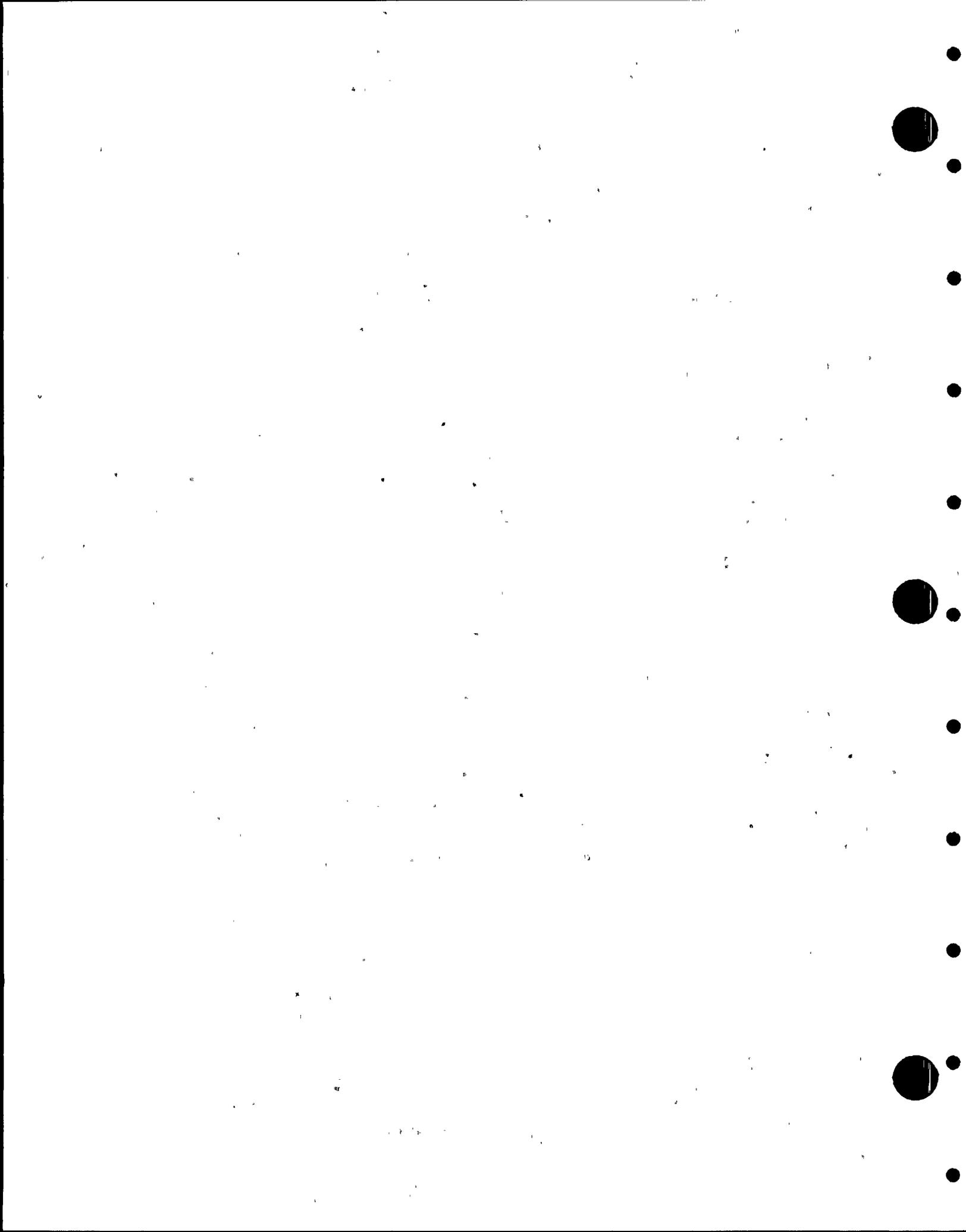
8 234 pounds of aluminum were assumed within the
9 containment.

10 58,498 pounds of zirconium were used within the
11 core, 26,335 pounds of zinc galvanized steel spread over a
12 278,940 square feet area, 7,200 pounds of zinc as zinc-based
13 paint over 181,000 square feet.

14 I have a correction. The slide didn't show it
15 very well. 284 pounds instead of 234.

16 Figure 4-2. This is a summary of the results of
17 the calculation. This curve here (indicating) shows the
18 accumulated hydrogen buildup following the accident. It
19 reaches 3.5% by volume at nine days after the accident. With
20 one recombiner operating, the peak is reached at about
21 16 days at 3.8%. It stays at that level until about 22 days
22 and then starts dropping off. With two recombiners, the
23 hydrogen drop-off is faster.

24 The individual contributions are shown on these
25 other curves: For zirconium-water, this one right here



1 (indicating); for zinc, this one right here (indicating);
2 the radiolysis is this one (indicating); and for aluminum
3 is this one right here (indicating). This is a revised
4 figure from the one that is in Section 6.2.5. The FSAR
5 will be revised or amended to include this figure.

6 MR. KEITH: That concludes this portion of the
7 presentation. Are there any questions?

8 MR. VAN BRUNT: Rich.

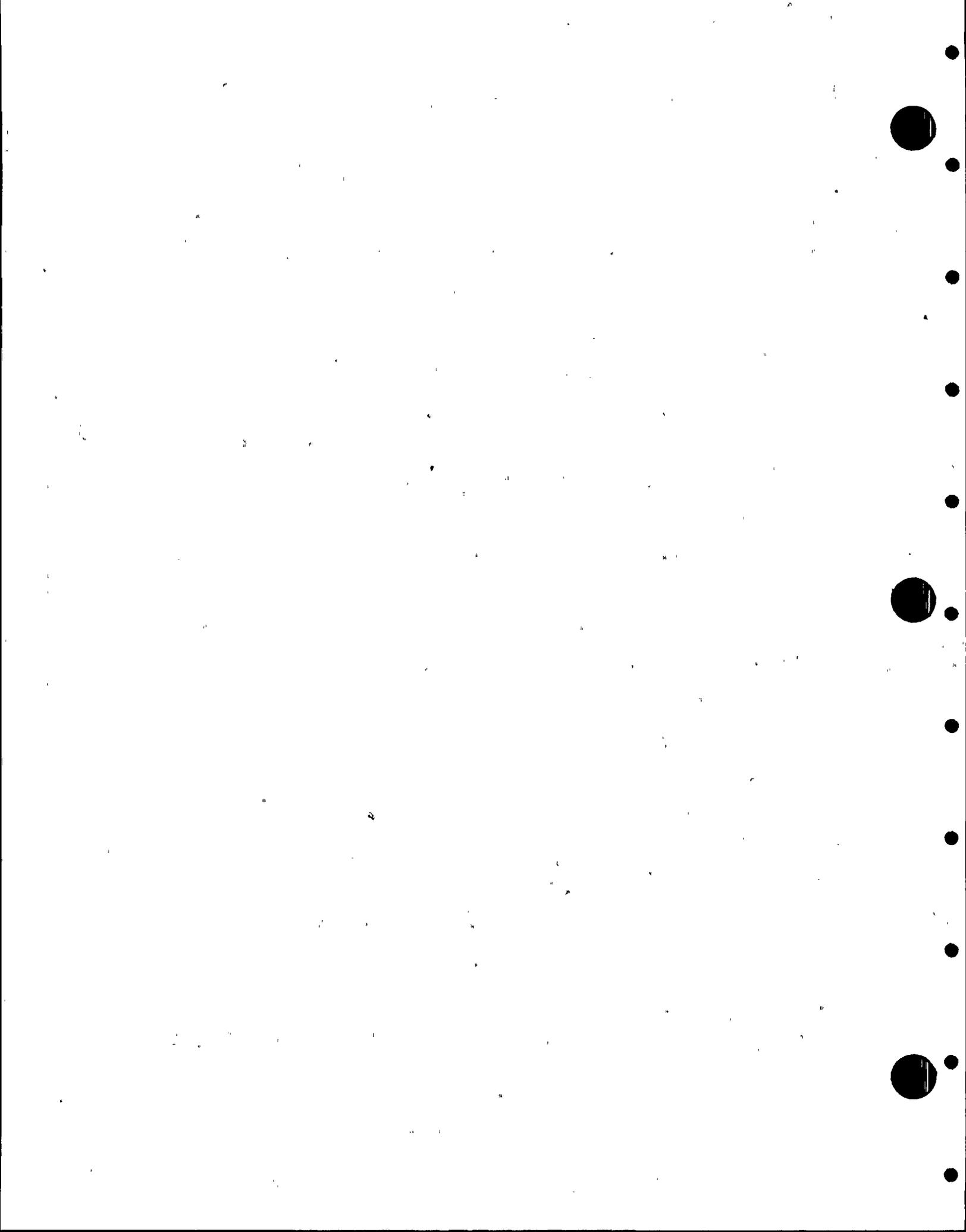
9 MR. TOSETTI: I have a question on Exhibit 4-1. Item
10 No. 4) on the pressures indicates the hydrogen analyzer
11 pressure and recombiner, et cetera. Are those designed
12 pressures or expected operating pressures?

13 MR. KEITH: Design pressures.

14 MR. TOSETTI: In the procedures following LOCA and
15 the hydrogen buildup, the purge acts as a backup to the
16 recombiner system. Would the purge be expected to come on
17 at the same time as the recombiner system and, if so, why
18 are they different pressures?

19 MR. BALDASARI: May I have Figure 4-2? The reason
20 for the difference is the purge unit is designed to be put
21 into operation at 4.0 volume percent versus 3.5 volume
22 percent. There is an additional buildup you would get at
23 this point before you would be required to put the purge
24 unit on in about 14 days.

25 MR. TOSETTI: On Exhibit 4-2, you talk about in Item



1 No. 6) the radiation level of 10^6 rads. Does that include
2 the activity buildup on the filter if the purge unit is
3 used?

4 MR. BALDASARI: This would include that value. The
5 primary reason for the 10^6 rads was airborne dose primarily.

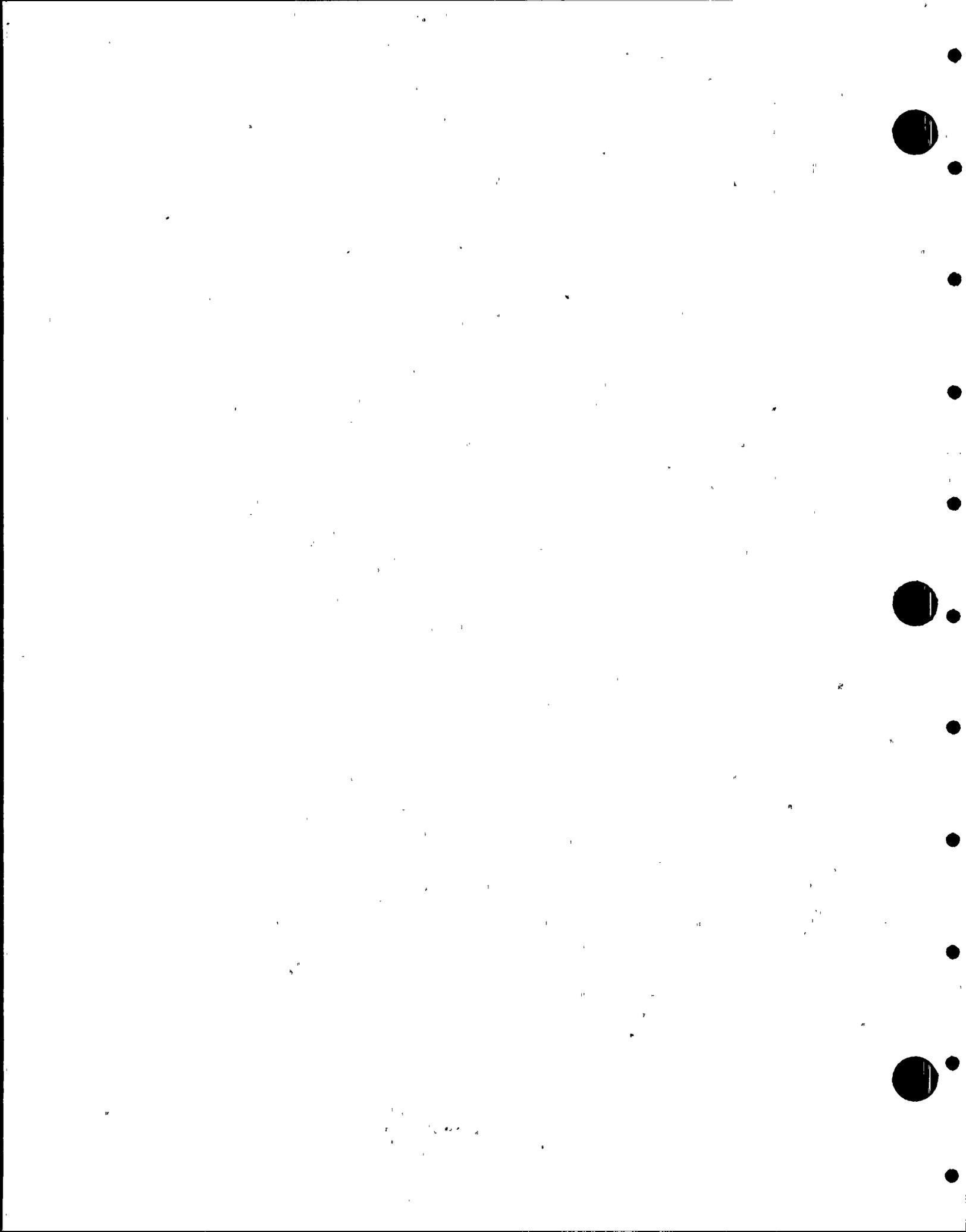
6 MR. TOSETTI: On the purge system, it is an open line
7 from the containment, and if you purge, then the lines would
8 be open. What is the driving force for that purge if the
9 containment is at atmospheric pressure?

10 MR. BALDASARI: May I have the simplified P&ID? If
11 that condition were in effect and it were lower than, let's
12 say, its atmospheric driving force would be, we could supply
13 service air through this connection here (indicating) and
14 into the containment through the return line and purge it
15 out this way (indicating). We could supply air at 50 standard
16 cubic feet per minute.

17 MR. TOSETTI: Would that produce enough pressure in
18 the containment to drive 50 cfm through the filter?

19 MR. KEITH: It would at some point in time.

20 MR. TOSETTI: I guess my concern, and it may be okay,
21 but it is not intuitively obvious that if there is such a
22 large surge volume there that it would produce it at the
23 same time that you needed the flow. There is time delay
24 between the initiation of the air and the flow through the
25 filter system.



1 MR. KEITH: You are correct. Of course, there would
2 be a time delay. We have not calculated that time delay.

3 Let me just for the record state that the purge
4 system would only be used if both recombiners failed, and
5 that is strictly a last resort, because, of course, you are
6 discharging radioactivity to the atmosphere. So it is
7 strictly a last resort system.

8 MR. VAN BRUNT: Are you satisfied?

9 MR. TOSETTI: I think you may want to look at it
10 just to see if there is a significant time delay or if it is
11 something reasonable that could be accommodated.

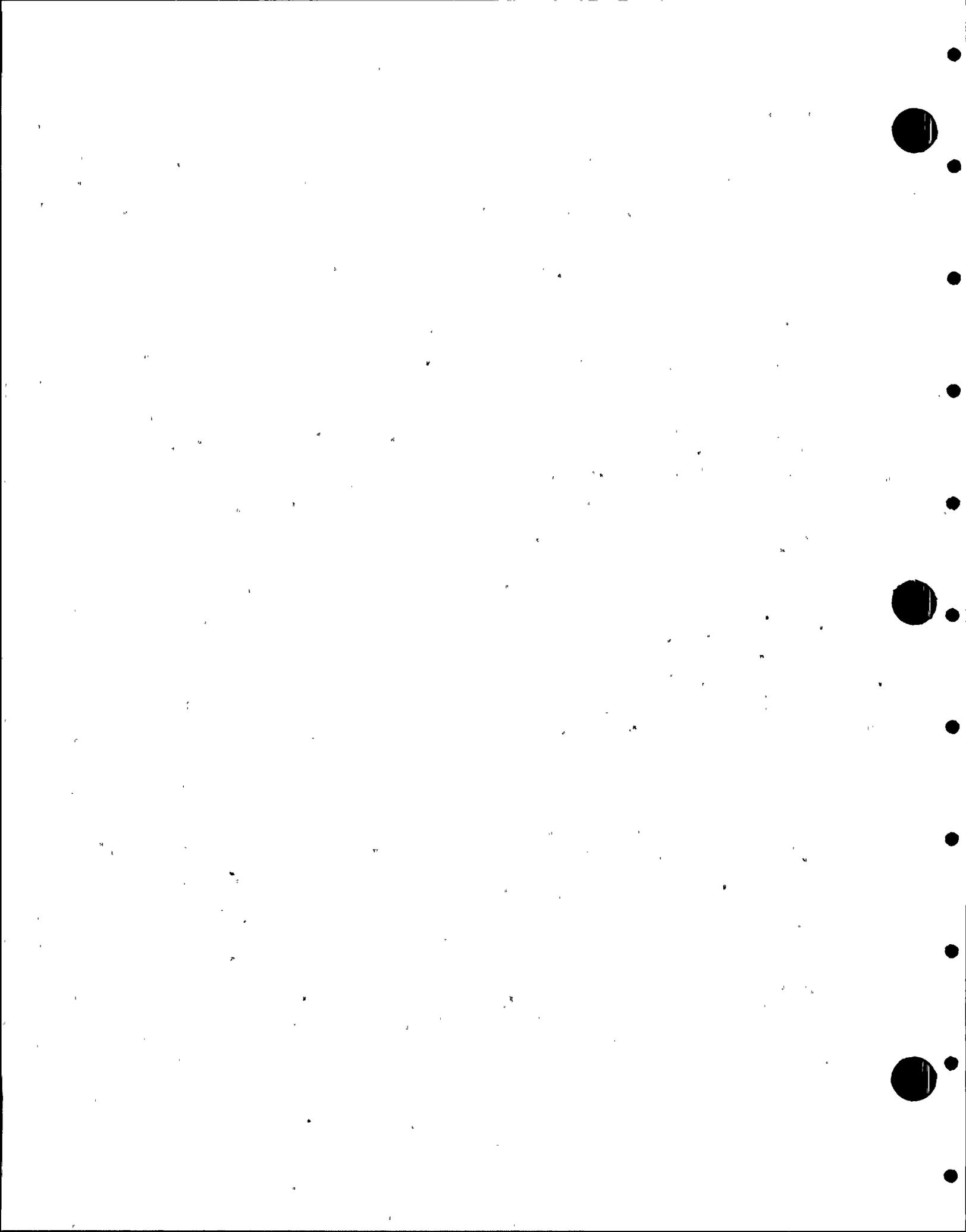
12 MR. KEITH: We will hold that as an open item.

13 MR. VAN BRUNT: Phil, you had a question.

14 MR. HEPNER: On the air supplied to these recombiner
15 units, if you lose the air supply, can that induce any
16 failure inside your box here?

17 MR. BALDASARI: The only air supply that goes to this
18 skid, it is actually mounted on skids, is a fan unit and this
19 takes air from the auxiliary building just from the surround-
20 ing atmosphere, runs it across the heat exchanger, and then
21 discharges it back out.

22 MR. HEPNER: Well, what I am wondering is if it stops
23 while the unit is operating, is that going to induce any
24 failure within the device that could breach the boundary.
25 You've got a single line coming in.



1 MR. BALDASARI: What would happen is that the
2 recombiner will shut down based on high temperature from the
3 heat exchanger. That will cure that one. The other one
4 would still be able to be operational.

5 MR. HEPNER: And it is fail-safe in the situation
6 where you have loss of air?

7 MR. BALDASARI: Yes.

8 MR. KEITH: Excuse me, I think there may be a
9 misunderstanding, Phil. There is no service air supply to
10 the recombiners. The air we are talking about is just
11 ventilation air. There is a Class Q blower that is part of
12 it.

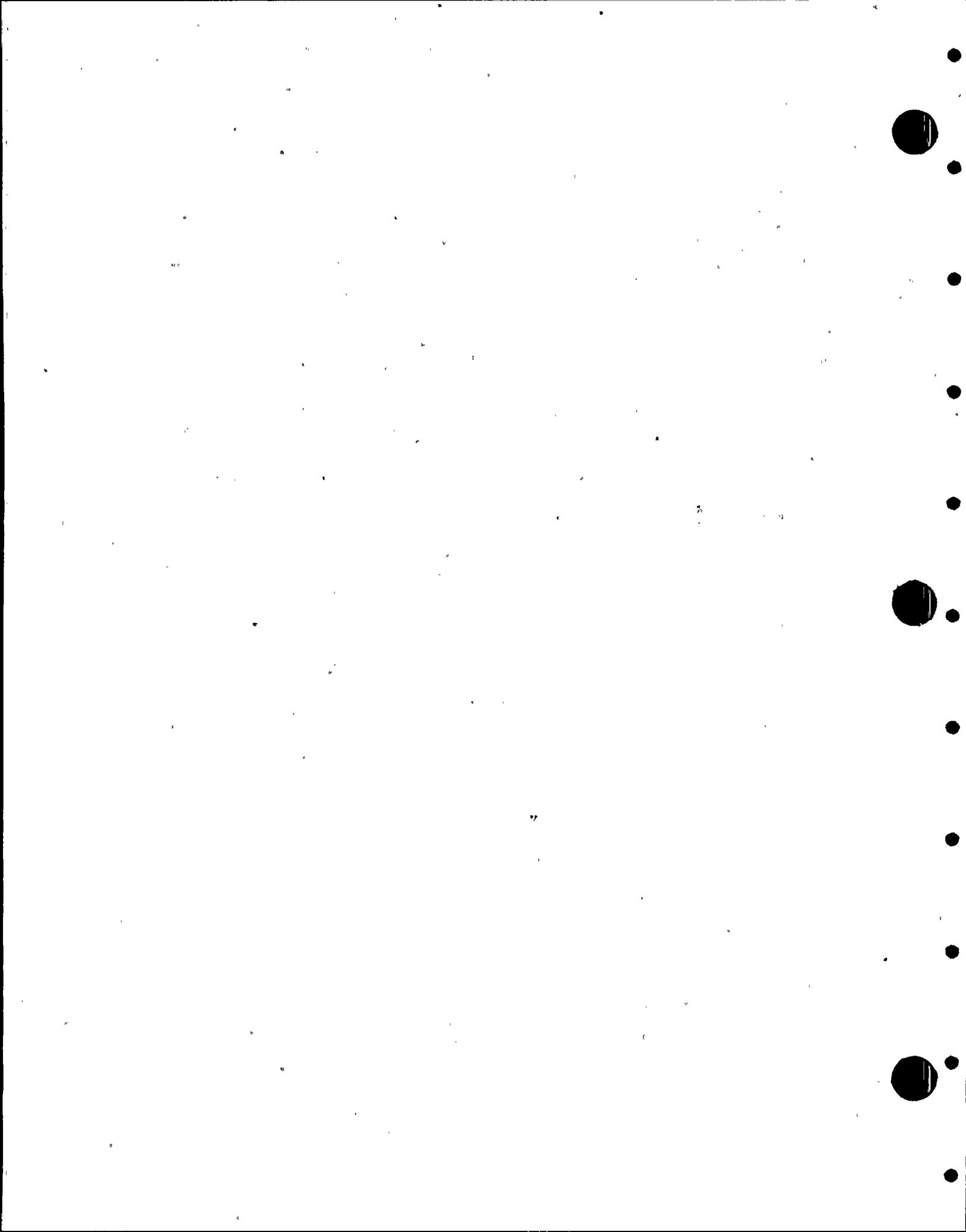
13 MR. HEPNER: It is circulated within the unit itself?

14 MR. KEITH: Yes.

15 MR. HEPNER: But it must cross some heat exchanger
16 surface that should maintain its integrity if it's gotten
17 hot and then you lose air, and you are saying you shut down
18 immediately so that temperature isn't a problem with this
19 boundary. The other thing is that you've got a single line.
20 Do you take any special precautions to maintain the integrity
21 of that common line under seismic or extraneous blockage
22 conditions that could exist?

23 MR. BALDASARI: You are talking about this line here
24 (indicating)?

25 MR. HEPNER: Yes, your intake line and your discharge



1 line.

2 MR. BALDASARI: It is Seismic Category I, Q Class,
3 so it is safety related.

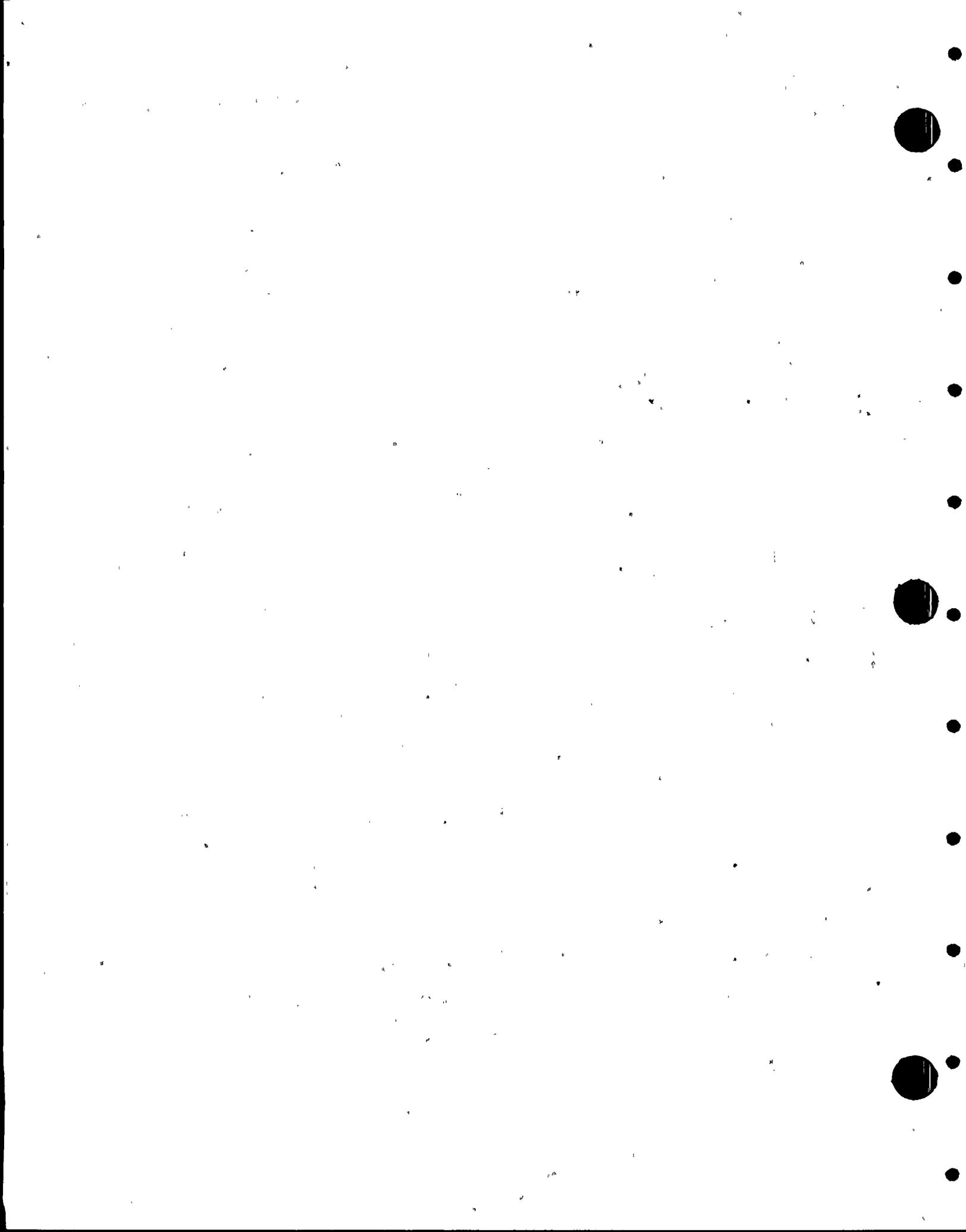
4 MR. HEPNER: And somebody can't throw a rag over the
5 intake or something like that or park a truck against it?

6 MR. KEITH: We have examined it as far as looking at
7 it from a high energy line break standpoint and those kinds
8 of things. It is protected from any postulated missiles or
9 pipe rupture or anything like that.

10 MR. BALDASARI: The other point is that the system
11 is placed in operation after the event, so it would be
12 manually initiated to hook it up. It is not going to be
13 a permanently installed type of thing that is going to be
14 there for people to allow rags to build up on it during the
15 shutdown period or when the plant is normally operating
16 without the recombiners required. You examine that portion
17 of the system before you place it in operation.

18 MR. HEPNER: The only temporary hookups you make are
19 along the containment line; there are no hookups to this air
20 source piping, then? That is all just off the skid itself.

21 MR. KEITH: The boundaries of the skid are right
22 here (indicating), so this ducting, which is HVAC ducting,
23 is permanently installed. The point which was being made
24 is simply that before you hook everything up, you will just
25 visually check that there are no obstructions in the suction



1 and discharge piping. It is just ventilation duct piping.

2 MR. HODGE: Just to expand on that, I have heard
3 discussions that maybe these units will be left in place for
4 storage. Is that a possibility? Would that change what you
5 just said?

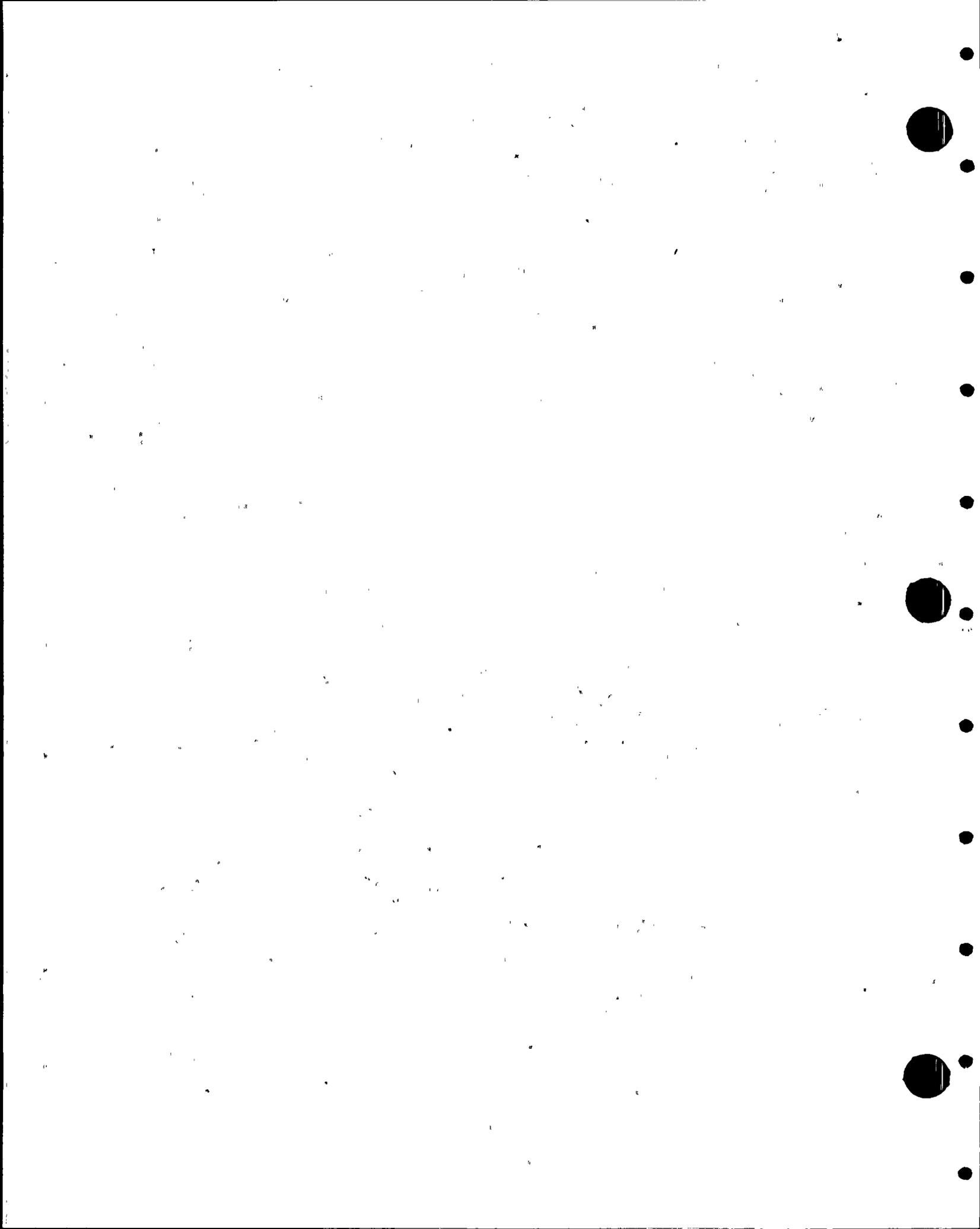
6 MR. KEITH: You're right, Mike. They will be left in
7 place. You would still examine the ends of the ducts before
8 you put the thing in operation.

9 MR. VAN BRUNT: Where are you going to leave them in
10 place?

11 MR. KEITH: Before Units 2 and 3 go into operation,
12 they will both be left in Unit 1. Then when Unit 2 goes
13 into operation, there will be one in Unit 1 and one in Unit 2.
14 Then when Unit 3 goes into operation, there will be one in
15 Unit 1, and one in Unit 3.

16 MR. VAN BRUNT: John, did you have a question?

17 MR. HELD: Yes. My question pertains to our determina-
18 tion of the acceptability of the hydrogen recombiner system.
19 I am not sure we have enough information yet to make that
20 determination. There is a reference listed in FSAR Section
21 6.2.5-6, Reference 1, authors Henry, J. O., and Stone, L. R.
22 Title "Thermal Hydrogen Recombiner System for Water-Cooled
23 Reactors." It is a Rockwell International Report No. AI-75-2
24 Revision 3(P), Canoga Park, California, July 1977. We have
25 been unable to obtain a copy of this. Are you familiar



1 enough with the contents of this report to say whether you
2 have covered it in the information in your presentation
3 today?

4 MR. KEITH: It has been a while since we have seen
5 that report, but I don't think there are as many details in
6 our presentation as are presented in the report.

7 MR. HELD: I would like you to present a synopsis of
8 what is in that report. If not today, maybe at some later
9 date.

10 MR. VAN BRUNT: Is that a proprietary book?

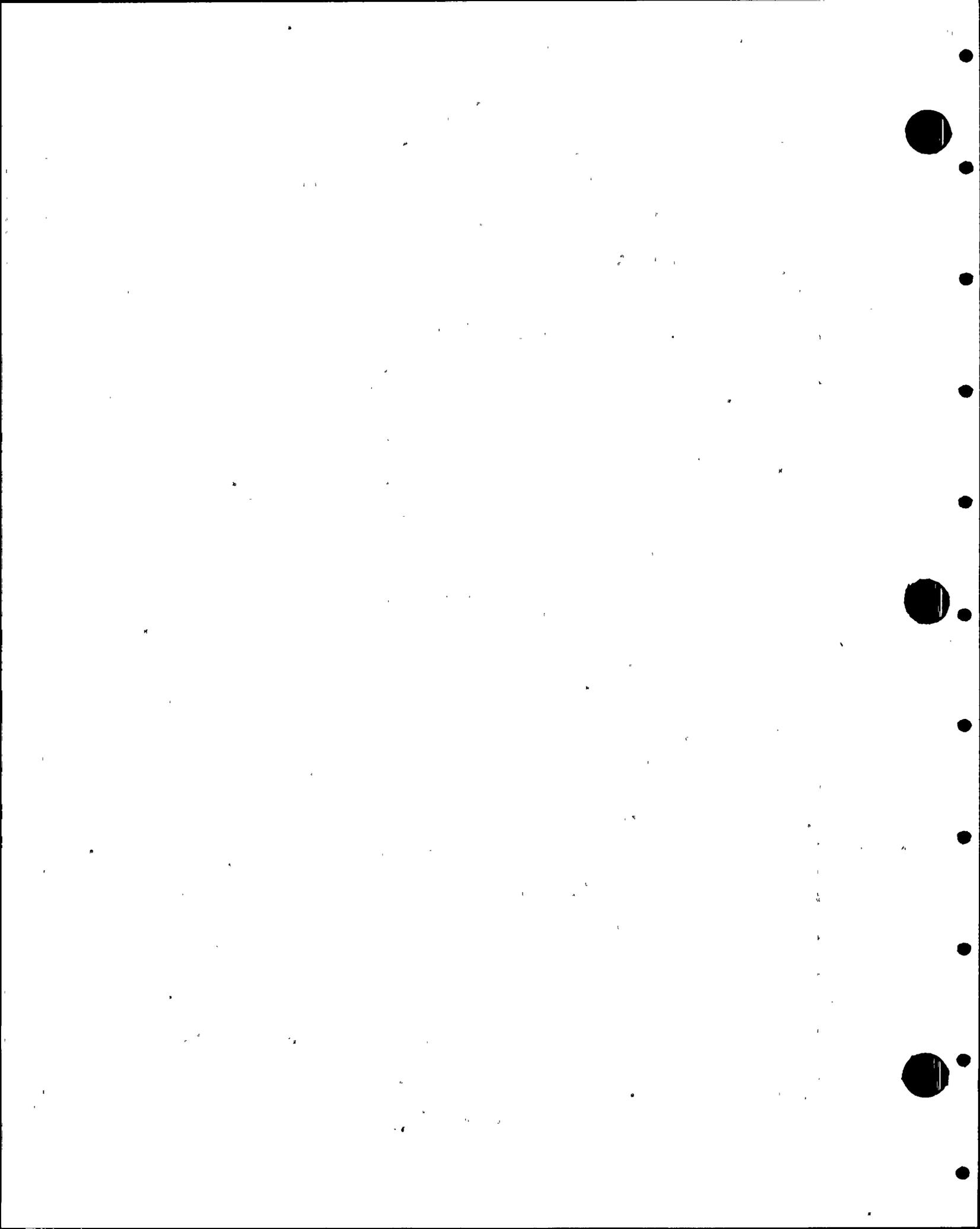
11 MR. HELD: I believe that is what the "P" means.

12 MR. KEITH: I am about 90% sure that that has been
13 submitted to the NRC. Maybe not to your branch. This was
14 back in the PSAR stage. I think the easiest thing is if we
15 can get a copy and send it.

16 MR. HUONG: If you can identify whether we have
17 reviewed it and whether we have accepted it, that would be
18 the easiest thing to do. If we have already reviewed it
19 and found it acceptable, just let us know.

20 MR. HELD: Yes. As an alternate to providing a
21 synopsis of this report, if you can just show that the NRC
22 has accepted a similar system on another plant, that would
23 be good.

24 MR. VAN BRUNT: Just as a side issue, we have loaned
25 one of the recombiners to Duke Oconee and it is at Oconee



1 right now. We are going to get it back for one of the others.

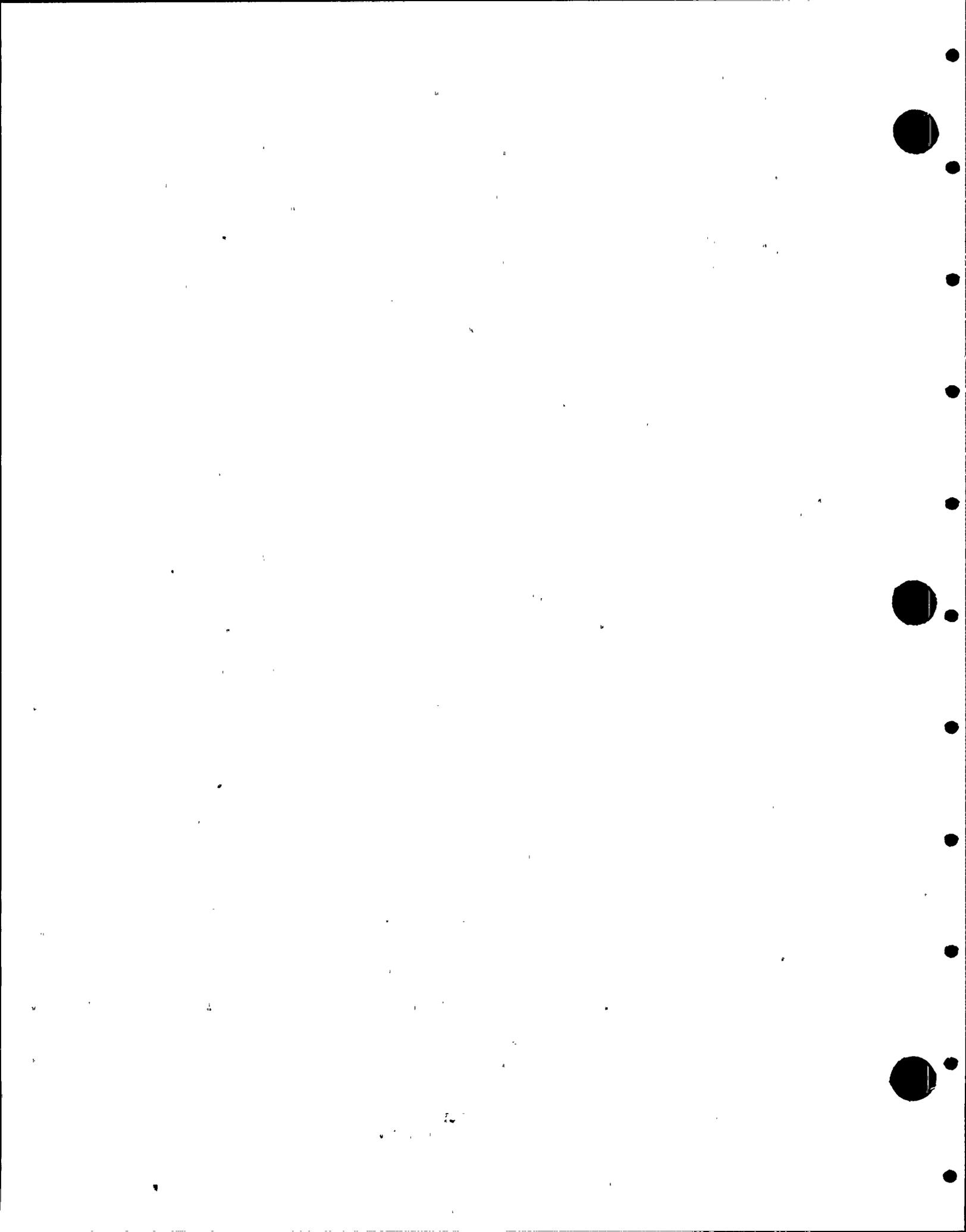
2 MR. HELD: Has that been accepted for use at Oconee?

3 MR. VAN BRUNT: As far as I know. We also have
4 another one that we have in our box ready to send to SMUD,
5 Sacramento Municipal Utility District, for use at Sequoia
6 on 24-hour notice, and they presented that under whatever
7 circumstances they were getting permission to continue to
8 operate after Three Mile Island and that was accepted as
9 the basis.

10 MR. HELD: Good.

11 MR. HUONG: On Exhibit 4-1 on Item 2), I would like
12 to make a comment on the hydrogen purge system. It is my
13 understanding of the regulation that we never made the
14 hydrogen purge system a backup to the hydrogen recombiner
15 system. It is a nonsafety system and the regulation requires
16 that you install controlled purge capability. That is what
17 we said in the regulation, I believe. All I want to tell
18 you is we don't treat it as a backup to the recombiner system.
19 Whether you agree with me or not, that is my understanding.
20 Therefore, on Exhibit 4-4, Item 5), you assume in the event
21 that both recombiners are inoperable. Since they are
22 redundant safety grade, I don't think we should assume two
23 of the systems failing in the post-LOCA condition.

24 MR. KEITH: We only said that because that is the
25 only reason we got the thing. There is no other reason to



1 have it.

2 MR. HUONG: There is a reason. I was giving the
3 reason. The control purge system may be used in the long-
4 term contaminant air control non-LOCA. Maybe a year or
5 several months later, you want to clean up contaminants,
6 and at that particular time, this controlled purge system
7 may be used for it. I just don't want the people to have the
8 wrong idea that this control purge system can be used as a
9 backup.

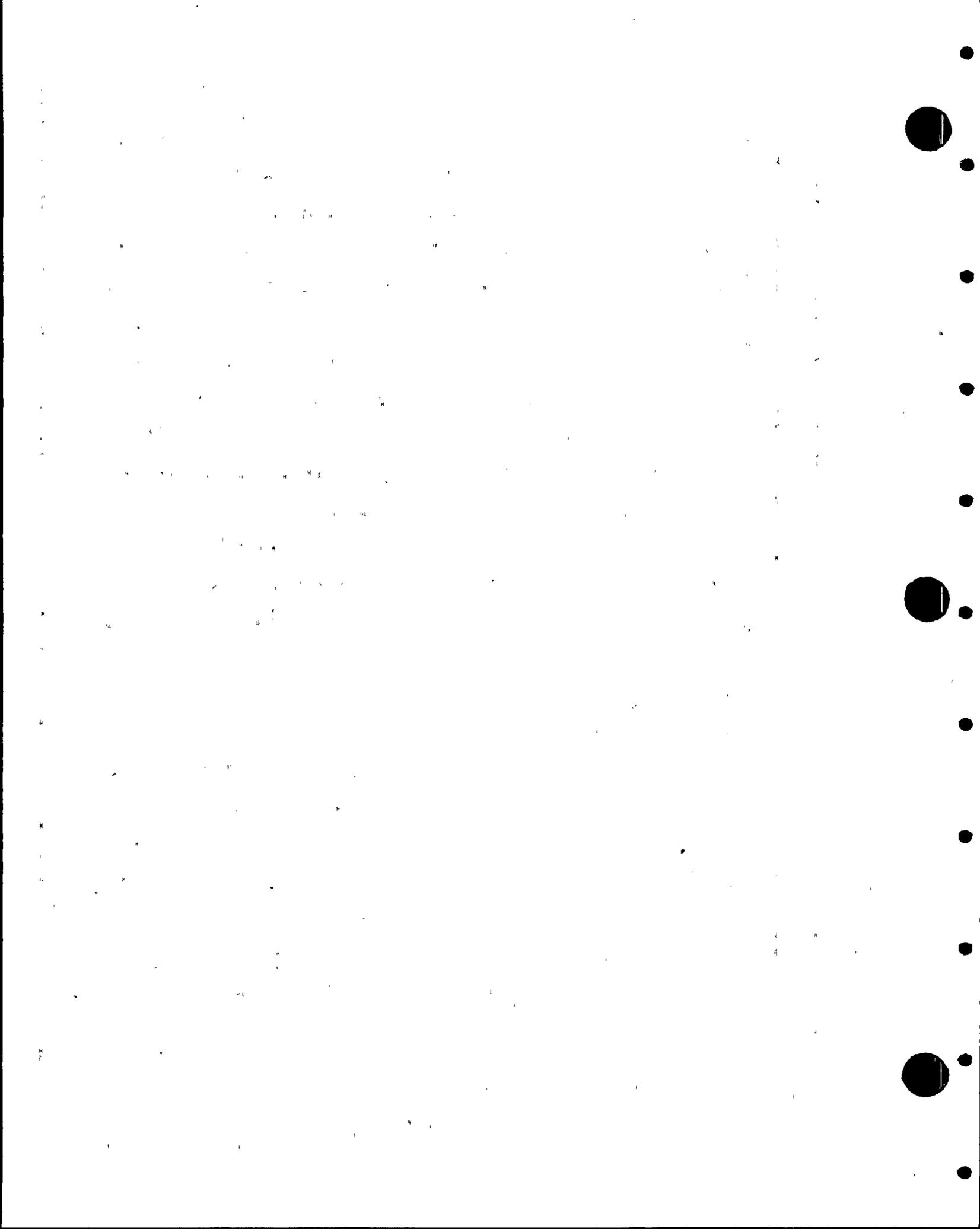
10 MR. TOSETTI: It does provide in the Standard Review
11 Plan, though. The reference was a backup system.

12 MR. VAN BRUNT: Ed, you had a question.

13 MR. STERLING: My only question was it is not indicated
14 in any of the exhibits that you have presented so far where
15 control of the hydrogen recombiners is once they are hooked
16 up. My understanding is that all control for those units
17 is in the control room. Is that correct?

18 MR. KEITH: All the controls are down here (indicating).
19 The only thing we have in the control room is an alarm to
20 indicate if we have any trouble with the units. Once you
21 press the button and start it up, it is designed such that
22 you don't require any operator action.

23 MR. STERLING: The valves that connect the system
24 together are all operated from the control room, is that
25 correct?



1 MR. KEITH: The main process valves, which are
2 containment isolation valves, are operated from the control
3 room, but those ventilation valves are operated locally.

4 MR. STERLING: In that area down there where those
5 control panels are, they are accessible during that period of
6 time for that guy to get down there and work?

7 MR. KEITH: Yes.

8 MR. VAN BRUNT: Mike, you had a question.

9 MR. HODGE: I am going to pass.

10 MR. VAN BRUNT: Are there any other questions on this
11 part of the presentation? John.

12 MR. ALLEN: On Exhibit 4-3, you talk about the two
13 recombiners have 50 cubic feet. Is that 25 apiece or each
14 of them at 50?

15 MR. KEITH: Each are 50.

16 MR. ALLEN: The total capacity of 50? You mean that
17 to be total process of 50?

18 MR. KEITH: Right. We need to say each.

19 MR. VAN BRUNT: Why don't you change that slide.

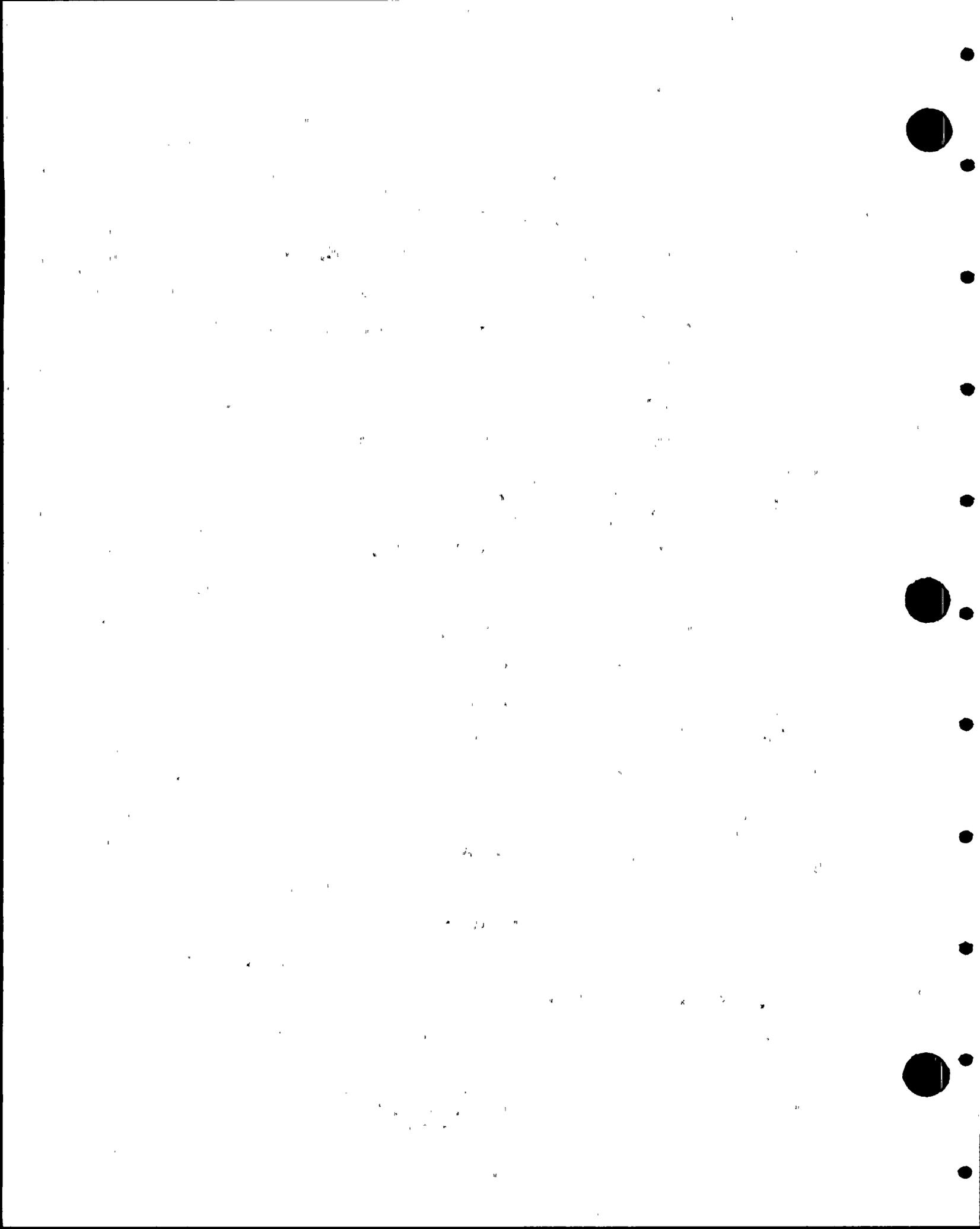
20 MR. KEITH: Will do.

21 MR. VAN BRUNT: Any other questions?

22 Seeing none, continue.

23 MR. KEITH: We will now go to Conformance With
24 Regulatory Requirements.

25 MR. BALDASARI: Figure 4-3 shows the Standard Review



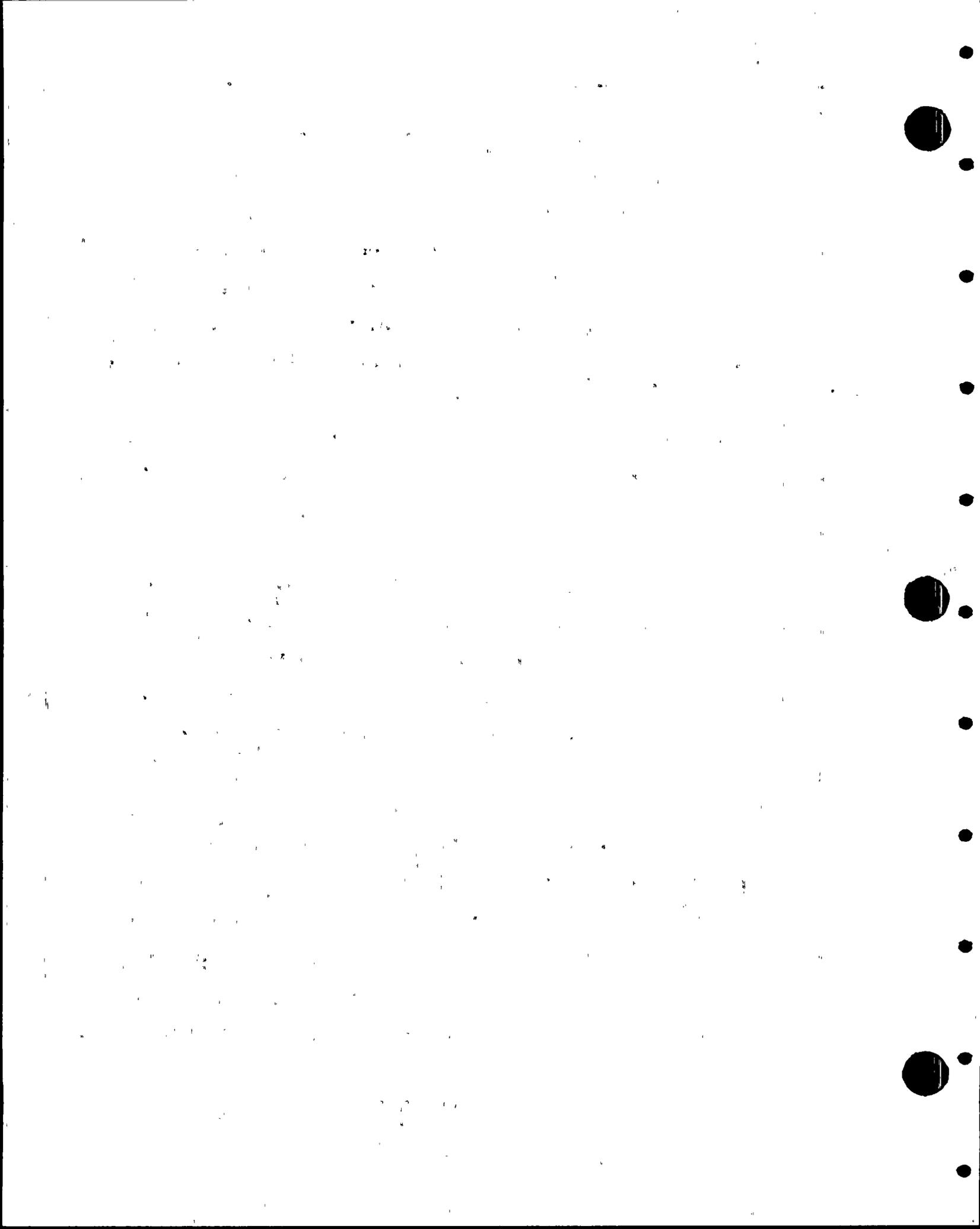
1 Plan 6.2.5, Revision 1; General Design Criteria GDC-41, 42,
2 43, and 50; Regulatory Guides 1.7, 1.26, 1.29; the Branch
3 Technical Positions ASB 9-2 and CSB 6-2.

4 Exhibit 4-6. The SRP Acceptance Criteria is
5 SRP 6.2.5, Combustible Gas Control in Containmentment.

6 Requirement 1. The analysis of hydrogen and
7 oxygen production in the containment following postulated
8 accidents should be based on parameters set forth in Table 1
9 of BTP CSB 602. Palo Verde is in compliance. The design
10 is based on parameters listed in Table 1 except that a
11 metal-water reaction fraction was conservatively taken as
12 five times the 1% mass.

13 Requirement 2. The fission product decay energy
14 used in the calculation of hydrogen and oxygen production
15 from radiolysis of the emergency core cooling water and
16 sump water is acceptable if it is equal to or more conserva-
17 tive than the decay model given in BTP ASB 9-2. We are in
18 compliance.

19 Exhibit 4-7. Requirement 3. A system should be
20 provided to mix the combustible gases within the containment.
21 The functional design of this system will depend on the type
22 of containment. It may consist of a fan, a fan cooler, or
23 containment spray. For containments which rely on convective
24 mixing in conjunction with system operation to mix the
25 combustible gases, the containment internal structures must



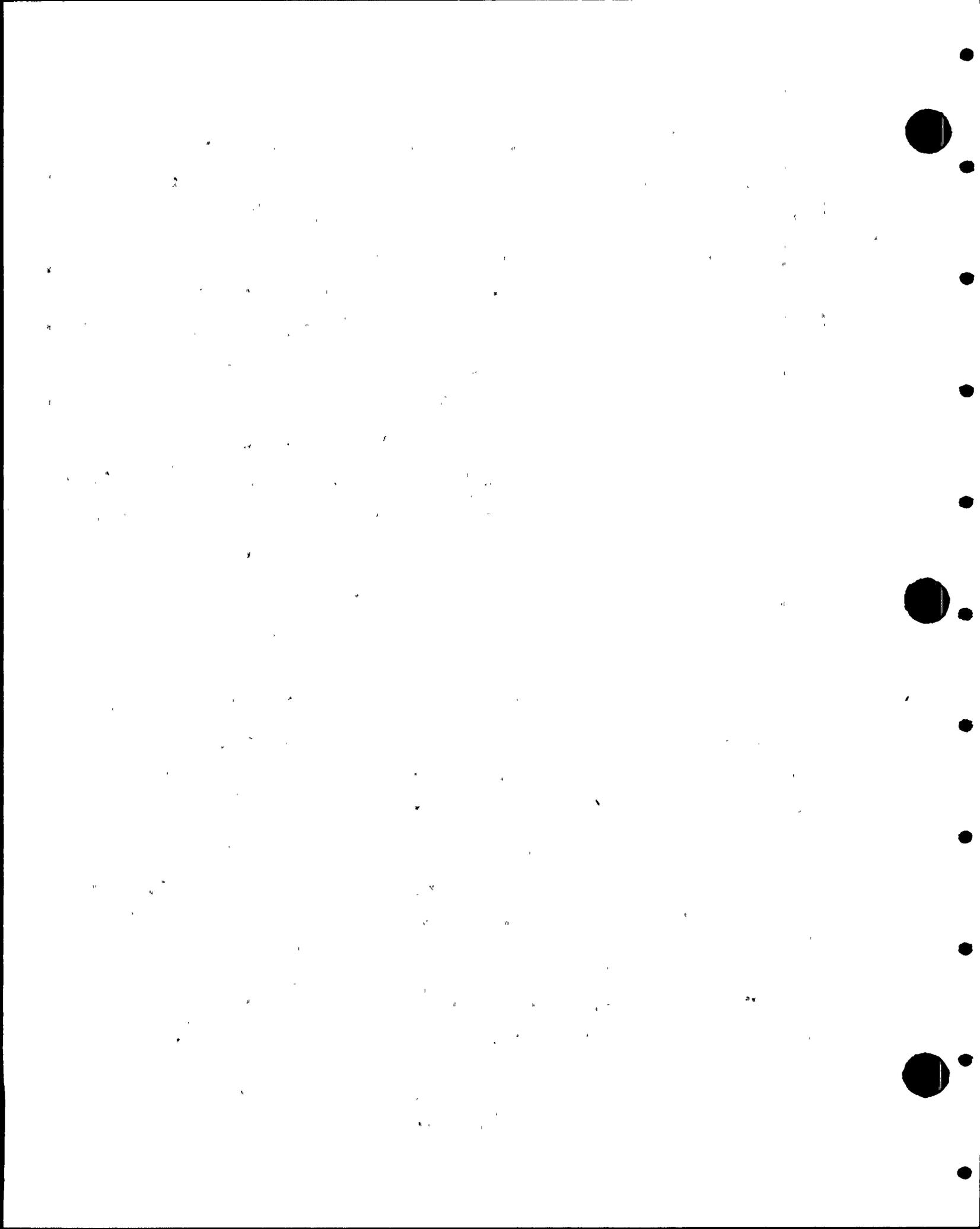
1 have design features which promote the free circulation of
2 the atmosphere. Palo Verde is in compliance. We use
3 containment sprays and natural convection based on temperature
4 differentials to mix combustible gases. Internal structures
5 are designed to promote free circulation of the atmosphere.

6 Figure 4-8. Requirement 4. The systems provided
7 to reduce the concentration of hydrogen or oxygen in the
8 containment will be accepted, from a functional standpoint,
9 if analyses indicate that a single system train is capable
10 of maintaining the concentration of hydrogen or oxygen below
11 the concentration limits specified in Table 1 of BTP CSB 6-2.
12 Palo Verde is in compliance. Systems provided for combustible
13 gas control are fully redundant. Margin is as shown in
14 Figure 4-2. The hydrogen recombiners are placed in operation
15 nine days after the accident.

16 Exhibit 4-9. Requirement 5. Containment
17 atmosphere sampling or analyzing equipment temperature
18 limitations should be compatible with the temperature of the
19 sample gases. Palo Verde is in compliance.

20 Requirement 6. Combustible gas control systems
21 should meet the redundancy and power source requirements for
22 essential safety features. Palo Verde is in compliance.

23 Exhibit 4-10. Requirement 7. Combustible gas
24 control systems should be designed, fabricated, erected, and
25 tested to Group B quality standards, as recommended in



1 Reg. Guide 1.26. Palo Verde is in compliance.

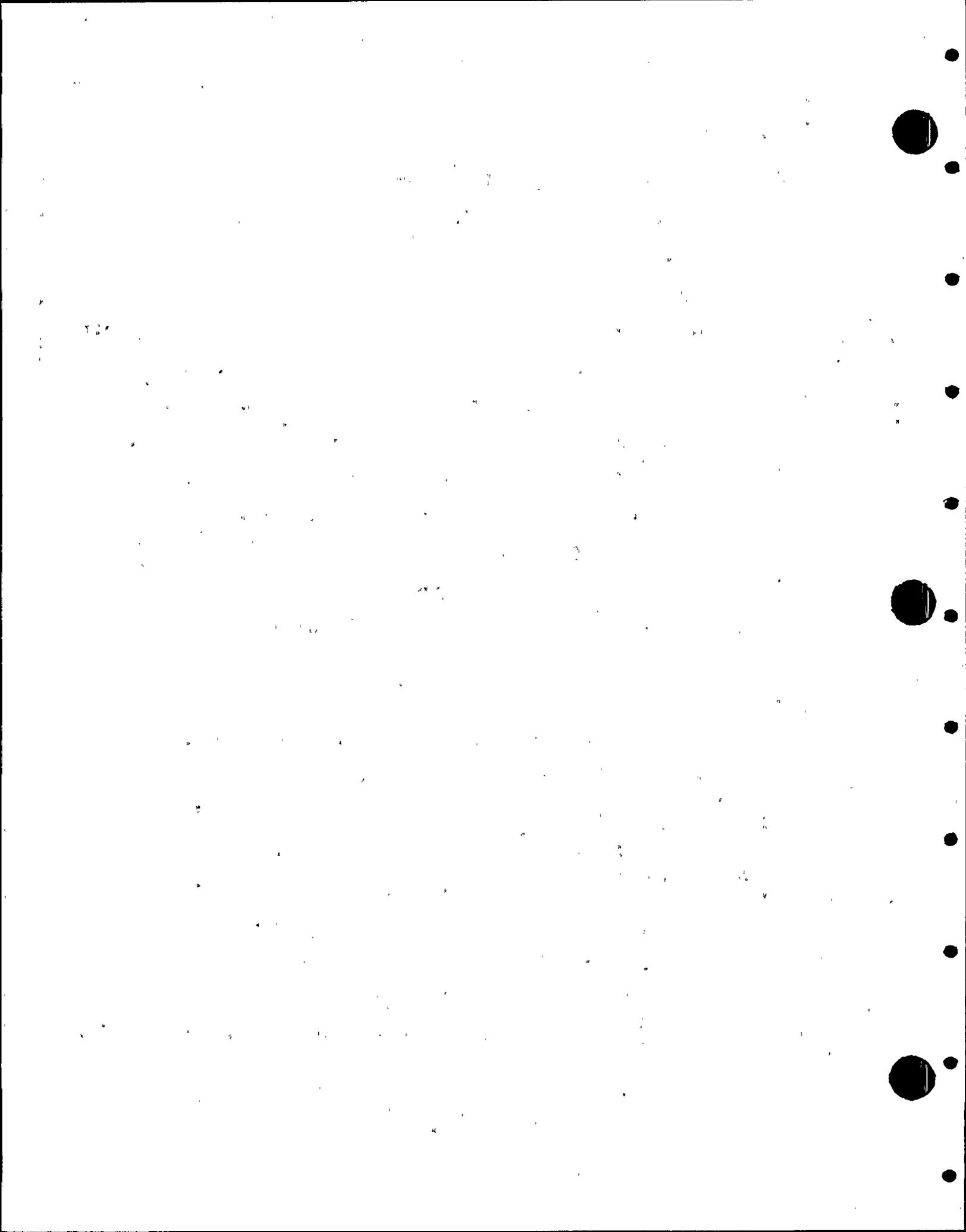
2 Requirement 8. Combustible gas control systems,
3 including foundations and supports, should be designated as
4 Seismic Category I. Palo Verde is in compliance.

5 Requirement 9. Qualification tests should be
6 performed on system components such as hydrogen recombiners,
7 combustible gas analyzers, air moving equipment motors, and
8 valve operators. The tests should support the analyses of
9 the functional capability of the equipment and demonstrate
10 that the equipment will remain operable in the accident
11 environment for as long as the accident condition require.
12 Palo Verde is in compliance.

13 Exhibit 4-11. Requirement 10. Combustible gas
14 control systems should be designed with provisions for
15 periodic inservice inspection, operability testing and leak
16 rate testing. Palo Verde is in compliance.

17 Requirement 11. Combustible gas control system
18 designs should include instrumentation needed to monitor the
19 system or component performance under normal and accident
20 conditions. Palo Verde is in compliance.

21 Exhibit 4-12. Requirement 12. The sharing of
22 system equipment between nuclear power units at a multi-unit
23 site or between sites is acceptable provided (a) the
24 availability of the shared equipment meets the redundancy
25 requirements for an ESF, (b) the shared equipment is designed



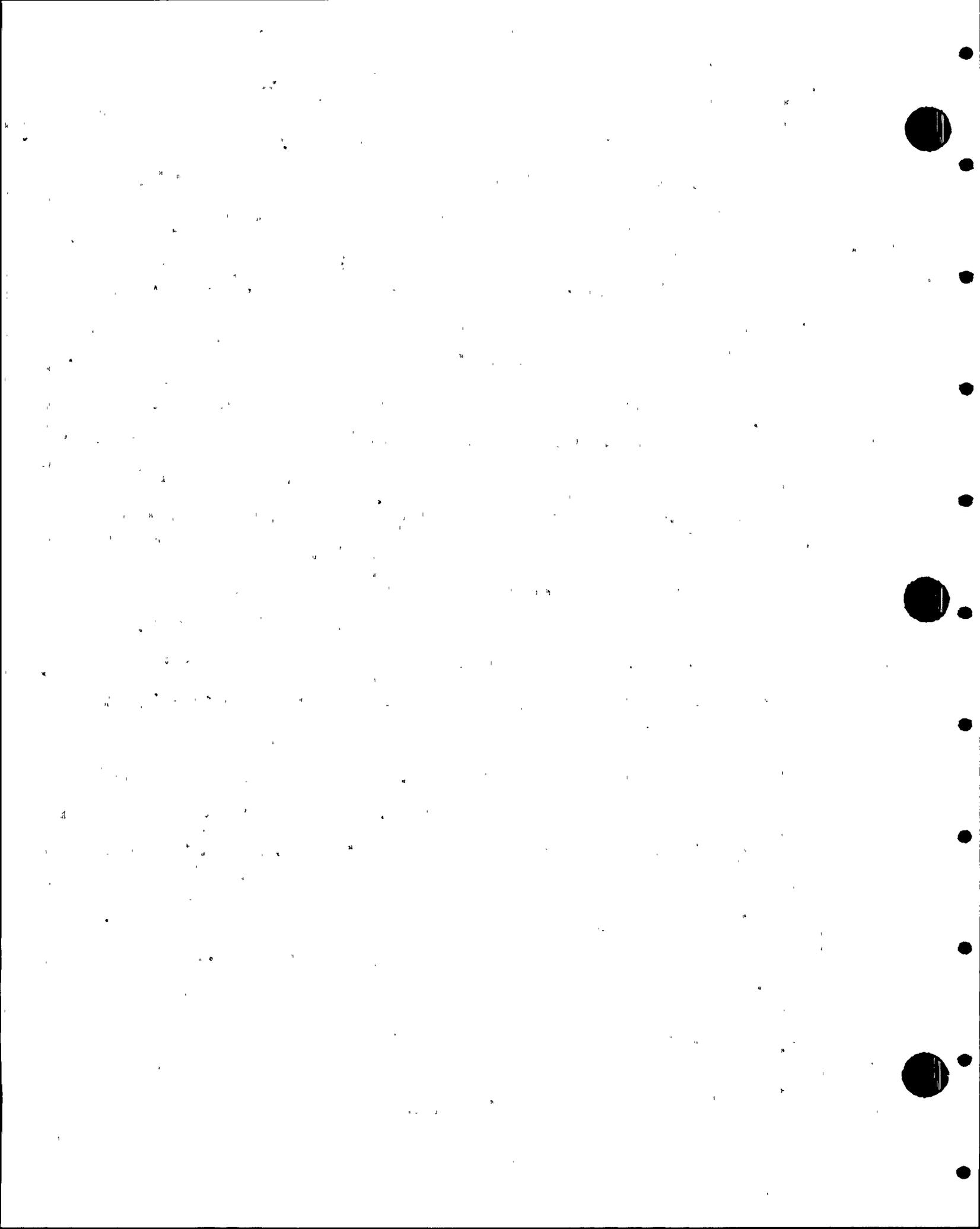
1 to Seismic Category I criteria, (c) the shared equipment is
2 mounted in a Seismic Category I structure, (d) adequate
3 design, installation, and procedural provisions have been
4 made, and (e) the stored equipment can be made available to
5 perform its function in a time period that is equal to or
6 less than one-half the time before it is required to operate.
7 Palo Verde is in compliance.

8 Exhibit 4-13. Requirement 13. Where system is
9 shared between nuclear power units at a multi-unit site or
10 between sites, surveillance programs should be coordinated
11 to assure that redundant equipment is not out of service at
12 the same time. Palo Verde will comply.

13 Requirement 14. Branch Technical Position 6-2
14 recommends that a backup purge system be provided. The
15 backup purge system is not required to be designed to ESF
16 requirements with regard to single failure protection, since
17 it is not the primary method for controlling combustible
18 gas concentrations in the containment. The backup purge
19 system is acceptable if purge doses are within the guidelines
20 established in Branch Technical Position 6-2. Palo Verde is
21 in compliance.

22 Exhibit 4-14, General Design Criteria 41, Contain-
23 ment Atmosphere Cleanup. Palo Verde is in compliance.

24 Exhibit 4-15, General Design Criteria 42,
25 Inspection. Palo Verde is in compliance.



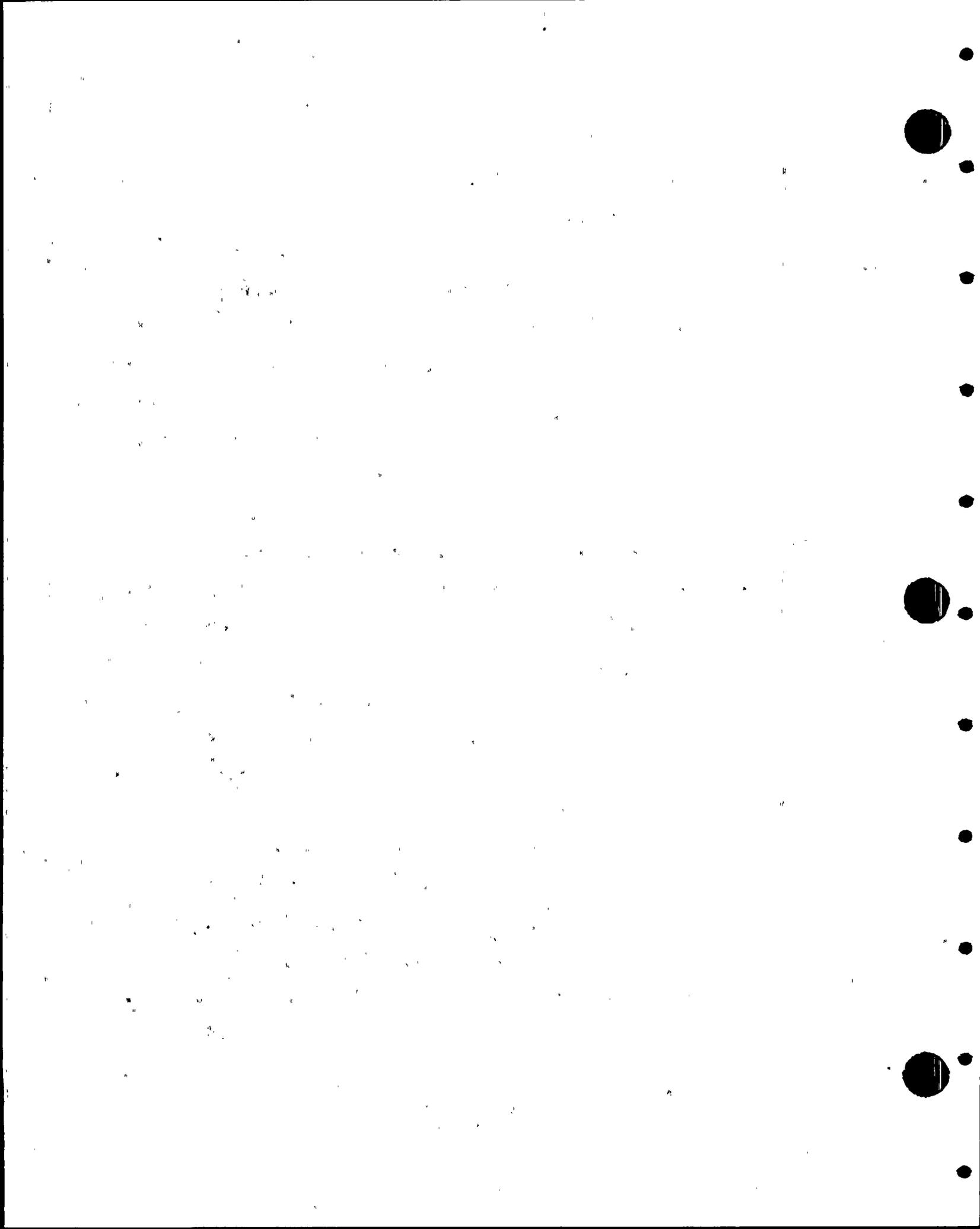
1 Exhibit 4-16, General Design Criteria 43, Testing.
2 Palo Verde is in compliance.

3 Exhibit 4-17, General Design Criteria 50,
4 Containment Design. Palo Verde is in compliance.

5 Exhibit 4-18, Reg. Guide 1.7, Control of Combustible
6 Gas Concentrations in Containment Following a Loss-of-Coolant
7 Accident. Each PWR fueled with uranium oxide pellets within
8 cylindrical zircaloy cladding should have the capability to
9 measure the hydrogen concentration in the containment, mix
10 the atmosphere in the containment, and control combustible
11 gas concentrations without relying on purging and/or
12 repressurization of the containment atmosphere following a
13 loss of coolant accident. Palo Verde is in compliance.

14 Exhibit 4-19. Requirement 2). The continuous
15 presence of redundant combustible gas control equipment at
16 the site may not be necessary provided it is available on an
17 appropriate time scale. Provisions should include access to
18 the area where the mobile combustible gas control system
19 will be connected and provision for shielding to allow the
20 coupling operation to be executed. Palo Verde is in compliance.
21 The recombiners are located on site and access to the
22 recombiners is possible at any time, since hookup locations
23 are outside of the containment. Coupling operation is
24 designed to be completed within 72 hours post-accident.

25 Exhibit 4-20. Requirement 3) Combustible gas



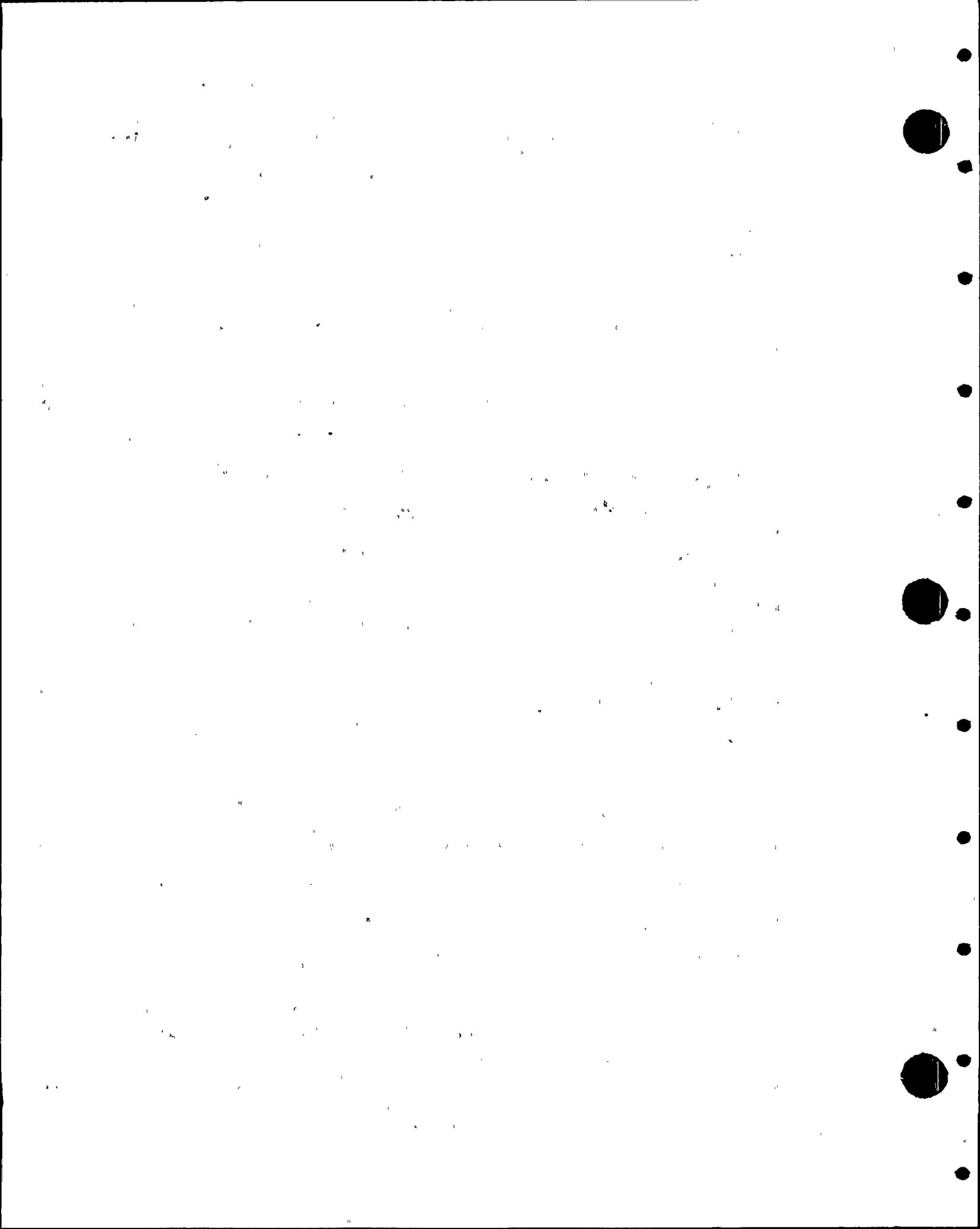
1 control systems and the provisions for mixing, measuring, and
2 sampling should meet the design, quality assurance,
3 redundancy, energy source, and instrumentation requirements
4 for an essential safety feature. Palo Verde is in compliance

5 Exhibit 4-21. Requirement 4). All water-cooled
6 power reactors should also have the installed capability
7 for a controlled purge of the containment atmosphere to aid
8 in cleanup. The purge or ventilation system may be a
9 separate system or part of an existing system. It need not
10 be redundant or be designated Seismic Category I, except
11 insofar as portions of the system constitute part of the
12 primary containment boundary or contain filters. Palo Verde
13 is in compliance.

14 Requirement 5). Defined parameter values should
15 be used in calculating hydrogen and oxygen gas concentrations
16 in the containment and evaluating designs provided to control
17 and to purge combustible gases evolved in the course of
18 loss of coolant accidents. Palo Verde is in compliance.

19 Exhibit 4-22, Reg. Guide 1.7. Requirement 6).
20 Materials within the containment that would yield hydrogen
21 gas due to corrosion from the emergency cooling or contain-
22 ment spray solutions should be identified, and their use
23 should be limited as much as practical. Palo Verde is in
24 compliance.

25 Exhibit 4-23, Reg. Guide 1.26, Quality Group



1 Classifications. Palo Verde is in compliance.

2 Exhibit 4-24, Reg. Guide 1.29, Seismic Classifica-
3 tions. Palo Verde is in compliance.

4 Exhibit 4-25, Branch Technical Position 9-2,
5 Residual Decay Energy. Palo Verde is in compliance.

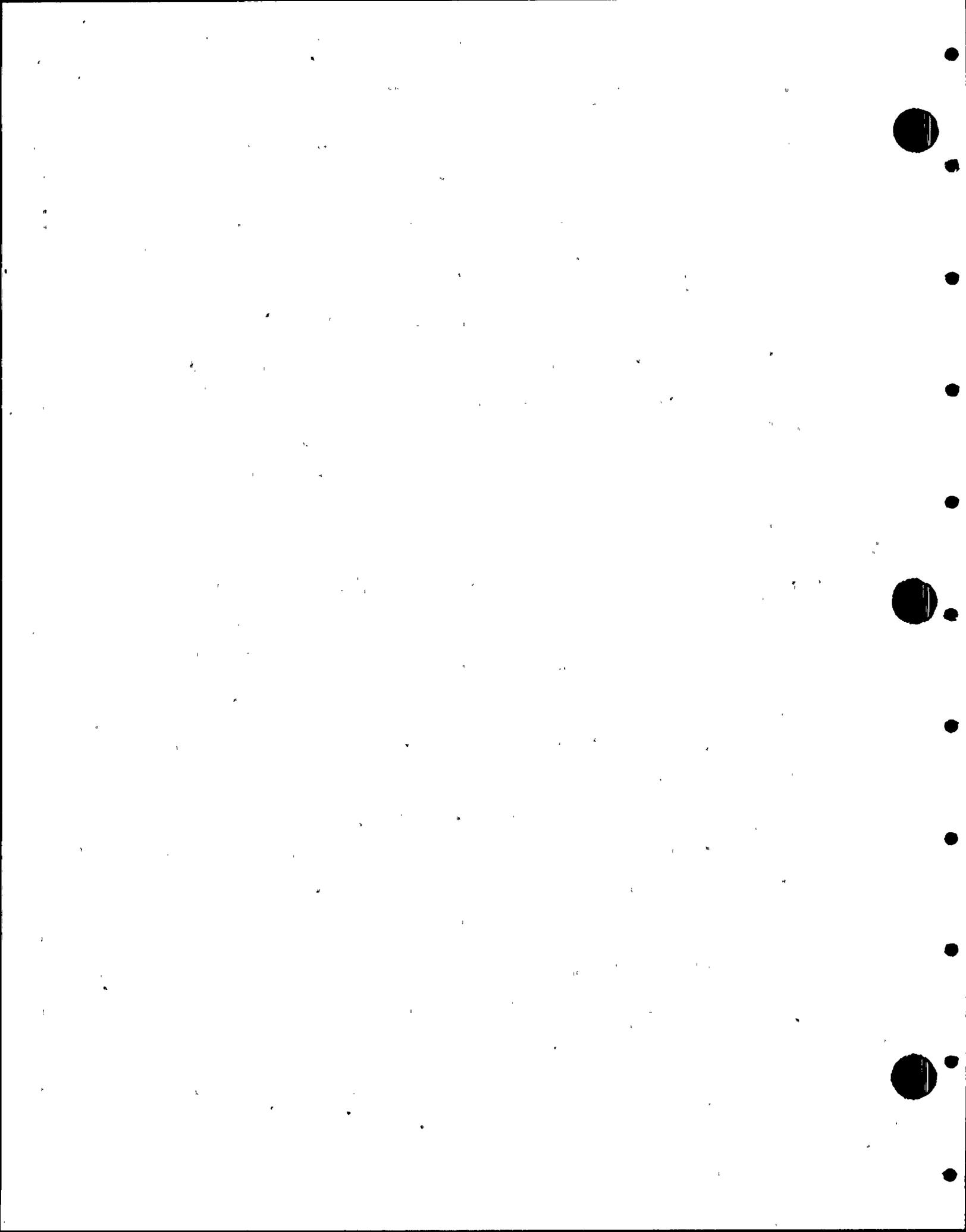
6 Exhibit 4-26, Branch Technical Position 6-2,
7 Control of Combustible Gas Concentration in Containment
8 Following a Loss-of-Coolant Accident.

9 All water-cooled power reactor facilities should
10 have the capability for measurement of the hydrogen concen-
11 tration, for mixing the atmosphere in the controlling
12 combustible gas concentrations without reliance on purging
13 of the containment atmosphere following a LOCA. Palo Verde
14 is in compliance.

15 Continuous presence of combustible gas control
16 equipment at the site may not be necessary provided it is
17 available on an appropriate time scale. Palo Verde is in
18 compliance.

19 Exhibit 4-27. Requirement 3). Combustible gas
20 control systems and the provisions for mixing, measuring, and
21 sampling should meet the design, quality assurance, redundancy,
22 energy source, and instrumentation requirements for an
23 essential safety feature. Palo Verde is in compliance.

24 Requirement 4). All water-cooled power reactors
25 should also have the installed capability for a controlled



1 purge of the containment atmosphere. The purge system need
2 not be redundant nor be designated Seismic Category I.
3 Palo Verde is in compliance.

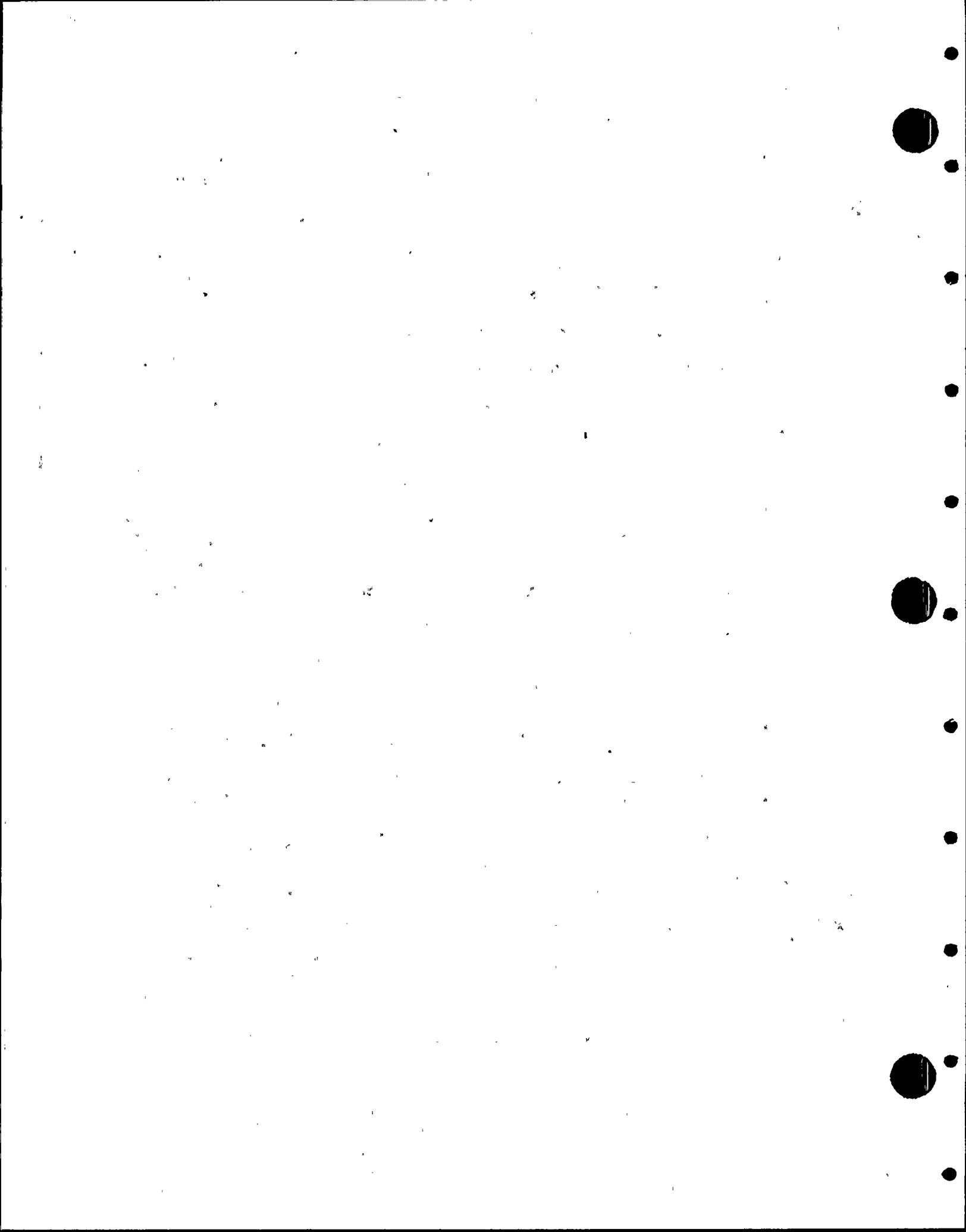
4 Exhibit 4-28. Requirement 5). Defined parameter
5 values should be used for the purpose of calculating
6 hydrogen and oxygen gas concentrations in the containment
7 and evaluating designs provided to control and to purge
8 combustible gases evolved in the course of loss of coolant
9 accidents. Palo Verde is in compliance.

10 Requirement 6). Materials within the containment
11 that would yield hydrogen gas due to corrosion from the
12 emergency cooling or containment spray solutions should be
13 identified and their use should be limited as much as
14 practical. Palo Verde is in compliance.

15 Exhibit 4-29. Requirement 7). Plants for which
16 a notice of hearing on the application for a construction
17 permit was published after November 5, 1970, should conform
18 to Items 1 through 6 of 10CFR50.46. Palo Verde complies
19 with those items.

20 Exhibit 4-30. This is NUREG-0737.

21 For plants using external recombiners or purge
22 systems for post-accident combustible gas control of the
23 containment atmosphere should provide containment penetration
24 systems for external recombiner or purge systems that are
25 dedicated to that service only, that meet the redundancy and



1 single failure requirements of General Design Criteria 54
2 and 56, and that are sized to satisfy the flow requirements
3 of the recombiner or purge system. Palo Verde is in
4 compliance. There are two portable recombiners. They are
5 on site and available for connection to the affected unit.
6 Either recombiner is capable of reducing hydrogen levels
7 as noted in FSAR Section 6.2.5. The two systems are
8 completely independent and meet single failure criteria.
9 Each system has dedicated containment penetrations, external
10 hydrogen monitors, and connection points for an external
11 hydrogen recombiner.

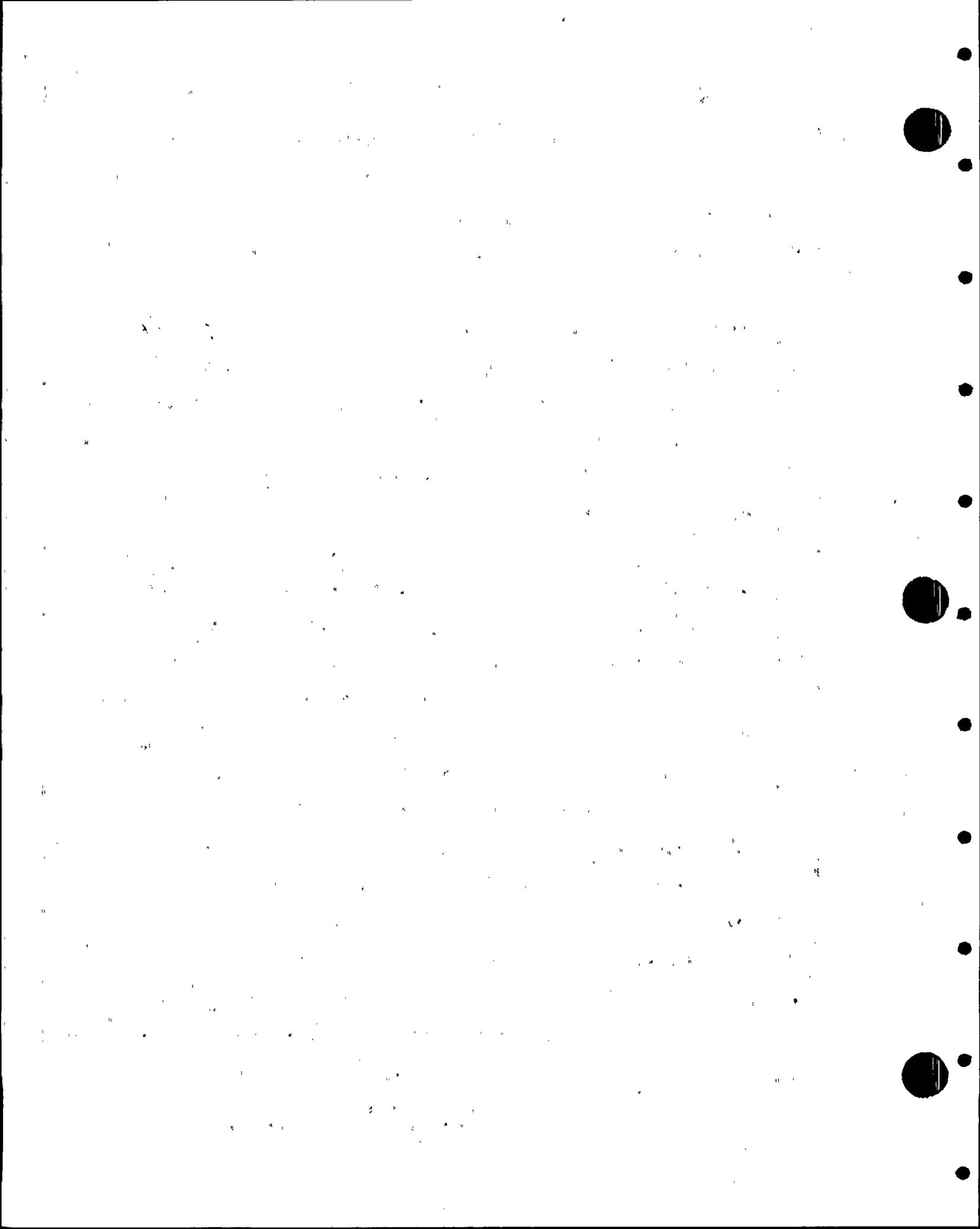
12 An additional hydrogen reduction capability is
13 provided by a nonsafety grade charcoal filtered purge
14 exhaust unit. This capability would only be utilized in
15 event of separate failures in both recombiner units.

16 Exhibit 4-31, continuing requirements for NUREG-
17 0737, Item II.E.4.1.

18 The procedures for the use of combustible gas
19 control systems following an accident that results in a
20 degraded core and release of radioactivity to the containment
21 must be reviewed and revised, if necessary. Palo Verde is
22 committed to reviewing our design under degraded core
23 conditions when generic guidance is provided.

24 Exhibit 4-32. This is Item II.F.1, Subpart 6.

25 A continuous indication of hydrogen concentration



1 in the containment atmosphere shall be provided in the
2 control room. Measurement capability shall be provided over
3 the range of zero to 10% hydrogen concentration under both
4 positive and negative ambient pressure. Palo Verde is in
5 compliance. Continuous indication of containment atmosphere
6 hydrogen concentration is available in the control room.
7 Indication is available within 30 minutes of the initiation
8 of safety injection.

9 The analyzer functions are as shown. Additionally,
10 the analyzers can monitor the containment atmosphere under
11 a negative pressure.

12 MR. KEITH: That concludes our presentation on
13 Combustible Gas Control.

14 MR. VAN BRUNT: Ed.

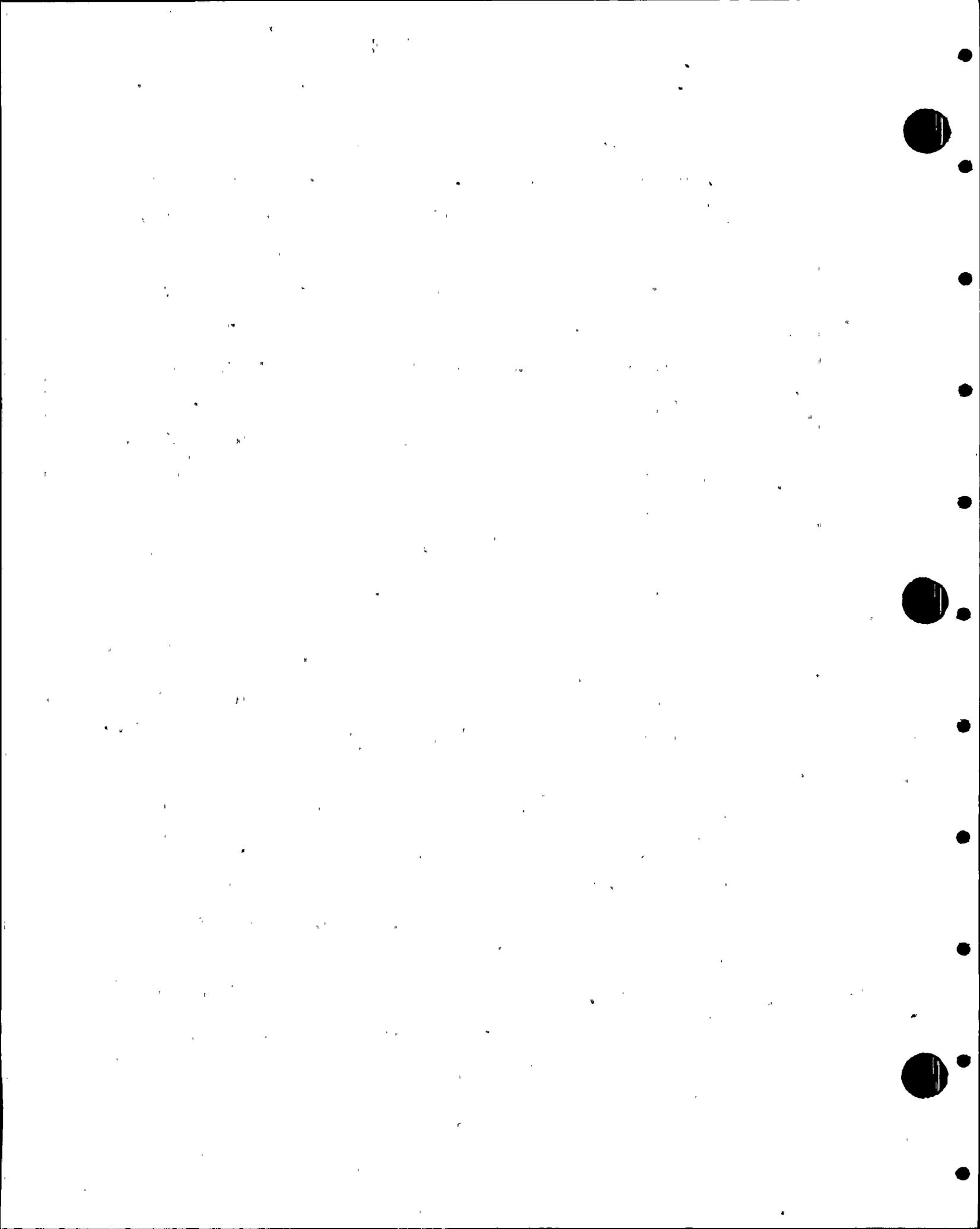
15 MR. STERLING: Before I make a comment, on Exhibit
16 4-30, that last paragraph down there which indicated that
17 the charcoal filter purges were in there in case of a double
18 failure, why don't we modify that paragraph the same as we
19 were going to do the one in the previous section?

20 MR. VAN BRUNT: I think there is a number of cases
21 where that applies.

22 MR. KEITH: Yes. I think wherever we say double
23 failure, we'll strike that.

24 MR. VAN BRUNT: Are there other questions? Mike.

25 MR. HODGE: On Exhibit 4-7, how do we prevent dead



1 spaces in the equipment drain tank room and in the elevator
2 shaft for that service elevator that is in the containment?

3 MR. KEITH: You are getting at the question the NRC
4 has asked.

5 MR. HODGE: I had that one before they asked it, too,
6 but also the elevator shaft.

7 MR. KEITH: I think, for the record, you said equipment
8 drain tank room, but meant reactor drain tank room.

9 MR. HODGE: I'm sorry, yes, and also the elevator
10 shaft.

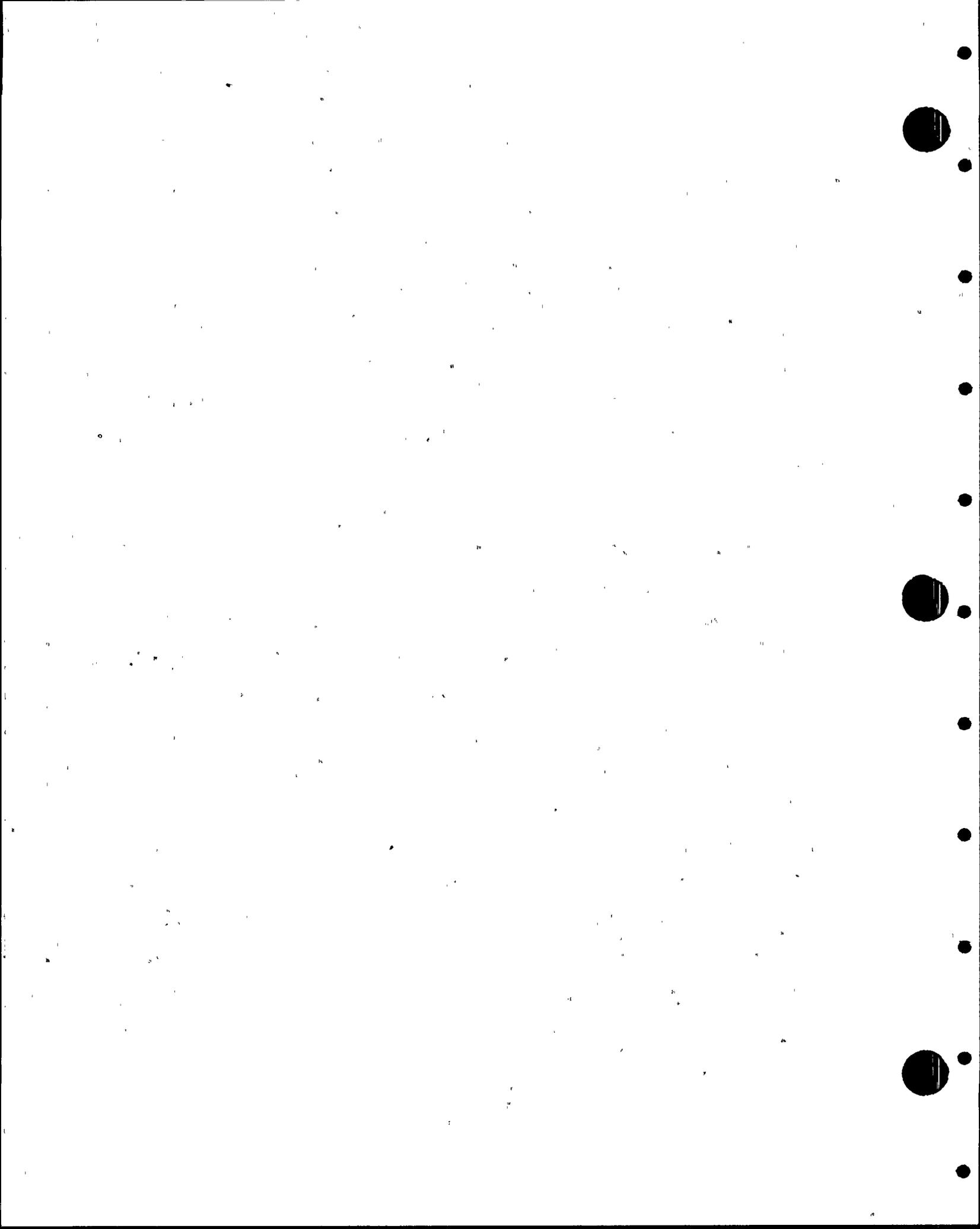
11 MR. KEITH: For the elevator shaft, there is no
12 source of hydrogen in there.

13 MR. HODGE: Is there any potential that some could
14 start accumulating in there where the source might be right
15 near the door or whatever? Is that sealed off in any way?
16 It is a large shaft. It goes through quite a few levels.

17 MR. KEITH: Well, obviously, it is not airtight.

18 MR. TOSETTI: I might comment perhaps that is a
19 question that is more addressed toward a degraded core
20 scenario where the concentrations of hydrogen could be
21 substantially higher versus the design basis conditions.

22 MR. VAN BRUNT: You might want to look, Dennis, at
23 whether that shaft is sealed at the top. I don't know. As
24 I remember from walking around, the driving mechanism is
25 on top and the shaft is open at the top, but I couldn't swear



1 to that. Why don't you check it?

2 MR. KEITH: Anyhow, we will hold that as an open item.

3 MR. HODGE: Do you want to go to their questions
4 first? I have two more questions.

5 MR. VAN BRUNT: Go ahead.

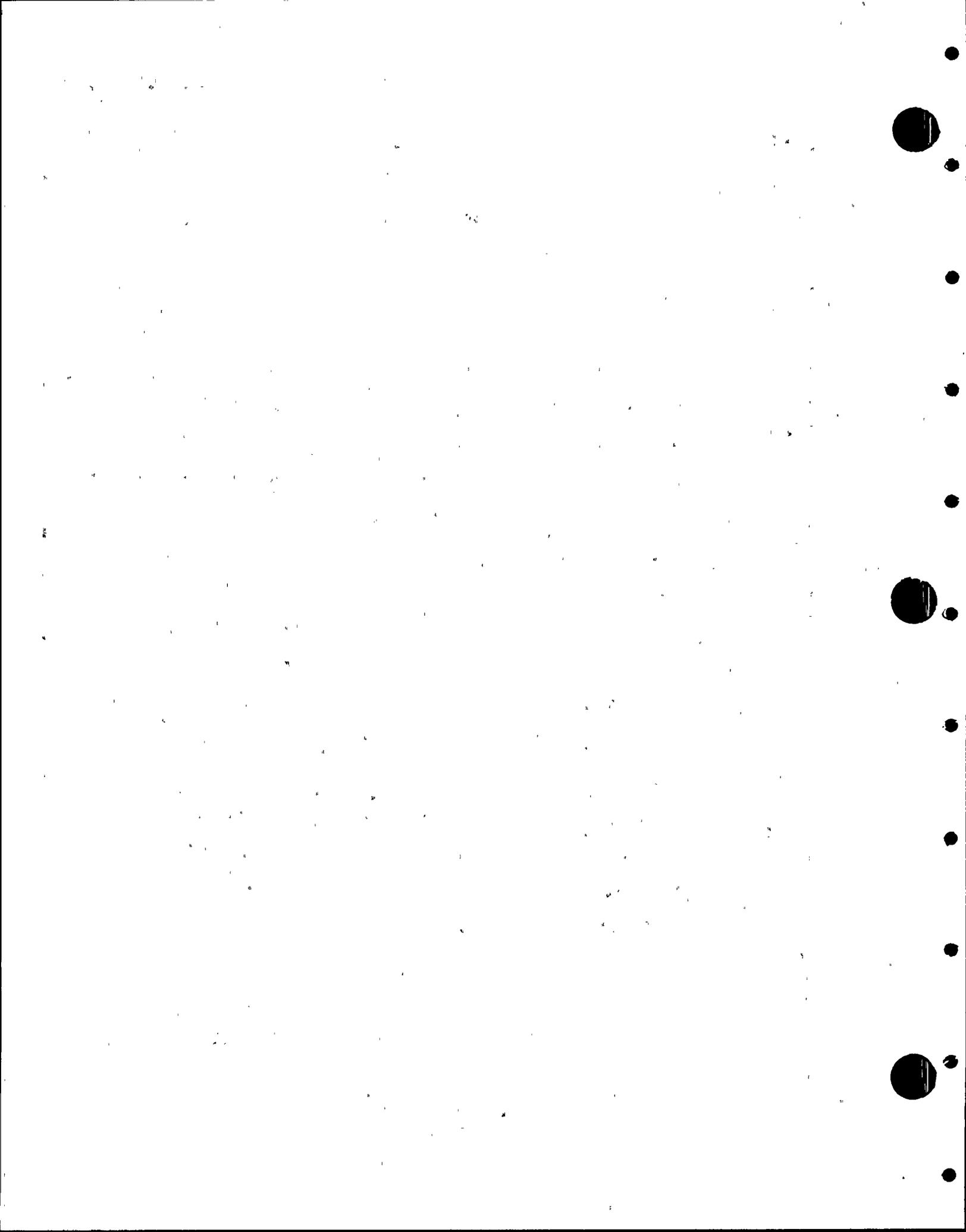
6 MR. HODGE: On Exhibit 4-10, you talk about qualifica-
7 tion tests for the recombiners. Is the area that they are
8 going to be placed in air conditioned to prevent heat
9 transients or something that might ruin instruments or parts
10 of the recombiner or is it designed to take maximum tempera-
11 tures that might occur in that building.

12 MR. KEITH: It is designed to the temperatures that
13 would occur in the building.

14 MR. HODGE: The last one is on Exhibit 4-14. That
15 is back to the P&ID which shows the hydrogen purge unit.
16 If we have a failure of that pressure control valve there
17 which has to cut the pressure to 5 pounds, is there a
18 potential of leak of radioactivity to the atmosphere through
19 the plant vent? Did you ever consider dual regulators there,
20 monitor regulation, in case there is a failure of that
21 pressure control valve?

22 MR. KEITH: You are talking about this valve
23 (indicating)?

24 MR. HODGE: Yes. I guess if it was raised to 5 psig
25 in that unit, if it did fail, would you blow out something



1 like the HEPA filters or something, the charcoal filters,
2 that could allow some additional radiation exposure than
3 what we would want?

4 MR. KEITH: It is extremely unlikely that we would
5 have a problem, because, as was pointed out by Rich Tosetti's
6 question, it is going to be a long time before we get up
7 to 5 pounds inside containment, since we are just bleeding
8 in through this valve past here (indicating) at the 50 cfm
9 rate and you will be monitoring the pressure in containment,
10 so it is unlikely that you would have any problem. Normally,
11 this valve (indicating) would be wide open and just provide
12 some protection in the event that we did get a little bit
13 above 5 pounds.

14 MR. HODGE: You think you have covered yourself, then?

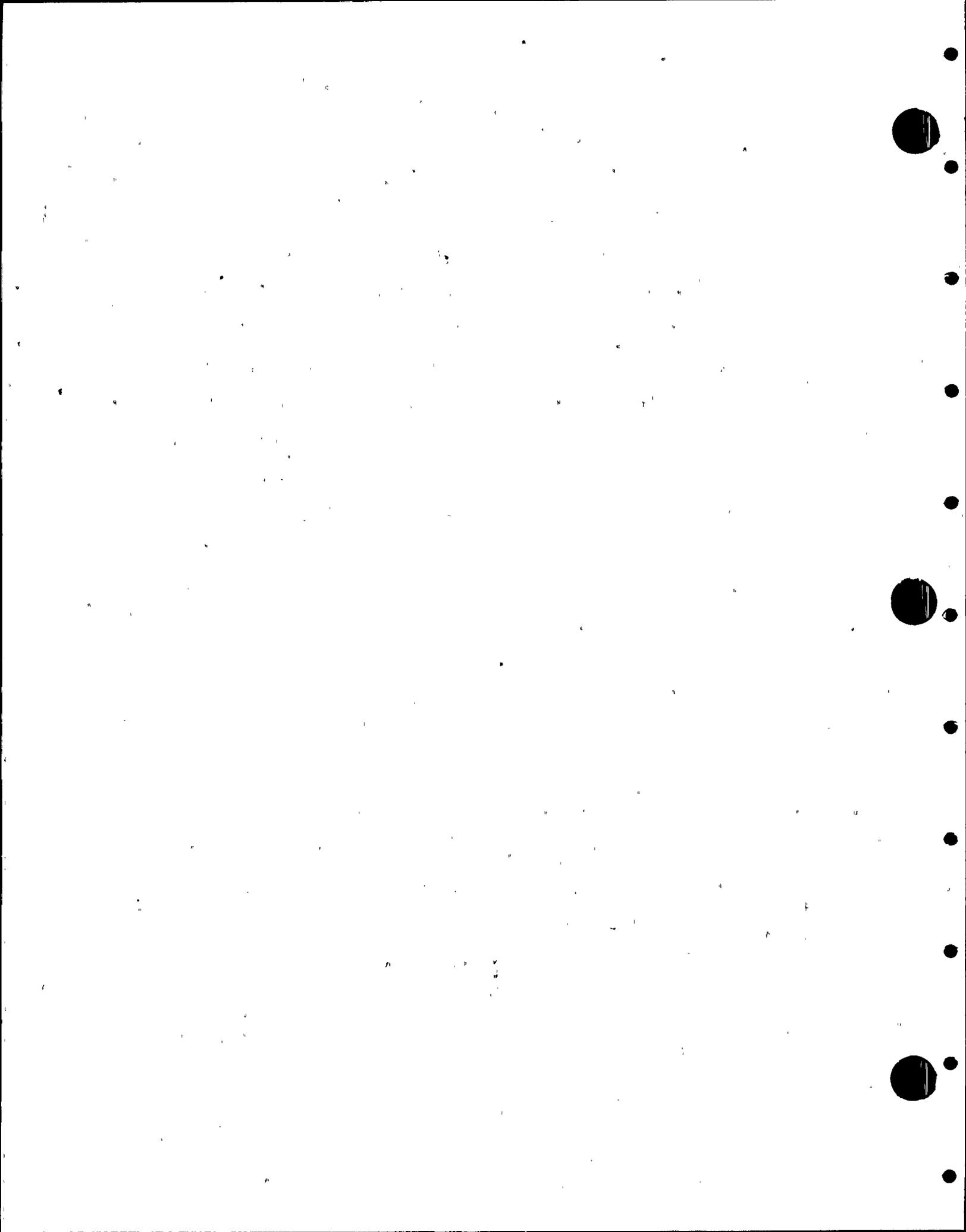
15 MR. KEITH: Yes.

16 MR. VAN BRUNT: Do you have any other questions,
17 Mike?

18 MR. HODGE: No.

19 MR. VAN BRUNT: Any other questions? Phil.

20 MR. HEPNER: On Exhibit 4-18, you talk about the
21 mixing function of the spray system. What sort of guidelines
22 have been developed and what information do we get out of
23 the hydrogen system equipment to get to the point where we
24 can tell the operator to stop the sprays and they are no
25 longer necessary to provide the hydrogen mixing function?



1 MR. KEITH: I know we have looked at the mixing back
2 in the PSAR stage and I think maybe somebody from Combustion
3 Engineering did an analysis then and, as I recall, it was,
4 in order to assure that we have maintained the hydrogen
5 mix, that we operate the sprays every so often. Even though
6 we didn't need it for containment cooling, you would operate
7 them every half hour for five minutes or something like that
8 was the kind of program that I recall.

9 MR. HEPNER: So you are going to do it on a programmed
10 basis and not derive any kind of indication from your
11 hydrogen system or some ultimate level where you would
12 reduce the concentration, say you no longer feel it is
13 necessary to provide the mixing.

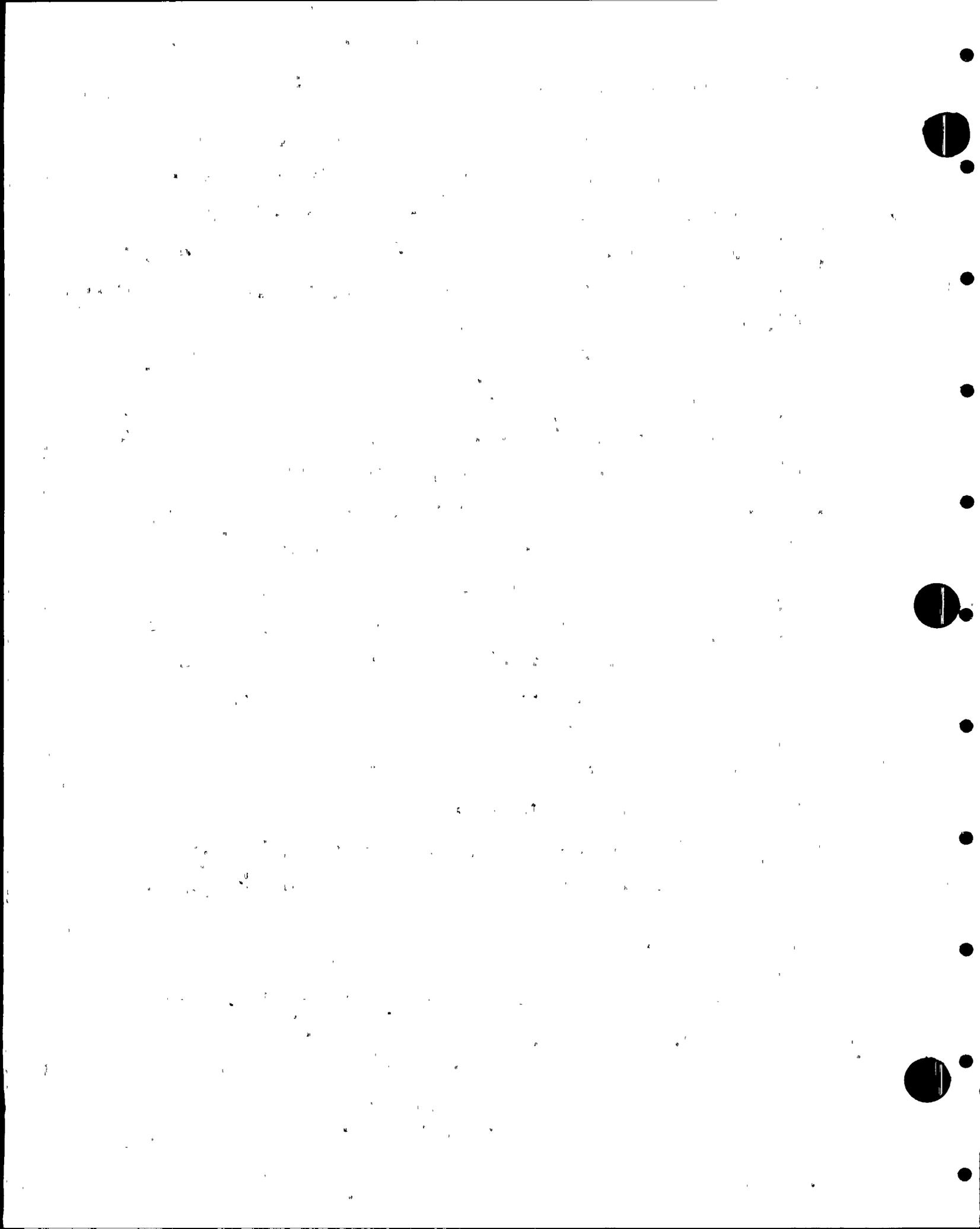
14 MR. KEITH: We are providing the capability in
15 addition to the spray to hook up our normal cooling fans
16 so that they could be used to mix the containment spray.

17 MR. HEPNER: At some extended point in time, you will
18 get out of it by --

19 MR. KEITH: By using fans.

20 MR. HEPNER: -- by using backup equipment?

21 MR. KEITH: Yes, I think at some point when you do
22 get the hydrogen concentration down low and, depending on
23 the accident, you can make inferences insofar as whether
24 there is any other hydrogen generation still going on inside
25 containment.



1 MR. VAN BRUNT: Any other questions? John, you had
2 one.

3 MR. HELD: This pertains to the post-TMI considerations
4 and it also relates to Reg. Guide 1.7. We would like you
5 to provide the results from NUREG-0737, Item II.B.2,
6 entitled "Plant Shielding" with regard to the installation
7 and operation of the hydrogen recombiners and hydrogen purge
8 system and operation of the hydrogen monitors following a
9 LOCA. If you are not prepared to do that now, we can just
10 make it an open item.

11 MR. VAN BRUNT: I think that ought to be an open item.
12 We are in the process of doing that analysis right now.

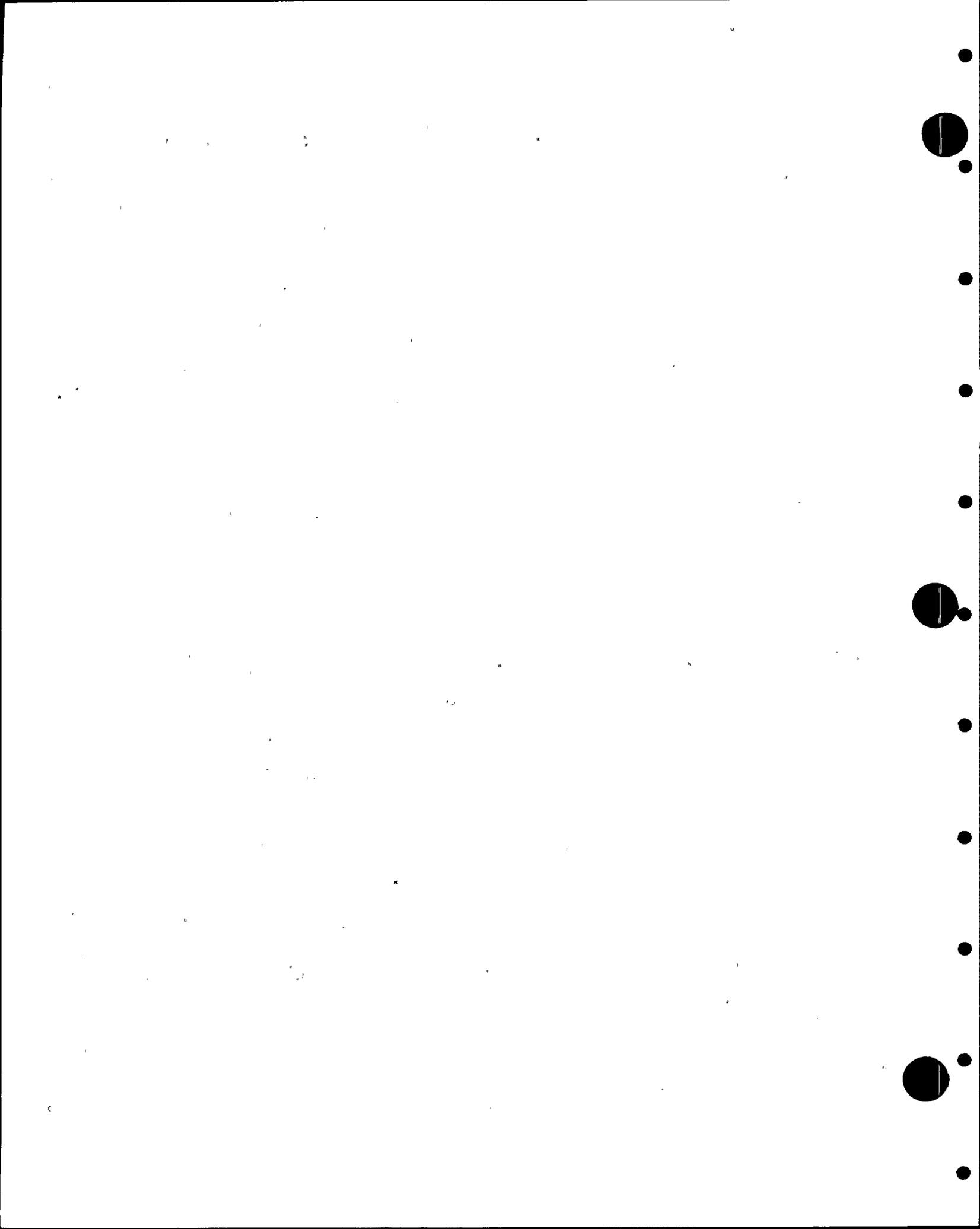
13 MR. HELD: Fine.

14 MR. KOPCHINSKI: We have been looking at that and
15 one thing I am having trouble coming to grips with is the
16 assumption of a degraded core tied in with the assumption
17 that the hydrogen recombiners are useful under that condition.

18 MR. HELD: That is something I am not prepared to
19 discuss now.

20 MR. KOPCHINSKI: Degraded core activities imply a
21 large amount of hydrogen. The recombiners are designed for
22 the Reg. Guide 1.7 quantities. It seems incompatible to me
23 to mix the two. If you can provide any guidance in the
24 future, we would appreciate it.

25 MR. HUONG: I think regarding Reg. Guide 1.7, we do



1 have a requirement for shielding considerations indicated
2 on Exhibit 4-19.

3 MR. KOPCHINSKI: That's correct, but those are
4 different assumptions.

5 MR. HUONG: You can use it for the time being. I
6 think at least you can use the design loss of coolant
7 accident as the basis there to evaluate the dose level in
8 the area.

9 MR. KOPCHINSKI: You think for the classical LOCA
10 where the activity is all mixed with the containment sump?

11 MR. HUONG: Yes, any sources you can identify.

12 MR. KEITH: We will provide you what we expect as far
13 as dose rates.

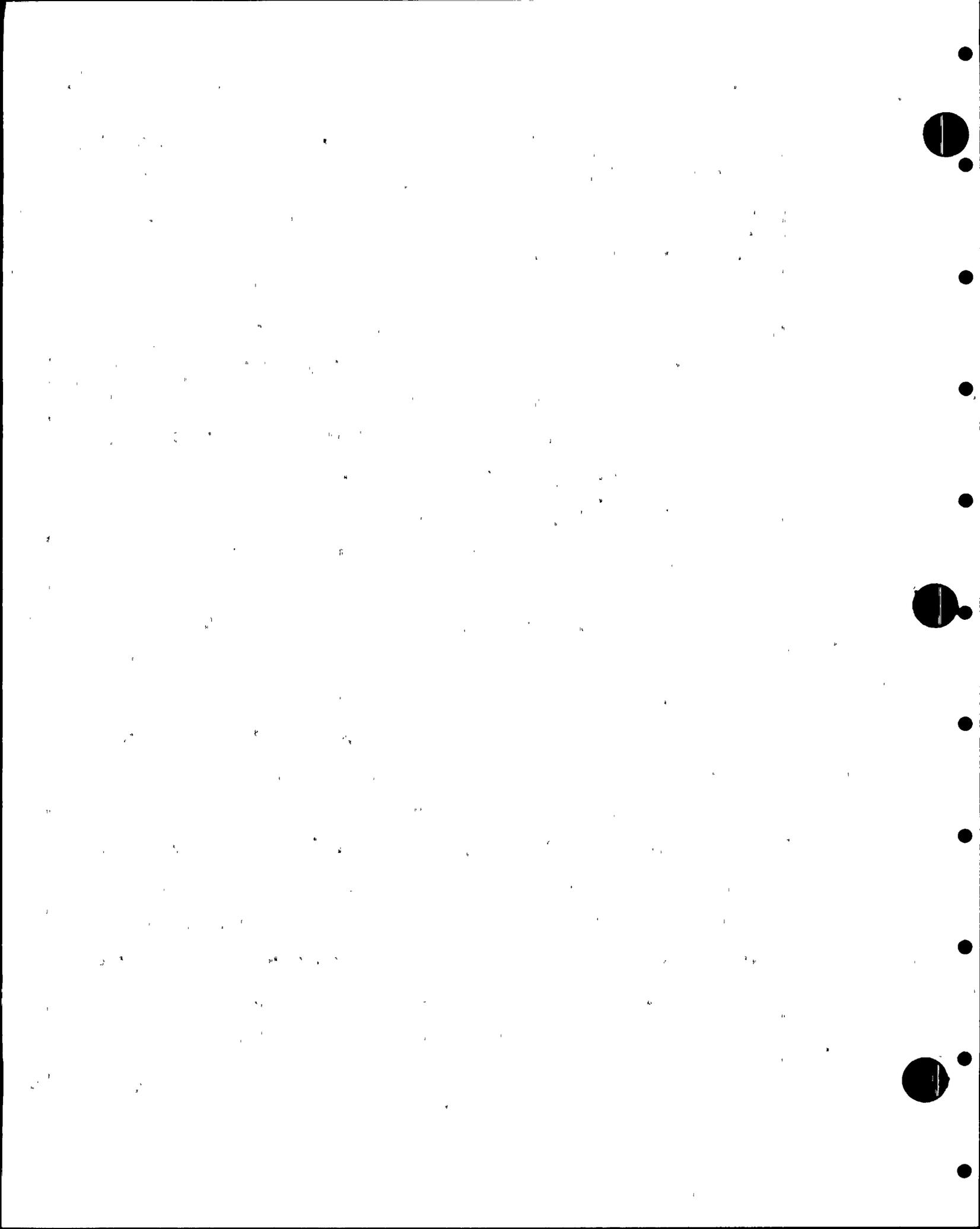
14 MR. VAN BRUNT: John, do you have any other questions?

15 MR. HELD: Not at this time.

16 MR. VAN BRUNT: John over here.

17 MR. ALLEN: Just for the record, could you describe
18 what we have done to be sure we can move these recombiners
19 around? Forklift? Cart? Whatever.

20 MR. KEITH: Yes. At our engineering facilities in
21 Downey, we have a three-quarter inch to the foot scale
22 model of the Palo Verde power block and we have in there
23 checked that we can move a recombiner around, that we don't
24 have piping or electrical cable trays or anything in the way.
25 We have made a complete check that the recombiners can get in



1 and out of the auxiliary building, and, of course, when they
2 are installed in Unit 1, that will be the final check.

3 MR. TOSETTI: In relation to that, are there any
4 special handling requirements in terms of rigging or mobile
5 cranes required?

6 MR. KEITH: No, a forklift is all that is required.

7 MR. VAN BRUNT: Are there any other questions?

8 MR. TOSETTI: A question regarding the hydrogen
9 monitor, and that is relative to Exhibit 4-32. There is a
10 difference between the accuracy stated in this table versus
11 that in the FSAR.

12 MR. KEITH: These are the correct ones. The FSAR
13 will be modified to reflect these.

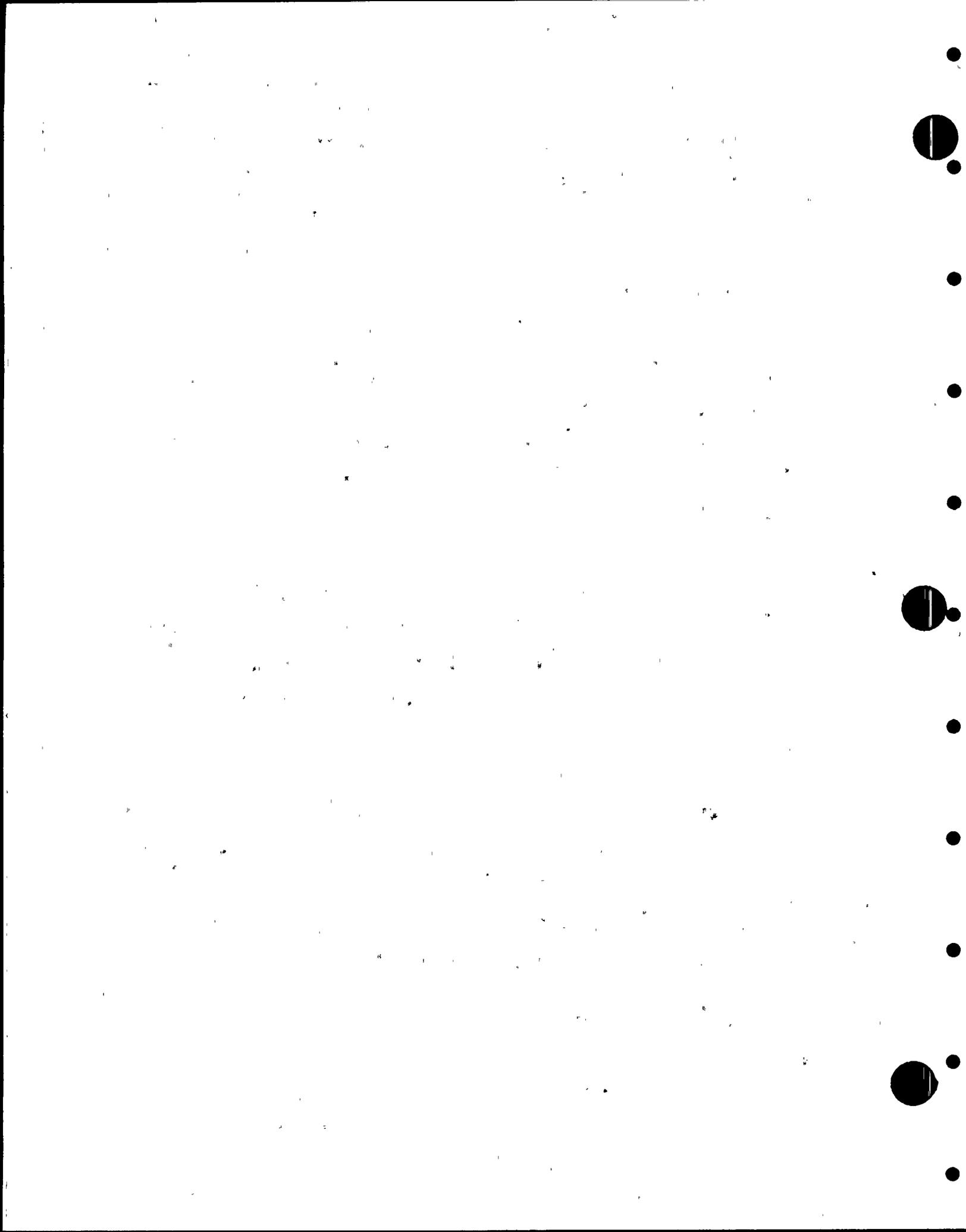
14 MR. VAN BRUNT: Are there any other questions? Ed.

15 MR. STERLING: On that same exhibit, there is some
16 difference between the availability in the paragraph above
17 and the system warmup time.

18 MR. KEITH: We keep the analyzers warmed up all the
19 time in order to meet that availability requirement. It is
20 necessary because of the warmup time to keep them warmed up
21 all the time.

22 MR. VAN BRUNT: Dennis, do you want to go to the
23 informal questions that we have?

24 MR. KEITH: Yes. Question 6.2.5-1. We will provide
25 you with those figures unless we already have.



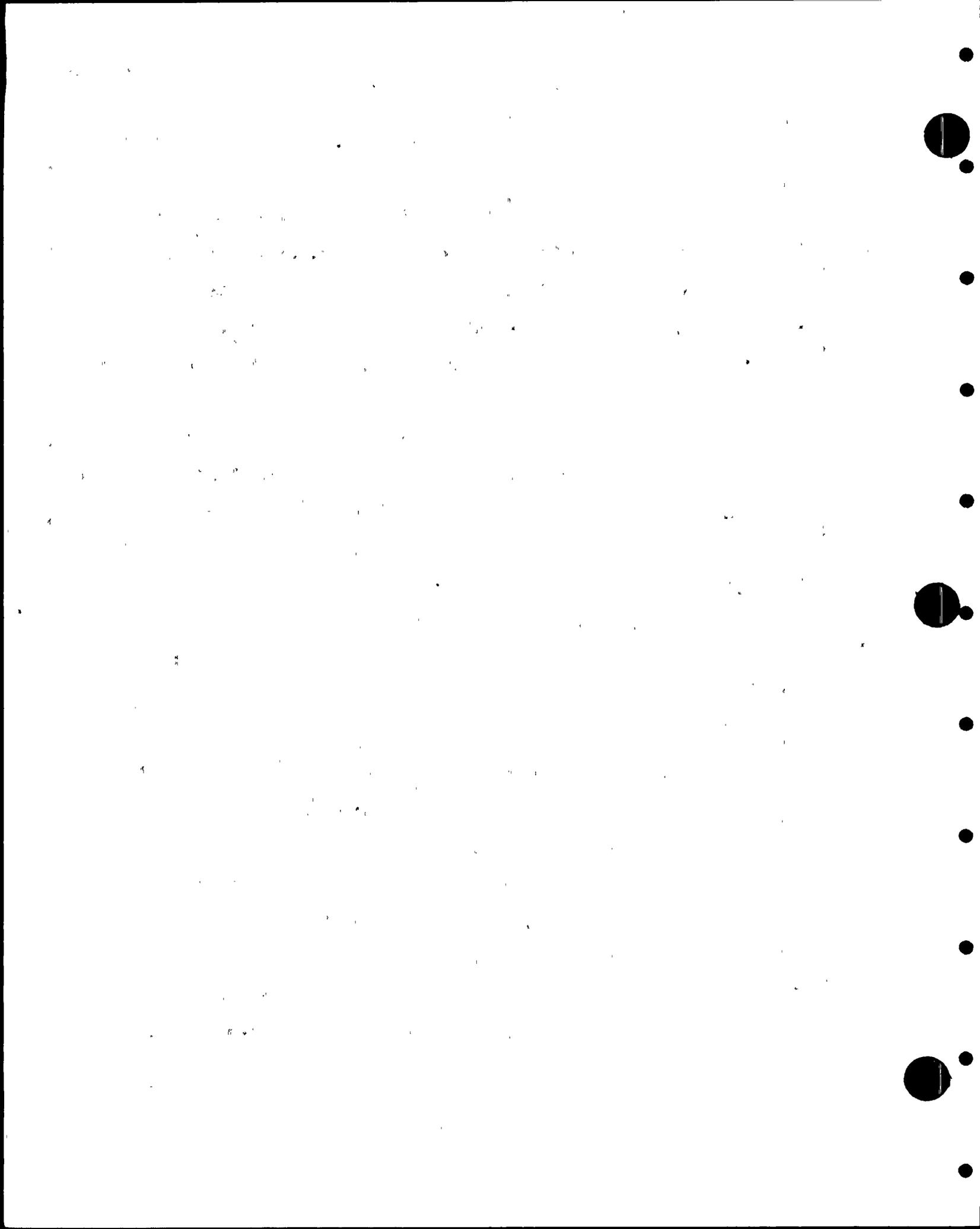
1 MR. HELD: You can delete that question. We have
2 them.

3 MR. KEITH: Question 6.2.5-2. Within each train,
4 the suction and discharge points are separated by 22 feet
5 in elevation and 22 degrees radially. A slab is located
6 between the suction and discharge points for the recombiners.
7 The two recombiner trains have a minimum radial separation
8 of 116 degrees. So one recombiner comes in about here
9 (indicating), the discharge coming in here (indicating),
10 and the suction coming in say about at this point (indicating).
11 The other train is located with the discharge coming in
12 about there (indicating) and the suction over here (indicating).
13 All the piping is designed to ASME Section III, Class 2.
14 It is designed for containment design pressure and is
15 supported to Seismic Category I requirements. Isolation
16 valves are qualified to post-LOCA environment and are powered
17 with Class IE power.

18 MR. HELD: Adding to this question a little bit, I
19 would like to make sure that the locations for hydrogen
20 monitoring will provide representative values.

21 MR. KEITH: John, the points that the analyzers are
22 using are the same as far as inside the containment. They
23 go through the same penetration.

24 MR. HELD: Are you reasonably assured then that the
25 samples you will be getting from those locations will give



1 you values which are representative of what is there
2 throughout the containment?

3 MR. KEITH: Yes. I think with the spray system
4 operating, the containment is going to be well mixed.

5 Question 6.2.5-3. We are putting in an FSAR
6 change to reflect that the hydrogen recombiner is Quality
7 Group B. The table did note that it was Section III, Class 2
8 which has been the case all along.

9 Question 6.2.5-4. PVNGS has two complete
10 recombiner units. After completion of construction, the
11 normal storage locations when all three units are in
12 operation is with one recombiner and its control cabinet in
13 Unit 1 in the auxiliary building and the other one in Unit 3.

14 The procedure to install and place the recombiner
15 into operation is as follows:

16 The recombiner and control cabinet are moved into
17 place via forklift.

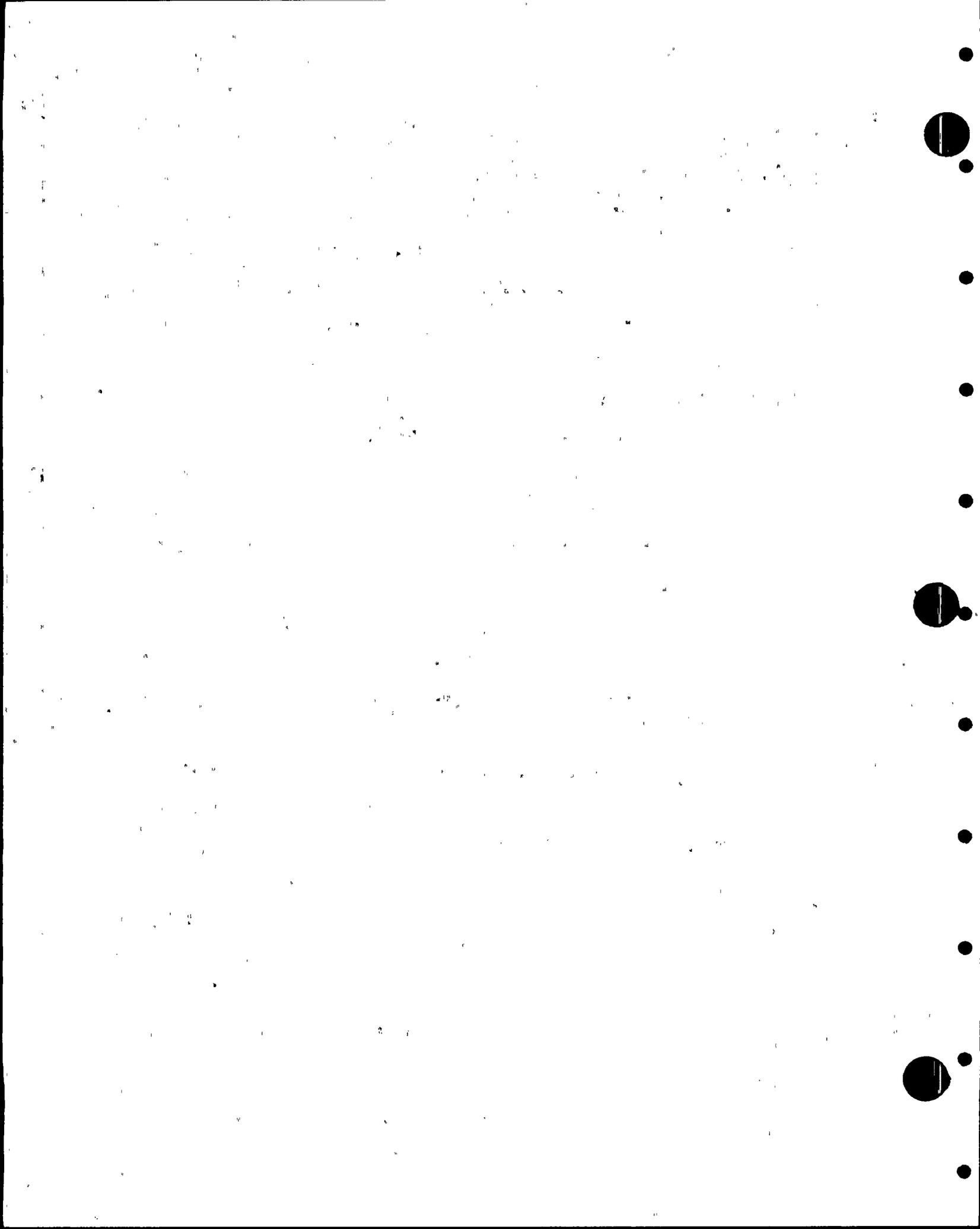
18 Cabinets are secured to mounting supports.

19 Power cables are connected between equipment and
20 dedicated Class IE power receptacles.

21 Blank flanges are removed from installed piping,
22 and connections made up to recombiner suction and discharge.

23 The recombiner is placed into a 24-hour warmup
24 mode.

25 The associated containment isolation valves are



1 opened and the recombiner blower is started.

2 MR. HELD: Do you think all that can be done
3 within 24 hours?

4 MR. KEITH: It can. As you saw, we committed to a
5 72-hour startup.

6 MR. HELD: But you think it would be reasonable to
7 expect it to be done within 24 hours if it had to?

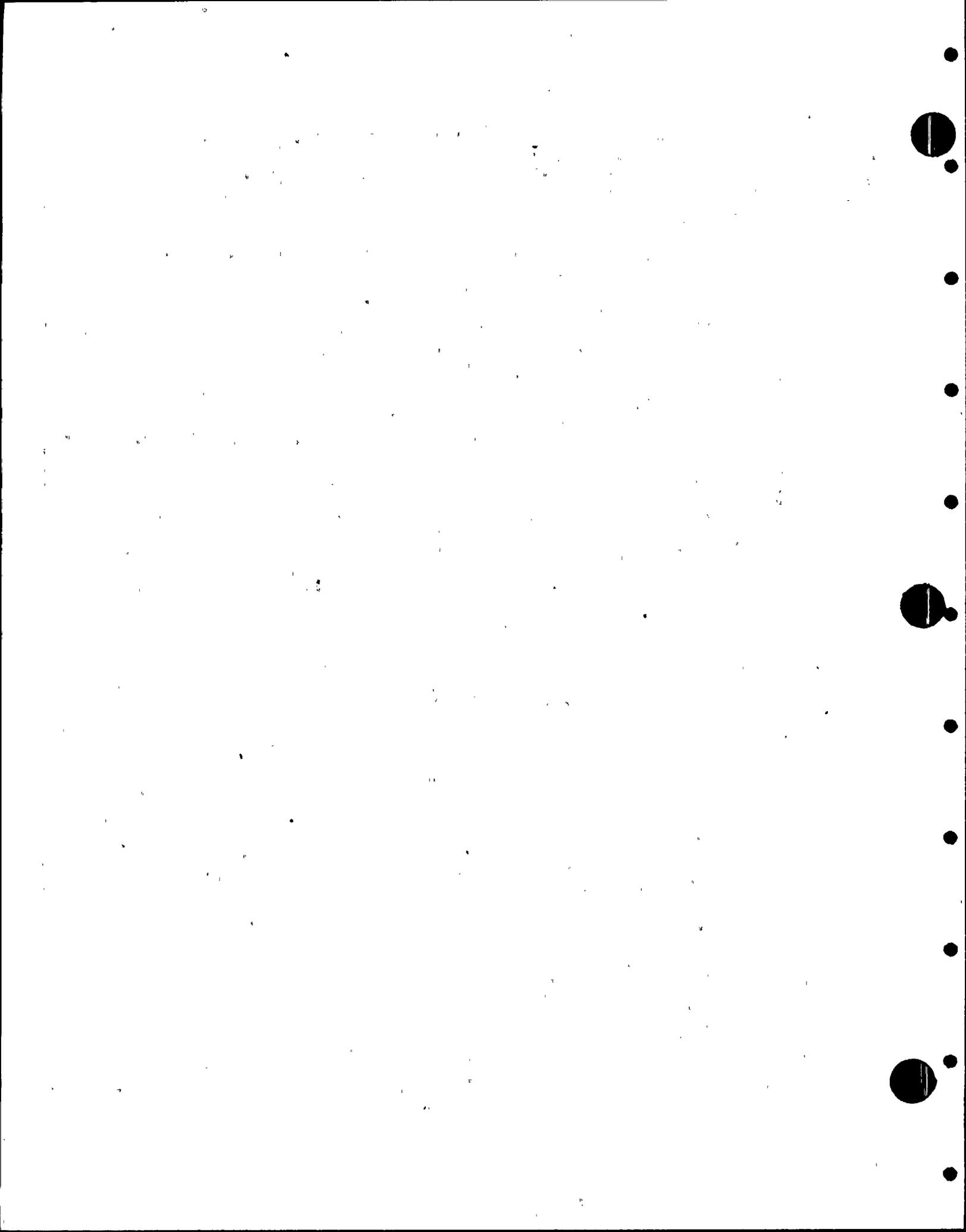
8 MR. KEITH: If it had to, yes.

9 Question 6.2.5-5. The hydrogen generator analyzer
10 subsystem had dual indication (zero to 1 volume percent and
11 zero to 10 volume percent) as well as an alarm function in
12 the control room. The control room has a trouble alarm from
13 the recombiner control cabinet. Specific alarm indications
14 are read on the recombiner control cabinet. Other local
15 indications are also available to monitor the operation of
16 both the recombiners and the purge system.

17 MR. HELD: On the last part of that question, I
18 wanted to verify that you also have recording in the main
19 control room in addition to indication.

20 MR. KEITH: We are adding recording for one channel of
21 the hydrogen analyzer.

22 Question 6.2.5-6. The hydrogen purge subsystem
23 will be installed in the affected unit along with both
24 recombiners following a LOCA. The purge unit installation is
25 as follows:



1 The skid is moved into place via forklift.

2 Piping is connected to installed suction and
3 discharge piping connections.

4 That is all there is for the installation. It is
5 just a matter of starting it.

6 The time required to install and place the purge
7 unit into operation is less than one day.

8 The normal storage location of the purge unit
9 is in the warehouse. Adequate radiation protection is
10 available for the operator, although that is an open item
11 which we are getting back to you, since we are talking about
12 the same area as the recombiners.

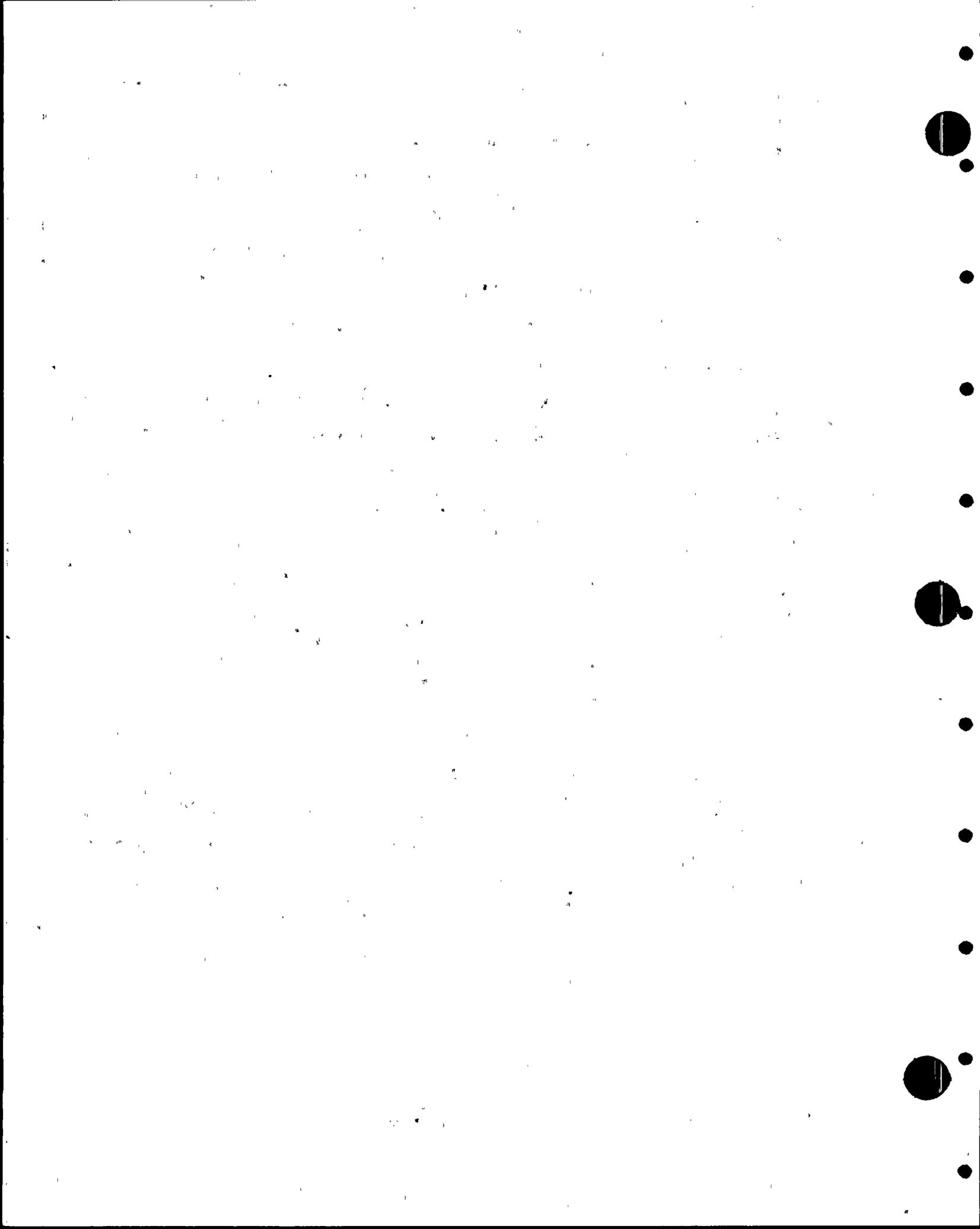
13 Question 6.2.5-7. The hydrogen analyzer, as we
14 have stated, is permanently installed and the readout is
15 in the main control room. Therefore, radiation exposure
16 to personnel is minimized.

17 Question 6.2.5-8. The steam mass was calculated
18 assuming saturated steam conditions inside the containment
19 and we used the pressure-temperature conditions that we
20 calculated for our pressure-temperature analyses as presented
21 in Chapter 6.2.

22 Does that take care of that one, John?

23 MR. HELD: I think so. I may come back with another
24 question later. Let's leave it at that for now.

25 MR. KEITH: Fine.



1 MR. VAN BRUNT: You always have that right anyway.

2 MR. KEITH: Question 6.2.5-9 is the one which Mike
3 brought up on the reactor drain tank. The rupture disk
4 does discharge inside the reactor drain tank compartment.
5 We haven't been particularly concerned about that compartment
6 because we don't feel there is any source of hydrogen
7 ignition.

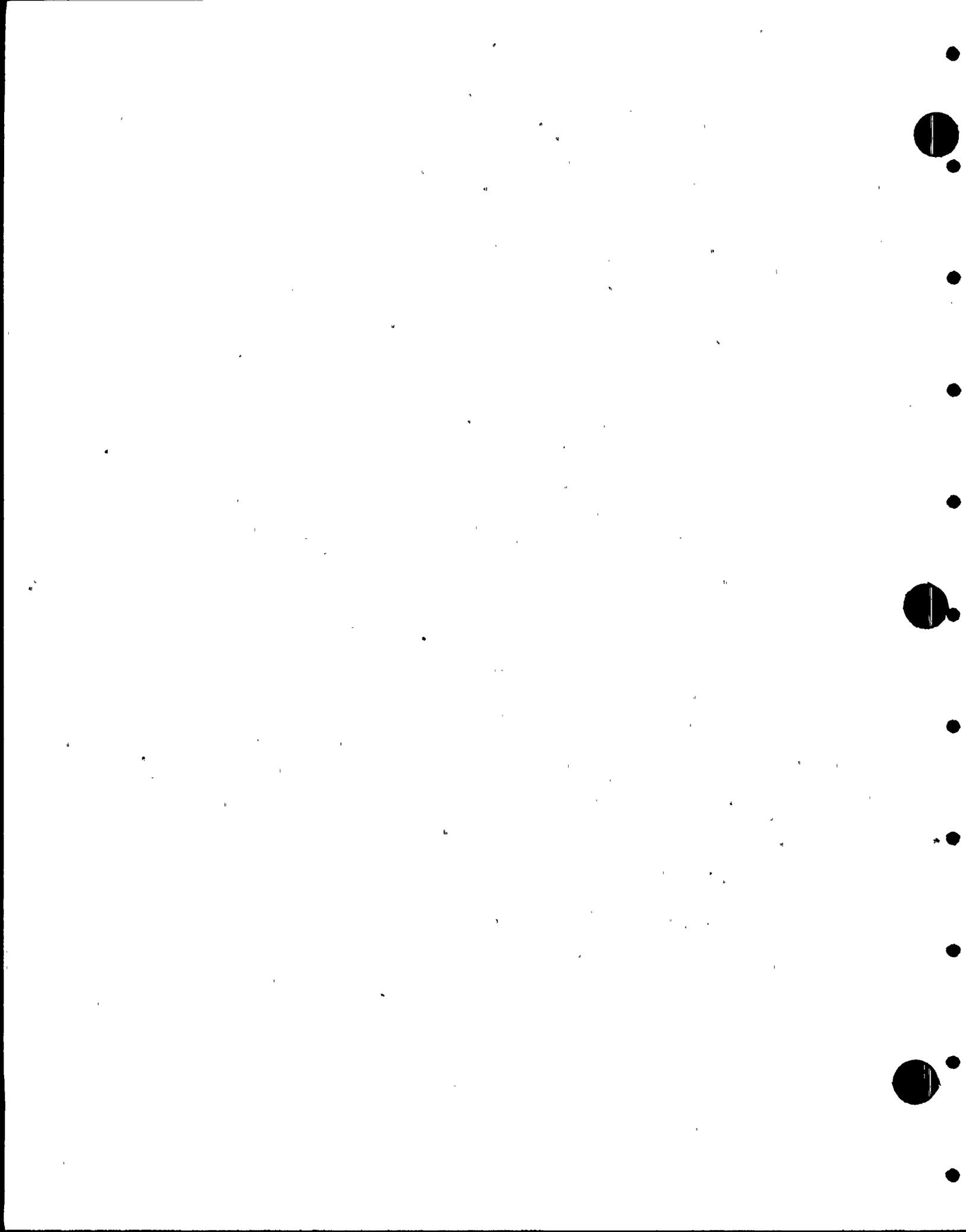
8 MR. HELD: That is not to say there is no source of
9 hydrogen.

10 MR. KEITH: That's correct if you postulate some sort
11 of pressure transients which would cause our safety valves
12 to relieve. We do not have a power-operated relief valve.
13 We have just code safeties, which go to 2,500 pounds,
14 roughly. So if you postulated them relieving, then the
15 rupture disk would go and, of course, there is hydrogen in
16 the pressurizer.

17 MR. HELD: This is related to our concern of hydrogen
18 pocketing within the containment and, in general, whether
19 there is adequate provision for mixing.

20 MR. KEITH: We looked at this a long time ago and,
21 as I said, concluded that there is no electrical equipment
22 in that compartment, so we didn't see it as a problem.

23 MR. HELD: I've got a couple of other comments related
24 to the same question. Have you done any analyses of the
25 containment atmosphere mixing to demonstrate that both



1 hydrogen mixing and containment cooling will be adequate
2 throughout?

3 MR. KEITH: When you say throughout, are you talking
4 about throughout the containment, not throughout the accident?

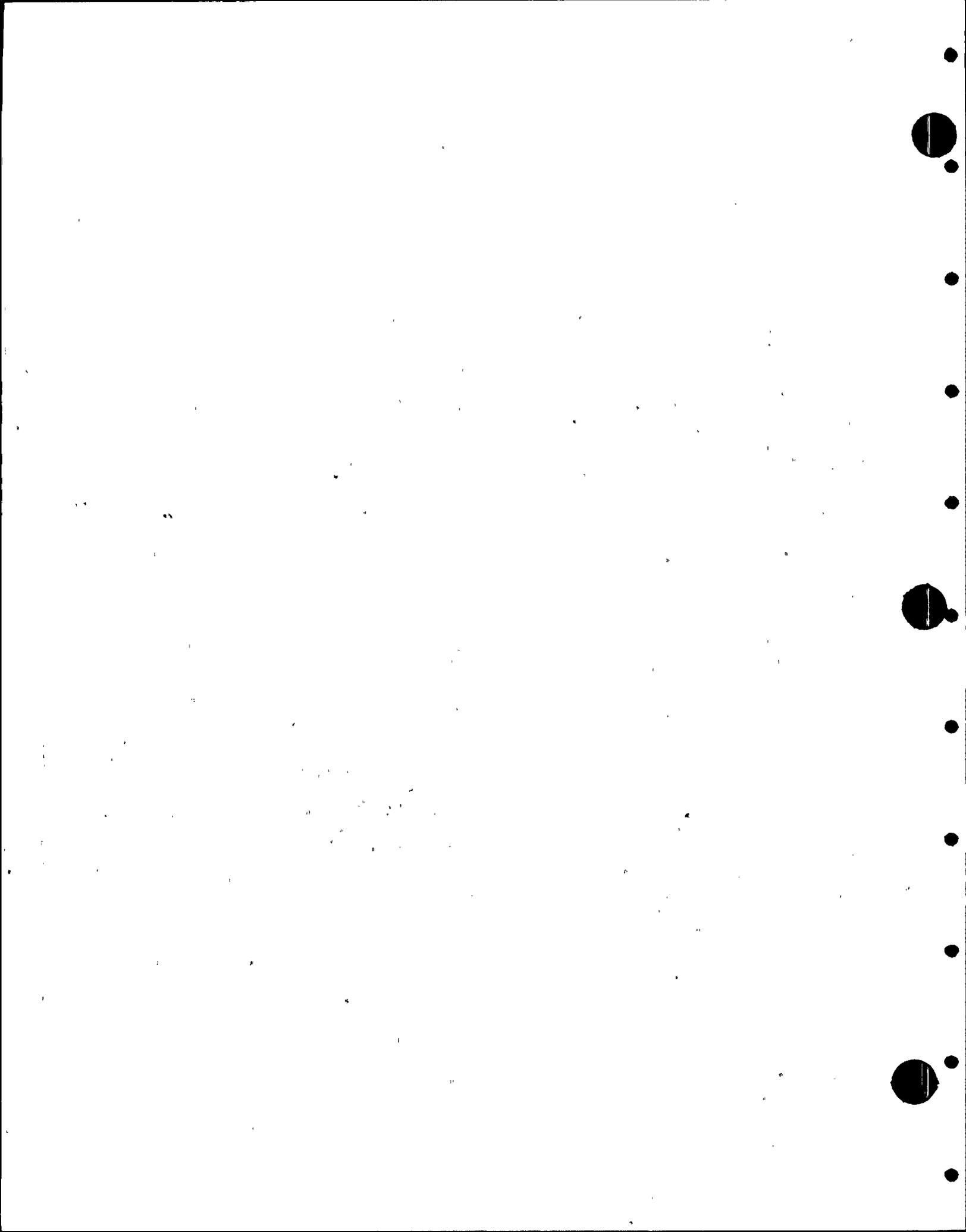
5 MR. HELD: Right. Throughout the containment, excuse
6 me.

7 MR. KEITH: Yes, we have. Mike has already brought
8 up the elevator shaft and I am sure at one time we looked at
9 that, and I just don't recall the results. We will have
10 to get back. We can get back with you, because I can recall
11 looking at drawings of sections through the containment to
12 see if there were any compartments that would likely create
13 significant hydrogen pockets. We will hold that as open.

14 MR. HELD: Along the same lines, what we would like
15 you to do is discuss, utilizing appropriate general arrange-
16 ment drawings, how the internal structures of the containment
17 building are designed to promote natural convective flows and
18 prevent stagnate accumulations of containment atmosphere.

19 MR. KEITH: We'll include that with the discussion.

20 Question 6.2.5-10. The cooling system is
21 essential to operation of the hydrogen recombiner. This has
22 been discussed earlier, you will recall. As we stated, the
23 blower for that ventilation system takes the suction inside
24 the auxiliary building and discharges inside the auxiliary
25 building. All that ventilation ducting is Seismic Category I.



1 Our ventilation duct, and this is true throughout the plant,
2 is not built to Section III, Class 2, so it is not Quality
3 Group B. Because it is inside the building, the inlet and
4 outlet are protected from tornadoes, floods, missiles. That
5 is no problem.

6 MR. HELD: I didn't catch whether you addressed
7 Point b there or not.

8 MR. KEITH: I was stating that the suction and
9 discharge are inside the building.

10 MR. HELD: Is the blower or fan for bringing in cooling
11 air from outside the auxiliary building and then returning it
12 to the outside provided as part of the portable hydrogen
13 recombiner skid package?

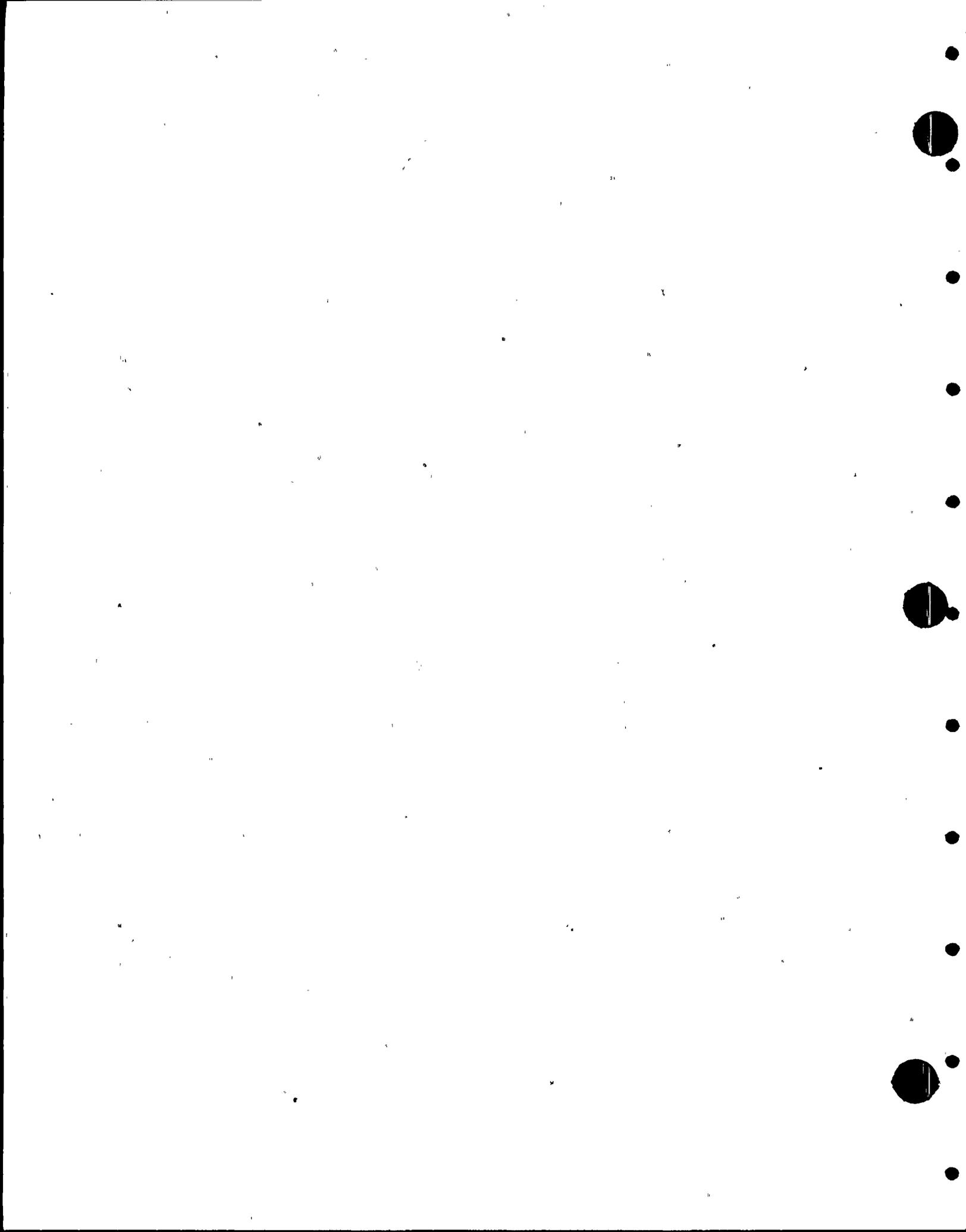
14 MR. KEITH: Oh, I'm sorry, I missed it. It is part
15 of the skid package. It is taking suction from inside the
16 building and discharging inside the building.

17 MR. HELD: So the question was partially in error,
18 too.

19 MR. KEITH: Yes. The blower is part of the skid
20 package and is Quality Class Q, Seismic Category I.

21 MR. HELD: I've got one more thing on that last item.
22 Since you are doing everything inside the building, have
23 you accounted for heat generation because of the operation
24 of that machinery and then provided for heat removal?

25 MR. KEITH: Yes.



1 MR. HELD: How is that done?

2 MR. KEITH: We have done analyses. Let me hold that
3 as an open item. We will get back to that and give you the
4 details on that.

5 MR. HELD: Fine.

6 MR. VAN BRUNT: Are you going to cover this NUREG-
7 0737 information?

8 MR. KEITH: I think we have already covered it all.
9 Do you know offhand, John? Is there anything we haven't?

10 MR. HELD: Could you address the first two points
11 on that page?

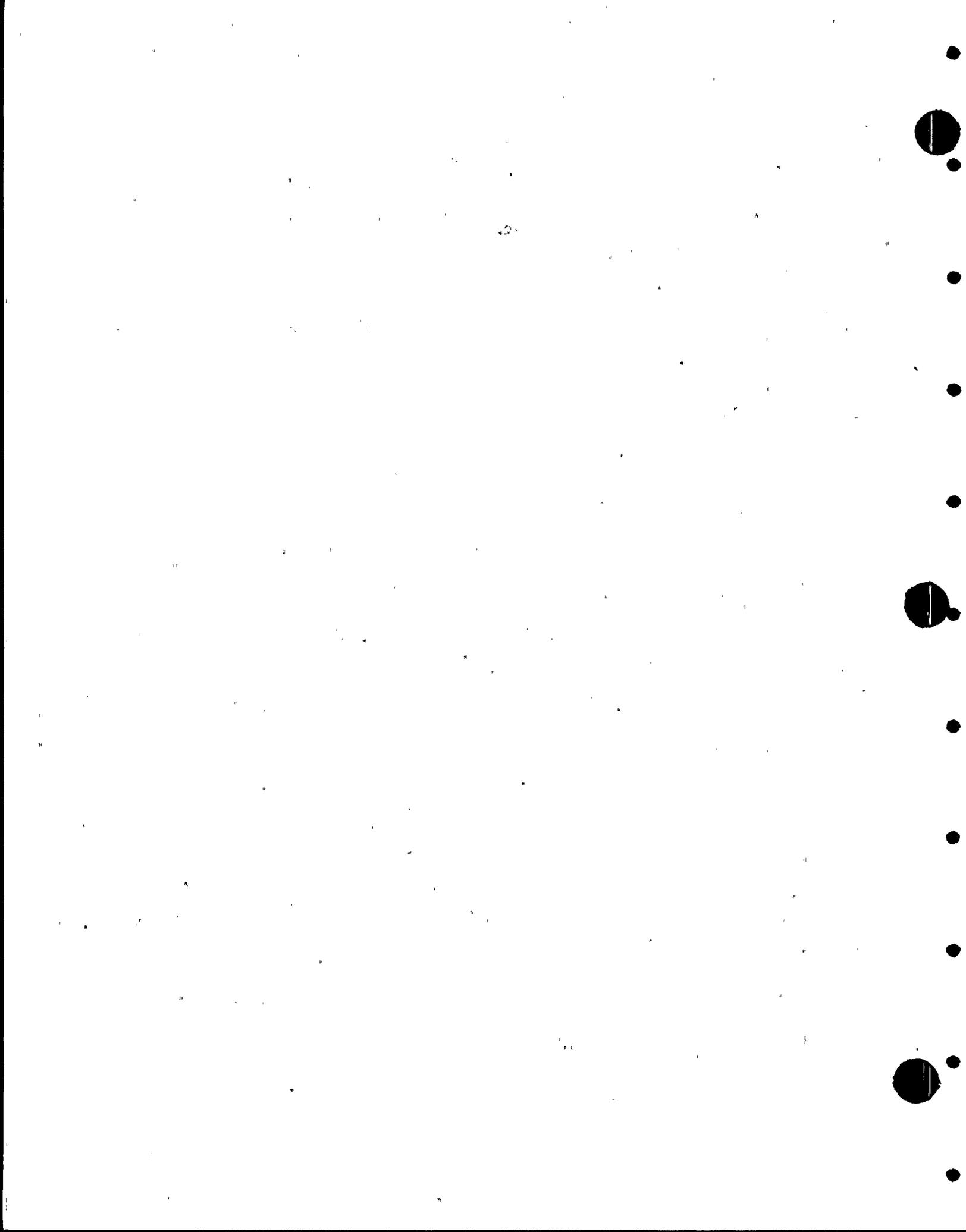
12 MR. KEITH: Point 3.a., we did add that it does
13 operate under negative pressure.

14 Let's see, John, can you help us? On Question
15 3.b., Appendix B, does that cover anything that we haven't
16 covered? I am not sure. I don't want to say we are meeting
17 that.

18 MR. HELD: Not having it right in front of me, I
19 can't verify that. I think we will have to talk about it
20 later.

21 MR. KEITH: Okay, we can talk about that one. Part
22 3.c., we have confirmed that we have recording and indication
23 within 30 minutes.

24 Item 4, we have stated we are in the process of
25 changing our containment pressure monitors to meet that



1 requirement.

2 We are responding to Question 5. We described
3 the water level monitor.

4 MR. HELD: All right.

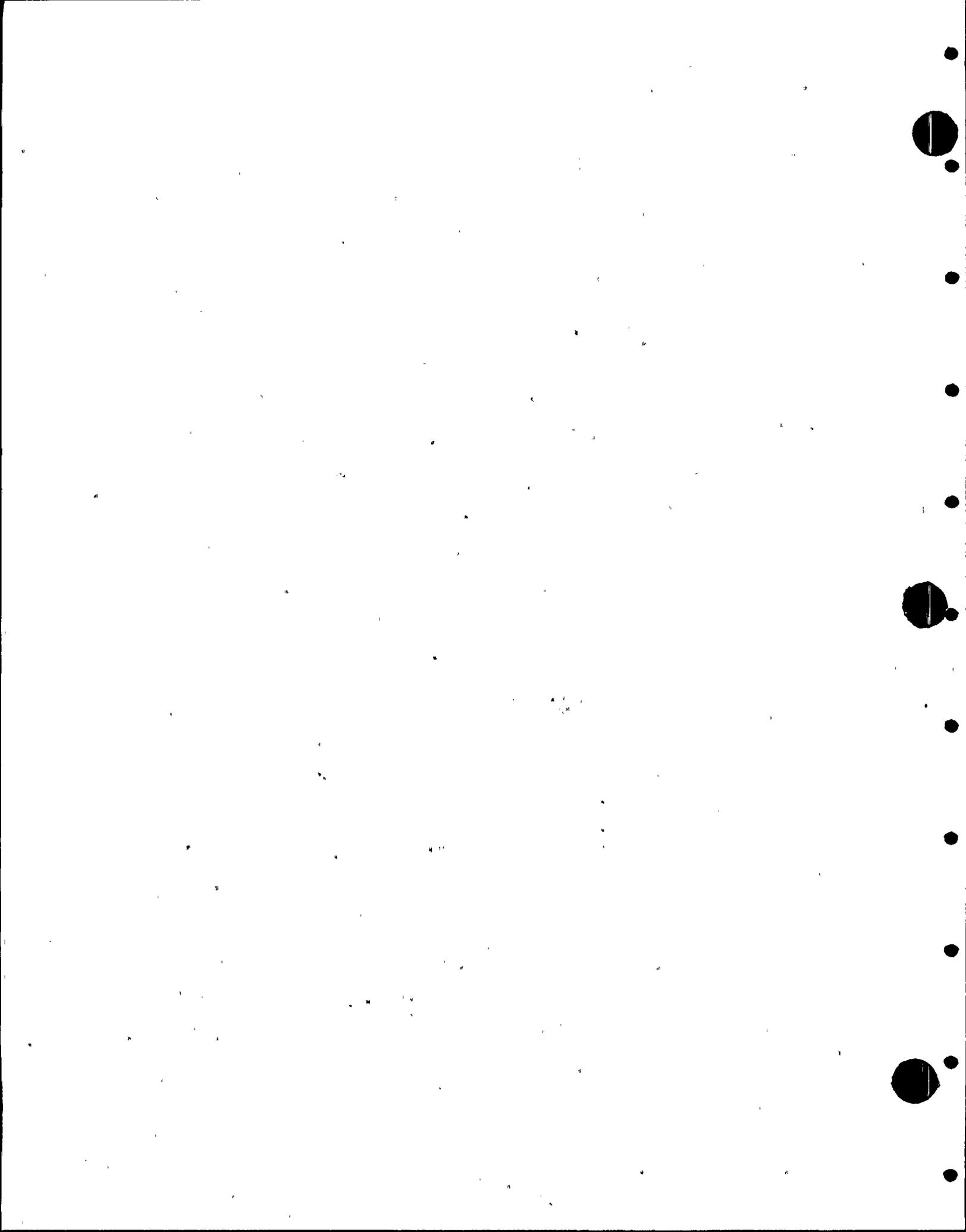
5 MR. ALLEN: John, for your information, also, we
6 submitted our lessons learned implementation report to the
7 NRC a while back. I don't know if you were provided with
8 that or not. It's got all the 0737 stuff in it.

9 MR. VAN BRUNT: Are there any other questions?

10 Let's go off the record for just a moment.

11 (Thereupon a brief off-the-record discussion ensued,
12 after which proceedings were resumed as follows:)

13 MR. VAN BRUNT: I would ask that Bill Quin and Gerry
14 Kopchinski compare notes on the open items and come up with
15 a final list and provide it for the court reporter so that
16 when we issue the record of this review that everybody that
17 receives it will have a list of the open items and they can
18 verify that they are satisfied with those. We will be
19 issuing that to all the Board members. Bechtel or whoever
20 else has been designated will be responding to the open
21 items very shortly. We will get those out. We don't really
22 have too many, I don't think, of any significance from this
23 hearing, so we ought to get them out pretty quick. We
24 would appreciate turn around or your agreement with those as
25 quickly as we can get them so we can submit the documents



1 to the commission and hopefully get this closed up so they
2 can get their draft SER.

3 Are there any other issues anybody wants to raise?

4 I want to thank everybody for their participation.

5 We will call this session closed.

6

7

* * *

8

9

10 I HEREBY CERTIFY that I was present at the meeting
11 before the Palo Verde Nuclear Generating Station Containment
12 Systems Review Board; that I made a shorthand record of all
13 proceedings and testimony had and adduced before said Review
14 Board at said meeting; that the foregoing 198 typewritten
15 pages constitute a full, true and accurate transcript of
16 said record, all to the best of my skill and ability.

17

18

Mark M. Grumley
MARK M. GRUMLEY
Court Reporter

19

20

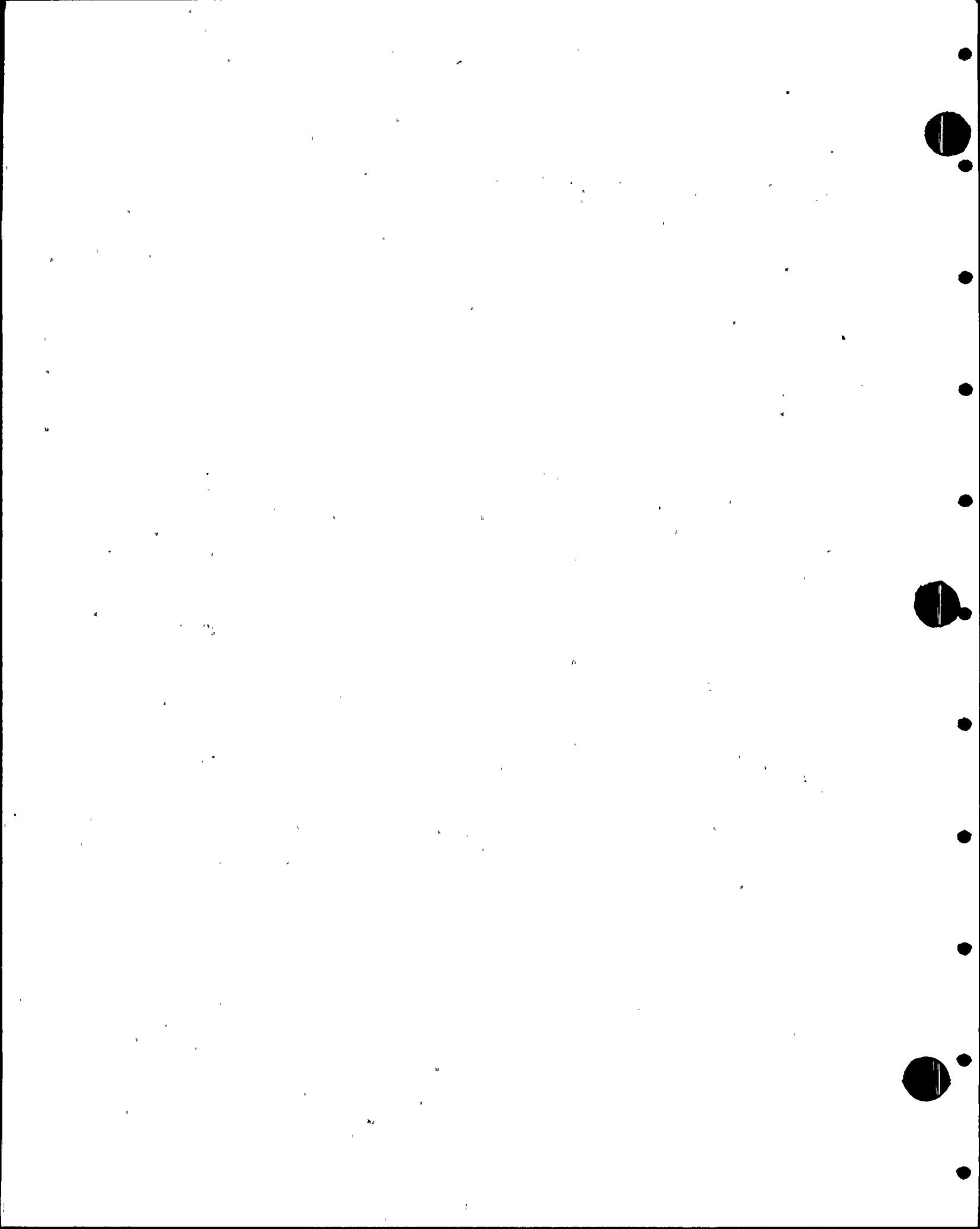
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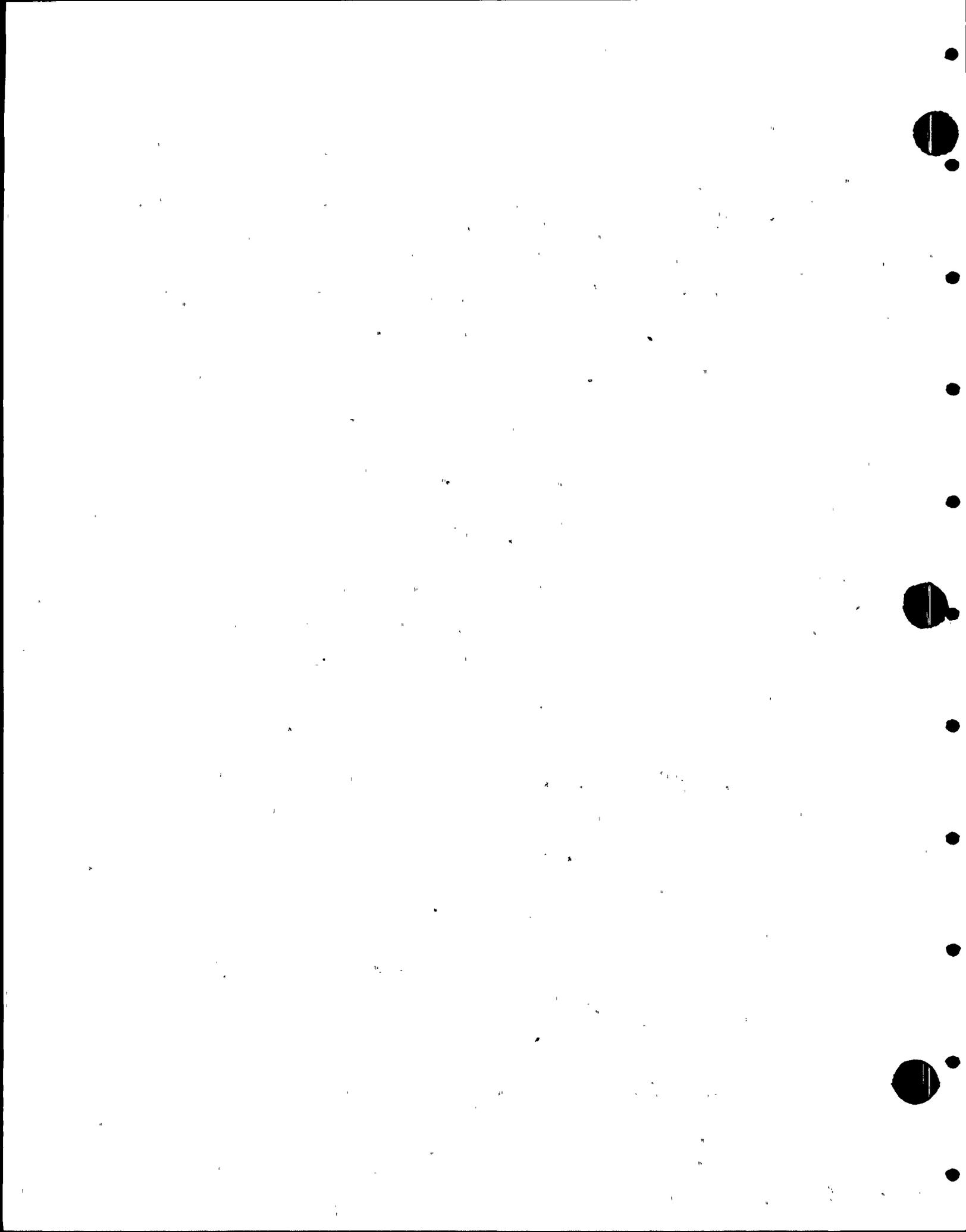
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23

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25





1 of the sprays. If significant overlapping of the sprays
2 exists, evaluate the effect in terms of degraded heat removal
3 capability. (Note: The above information is not provided
4 in Section 6.5.2.2.)

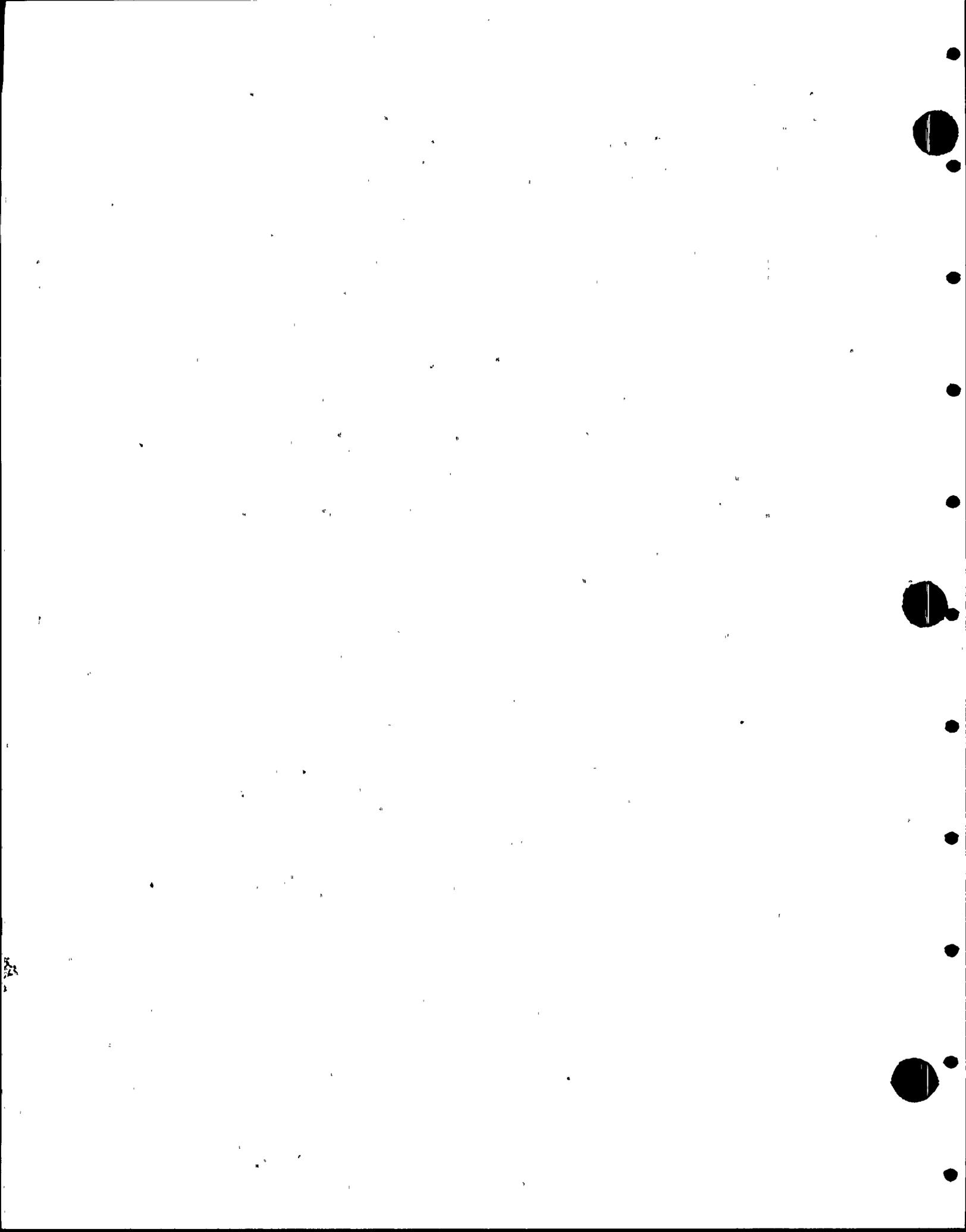
5
6 QUESTION 6.2.2-3:

7 Provide an analysis of the heat removal capability
8 of the containment spray system. The analysis should include
9 the degree of thermal equilibrium attained by the spray
10 water, reference SRP Section 6.2.2. (Note: The above
11 information is not provided in the referenced CESSAR
12 Appendix 6A, Section 2.1.2.)

13
14 QUESTION 6.2.2-4:

15 Provide additional information on the operation of
16 shutdown heat exchangers, including:

- 17 a. Operational modes and actuation during the
18 injection and recirculation phase of the
19 spray system.
- 20 b. The potential for surface fouling of the
21 secondary side and how this effect has been
22 treated in the heat removal capacity of the
23 heat exchanger used in the Section 6.2.1
24 analyses.
- 25



1 QUESTION 6.2.2-5:

2 Verify that the Containment Spray System has been
3 designed in accordance with Regulatory Guide 1.1 to provide
4 adequate NPSH to the system pumps assuming no increase in
5 containment pressure from that present prior to postulated
6 loss of coolant accidents.

7

8 QUESTION 6.2.2-6:

9 Identify the limiting restriction in systems served
10 by the CSS sumps, upon which the maximum fine screen opening
11 of 0.09 inch is based.

12

13 QUESTION 6.2.2-7:

14 Describe the design features of the pump intakes in
15 the CSS sumps which will minimize vortexing and other degrad-
16 ing effects on pump inlets.

17

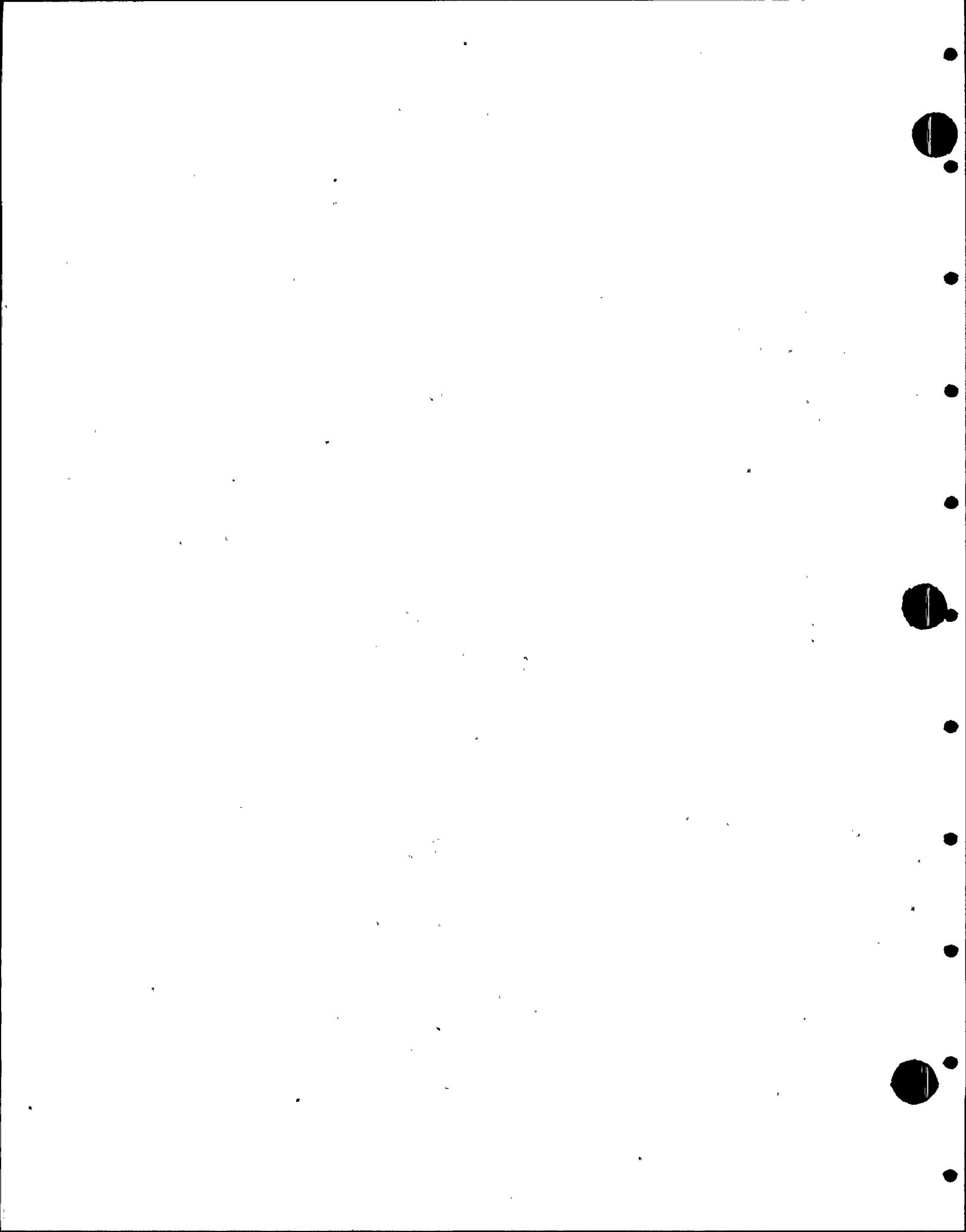
18 QUESTION 6.2.2-8:

19 Identify the material from which the outer trash rack
20 is fabricated, and provide assurance that this material is
21 resistant to degradation during long periods of inactivity
22 and has a low sensitivity to spray induced corrosion.

23

24

25



1 QUESTION 6.2.2-9:

2 Explain why Valves SI-UV672 and SI-UV671 in the lines
3 between the shutdown cooling heat exchangers and the contain-
4 ment spray headers (passing through Penetrations 21 and 22)
5 are locked closed during normal operation. These valves are
6 supposed to open automatically on receipt of a containment
7 spray actuation signal.

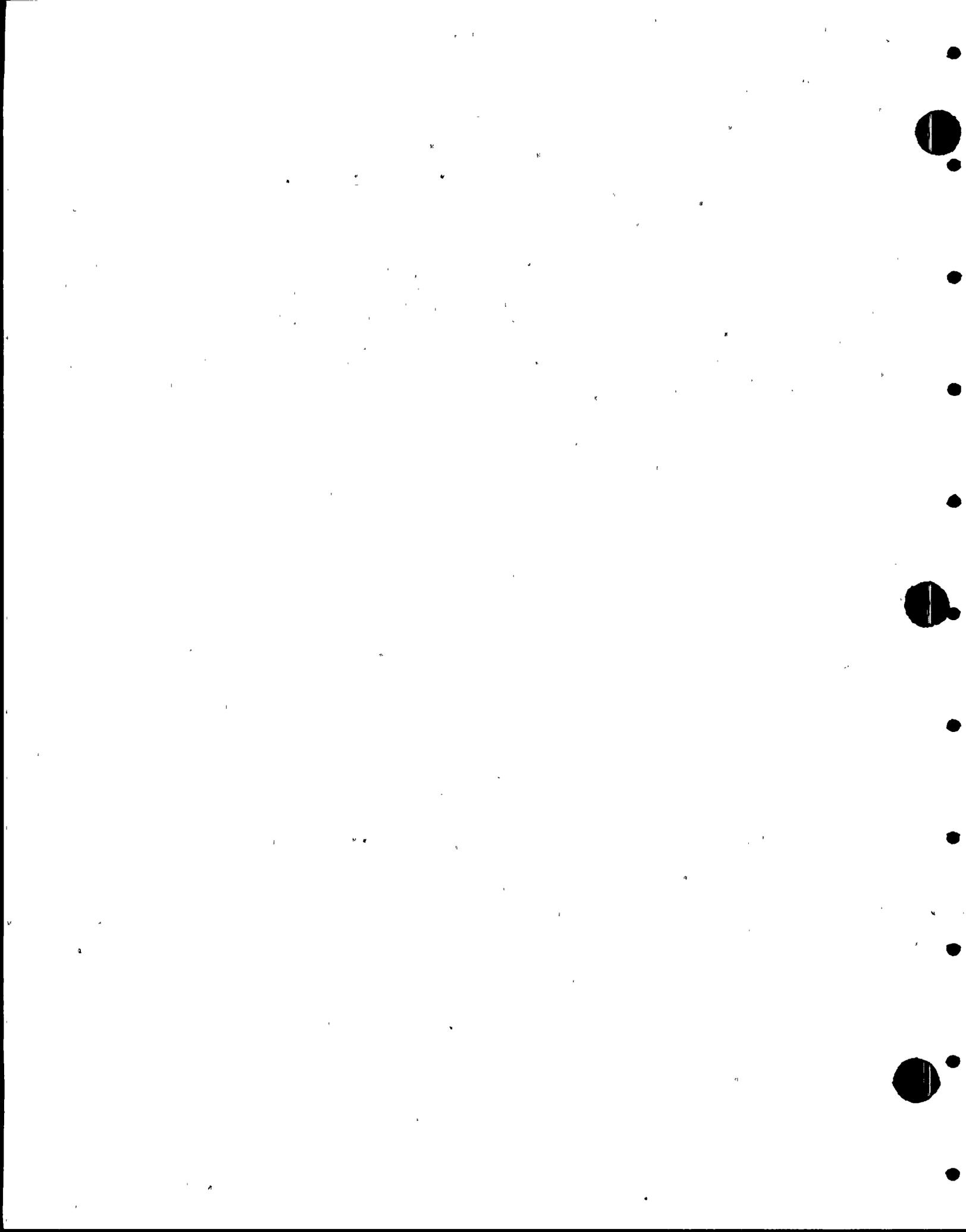
8
9 QUESTION 6.2.4-1:

10 Describe containment isolation provisions for the
11 following penetrations which are not included in FSAR
12 Figure 6.2.4-1:

13	<u>Penetration No.</u>	<u>Function</u>
14	5	Spare
15	32B	Spare
16	32C	Spare
17	62B	ILRT Verification leak
18	62C	ILRT Pressure measurement

19 QUESTION 6.2.4-2:

20 FSAR Section 6.2.4.3 states that an Operating
21 Procedure will require that manual valves such as those shown
22 in Valve Arrangements 3, 5, 12, 28, and 35 be verified as
23 closed prior to any operation requiring containment integrity.
24 It is our position that in order for a manual valve to serve
25 as an isolation barrier, the valve should be under the



1 administrative control required for "sealed closed barriers"
2 as defined in SRP Section 6.2.4.11.3.1. This guidance
3 applies also to manual valves in test, vent, and drain lines
4 although screwed or welded caps or blind flanges may be used
5 in place of sealed closed isolation valves.

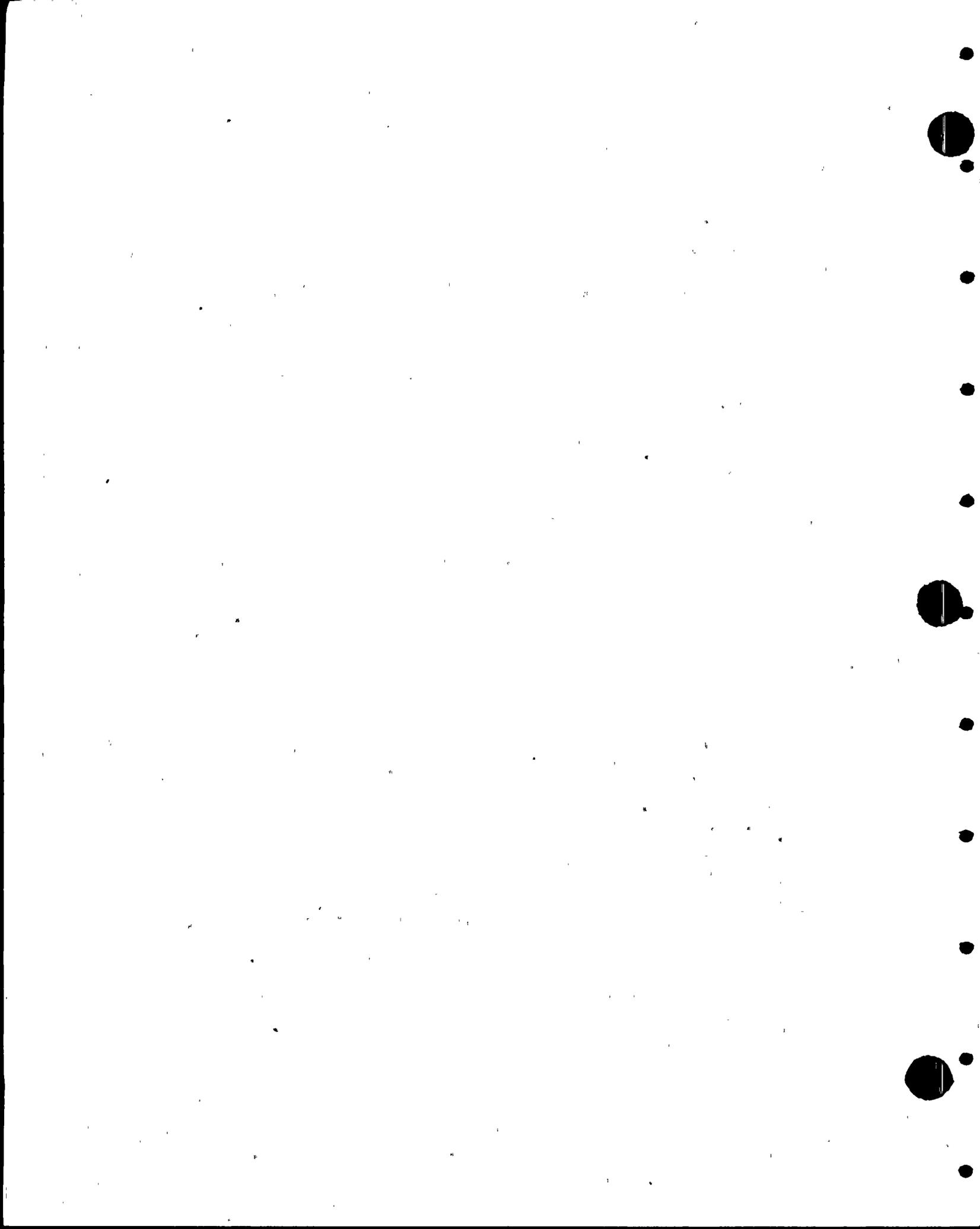
6 Provide assurance that the above guidance will be
7 followed for all manual valves employed as containment
8 isolation barriers. (Note: This does not apply to remote
9 manual valves in lines which must be opened for safe shutdown
10 of the plant.)

11
12 QUESTION 6.2.4-3:

13 Provide evidence that all valves in FSAR Table 6.2.4-1
14 greater than 10 feet from the containment have been placed
15 as close to the containment as practical, as required by
16 GDC 55, 56 and 57.

17
18 QUESTION 6.2.4-4:

19 Valve closure times should generally be less than
20 one minute. Reference SRP 6.2.4. The maximum closure for
21 16-inch valves SID-UV654, SIB-UV656, SIC-UV653, SIA-UV655 is
22 80 seconds. Refer to Table 6.2.4-2, Sheet 4. Discuss
23 considerations such as system design capabilities on which
24 this valve closure time is based in order to justify this
25 longer than prescribed closure time.



QUESTION 6.2.4-6:

Tabulate information demonstrating that containment isolation provisions are designed to allow the isolation barriers to be individually tested.

QUESTION 6.2.4-7:

Provide assurance that Valve CH-V393 in the regenerative heat exchanger vent line (Reference FSAR Figure 9.3-13 Sheet 1 of 5) will be locked closed during normal operation.

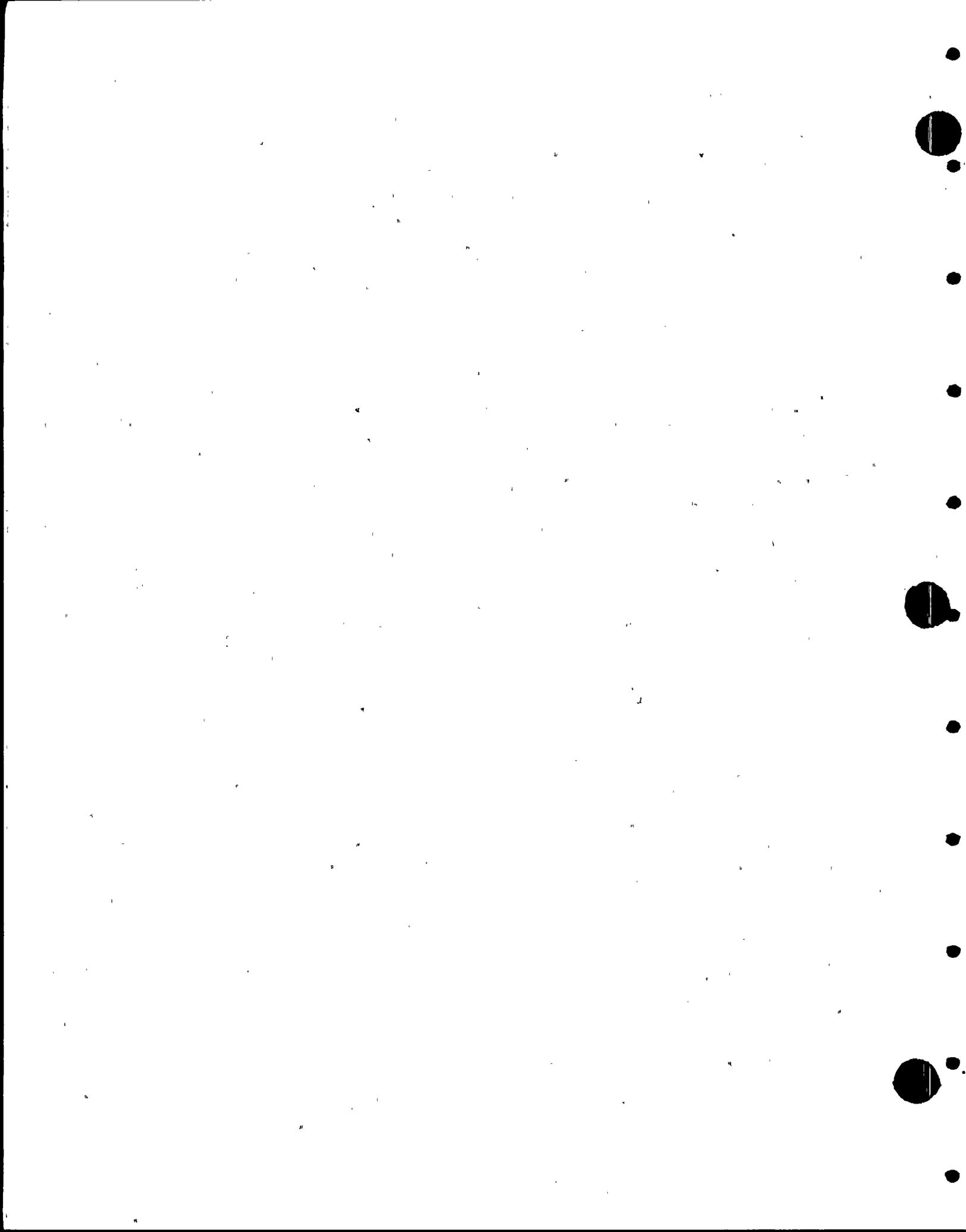
QUESTION 6.2.4-8:

Explain why the following valves will not be automatically closed by a containment isolation signal:

<u>Penetration Number</u>	<u>Valve Number</u>	<u>Service</u>
35	HP-HV007A	Hydrogen Control
36	HP-HV008A	Hydrogen Control

QUESTION 6.2.4-9:

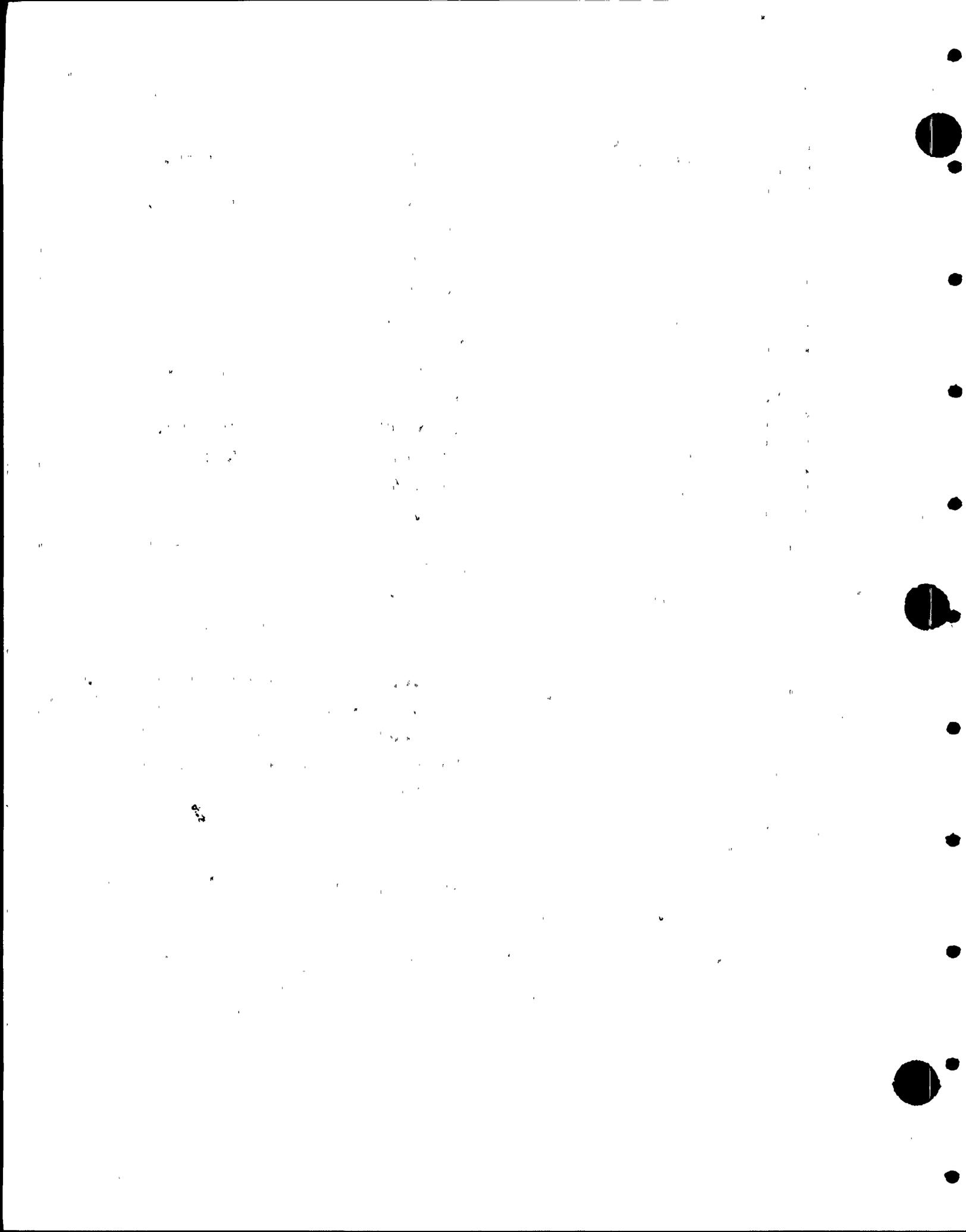
Explain why the following valves in nonessential lines will not either: (1) be automatically closed in the event of an accident requiring containment isolation and fail closed on loss of power to the valve operators; or (2) be locked closed during normal operation:



	<u>Penetration Number</u>	<u>Valve Number</u>	<u>Service</u>
1			
2			
3	1	SG-V127	Main Steam
4	1	SG-HV184	Main Steam
5	1	SG-V603	Main Steam
6	2,3	SG-V096	Main Steam
7	2,3	SG-V092	Main Steam
8	2	SG-HV178	Main Steam
9	2	SG-V133	Main Steam
10	3	SG-V139	Main Steam
11	3	SG-HV185	Main Steam
12	4	SG-V611	Main Steam
13	4	SG-V145	Main Steam
14	4	SG-HV179	Main Steam
15	7	FP-V089	Fire Protection Water
16	9	RD-UV023	Radwaste Water
17	56	CP-UV003A	Containment Building Purge
18	56	CP-UV002A	Containment Building Purge
19	57	CP-UV002B	Containment Building Purge
20	57	CP-UV003B	Containment Building Purge
21	78	CP-UV005A	Containment Building Purge
22	78	CP-UV004A	Containment Building Purge
23	79	CP-UV004B	Containment Building Purge
24	79	CP-UV005B	Containment Building Purge
25			

QUESTION 6.2.4-10:

Describe the special precautions that will be taken, such as locking the test connection closed, to ensure that a double barrier will be maintained at each of the following penetrations during normal operation:



	<u>Penetration Number</u>	<u>Service</u>
1		
2		
3	53	Fuel Transfer Tube
4	L-2	Equipment Hatch

5 QUESTION 6.2.5-1:

6 Provide copies of Figures 6.2.5-1, -2, -3 missing
7 from the FSAR.

8

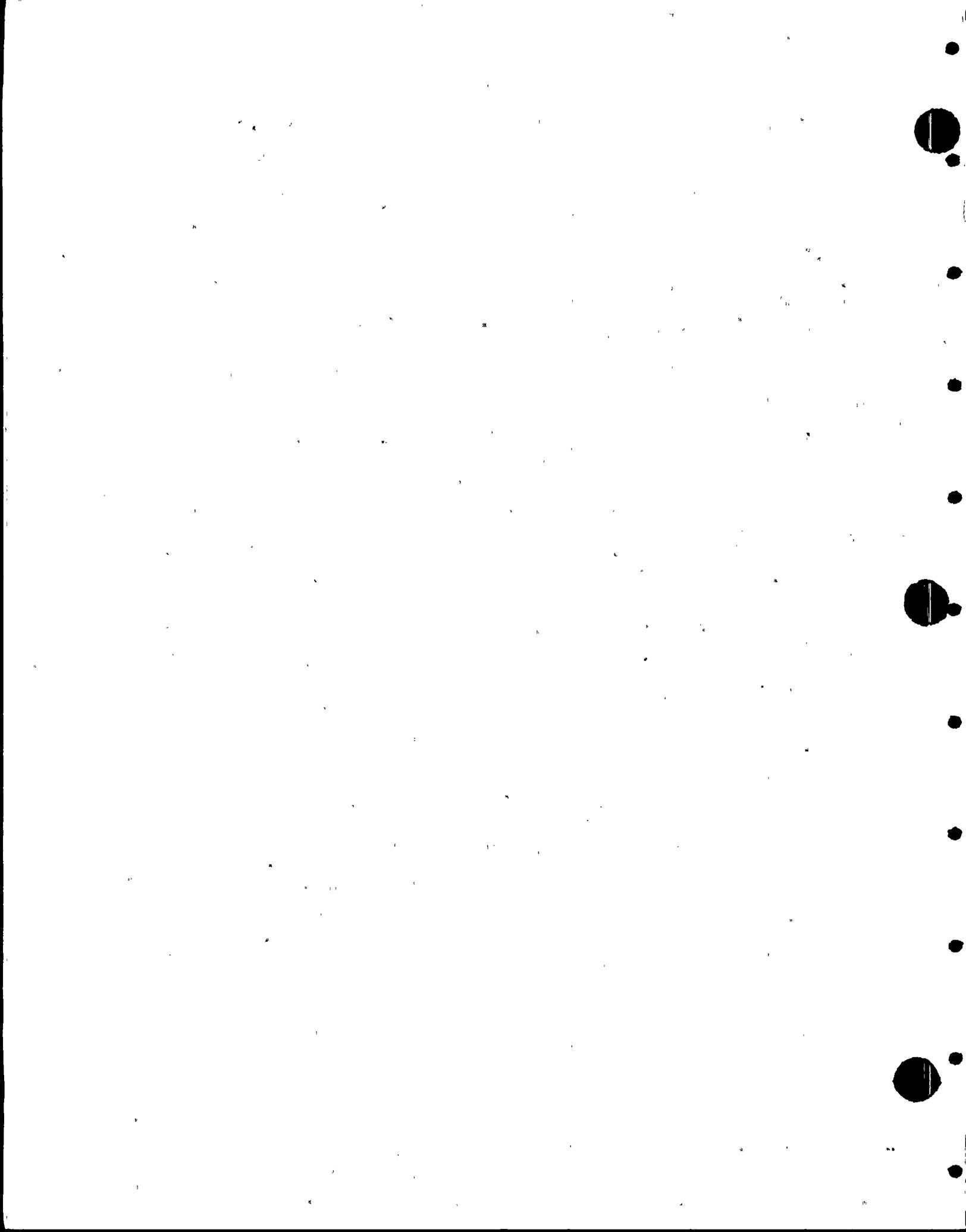
9 QUESTION 6.2.5-2:

10 Provide additional information (i.e., description,
11 drawings) showing the location of the containment H₂ control
12 system influent and effluent piping in containment. Provide
13 sufficient detail showing that direct recirculation between
14 effluent and influent will not occur. Provide additional
15 information on capability of influent and effluent piping to
16 withstand environmental and dynamic effects such as pressure
17 spike transients following a LOCA.

18

19 QUESTION 6.2.5-3:

20 Table 3.2-1 shows that the containment combustible
21 gas control system is not classified to Reg. Guide 1.26
22 Group B. NRC position is that these systems with the
23 exceptions of the H₂ purge system be designed, fabricated,
24 erected, and tested to Group B. Provide a discussion of your
25 plans to correct this design deficiency.



1 QUESTION 6.2.5-4:

2 Provide a more complete description of the procedure
3 to install and put into operation the H₂ recombiner. State
4 where the H₂ recombiner and control cabinets are stored
5 during normal operation.

6
7 QUESTION 6.2.5-5:

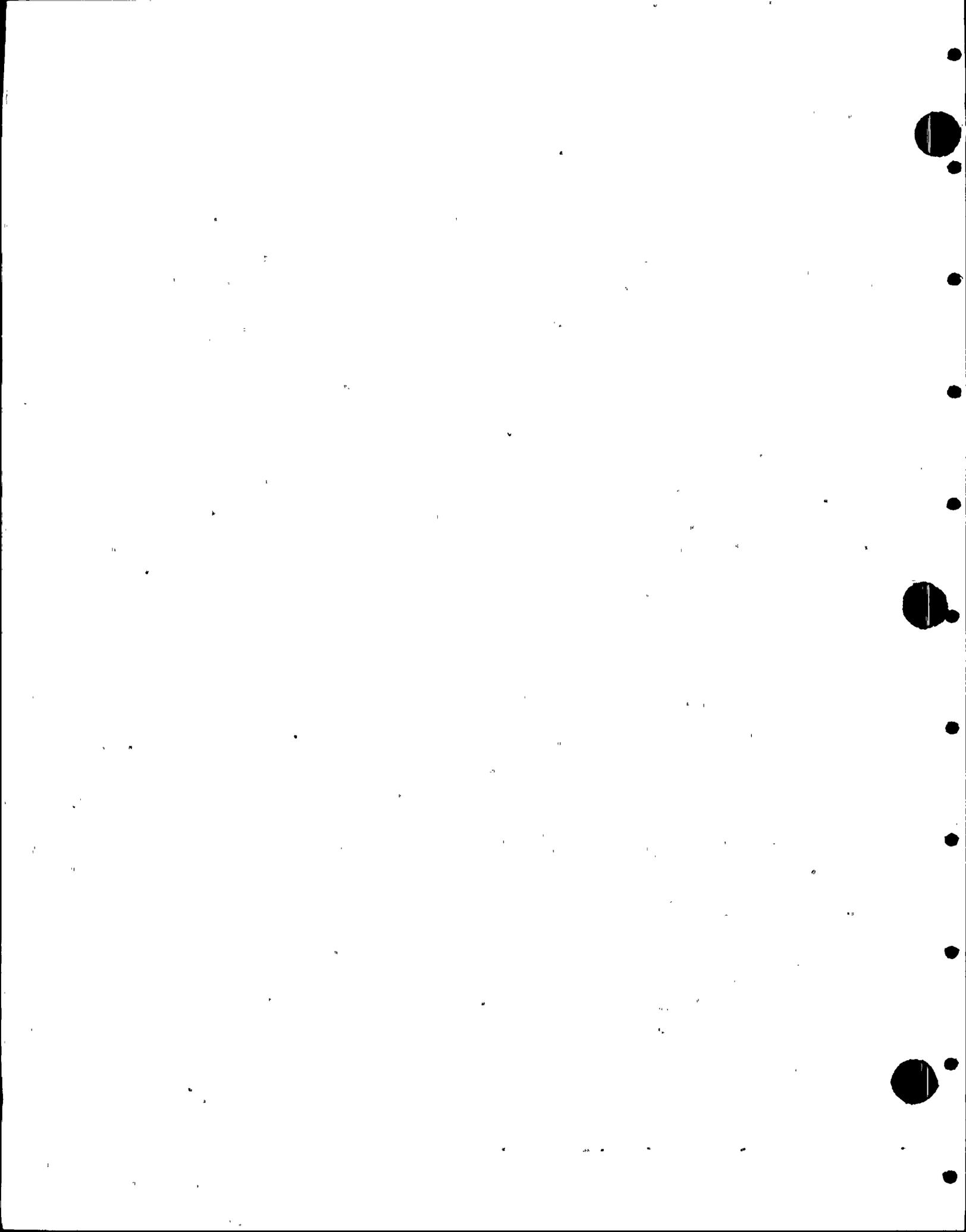
8 Describe more completely the instrumentation provided
9 both locally and in the main control room to monitor the
10 operation and performance of the H₂ recombiners and purge
11 subsystems. Also verify that the H₂ monitoring system has
12 indication and alarms in the main control room.

13
14 QUESTION 6.2.5-6:

15 State whether the H₂ purge subsystem will be immediately
16 installed along with H₂ recombiner following a LOCA. Provide
17 a brief description of the procedure to install the H₂ purge
18 subsystem and the estimated maximum time to put it into
19 operation. State where the H₂ purge subsystems will be stored
20 during normal operation. Verify that adequate shielding is
21 available for radiation protection of personnel during H₂
22 purge subsystem hookup and operation.

23
24 QUESTION 6.2.5-7:

25 Describe the procedure required to manually initiate



1 the operation of the H₂ monitoring subsystem. Verify that
2 following a LOCA this can be done with adequate radiation
3 protection to personnel.

4
5 QUESTION 6.2.5-8:

6 Provide additional information on how FSAR Figure
7 6.2.5-2 accounted for the steam released into the containment
8 atmosphere following a loss of coolant accident and how the
9 steam mass as a function of time was calculated.

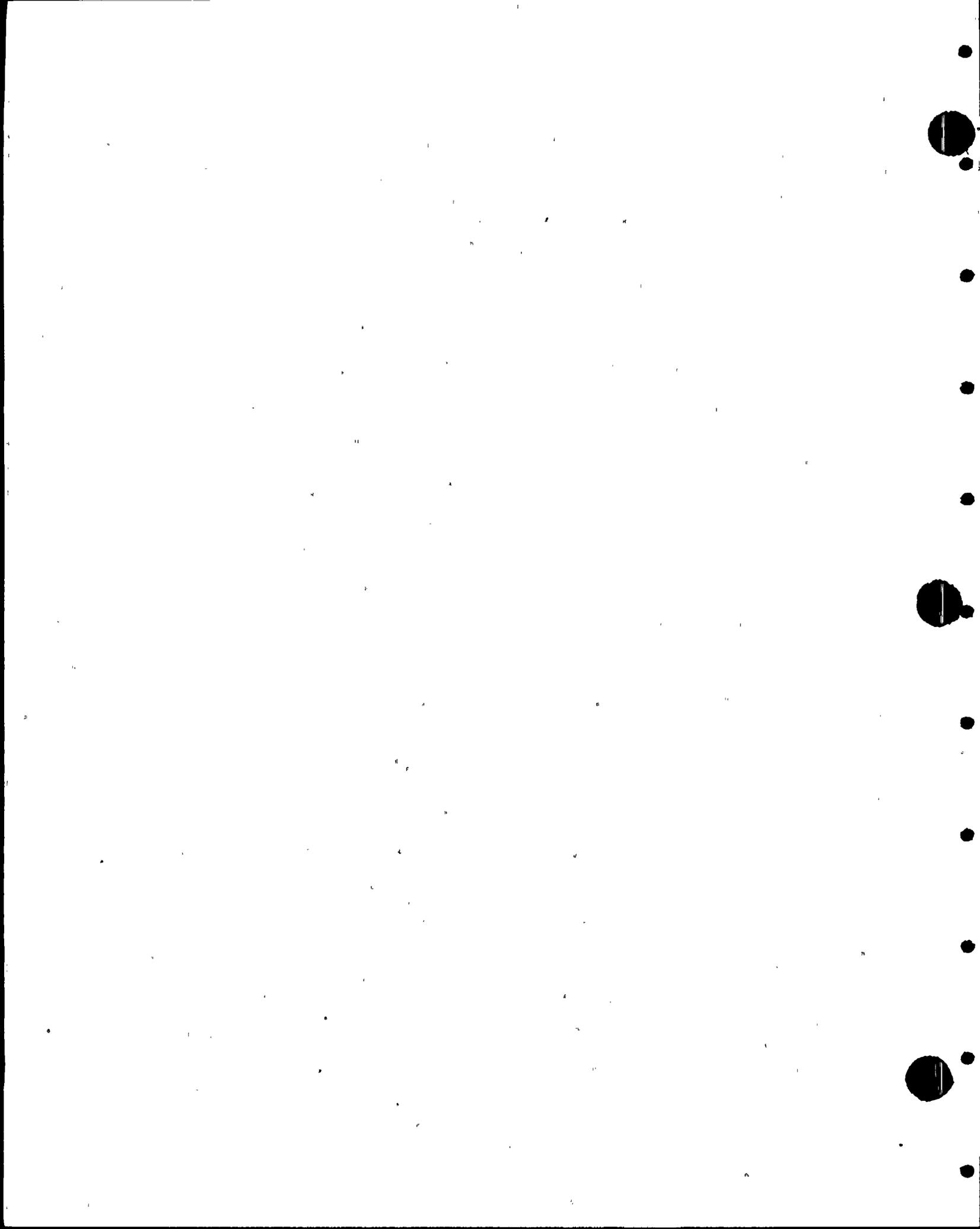
10
11 QUESTION 6.2.5-9:

12 Provide additional information supporting the FSAR
13 statement that no source of hydrogen is generated within the
14 reactor drain tank compartment. Specifically indicate if the
15 reactor drain tank rupture disk line discharges inside or
16 outside the reactor drain tank compartment.

17
18 QUESTION 6.2.5-10:

19 Provide the following information concerning the
20 hydrogen recombiner's cooling air system:

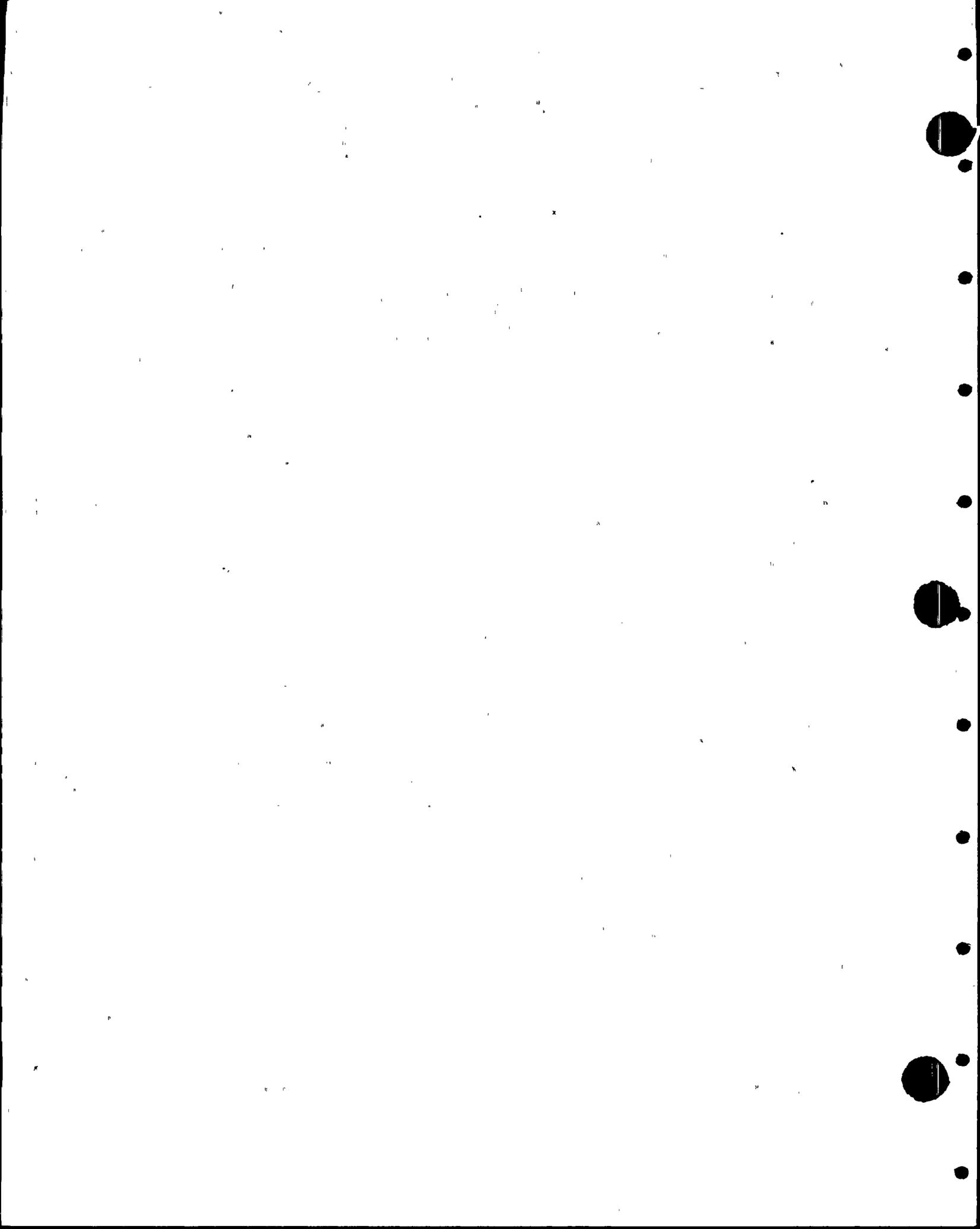
- 21 a. Is the cooling system essential to operation of
22 the hydrogen recombiner?
23 b. Is the blower or fan for bringing in cooling
24 air from outside the auxiliary building and
25 then returning it to the outside provided as



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part of the portable hydrogen recombiner
skid package?

- c. Are the permanent portions of the cooling air ducts, filter, and louvers designed to Seismic Category I and Quality Group B?
- d. Are the cooling air inlet and outlet structures protected against tornados, floods, missiles, et cetera?



1 TMI NUREG-0737 RELATED
2 REQUESTS FOR ADDITIONAL INFORMATION
3

4 1. Item II.E.4.1 - Dedicated Hydrogen Penetrations:

5 Applicant must commit to review and revise as necessary
6 the Palo Verde procedures for the use of combustible gas
7 control systems following an accident that results in a
8 degraded core and release of radioactivity to the containment
9 and report the findings of the review to NRC.

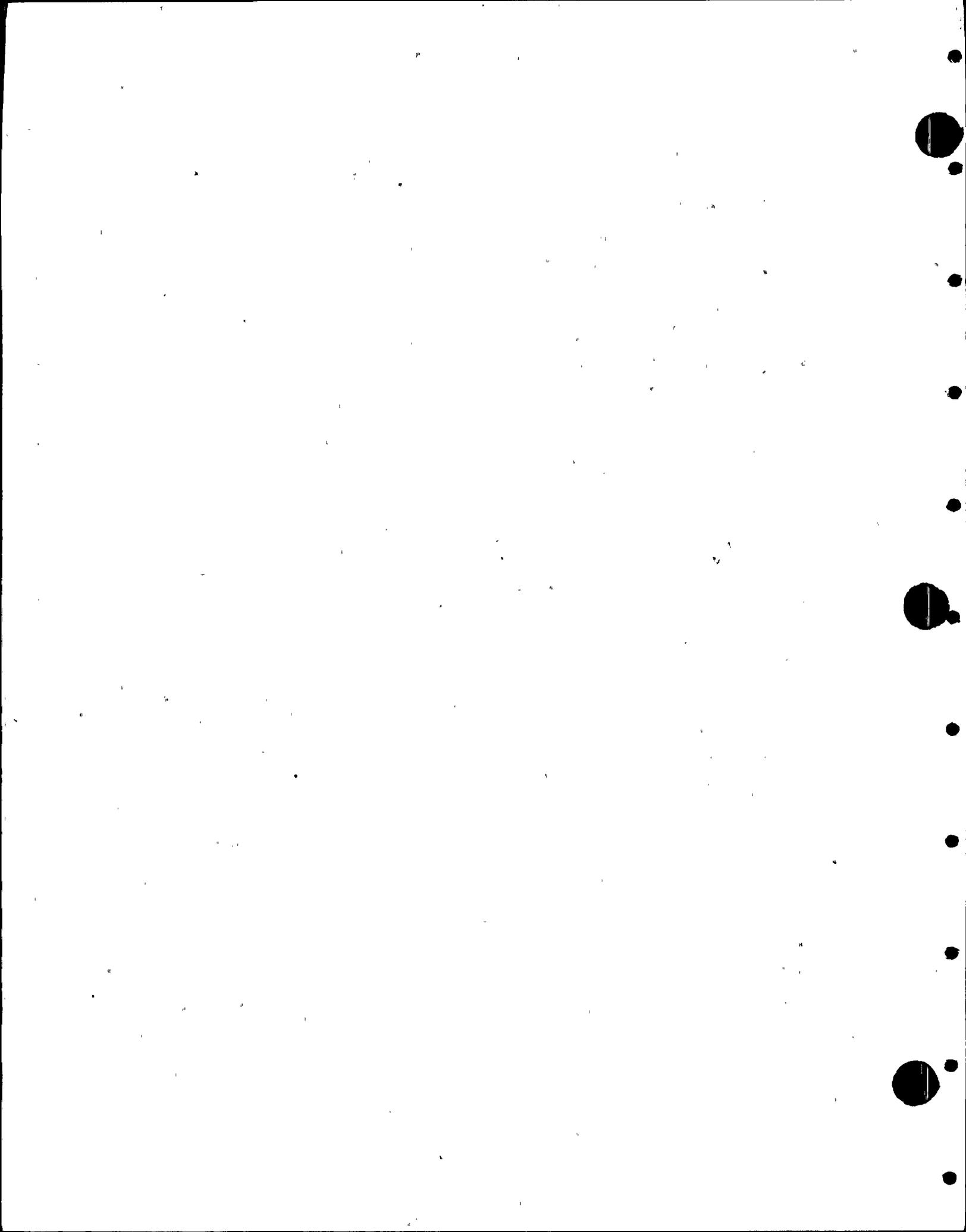
10
11 2. Item II.E.4.2 - Containment Isolation Dependability:

12 Provide all required information to demonstrate
13 compliance with this NUREG-0737 requirement.

14
15 3. Item II.F.1 - Attachment 6, Containment Hydrogen Monitor:

16 Provide the following information concerning the
17 containment hydrogen monitors.

- 18 a. Confirm that the hydrogen monitors will function
19 under both positive and negative pressure.
- 20 b. Verify that the hydrogen monitoring system will
21 conform to NUREG-0737, Appendix B requirements.
- 22 c. Indicate whether the hydrogen monitors can
23 provide continuous indication and recording in
24 the control room within 30 minutes of the
25 initiation of safety injection. Recording
capability must be incorporated into the design.



1 4. Item II.F.1 - Attachment 4, Containment Pressure Monitor:

2 The existing containment pressure monitors at Palo
3 Verde (CESSAR Section 7.5) do not meet the measurement and
4 indication capability of three times the design pressure of
5 the containment (3 x 60 psig = 180 psig) and -5 psig.
6 Provide information on how the design will be modified to
7 conform to this requirement. Also provide confirmation that
8 NUREG-0737, Appendix B requirements will be met and provide
9 the accuracy and response time specification of the complying
10 pressure monitors.

11

12 5. Item II.F.1 - Attachment 5, Containment Water Level Monitor:

13 Provide all required information to demonstrate
14 compliance with this NUREG-0737 requirement.

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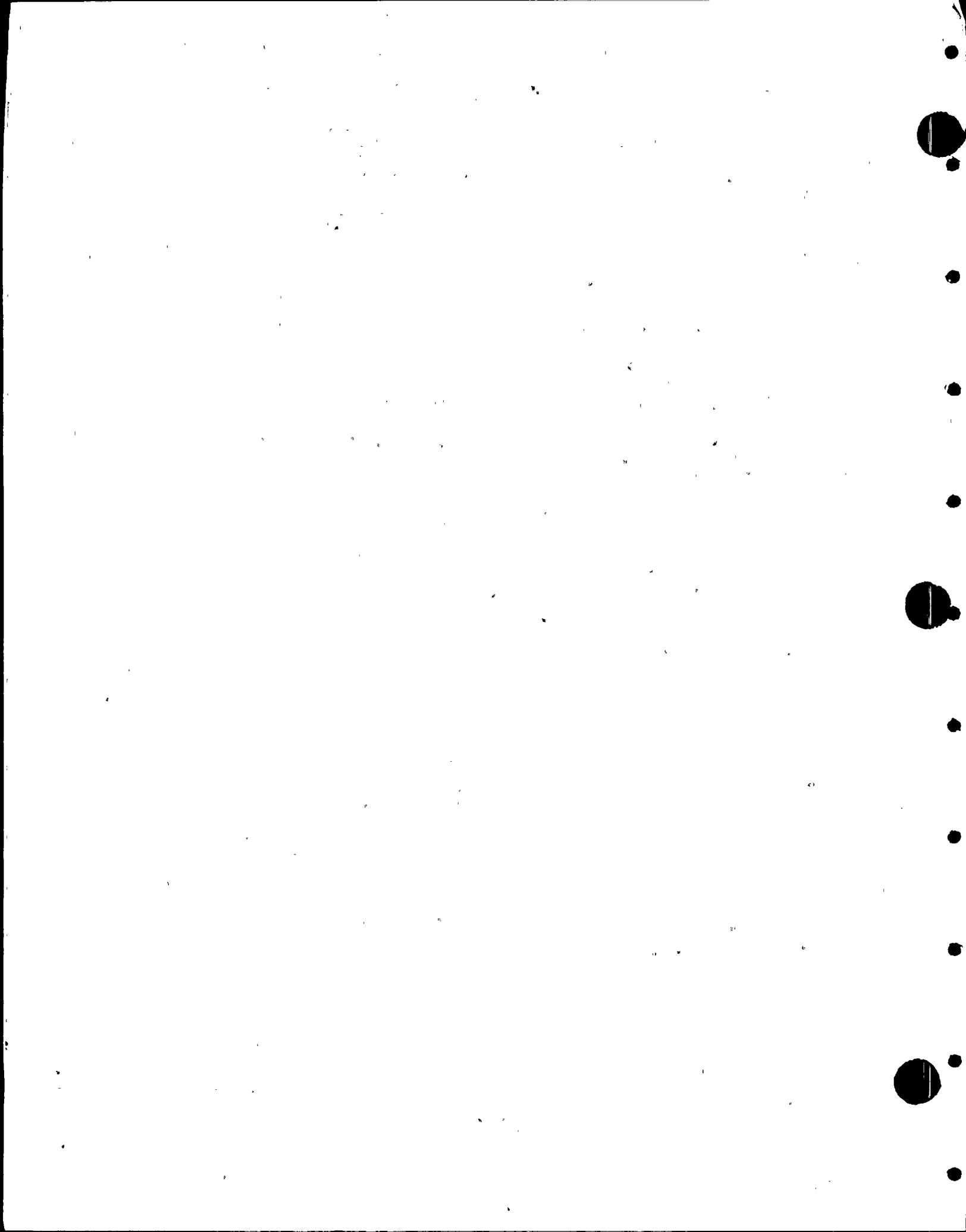
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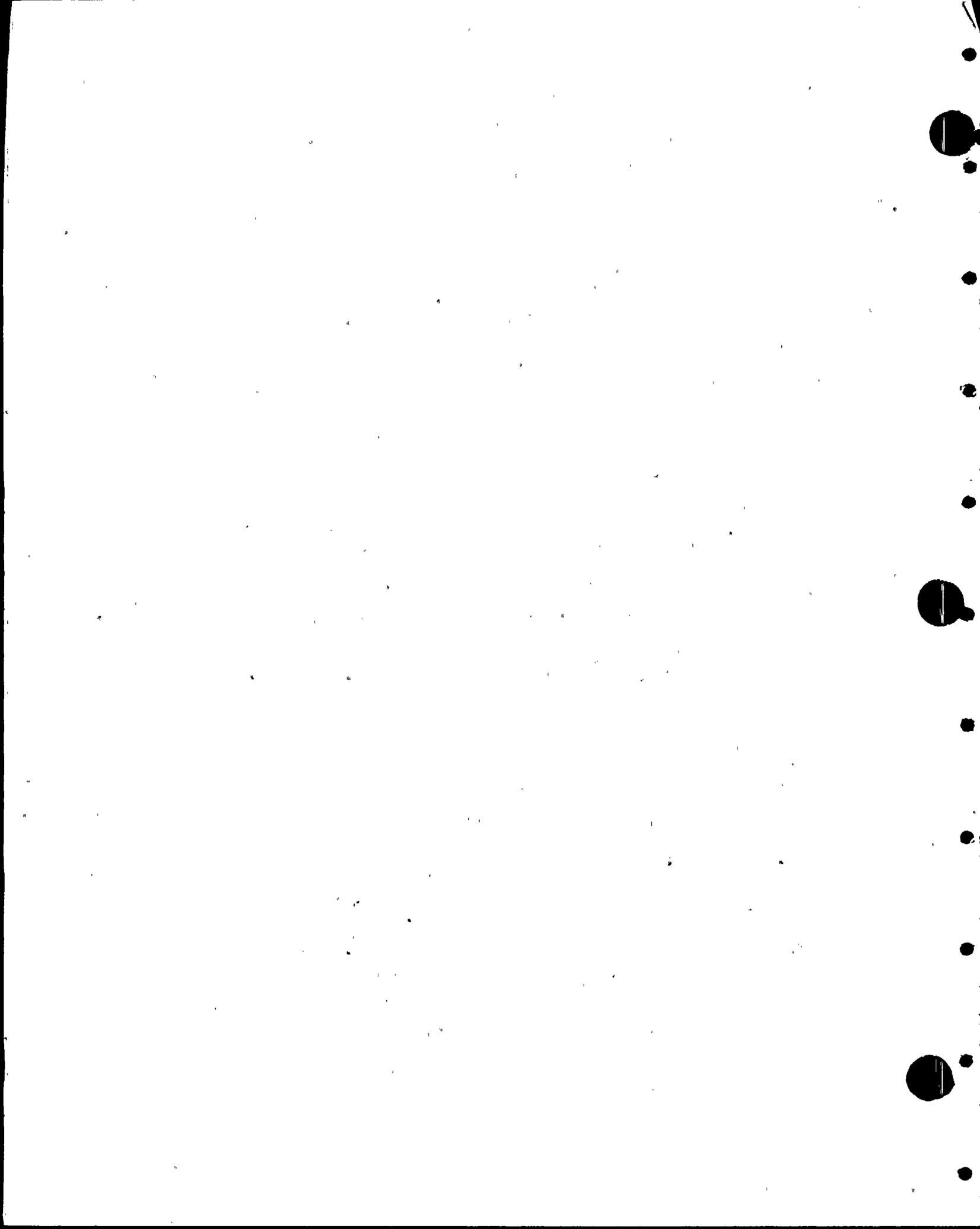
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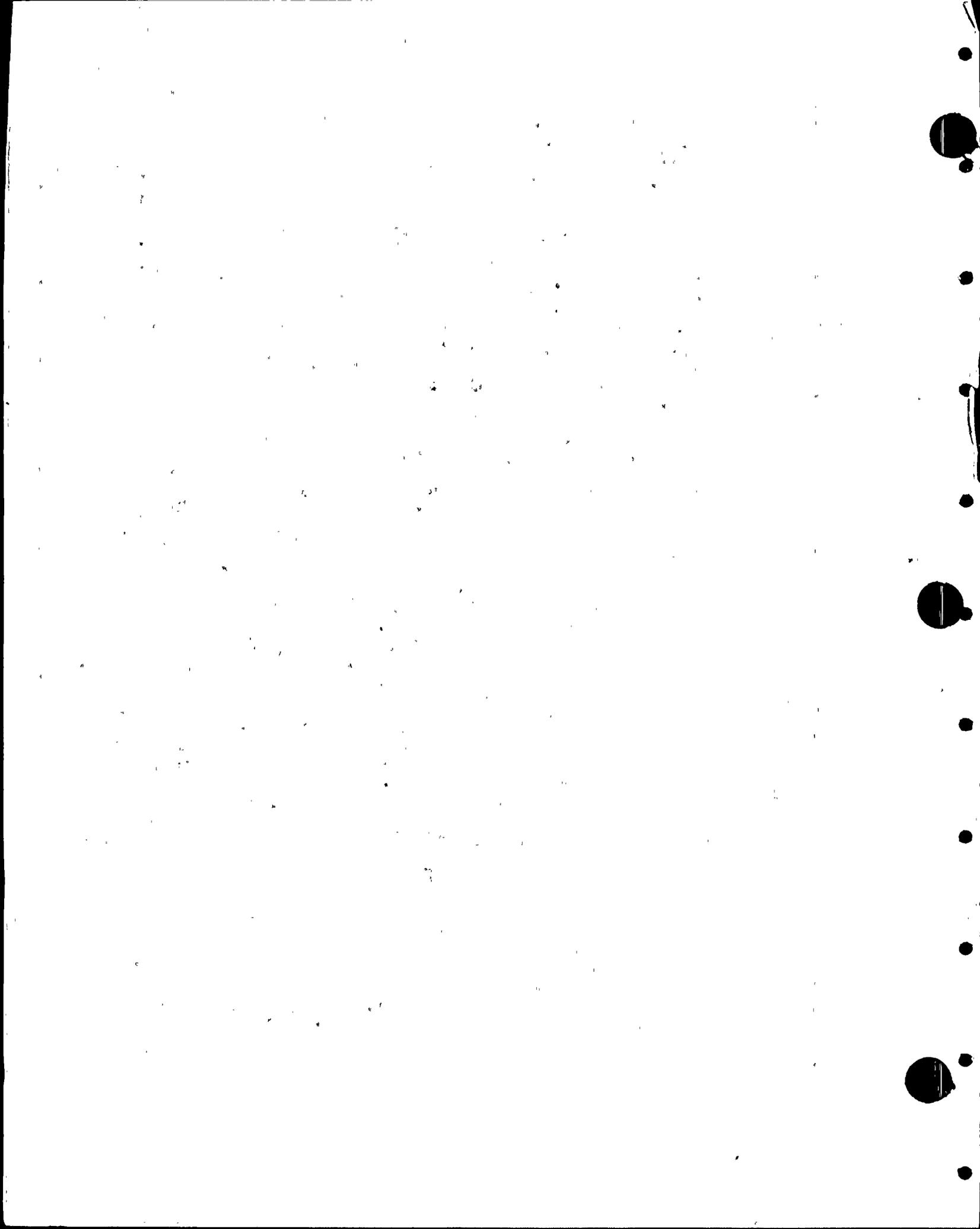
ADDENDUM II - OPEN ITEMS

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1. Change Figure 2-1 to include the shutdown heat exchanger bypass line. (Page 34)
2. Alter wording of Exhibit 2-5 to clarify power sources for spray pumps. (Page 39)
3. Investigate potential of high activity leakage being present in the piping downstream of the leakage relief valves which discharge into the auxiliary building. (Page 49)
4. Investigate loading restrictions on the ground over the pipe tunnel to the refueling water tank. (Page 54)
5. Add suction markings to Figures 2-8 and 2-9 as applicable. (Page 66)
6. Indicate the extent of the modeling done during the containment sump flow testing on Figure 2-5. (Page 70)
7. Add height of screen to Figure 2-6. (Page 73)
8. Determine justification for jog capability for valve 13-M-SIP-002, and if valid for PVNGS. (Page 78)
9. Document guidelines that have been provided to APS operations for the containment spray system operation as per Exhibit 2-40, Paragraph 2. (Page 79)
10. Provide the accuracy specification of the containment water level monitors. (Page 93)
11. Provide drawings of spray patterns to be appended to transcript. (Page 98)
12. Provide the maximum allowable overlap of the sprays and the fractions coverage. (Page 98)
13. Clarify valve arrangements of Figure 3-3. (Page 112)
14. Provide indication on Figure 3-7 of type of seal on outer hatch of personnel lock. (Page 113)
15. Look into possibility of atmospheric leakage through Type C penetrations, particularly via spray leaders. (Page 120)



- 1 16. Remove the shutdown cooling system from the "non-
2 essential" list of Exhibit 3-57, to "essential" list
on Exhibit 3-55. (Page 138)
- 3 17. Reword Exhibit 3-59 to show automatic transfer to
4 emergency power, also 3-9. (Page 139).
- 5 18. Clarify application of Reg. Guide 1.11 to containment
6 penetration monitors. (Page 141)
- 7 19. Examine the need to add relief systems to closed-cold
8 penetrations. (Page 142)
- 9 20. Identify the Type C tested 1-inch steam penetration in
10 Table 6.2.4.1 of FSAR. (Page 143)
- 11 21. Clarify the use of steam straps on the main steam lines
12 as per GDC 56 and 54. (Page 145)
- 13 22. FSAR Section 6.2.4.3 states that an Operating Procedure
14 will require that manual valves such as those shown in
15 Valve Arrangements 3, 5, 12, 28, and 35 be verified as
16 closed prior to any operation requiring containment
17 integrity. It is our position that in order for a manual
18 valve to serve as an isolation barrier, the valves
19 should be under the administrative control required for
20 "sealed closed barriers" as defined in SRP Section
21 6.2.4.11.3.1. This guidance applies also to manual
22 valves in test, vent, and drain lines although welded
23 caps or blind flanges may be used in place of sealed
24 closed isolation valves.
25 Provide assurance that the above guidance will be
followed for all manual valves employed as containment
isolation barriers. (Note: This does not apply to
remote manual valves in lines which must be opened for
safe shutdown of the plant.) (Page 150)
23. Provide assurance that Valve CH-V393 in the regenerative
heat exchanger vent line (Reference FSAR Figure 9.3-13
Sheet 1 of 5) will be locked closed during normal
operation. (Page 150)
24. Explain why the following valves will not be auto-
matically closed by a containment isolation signal
--HP-HV007A, 008A. (Page 152)
25. Confirm that the usage of motor operated valves for
containment purge valves is acceptable. (Page 155)



- 1 26. Resolve possibility of test connection being left open
2 on double o-ring type seals, thereby defeating one of
two barriers. (Page 156)
- 3 27. Revise the FSAR Hydrogen Generation figures to those
4 presented. (Page 163)
- 5 28. Determine time delay due to surge volume of containment
6 prior to 50 cfm purging being driven by injected service
7 air. (Page 164)
- 8 29. Provide a copy of, or location of, "Thermal Hydrogen
9 Recombiner System for Water-Cooled Reactors," Rockwell
10 Int'l Report No. AI-75-2, Rev. 3 (P), Canoga Park, Ca.
11 July 1977 as referenced in FSAR Sec. 6.2.5-6, or
12 demonstrate NRC acceptance of a similar system on an
13 existing plant. (Page 168)
- 14 30. Revise Exhibit 4-3 to clarify capacities of individual
15 recombiners and total capacity. (Page 171)
- 16 31. Remove references to double failure of recombiners,
17 throughout, as basis for need of purge system. (Page 181)
- 18 32. Examine and resolve possibility of hydrogen accumulations
19 of higher concentration in closed regions of the
20 containment, particularly reactor drain tank room and
21 elevator shaft. (Page 182)
- 22 33. Provide results of Shielding Review as per NUREG-0737,
23 Item II.B.2. (Page 186)
- 24 34. Revise FSAR to indicate corrected accuracy of hydrogen
25 monitor. (Page 188)
35. Demonstrate the adequacy of containment designed arrange-
ment to assure convective mixing throughout of hydrogen
and adequate cooling. (Page 194)
36. Provide data demonstrating adequate HVAC capacity in
auxiliary building with recombiners in operation.
(Page 195)
37. Verify that the hydrogen monitors will conform to NUREG-
0737, Appendix B. (Page 196)

