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SYSTEM REVIEW
of the
PALO VERDE NUCLEAR GENERATING STATION
AUXILIARY FEEDWATER SYSTEM

Before the
AUXILIARY FEEDWATER SYSTEM REVIEW BOARD

VOLUME I OF II
Pages 1 - 181

Phoenix, Arizona
August 21 & 22, 1980

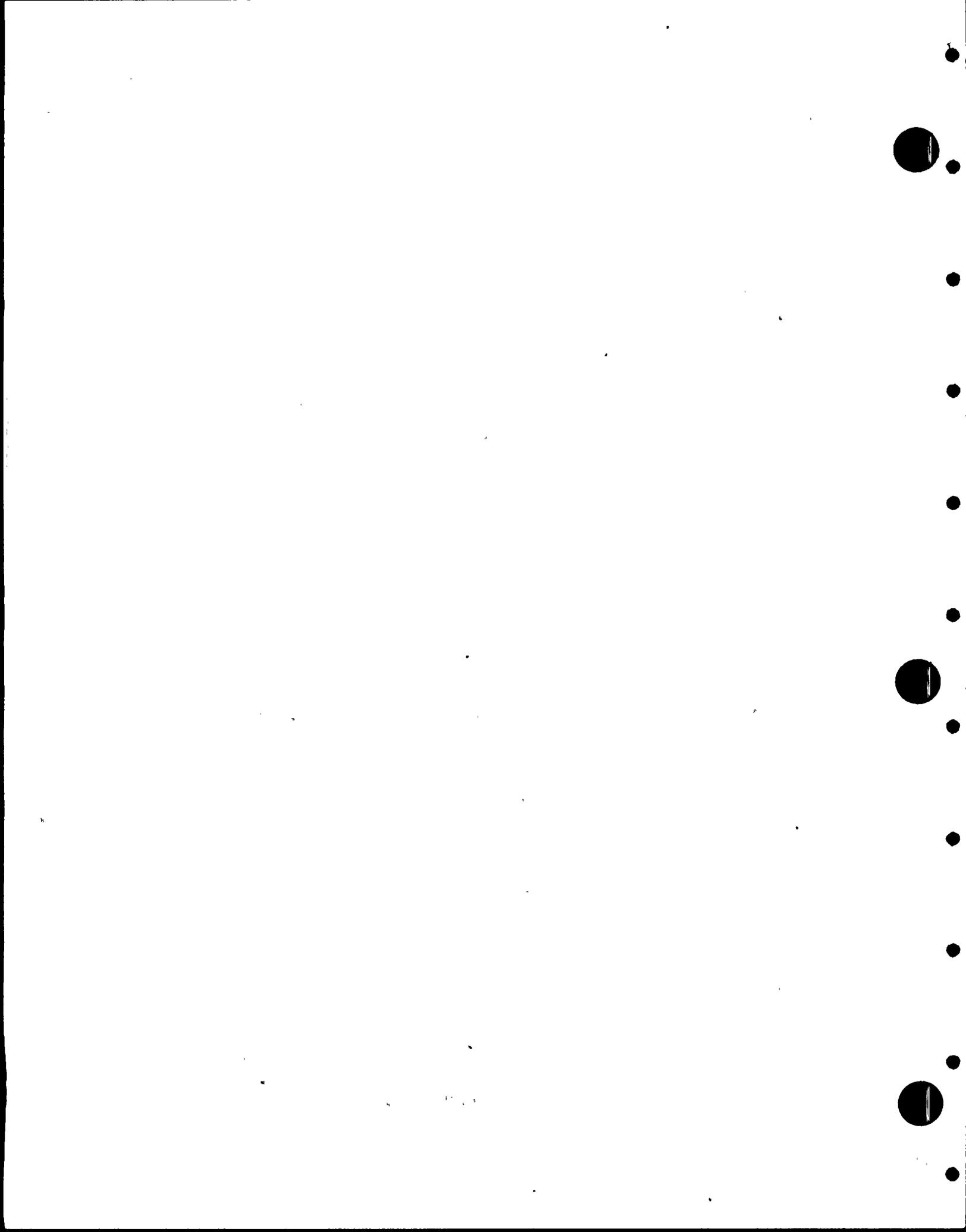
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1		
2		VOLUME I
3		<u>I N D E X</u>
4	Participants	i
5	System Overview	
6	Design Criteria	15
7	Operation	96
8	Layout	111
9	Standard Review Plan Acceptance Criteria	
10	General Design Criteria	123
11	Regulatory Guides	137
12	Branch Technical Positions	140
13	Recapitulation of Open Items	163
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		



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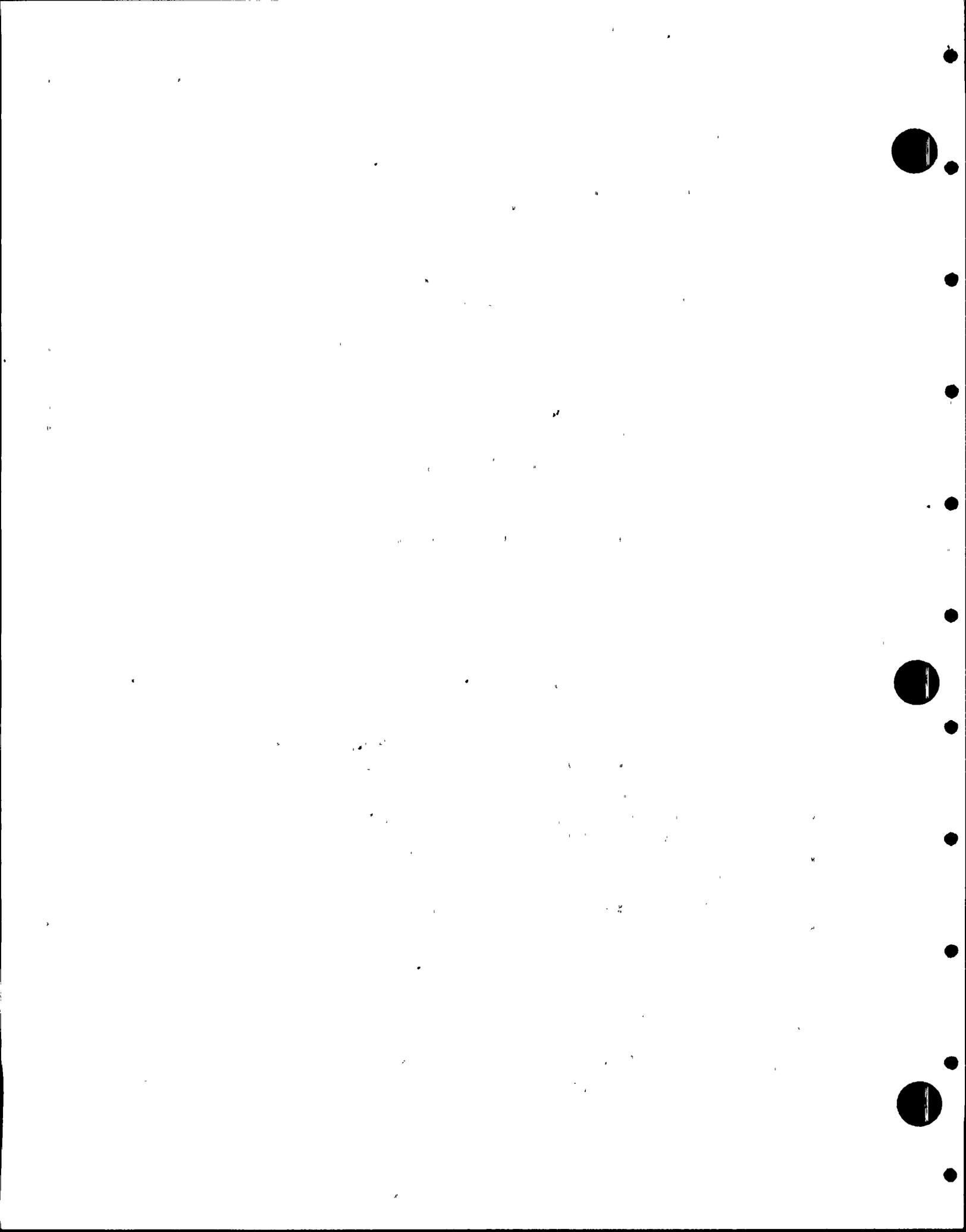
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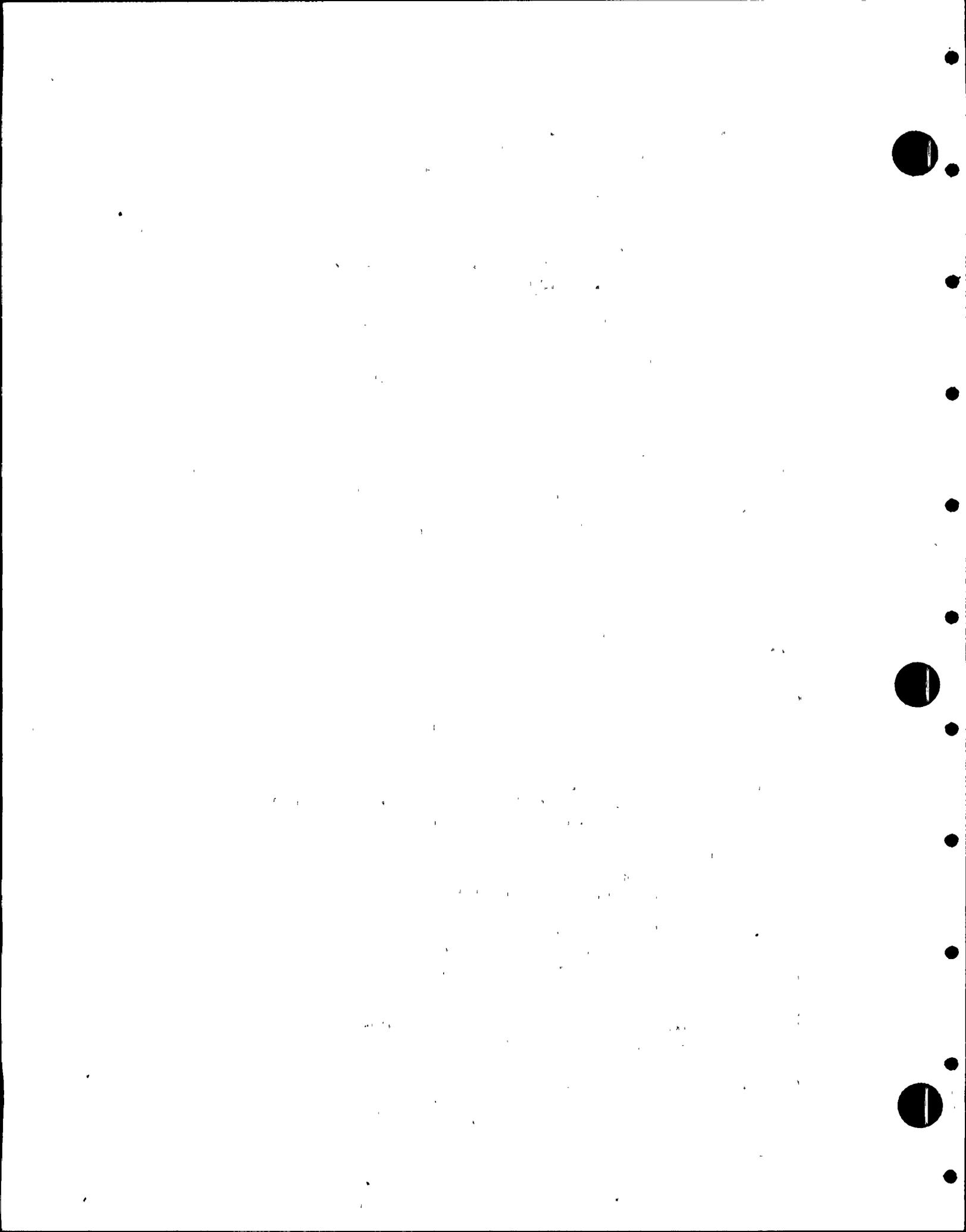
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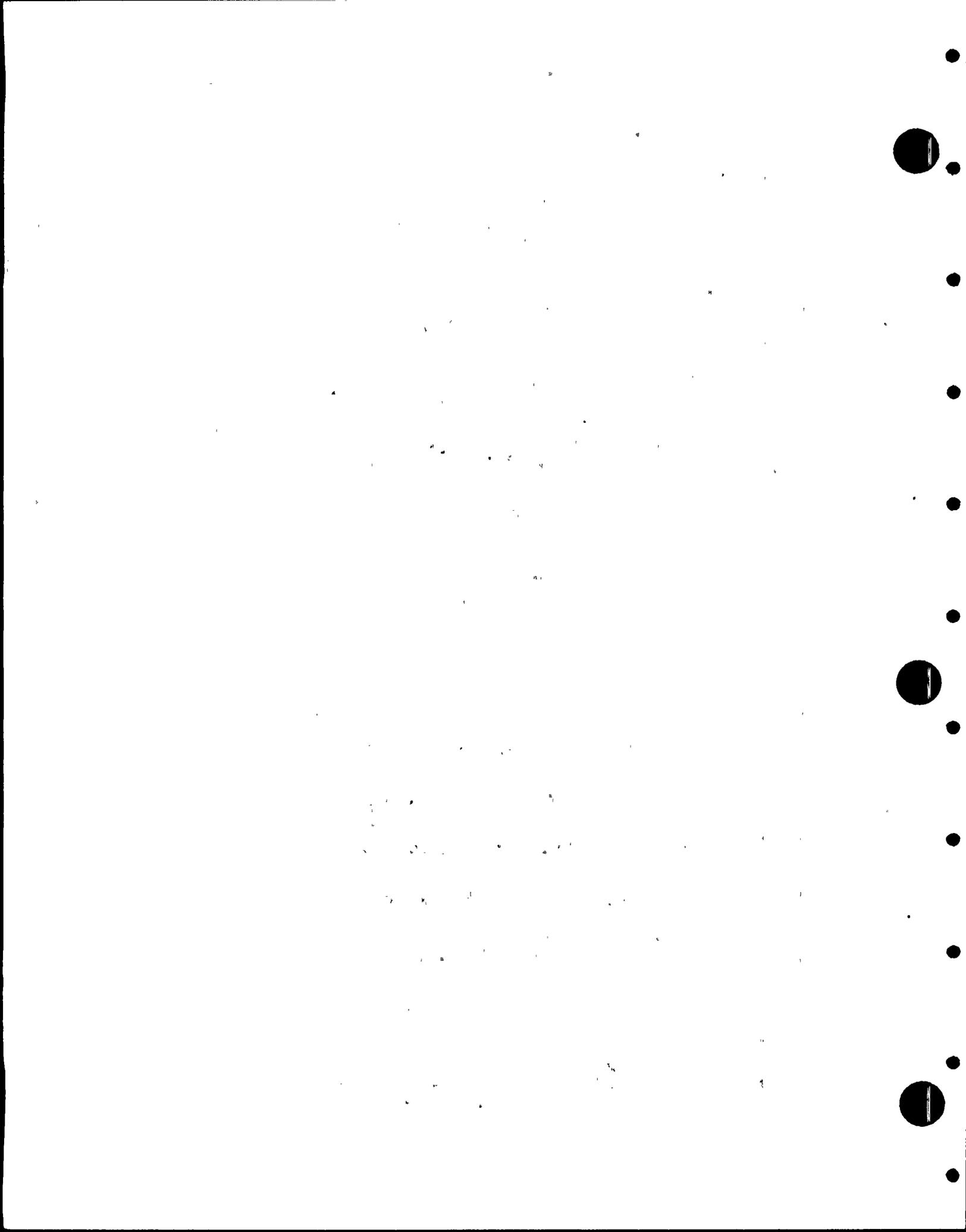
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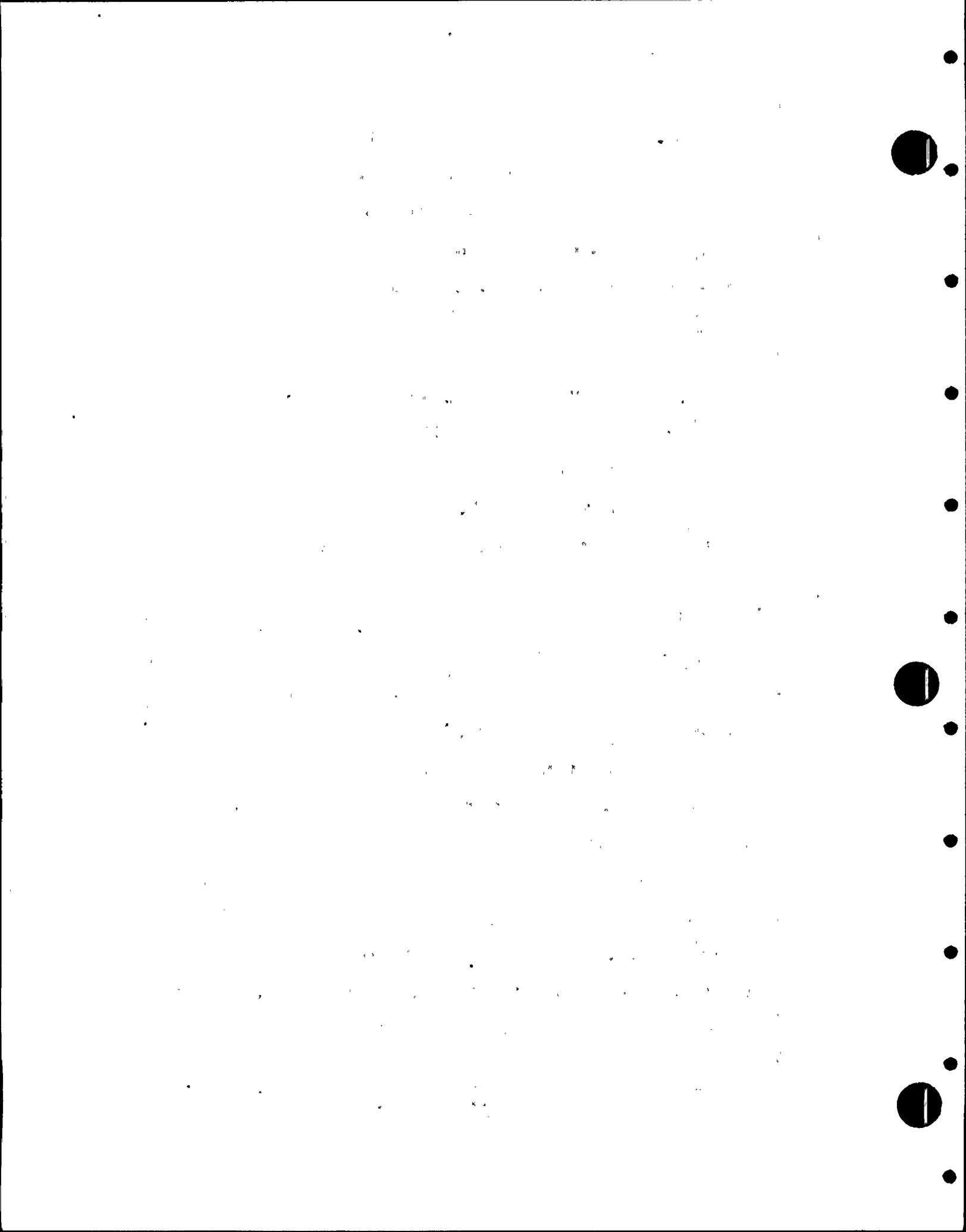
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1 The Auxiliary Feedwater System Review Board of the
 2 Palo Verde Nuclear Generating Station convened in Navajo Room
 3 A, Adams Hotel, Phoenix, Arizona, on the 21st day of August,
 4 1980, Mr. Edwin E. Van Brunt, Jr., Vice-President, Nuclear
 5 Projects Management, Arizona Public Service Company,
 6 Presiding.

7
 8 MR. VAN BRUNT: For those of you who don't know, my
 9 name is Ed Van Brunt. I am Vice-President of Nuclear Projects
 10 Management for Arizona Public Service Company. I am the
 11 officer responsible for the engineering design, construction,
 12 and quality assurance for the Palo Verde Nuclear Generating
 13 Station.

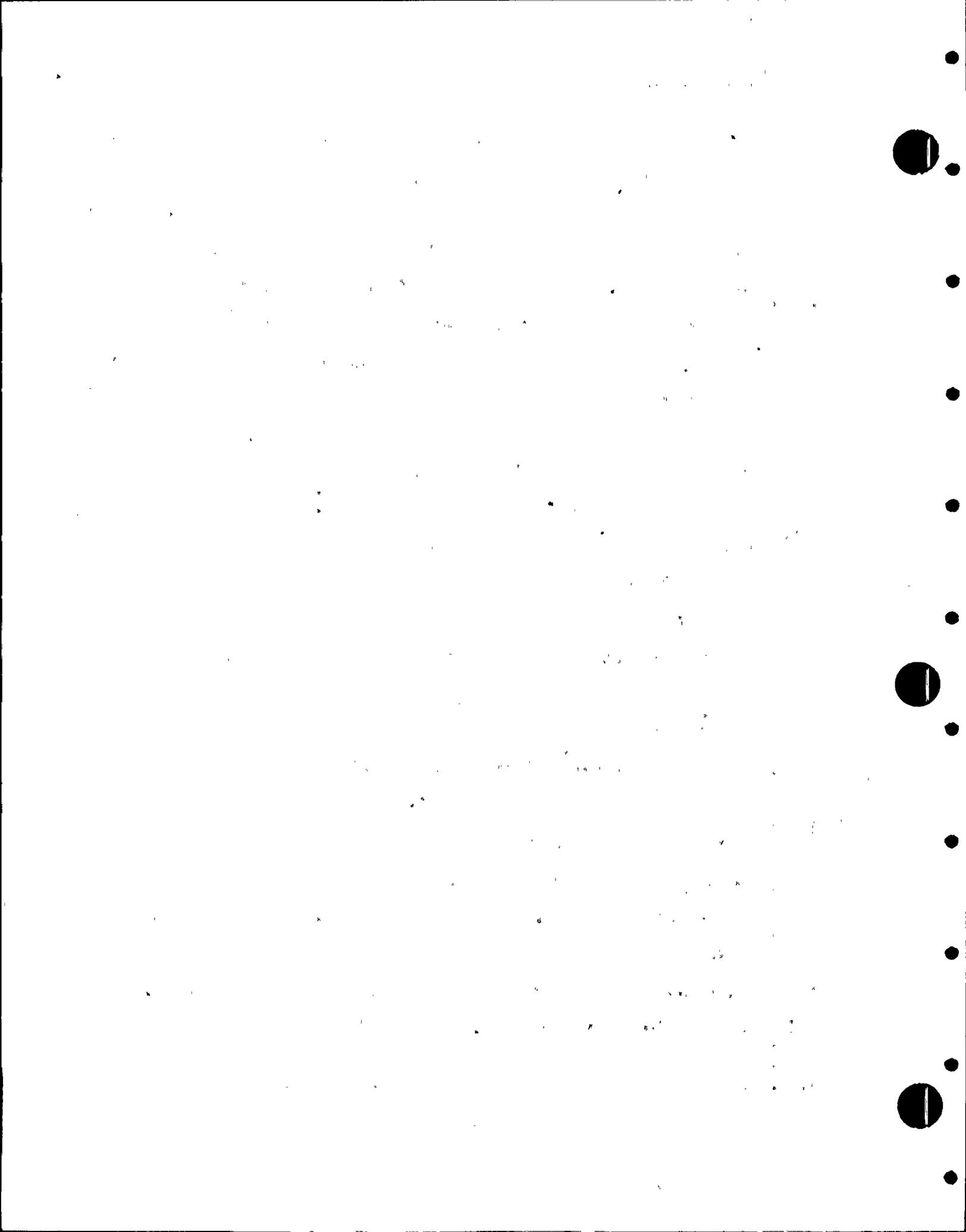
14 The purpose of today's meeting is to perform a system
 15 review of the Palo Verde Nuclear Generating Station Auxiliary
 16 Feedwater System. The concept of performing a system review
 17 was developed in a number of meetings between representatives
 18 from APS and Bechtel and Combustion Engineering and the NRC
 19 Director of Nuclear Reactor Regulation, Dr. Harold Denton. With
 20 this concept, the design of a specific plant system is thoroughly
 21 reviewed for adequacy of design and compliance with regulations
 22 by Bechtel project personnel in the technical disciplines
 23 associated with it. As you know, Bechtel Power Corporation
 24 is the engineer-constructor for the Palo Verde Plant. The
 25 system review is then formally presented to a review board of



1 technical experts for their concurrence. Participation by
2 Nuclear Regulatory Commission personnel in this presentation
3 is encouraged and we believe should aid in their understanding
4 of the system design bases, detailed design, construction and
5 operation, thereby minimizing, if not eliminating, the review
6 manhours required for that particular system.

7 As a result of the discussions that we had with
8 Dr. Denton, APS has performed to date two system reviews, one
9 for the DC power system and one for the AC power system
10 associated with Palo Verde. The first system review was
11 performed here in Phoenix. That was on the DC power system.
12 The second review of the AC power system was done in the
13 Nuclear Regulatory Commission offices in Bethesda, Maryland,
14 to provide an opportunity for greater participation and
15 observation by NRC management and staff. As you all know,
16 today we will be performing a system review of the auxiliary
17 feedwater system.

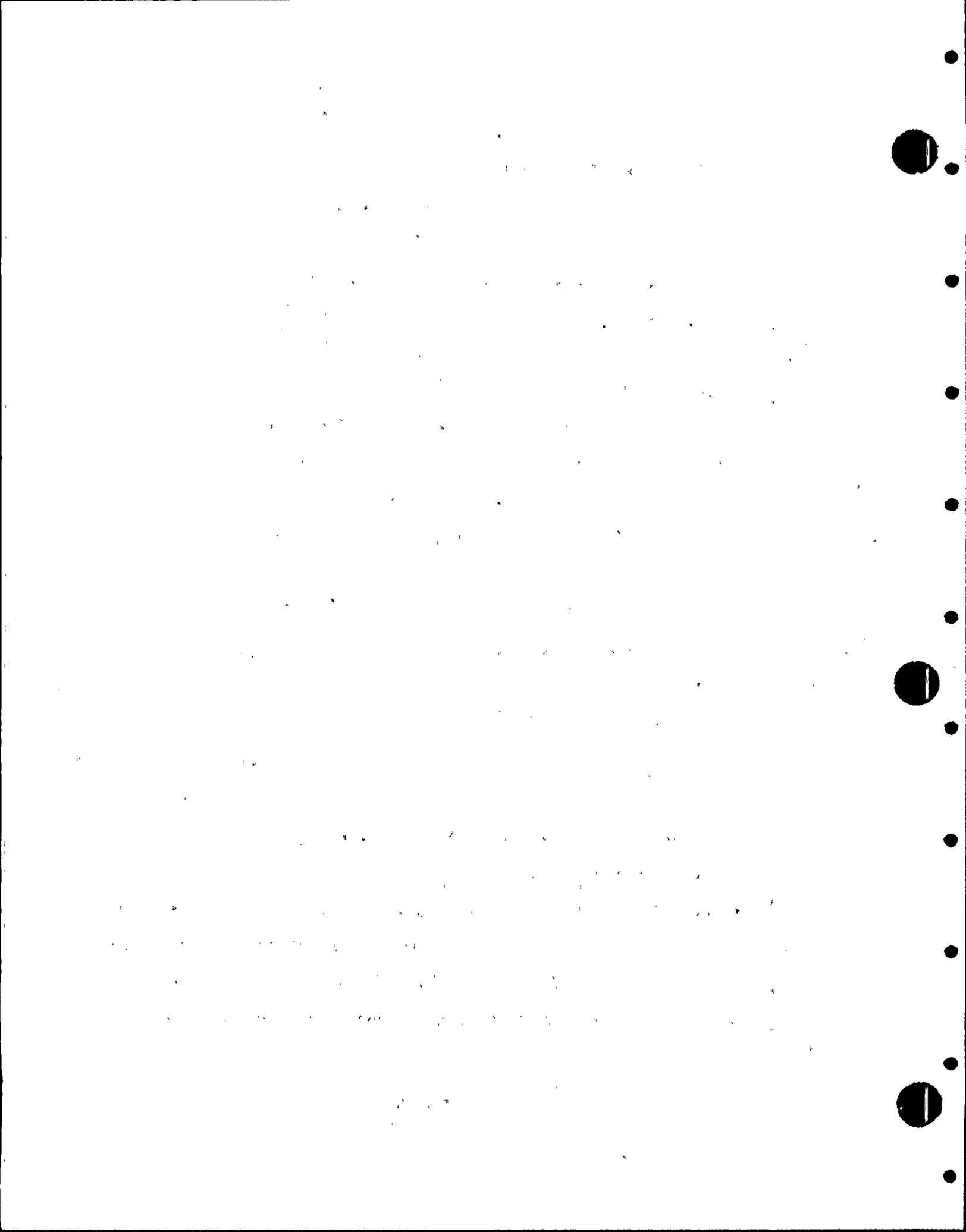
18 The Bechtel project staff have prepared the auxiliary
19 feedwater system review and will present it in two parts. The
20 agenda for the first part, to be presented today, will include
21 the system overview, layout and operation, and the standard
22 review plan acceptance criteria compliance. The second part,
23 which will be presented tomorrow, will discuss the reliability
24 study which was performed in compliance with NUREG-0635, which
25 is entitled Generic Evaluation of Feedwater Transients and



1 Small Break Loss-of-Coolant Accident in Combustion Engineering
2 Designed Operating Plants.

3 Bechtel will prepare formal responses to any open
4 issues defined by the Review Board during this auxiliary
5 feedwater system review. These responses will be reviewed
6 by the Review Board for their concurrence. When the final
7 resolution of these items is accomplished, they will then be
8 forwarded to the NRC.

9 For today's review of the Palo Verde auxiliary
10 feedwater system, we have assembled a review board with a
11 varied background due to the complexity of the system being
12 reviewed. This board includes members from the following
13 general areas of expertise: overall project management,
14 licensing, auxiliary feedwater system design, reliability
15 analysis, and mechanical systems design background. Since the
16 responsibility for an adequate review lies with the applicant,
17 i.e., APS, the board's basic formation starts with APS
18 personnel, complemented with personnel from other groups who
19 have expertise and experience not necessarily available within
20 APS. Board members were provided with appropriate sections of
21 several documents to familiarize themselves with the Palo Verde
22 auxiliary feedwater system. These included sections from the
23 Palo Verde FSAR, the Palo Verde Systems Description Manual,
24 NUREG-0635, Palo Verde Auxiliary Feedwater System Reliability
25 Evaluation, and the Standard Review Plan for the Auxiliary

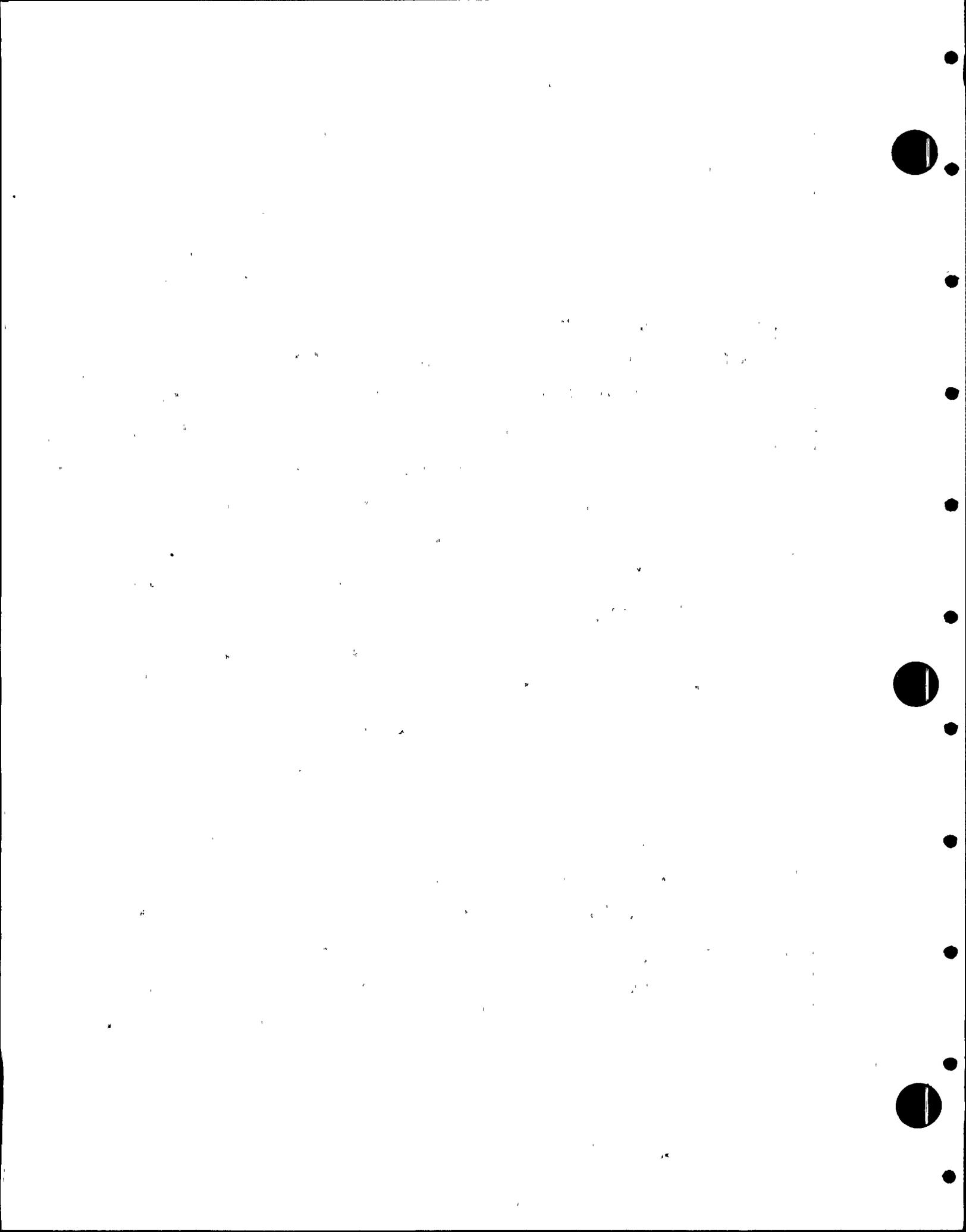


1 Feedwater System which is promulgated by the Nuclear Regulatory
2 Commission.

3 At this time, I would like to introduce the members
4 of the board, give you a little bit of their background and
5 why they were selected, and then I will have Bill Bingham, who
6 is the Project Engineering Manager for Bechtel for the Palo
7 Verde Project, introduce the Bechtel project representatives.

8 John Allen, who is sitting over here, is one of the
9 two APS Nuclear Engineering Managers and reports directly to
10 me. John is responsible for the areas of electrical engineer-
11 ing, instrumentation and control, licensing, and health physics.
12 He is also responsible for our Records Management Section.

13 Carter Rogers, who is sitting here to my left, is
14 the other APS Nuclear Engineering Manager, who also reports
15 directly to me. Carter has responsibilities for mechanical
16 engineering, chemical engineering, civil engineering, nuclear
17 fuel and other nuclear-related items. Bill Quinn, sitting
18 over here, is the Supervising Licensing Engineer. Bill reports
19 to John Allen and has responsibility for all licensing matters
20 and coordinating the day-to-day interface with the Nuclear
21 Regulatory Commission's assigned project manager. Mike Hodge
22 is a Supervising Mechanical Engineer who reports to Carter
23 Rogers. He has been responsible for the review of the Palo
24 Verde mechanical systems for APS and the day-to-day interface
25 with Bechtel and Combustion Engineering personnel involved in

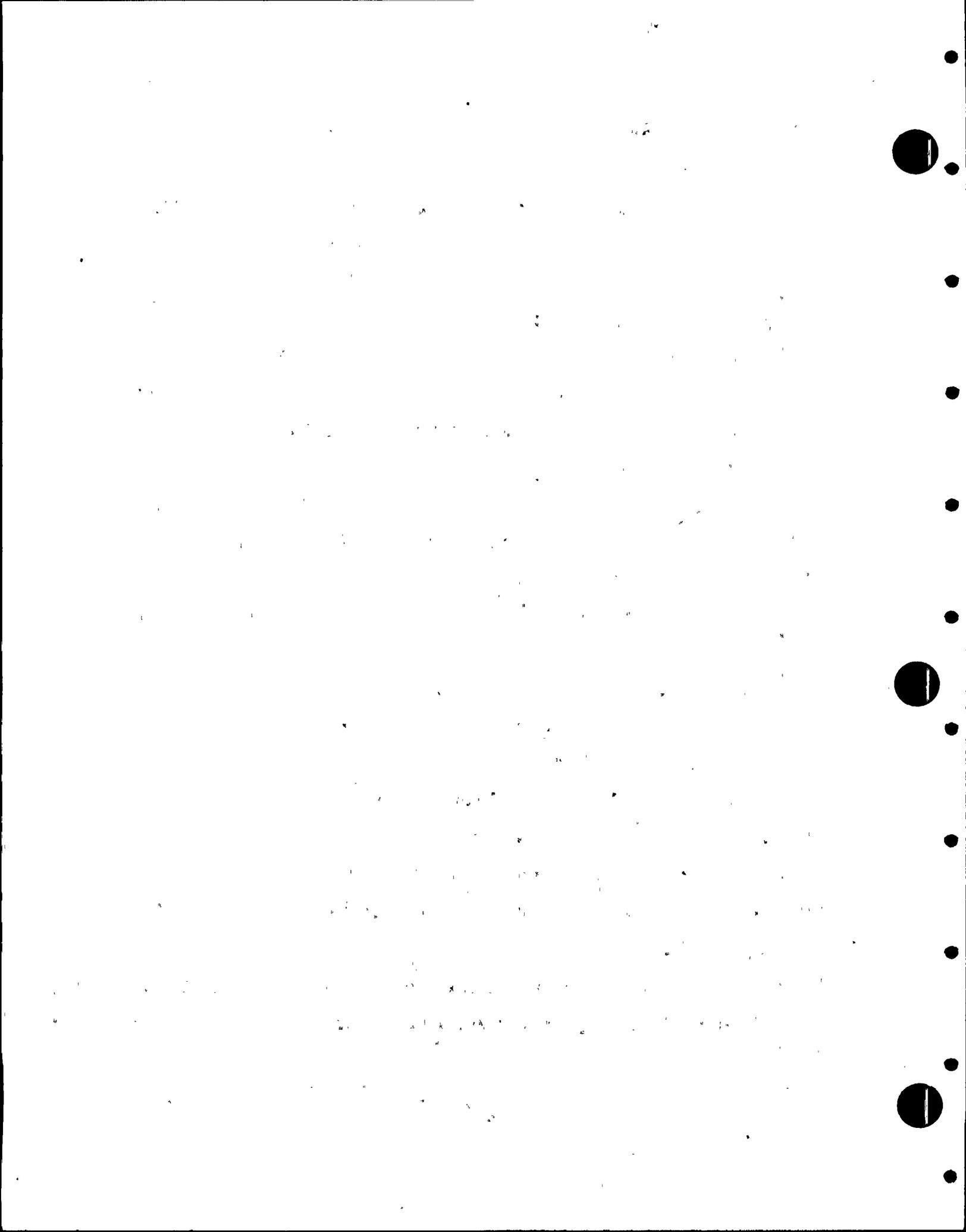


1 those systems. This would obviously include the auxiliary
2 feedwater system. Norm Hoefert is the Operations Engineering
3 Supervisor in the operating department for the Palo Verde
4 Nuclear Generating Station and is responsible to the Engineering
5 and Technical Services Superintendent for mechanical and
6 electrical engineering support, including monitoring station
7 performance and the in-service inspection program.

8 We have also asked Dale Thornburg, sitting down here,
9 Senior Consulting Engineer with Arizona Public Service Company's
10 Generation Engineering Department, to participate as an
11 independent member from APS on this board. Dale is not directly
12 involved in the Palo Verde project, although from time to time,
13 he has been utilized as a consultant in various areas. He has
14 been with APS for some 30 years and has been involved in the
15 design and construction of most of our fossil power plants
16 and is particularly knowledgeable in mechanical system design.

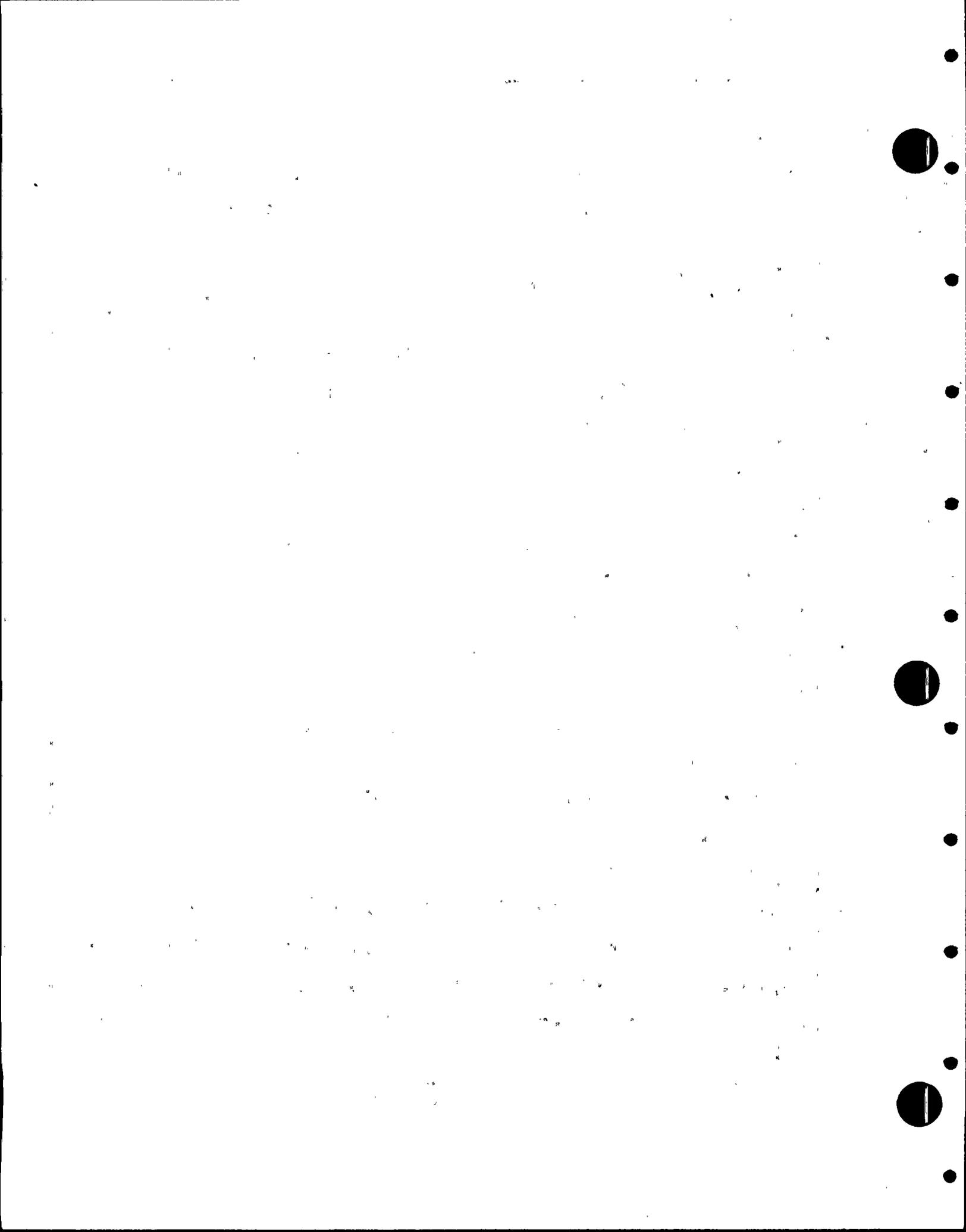
17 Two of the review board members are from Bechtel's
18 Engineering staff in their Norwalk office. These representa-
19 tives are Angie Ortiz, Chief Mechanical Engineer, and Sheldon
20 Freid, Nuclear Staff Group Leader. They also are not directly
21 involved in the design of the Palo Verde project; however, they
22 may be used as consultants by the Bechtel project staff as
23 appropriate.

24 Representing Combustion Engineering, the Palo Verde
25 Nuclear Steam Supply System's supplier, are Mike Barnoski,



1 Palo Verde Assistant Project Manager, and Rick Turk, Supervisor
 2 of Primary Systems and Special Projects. Mike reports directly
 3 to the Combustion Engineering Project Manager and is
 4 responsible for the CE interface with Bechtel project staff,
 5 especially resolution of balance of plant-nuclear steam supply
 6 system interfacing problems. He is also responsible for CE
 7 interface with APS, providing licensing support, technical
 8 support and liaison with the Combustion Engineering plant
 9 engineering staff. Rick Turk works in the CE Plant
 10 Engineering Department and has not been directly involved in
 11 the design of the Palo Verde project. However, he has been
 12 involved in the design of auxiliary feedwater systems for
 13 CE on other projects and was also responsible for the
 14 reliability analysis of San Onofre's auxiliary feedwater
 15 system.

16 To provide added expertise on the board in the
 17 relatively new area of reliability analysis as applied to
 18 nuclear plants, APS has asked Dr. Boyer Chu, of the Electric
 19 Power Research Institute, to participate on this board.
 20 Dr. Chu is a Project Manager in the Risk Assessment Group of
 21 the Nuclear Safety and Analysis Department of the Nuclear
 22 Power Division of EPRI. Dr. Chu has extensive experience
 23 related to nuclear power plant reliability, availability and
 24 safety. One of his recent projects related to this meeting
 25 was a reliability evaluation of the auxiliary feedwater system

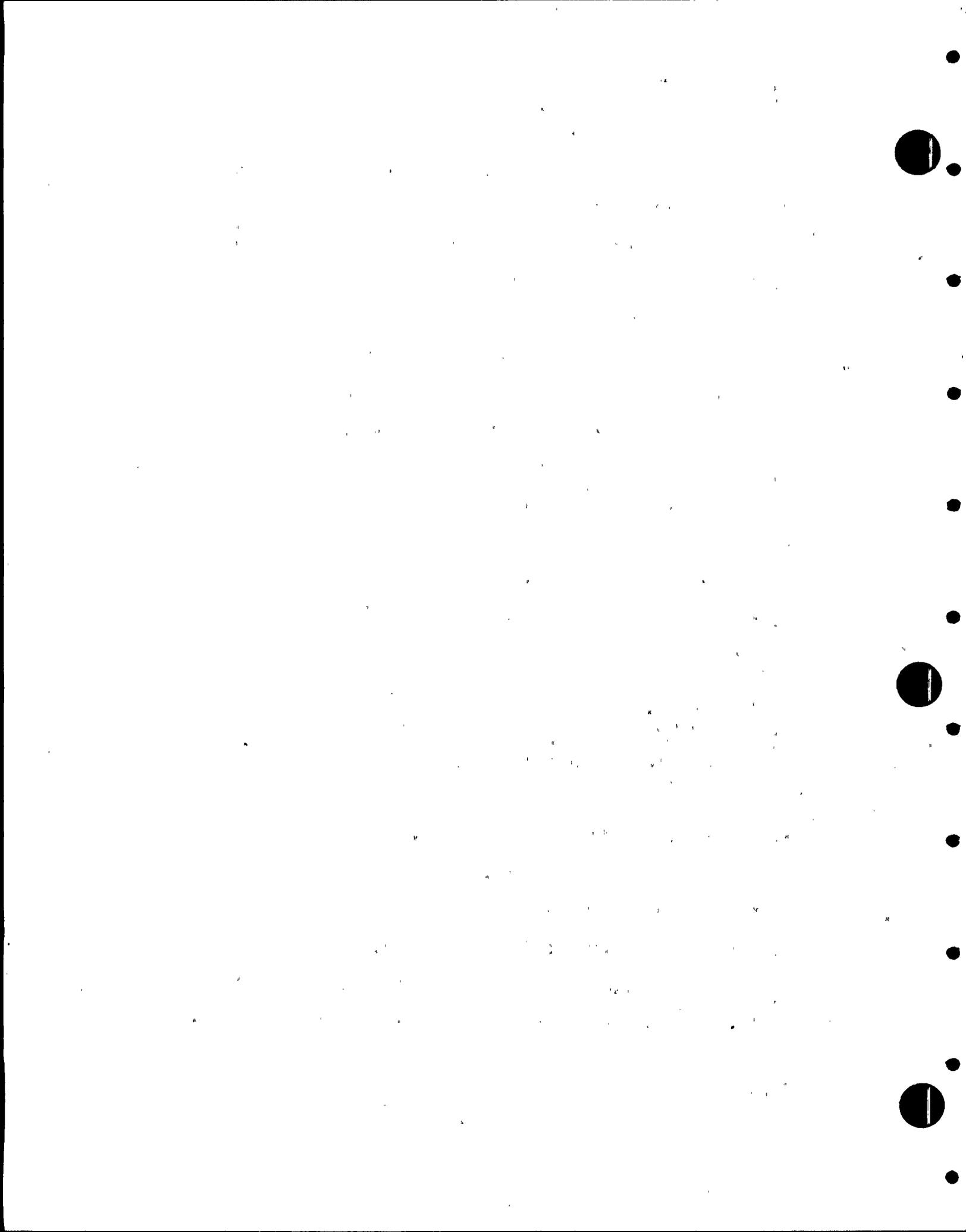


1 of TVA's Sequoyah Nuclear Power Station. He is now involved
2 in a TVA-EPRI joint effort evaluating Sequoyah's full plant
3 safety and reliability.

4 Ralph Phelps, from Southern California Edison
5 Company, is also a member of this review board. Ralph is a
6 Nuclear Projects Group Leader for Southern California Edison
7 and he was directly involved in San Onofre's auxiliary
8 feedwater system modification. It should be noted that
9 Southern California Edison Company is one of the participants
10 in the Palo Verde project, and this is one of the things that
11 gives us added expertise from time to time when we need it.

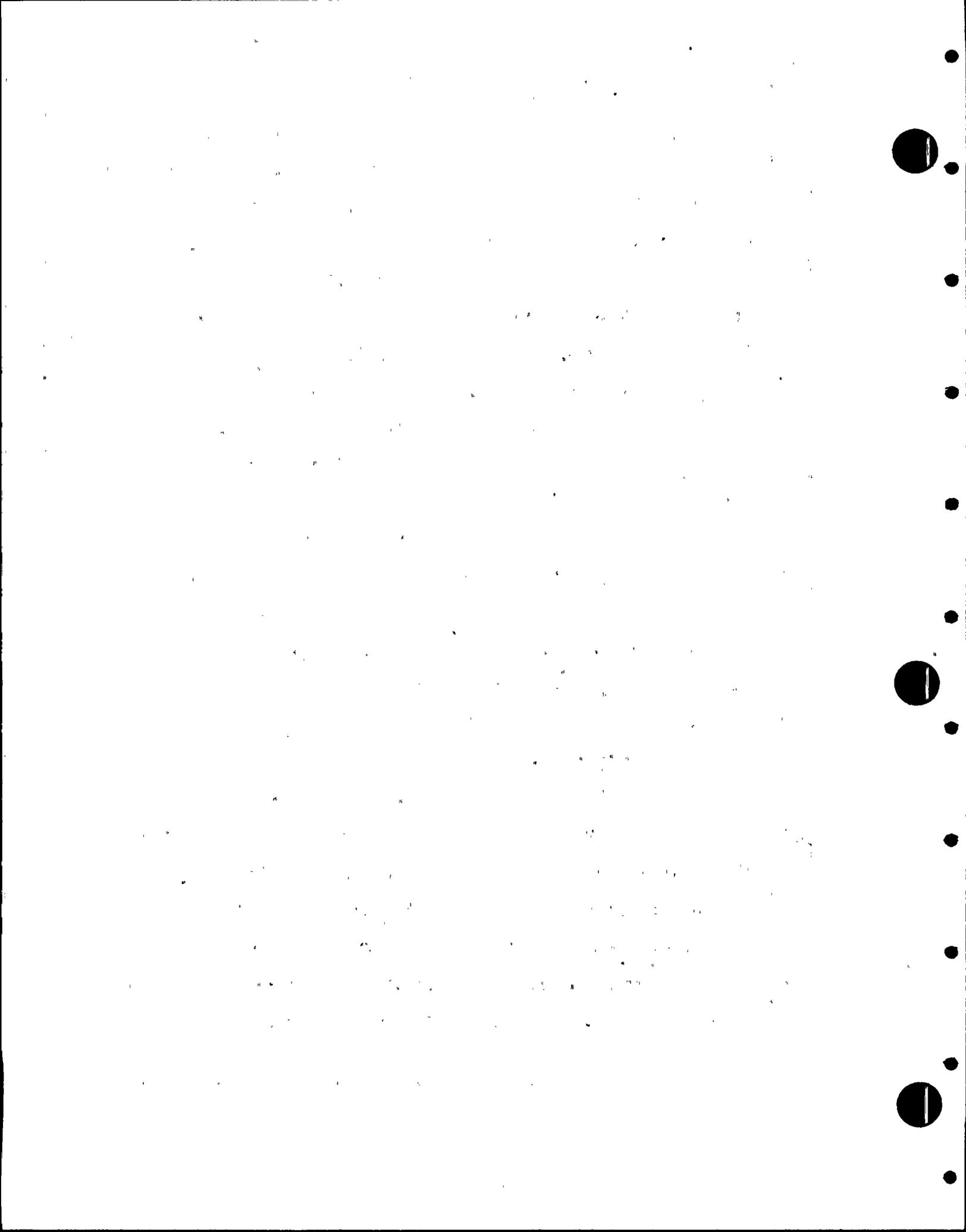
12 The Nuclear Regulatory Commission has sent a number
13 of representatives to observe and participate in this system
14 review. Olan Parr, who is the Auxiliary Systems Branch Chief,
15 is present and will sit on the board, and, Olan, if you would,
16 I would like you to introduce the members of your group and
17 maybe tell us a word or two about their backgrounds and what
18 their participation will be.

19 MR. PARR: All right, fine. To my left is Jerry
20 Wermiel, who is the reviewer for this project. Jerry and I
21 are, I suppose you might say, the official members of the
22 panel. However, we have other people here. Nick Fioravante
23 and Lynda Huang, back near the wall, are from my branch.
24 Additionally, we have Pat O'Reilly, from the Reliability and
25 Risk Assessment Branch, here. Pat in turn has consultants



1 from the Sandia Laboratory. George Bradley is here already
2 and I understand Greg Kolb will be here shortly. One last
3 person is Herman LaGow back here, who is a consultant to
4 Harold Denton and more specifically to me in the holding of
5 such meetings as this. As I said earlier, Jerry and I are
6 the official panel members. However, we may vary that.
7 Specifically tomorrow when we get into the reliability portion,
8 we will bring up the people from Sandia. That's all.

9 MR. VAN BRUNT: Thanks, Olan. We will provide a
10 transcript of this review to the Nuclear Regulatory Commission
11 and we have already done that as far as the DC power system
12 is concerned, as soon as we have received it from the court
13 reporter and proofed it and made the necessary corrections.
14 For the benefit of the court reporter, I would ask that the
15 review board members or anyone else who makes a statement
16 during these proceedings please identify themselves before
17 making any statements. We encourage the Nuclear Regulatory
18 Commission representatives present to participate in this
19 review. At the completion of the review, the open items which
20 have been identified will be reviewed and, when agreement on
21 their scope has been reached, Bechtel or other responsible
22 organizations who might be designated will then prepare
23 responses which will be sent to the members of the board for
24 their review, comment and ultimate concurrence. Then, as I
25 said before, we will submit those responses to the NRC as well.



1 In this connection, I would ask that Bill Quinn, out of my
2 staff, and Gerry Kopchinski, of Bechtel's project staff,
3 act as the secretaries for collecting the specific open items
4 and we will use them as a checklist against each other to be
5 sure we haven't missed any as we go along.

6 Bill Bingham, based on our experience from the past
7 couple of meetings we had, I would request that the review
8 board and the NRC be allowed to ask questions at the close of
9 each section of your presentation. Also, whenever anybody is
10 referring to some figure or something, that they refer to the
11 number on that figure so that when you read the transcript,
12 you can make some sense out of what is going on. Otherwise,
13 you won't realize what anybody is talking to.

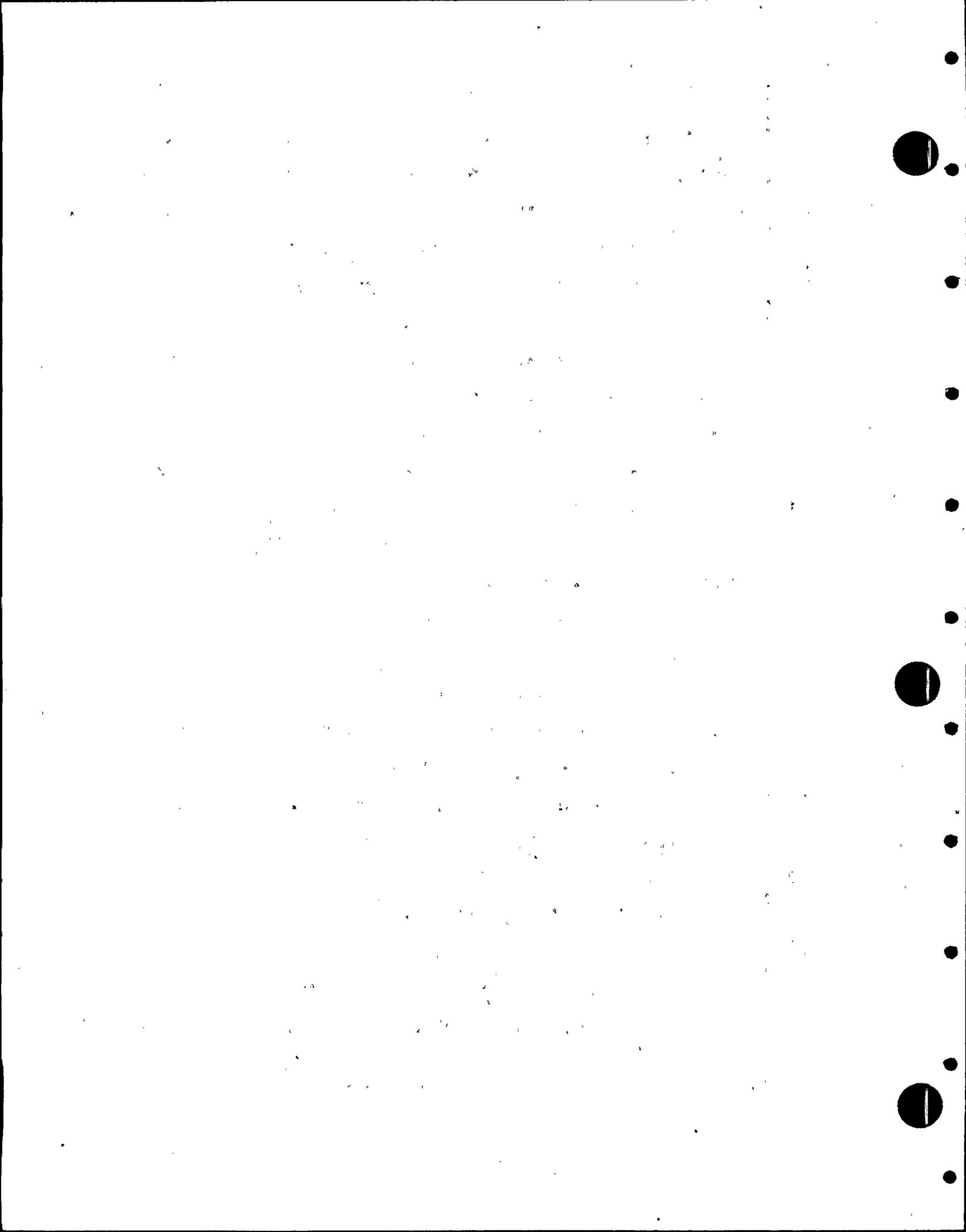
14 With that, if there are no questions from the board
15 or anything else, I will turn it over to Bill Bingham to
16 introduce the Bechtel project staff and then we will proceed
17 with the review. I would anticipate that we will go until
18 about 10:30 and then take a short break to let the reporter
19 take a breather and then continue until about noon. That is
20 when lunch is, is that right, Terry?

21 MR. QUAN: Yes.

22 MR. VAN BRUNT: Bill, it's all yours.

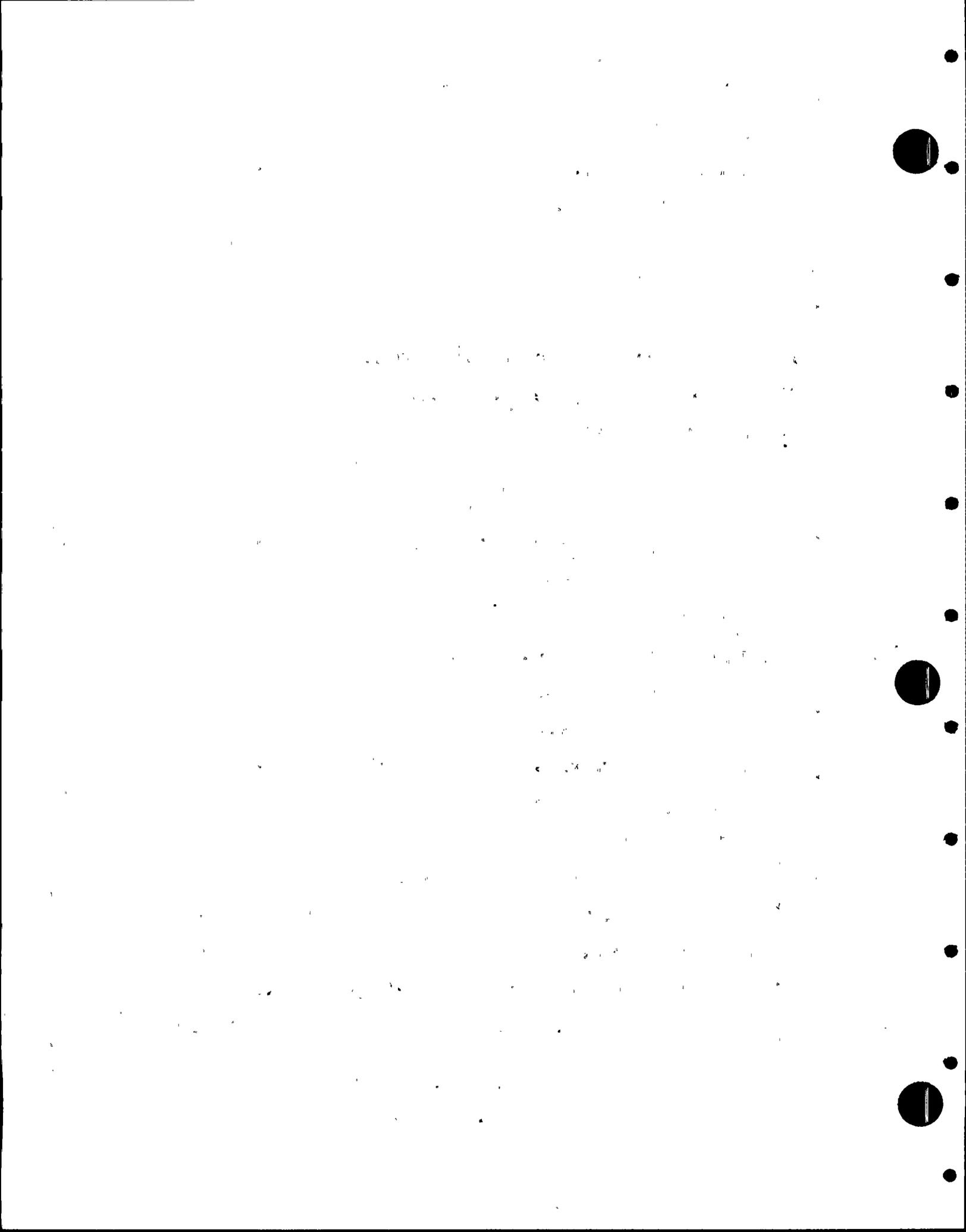
23 MR. BINGHAM: Thank you, Ed.

24 My name is Bill Bingham. I am the Project
25 Engineering Manager for Bechtel. As Ed Van Brunt indicated,



1 we are here today to present the auxiliary feedwater system
2 at the third formal meeting of the PVNGS Systems Review Board.
3 I have with me today Dennis Keith, who is Assistant Project
4 Engineer for Bechtel. Dennis has been involved in the
5 auxiliary feedwater system from the inception of the design
6 and establishing interfaces with Combustion Engineering. He
7 has also chaired the ANS Subcommittee 51.10, which was to
8 develop auxiliary feedwater criteria. Also assisting us today
9 is Gery Kopchinski. Gerry is the Engineering Group
10 Supervisor for the nuclear discipline and responsible for our
11 contribution to the licensing effort. We also have with us
12 Bill Boles, Mechanical Engineer, who is now responsible for
13 the system and is very familiar with the details of the design
14 so that we can provide any information and hopefully answer
15 all questions that the board may have today on the system.

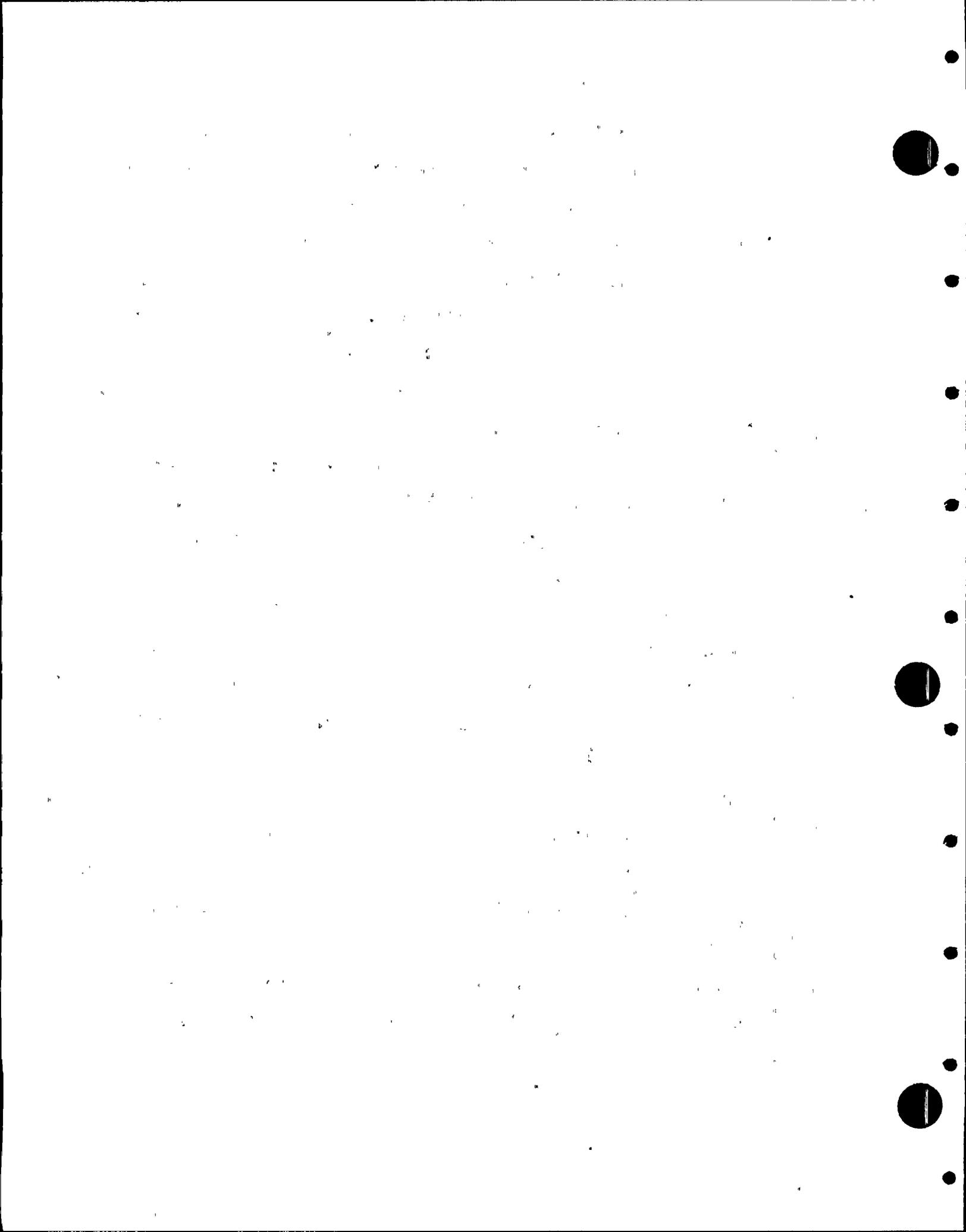
16 As Ed mentioned, the presentation will be conducted
17 over two days. There is a considerable amount of material
18 that we want to present and it will be presented in a form
19 to give you a system overview today plus a comprehensive
20 review and comparison of the design with the Standard Review
21 Plan Acceptance Criteria. Tomorrow we will discuss in detail
22 our NUREG 0635 reliability analysis. As the board is aware,
23 we have had meetings with NRC and they have expressed concern
24 that our system may not meet their present criteria for such
25 systems as presented in ASB 10-1, auxiliary feedwater system



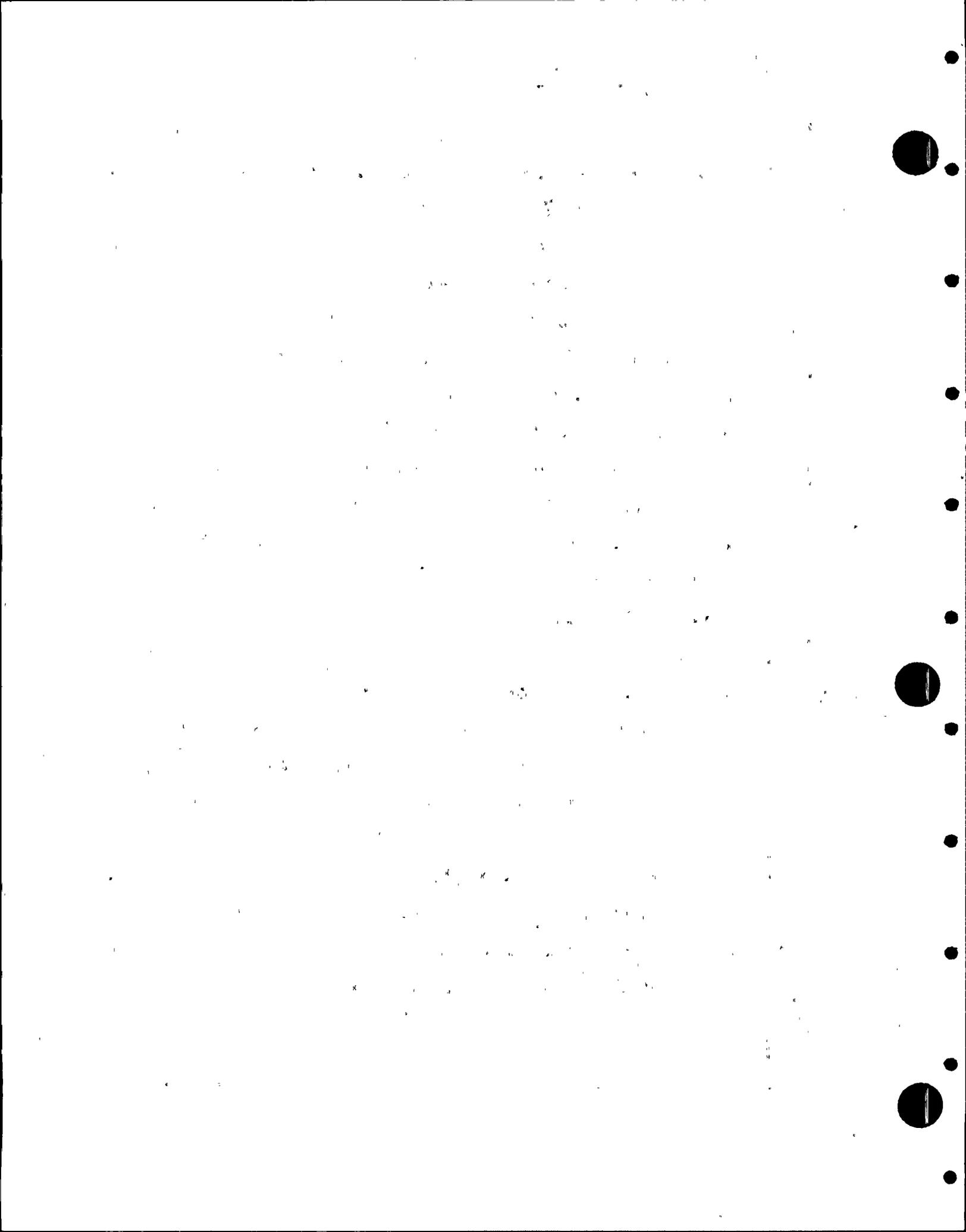
1 diversity, and, further, that it may be necessary to add a
 2 fourth auxiliary feedwater train to the system. As a result,
 3 we have performed a reliability analysis of the present
 4 Palo Verde auxiliary feedwater system and also three modifica-
 5 tions of that system to present a comprehensive overview of
 6 the reliability of the system as it presently exists and to
 7 provide the board with an estimate of potential increased
 8 reliability for various enhancements. That information will
 9 be presented tomorrow to you.

10 I would also like to indicate that there have been
 11 new requirements since the FSAR presentation for this system,
 12 and I would also like to indicate that where we have
 13 determined through the review of the design that we don't
 14 comply or as a result of the work that we have done to put
 15 together this presentation have found areas that need modify-
 16 ing, we have been working with APS engineering and have been
 17 making the proper and mandatory modifications. You will hear
 18 this a little later through the presentation both today and
 19 tomorrow.

20 At the past system review meetings, it was clear
 21 that there was a necessity for me to spend some time to take
 22 you through, at least for the board and the observers, an
 23 overview of the system design and how it is conducted for
 24 Bechtel to assure that the design meets the established
 25 requirements. I think also important is that I spend a few

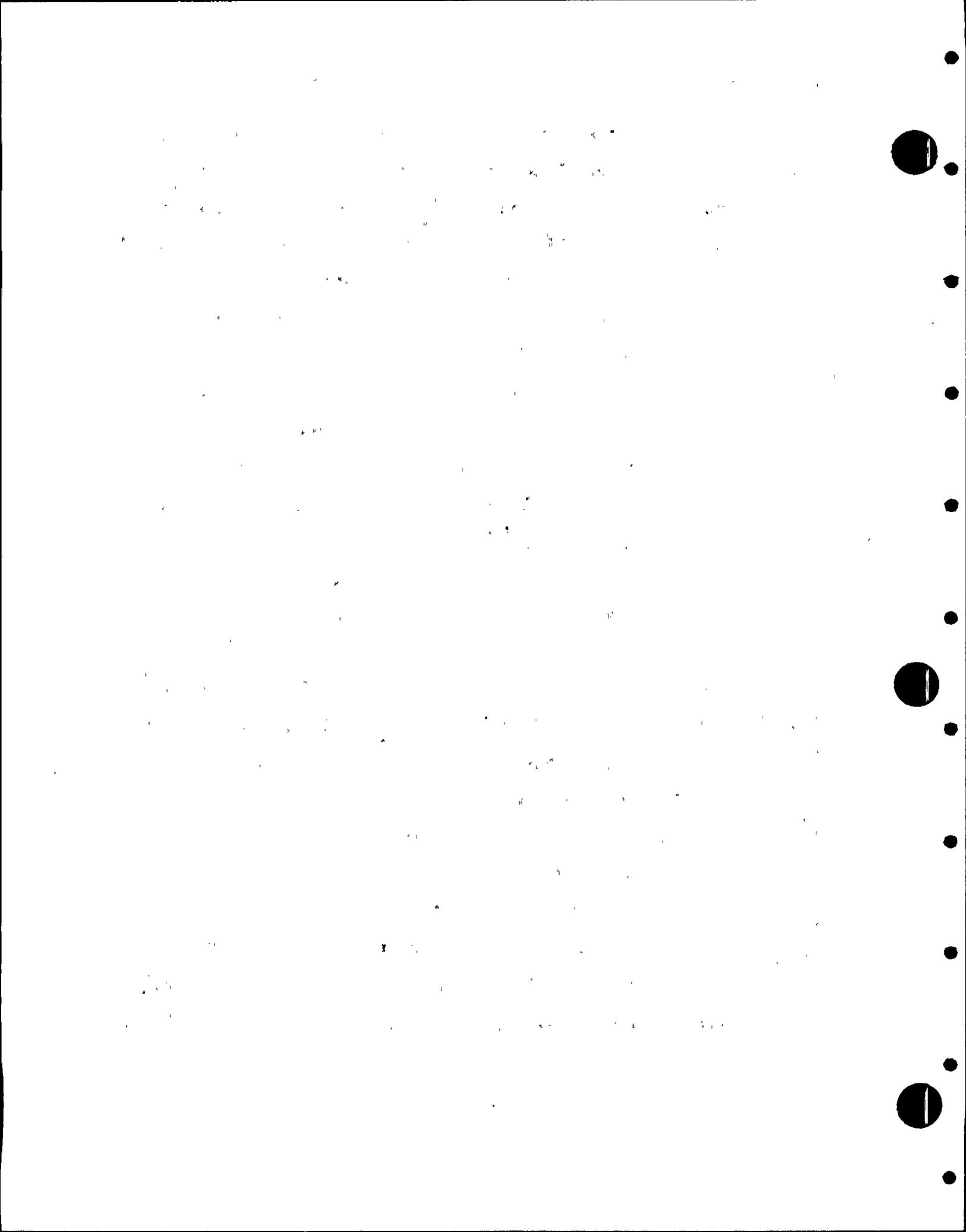


1 minutes on how Bechtel has prepared for this particular
2 presentation and others that we will do subsequently. Most
3 of the information that you are going to hear today is
4 information that we have discussed with APS over the last
5 six or seven years of the project in various meetings that we
6 have had, various interchanges of correspondence. However,
7 it is not easy for one to quickly pull together all the
8 information to have a complete overview. We have spent about
9 two months, maybe two and one-half months, on this system to
10 go back through the various meetings that we have had and the
11 correspondence and the reviews that have been documented and
12 pulled the information together today to make it easy for the
13 board to understand the design and how the design meets the
14 established criteria. On Figure 1, I have shown the PVNGS
15 Design Development and, as we have indicated to the board
16 before, all of the work kind of centers around the design
17 criteria, which basically we call the hub of the design. This
18 is a set of criteria that is reviewed and approved by the
19 owner and establishes the scope of the system. These three
20 volumes labeled Design Criteria Manual Palo Verde Units 1, 2
21 and 3 shown here reflect all the design criteria for the
22 plant. This is a dynamic document. It is updated as new
23 criteria are determined necessary to incorporate into the
24 plant and it is the document that is used to reflect the
25 design of the plant.



1 As you can see from this chart, there are utility
2 or the owner-applicant's specific input requirements for the
3 plant. There are standard NSSS System 80 at this point,
4 interface information to develop the plant information that
5 is fed in. There is from that then information to the
6 licensing documents, development of a standard design, and
7 then, of course, feedback with the regulators. From that, we
8 develop the procurement specifications, system descriptions,
9 schedule, construction specs, and so forth. Also from the
10 design criteria comes the plant arrangement through the use
11 of the model. On this project, for those who don't know,
12 there is a three-quarter inch to the foot scale model of all
13 of the power blocks. Then, of course, from that we go to our
14 detailed construction drawings and planning photographs.
15 The final input to the design criteria covers the schedule,
16 licensing input, basic criteria, and P&ID's. So what we have
17 then is one set of documents that establish the criteria.
18 From that set, we put our descriptions into the licensing
19 documents and, from reviews, we keep it current.

20 This process generally takes two or three years in
21 order to assure that the design is correct and reflects all
22 of the requirements. We have several multi-discipline reviews.
23 This is where the different disciplines get together either
24 at the model or at the reviews and analyze the systems, looking
25 at the design, looking at safety, separation, and all the



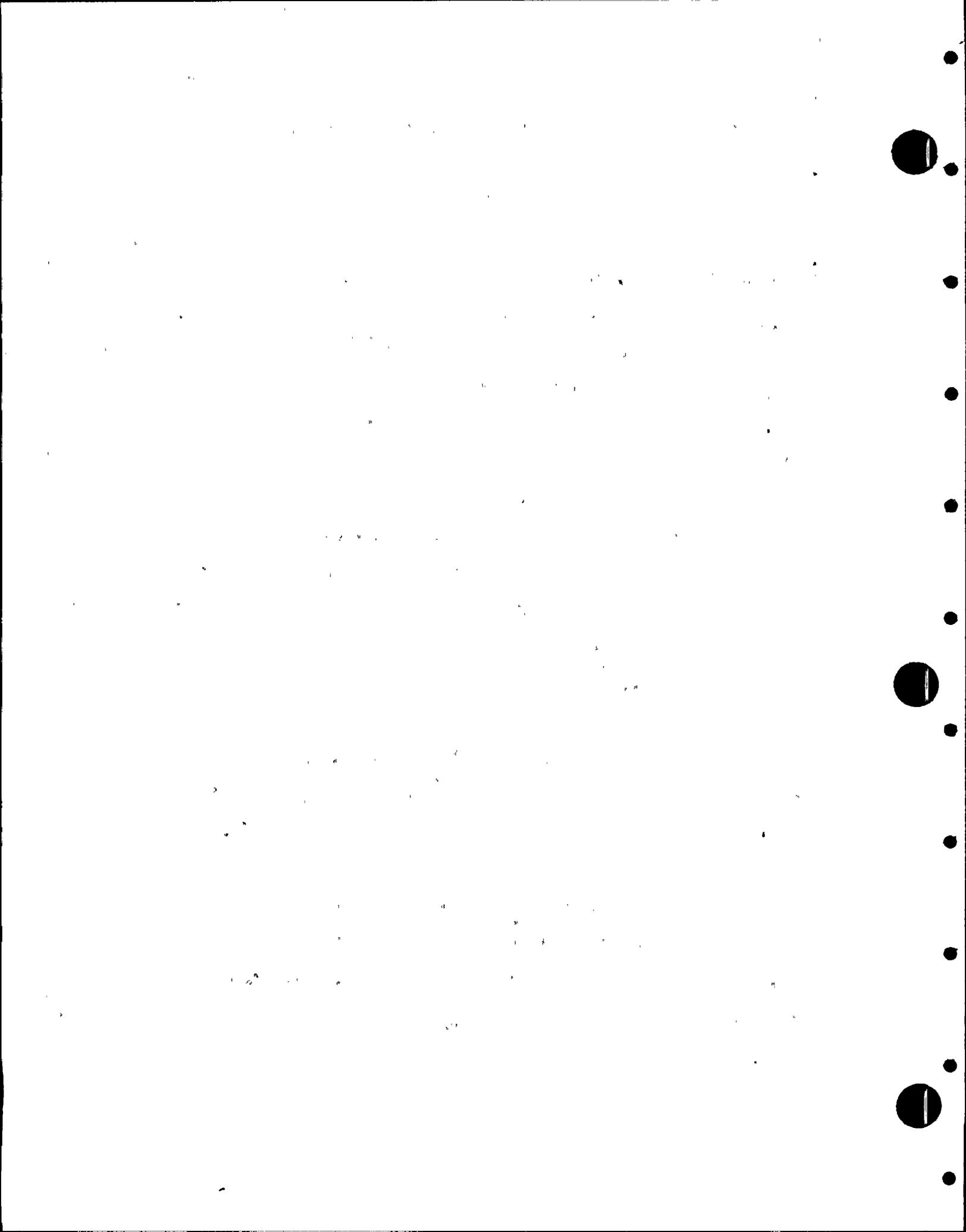
1 criteria to assure that the system does meet the criteria
2 established. As I indicated earlier today, we are going to
3 spend time to tie all of these reviews together and I believe
4 that we will be able to demonstrate to the board that the
5 system as designed does meet the criteria.

6 Our agenda today is going to have a system overview,
7 and what I am going to ask is that we hold our questions on
8 the presentation until we complete each of these subheadings
9 design criteria, operation, layout, and I will ask for
10 questions then at that time. That will probably take most
11 of the morning session. Second will be the review of the
12 acceptance criteria, and again I would request that at the
13 end of each of the headings that we entertain questions. We
14 will at the end summarize for the board basically what we are
15 going to present tomorrow on the reliability study, and
16 tomorrow again we have given you the major headings under
17 that when we will ask the board for questions.

18 I believe with that introduction, I would like to
19 ask Dennis Keith if he would start the presentation.

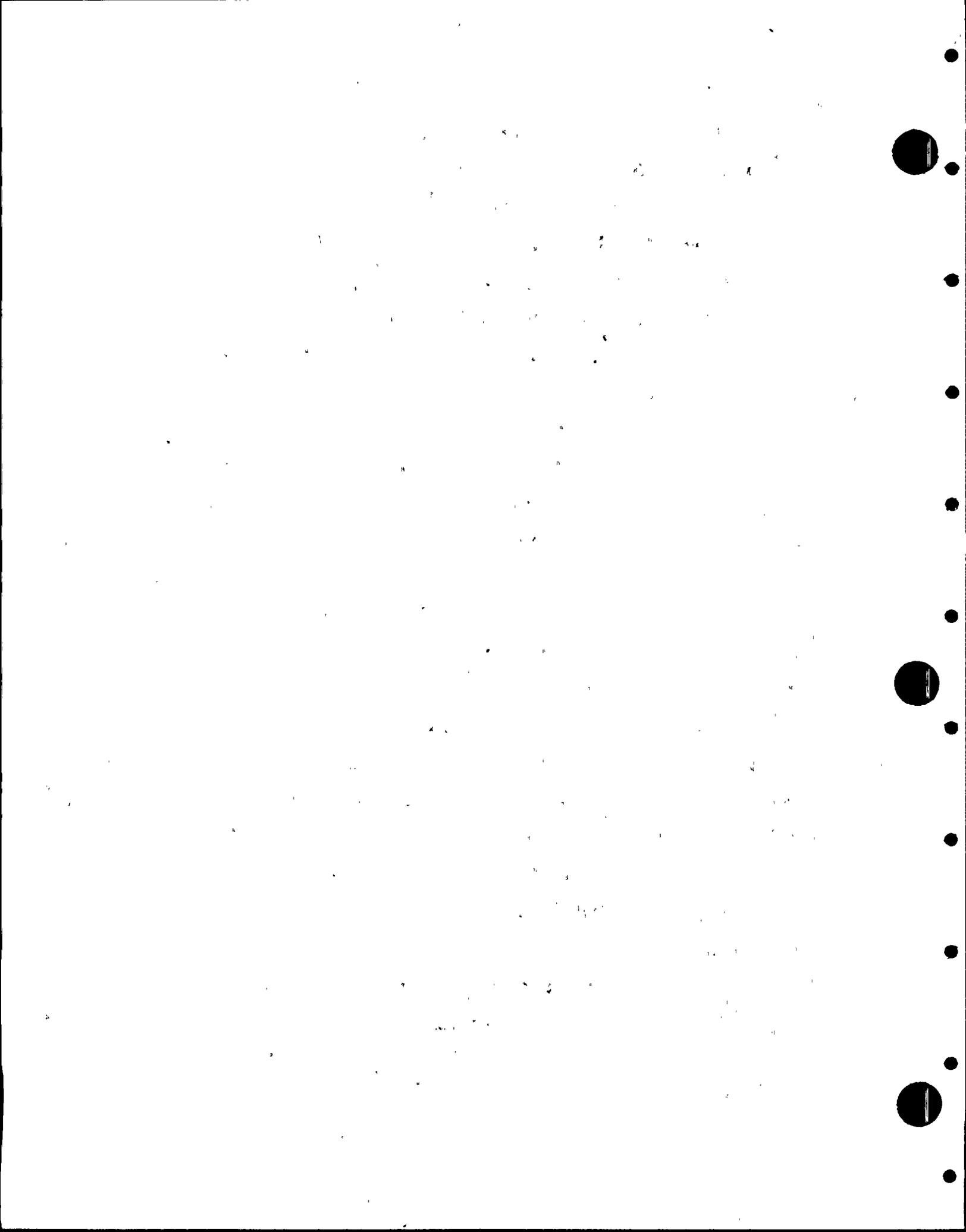
20 MR. KEITH: First, starting off with design criteria,
21 I wanted to just tell you briefly what our system consists of
22 and then relate the design criteria to the system. (Figure 2)

23 We have three auxiliary feedwater pumps in our system.
24 Two of them are safety-related pumps, one turbine-driven
25 pump, one motor-driven pump which is capable of being supplied



1 by the diesel generator, and a startup auxiliary feedwater
2 pump, which is currently capable of receiving power from the
3 turbine generator or from offsite power only. The two
4 safety-related pumps are used only during emergency conditions.
5 The startup auxiliary feedwater pump is used during the
6 normal operation conditions of startup, hot standby, and
7 shutdown. The nomenclature we have used in the PSAR and the
8 FSAR is to call this, just the whole system, the auxiliary
9 feedwater system and we have called these the safety-related
10 auxiliary feedwater pumps and this one, I believe the term we
11 use is nonsafety-related auxiliary feedwater pump or startup
12 in the FSAR. For the presentation today, we thought it would
13 be simpler -- the way that the slides are labeled and hope-
14 fully we titled them -- to call the two safety-related
15 auxiliary feedwater pumps emergency feedwater pumps and the
16 pump used for startup, hot standby, and shutdown operation
17 will be called the startup auxiliary feedwater pump. So if
18 you are not already confused, I hope that will simplify things.
19 This is in conformance with the CESSAR terminology that is in
20 the Combustion Engineering Standard Safety Analysis Report
21 which is referenced in our FSAR. Combustion refers to the
22 emergency feedwater system, it would be these two trains
23 which would be applicable in our system.

24 To get into the design criteria, this is Exhibit
25 1A-1, the auxiliary feedwater system shall provide an

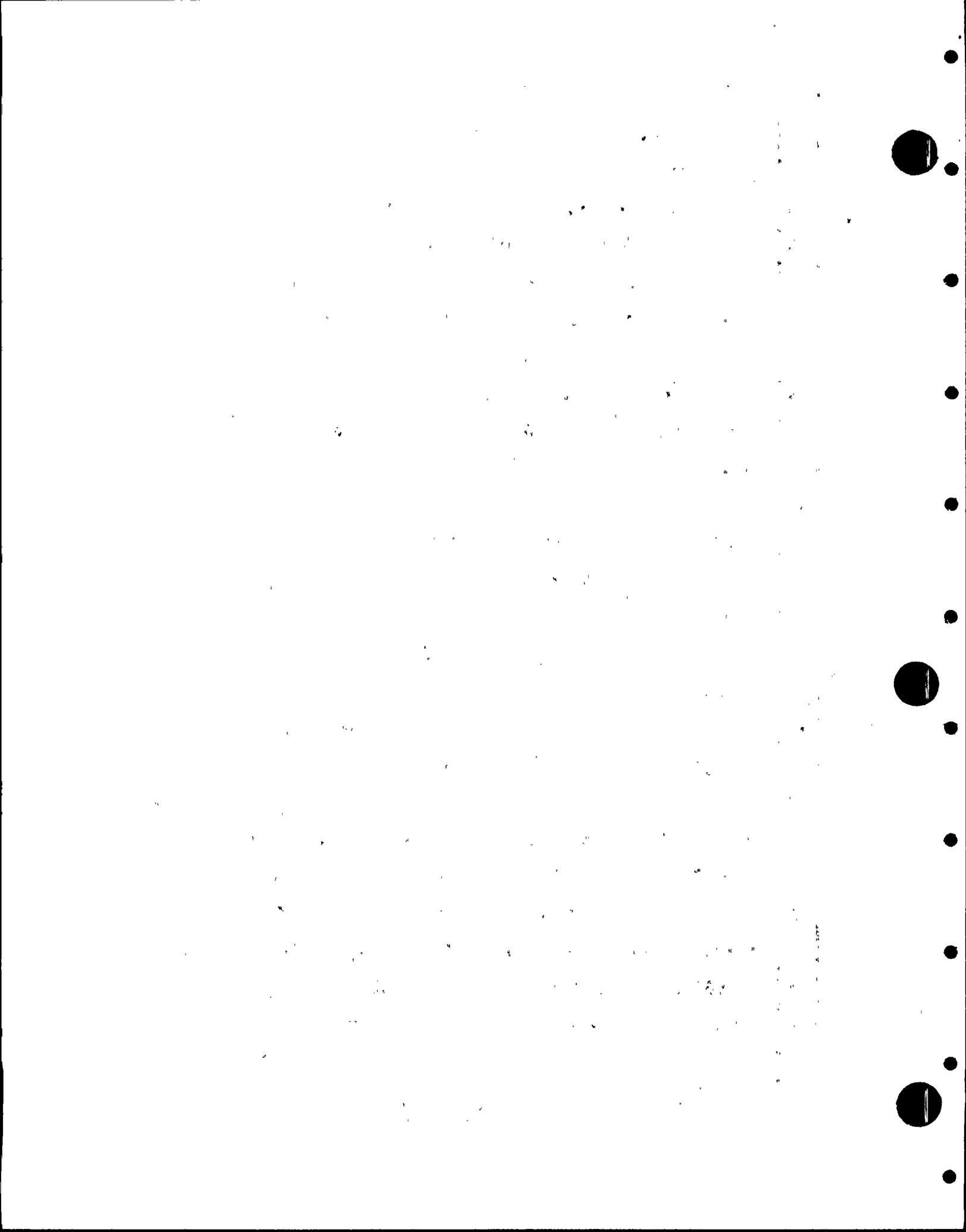


1 independent means of supplying feedwater to the steam
2 generator in addition to the main feedwater system and will
3 have a sufficient reserve of feedwater to maintain a hot
4 standby condition for eight hours and have sufficient
5 feedwater to take you to a cold shutdown condition. This is
6 generally done at 75 degrees an hour maximum cooldown rate.

7 Our emergency feedwater trains are designed to
8 withstand a safe shutdown earthquake. They will remain
9 functional during and following the safe shutdown earth-
10 quake.

11 The startup feedwater train, as I said earlier, is
12 providing feedwater during the conditions of startup, hot
13 standby, and shutdown. This system is designed to remain
14 functional following an OBE. We will get into the details
15 of our seismic design classifications that we use on the
16 project later.

17 On Exhibit 1A-2, the emergency feedwater pumps are
18 designed to Section III, Class 3, criteria. As a consequence,
19 they also meet Section XI. All the applicable parts are
20 accessible for the in-service inspection requirements of
21 ASME Section XI. We also meet Hydraulic Institute standards
22 and American Petroleum Institute Standard 611. Let me just
23 clarify. We have on this slide in parentheses that we meet
24 CESSAR and then the section of CESSAR. As you know, in a
25 standard safety analysis report, there are various interface



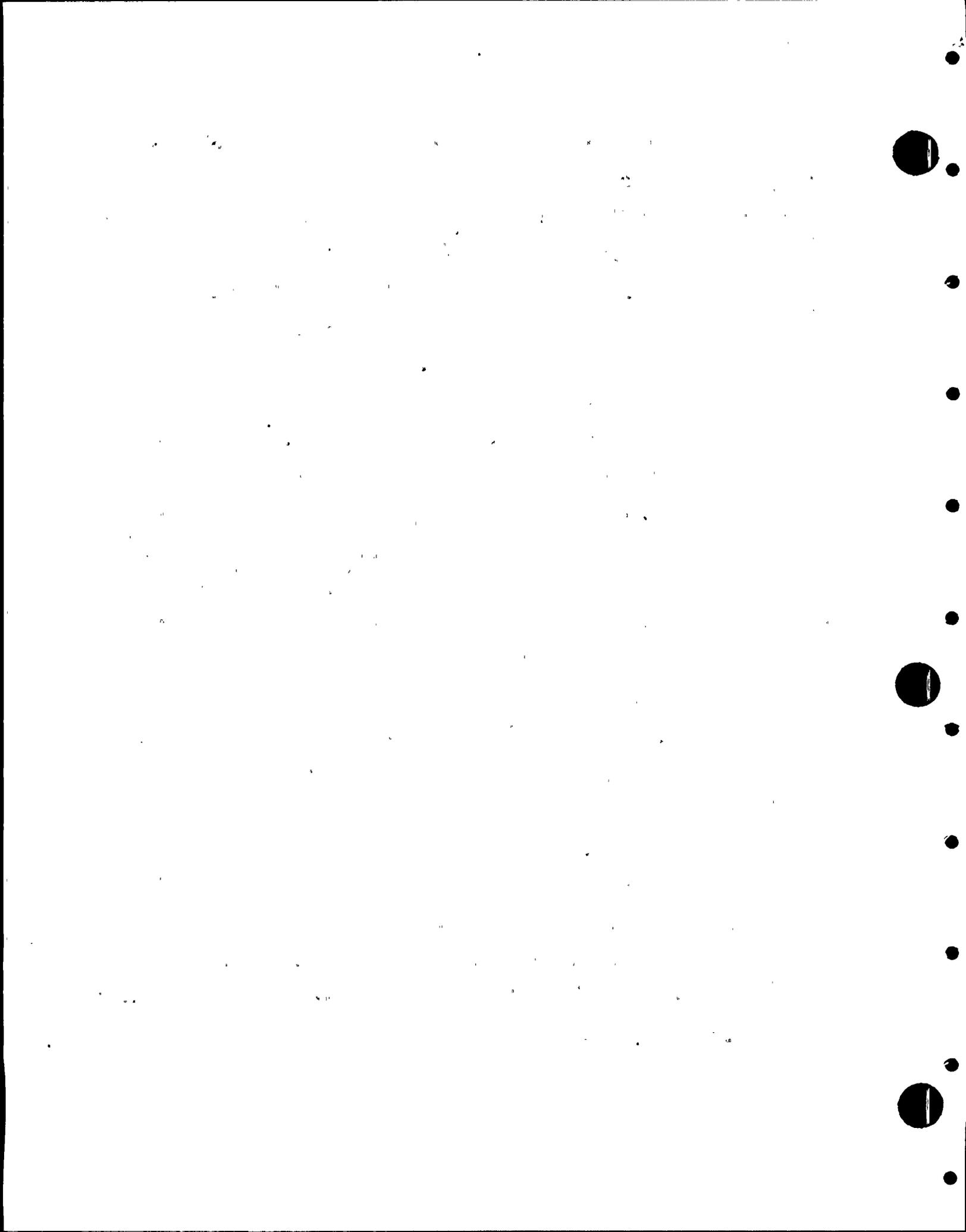
1 requirements which must be met by the utility referencing a
2 standard safety analysis report. These numbers refer to
3 CESSAR interface requirements. You will see that throughout
4 the presentation.

5 Exhibit 1A-3. The piping from the condensate storage
6 tank to the auxiliary feedwater isolation valve, that is here
7 up to here (indicating) on both trains and also the crossover
8 to this valve (indicating), meet the requirements of ASME
9 Section III, Class 3, and from the downstream isolation valves
10 to the steam generators, the piping and other equipment in the
11 line meet the requirements of ASME Section III, Class 2.

12 Our steam turbine receives steam from both steam
13 generators and the piping to the turbine meets the require-
14 ments of ASME Section III, Class 3. Up to this point
15 (indicating), it is Section III, Class 2.

16 This is Exhibit 1A-4. All the other piping and
17 valves which we haven't discussed yet meet the requirements
18 of ANSI B31.1, and, in general, our system is arranged such
19 that we meet the requirements of OSHA, the Occupational
20 Safety and Health Act.

21 As I said earlier, during normal type conditions,
22 these pumps are not in operation, and by normal plant
23 conditions, I am including the conditions of startup, hot
24 standby, and shutdown as well as normal operations where the
25 reactor is producing power.

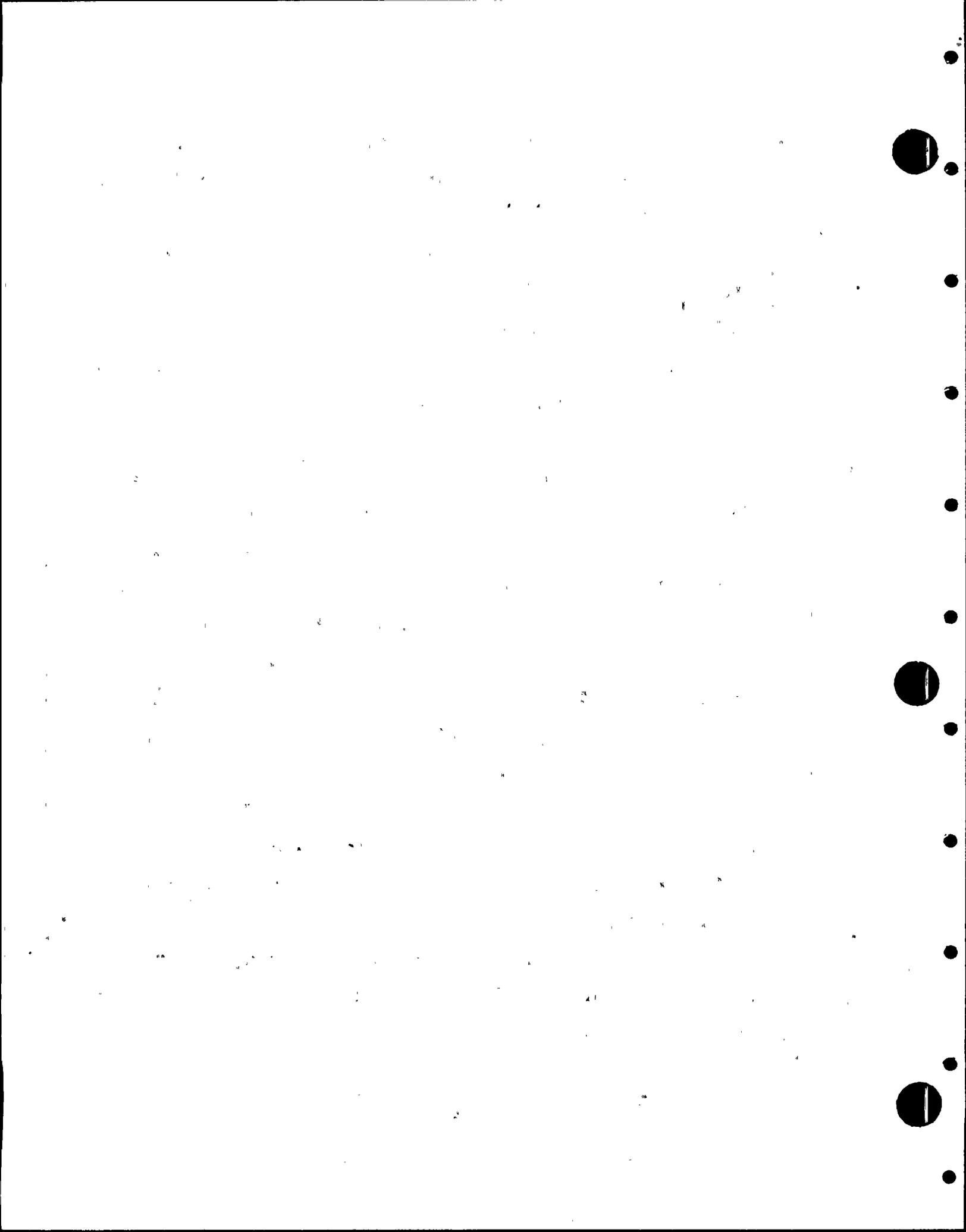


1 The emergency trains, these two pumps here and two
2 trains (indicating), are designed to meet Seismic Category
3 I requirements.

4 Our trains consist of one 100-percent capacity
5 electric-driven pump and one 100-percent capacity steam
6 turbine-driven pump, and we will get into more about the
7 power supplies to those pumps later. The startup pump, as I
8 said earlier, is a motor-driven pump receiving power from
9 offsite and the turbine generator.

10 Exhibit 1A-5. The requirements on the emergency
11 feedwater pumps are that they actuate automatically upon
12 receipt of an auxiliary feedwater actuation signal, an AFAS.
13 In CESSAR, you may see the terminology later, CESSAR refers to
14 this as an EFAS. It is the same signal. In that case, it is
15 an emergency feedwater actuation signal. This logic is
16 provided by Combustion Engineering. The logic for the AFAS is
17 such that the emergency feedwater pumps will start automatically
18 during the following accidents: A main steam line break, loss
19 of main feedwater, loss of offsite power, and loss of offsite
20 and onsite AC power. During the latter condition, only the
21 turbine-driven pump would be available. It would start
22 automatically.

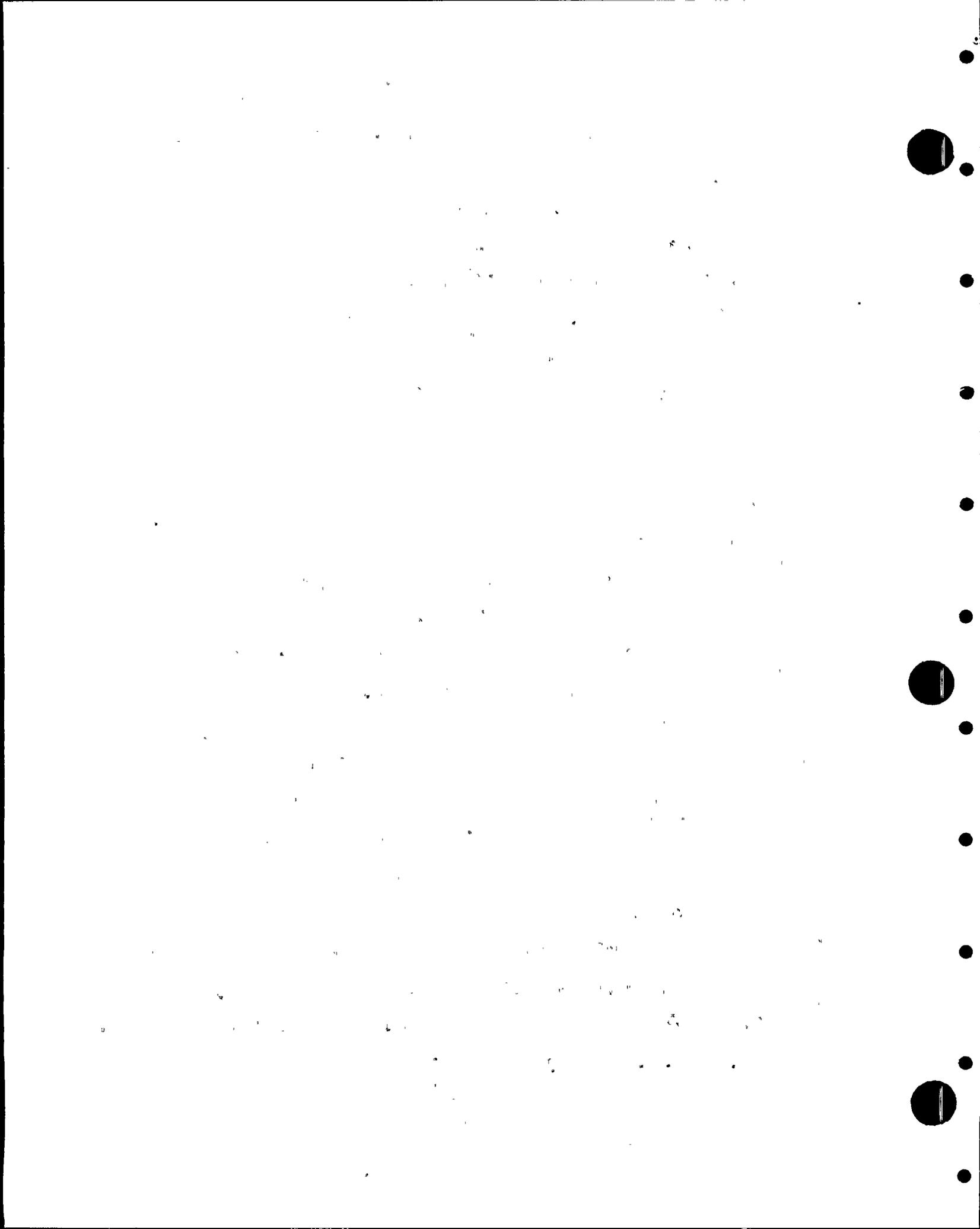
23 The startup feedwater pump is manually actuated and,
24 as we have said, used during the conditions of startup, hot
25 standby, and shutdown.



1 The motor-driven emergency feedwater pump, this
2 train and these valves (indicating), is capable of receiving
3 power from the onsite or standby diesel generator, so that we
4 have that available in the event that we don't have the
5 turbine generator and offsite power available.

6 This is Exhibit 1A-6. Now we are getting into the
7 power supply to the turbine-driven emergency feedwater pump.
8 All the valves in this train (indicating), the motor-actuated
9 valves, and the crossover valves to feed the other steam
10 generator from the turbine-driven pump and the steam admission
11 valves and all the controls associated with the turbine,
12 all receive power from the DC bus so that we can meet the
13 previous design criteria, which said that this pump would be
14 operable during a complete loss of AC power. As you can see --
15 well, let me just tell you, and you can see from the arrange-
16 ment, but the power supplies and all to these two trains are
17 completely independent so that we can take a single failure
18 anywhere in the system and still feed both steam generators
19 from the other train. We also, between these two trains, have
20 complete physical separation between the two pumps, and we
21 will demonstrate that and show our plant layout later on in
22 the presentation.

23 Exhibit 1A-7. The requirement on our emergency
24 feedwater pumps is that they have the capability to feed
25 875 gallons per minute to the steam generator at the accumula-
tion pressure of the lowest safety valve. It also operates at

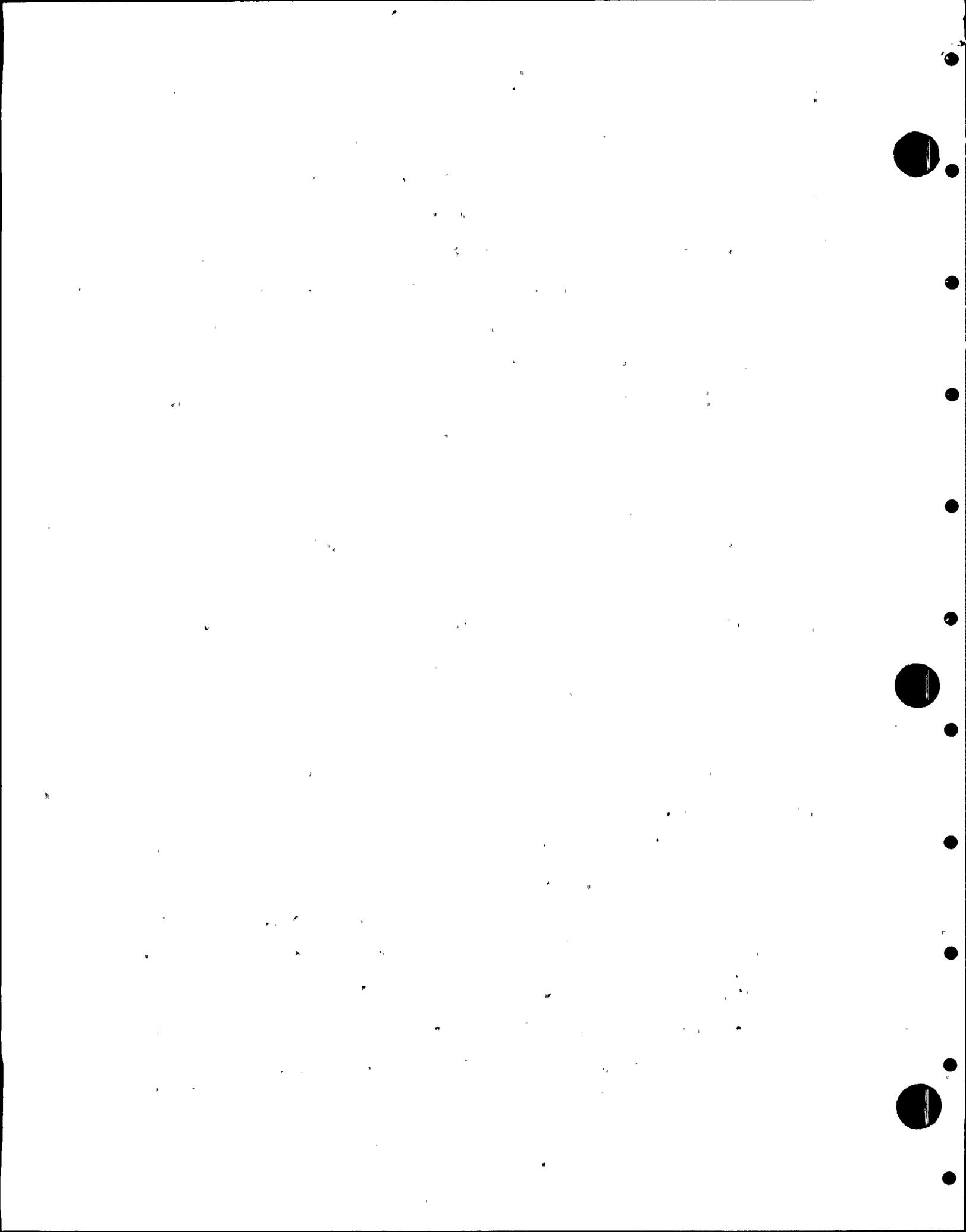


1 pressures down to 135 psi, and we have low pressure alarms
2 on the discharge at the pump to alert the operator in the
3 event that we are approaching a runout condition on those
4 emergency feedwater pumps plus meet all those requirements.

5 The requirement on the availability of the pumps in
6 the event of an auxiliary feedwater actuation signal, they
7 must be available within 10 seconds when offsite power is
8 available and within 45 seconds when offsite AC power is not
9 available. That is giving us time for the diesels to come up
10 to speed, the latter requirement.

11 We have another requirement which is after
12 initiation of auxiliary feedwater flow, there be no decrease
13 in the flow rate for any reason other than as a result of
14 normal operation of the auxiliary feedwater controls, and there
15 is nothing in our control logic to decrease the flow. You
16 can take manual control of these valves and jog them to an
17 intermediate position, but that is only done when the operator
18 has determined that the situation is under control and we have
19 adequate flow to the steam generators.

20 This is Exhibit 1A-8. As I stated, the AFAS does
21 automatically control the level to the steam generators by
22 opening and shutting these valves as appropriate. There is no
23 modulation. It is a complete open and complete shut on those
24 valves. So the level is maintained between the bands, the
25 set points, of the AFAS. However, as I stated, the operator
can when he has determined that the situation is stabilized



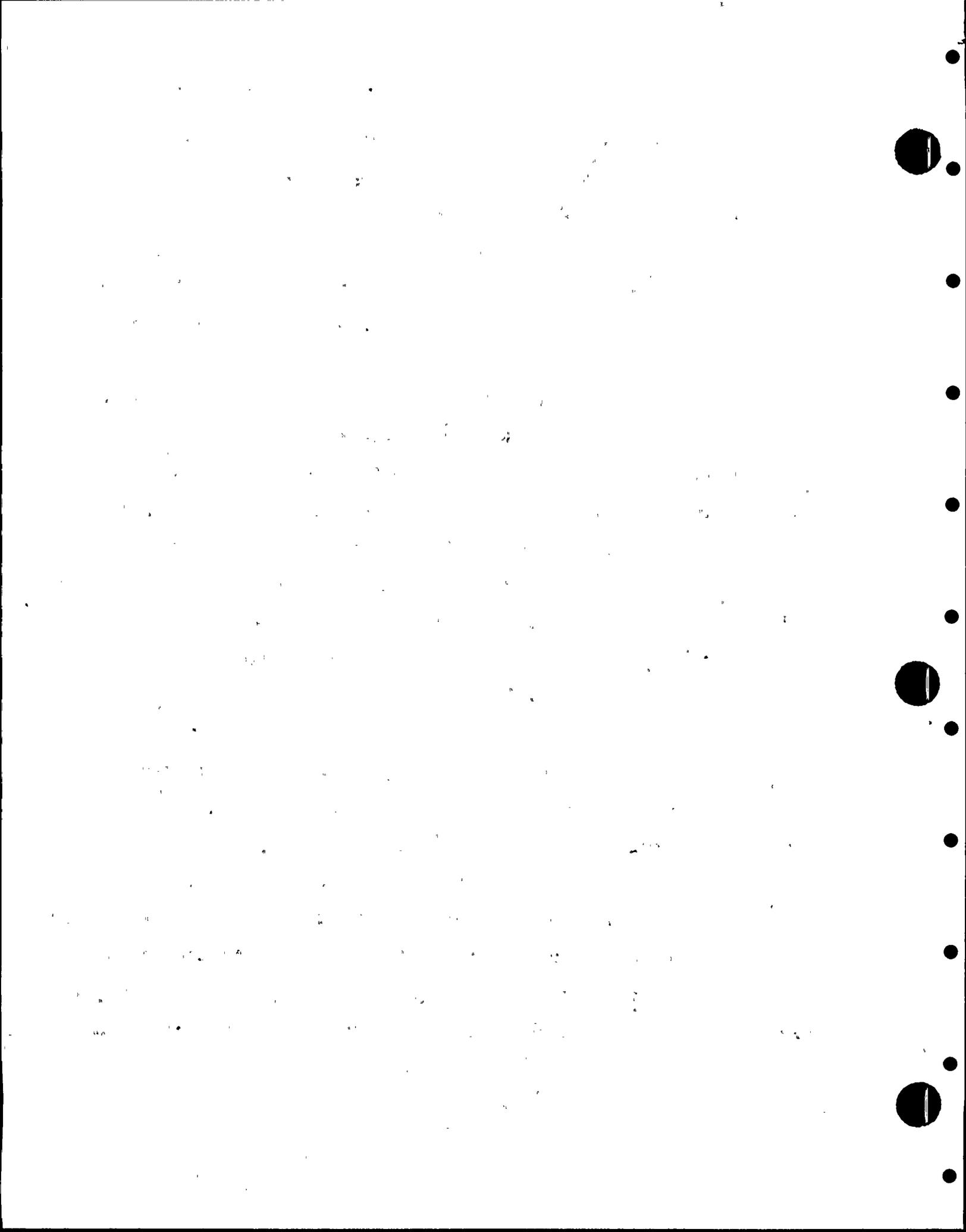
1 take manual control of these valves and put them in an
2 intermediate position so that the valves are not going at the
3 full open, full shut positions.

4 As I stated earlier, we do have means, accessibility
5 and all, to meet all the requirements of Section XI for
6 in-service inspection and for testing of the components in
7 the system.

8 In the unlikely event that we would have to evacuate
9 the control room, we do have controls for the emergency
10 feedwater pumps at the remote shutdown panel. This is a panel
11 in the control building which is remote from the control room
12 where the operators can go and control the auxiliary feed-
13 water system and maintain the plant in a hot standby condition.

14 The primary source of water for the auxiliary
15 feedwater system is the condensate storage tank. We will be
16 describing this tank in more detail later. It is a Seismic
17 Category I tank. A secondary source is the reactor makeup
18 water tank. This can be manually tied into the system in the
19 event we reached a low level condition in the condensate
20 storage tank.

21 We have a continuous minimum flow line on each of the
22 pumps to prevent overheating so that you have recirculation in
23 the event these valves shut. The pumps operate continuously
24 while these valves are opening and shutting. When these valves
25 are shut, we have these miniflow lines with the locked open



1 valves going back to the condensate storage tank to prevent
2 the pumps from overheating.

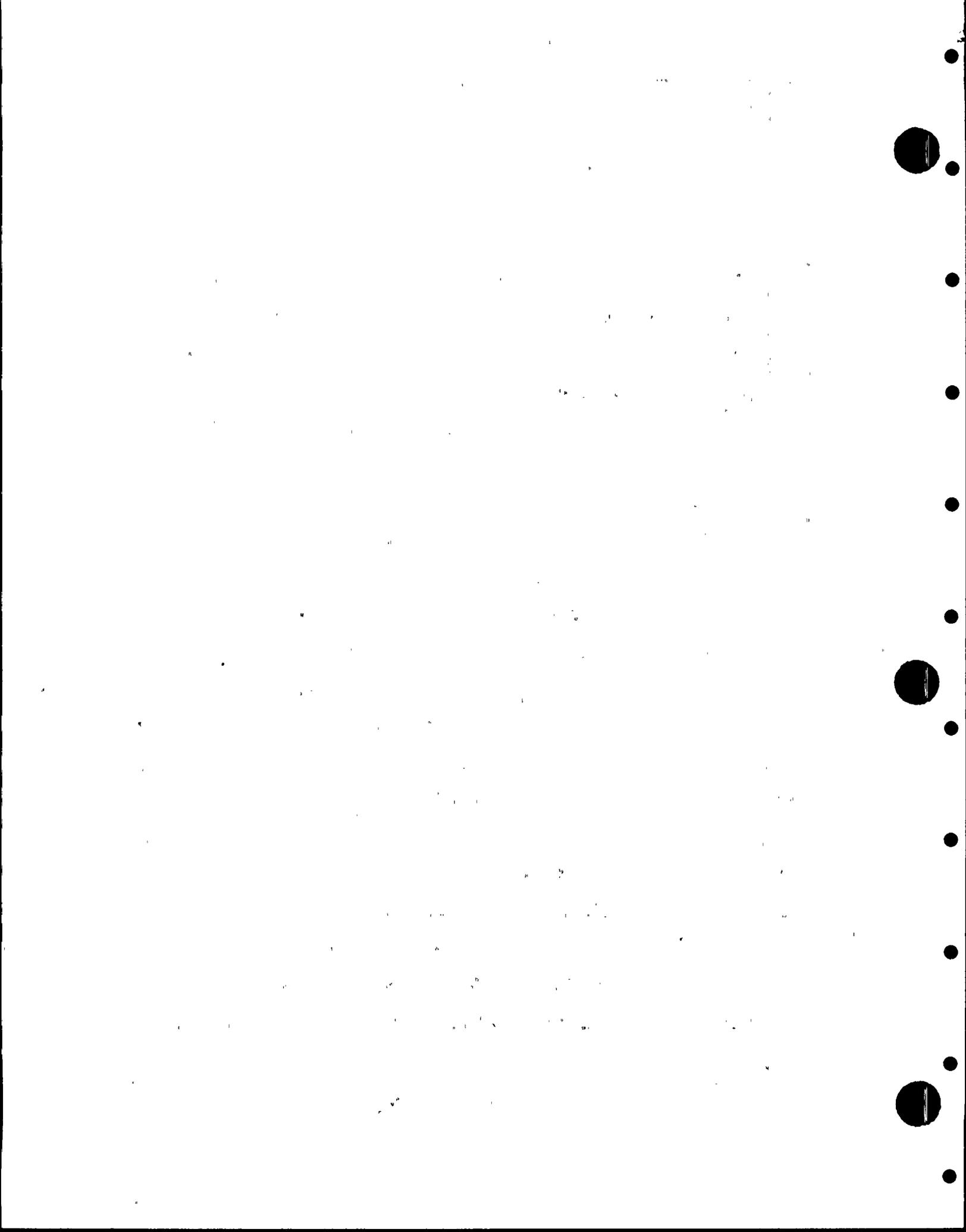
3 Exhibit 1A-9. Our system ties into the feedwater
4 system, and this auxiliary feedwater system in conjunction
5 with the main feedwater system is designed to prevent
6 waterhammer transients. These are interface requirements in
7 terms of routing of the piping and all that we meet to avoid
8 a waterhammer condition.

9 The next requirement is that the auxiliary feed-
10 water system have double isolation from the main feedwater
11 system during system operation, and that is the case with
12 these two isolation valves in the lines.

13 The auxiliary feedwater temperature as applied to
14 the condensate storage tank must be at least 40 degrees and
15 less than 180 degrees. In our climate here, that is no
16 problem and we meet that interface requirement.

17 The next requirement is that we have 300,000 gallons
18 available, and that is what is required to support the earlier
19 design criteria we mentioned of being capable of remaining at
20 hot standby for eight hours and then cooling down to the
21 initiation of shutdown cooling. The 300,000 gallons are shown
22 here (indicating) in the condensate storage tank.

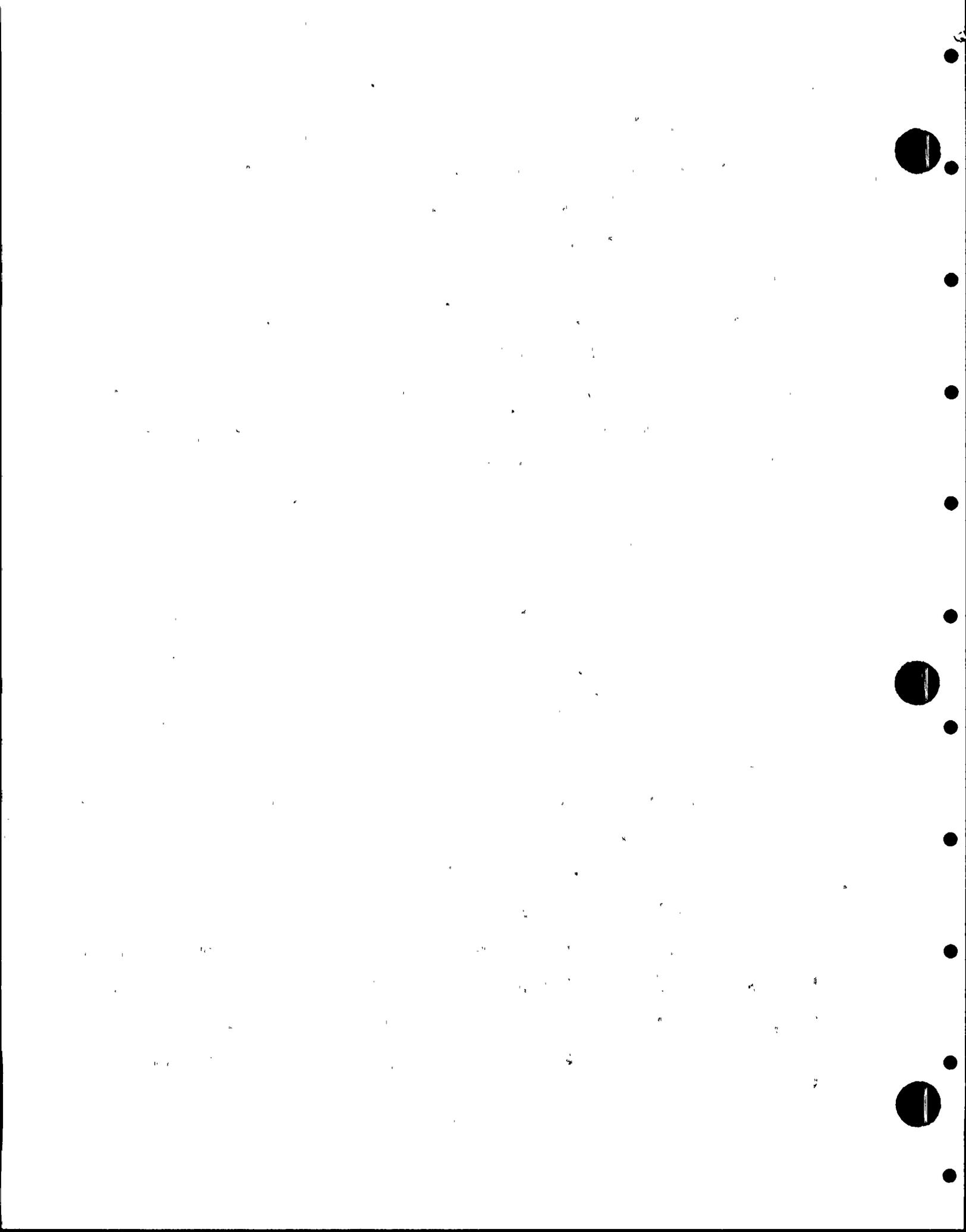
23 This is Exhibit 1A-10. The CESSAR interface
24 requirement is that if the emergency feedwater system is
25 used during startup condition, which is the condition we are



1 concerned about here, when steam generator pressure is very
2 low, it must have some means of assuring that were the pumps
3 to be operated in that condition that we would not damage
4 the pumps. Our emergency feedwater pumps are not used, as I
5 have stated earlier, during startup conditions when we have
6 that low pressure in the steam generator condition. It is
7 extremely unlikely during those conditions that it would be
8 possible to have an auxiliary feedwater actuation signal. If
9 one did, we do have the alarms which I mentioned earlier on
10 low pressure to alert the operator that we would have a
11 potential runout condition on those pumps.

12 The next interface requirement is that we have no
13 automatically actuated valves located upstream of the MSIV's
14 except as required to supply steam to the steam-driven
15 emergency feedwater pump, and also that we prevent blowdown
16 of both steam generators through those emergency feedwater
17 pump lines. There are no automatically actuated valves
18 upstream of the MSIV's. The logic on these valves is such
19 that only one of the them can be operated at a time, so these
20 valves do not open simultaneously.

21 Exhibit 1A-11. Let me now talk just briefly about
22 our quality class designations that we use on the Palo Verde
23 Project. We have three quality class designations, Q, R, and
24 S. Class Q applies to all our ASME Section III components,
25 all of our Seismic Category I equipment, all of our Class IE
equipment on the electrical side, and for all those Quality



1 Class Q items, the quality assurance program meets 10CFR 50,
2 Appendix B, and ANSI N45.2.

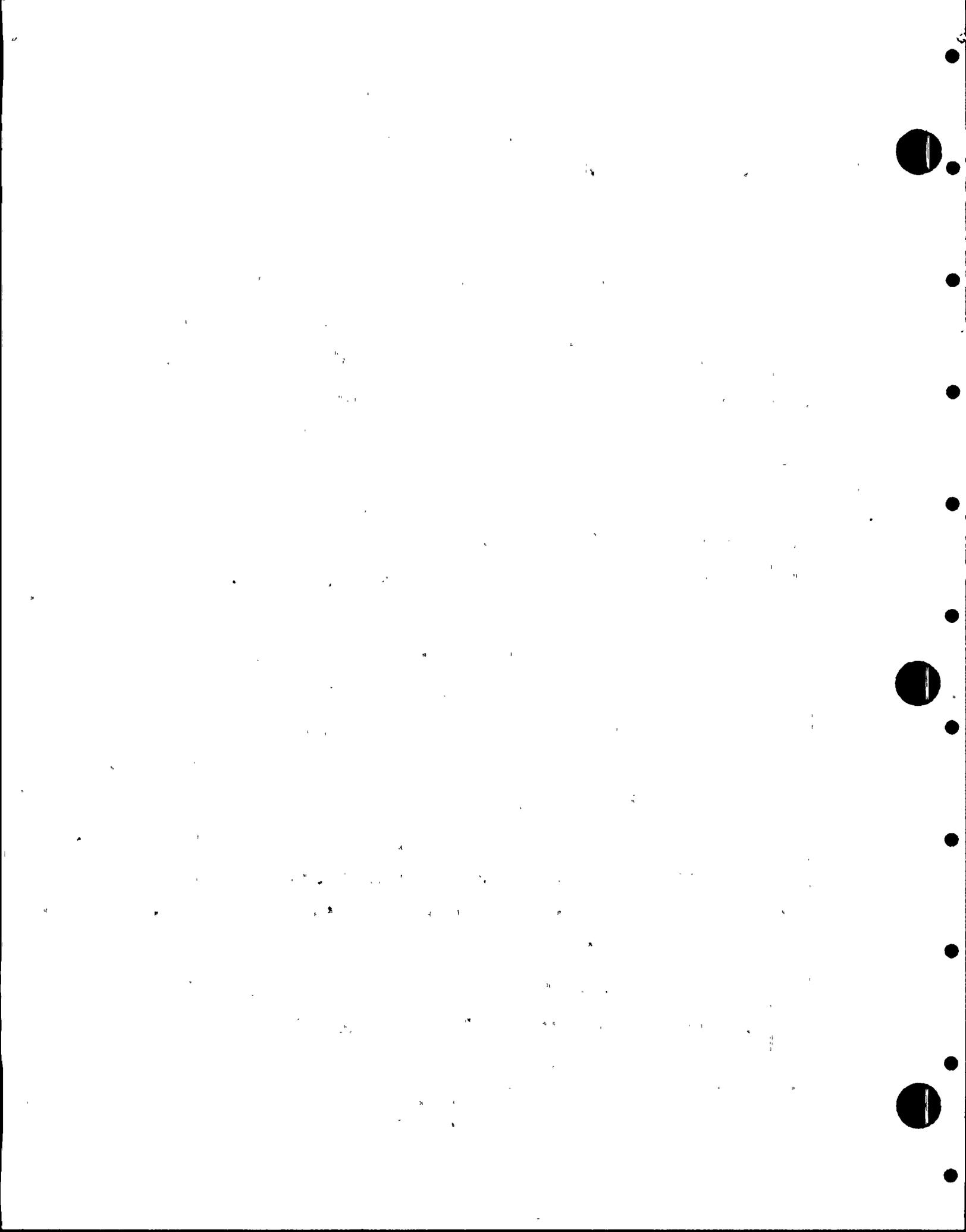
3 Our next quality class, Quality Class R, consists of
4 items which are important to keep the turbine generator on
5 line, keep the plant producing power, and also important to
6 safety of personnel. For Quality Class R items, depending
7 on the item, we invoke certain of the criteria of 10CFR 50,
8 Appendix B. We do have a formal quality assurance program,
9 but it doesn't meet all of the components of the 10CFR 50,
10 Appendix B.

11 Quality Class S applies to our other equipment,
12 and this is industry standard off-the-shelf items, so there
13 is no quality assurance program as such with our Quality
14 Class S program.

15 Exhibit 1A-12. In our seismic categories,
16 Seismic Category I, everything that is Quality Class Q is
17 Seismic Category I. Similarly, in Seismic Category I, as
18 you know, are things designed to remain functional during and
19 after a safe shutdown earthquake.

20 Seismic Category II applies to all the Quality Class
21 R items, so everything that is R is Class II and vice versa.
22 These components are designed to remain functional during and
23 after an OBE.

24 We also have another seismic category, Seismic
25 Category IX, and this applies to items which in the event of a



1 safe shutdown earthquake could become dislodged or collapse
2 or something and possibly damage some of our Quality Class Q
3 items, so these items are designed to remain intact or cannot
4 collapse following a safe shutdown earthquake.

5 Let me show just to relate our seismic categories
6 to the system and consequently the quality class, also. Our
7 startup feedwater train, as I said, was designed to remain
8 functional following an OBE, and it is designed to Quality
9 Class R and Seismic Category II. The startup feedwater
10 pump, as we will see shortly, is located inside the turbine
11 building and our turbine building is designed as Seismic
12 Categories II and IX. It will remain functional following an
13 OBE and it is checked that it doesn't collapse following an
14 SSE.

15 That concludes the design criteria portion.

16 MR. BINGHAM: Thanks, Dennis.

17 Are there any questions at this time?

18 MR. VAN BRUNT: Bill, could I suggest that to break the
19 question into two parts might be helpful. One, if you go back
20 to your initial remarks and the slides that you use there,
21 see if there are some general questions about the overall
22 development of the criteria and then get into the specifics
23 of the various items, it might be helpful.

24 MR. BINGHAM: Why don't we do it that way. It might
25 take care of a lot of redundant questions.

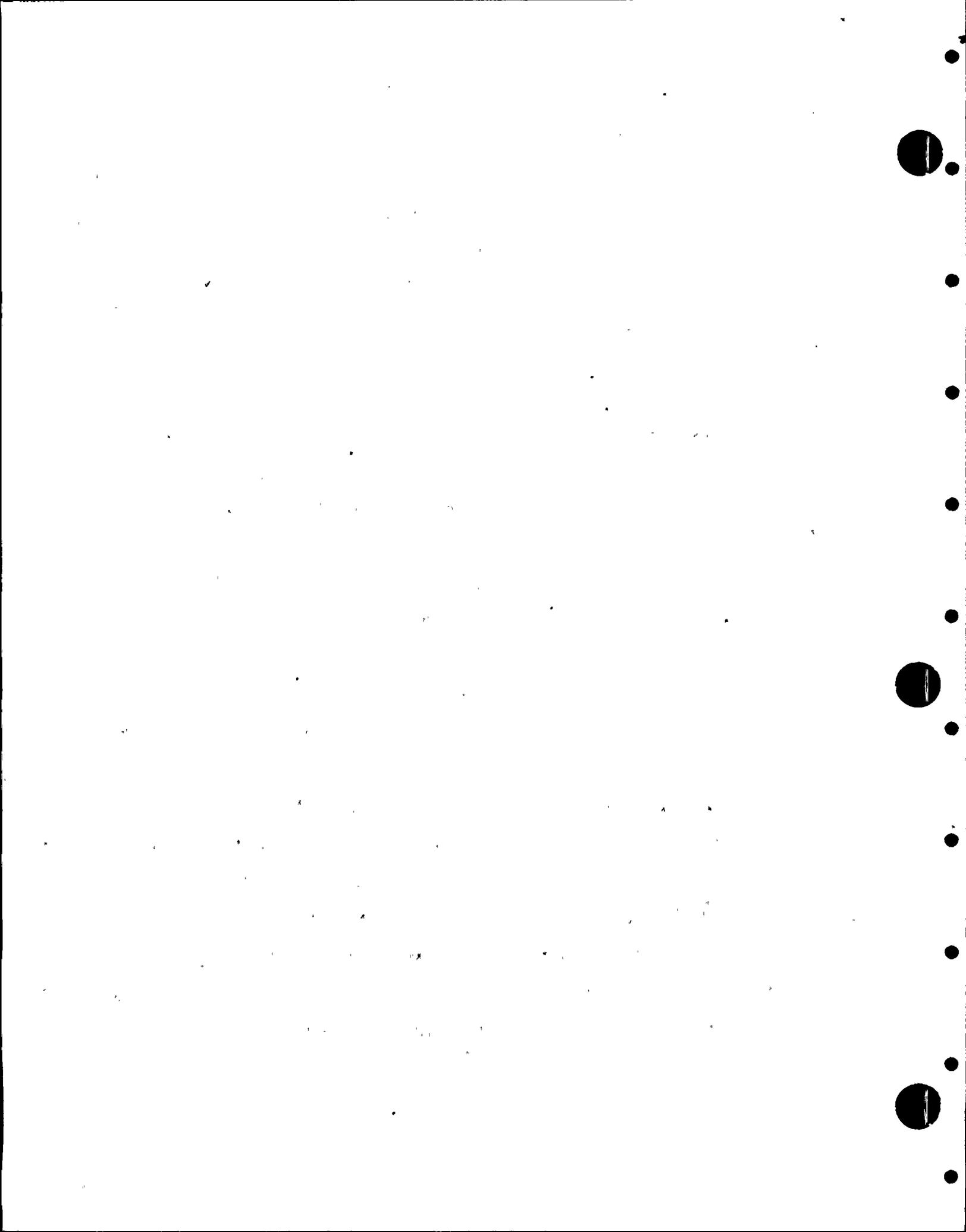
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1 Are there any questions on that?

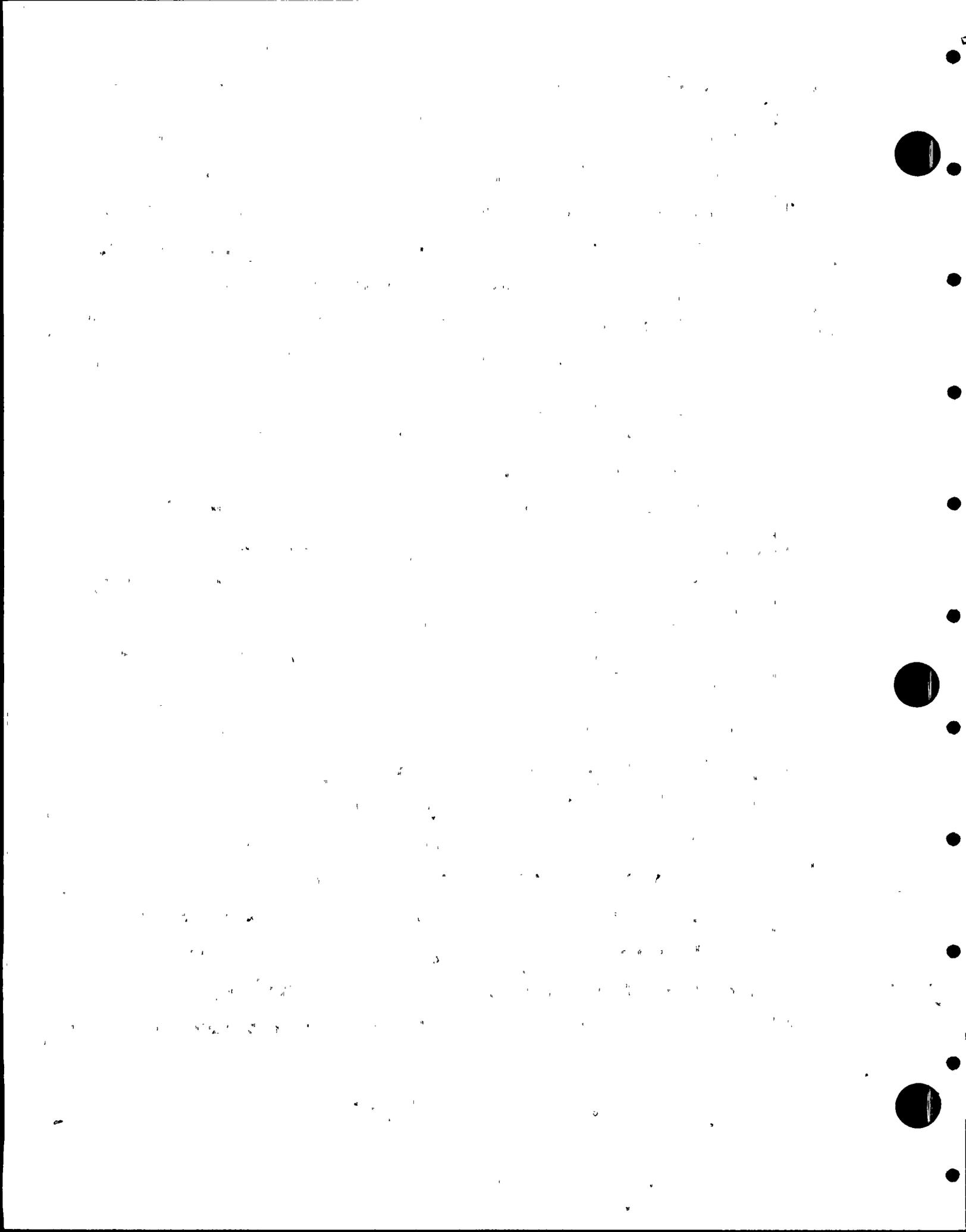
2 MR. ALLEN: I have one, Bill. On your initial slide
3 here, it is obvious that there is a lot of interdisciplinary
4 cooperation in the design of this. How do you ensure that,
5 for example, your instrumentation control people are involved
6 in design and know the problems that the mechanical people
7 are having, and the same with your electrical people?

8 MR. BINGHAM: In the early phases of development of
9 the design, John, I have conducted several review meetings
10 not unlike what we have here where I bring together the whole
11 team and we, for example, review the P&ID, which is basically
12 the diagram that describes the system. We have the preliminary
13 design criteria that we review. We hold a meeting where the
14 responsible engineer, an individual like Bill Boles, will get
15 up and present the particular system going through much of the
16 sort of things that you have heard us discuss in some of our
17 previous system reviews. At that meeting, there is a critique
18 by usually representatives from our chief's office to get the
19 overall perspective of input from many of our jobs and,
20 secondly, the project related inputs. So what we have then is
21 the mechanical engineer describing the system, indicating
22 his or her understanding of how the system is to perform and
23 what actuation signals are coming to it and their understand-
24 ing of the regulatory commitments in the PSAR. Generally
25 through these discussions, these open discussions, we find that



1 they are developing a better understanding of all the various
2 people that have input, such as electrical and controls
3 people, as well as the nuclear people, who particularly look
4 after the licensing commitments and the regulatory guidelines
5 that exist at that time. So what we do then is we call this
6 a multi-discipline review where we review the basic criteria
7 and how the design is being formulated. That is in the early
8 days.

9 Carrying that on a little bit further, we are very
10 concerned about the physical development of the particular
11 system; that is, have we properly looked at such things as
12 high energy line break, have we looked at separation of the
13 safety trains, have we assured ourselves that we don't have
14 a conduit or cable from one train crossing into the room of
15 another train and so forth. These reviews are conducted then
16 on drawings as well as on the model where we lay out the
17 system, and you will see some pictures of the model of this
18 particular system later on today, and from that we document
19 all of the information and pass it back through the groups
20 for final review of the information. I think that this gives
21 us a broader perspective then of how the total system is
22 integrated and constantly encourages the various disciplines
23 to make sure that they have given their inputs and they
24 understand the inputs and have reviewed the interfaces provided
25 by CESSAR with Combustion Engineering in this particular case.

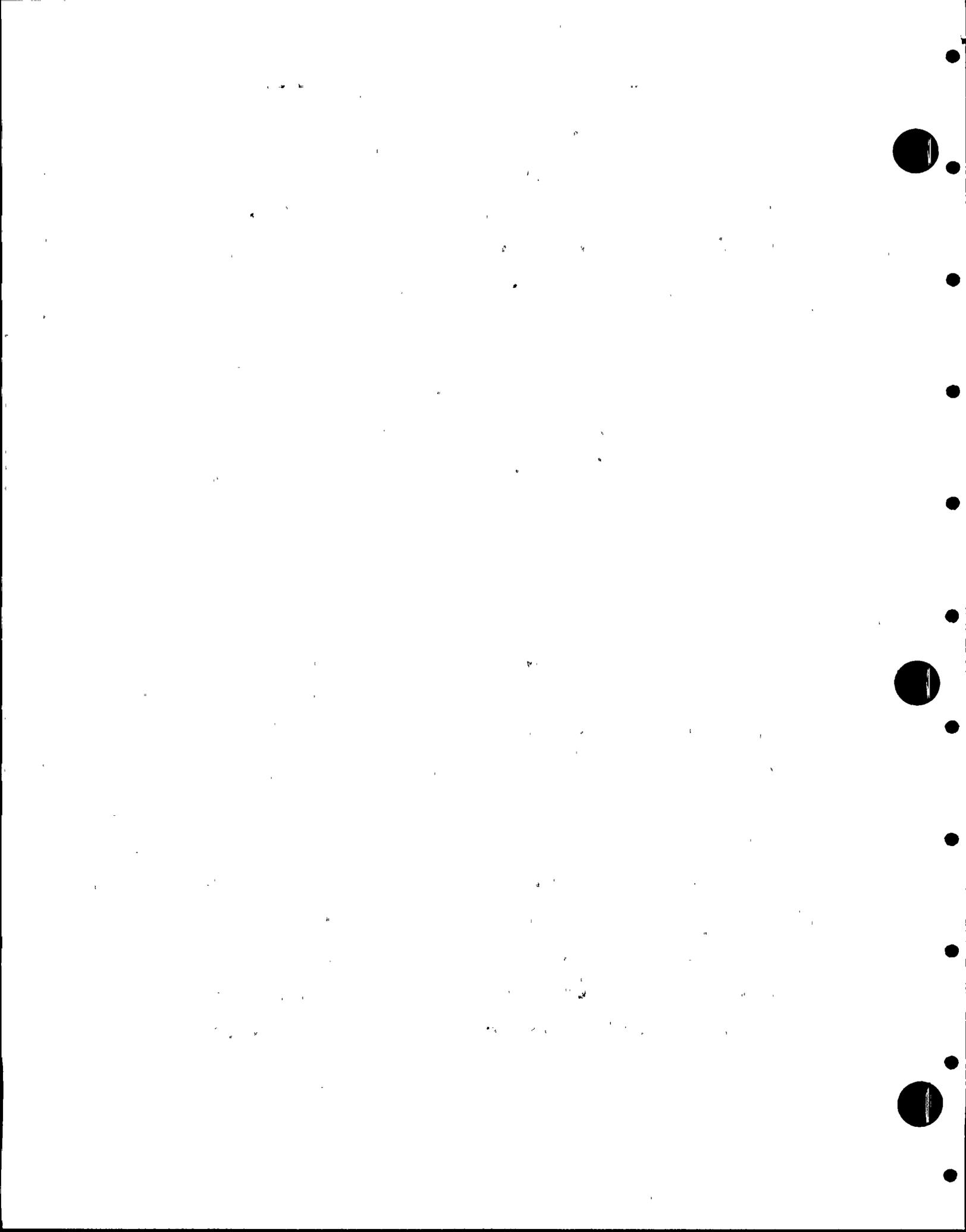


1 MR. ALLEN: Does that go back up then to the chief
2 engineer, as you said?

3 MR. BINGHAM: Yes, many times, and, of course,
4 depending on what system we are talking about, the operations
5 will end up in a chief's review of the system.

6 MR. FREID: Bill, one of the things we noticed in
7 previous reviews, and I have just noticed one on this one,
8 too, sometimes the information presented at these review
9 boards are updated versions of what are in the FSAR. Are those
10 going to be denoted at these review boards and how do we get
11 that back into the formal licensing document?

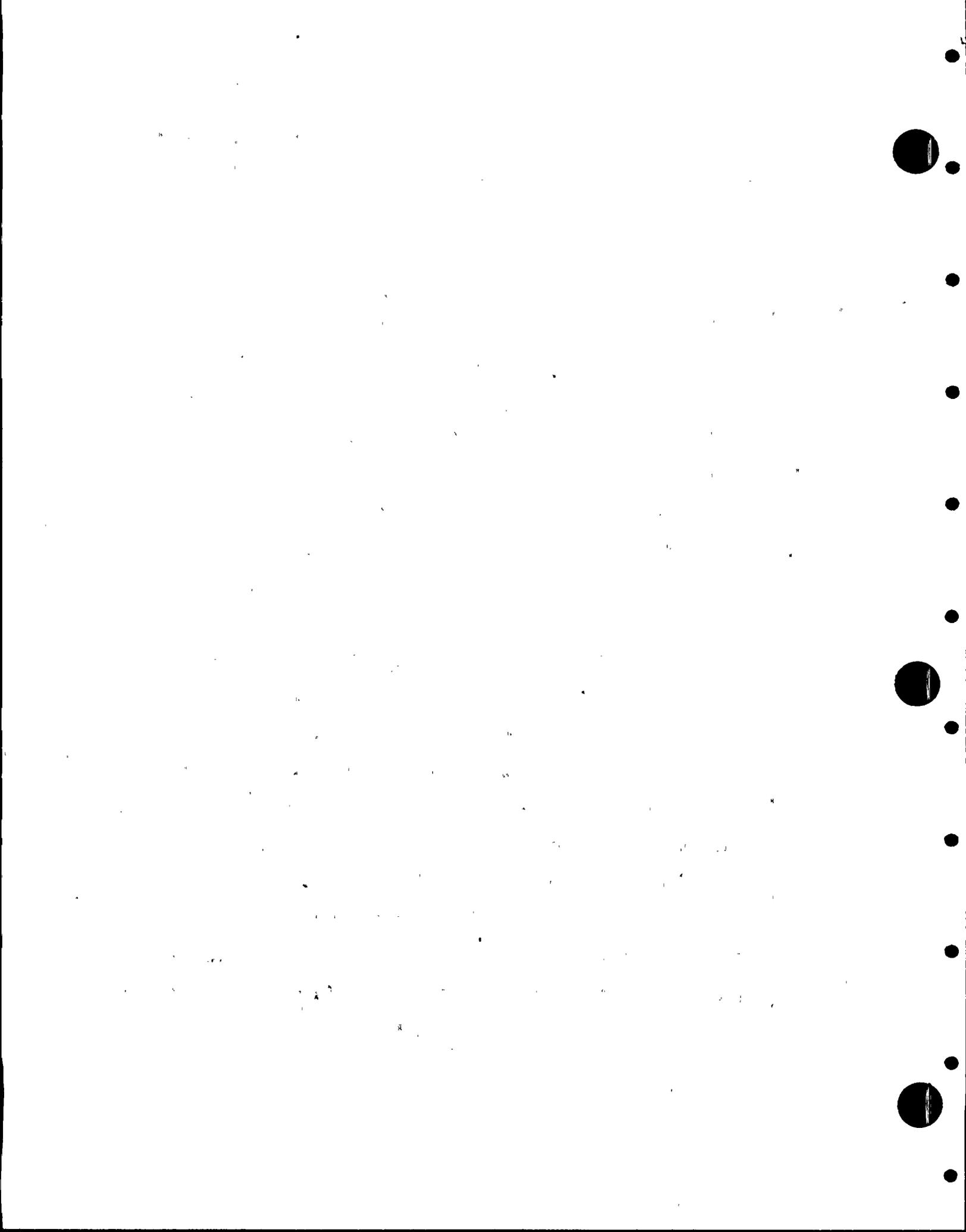
12 MR. BINGHAM: The answer to that question, of course,
13 is yes. I believe in my introductory remarks, Shelley, I
14 indicated that we would indicate to the board those areas where
15 there have been modifications as a result of our further work
16 from the FSAR commitments and description of the systems,
17 and then also as a result of the work we have been doing to
18 pull together the presentation for today both in the systems
19 overview and comparison with the SRP's and reg guides and
20 technical positions and the work that has resulted from our
21 reliability analysis of the particular system, which as you
22 probably know is new work that is being done by many of the
23 utilities throughout the industry. So to answer your specific
24 question, we meet with APS engineering, review these particular
25 issues, and from these meetings develop a course of action for



1 incorporation in an appropriate manner these items that we
2 have found in our recent studies. They then will be reflected
3 as a design criteria change and will be incorporated into the
4 design.

5 MR. VAN BRUNT: Bill, as you pick up an item here,
6 what is the formal process you go through to assure that that
7 item does in fact get factored back into the FSAR, which from
8 a regulation viewpoint is the document that will control the
9 future changes that are planned, the operation, and other
10 things?

11 MR. BINGHAM: We have a system, Ed, that when we
12 initiate a change to the criteria, one of the boxes on the
13 sheet indicates is an SAR change required. That is reviewed
14 by our Nuclear Group Supervisor to determine whether that has
15 been interpreted properly by a discipline. To take an example
16 Bill Boles determines that there is a particular feature, a
17 valve or something, that wasn't properly handled in the system
18 and that we really hadn't established criteria properly. He
19 will indicate what we call a design criteria change request
20 indicating the change and that will go to the Nuclear Group
21 Supervisor, Gerry Kopchinski in this case, for review, and
22 he'll say, "Yes, check off the box; that indeed is required."
23 The change then goes through the other appropriate cycles for
24 approval, is incorporated, and there is another system that
25 takes those and says from this information, then we must assure

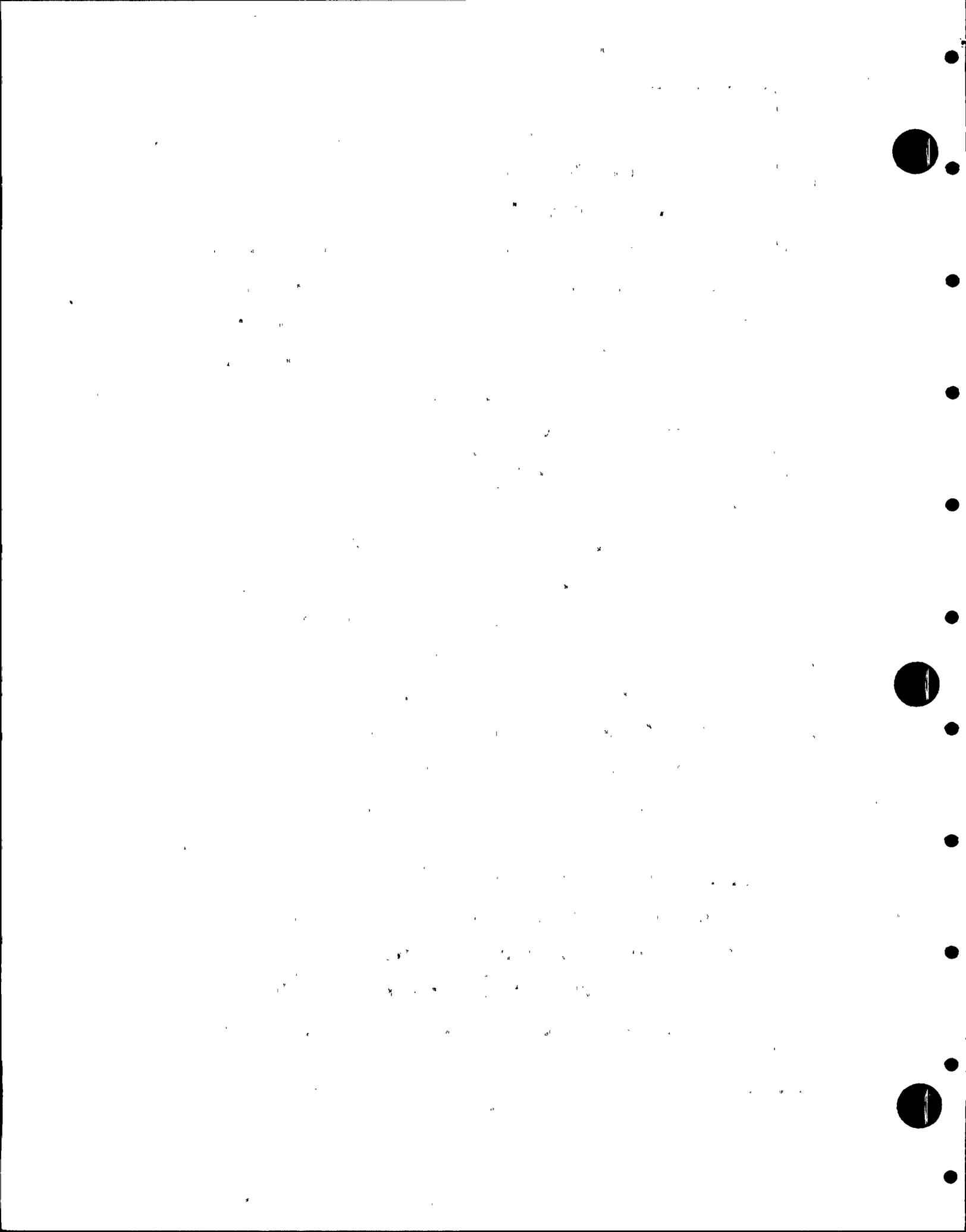


1 that this gets in the licensing document. That becomes
2 Gerry's responsibility. We have the other side of that that
3 occurs, and that is that if there is a licensing change that
4 is noted for some reason, there will be an SAR deviation form
5 which is written, and on that it will check whether the
6 design criteria has to be modified. It goes through the
7 proper line of approval including a sign-off by APS and then
8 it is the responsibility of the responsible engineer to put
9 it in the design criteria. So there are cross-checks to make
10 sure that any of these changes between the licensing documents
11 and the design criteria are matched and there is a closeout
12 on each of those.

13 MR. ROGERS: Bill, the importance of the design
14 criteria is evident. In order to get the design criteria
15 initiated properly, you get input from the utility, you get
16 input from major contractors such as Combustion Engineering.
17 I wonder if you would describe how you would receive that
18 input and what assurances are made and how the assurances are
19 made that Bechtel has understood the criteria input from
20 balance of plant interface requirements that Combustion might
21 have or utility requirements. How is that initially made and
22 how do you ensure that as time goes on those criteria are
23 implemented properly in the design?

24 MR. BINGHAM: That's a mouthful. Olan;

25 MR. PARR: Could I add just a little bit?

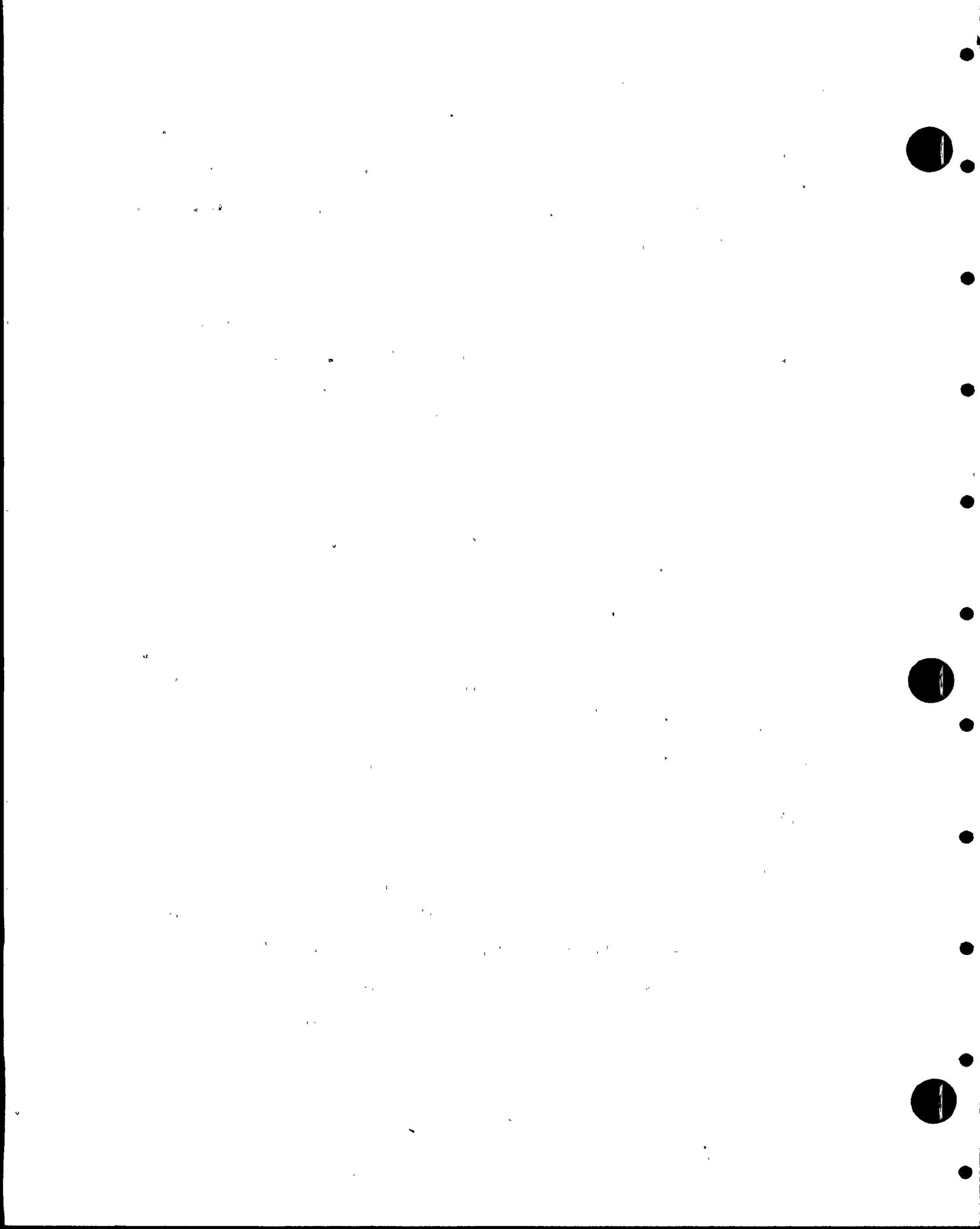


1 MR. BINGHAM: Yes, a little more.

2 MR. PARR: How does Combustion, as an example, review
3 how you have interpreted these criteria that you got from
4 Combustion, as an example?

5 MR. BINGHAM: Let me take the two separately. I'll
6 talk about the utility first and then I'll talk about the
7 utility and Bechtel and Combustion interface, because there
8 has been quite a bit of emphasis on the part of assuring this
9 interface works properly, particularly by Ed, throughout the
10 life of the project.

11 On the utility inputs, generally what we have is a
12 letter or result of discussions with the utility that says
13 these are our particular requirements. I am talking from the
14 beginning, the inception of the particular job. For example,
15 they may say, "I want a system that has 100% reliability,"
16 or "I want a system that --" excuse me, 90% reliability, or
17 availability -- I am sure you would like 100%, but it is not
18 quite achievable -- or they may have some particular require-
19 ments for the layout of the plant, and that information will
20 come to us. We will apply it to the design and then we will
21 send it back to the customer in the form of preliminary
22 drawings for their review. That is followed up by subsequent
23 meetings and presentations. I would guess that over the life
24 of this project that we have probably had over 100 presenta-
25 tions by Bechtel on how we interpret and have included the

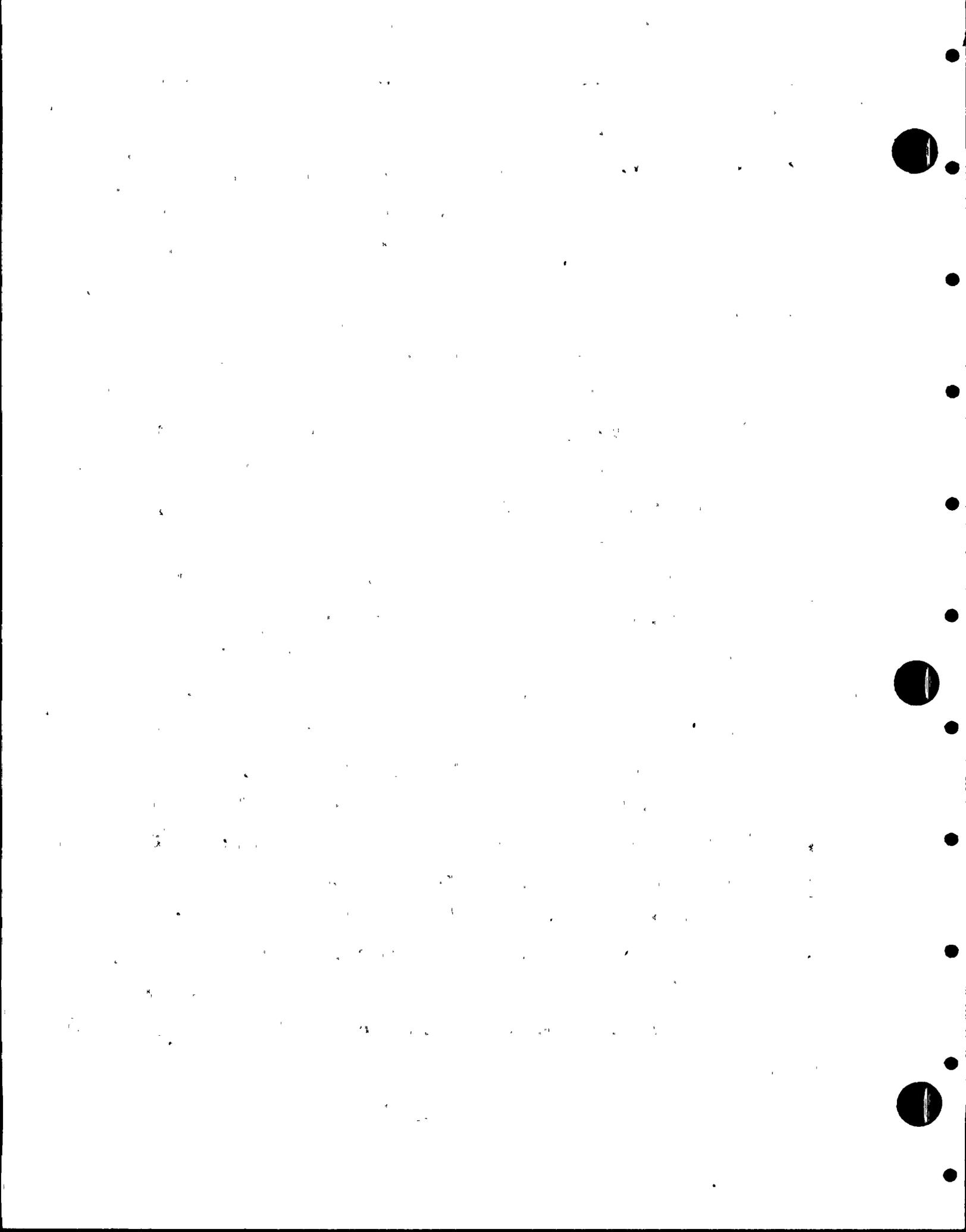


1 criteria set by the utility into the design of the plant.
2 They then have the opportunity to review that, to offer
3 comments and suggestions, and the result is then that the
4 design that we submit to the utility has had their review,
5 and for key documents such as general arrangements, P&ID's,
6 single lines, design criteria, system description, the customer
7 reviews those and assures themselves that the documents are
8 in order.

9 MR. VAN BRUNT: Bill, just to carry that further before
10 you go into the others, are those reviews documented and the
11 resolutions of any differences of opinion, and so forth like
12 that, documented as well, and how?

13 MR. BINGHAM: Generally, there usually aren't
14 differences of opinion when we get all done with the review.
15 I mean that is the objective. I think over the project that
16 there may have been one or two cases that I can remember, and
17 in that particular case, there are special letters that have
18 been written to document the particular disagreement.

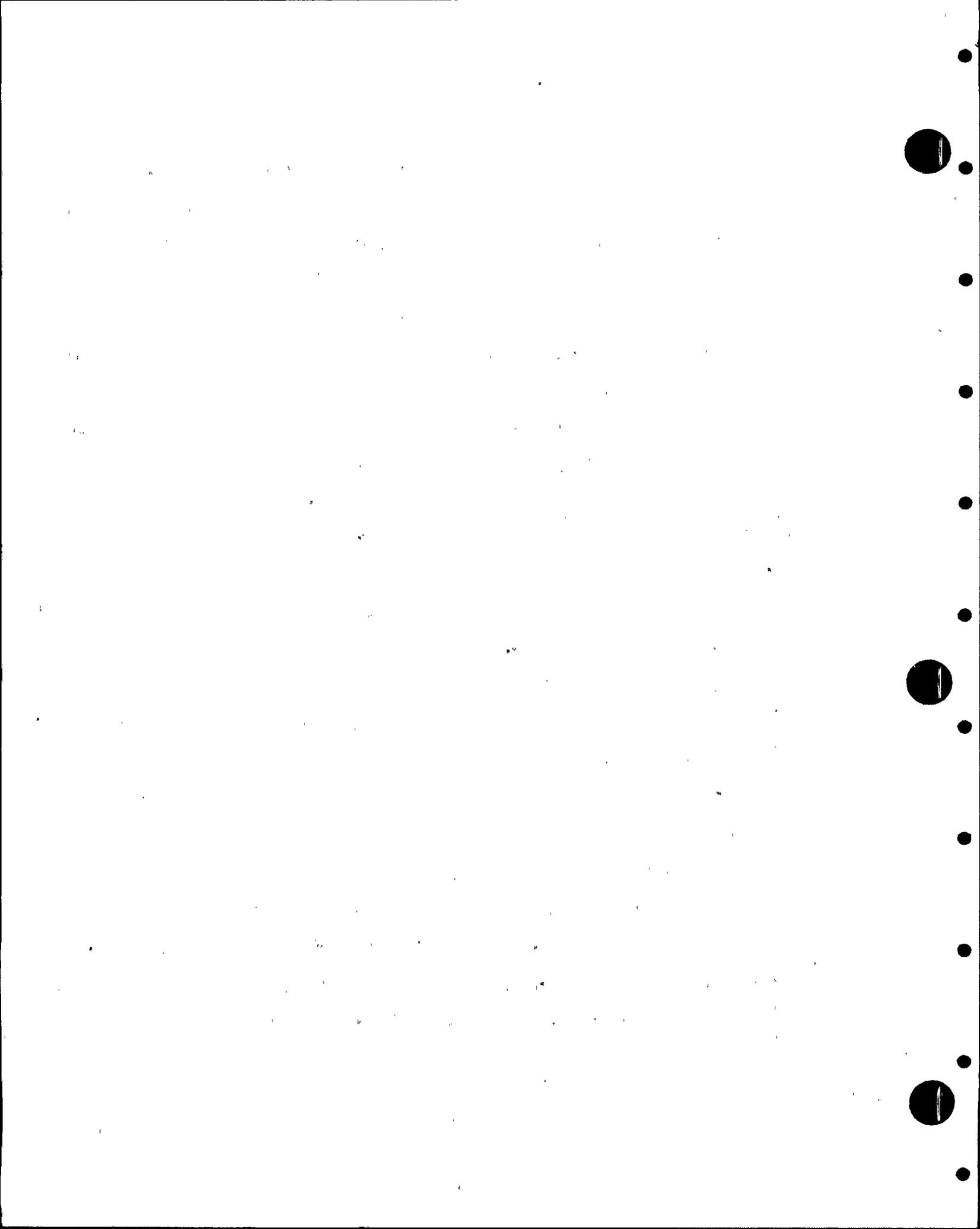
19 MR. VAN BRUNT: What I was really thinking about is you
20 have had these 100 or more meetings, I would expect it is more
21 than 100, wherein a particular system, take the aux feedwater
22 system for example, is reviewed in some detail. Are the
23 results of those meetings and any open items that come up
24 documented in some form and then is there some mechanism to
25 ensure that whatever the area of concern is is in fact finally



1 resolved and put to bed?

2 MR. BINGHAM: Yes, there is. We write minutes of
3 each of our meetings not just with the utility, but generally
4 with every vendor or with regulatory agencies that we are
5 involved in. At those meetings, we will discuss the outcome
6 of the particular subject and with it is an action item that
7 has a date for responding. We flag the responsible party and
8 then we have a system to track in very great detail the
9 results of those outcomes. We have a system that closes out
10 each of these items. It is tracked. It is all computerized
11 and there is a small roomful of printouts that if one really
12 wanted to, they could track these things from the inception
13 through the completion of the particular review.

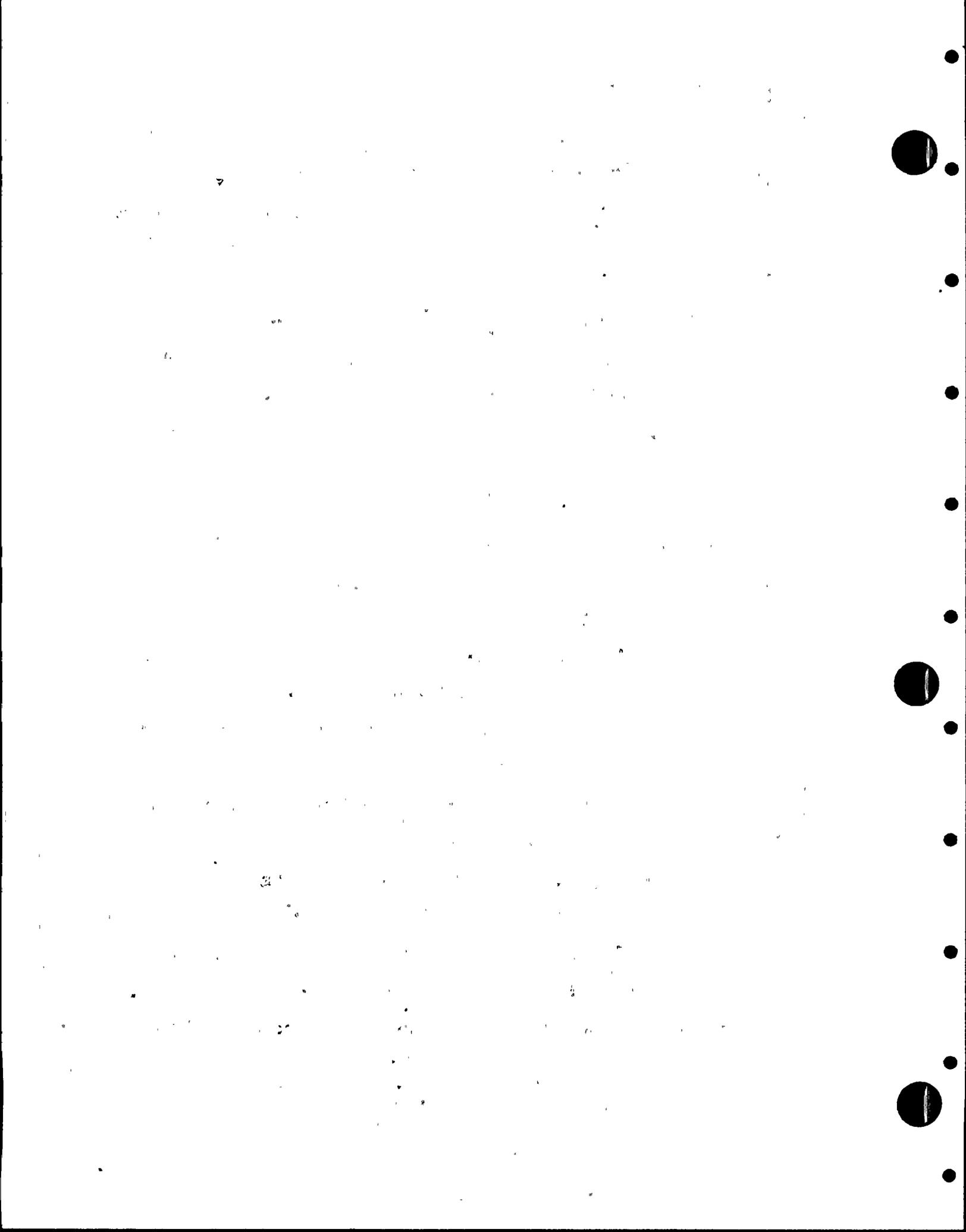
14 Let's get on to the vendor. In particular, I think,
15 Carter, you asked about Combustion Engineering in this case,
16 although many of the comments I would give pertain to other
17 vendors as well. With Combustion Engineering, through the
18 standard System 80 documents, we received early on a volume
19 called their standard or SEP, Standard Engineering Package,
20 and that gave the basic criteria for the particular inter-
21 faces that we had to provide. Subsequently, through the
22 CESSAR-P, interfaces were established that we used, and, of
23 course, as most of you know, CESSAR-P now has the final
24 interfaces that Bechtel is using for design. These interfaces
25 are taken by us and incorporated into the design. We have



1 then set up a system that is computerized whereas all of
2 the information that affects CE, that is, all of the drawings,
3 all of the key documents, are flagged in our document control
4 system and those are sent to Combustion Engineering for
5 review. They review them and reply back formally to us any
6 comments that they may have. This is a system that APS has
7 implemented contractually. It is a system that works
8 extremely well and I think generally we have had very good
9 success with making sure that Combustion Engineering and
10 Bechtel truly understand the intent of the interface require-
11 ments. There is also a utility involvement, kind of an
12 overview of what the two organizations are doing, to make sure
13 that conflicts are readily resolved and that the project
14 moves on smoothly.

15 MR. VAN BRUNT: Bill, I might ask again in that
16 context what is the documentation of this interface review
17 and has that been subject to audit from time to time by either
18 your organization or mine or CE's?

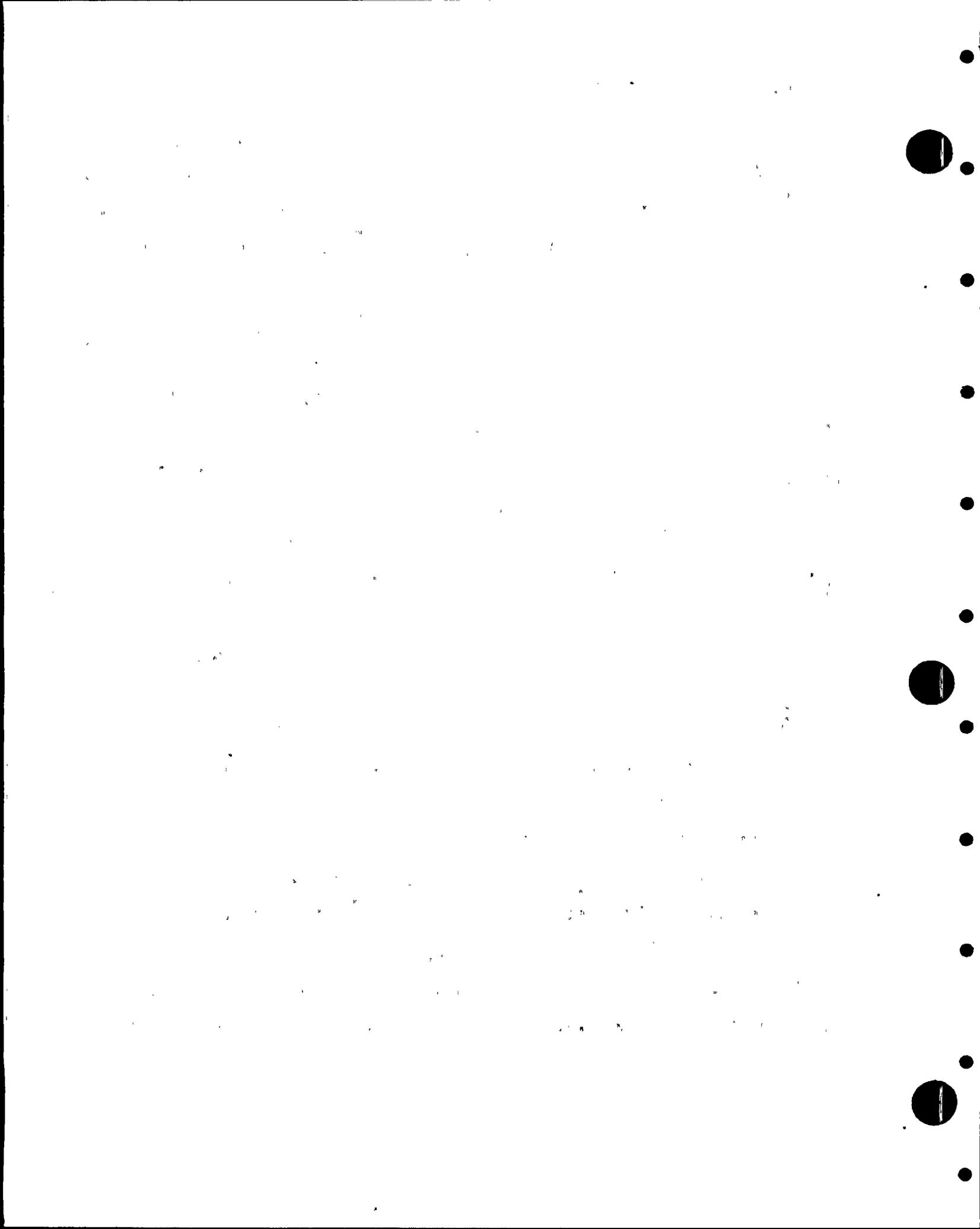
19 MR. BINGHAM: The documentation is in the form of
20 letters. There is a transmittal letter that goes to
21 Combustion Engineering and on the bottom of the letter is a
22 place for them to sign when it is received. We assure that
23 those are closed out through the system that we have in our
24 document control. In other words, the drawings come in and
25 are issued. In our document control procedures, it has a flag



1 to tell whether it goes to Combustion, the letters go out to
2 Combustion with proper signoff by our people, and the return
3 then is monitored to assure that it has come back. I am not
4 sure whether APS has audited that particular issue, Ed, but
5 I do know that we have from time to time looked at the
6 process.

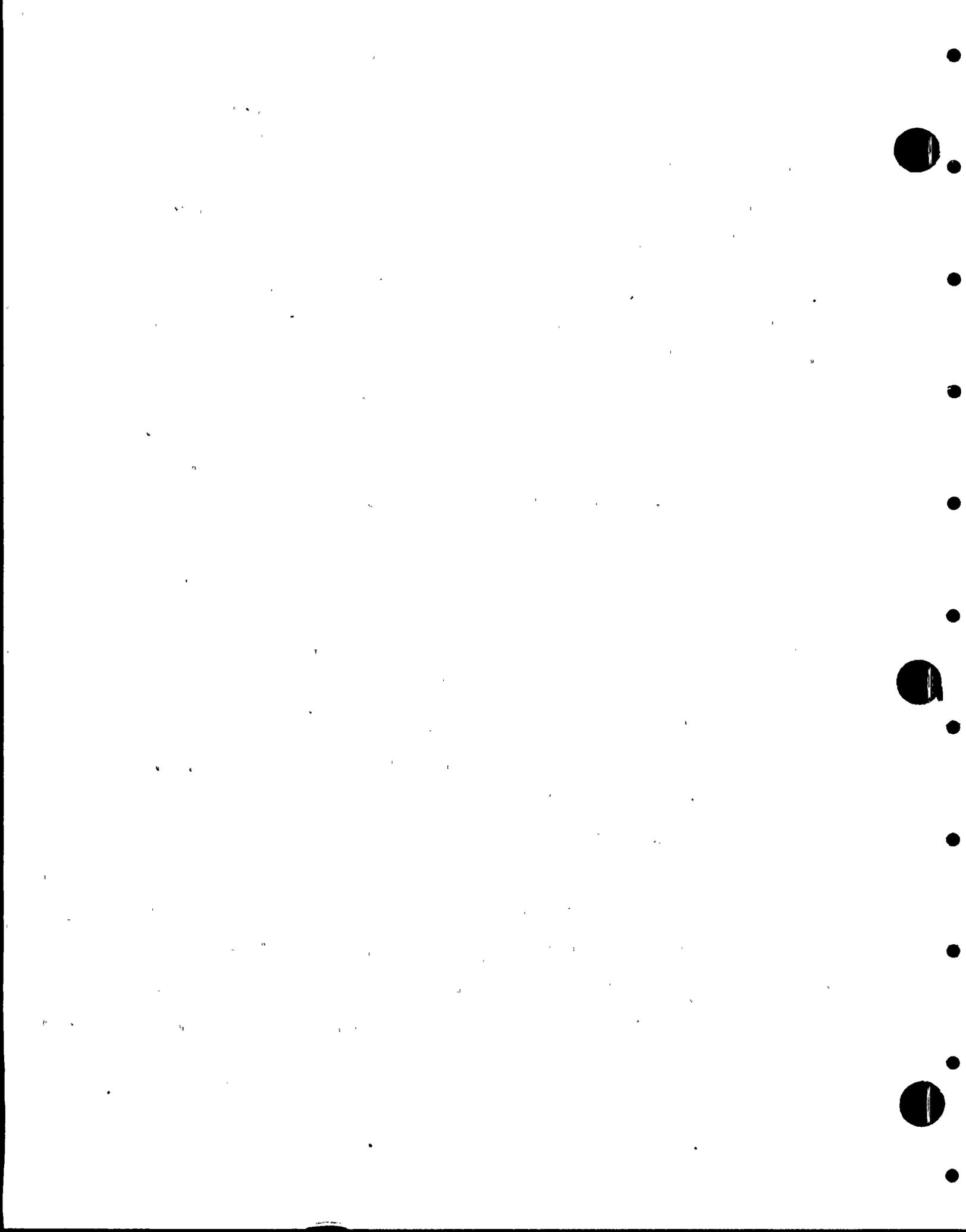
7 MR. ROGERS: Bill, you have mentioned meetings and
8 correspondence. Can you give us an example of the types of
9 meetings that you had, both formal and informal, and can you
10 tell us if Combustion comes into your shop often to visit
11 and help you with the design or that type of thing.

12 MR. BINGHAM: Sure. Depending upon where we are in
13 the project, it has been our policy to set standard or routine
14 reviews with the utility. That generally is every month, and
15 I think without fail we have met about once a month since the
16 inception of the project formally in what we call the design
17 review meeting. We have also extended that concept to the
18 particular vendors and generally, depending upon the involve-
19 ment, we will meet with that vendor either once a month,
20 quarterly, or at least twice a year during the formative
21 phases in the development of the basic criteria. With
22 Combustion Engineering, because of the intensive interfaces,
23 of course because of the licensing requirements, we were
24 probably meeting with them on the order of every two to three
25 months. We now from the engineering side meet with them



1 perhaps every four or five months. Those reviews were
2 documented. Review meetings with preestablished agendas
3 included the utility as well as Bechtel essentially reviewing
4 all of the information presented to make sure that it was
5 incorporated properly in the documents and, further, many
6 times to expedite information from the vendors, CE in this
7 case, to meet our particular schedules for release of drawings.

8 In addition to that, because of the fact that
9 System 80 was new to Bechtel, we did have the resident
10 Combustion Engineering engineer in our offices for about three
11 years. In the first year and one-half, we had an individual
12 that was oriented toward mechanical and systems design so
13 that the information when it came in in those areas at that
14 time, Carter, would be reviewed by the individual, he would
15 take the time out on the floor to explain how to interpret
16 it to the individuals doing the drawings, and, in addition,
17 would help to obtain information that was required to make
18 the design go on. The latter part of that work was with an
19 individual with a background in instrumentation controls and
20 electrical areas and, as we moved through the project, then
21 we were more focusing on the ICE area from Combustion
22 Engineering and the individual there would then take the time
23 to explain to the designers the logic, the interfaces, and
24 obtain information that was necessary. We really had the
25 meetings, of course, at the same time going on in order to make

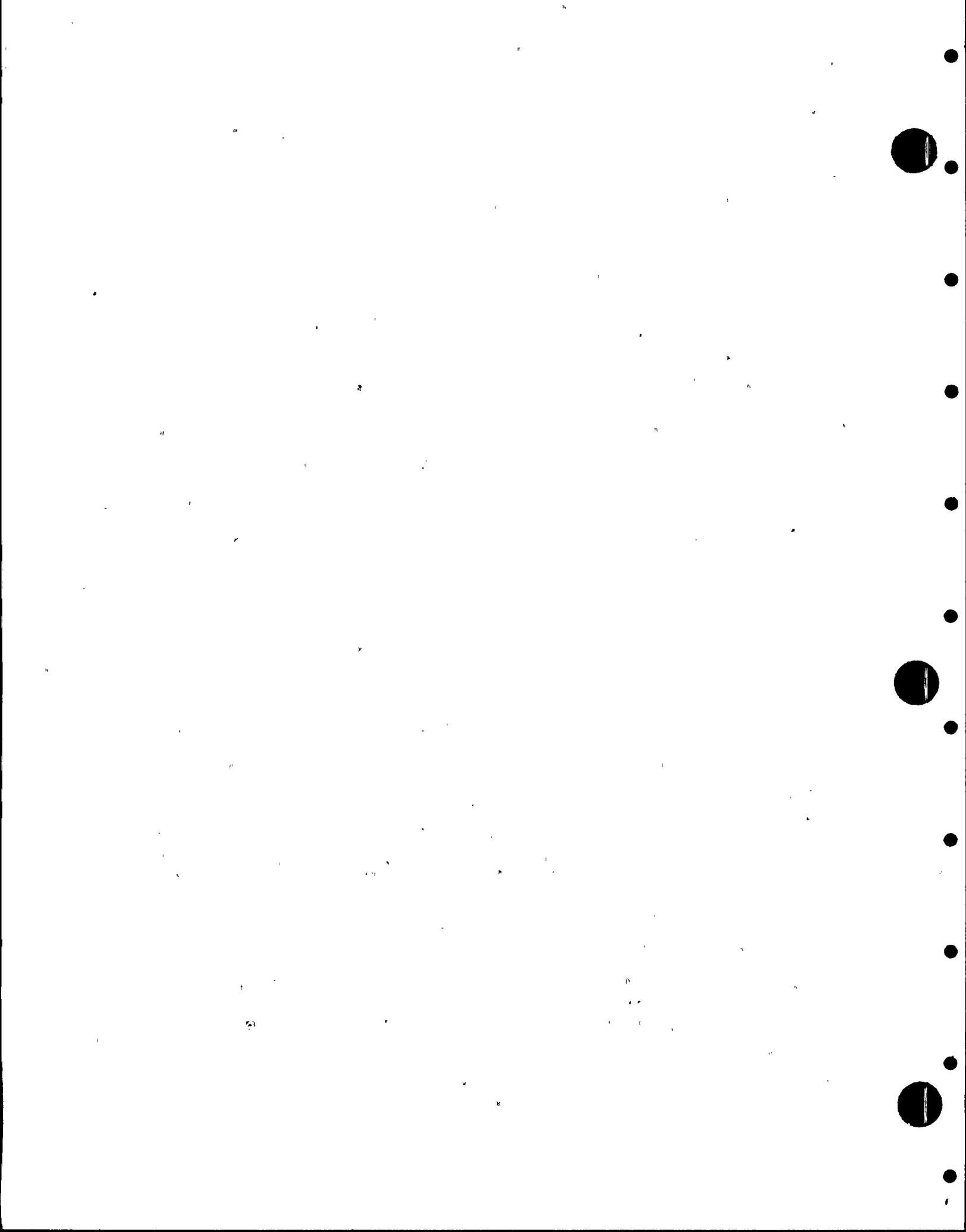


1 sure that we have an overall understanding, but we also had a
2 system to work with the individuals at the working level to
3 make sure that the information was interpreted and incorporated
4 properly.

5 MR. ROGERS: Bill, are the design review meetings with
6 Combustion Engineering still continuing and are there other
7 types of meetings that are being conducted to tackle such
8 things as construction problems and these types of items.

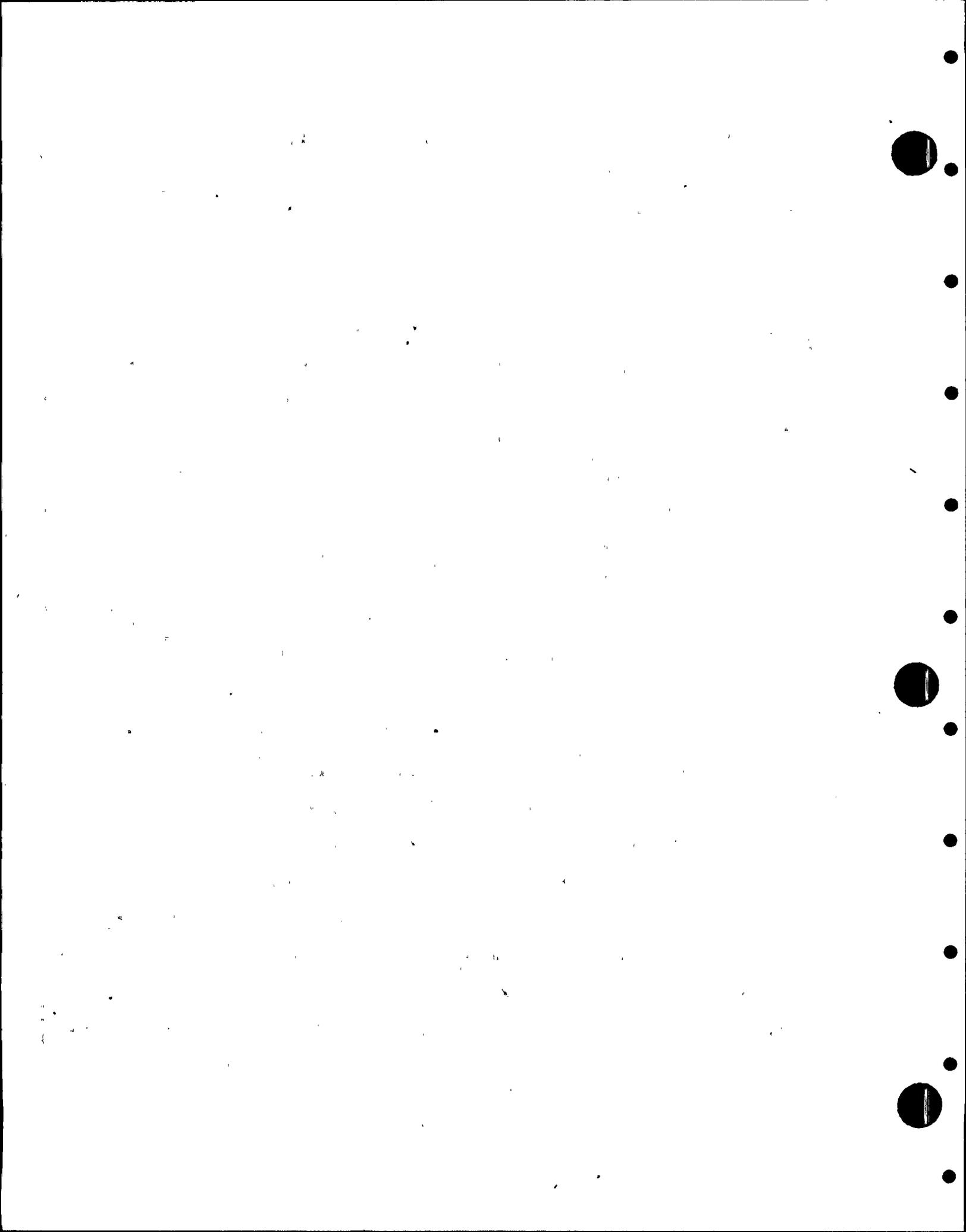
9 MR. BINGHAM: Yes, there are. We still have a lot of
10 loose ends to clean up with Combustion Engineering as well as
11 the new issues that have resulted from the TMI, so I would say
12 that generally about every four months we have been getting
13 together with Combustion Engineering back in Windsor,
14 Connecticut. With regard to the construction, there is a
15 resident engineer at the site, I guess supplemented now by
16 other individuals, and we conduct a Combustion-Bechtel
17 interface in the field about every six weeks. There are
18 some interrelationships between engineering and construction
19 that go on in those meetings that are necessary, and we use
20 that forum as well to assure that all the established
21 criteria have been implemented properly and all the interfaces
22 that occur and that affect engineering are quickly resolved
23 so that construction can continue.

24 MR. ROGERS: Let's assume that the Combustion
25 Engineering person discovers something in the field that



1 appears to be incorrect and it appears that a change must be
2 made in Bechtel's design in order to meet his idea or his
3 interpretation of the interface criteria: How would a change
4 of that type be handled from field back to engineering and
5 back to appropriate resolution, correction, and signoff?

6 MR. BINGHAM: Generally what happens is the NSSS supplier,
7 Combustion, would issue an internal document called the
8 FAR and that is signed by the project manager at Combustion
9 Engineering. The project manager will write us a letter
10 through their procedures informing both Bechtel and APS of
11 the change that is required. That change comes in through
12 our formal system. It automatically gets an action assigned
13 to it and a due date. Depending upon what the issue might be,
14 a particular discipline would take that and, if it would be
15 something that affects design criteria, they would review it,
16 review it with the other disciplines and their supervisors,
17 and initiate a design criteria change request if it was for
18 the design criteria or they would issue a drawing change
19 notice if it was something that affected a particular drawing.
20 Then through that avenue, it would go to the field, be
21 recognized as a later addition, and would be incorporated into
22 the construction. I might indicate that, being far along in
23 construction, as Palo Verde is, particularly Unit 1, it may be
24 something that already is built. In that particular case,
25 Combustion or some other vendor or Bechtel would provide the

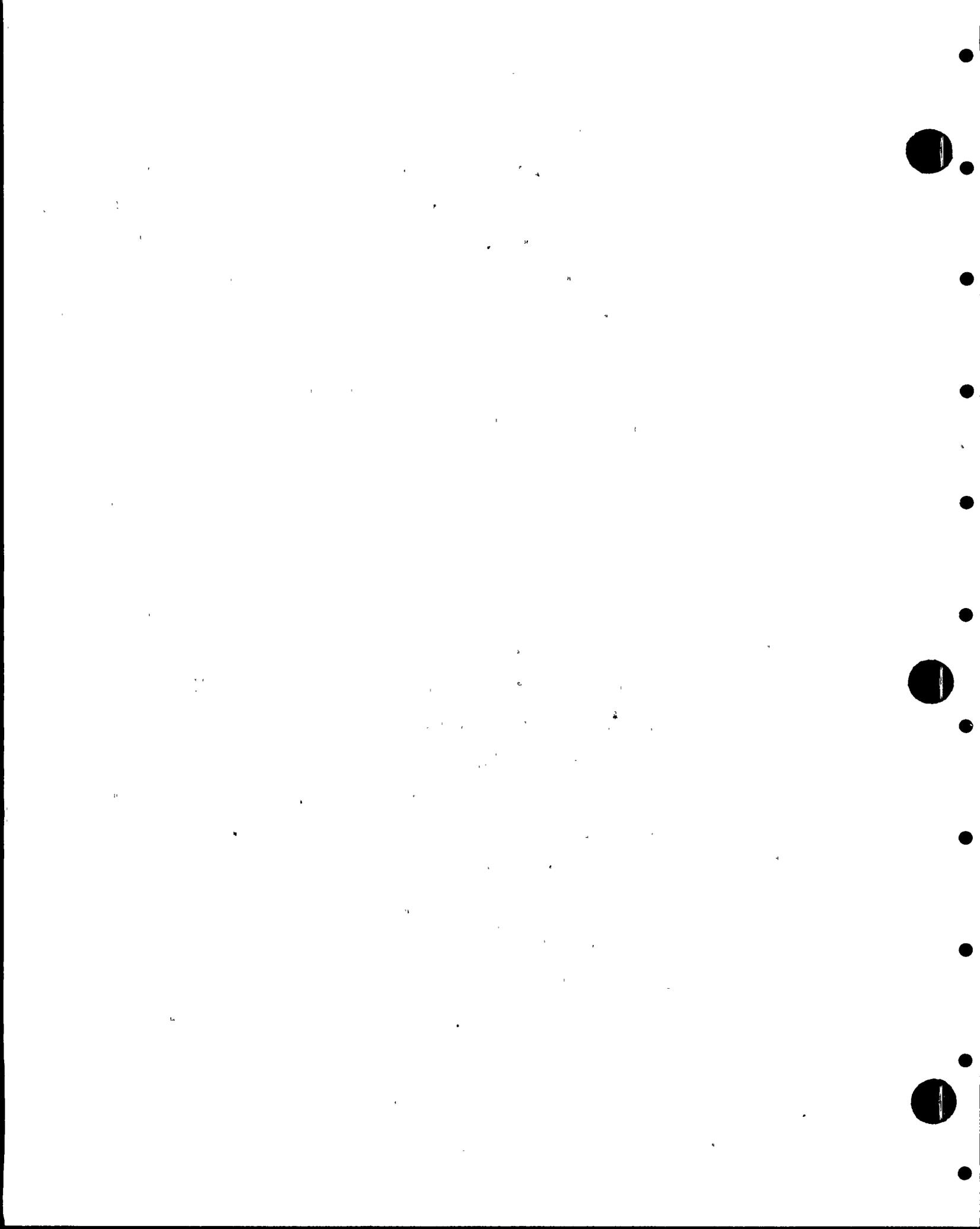


1 details for making the change with a document called the
2 Design Change Package. That goes to the field, is incorporated,
3 signed off, and comes back to the engineer to assure that it
4 has been properly installed. Of course, you have a QC that
5 checks it out, also. So that is kind of the overall general
6 flow. In many cases, they are handled just a little bit
7 different, but there are procedures to handle those.

8 MR. VAN BRUNT: Are there some other questions? I
9 have a couple others in that area, but I don't want to
10 monopolize.

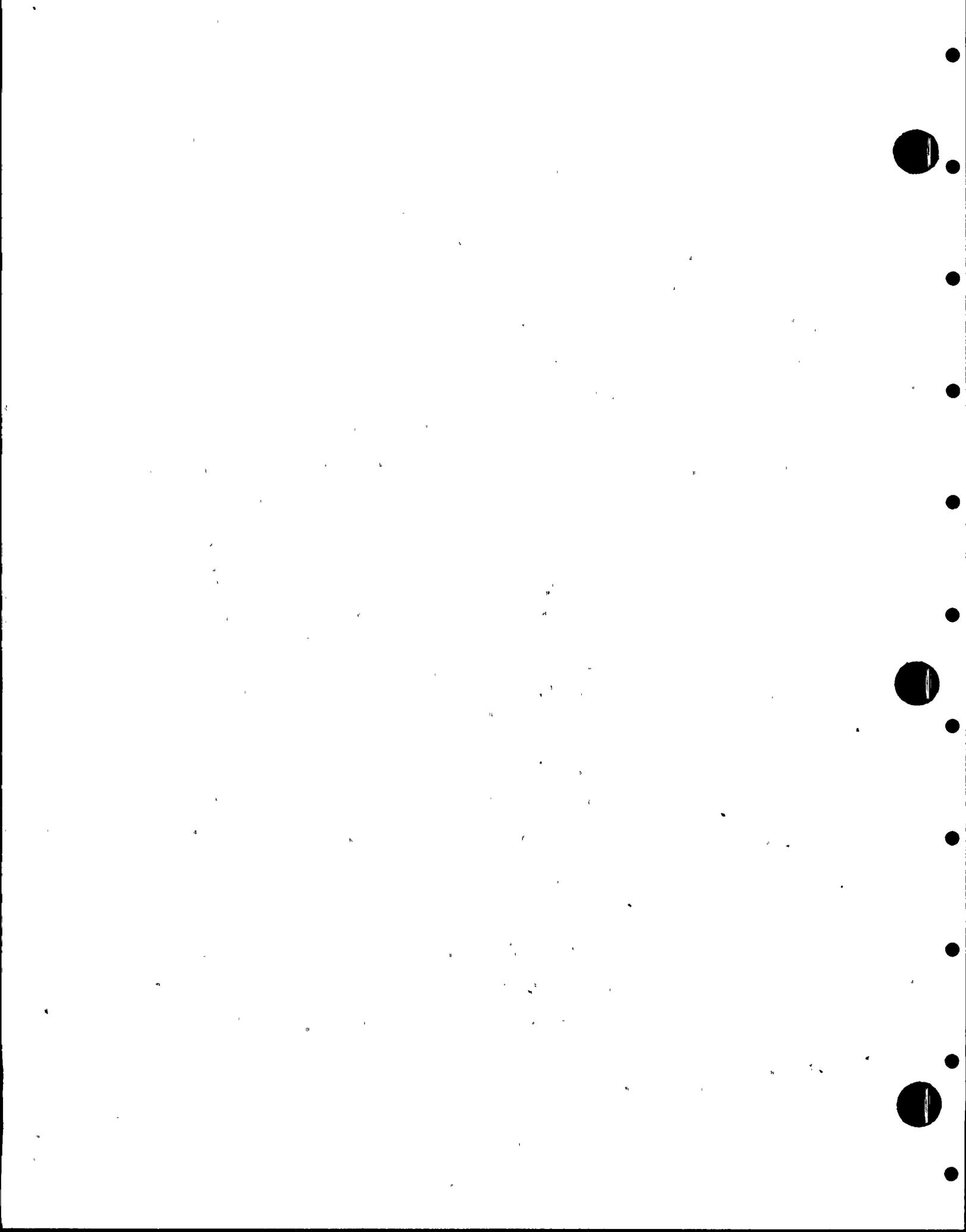
11 MR. PARR: I have about four questions, but only one
12 of these applies to this particular figure that is on the
13 board at the moment. At the construction permit review, of
14 course, at that time, it became very proper to talk about
15 interfaces, and you have touched on them here today. There
16 are many types of interfaces, those between the NSSS and
17 BOP, those between the utility and how he is going to do this,
18 that, and the other thing. Are you as the AE controlling all
19 of these interfaces or does the applicant control some of
20 them? A second part of that question is, Keith has touched
21 on the fact that Combustion has many interfaces and had some
22 in his slides, have you found that Combustion did a good job
23 establishing interfaces or have you had to go back to them
24 and have them modified.

25 MR. BINGHAM: Let me take the first one. We do for



1 the utility as their agent control all of the interfaces.
2 In other words, there is one place where all the interfaces
3 are controlled. It may be that there are particular inputs,
4 and so forth, that come from the utility, but they do look to
5 us to aid them in this particular area.

6 The second point is that we have had many, many
7 meetings with Combustion Engineering on interfaces, and
8 because System 80 is a new system, not the fact that it is
9 much different, say, than a San Onofre plant, but it does
10 have some new features, and the fact that we must become
11 acquainted with it, and Bechtel has been extremely involved
12 in nuclear power with many, many plants for the last few
13 years, we found areas where we have thought that the interface
14 as given to us by the vendor perhaps was not practical to
15 incorporate in the design and we have asked in many cases
16 that they reconsider and assure themselves that these inter-
17 faces are proper. I think to put it in perspective, Olan,
18 what I am saying is that in CESSAR P, there may have been an
19 overreaction from the NSSS supplier to provide or have the
20 balance of plant AE provide capabilities that really pushed
21 the problem away from the NSSS. So we said well, that's nice,
22 but there has to be a compromise for these two,
23 not in any event talking necessarily about safety, because
24 the safety issue was always fairly clear. What we were
25 talking about was how do you implement it? Where do you



1 establish it? What does the NSSS really do with regard to
2 this scope? What does the balance of plant architect-
3 engineer do with regard to their scope, and, depending on the
4 system, it may be that the AE can do a little bit more to
5 have the more optimum achievement of the overall safety goals
6 or that the NSSS may have to do a little bit more to get
7 practicality in it so that you truly can build it. So there
8 have been many, many meetings with Combustion over several
9 years to review these interfaces.

10 MR. WERMIEL: Can I assume then that where there are
11 differences that you have developed over the course of your
12 design from the interfaces that have been identified by CE
13 that the FSAR or some other document to NRC reflects this?

14 MR. BINGHAM: Yes, that's correct.

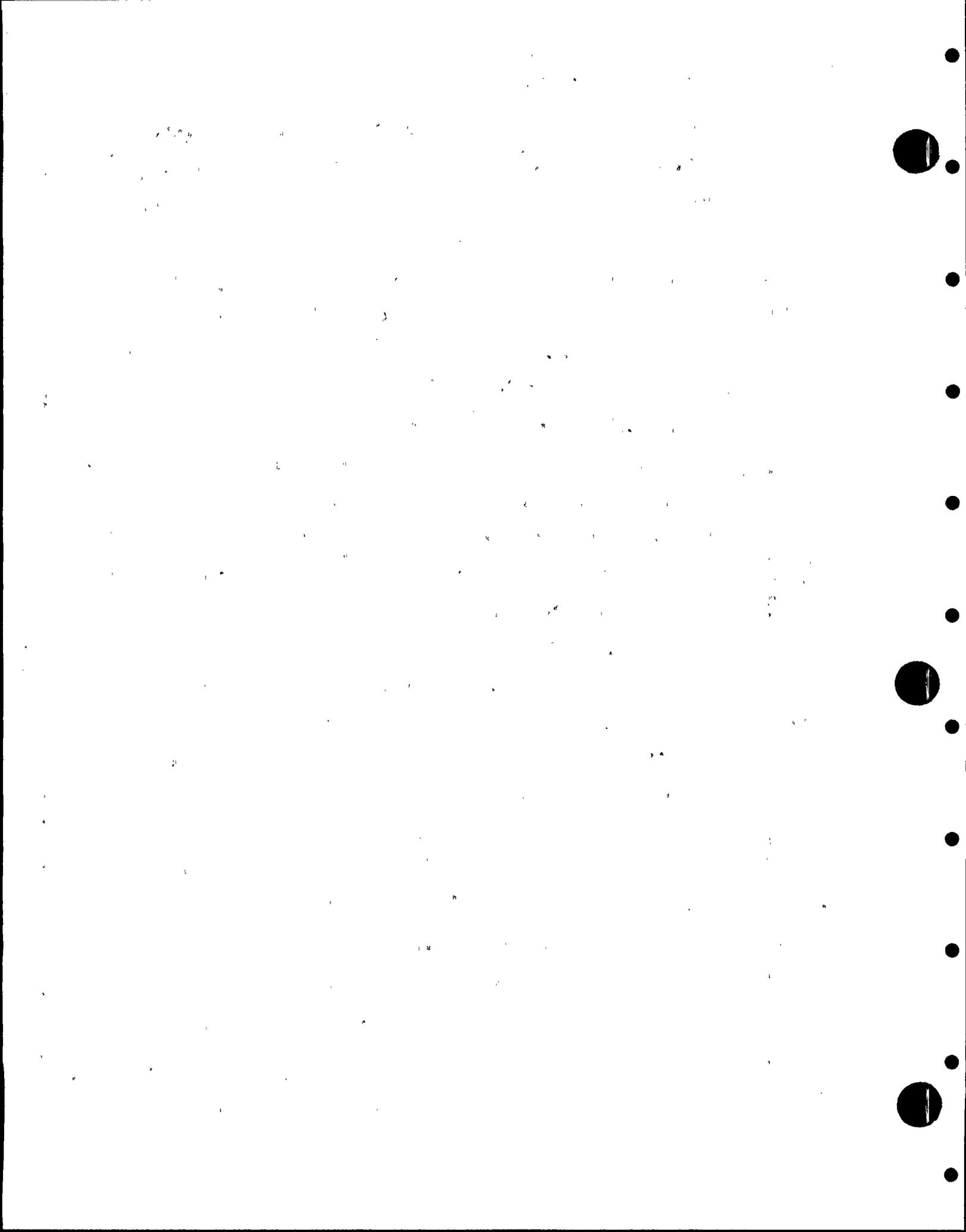
15 MR. WERMIEL: In other words, when we look at the FSAR,
16 with a reference to CESSAR we will know where there is a
17 difference in the interface interpretation?

18 MR. BINGHAM: Yes. In the licensing document, we use
19 a different color page, I think it is pink in this particular
20 case, to flag those differences, and in the front of the
21 document it explains where they occur and what they are. There
22 are very few of them. One?

23 MR. KOPCHINSKI: I think there may be three or four.

24 MR. BINGHAM: Okay. It is less than five.

25 MR. VAN BRUNT: It used to be one.



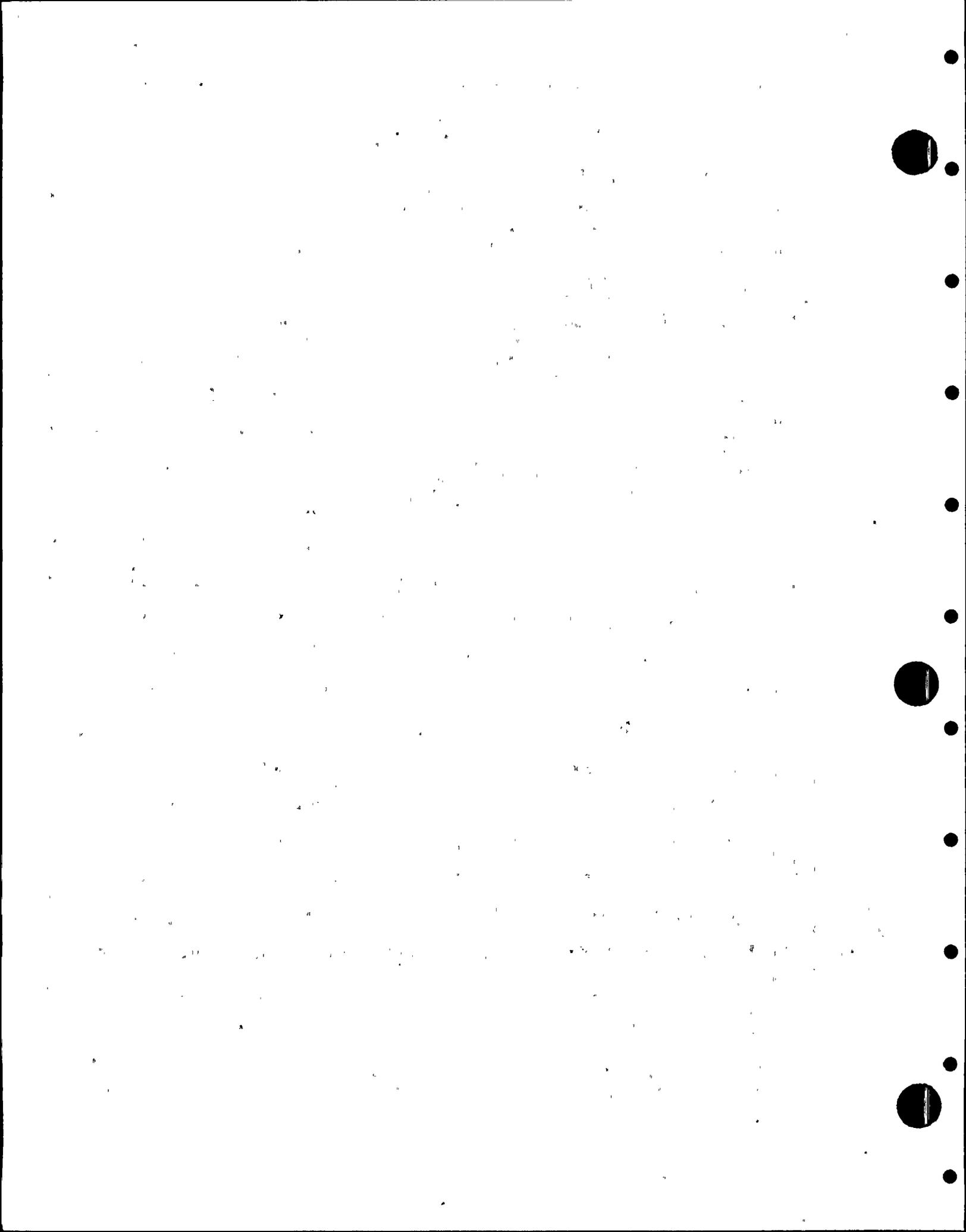
1 MR. BINGHAM: It used to be one. So those are flagged
2 for everybody understanding.

3 MR. ROGERS: A quick one this time. You indicated
4 that Bechtel controls the interfaces. Is the utility
5 involved at all in overseeing this interface?

6 MR. BINGHAM: Yes, extremely involved.

7 MR. QUINN: Bill, you have described all the inputs
8 that were taken to develop the Design Criteria Manual and
9 also that it is a dynamic document. Could you explain how
10 you assure that a specific engineer in your organization is
11 using the correct, up-to-date particular section of that
12 document?

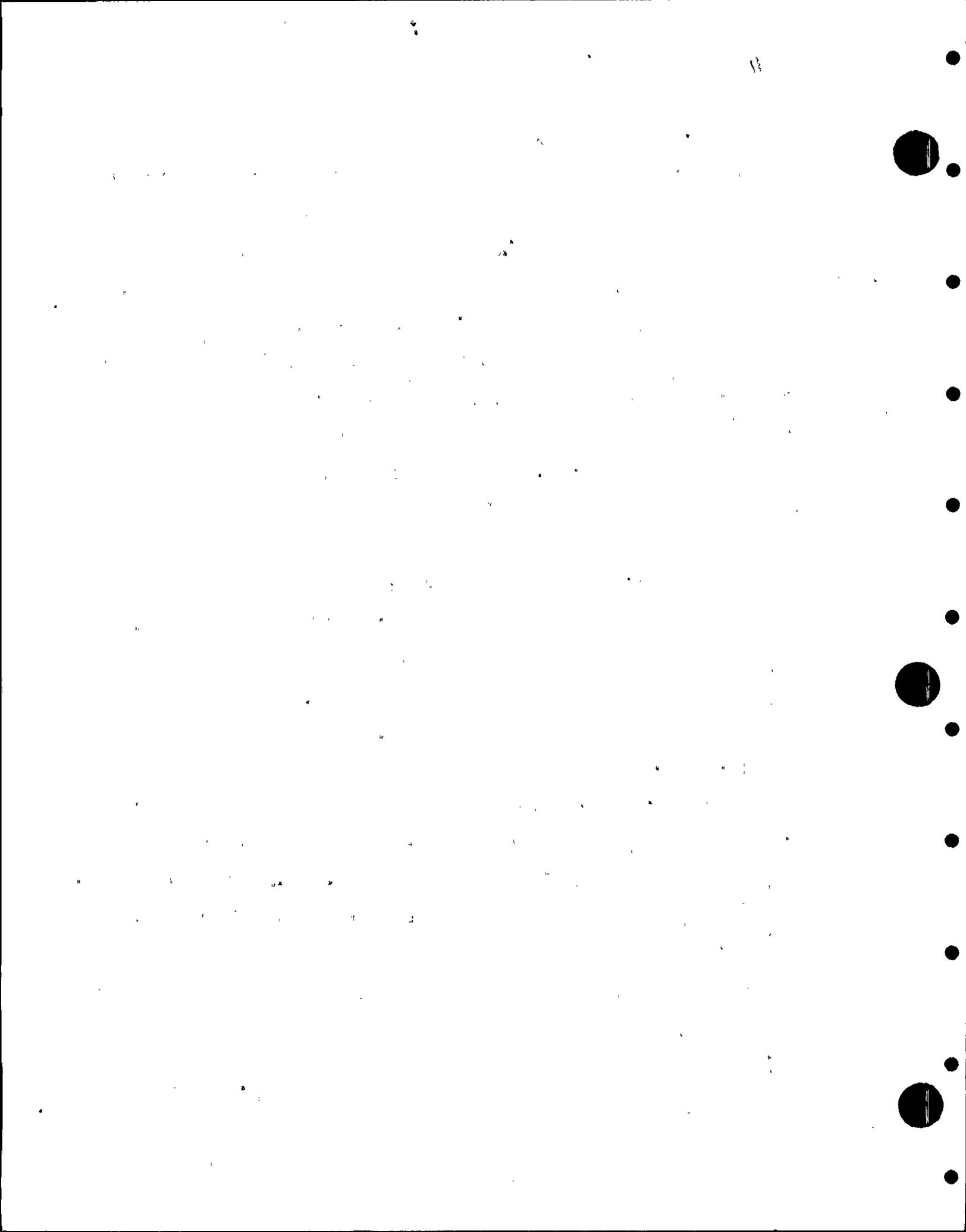
13 MR. BINGHAM: Yes. There are, I guess, about three
14 different ways that we assure that. The particular documents
15 are controlled on the project, updated, and are with each of
16 the discipline group supervisors. The group supervisors are
17 charged with assuring that their people have the proper
18 documents in front of them as they are doing the design or are
19 made aware of the changes. It is the responsibility of the
20 individual responsible for the system, what we call a
21 responsible engineer, to take that information and make sure
22 that it is incorporated properly. There are checks and
23 balances on that system, although that is the primary system
24 that we rely on. We have quarterly training sessions
25 reminding all of the responsible people on the project, and



1 for your information, for a project this size, that is about
2 70 people who form the key for the design, of the importance
3 of this, and we also review key issues that are important
4 for them to know at the time. Second, we have audits that we
5 conduct internally both in engineering and in our management
6 group to go to the individuals and to check first of all that
7 they have the right version of the criteria in the documents
8 and, second, they go to the designers and ask questions to
9 determine whether or not they have the proper details at hand
10 or they know about them. In addition, there are audits by
11 the utility to assure that we are doing what we said we are
12 going to do from a pure audit side, and from the engineering
13 side, through our monthly meetings, we are constantly
14 reviewing the information, current changes, and the implementa-
15 tion. So not only do we have our own internal checks and
16 audit checks, but we have an engineering check that information
17 is being processed properly. That is not to say that things
18 don't slip by from time to time, but it is a quite in-depth
19 way that we have established between the utility and ourselves
20 of assuring that all of the changes are implemented properly.

21 MR. VAN BRUNT: Do we have some other questions?
22 Anybody on the board? I have one other, but it is in a
23 different area entirely.

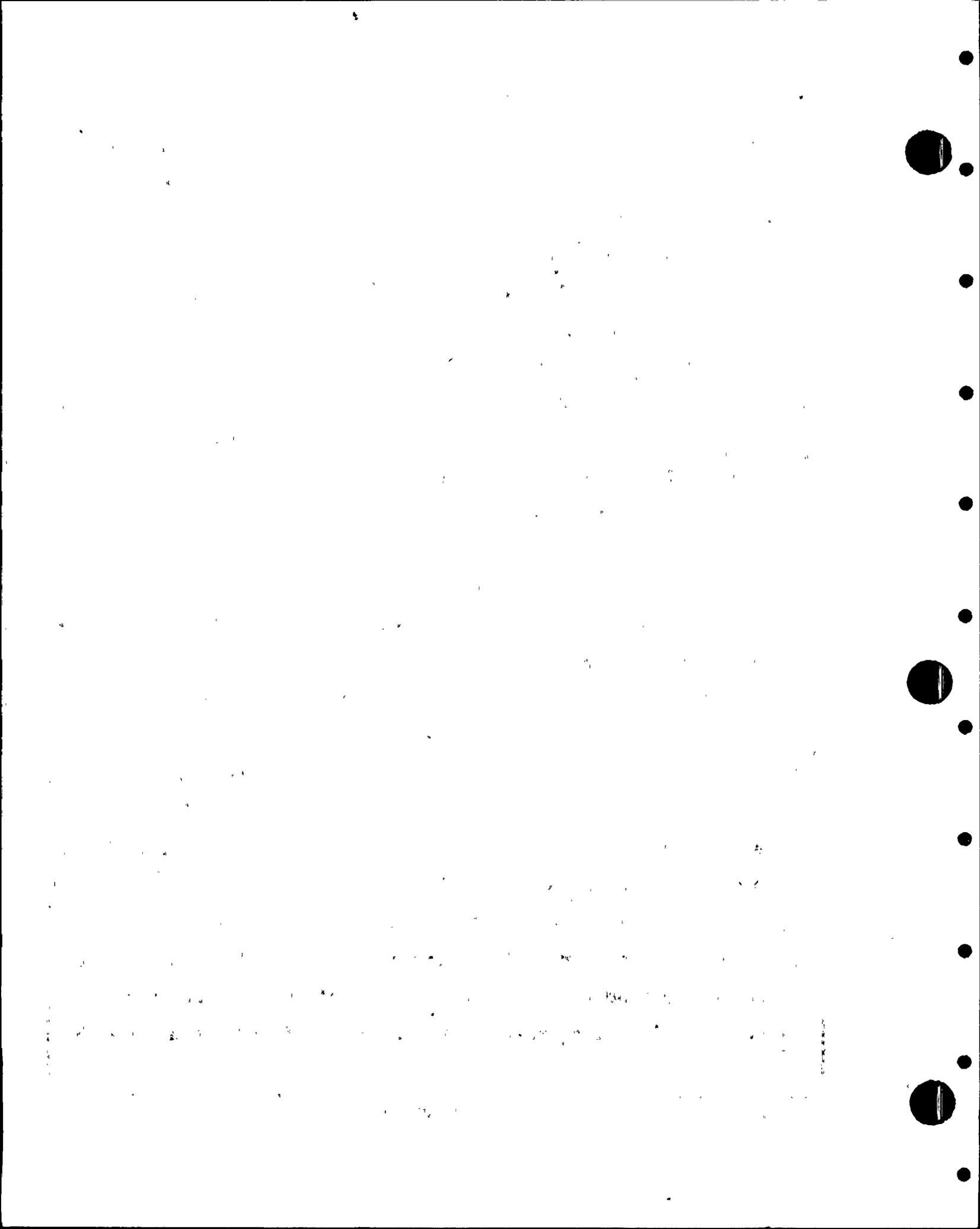
24 Bill, let me just ask one other area. Then I think
25 we will take a break. In your design development process up



1 there, it is fairly obvious that the design model plays a
2 very important part. Just exactly how representative of the
3 design is that model, and if in fact it is a detailed design
4 tool or construction tool, what, if anything, is left off the
5 model, and secondly, what are the controls to ensure that
6 that model does in fact reflect all the things that are on
7 the engineering drawings?

8 MR. BINGHAM: Maybe it would be useful if I could show
9 Model Slide 1 so that I can give you a prespective of the
10 model. We will show some details later on as Dennis gets
11 into his presentation.

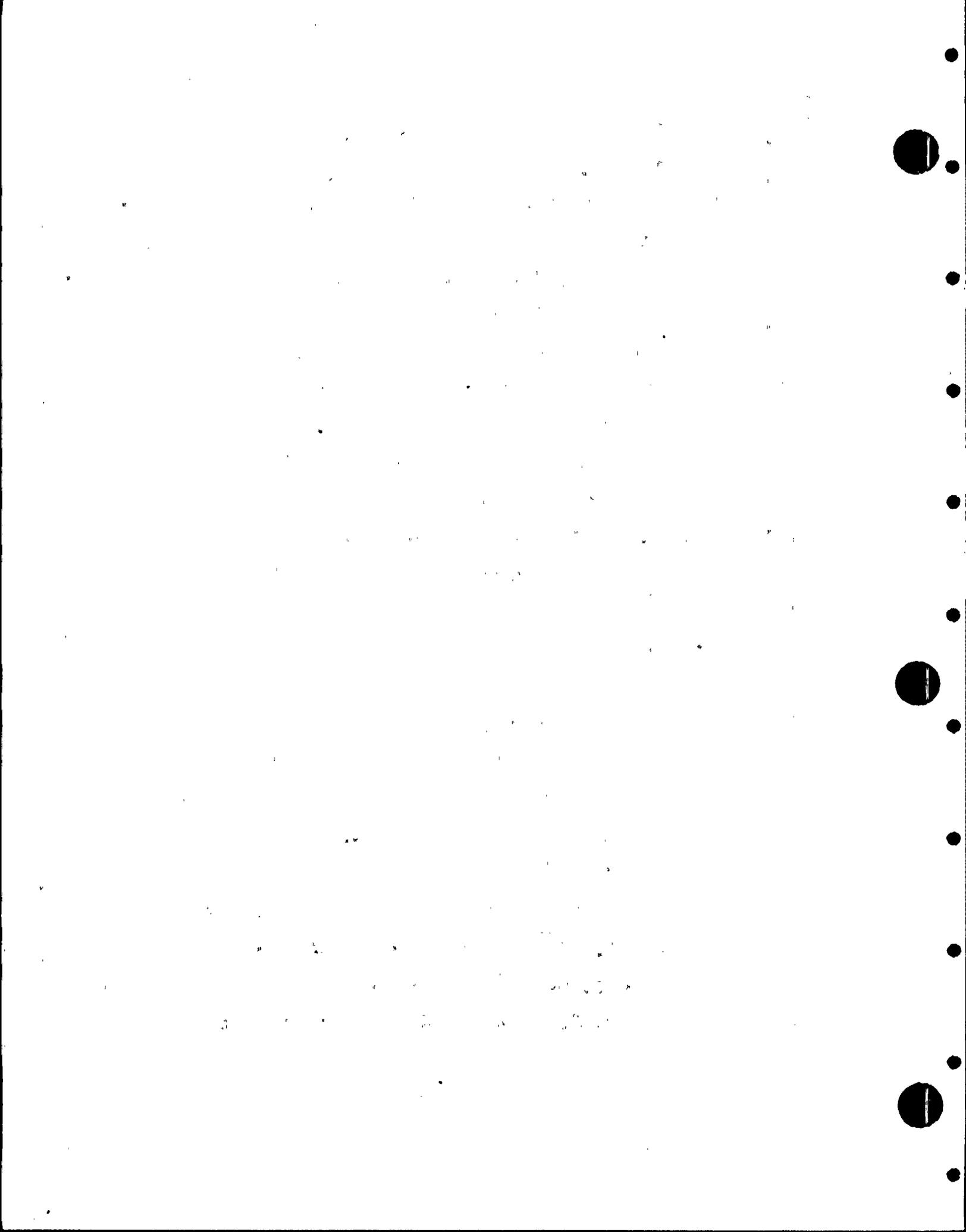
12 I indicated earlier, Ed, that we had a scale model
13 for every building in the power block. I talked about the
14 turbine building, the main steam support building, the
15 containment building, the control building, the fuel building.
16 This happens to be the main steam support structure, which
17 you are going to hear a little bit more about. It is a
18 three-quarter inch to the foot scale model. It shows all of
19 the piping including the small piping, it shows all the
20 hangers and supports, it will show all the HVAC, it shows the
21 electrical trays, and in many cases, particularly in congested
22 areas, it will show all the conduit. This model is large
23 enough that we can work out interferences at least within six
24 inches, depending upon construction tolerances, and in some
25 cases to less than that. The design, as I indicated from the



1 other slide, is conceptually put together, that is, we make
2 preliminary layouts. We then put that on the model for all
3 the disciplines working out the interferences, and once it
4 is on the model, interferences are worked out, we then make
5 the key drawings, the construction drawings, on this project.
6 The drawings are checked with the model. They are reviewed
7 at the model and, of course, the final check is when we build
8 it in the field as far as interferences, but the design before
9 it goes to the field I would say has a majority of the inter-
10 ferences worked out. It has had them all by a multi-discipline
11 review conducted, it has had the separation review completed,
12 it has had the high energy line break review completed, and
13 it has had a constructability review completed, as well as
14 assuring that the systems have the correct vent and drain
15 points and are set for easy startup of the particular system.
16 So we use it as a model, Ed, for not just engineering, but
17 for the complete, overall, total review of all the requirements.
18 Once those are in order, then we issue the drawings.

19 MR. VAN BRUNT: Are those documented reviews and if
20 some interference or something is identified, is there some
21 loopclosing on that?

22 MR. BINGHAM: Yes, they are all documented. There is a
23 loopclosing system. There are periodic model reviews. Every
24 Friday morning, we have a model review covering a particular
25 area, a particular level, and there are records of those



1 particular reviews with action items. I think I might add,
2 also, that I didn't mention that periodically there is an
3 operations and maintenance review that is conducted by us
4 with the utility, both operations and engineering, to review
5 the design to assure that you can meet your ALARA requirements
6 for removal of equipment, it can be removed easily, and that
7 there is access to the various points that you have to get to.

8 MR. VAN BRUNT: Any other questions in this area?

9 MR. O'REILLY: Bill, I assume from your response that
10 these models are at your office.

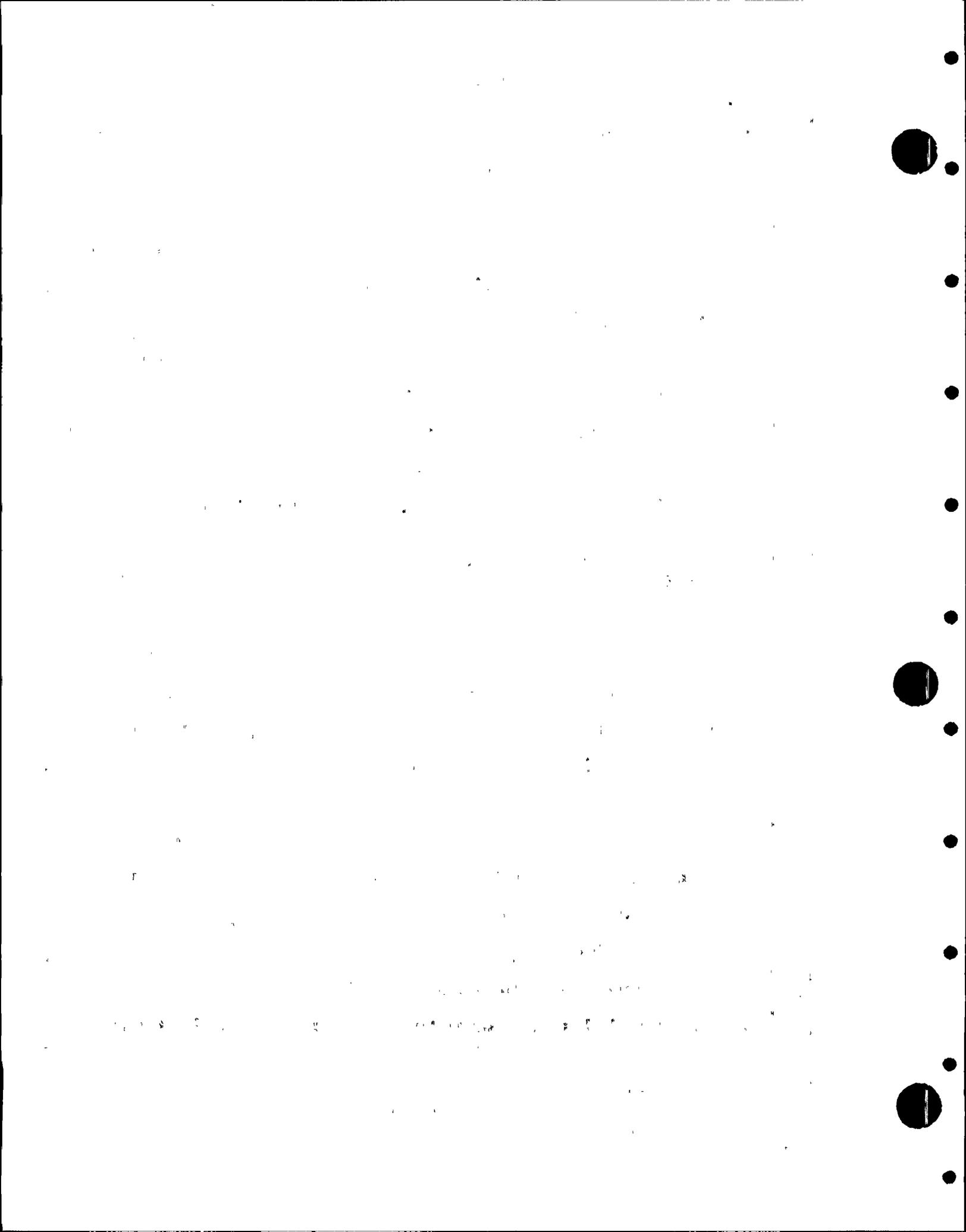
11 MR. BINGHAM: They are at our office. Perhaps you
12 might have seen the model that SNUPPS has.

13 MR. O'REILLY: Yes.

14 MR. BINGHAM: The model is very similar to the one
15 that SNUPPS has. One of the differences is that on the SNUPPS
16 model, the drawings are made, then checked on the model. Here
17 we build it on the model and make the drawings. That is kind
18 of on purpose to determine in our company what is the best
19 combination and ways to use the model.

20 MR. VAN BRUNT: I might point out for the record that
21 when the plant is completed, the model is going to be shipped
22 to the field to be used as a tool for our operating department
23 in the operation of the plant.

24 Any other questions in this area or about the
25 particular slides that were talked about? I think it was



1 helpful to deal with it generally and ward off a lot of
2 specific questions about interface.

3 MR. PARR: Excuse me, are we going to come back to
4 some of the other slides? So far I thought we just covered
5 the first slide.

6 MR. VAN BRUNT: That's correct. I thought it would
7 be helpful to cover this in a general way rather than talk
8 about a specific item of equipment and how the interfaces
9 were covered, because I had a whole lot of questions about
10 that.

11 Are there any other questions? If not, let's take
12 a 15-minute break until about a quarter to eleven.

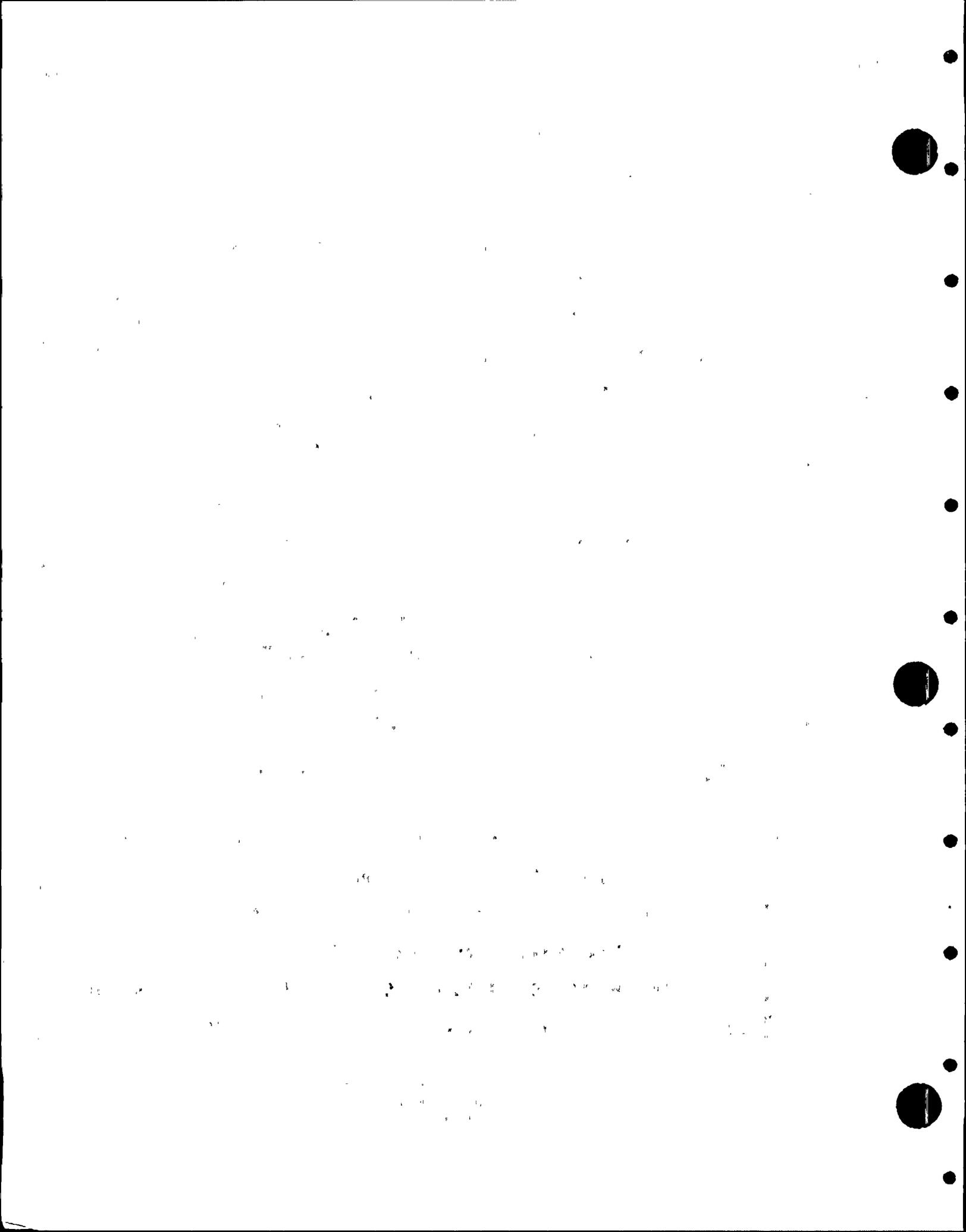
13 (Thereupon a brief recess was taken, after which
14 proceedings were resumed as follows:)

15 MR. VAN BRUNT: Why don't we go to Item 1A, I think it
16 was, on the agenda, which was the information that Dennis
17 Keith presented, and I will open it up for questions on that
18 portion of the presentation. Who would like to go first?

19 MR. BINGHAM: I am not sure I mentioned it earlier,
20 but I would prefer that you address all the questions to me
21 and we may caucus from time to time and get the proper
22 individual to answer the question on the detailed presentation.

23 MR. VAN BRUNT: Okay, fine. Mike.

24 MR. BARNOSKI: I have a few questions. First is on
25 Figure 2. There were a couple symbols there that I am not



1 sure I recognize. I think one of them is containment
2 penetration and right before it is some kind of flow element.
3 Could you clarify those two?

4 MR. KEITH: Yes. These symbols (indicating) are
5 containment penetrations and these (indicating) are flow
6 elements for flow transmitters.

7 MR. BARNOSKI: Just for measurement?

8 MR. KEITH: Just for measurement, yes.

9 MR. BARNOSKI: Secondly, you show normally closed
10 valves on I believe the steam admission to the turbine, and
11 do you have provisions in your design to remove the water
12 that may accumulate in there so that it doesn't become a
13 problem on actuation of the turbine?

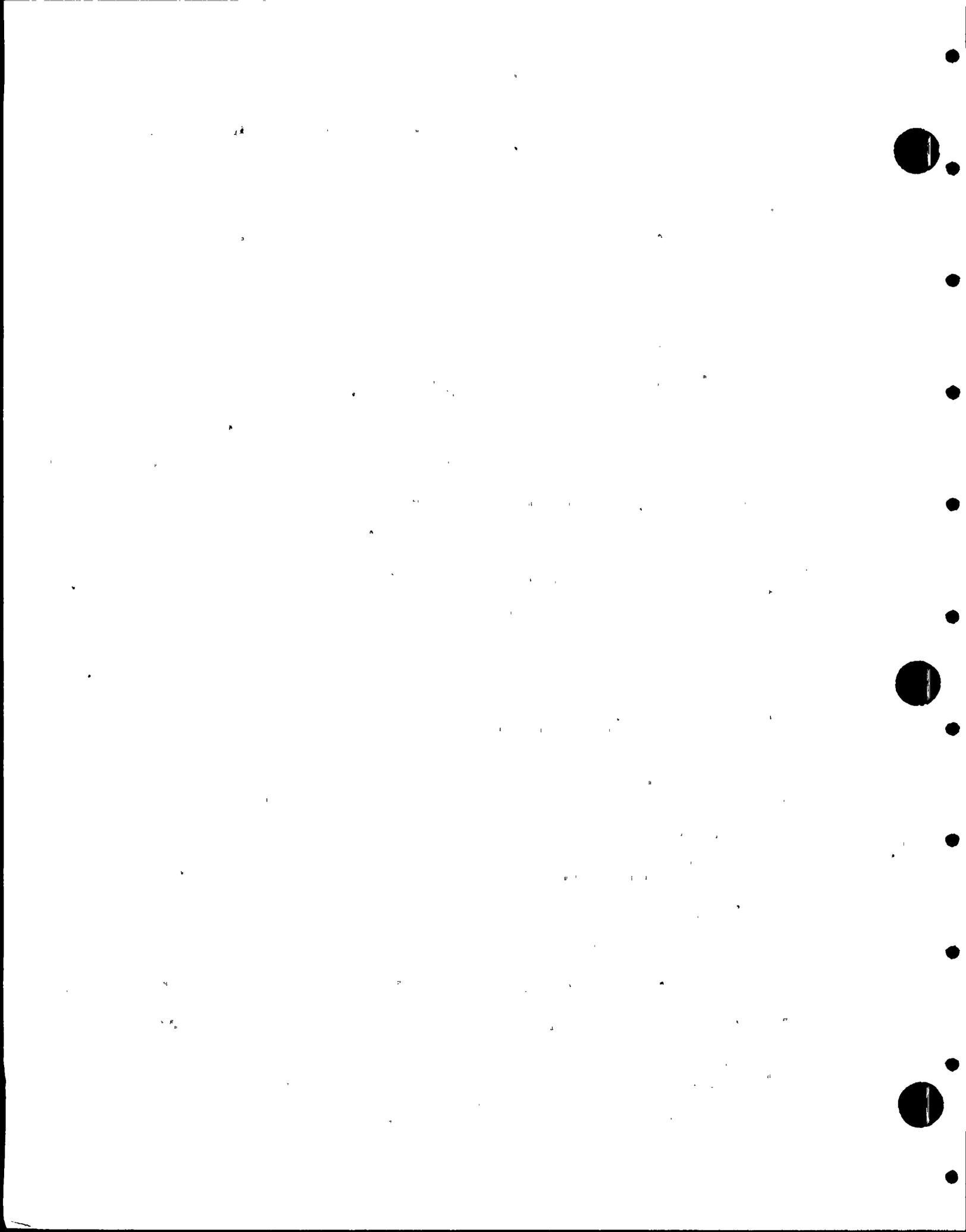
14 MR. KEITH: Yes, there are steam traps in those
15 lines.

16 MR. BARNOSKI: On Exhibit 1A-4, you mentioned that
17 the system is not pressurized. I assume it is full of water.

18 MR. KEITH: That's correct.

19 MR. BARNOSKI: What are the materials of the piping
20 and the valves and what provisions have you made to minimize
21 corrosion problems for just a system standing in water for
22 a while?

23 MR. KEITH: All the piping and valves are stainless
24 steel to minimize corrosion that way. The condensate storage
25 tank does have a nitrogen cover on it to minimize oxygen
content.



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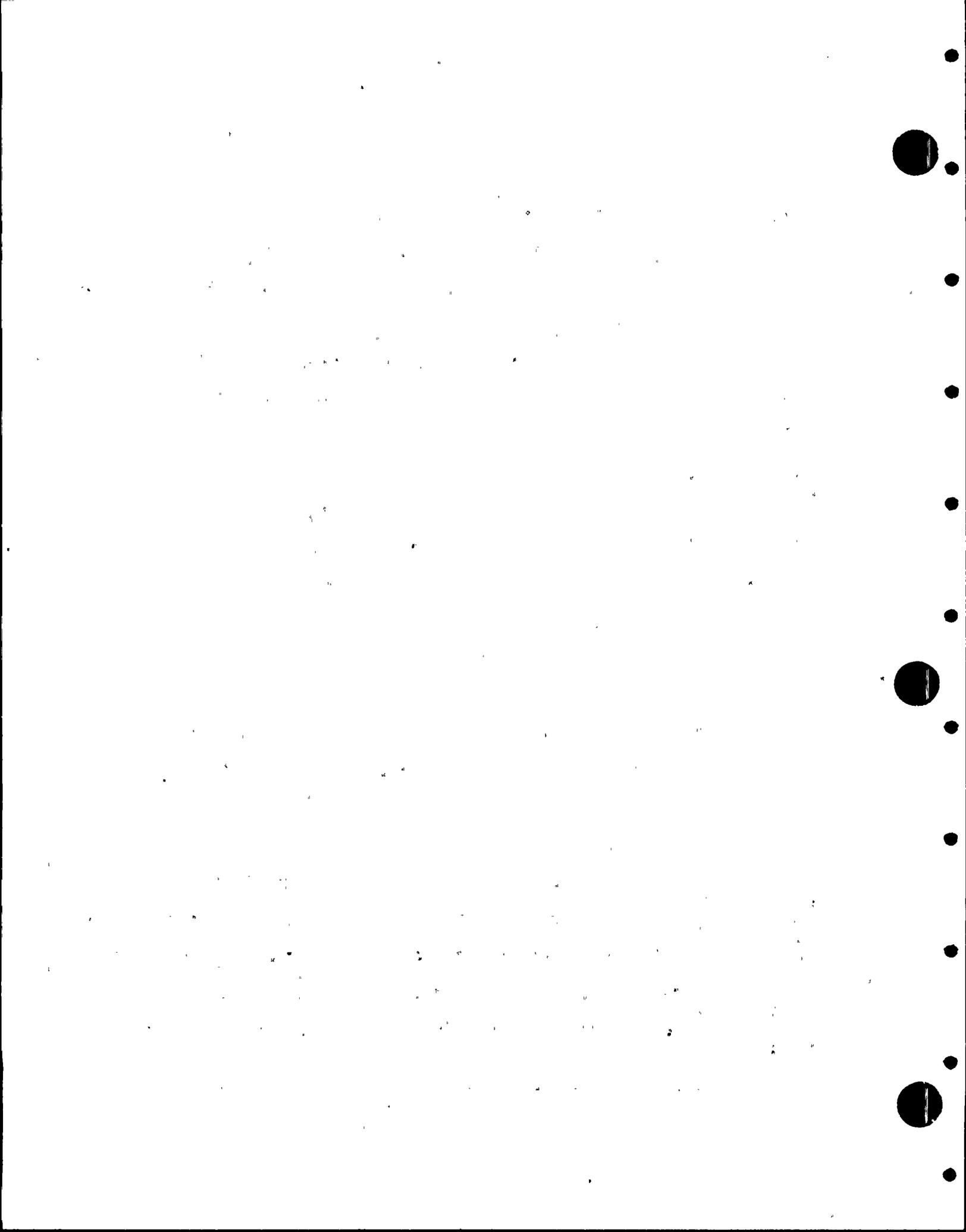
MR. BARNOSKI: Is there any chemical addition?

MR. KEITH: No, not for the aux feedwater system.

MR. BARNOSKI: Another question related to Figure 2. I note that you have recirculation on the pumps. Does the capacity of the pump include that so you have 875 GPM to the generator plus the flow required?

MR. KEITH: Yes, the pump is sized such that I believe it is 110 gallons per minute recirc flow -- 135 gallons per minute recirc flow, so we have that plus the 875 to the generator.

MR. BARNOSKI: I have one final question, and that is on Exhibit 1A-9, Item 23). You said the feedwater temperature will be at least 40 degrees, and my concern centers around the thermal transient at the junction of the emergency feedwater system that the main feedwater system is going to see. I believe your main feed would be at about 450 degrees. Injecting 40-degree water seems to me to be a rather severe transient thermally on that juncture. I seem to recall that boiling water reactors at least a while back, and I happened to work on that, for similar application used what they called the thermal tee to minimize the thermal transient at the junction of the cold and hot water interface. Could you tell me specifically if you have looked at a thermal tee and what analyses you have done in addition to the normal analyses required of ASME Section III, Class II piping to assure that



1 this thermal transient will not be a problem.

2 MR. KEITH: Well, as part of the stress analysis we
3 do on the piping, we look at thermal transients. The number
4 of cycles is given as a requirement from Combustion Engineering
5 so the stress analysis of the piping considers that problem.
6 As far as the thermal tee, let me caucus for a minute.

7 As I stated, the design has taken care of those
8 transients. If you want further information as far as whether
9 specifically we have used a thermal tee, we are not sure at
10 this point. We could provide that to you.

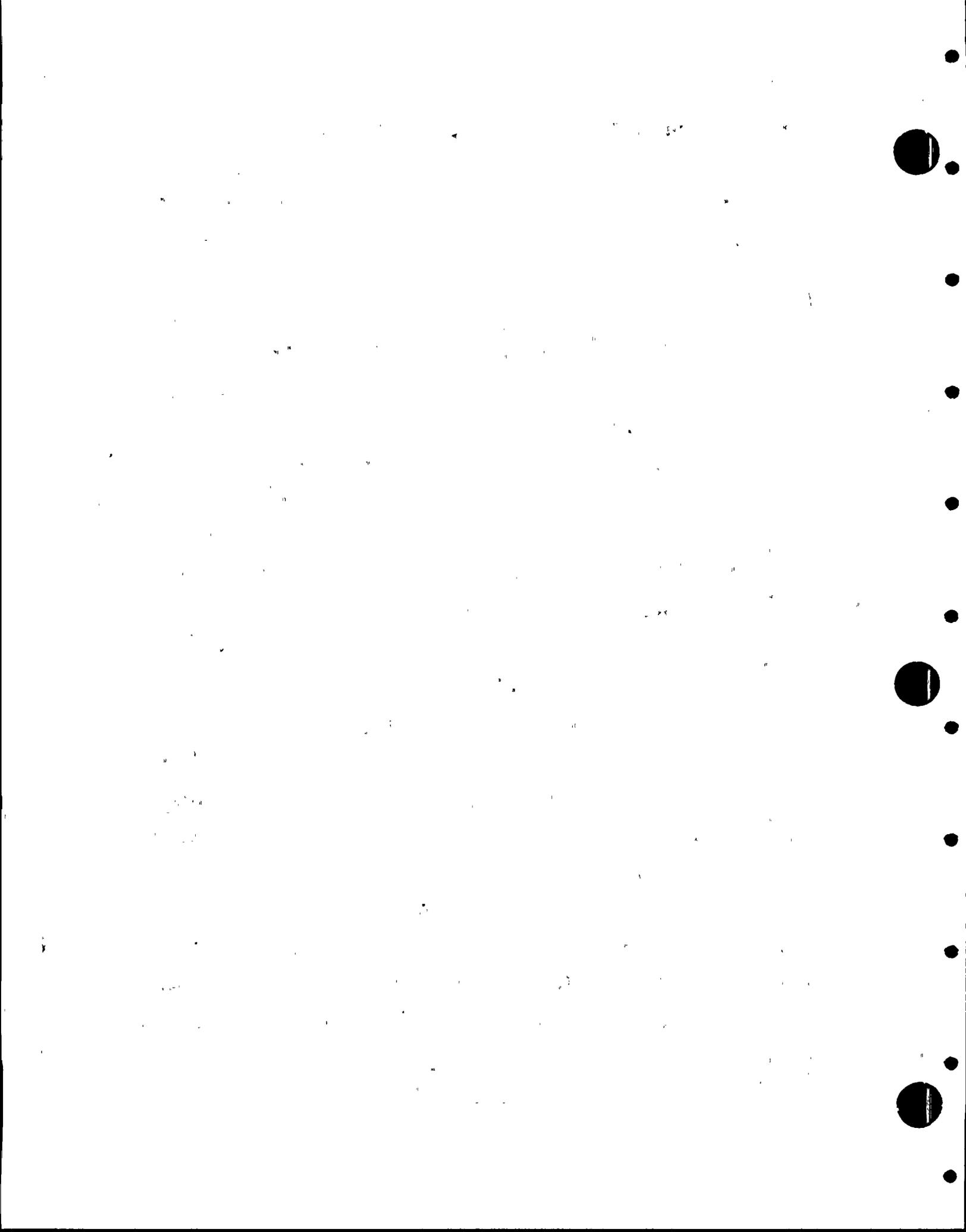
11 MR. VAN BRUNT: I think, Bill, why don't you put down
12 on the list of items that we will verify what the results of
13 the analysis are that show whether the piping is any problem
14 under the 40-degree condition that you mentioned or that a
15 thermal sleeve has been used to take care of the situation.

16 MR. BARNOSKI: Fine.

17 MR. VAN BRUNT: Any other questions?

18 MR. HOEFERT: The steam line to the auxiliary feedwater
19 steam turbine is normally closed and on a start signal, the
20 valves come open, and it would seem to me that the steam
21 piping and the turbine would undergo a rather severe thermal
22 shock as well. Has this been considered in the selection of
23 the turbine and the design of the piping?

24 MR. KEITH: Yes. They even say they can take water
25 slugs in that turbine. It is made specifically for this type
of duty.



1 MR. HOEFERT: What about the piping design? Has
2 that been looked at for the thermal transients that it will
3 undergo repeatedly?

4 MR. KEITH: Yes. Similiar to what Mike Barnoski
5 brought up, our stress analysis looks at exactly that type
6 of thing.

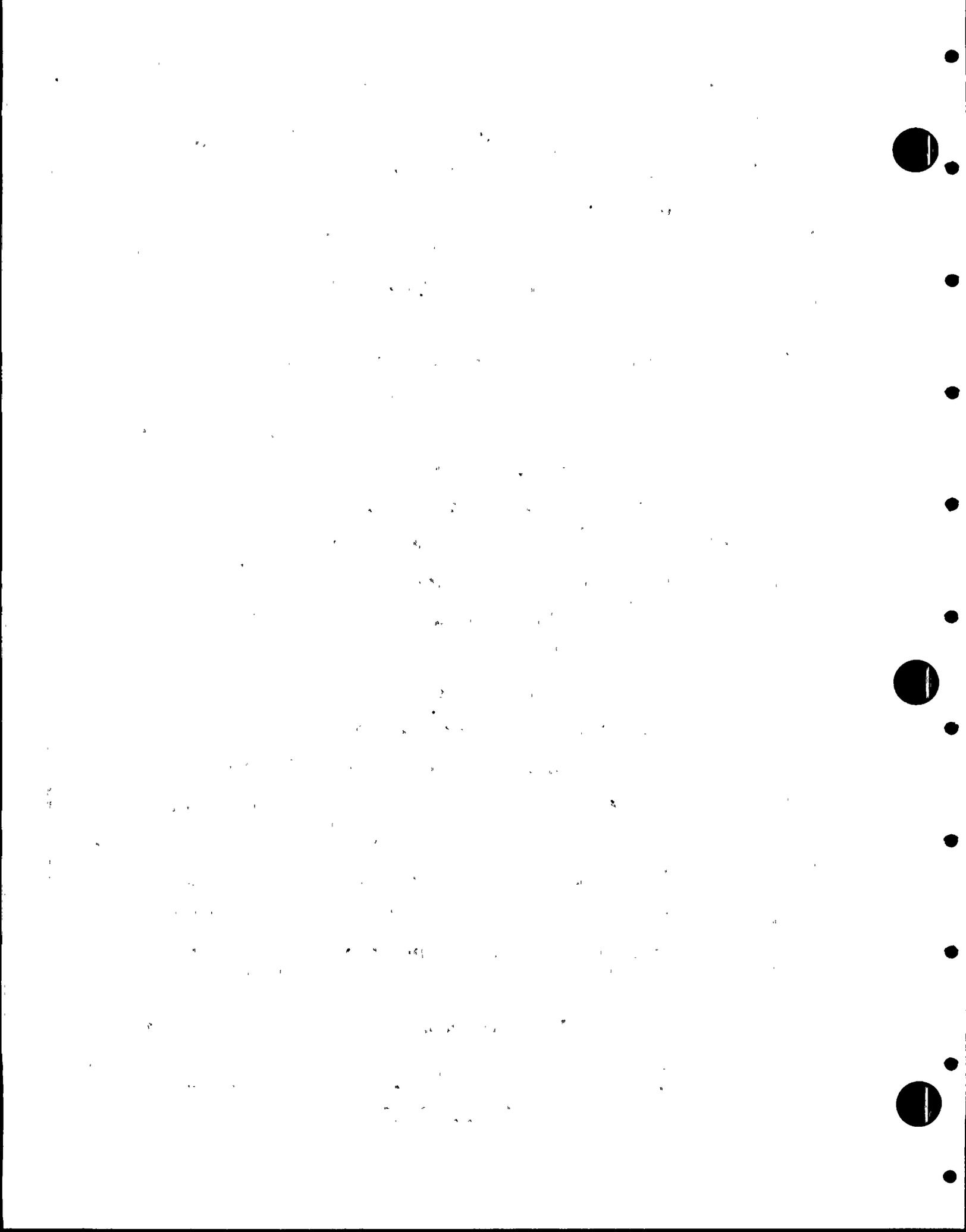
7 MR. BINGHAM: I might indicate, Norm, also, that
8 there are some plants that have a turbine that has not been
9 designed for this particular slug of water and, consequently,
10 there are some people in the industry that are looking at
11 their particular applications, but we have been aware of
12 this and have assured ourselves that the design is capable
13 of taking this particular condition.

14 MR. HOEFERT: Has the vendor stated this in a tech
15 manual or letter?

16 MR. BINGHAM: Yes, they have. We have it in writing.

17 MR. HOEFERT: I have another question, again with
18 regard to the steam line, but a little different area.
19 I notice that a portion of one of the steam lines runs
20 through the pump room, the motor-driven pump room. Doesn't
21 this violate the separation criteria? It would seem to
22 me a rupture of that line would wipe out the steam-driven
23 pump and could also affect operation of the motor-driven
24 pump.

25 MR. KEITH: A steam line does not go through that



1 motor-driven pump room.

2 MR. HOEFERT: Yes, I verified this by observation.
3 There are two lines coming down the main steam support
4 structure and they come together in the steam-driven pump
5 room, but one line does go through the motor-driven pump room
6 for perhaps 20 feet of piping.

7 MR. BINGHAM: Let's hold that question. We do have a
8 slide here that will show it and we can take care of that
9 particular one.

10 MR. VAN BRUNT: Norm, we will come back to that.

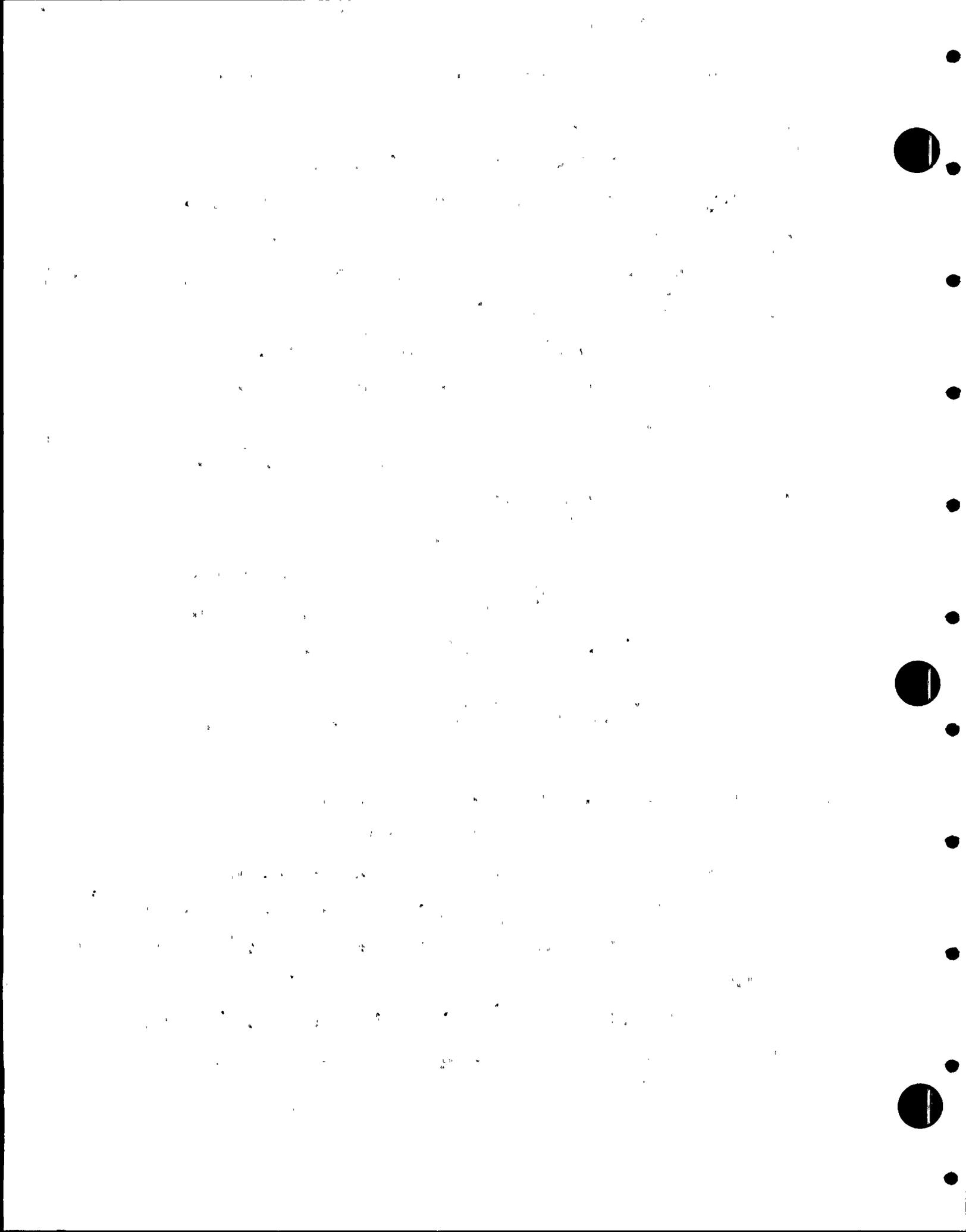
11 MR. KEITH: Apparently I was incorrect on saying that
12 it doesn't.

13 MR. VAN BRUNT: Before I call on other people, are
14 there other questions in this same general area or would
15 somebody want to go to a different area?

16 MR. WERMIEL: I have one in this area. On the steam
17 admission valve itself, you said one of the two normally
18 opens on an AFAS signal. What is my assurance in the single
19 failure when the valve doesn't open that the other one will?
20 Is there an automatic system that will open the second valve
21 or do I have to rely on the operator to open it?

22 MR. KEITH: No, it is part of the logic. If the
23 turbine is not up to a certain speed in a certain time, then
24 the other one will open.

25 MR. WERMIEL: There is a time delay then for the
turbine to reach a particular speed and then the other valve



1 will open if it doesn't?

2 MR. KEITH: That's correct.

3 MR. WERMIEL: Is this all part of the DC power system,
4 this logic?

5 MR. KEITH: Yes, it is all associated with it. The
6 turbine driven aux feedwater pump is powered off the DC.

7 MR. WERMIEL: Also in that same vein, when the valve
8 opens, then I get the sudden slug of steam, is the governor
9 designed such that I don't immediately overspeed the turbine
10 and trip it?

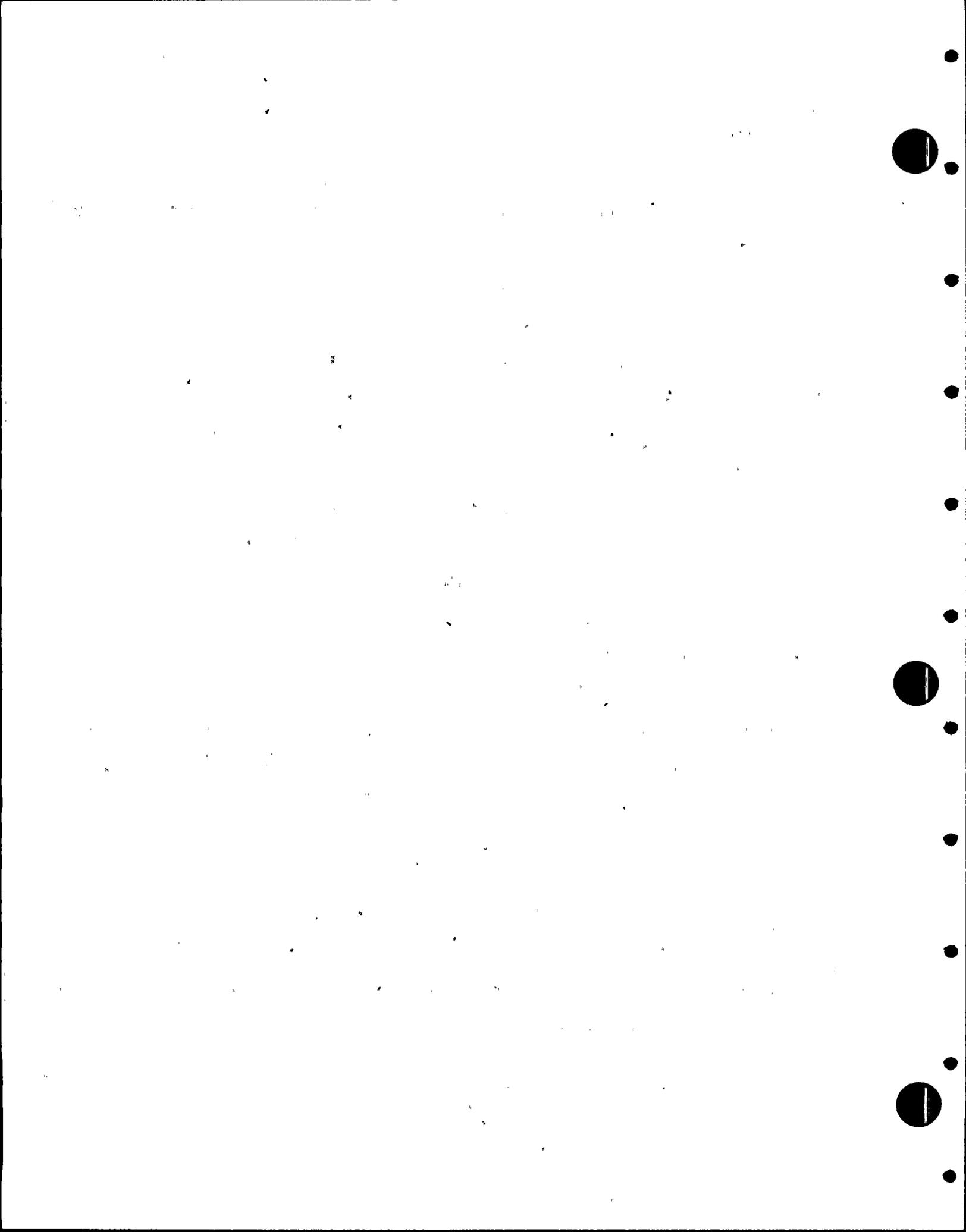
11 MR. KEITH: Yes. When it gets an aux feedwater
12 actuation signal, there is a signal to the control valve as
13 part of the turbine that shuts it down so that you don't
14 overspeed on that initial slug. There is a ramp input
15 gradually.

16 MR. PARR: I would like to continue that one. You
17 open one valve, just in case the steam generator has got a
18 break in it someplace, was that the logic that led you to
19 this, or what?

20 MR. KEITH: Well, we don't want to open a valve from
21 a ruptured steam generator.

22 MR. PARR: So that was the reason?

23 MR. KEITH: Yes. Well, plus we didn't want to open --
24 When you have both steam generators intact, we didn't want to
25 have both valves open.



1 MR. PARR: Not have both of them open?

2 MR. KEITH: Yes.

3 MR. PARR: May I ask why?

4 MR. KEITH: Well, I believe that the CE interface
5 requirement on cross-connecting both steam generators is
6 what you have in that case. Although we do have check-valves
7 in the line, we just thought it best to just be feeding from
8 the one steam generator.

9 MR. WERMIEL: Then that means that if I have, say, a
10 steam line break in one steam generator, the valve for that
11 one, of course, won't open.

12 MR. KEITH: That's correct.

13 MR. WERMIEL: Then I do ask the other valve to open
14 and it single fails, then I cannot take credit for my turbine
15 except perhaps by manual action.

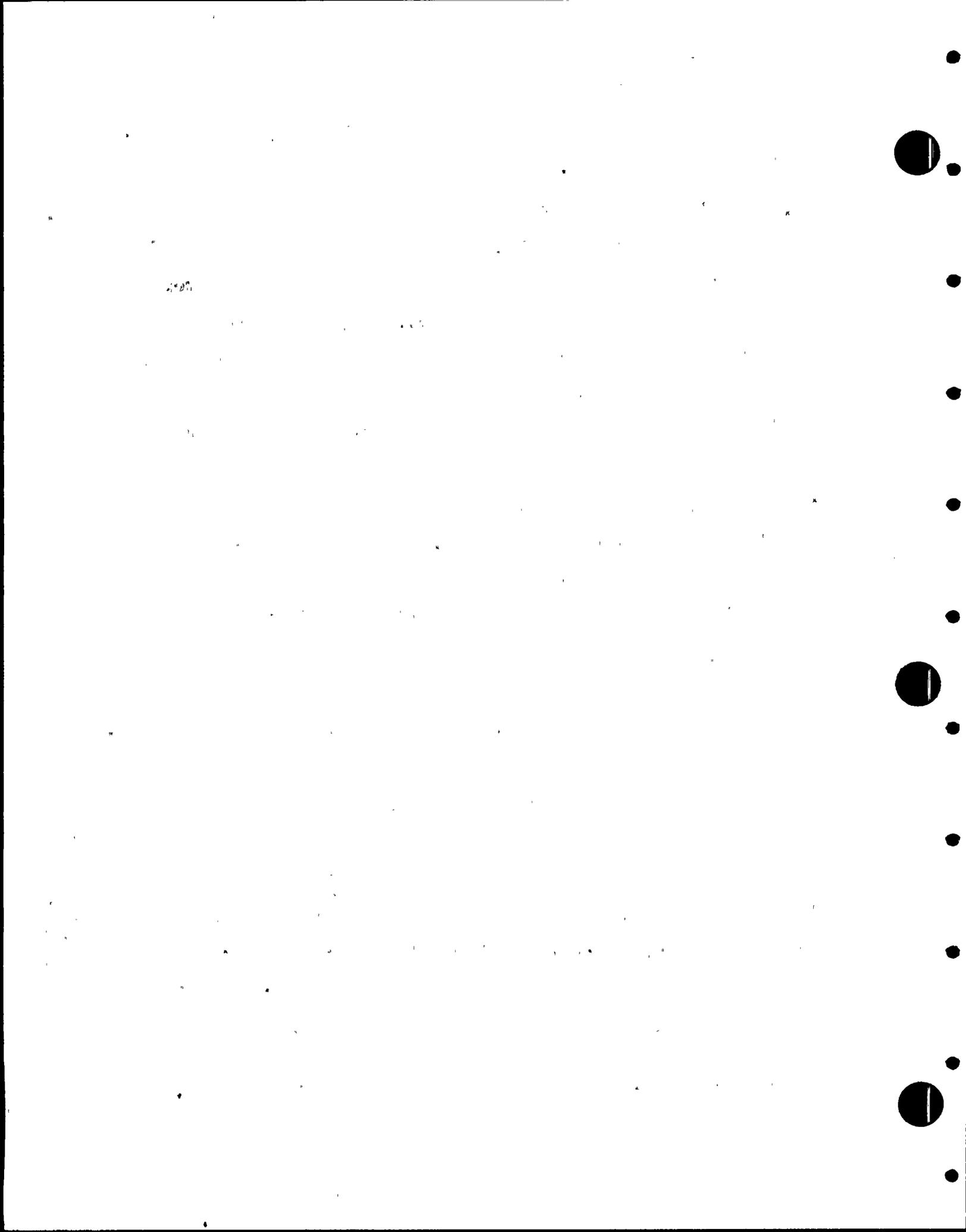
16 MR. KEITH: That's correct.

17 MR. WERMIEL: Then I have to rely on my motor-driven
18 pump.

19 MR. KEITH: That's correct.

20 MR. VAN BRUNT: Was there another question back here?

21 MR. KOLB: In the area of thermal shock, let's say
22 that your steam generators would dry out and for some reason
23 your aux feedwater was delayed in getting water to your steam
24 generators, what effect would it have on your U-tubes if you
25 reflooded that hot generator with a shock?



1 MR. KEITH: Well, first, the aux feedwater actuation
2 signal, all the logic in the system and all is designed such
3 that we avoid a dryout condition. We have gone over our
4 system design very extensively with CE. As far as the effects
5 on the steam generator, I would really have to defer that to
6 Combustion Engineering for the metallurgical effects and
7 all, and I think -- Well, I just better not say what they
8 have in terms of cycles for that kind of thing in their
9 design.

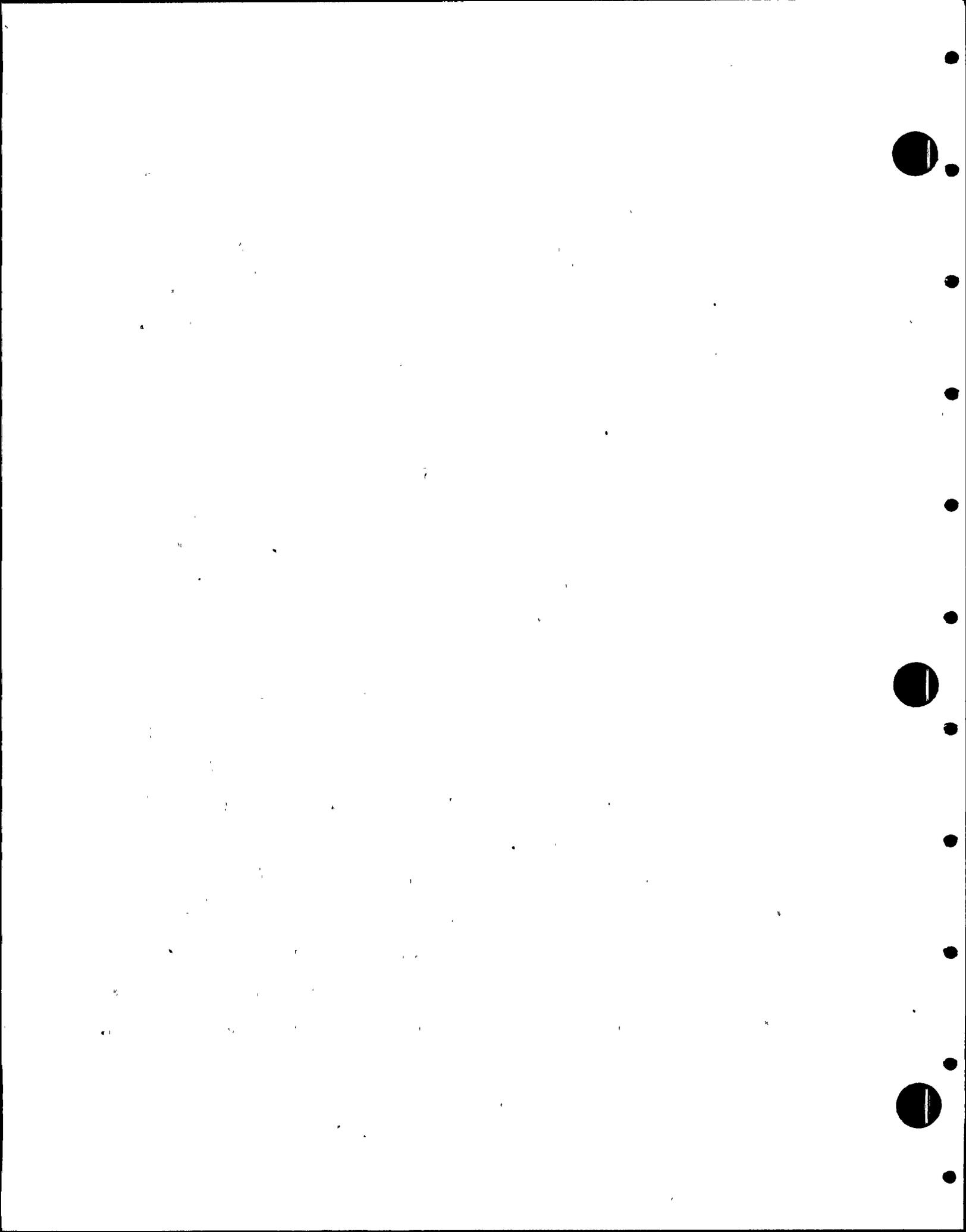
10 MR. VAN BRUNT: Shelley, you had a question.

11 MR. FREID: Yes. On your Exhibit 1A-3, you talked
12 about the line classes and you mentioned that it was ASME
13 Section III, Class 3, from the valves to the turbine and you
14 did not say what the line class was from the main steam line
15 to those valves. Your last all-inclusive statement was that
16 everything else is B31.1, and I don't believe that is really
17 true of the lines from the steam lines to those valves.

18 MR. KEITH: I thought I mentioned this, but you are
19 correct. The lines from the steam lines to the valves are
20 Section III, Class 2,

21 MR. VAN BRUNT: Rick, you had a question?

22 MR. TURK: Yes. On the criteria for waterhammer,
23 I forget which one that was on, it was basically that water-
24 hammer has been designed for. One of CE's specific require-
25 ments was that a checkvalve be placed on the upstream side of



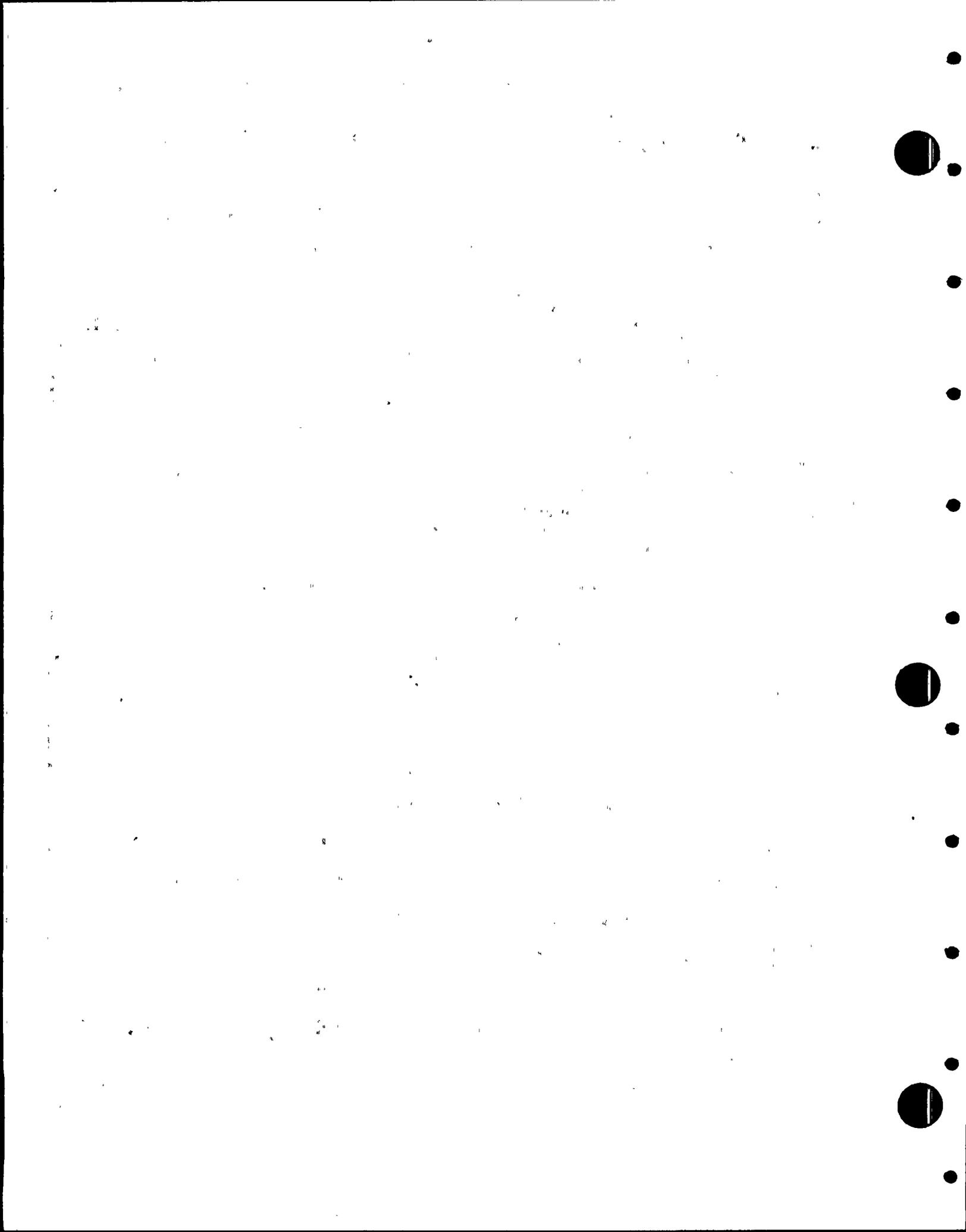
1 the downcomer line to prevent feeding back through the
2 cross-connect into the economizer box with cold aux feedwater.
3 Those checkvalves are in place on the emergency lines, but
4 I don't see a checkvalve on the startup pump to prevent
5 feeding with the startup pump to the economizer box. Is that
6 an omission from the P&ID? In other words, there is a path
7 to take the cold condensate and deliver it from the startup
8 pump to the economizer line.

9 MR. KEITH: I think, Rick, that the way that is taken
10 care of is that when that pump is in use, you have already
11 shut your main feed isolation valves, these valves here
12 (indicating).

13 MR. TURK: Yes, but is there anything to prevent
14 operator action, inadvertent operator error, from opening
15 those valves? That was the intent of the checkvalve to prevent
16 waterhammer, to prevent operator error from inducing that
17 cold water into the economizer box.

18 MR. KEITH: As far as on the startup pump, no. All the
19 valves are shown. This is obviously a simplified P&ID, but
20 the valves are shown here as we have it. I think we interpreted
21 that it is there to be primarily with the automatic starting
22 system where you didn't have time to take care of isolating
23 yourself from the economizer section.

24 MR. TURK: Well, I guess the case I am thinking of is
25 that you are feeding during startup and you have operator



1 error to open the main feed reg valves and you could intro-
2 duce that cold water into the economizer box, and there was
3 a specific interface requirement for a checkvalve in the
4 downcomer line upstream of the intersection of emergency
5 feedwater.

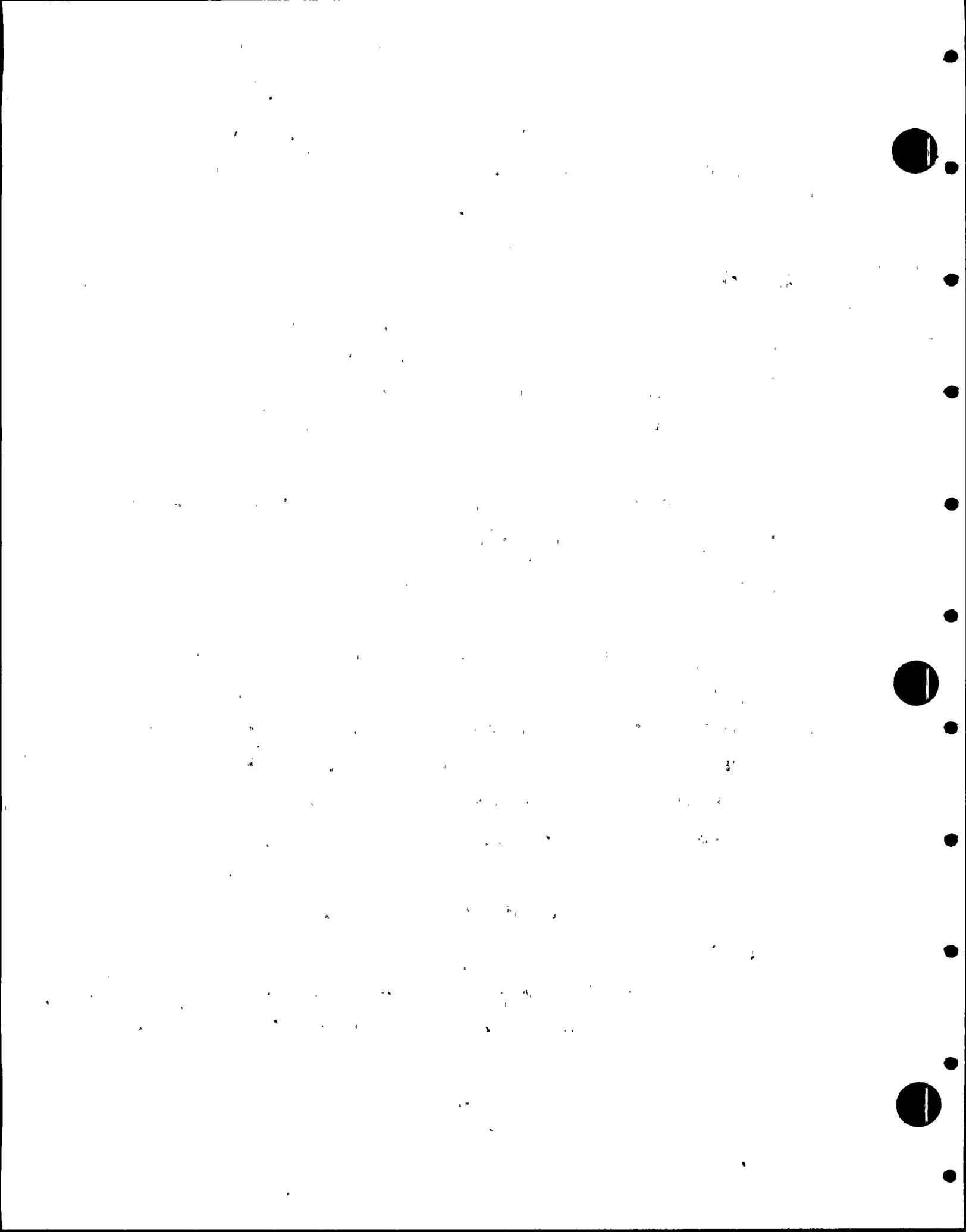
6 MR. BINGHAM: Excuse me, you say there was an inter-
7 face requirement or there is an interface requirement?

8 MR. TURK: There is. I don't have it.

9 MR. VAN BRUNT: Well, Rick, if there is in fact an
10 interface requirement, then I would ask that you fellows
11 verify that that is the case, and if you have not complied
12 with that, then you better demonstrate that what you have done
13 is appropriate or whatever. So that is an item that we
14 ought to have on the list of items to check.

15 MR. TURK: I had one other question. I believe it is
16 Criterion 25, which was if the emergency feedwater trains
17 are used during the auxiliary or startup mode, and you said
18 that because your pumps weren't used during that mode that
19 it wasn't a problem, that the protection here would provide
20 runout protection on the pumps. By that, did you mean that
21 you have the automatic feature blocked some way during
22 startup when you are using the auxiliary pump or the startup
23 pump?

24 MR. KEITH: What I think I said, what I meant to say,
25 was that in the unlikely event we get an AFAS -- I didn't say



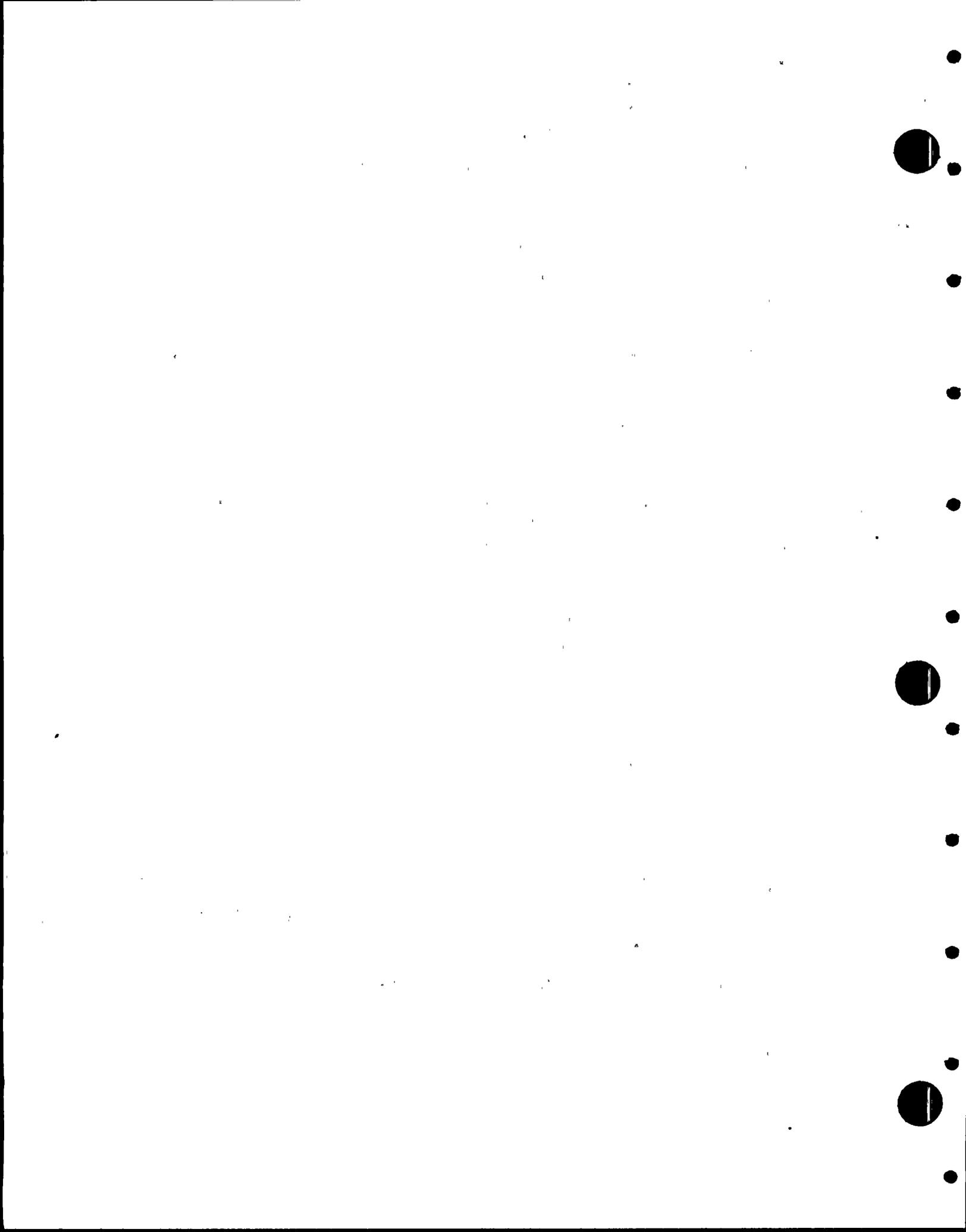
1 we had the AFAS blocked. I just think it is extremely
2 unlikely that you get one during that startup condition when
3 you have a depressurized steam generator.

4 MR. TURK: I think most of the data indicate that there
5 are a lot of low level trips during startup operations and
6 cooldown operations, because you are controlling in a manual
7 mode, and the intent was there that if the pumps do start
8 automatically that there is a criterion for protecting them
9 from runouts so that you don't wind up damaging both pumps
10 even though they are not needed immediately because you are
11 in a low power level type situation, so is that criterion
12 included in your criteria in your overall?

13 MR. KEITH: The way we have taken care of it is by
14 having the low pressure alarms on the pump discharges so
15 that the operator would be alerted to an unsafe condition
16 and have to shut off those aux feedwater pumps.

17 MR. TURK: Can he do that in sufficient time to prevent
18 damaging the pumps?

19 MR. KEITH: On the turbine-driven pumps, we do have a
20 feature that prevents it from overspeeding and reaching a
21 runout condition, so that is taken care of on the turbine-
22 driven pump. On the motor-driven pump, though, in the event
23 you get into this kind of condition, you would be relying on
24 the operator when he sees this low pressure alarm to stop
25 that pump. It is not that it is going to be damaged in two



1 minutes or anything, but you can't let it run for an extended
2 period.

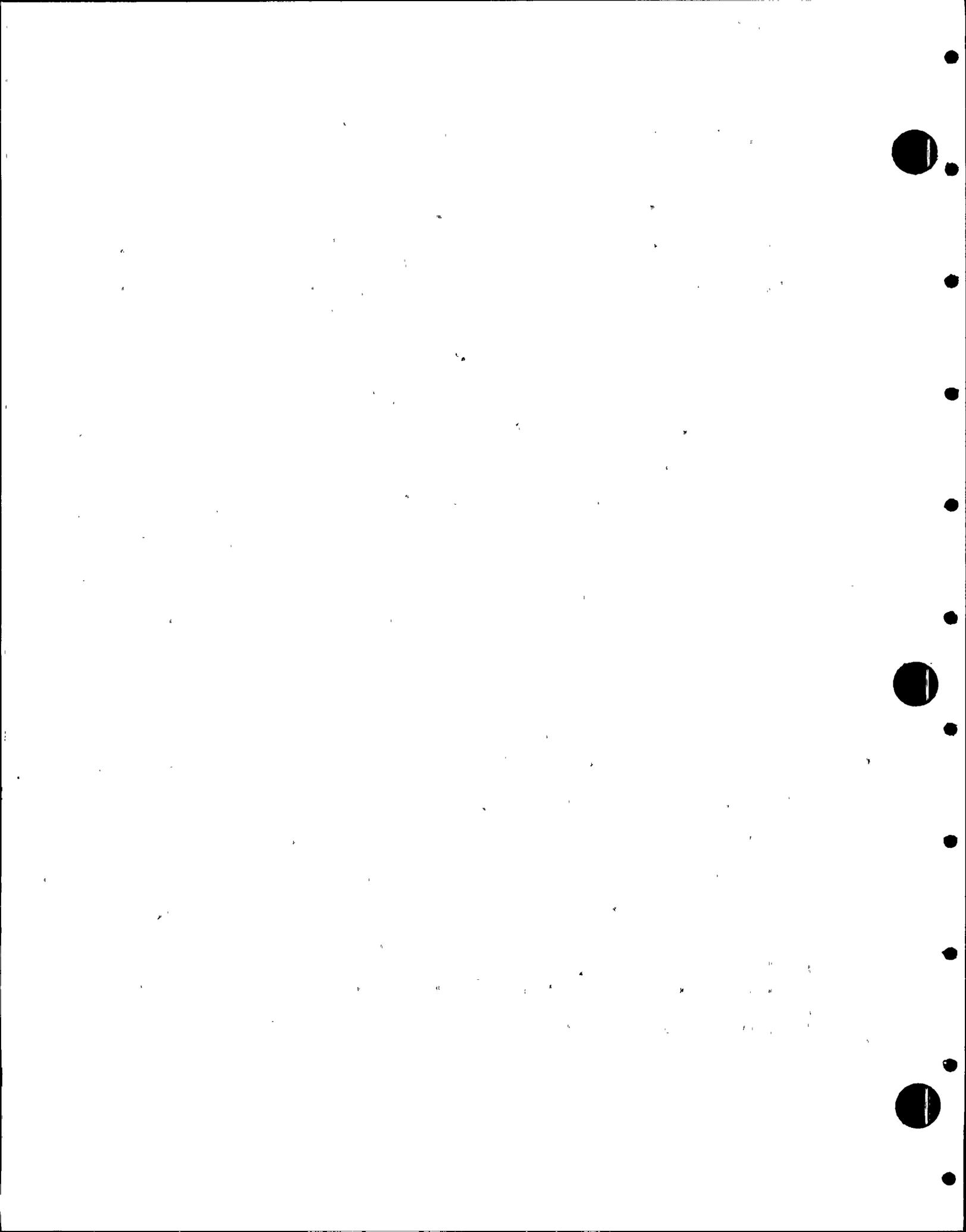
3 MR. VAN BRUNT: Jerry, did you have a question.

4 MR. WERMIEL: Yes. I would like to get back to water-
5 hammer. There is the general requirement there that a water-
6 hammer be prevented. I would like to know how you have
7 assured yourself that your design does do this. In other
8 words, we have required in the past tests of all the pressur-
9 ized water reactor plants. Are you going to commit to do a
10 waterhammer test to verify this criterion? If so, will you
11 use one or both steam generators and at what time and
12 precisely how will the test be conducted, this kind of thing.

13 MR. PARR: How will you select which steam generator
14 you are going to use? If you go with one steam generator,
15 how will you select that one, which one of the two?

16 MR. WERMIEL: Have you thought about a test at this
17 point? It may be premature.

18 MR. BINGHAM: Jerry, I don't know of any commitment
19 that we have made to run that particular test. There are
20 requirements in our test specifications that we will take a
21 look at and can advise the board on where we stand. Generally
22 on some of these small lines, we have not done any more than
23 do the analysis and checked the analyses from other plants
24 where perhaps there may have been a concern that occurs.
25 Analytically, there are a lot of tests that we do run where we



1 can't make those particular comparisons. I wasn't aware that
2 NRC is looking at other plants that are running these
3 particular tests and I think perhaps that would be informative
4 to us, Ed, if we could be made aware of what is going on.

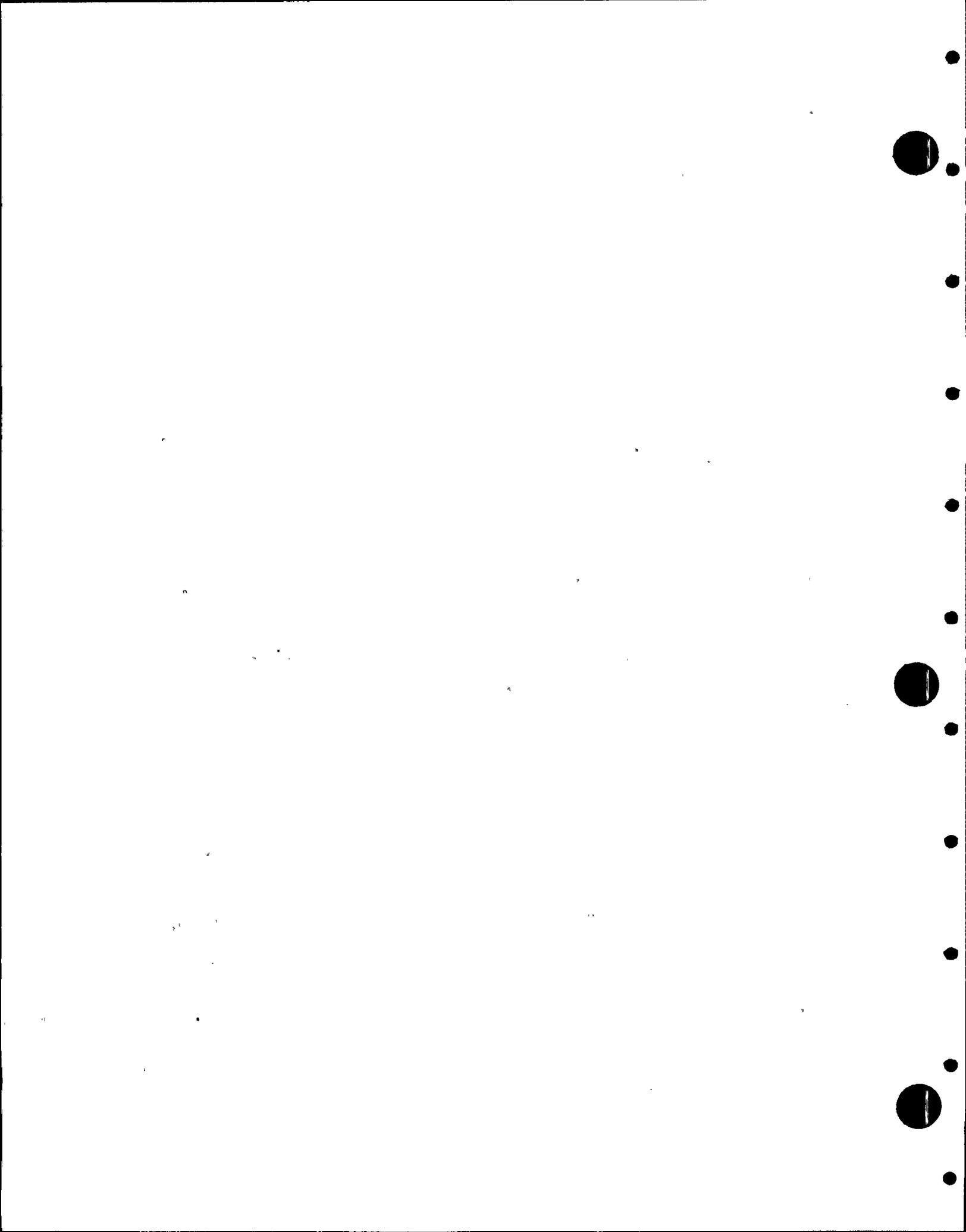
5 MR. WERMIEL: We can tell you all you need to know.

6 MR. PARR: All the plants that are starting up
7 presently are running the tests.

8 MR. WERMIEL: The thing I think that comes to mind
9 right away is I believe this is the first steam generator
10 of its type that will come into operation and, therefore,
11 there may be unique design features one way or the other for
12 mitigating, or something we hadn't thought of that may cause
13 a waterhammer, which is. I think one of the particular
14 reasons why something should be included in either the startup
15 test program or hot functional testing something like that.
16 To identify the potential for waterhammer is going to be a
17 very important thing for us to look at, I believe.

18 MR. VAN BRUNT: Bill, would you put on the list of
19 items or questions that as an open item, Bechtel will respond
20 as to how we plan to demonstrate that the system is adequately
21 designed to accept waterhammer situations.

22 MR. ALLEN: Ed, I would like to add one thing.
23 NUREG 0635 has a recommendation in it or something like that
24 where they want to find out if we plan to throttle back on
25 the valves to avoid waterhammer, so I think we should put that



1 on the same criteria and verify that they don't intend to
2 throttle back to prevent waterhammer.

3 MR. VAN BRUNT: Bill, will you add that to the list?

4 MR. BINGHAM: We could add the information then from
5 Olan.

6 MR. VAN BRUNT: Yes. Olan, if we could, we would ask
7 you to provide us with anything specific in this area that
8 you have been applying in some of the recent plants.

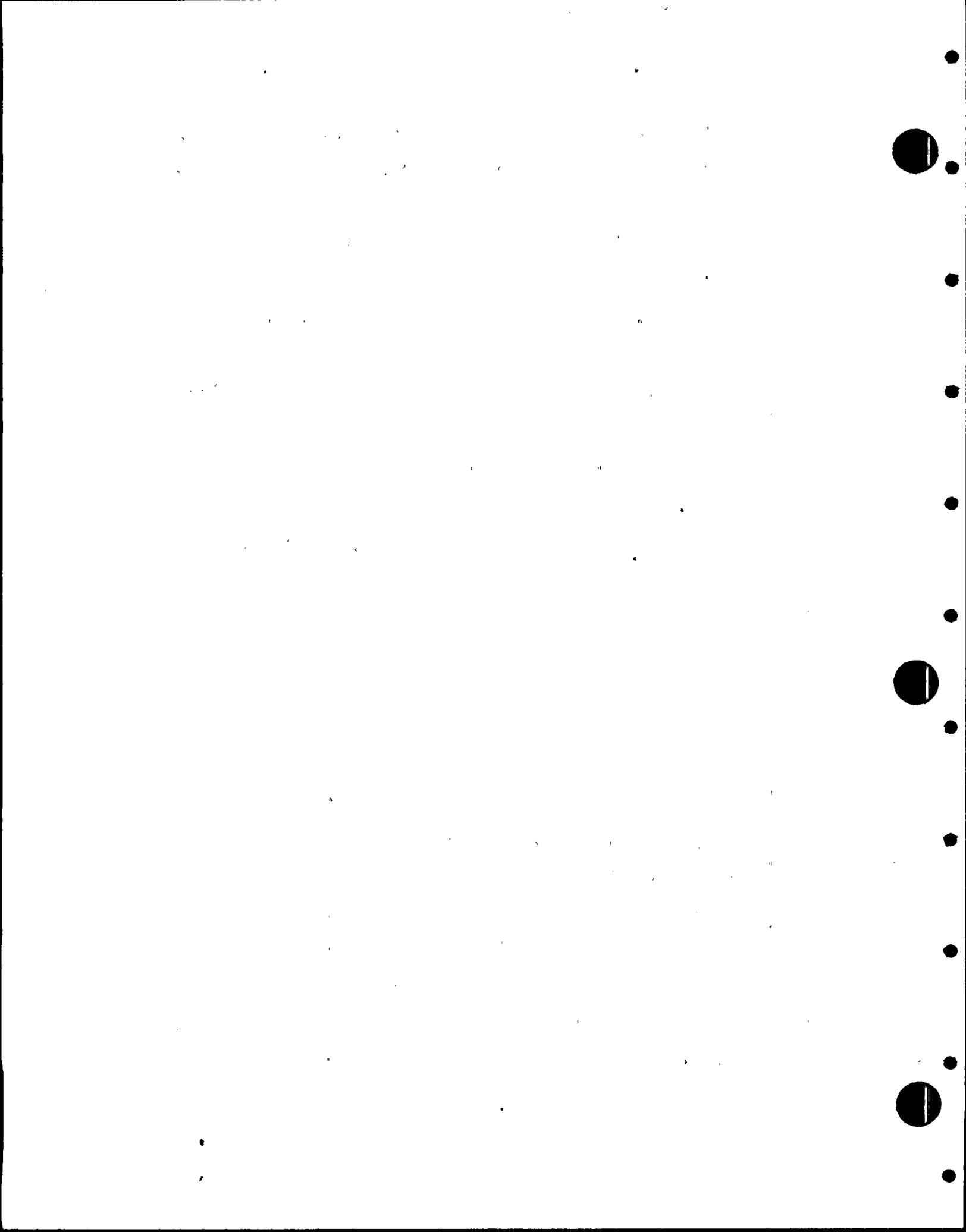
9 MR. BINGHAM: And some of the things learned. I think
10 that is the important thing.

11 MR. VAN BRUNT: Mike, you had some questions?

12 MR. HODGE: Bill, I have a question as far as the
13 applicability of some of the standards. You indicated that
14 the plant is designed at HIS standards, the design of this
15 particular system, and I looked at a few of the isometrics
16 and there is a reducer which goes into the suction pipes and
17 the HIS standard recommends that when you use a reducer going
18 into the suction that you use an eccentric reducer with a
19 flat top on it to prevent air entrainment and such into the
20 pump. This particular design has switched the reducer so
21 that the flat part is on the bottom. Do you have any reasons
22 or any decisions why you decided to go that way?

23 MR. BINGHAM: Yes, I think we can respond to that.

24 MR. KEITH: Our design guide calls for it to be
25 installed in the way which it is, and we understand that
the latest version of the HIS standard differentiates on



1 whether the pipe is coming up to the pump or down to the pump.
2 Let's say this particular pipe is coming down to the pump and
3 the reducer is oriented in the correct direction for that
4 by the latest version of the HIS standards.

5 MR. BINGHAM: Any other questions on that?

6 MR. ROGERS: I would like to proceed on that line.
7 If the reducer is oriented with the eccentricity towards the
8 top, the flat toward the bottom, will this get you into a
9 condition where air or steam could collect in that upper
10 level and provide an inhibit to pump suction?

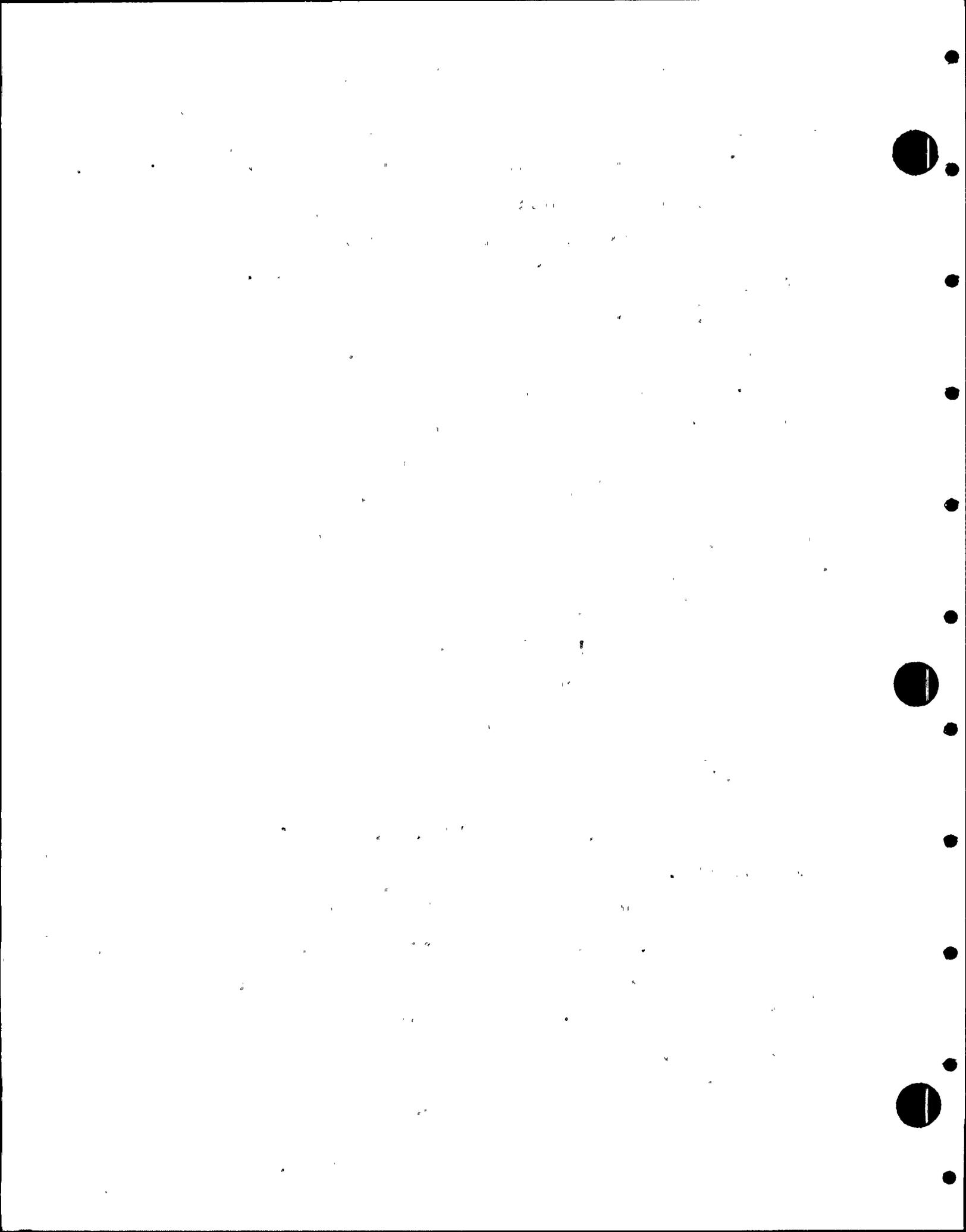
11 MR. KEITH: No, I think with the pipe coming down,
12 you have a vent path for any possible gas that might collect
13 there.

14 MR. VAN BRUNT: Dennis, if I understand you correctly,
15 you indicated that the latest edition of the Hydraulic
16 Institute Standards allows this type of installation to this
17 particular situation. I think in light of that that I would
18 ask that we just verify that that is the case.

19 MR. KEITH: Fine.

20 MR. HODGE: I would like to see, if we could, the
21 standard.

22 MR. ROGERS: I would like to continue on a little bit
23 further on that. Were you aware of a problem that occurred
24 on Arkansas 2, which is a CE-Bechtel plant, which is a case
25 where the emergency feedwater pumps lost suction due to high



1 temperature water being brought into the suction side of the
2 feed pumps? This is an incident that occurred on April 7,
3 1980. I don't think it is an I&E Bulletin, but it is --

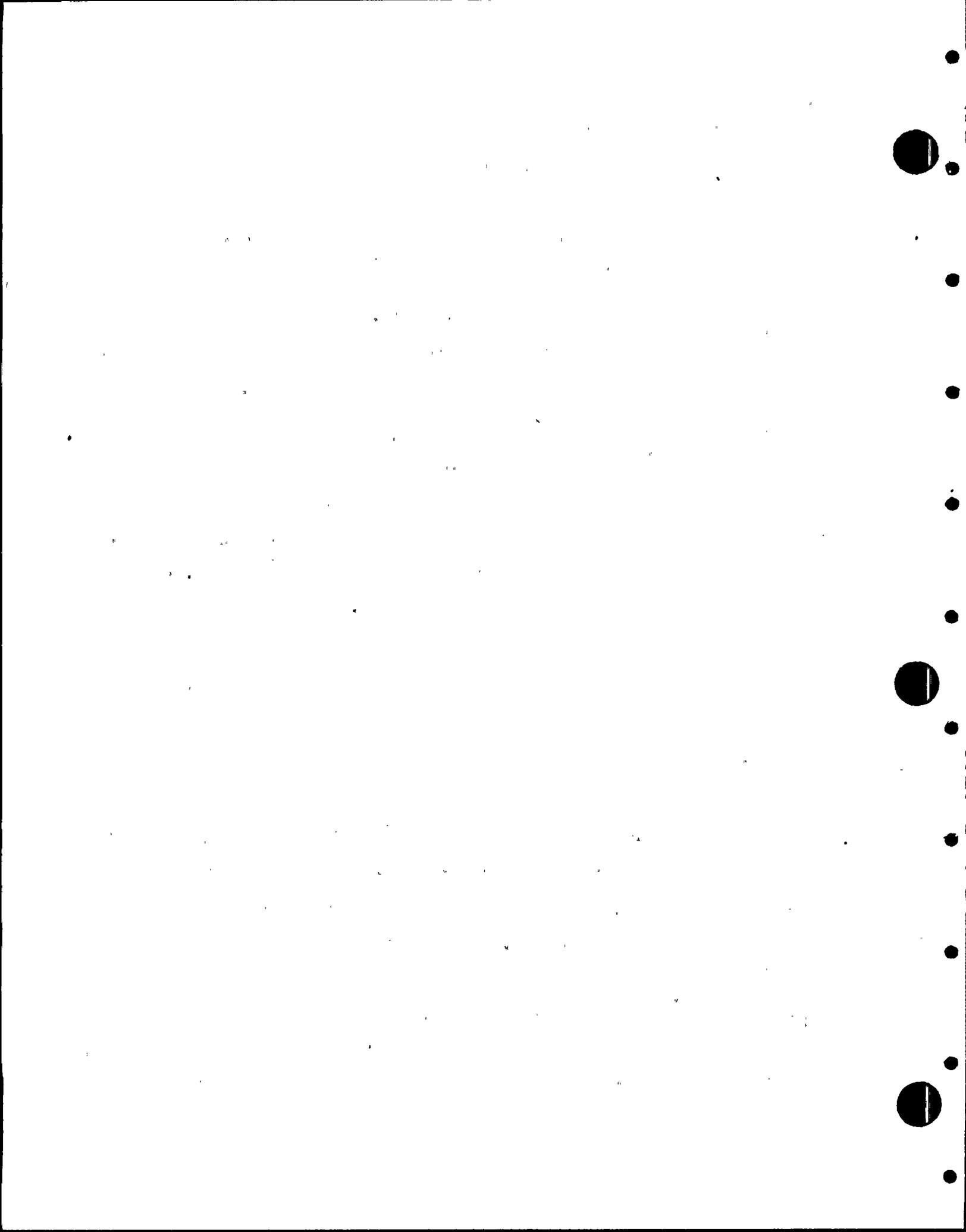
4 MR. VAN BRUNT: It is an LER that has come out
5 recently.

6 MR. KEITH: We are aware of that. The only suctions
7 that we take on our aux feedwater pumps are from the conden-
8 sate tank or from the reactor makeup water tank, and both of
9 those tanks are sufficiently low in temperature that we don't
10 think there is any problem.

11 MR. VAN BRUNT: Dennis, let me just pursue that for a
12 second. You indicate that the tanks are sufficiently low in
13 temperature. Those tanks are out of doors. It does get warm
14 here in the summertime, 120 degrees sometimes, particularly
15 out at that site. Is there any particular protection provided
16 to the tanks or insulation or have you done some computation
17 on heat-up of the water to assure that the 180-degree limit
18 that has been set will in fact be met?

19 MR. KEITH: Yes, we have taken a look at it analytically,
20 Ed. At this time, let me just describe -- we are getting a
21 little bit ahead of ourselves. The condensate storage tank
22 is a concrete tank with a stainless steel liner. It has a
23 steel top, but the top has insulation. The concrete as I
24 recall is about a foot thick.

25 MR. VAN BRUNT: The concrete is there for tornado



1 protection probably.

2 MR. KEITH: Correct. That is for the tornado
3 protection.

4 MR. HODGE: I would like to ask just one last question.
5 How are we verifying or how do we prevent valves from getting
6 closed in our suction line? I notice that we have several
7 valves that go between the pump and the condensate tank.

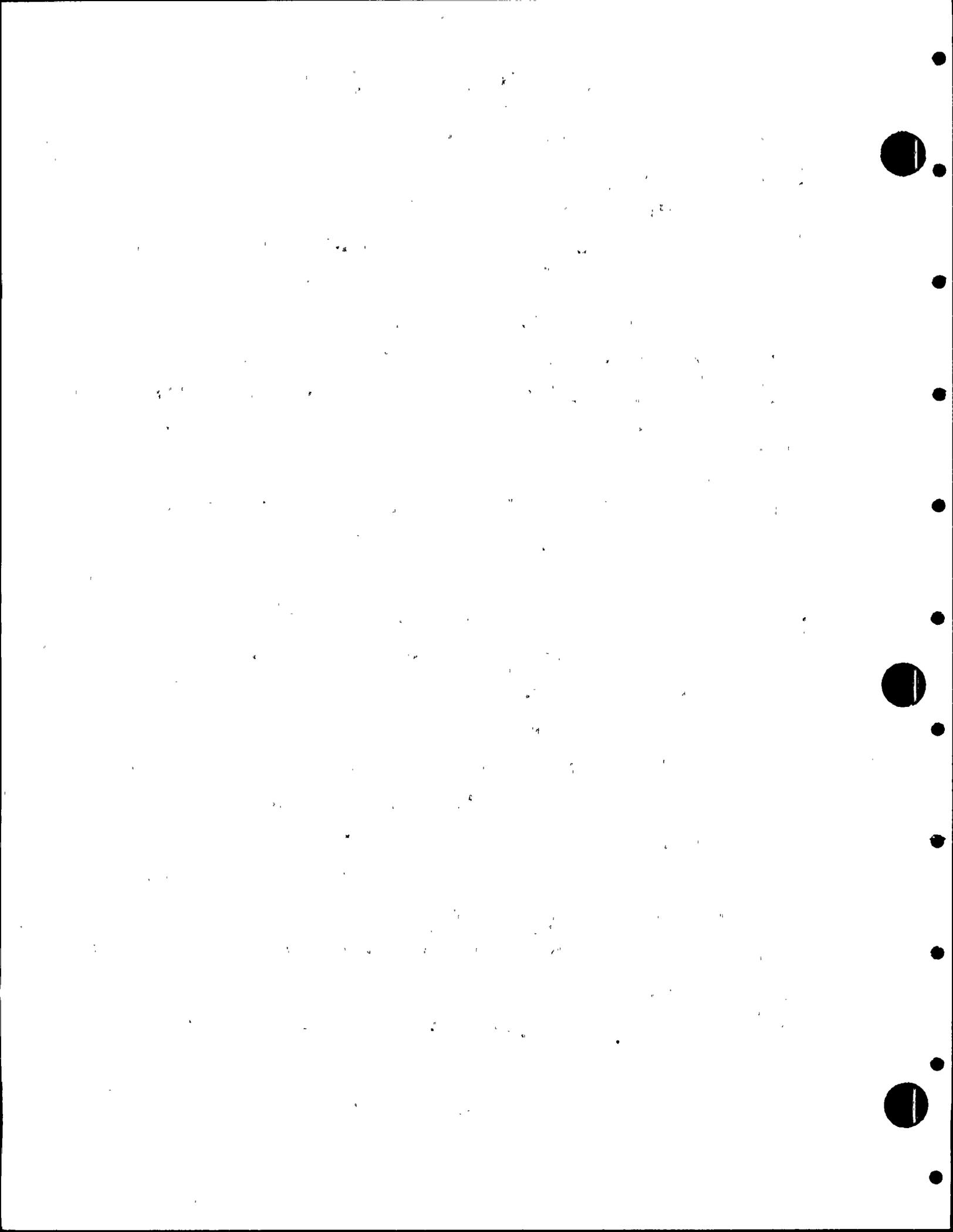
8 MR. KEITH: Those valves are locked open. There will
9 probably be a technical specification to check those on a
10 periodic basis.

11 MR. ROGERS: You said that that tank has a nitrogen
12 overpressure in it. You've got 180-degree water or it could
13 get up to that temperature. At least your criteria indicates
14 that you don't keep it any lower than that. Since this is
15 not an open vented tank, could you pull a vacuum in the tank
16 and therefore get some sort of water vapor formed in the
17 suction of the pump?

18 MR. KEITH: We have looked at both the possibility of
19 a vacuum and a pressure building up in that tank due to the
20 temperature changes and have determined that the design is
21 satisfactory. That is one of the reasons for providing the
22 insulation in the top of the tank.

23 MR. ROGERS: Do you have vacuum breakers or that type
24 of thing?

25 MR. KEITH: Yes, we do have vacuum breakers on that



1 tank.

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

3 MR. PHELPS: I had a couple of questions. Some of
4 them you might want to save until a little bit later. I
5 couldn't tell from reading your handout whether any of the
6 valves in your auxiliary feedwater system received main steam
7 isolation signals. Do they?

8 MR. KEITH: No.

9 MR. PHELPS: Let me ask a hypothetical question, then.
10 If they don't, how do you prevent continuing to feed a
11 ruptured steam generator if you have a steam line break at
12 zero power condition? Presumably you are on your nonsafety-
13 related motor pump.

14 MR. KEITH: Yes.

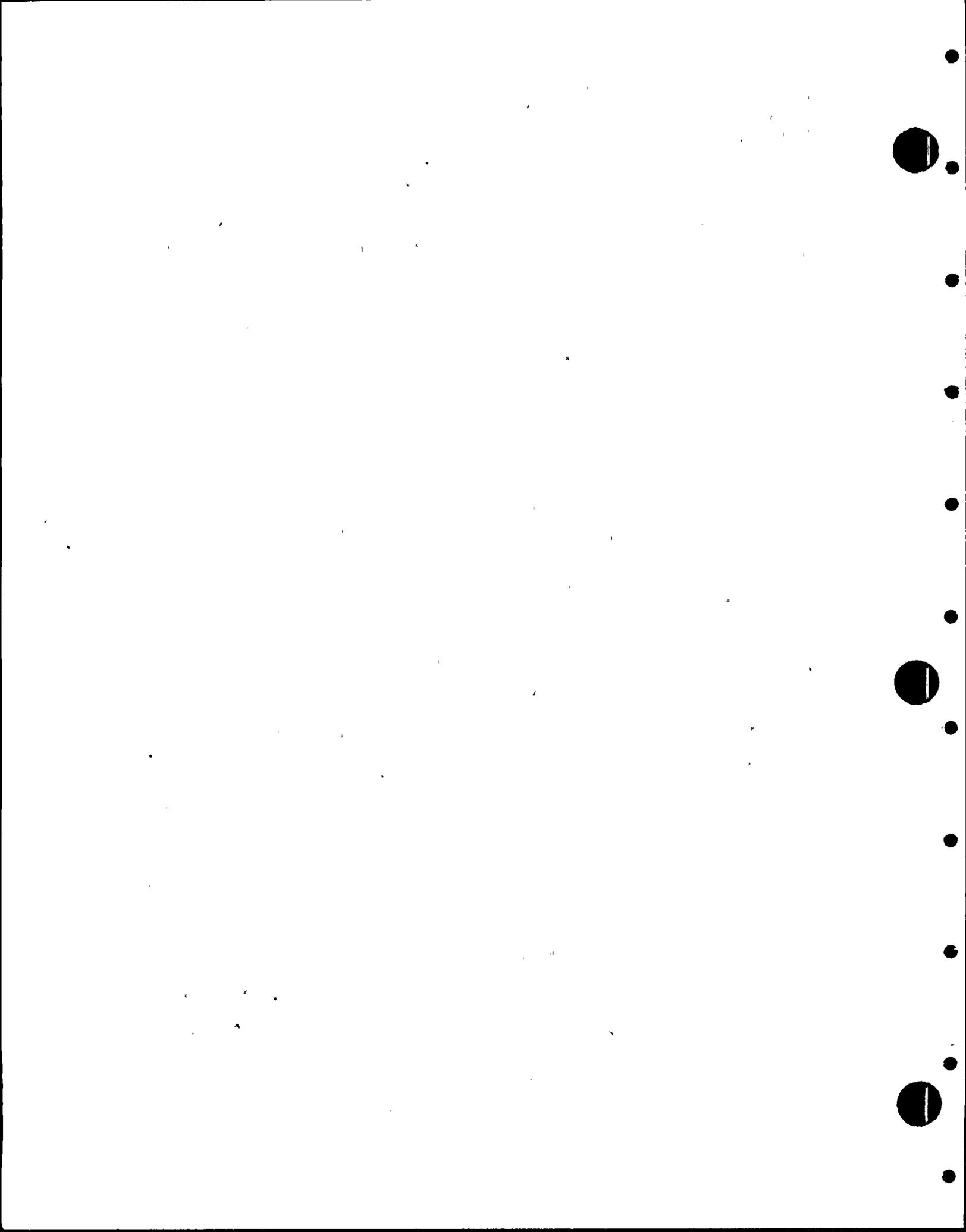
15 MR. BINGHAM: Ed, I believe we have the answer, but
16 we would like to have a few minutes time maybe at the break
17 to go through that particular scenario and we will answer
18 that.

19 MR. VAN BRUNT: We will defer the answer to this
20 question until after the lunch break. Okay, Ralph?

21 MR. PHELPS: Yes. I have one more question, if I
22 could.

23 MR. VAN BRUNT: Go ahead.

24 MR. PHELPS: Does your Seismic Category II exclude
25 Seismic Category IX in all cases unless specifically stated?



1 MR. KEITH: Generally, anything that is Seismic
2 Category IX is also Seismic Category II. You are asking the
3 opposite of that.

4 MR. PHELPS: Yes.

5 MR. KEITH: No. The converse is not true, that any-
6 thing that is Seismic Category II is Seismic Category IX.
7 That is not true, and we would have to just answer for specific
8 pieces of equipment.

9 MR. PHELPS: Let me ask you a specific question. On
10 the suction line from the startup feed pump, the nonsafety
11 pump, you have categorized that as Seismic Category II. That
12 is the line with the two motor valves in it. If you had a
13 design basis event, what would prevent that line from
14 rupturing and causing a leak at the tank?

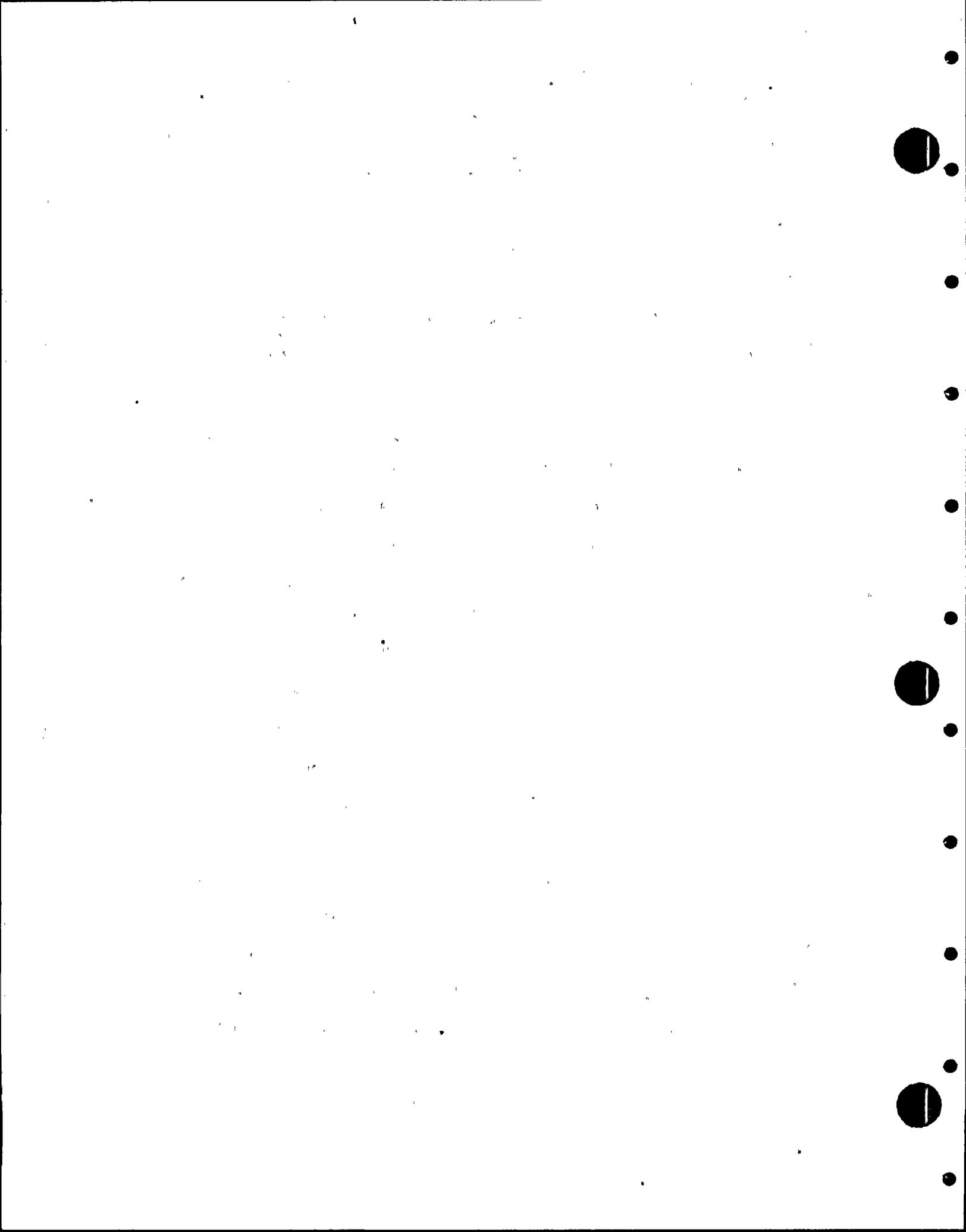
15 MR. KEITH: I wasn't complete in my description. You
16 are getting a little bit ahead of me. This line from here
17 (indicating) to this valve (indicating) is Section III, so
18 that is how we take care of that, and Seismic Category I.

19 MR. VAN BRUNT: Are you finished, Ralph?

20 MR. PHELPS: Yes, I am.

21 MR. VAN BRUNT: Olan, I think you had a question.

22 MR. PARR: You spoke that the Tech Specs will allow
23 72 hours for a particular component to be out, and I am
24 thinking particularly of the turbine-driven pump. The electric-
25 driven pump is off of one diesel. Now they have a 72-hour
time out, is that right?



1 MR. KEITH: I believe the 72 hours is kind of going
2 through the -- I believe you're correct.

3 MR. PARR: Might I then conclude that if you took a
4 specific 72 hours, both the turbine-driven pump and the diesel
5 could be out?

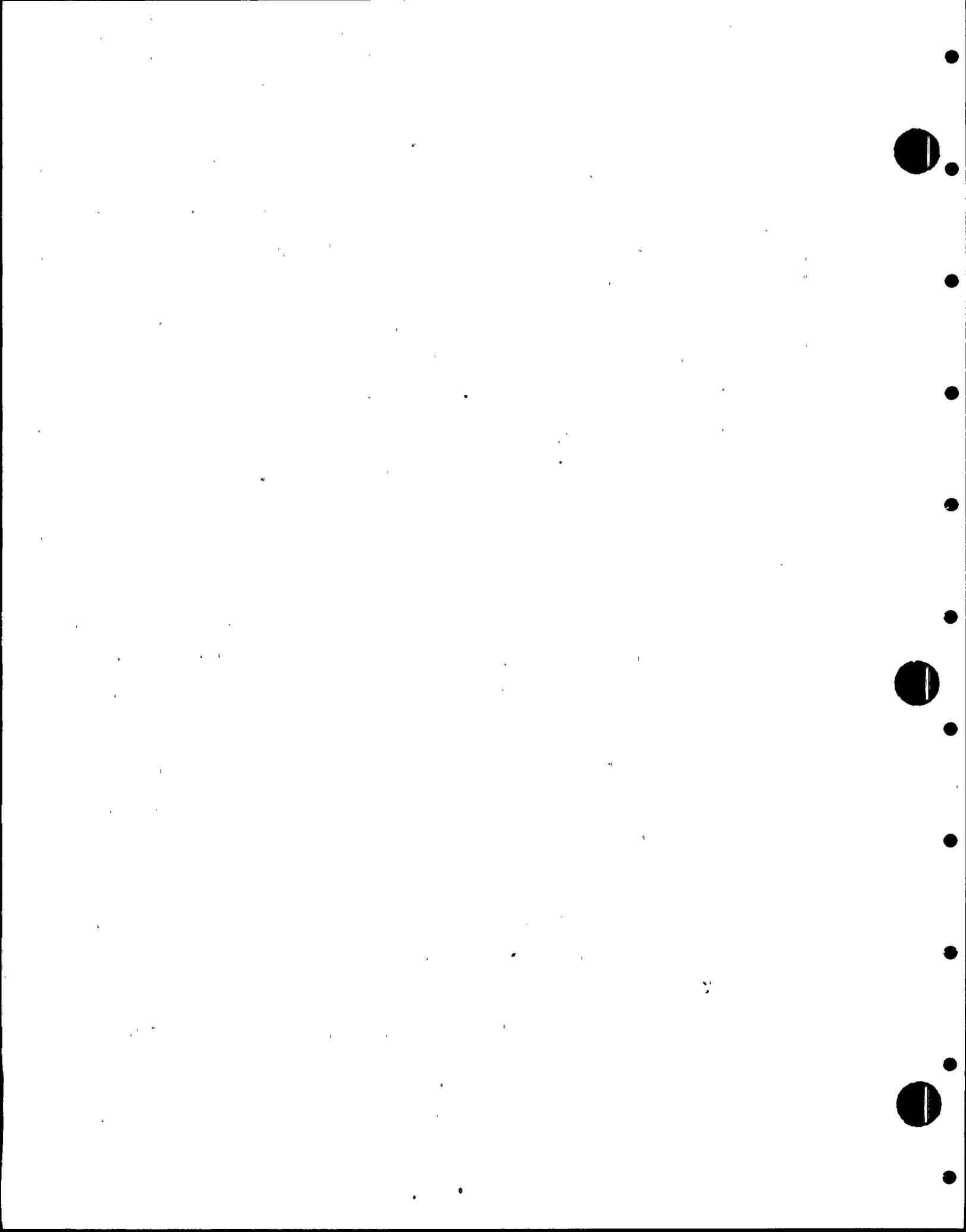
6 MR. KEITH: If your Tech Specs weren't written
7 correctly, I guess that would be possible.

8 MR. PARR: My question then is how will you take care
9 of this in the Tech Specs?

10 MR. KEITH: Well, the Tech Specs will state -- No, I
11 take it back. Let me scratch what I said earlier about them
12 not being written correctly, because the Tech Specs will state
13 that you can only have one aux feedwater pump down. Then it
14 is a matter of interpretation on whether if the Train B
15 diesel, which is the diesel feeding our motor-driven emergency
16 feedwater pump, then it is a matter of interpretation on
17 whether you would consider with the diesel out whether that
18 would mean the aux feedwater pump out, because if you didn't
19 lose offsite power, obviously that aux feedwater pump would be
20 available.

21 MR. VAN BRUNT: I guess I would like to have an item
22 put on that we assure that the Tech Specs will be properly
23 written so they are clear and understandable to deal with the
24 problem that Olan has raised.

25 MR. WERMIEL: I realize that this may not be the

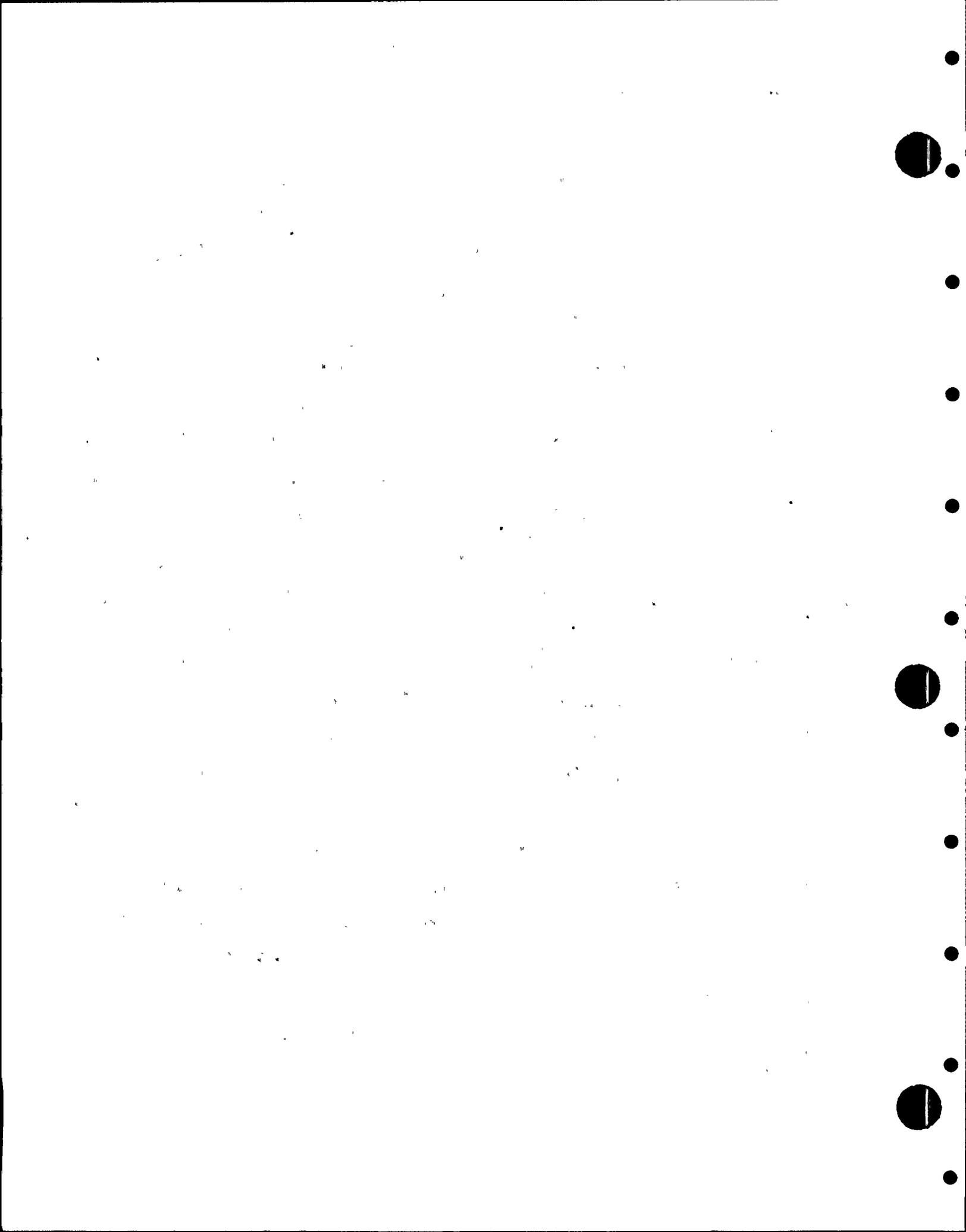


1 appropriate time to bring up Tech Specs in general, but we
2 do have a concern about the Tech Specs for the auxiliary
3 feedwater system, the general presentation I think of the
4 Tech Spec which relates to other Tech Specs, and I don't
5 know if you are going to dwell on it later or whether I
6 should do it now.

7 MR. BINGHAM: Why don't you indicate your concerns and
8 then we can --

9 MR. WERMIEL: Since this review in general here today
10 is concerned with the auxiliary feedwater system, I thought
11 I would look at the Tech Specs in Chapter 16 of the FSAR.
12 What you have done in there is to make a statement for the
13 aux feedwater system that I refer to CESSAR Chapter 16 and
14 appropriate Tech Spec. We have had discussions in house at
15 NRC about this and we have been informed that if this
16 reference is only meant to indicate a general idea of what
17 the Tech Spec will eventually look like, it is fine as shown,
18 but eventually Chapter 16 and specifically the license for
19 Palo Verde will have to have unique Palo Verde generated
20 Tech Specs with no cross-reference to CESSAR. We, of course,
21 are unsure how you are going to do it and I guess it hasn't
22 been done, but the way of presenting it here we don't think is
23 going to be acceptable as far as a license Tech Spec document
24 goes.

25 MR. BINGHAM: Can you indicate a couple of areas where



1 it would need enhancement to be acceptable.

2 MR. PARR: That is not the question. What we are
3 saying is we are taking your cross-reference to CESSAR as
4 guidance, that your Palo Verde Tech Spec will be complete
5 and it will look like what we found in CESSAR here.

6 MR. BINGHAM: Okay, specific for Palo Verde.

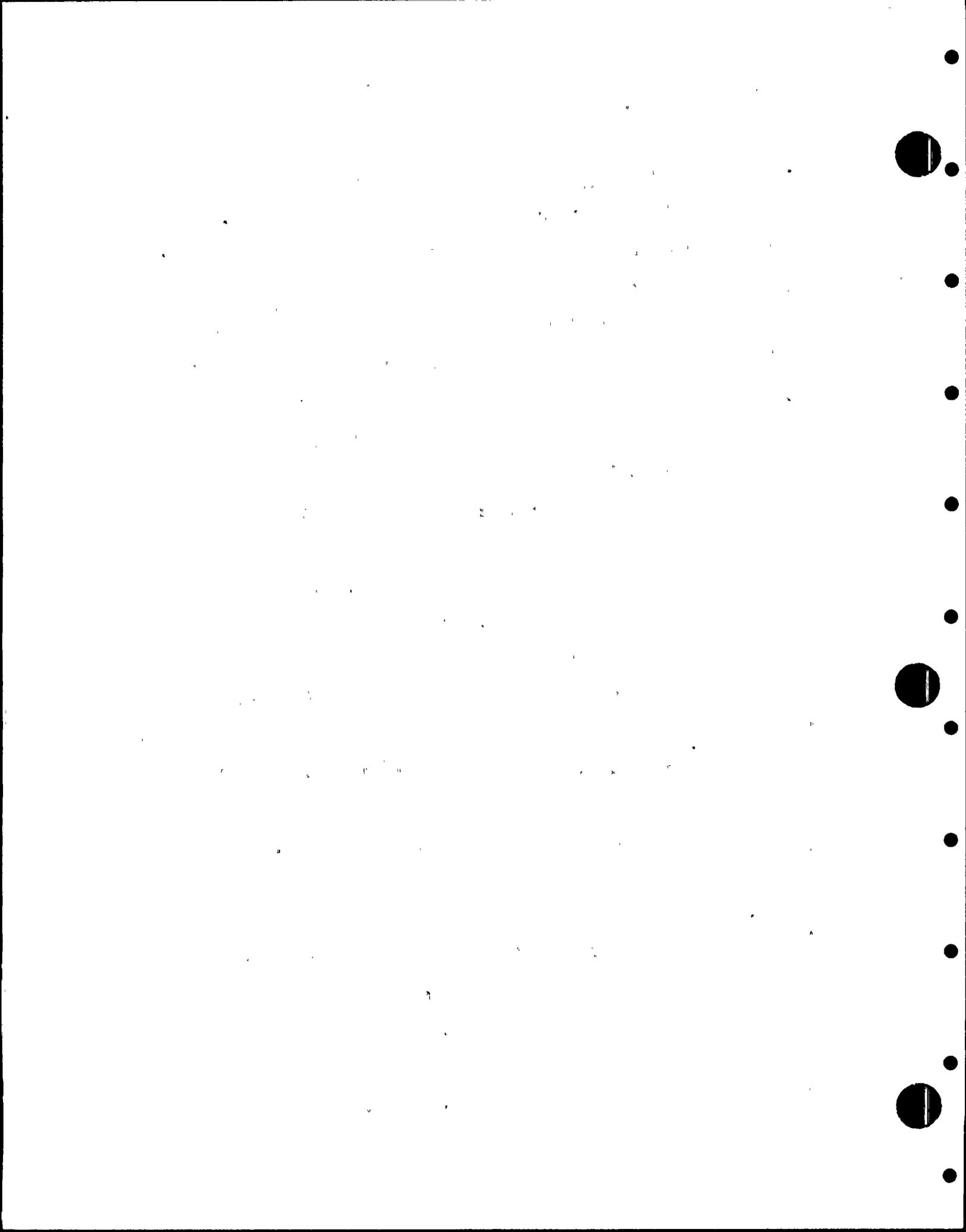
7 MR. PARR: Specific for Palo Verde. The cross-
8 reference would not be acceptable in that type of thing.

9 MR. VAN BRUNT: Let me again suggest that on your list
10 of items, Bill, we put an item that we will clarify how the --
11 I guess I would call them representative Tech Specs or Tech
12 Spec requirements that are presented in CESSAR will be
13 ultimately promulgated as Tech Specs for Palo Verde and we
14 will respond to that as a specific item.

15 Dale, you had a question?

16 MR. THORNBURG: Yes. This question relates to Exhibit
17 1A-7 and 9 to some degree. Would you discuss the methods,
18 procedures, assumptions that you used to develop the 875 gallon
19 per minute flow rate for the pump, 75 degrees per hour cooldown
20 rate on the steam generator for eight hours, and the determina-
21 tion of the 300,000 gallon requirement in the condensate
22 storage tank.

23 MR. BINGHAM: Before Dennis answers that, I would like
24 to make one statement that from our perspective that is
25 input that is provided to us by Combustion interface and they



1 are responsible for it. However, as general information and
2 from our reviews with Combustion, we can at least cover this
3 general form if you would like.

4 MR. VAN BRUNT: I guess I would also like to say, Dale,
5 that as a part of the commission's review of CESSAR and the
6 preparation by Combustion of CESSAR to develop these inter-
7 faces, the specific mechanisms that are involved in developing
8 these numbers are covered there.

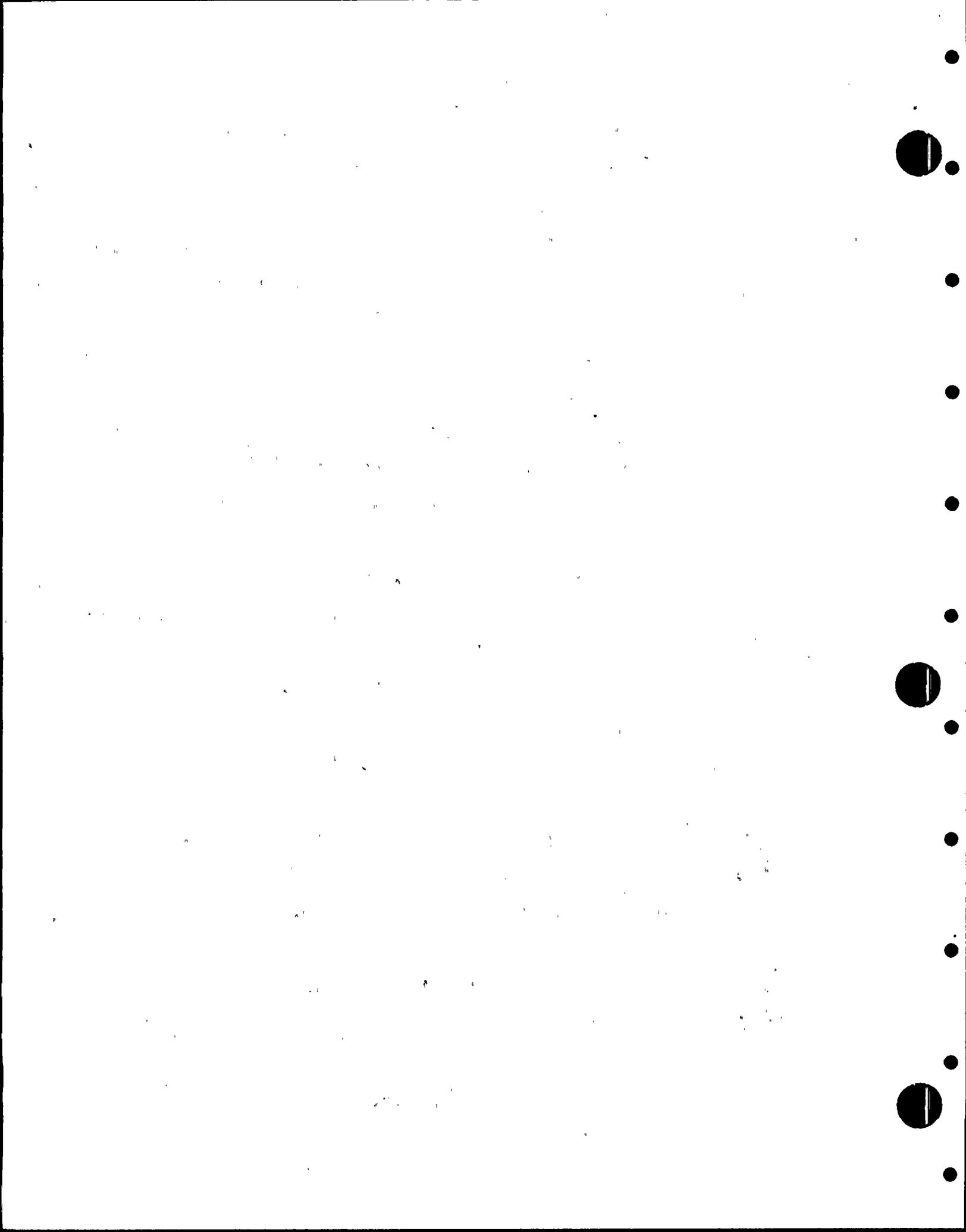
9 Mike, why don't you let Bill go ahead and outline
10 it and then if you don't agree, you can comment on it.

11 MR. KEITH: The 875 gallons per minute is what is
12 required. It corresponds to a 5% reactor power level. The
13 decay heat on the reactor following a shutdown for accident
14 or for normal conditions is decreasing with time and the
15 5% corresponds to a period very shortly after shutdown and
16 the requirement actually drops off as you go out in time.
17 The 75 degrees per hour cooldown is a limitation such that you
18 don't introduce stresses to the reactor vessel. So we are
19 limited to not cooling down any more than 75 degrees per hour.

20 MR. THORNBURG: How do you know that this is occurring'
21 or not?

22 MR. KEITH: By the reactor coolant loop temperature
23 indication that we have.

24 MR. THORNBURG: Then the determination of the quantity
25 in the condensate storage tank, there is a hiatus in your



1 Exhibit 9 and your Exhibit 2. One shows 300,000, the other
2 330,000.

3 MR. KEITH: We put in a 10% margin. Three hundred
4 thousand gallons is the Combustion Engineering number and we
5 put in a 10% margin.

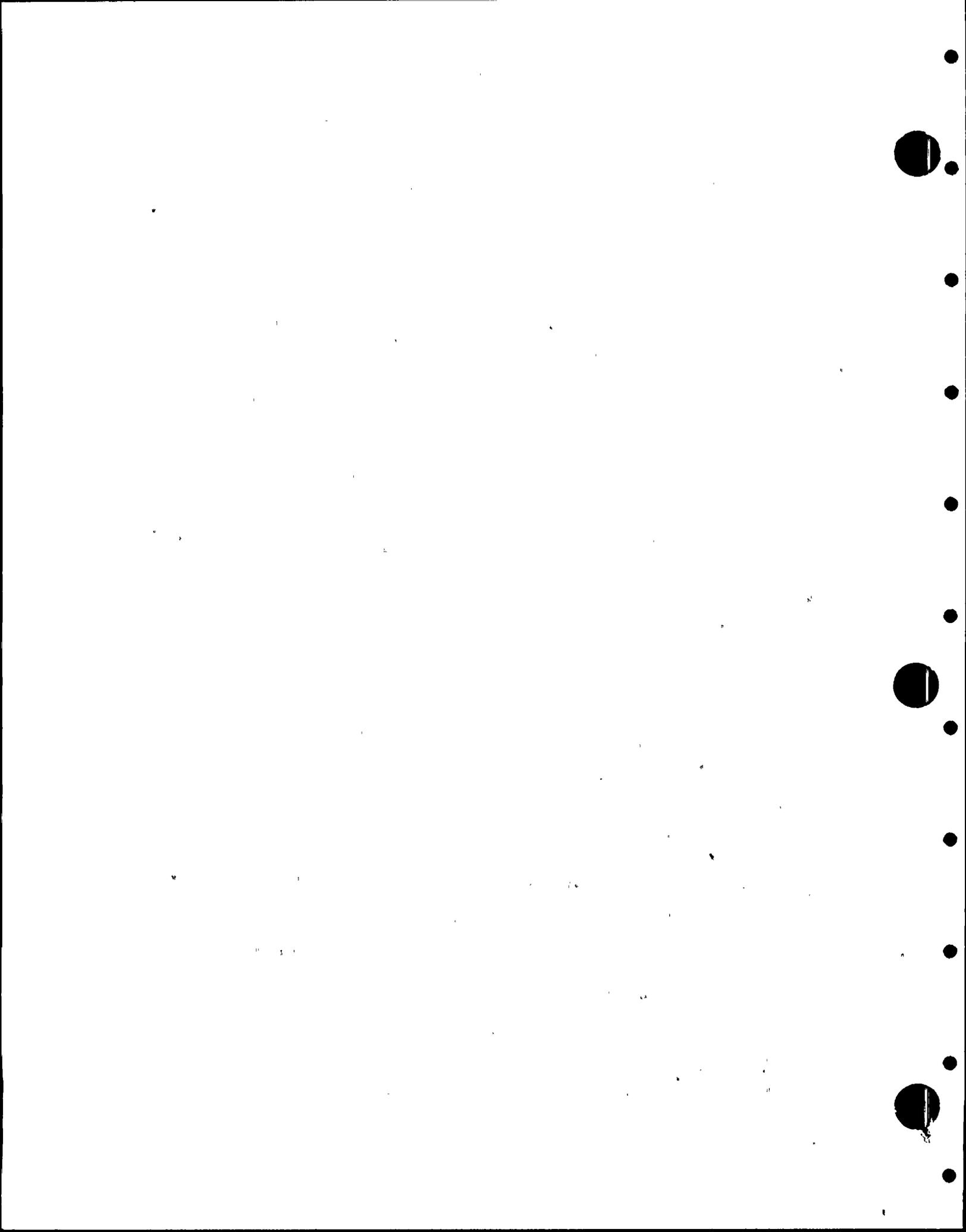
6 MR. VAN BRUNT: Angie, you had a question?

7 MR. ORTIZ: Yes. On your Exhibit 1A-9, No. 21), has
8 a transient analysis been conducted of the aux feedwater
9 system?

10 MR. KEITH: That is in process right now, that analysis.
11 Of course, we will be looking into that aspect.

12 MR. ORTIZ: On the same exhibit, No. 24), the capacity
13 of the condensate storage tank, I notice in your diagram that
14 you have the takeoff for the startup pump above the 300,000
15 storage capacity. Bill stated that you are considering
16 perhaps a fourth train, and I believe he also stated or I
17 have heard that one of the means of accomplishing the intent
18 without having to put a fourth train was with the use of a
19 startup pump, so my question is if that is your present
20 thinking, shouldn't you take the suction to that pump from
21 the bottom of the tank as you do with the emergency pumps?

22 MR. KEITH: Yes, we agree with you completely. Figure
23 2 is schematic and it is in error. The suction line to the
24 startup auxiliary feedwater pump does come off the bottom of
25 the tank, so it does have the 300,000 gallons available.



1 MR. ORTIZ: The condensate lines leading from the
2 condensate storage tank to the pumps, are they also Seismic
3 Category I and missile protected?

4 MR. KEITH: Yes, the lines to the two emergency pumps
5 are Seismic Category I and missile protected. This line
6 (indicating) is missile protected and Seismic Category I.
7 This (indicating) is the line to the startup pumps to this
8 point, to the second suction isolation valve is Seismic
9 Category I and missile protected.

10 MR. ORTIZ: How do you accomplish the missile protec-
11 tion on portions of those lines which are running in the yard?

12 MR. KEITH: They are in a pipe tunnel which provides
13 that protection.

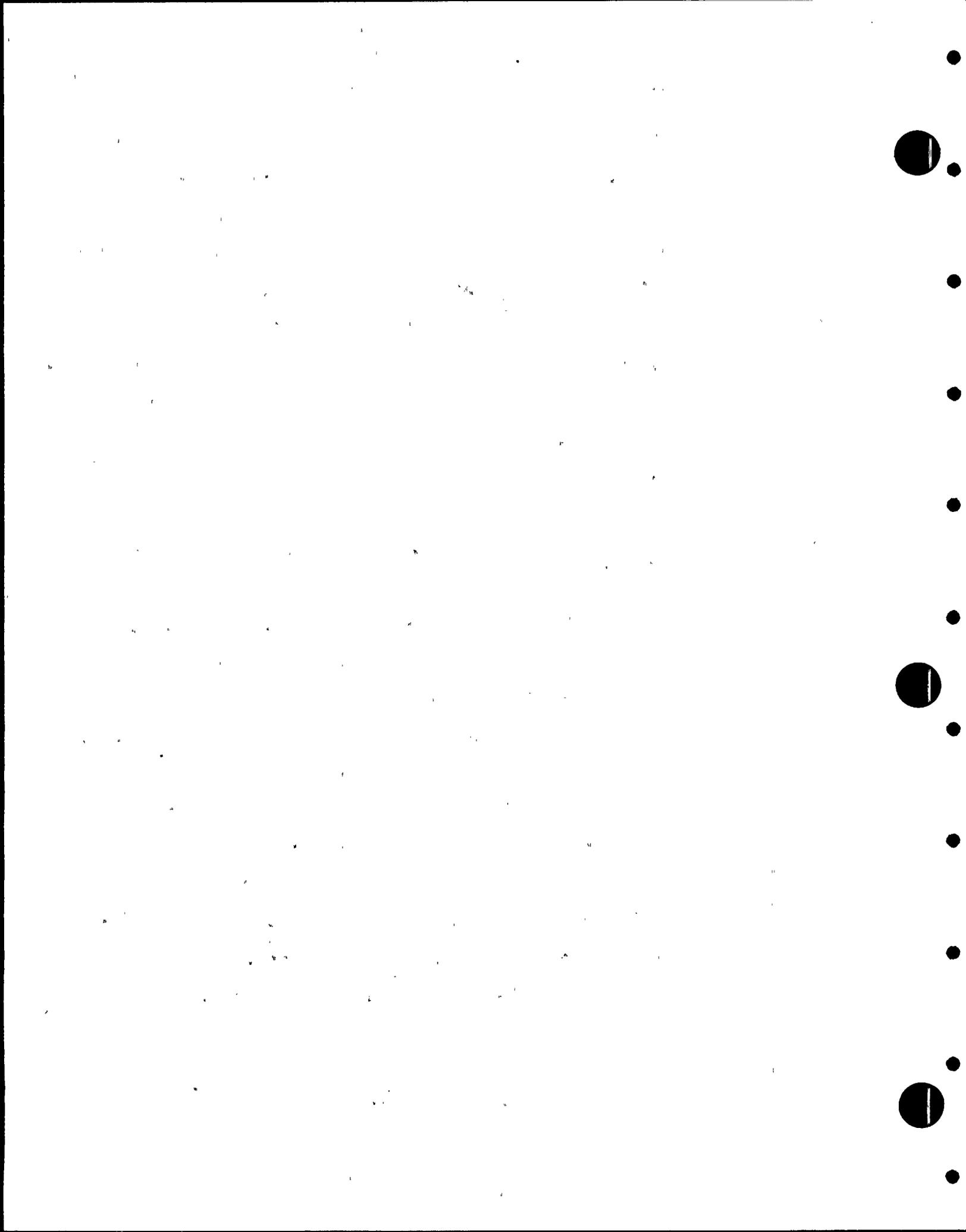
14 MR. VAN BRUNT: Do you have any other questions, Angie?

15 MR. ORTIZ: Yes, a couple more questions, Ed.

16 MR. VAN BRUNT: Go ahead.

17 MR. ORTIZ: Obviously you have postulated main steam
18 line breaks and main feedwater line breaks in the pipe support
19 structure. Have you documented analysis that such breaks
20 will not affect the aux feedwater system piping?

21 MR. BINGHAM: Ed, several of these questions are
22 getting substantially ahead of our presentation and I wonder
23 if it wouldn't be good to let us go through the operation and
24 the layout portion of part one and then entertain the
25 questions at that time.



1 MR. VAN BRUNT: Bill, I think that is your prerogative
2 to indicate to Angie that you are going to cover that area
3 or you will cover it later in the presentation with some
4 additional information that you have. I think it is kind of
5 hard for the board to deal with whether it is going to come
6 later or not. You can only tell us that. So if you run into
7 that situation, just put the question off and we will make
8 note of it and be sure that we cover it later.

9 MR. BINGHAM: That one falls in that category, Angie.

10 MR. VAN BRUNT: Angie, do you have any other items?

11 MR. ORTIZ: I don't have any other items.

12 MR. VAN BRUNT: John.

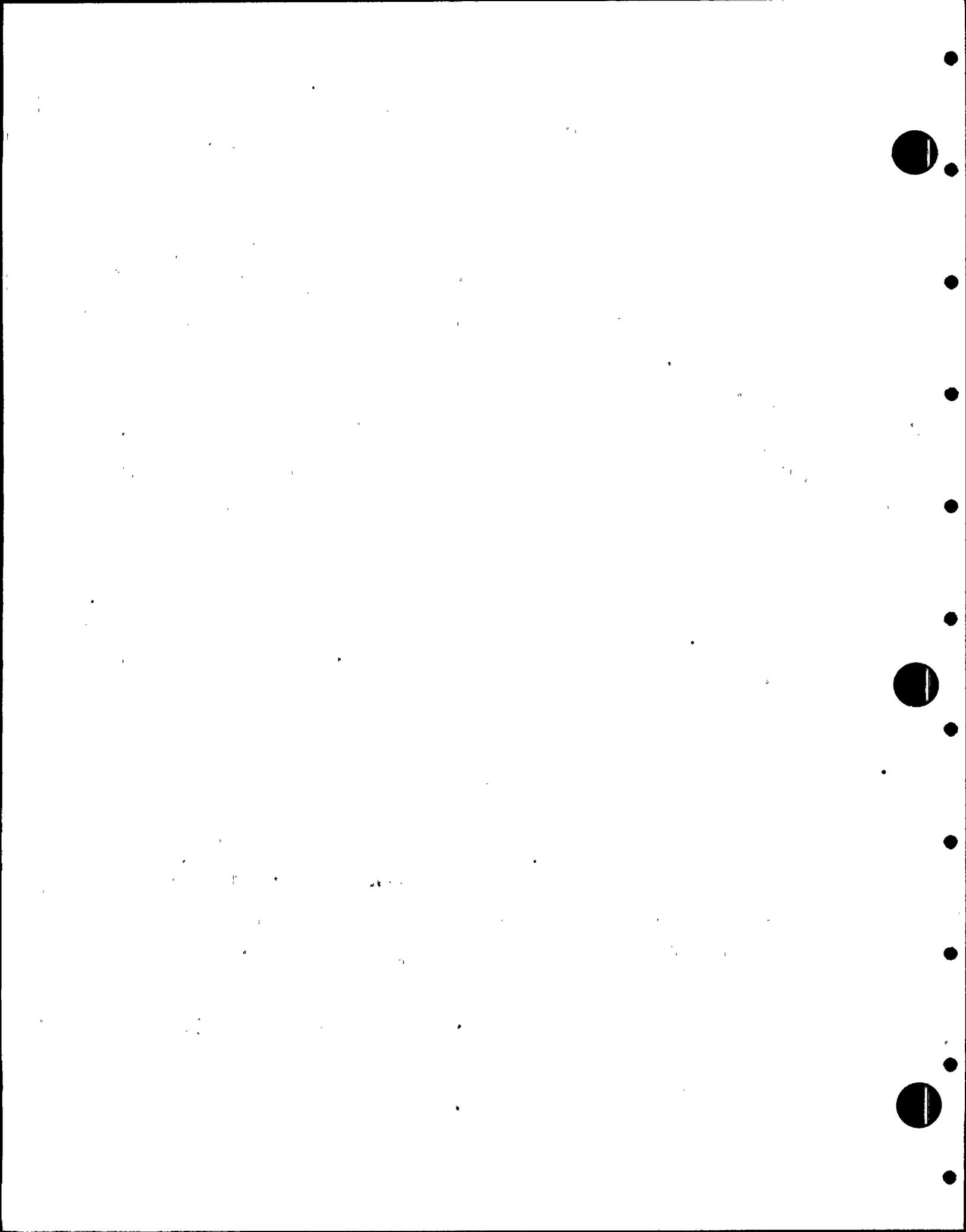
13 MR. ALLEN: Dennis, I noticed in the design criteria
14 that there wasn't any design criteria for instrumentation,
15 control, or electrical. Could you comment on that, where
16 you would pick that up for the aux feedwater system?

17 MR. KEITH: Yes. We have separate design criteria for
18 each of the disciplines and the control system has a design
19 criteria covering that engineered safety feature actuation
20 system.

21 MR. ALLEN: One other question. Are all electrical
22 components and instrumentation and control components
23 classified as IE on both the emergency trains?

24 MR. KEITH: Yes.

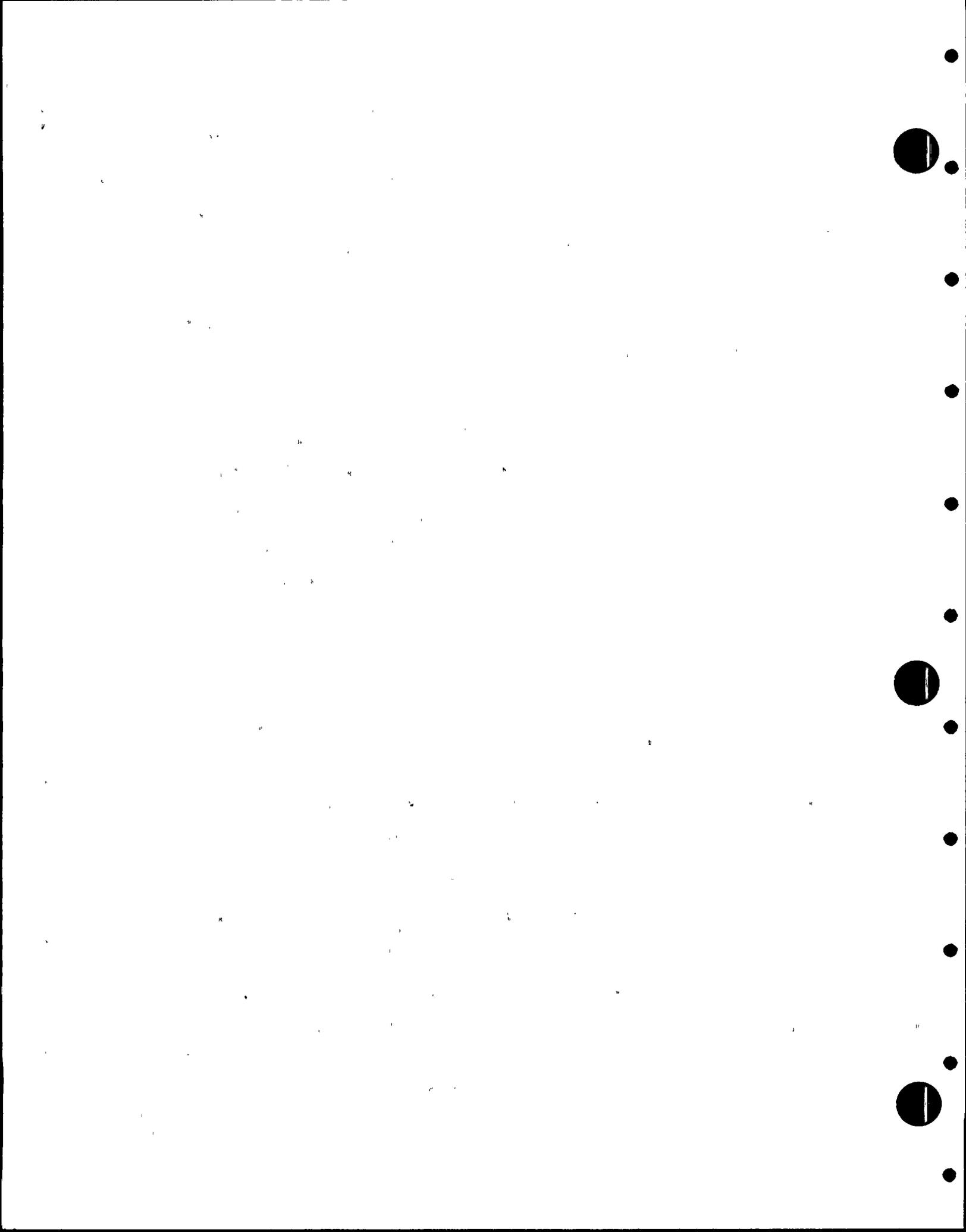
25 MR. VAN BRUNT: Shelley, you had a question.



1 MR. FREID: Yes, I have several questions. One is on
2 Exhibit 1A-7, Item 15), which had to do with the sequence.
3 It has to do with, in fact, the time at which the pumps have
4 to be able to deliver feedwater. The first one is within
5 10 seconds when offsite power is available. The other one
6 is within 45 seconds when offsite power is not available.
7 When we went through the AC system, one of the things we
8 note is that the sequencer has to be able to handle concurrent,
9 prior, and post-loss of AC power. The question I have is if
10 one gets an AFAS signal and before the 10 seconds is up one
11 loses offsite power, which could happen due to turbine trip,
12 you then lose the power that you had to the auxiliary feedwater
13 pump and you put it on the sequencer and then it goes through
14 the sequencer, could you lose both of those time criteria by
15 having a loss of offsite power within that 10-second window
16 before you first started putting the feedwater out?

17 MR. KEITH: At the time we get an AFAS, the auxiliary
18 feedwater pump is on the 10-second step on the sequencer. It
19 is sequenced on whether we have the diesel available or
20 offsite power available. Now, if offsite power is not available,
21 the diesel generator breaker will close in 10 seconds and then
22 the auxiliary feedwater pump is on the 10-second step, so the
23 maximum time should be 20 seconds with offsite power not
24 available before we have that pump on.

25 MR. FREID: And it would be back up to speed in time



1 to deliver the flow?

2 MR. KEITH: Yes, it gets up to speed very quickly.

3 MR. FREID: I have another question on Exhibit 1A-8, and
4 that is in terms of your backup water supply. What is the
5 signal that tells you to go to a backup water supply and how
6 long do you have to get that water supply on, and the
7 question is is there enough liquid left in the bottom of the
8 condensate storage tank to make that transfer before you
9 cavitate the pump?

10 MR. KEITH: We have a low level alarm in the condensate
11 storage tank which provides us with 30 minutes to make that
12 switch over to the reactor makeup water tank.

13 MR. FREID: So you have 30 minutes to do this and you
14 have gone through the sequences to know that that is well
15 within the time necessary to make that transfer?

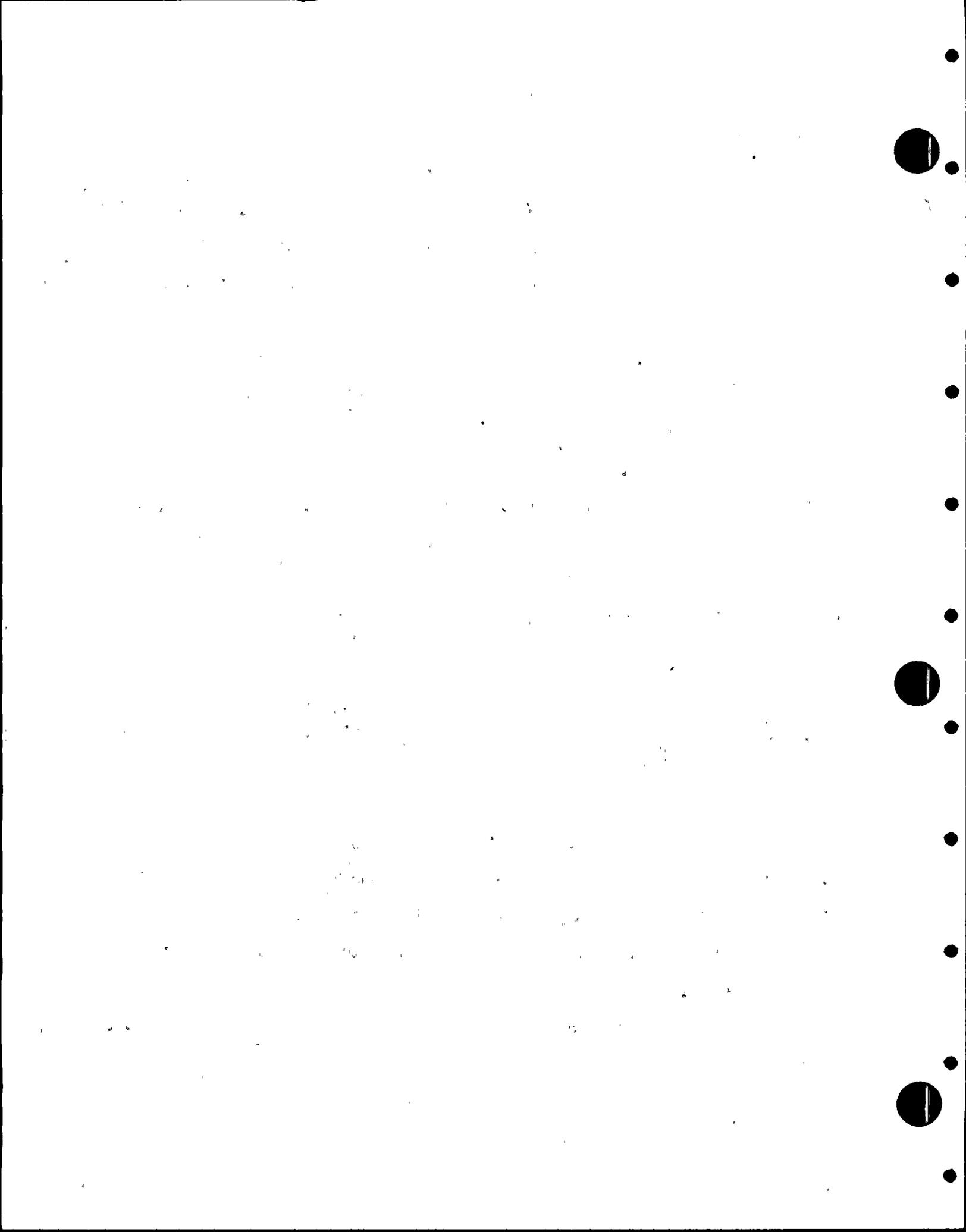
16 MR. KEITH: Yes.

17 MR. ALLEN: Dennis, is that level indicator Class IE
18 on that tank?

19 MR. KEITH: No, that level indicator is not.

20 MR. HODGE: In that same light, do we have any backup
21 capabilities in our makeup water to the condensate tank? Do
22 we provide makeup water for the condensate tank, also, at the
23 time we are using water? Is that an additional margin that
24 we can have?

25 MR. BINGHAM: We are going to be covering that one also.



1 Ed. Why don't we wait until that time.

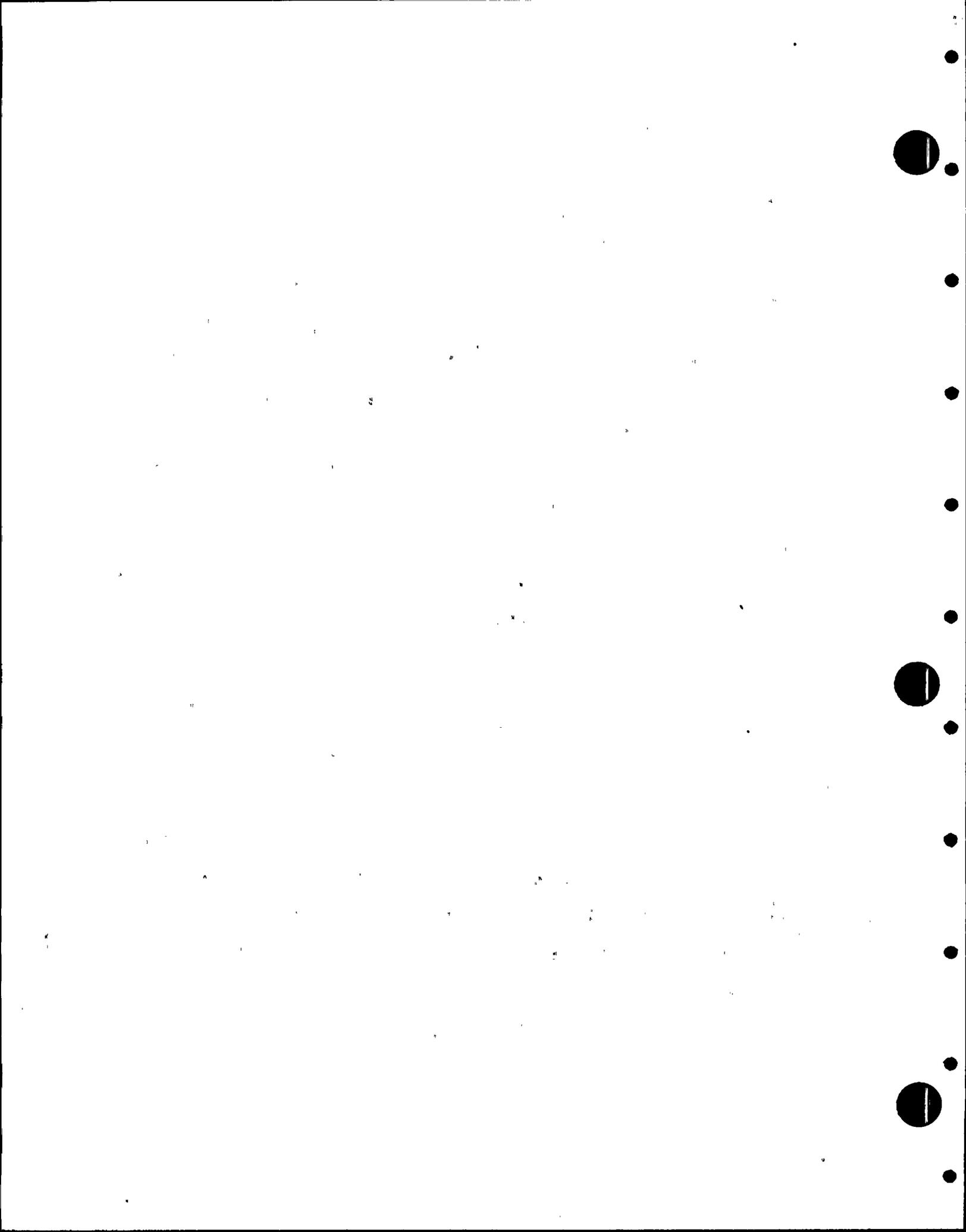
2 MR. VAN BRUNT: Okay. Jerry.

3 MR. WERMEIL: I have I guess a general question on
4 some of the things that have recently been raised. A lot of
5 these are included in the March 10th letter on aux feedwater
6 systems. Specifically, the generic short-term and long-term
7 requirements that we developed from NUREG 0635, is that going
8 to be addressed separately in this presentation?

9 MR. BINGHAM: Yes, Jerry. As I indicated earlier, the
10 reliability analysis did use the March 10th letter and we
11 have determined that there are concerns that need to be
12 addressed. We have addressed them and have made some
13 modifications already to the design. Tomorrow you will hear
14 all about those and what we have done.

15 MR. VAN BRUNT: Shelley, do you have another? I'm
16 sorry, I didn't mean to cut you off.

17 MR. FREID: On the same exhibit, if we can get the
18 P&ID on -- In fact, I don't know, it may be covered tomorrow,
19 too. One of the items that was of concern was the lock open
20 valve in the suction line and whether or not it has surveil-
21 lance. We talked about that before, but there is another
22 concern, and that has to do with the miniflow line, which may
23 get closed since the system is not normally operated. Are we
24 going to have surveillance on the miniflow line as well to
25 assure that it is open when the pump needs to be started?



1 Will that be a Tech Spec, or how do you handle that?

2 MR. KEITH: I think the Tech Spec -- I can't really
3 talk for APS, which is responsible for the Tech Spec. I think
4 the Tech Spec would probably include a complete valve lineup
5 on the system at some periodic basis.

6 MR. FREID: The last question I have, since we did not
7 get into the controls, one of the salient features of this
8 system is the ability to feed the good steam generator only.
9 Are you at any point going to get into the logic of that
10 system?

11 MR. KEITH: We will be discussing it somewhat briefly
12 later. We can go into more detail if you would like to, but
13 that is in the next section of our presentation.

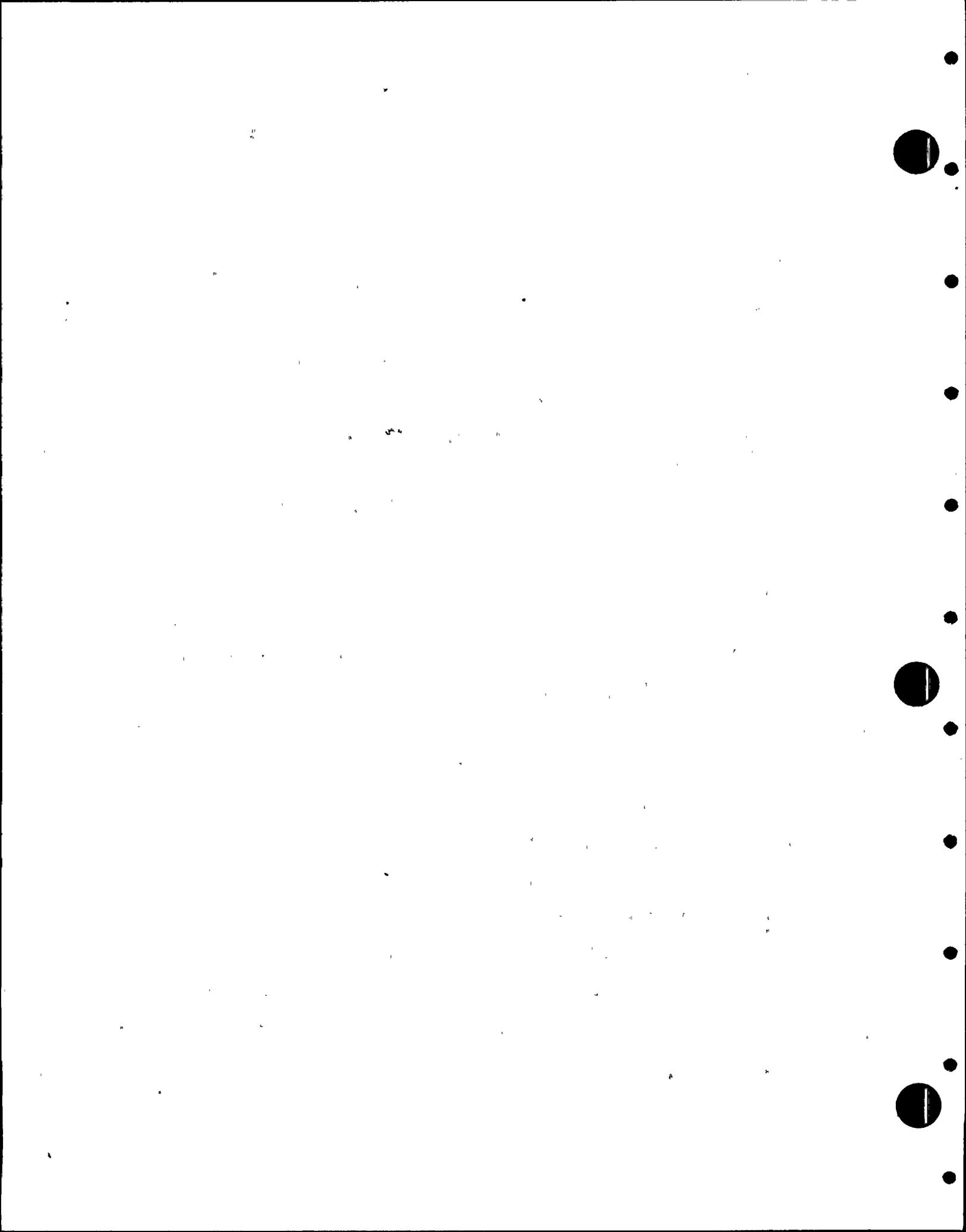
14 MR. FREID: The question relates to when you established
15 the criteria for the condensate storage tank volume in order
16 to be able to handle the eight hours, did you include a
17 significant amount of spillage through a broken line or is
18 this system so fast that that is not a credible addition to
19 the volume necessary in that tank?

20 MR. KEITH: The volume in the tank did include a
21 broken recirc line so you are losing a continuous amount of
22 135 gallons per minute.

23 MR. ORTIZ: For how long?

24 MR. KEITH: Continuously for the whole period.

25 MR. FREID: But my question is somewhat further down



1 the system. Is that precluded from the design because of
2 the logic sequence in the feedwater good steam generator
3 only?

4 MR. KEITH: Yes. You could eat into some of the
5 eight-hour margin with some of these accident scenarios,
6 but in the 300,000 gallons, I believe the only margin is this
7 continuous 135 gallons per minute for a broken recirc line.
8 We do not take, you know, dumping a lot of water through a
9 faulty --

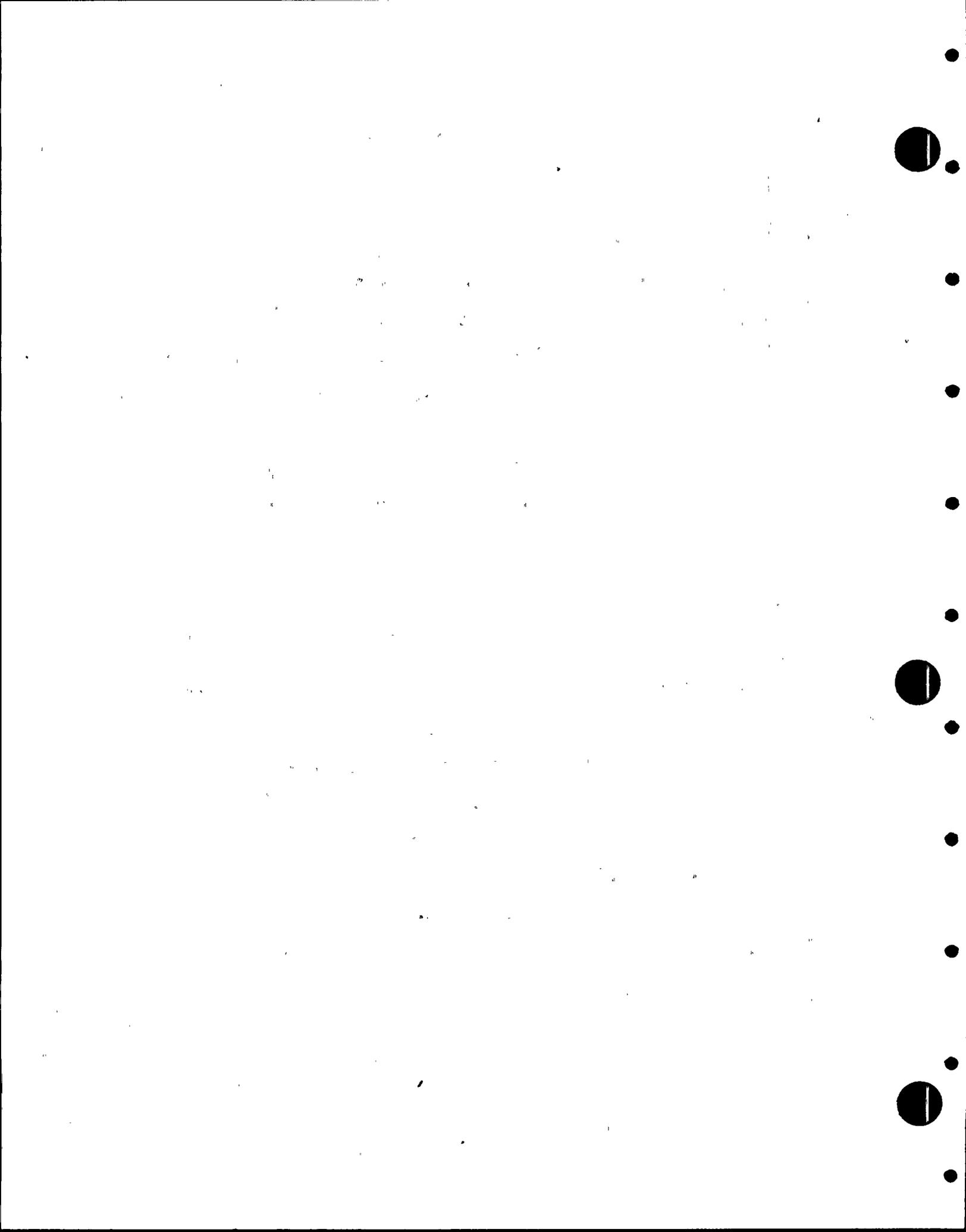
10 MR. ORTIZ: I don't read it that way, Dennis. The way
11 I read your point 20) is that you have a continuous recircula-
12 tion back to the tank, but I believe the question was if you
13 have a broken recirculation line, then you are losing 135 GPM
14 continuously.

15 MR. KEITH: Yes.

16 MR. ORTIZ: Does the 300,000 capacity reflect that
17 loss?

18 MR. KEITH: That's what I was saying. It does
19 reflect that loss. It does not reflect additional losses
20 which Shelley was talking about. It reflects a continuous
21 loss of 135 GPM.

22 MR. PHELPS: Let me just interject one point, which
23 maybe I will address to Shelley. Don't forget all the valves
24 in the emergency system are initially closed, so if you were
25 worried about additional water feeding the steam generator,



1 they are all closed to begin with. The EFAS logic will
2 selectively feed the one that is not broken.

3 MR. FREID: That's what I said, the ability not to
4 consider any additional losses because of the feedwater good
5 steam generator logic, and since we haven't discussed it at
6 all, I was wondering at what point in the presentation we
7 would get into that just to make us all feel very warm and
8 comfortable that that is a good assumption.

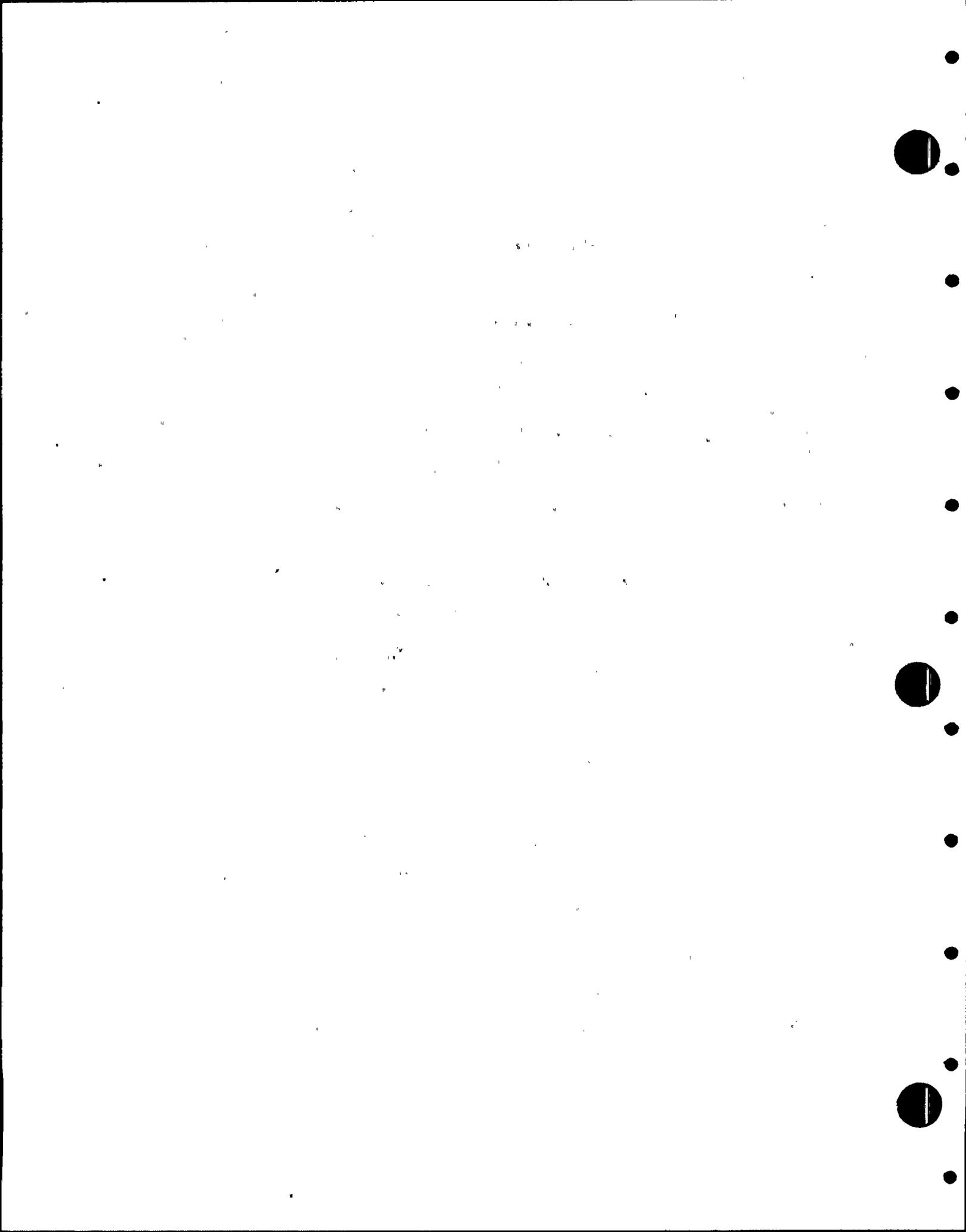
9 MR. VAN BRUNT: Go ahead, Mike.

10 MR. BARNOSKI: I think the CESSAR requirement requires
11 300,000 gallons to the steam generator storage, and I would
12 like to get a little clarification. Presumably that 300,000
13 includes some spillage out of the recirc line, and that is
14 not the way I read the CESSAR interface requirement.

15 MR. KEITH: Well, the CESSAR interface requirement --
16 What I was getting into was the calculation behind the 300,000
17 gallons, Mike.

18 MR. TURK: No, our calculation is a thermal calculation
19 based upon the decay heat requirements, the sensible heat
20 requirements, and the reactor coolant pump heat requirements,
21 and the interface is worded that you have to have 300,000
22 gallons available to be delivered to the generator. In other
23 words, any spillage or any recirculation flow would have to be
24 added on a plant-by-plant basis.

25 MR. KEITH: Let's hold that as an open item. I would



1 like to get together on a break on that point.

2 MR. VAN BRUNT: You want that as an open item to be
3 responded to later in your presentation?

4 MR. KEITH: I think we can.

5 MR. BINGHAM: I think, Ed, if I could make a comment,
6 since we have a two-day presentation, we don't have all of
7 our capabilities here, and if we can answer, I would like to
8 close out as many of these items as we can while the board is
9 in session.

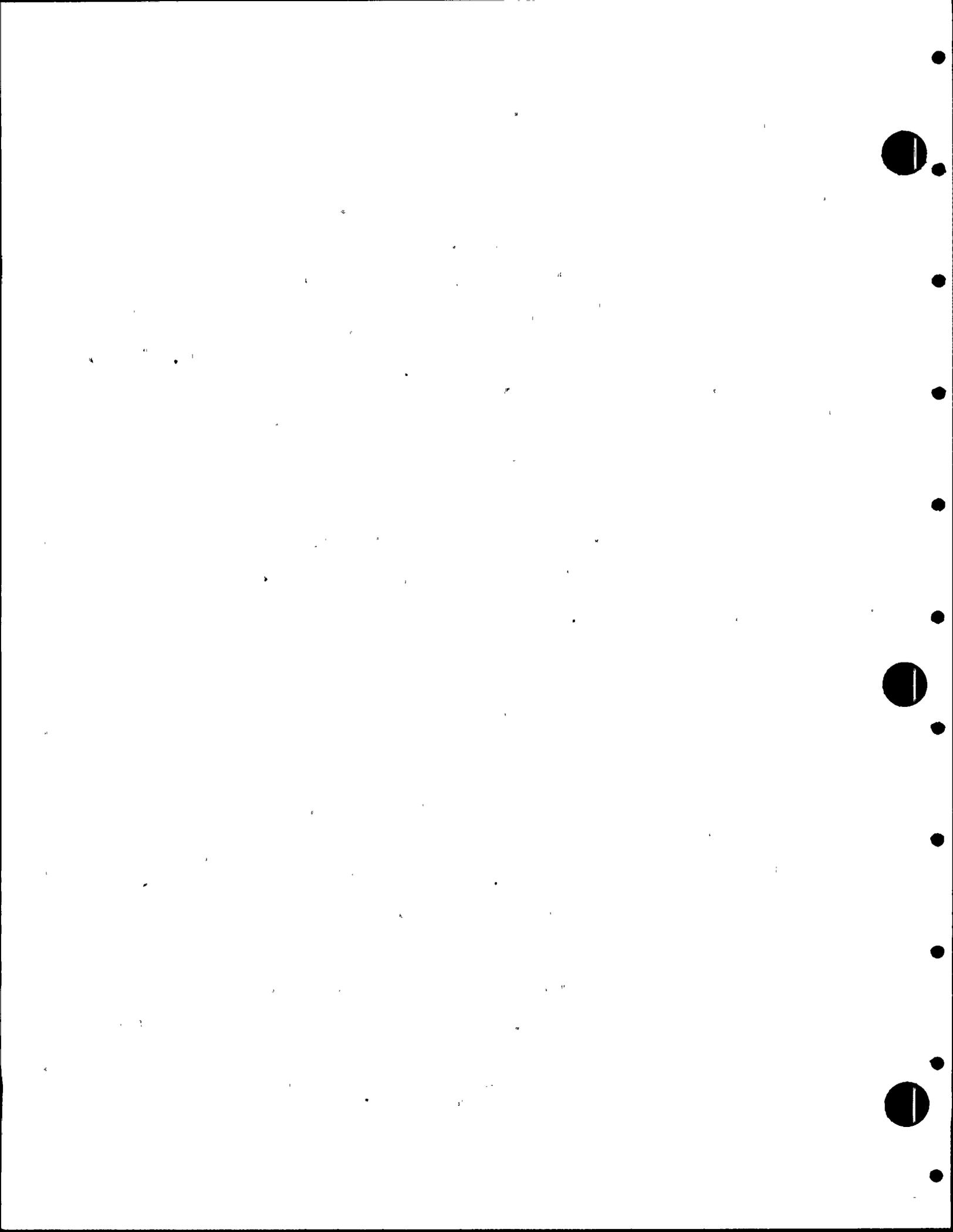
10 MR. VAN BRUNT: I agree with you.

11 Yes, Mike, go ahead.

12 MR. BARNOSKI: I am concerned about the suction line
13 to the startup feed pump and any tornado missile, or any
14 credible events that could draw down on the Tech Spec volume
15 on the water tank and how you preclude that.

16 MR. BINGHAM: Mike, would you repeat that question,
17 please?

18 MR. BARNOSKI: Yes. My concern is with the Tech Spec
19 volume in the storage tank and an event that would, in essence
20 create a leak in the suction to the startup feed pump and
21 drain it down, take some of the Tech Spec volume away from
22 what it was meant to be. You indicate you've only got
23 protection through the isolation valve. I don't see any kind
24 of automatic system for closing those valves on sensing that
25 something is wrong downstream. I wonder how you preclude that



1 from happening.

2 MR. KEITH: Mike, these valves -- As I said, we are
3 tornado protected up to this point (indicating).

4 MR. BARNOSKI: I am worried past those.

5 MR. KEITH: Okay, so we are talking about a break down
6 here (indicating). All we have is in the event of an AFAS
7 auxiliary feedwater actuation signal, these valves will close.
8 That is the protection you have.

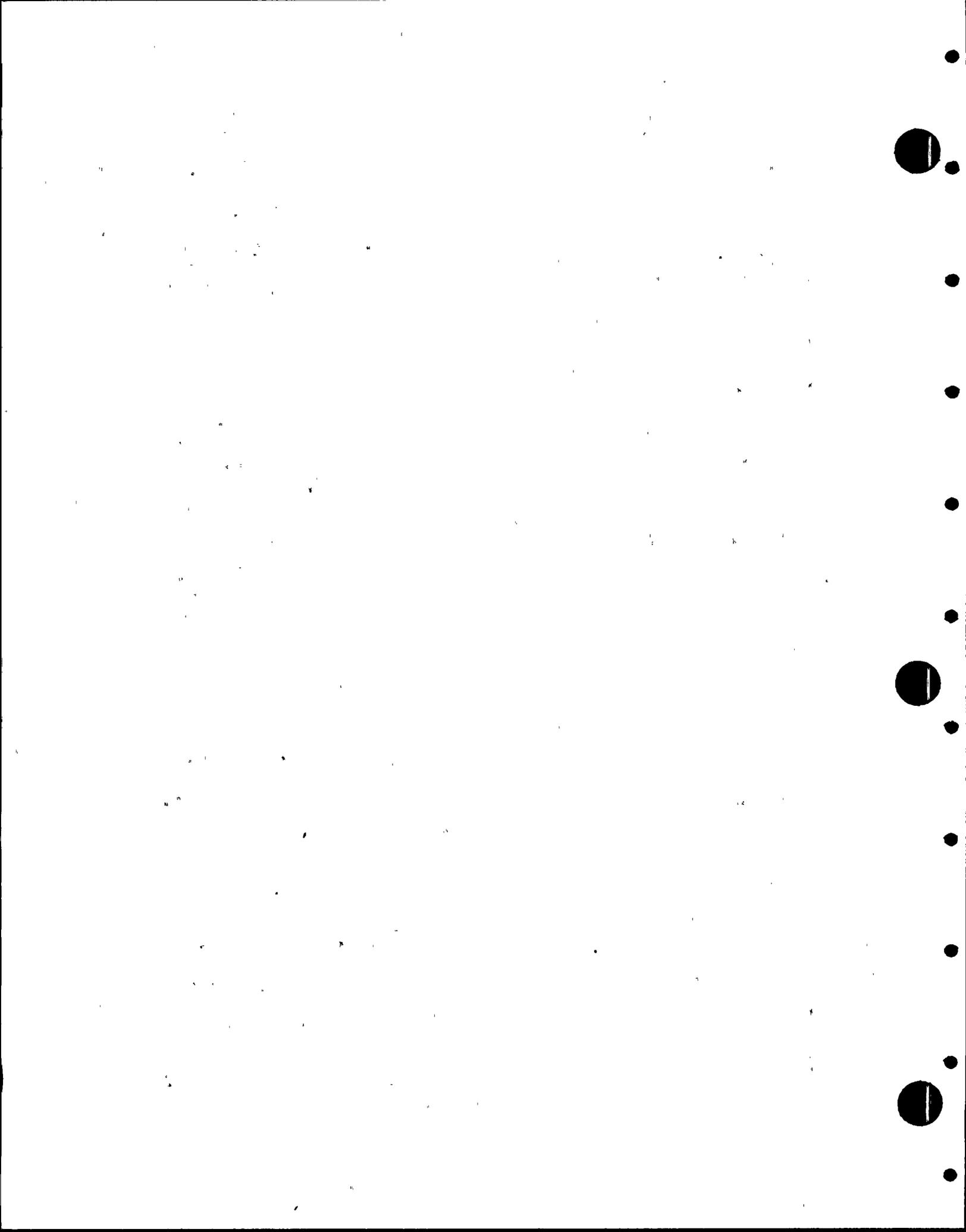
9 MR. VAN BRUNT: Does that satisfy your question,
10 Mike?

11 MR. BARNOSKI: I am not sure, but I'll think about it
12 and go back.

13 MR. VAN BRUNT: Anybody have any other questions? I've
14 got a couple. Go ahead, Norm. I will wait until the end.

15 MR. HOEFERT: Assuming you have an AFAS, both pumps
16 start, all eight valves open, you are now pumping an awful
17 lot of water into the steam generators. What does this do to
18 your reactor coolant system? What type of transients does it
19 cause on it? I am specifically concerned if the cooldown
20 rate would be so fast and the shrinkage that would result
21 from it that you could initiate a safety injection signal. Is
22 this possible?

23 MR. BINGHAM: Ed, this again is a question that is in
24 the CE side, which has been analyzed, and the established
25 criteria are such as to preclude these sorts of issues



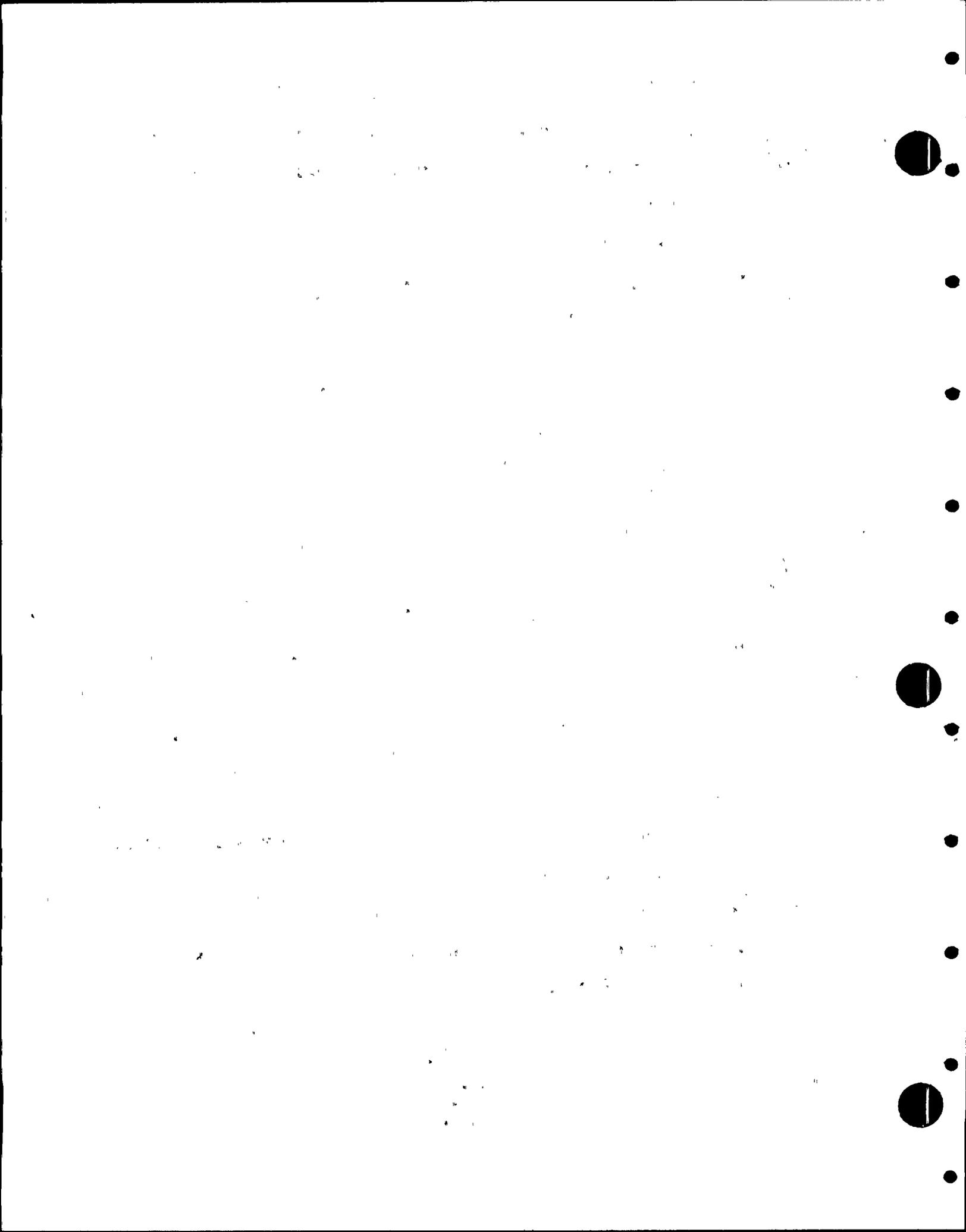
1 becoming a problem. We could discuss it or, if the board
2 prefers, we could get a response directly from Combustion
3 Engineering as an open item.

4 MR. VAN BRUNT: I would suggest, Bill, that in a
5 general way if you or Dennis could deal with it, and if Mike
6 or Rick take exception to it, then we will get Combustion to
7 provide some additional information, but if we can, I would
8 like to deal with Norm's question and put it to bed at least
9 to his satisfaction at this point.

10 MR. BINGHAM: That would be fine.

11 MR. KEITH: Well, there are some events such as a
12 steam line break where you do get excessive cooldown and an
13 SIAS is initiated. I can't really deal with whether the SIAS
14 is due to the auxiliary -- Obviously, it is a combination of
15 the aux feedwater and the steam line break, so it is kind of
16 difficult to separate them out. On the loss of main feedwater
17 I am not sure whether we get an SIAS on that accident analysis

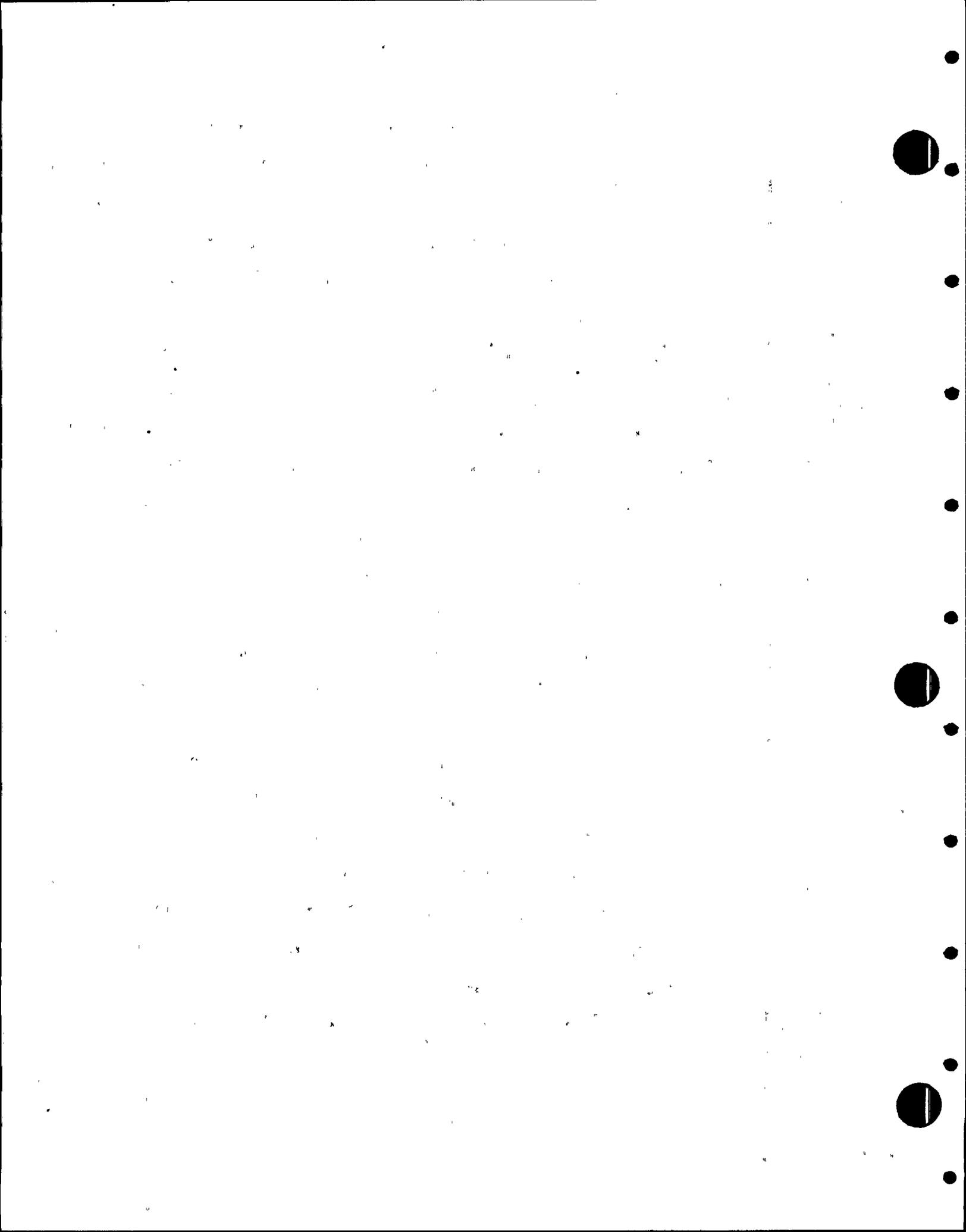
18 MR. TURK: The question is dealing with the idea of
19 delivering feedwater in excess of the actual heat requirements
20 and that is inherent in a system that requires redundancy. In
21 other words, the system has been sized for maximum heat loads
22 and then it is required to be redundant, in some cases
23 tertiary redundancy. So that ability to cool in excess of
24 the heat requirement is inherent in the system if the system
25 is actuated, for instance, a couple days after startup when



1 you have low decay heat levels just as the 875 is going to be
2 in excess of the heat load requirements. So it is essentially
3 the operator action and the ability to regulate the feedwater
4 flow after the initial actuation that accounts for regulating
5 the feedwater flow down to an acceptable amount. That can be
6 done coarsely by turning off one pump after both have started,
7 but inherently the redundancy required for the safety function
8 takes precedence over the necessity to regulate flow to the
9 actual required amount. So that regulation process is not a
10 design criteria, but rather an operator action. In other
11 words, we looked at trying to determine what a maximum flow
12 should be; in other words, to give a window on flow. In
13 other words, what flow would be sufficient to prevent safety
14 injection actuation. But if you take the worst case heat
15 loads, in other words, no decay heat, a plant that has just
16 started up, and a loss of power or you have no reactor
17 coolant pump heat, that number turns out to be less than the
18 875. So, yes, there are cases where automatic actuation
19 could result in a safety injection transient if you don't have
20 worst case decay heat loads, but it is an operational problem.

21 MR. HOEFERT: In the majority of cases, you can live
22 with the exceptions, perhaps, but during most of these aux feed-
23 water system actuations, is operator action required to prevent
24 getting a safety injection signal?

25 MR. TURK: I have no way of answering that. I don't



1 know what most of the cases are and I don't know what the
2 answer is, and I don't know what the answer is with a 100%
3 power case offhand. I believe that the answer, though, is that
4 the 100% power case does result in a safety injection.

5 MR. VAN BRUNT: Norm, are you satisfied or do you want
6 to raise an open item here on that?

7 MR. HOEFERT: I would like to receive more information
8 on this.

9 MR. VAN BRUNT: Would you phrase the question so we can
10 put it on the record here?

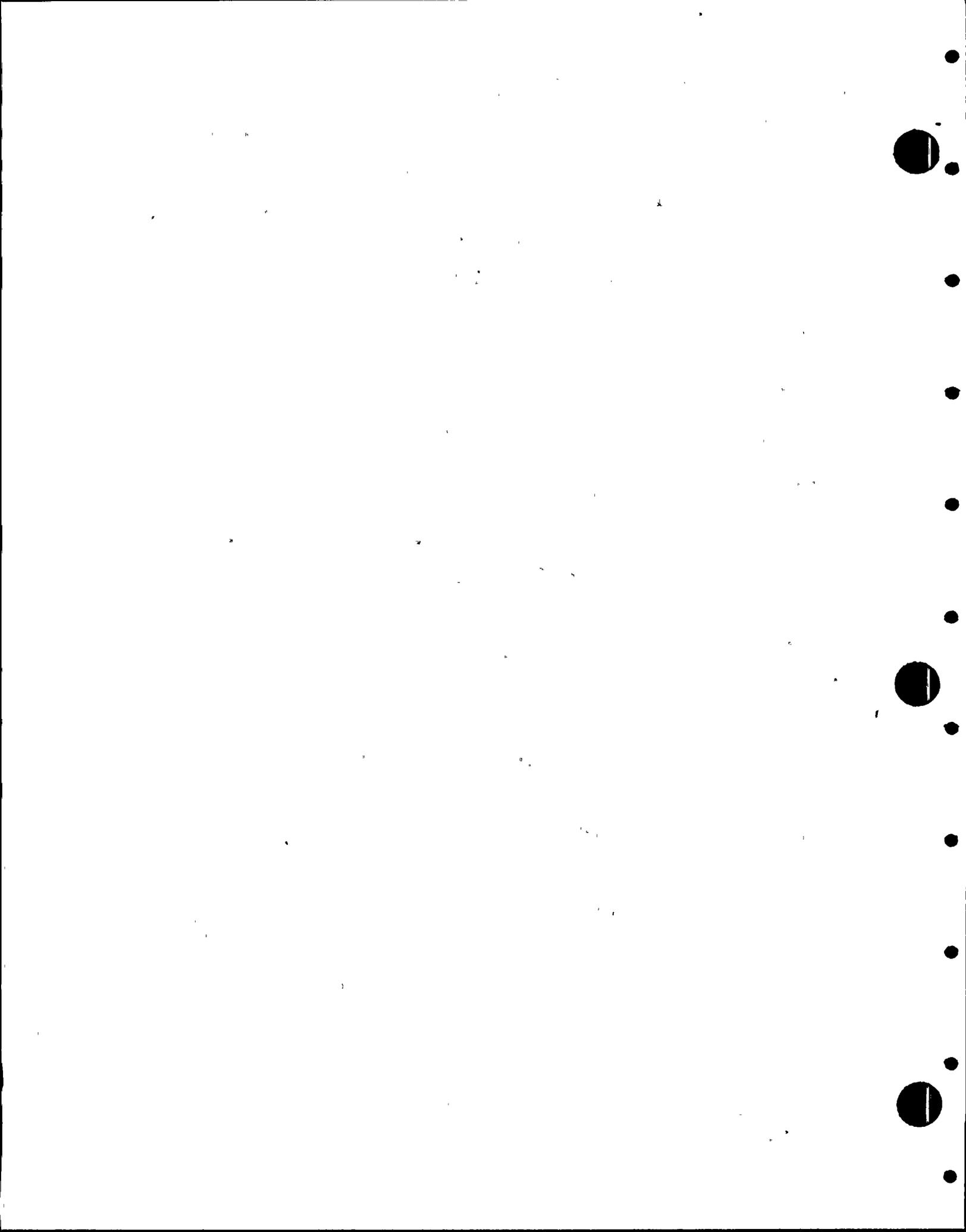
11 MR. HOEFERT: I think just the way I stated it
12 originally might do. Is there a possibility of getting a
13 safety injection signal after auxiliary feedwater is
14 automatically initiated and, if so, when will we get those
15 safety injection signals, and along with that what operator
16 action is required to prevent a safety injection signal from
17 occurring?

18 MR. VAN BRUNT: Okay, we will mark that as an open
19 item to get Bechtel and/or CE to respond to.

20 Are there some other questions? I've got a couple.

21 MR. TURK: I have one more real quick. Criterion No.
22 7) was that the system should include one 100% capacity
23 turbine pump and one 100% capacity motor pump and one startup
24 pump. What was the sizing criteria for the startup pump?

25 MR. KEITH: The startup pump is almost identical.



1 However, it is sized for 875 GPM at a lower pressure, at
2 normal operating pressure for zero power rather than at the
3 accumulation of the lowest safety valve.

4 MR. TURK: Do you know what that pump delivers at the
5 safety valve set point offhand?

6 MR. KEITH: Seven hundred forty GPM.

7 MR. VAN BRUNT: Rick, does that take care of you?

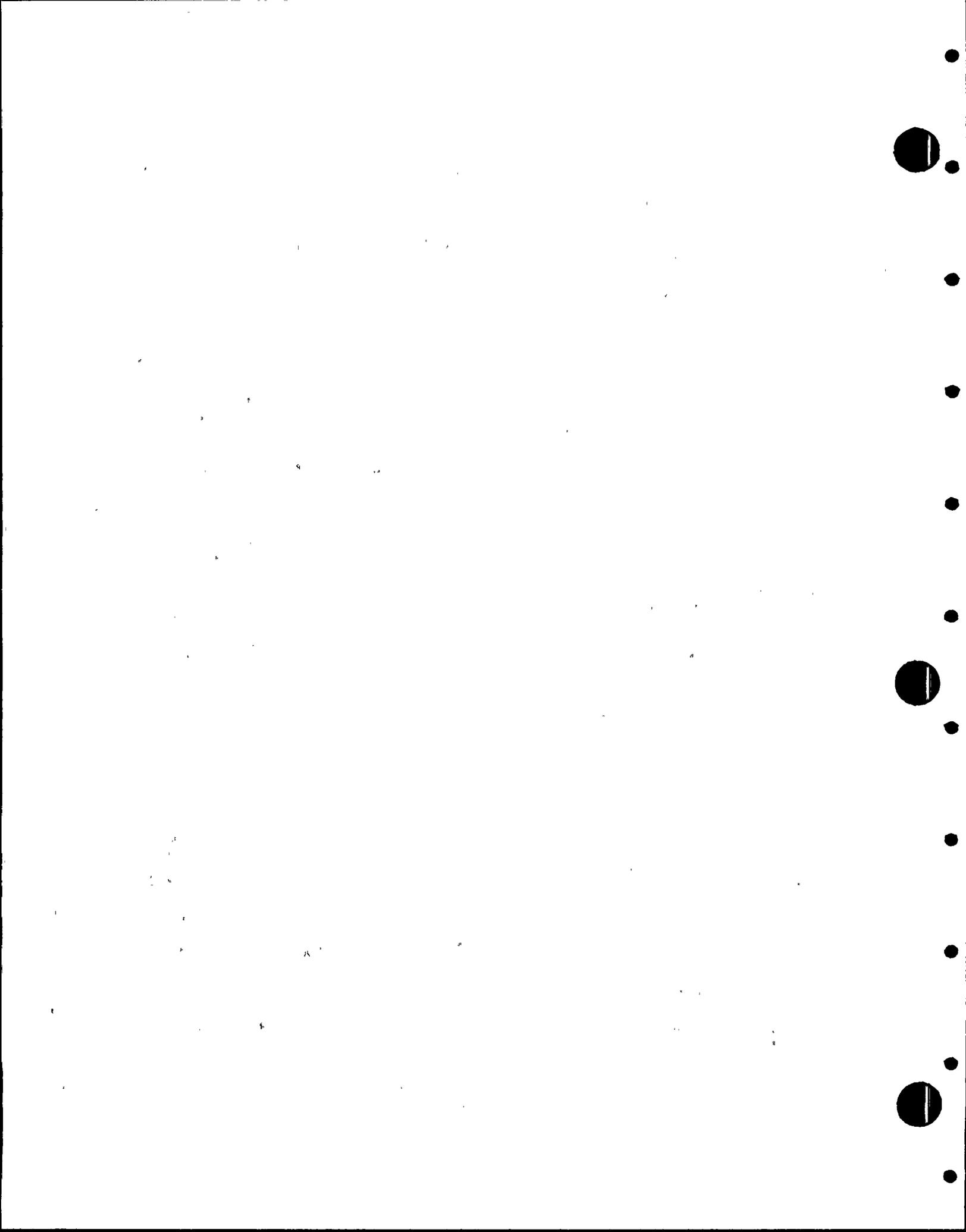
8 MR. TURK: Fine.

9 MR. VAN BRUNT: Could we go back to Figure 2? Dennis,
10 getting back to our friend here, on the reactor makeup tank,
11 you show the valve on the suction of the emergency feed pump
12 there, the motor-driven, as being normally closed. Under what
13 circumstances is that valve opened? Is it opened manually?
14 Is that the only way it is opened, or can it be opened
15 automatically? Under what circumstances would it be opened?

16 MR. KEITH: On a low level condition in the condensate
17 storage tank is the only circumstance under which you would
18 open it, and it is a manual valve.

19 MR. VAN BRUNT: Let me hypothesize here then an
20 operator inappropriate action that with the condensate storage
21 tank probably full or very close to full that somebody somehow
22 opens that. Can you get yourself in a situation now where you
23 have really two water supplies where you could pressurize the
24 condensate storage tank?

25 MR. KEITH: We have these two checkvalves in the recirc



1 line. You are postulating operating this pump (indicating)
2 and these valves (indicating) shut and you are taking recirc
3 water from the reactor.

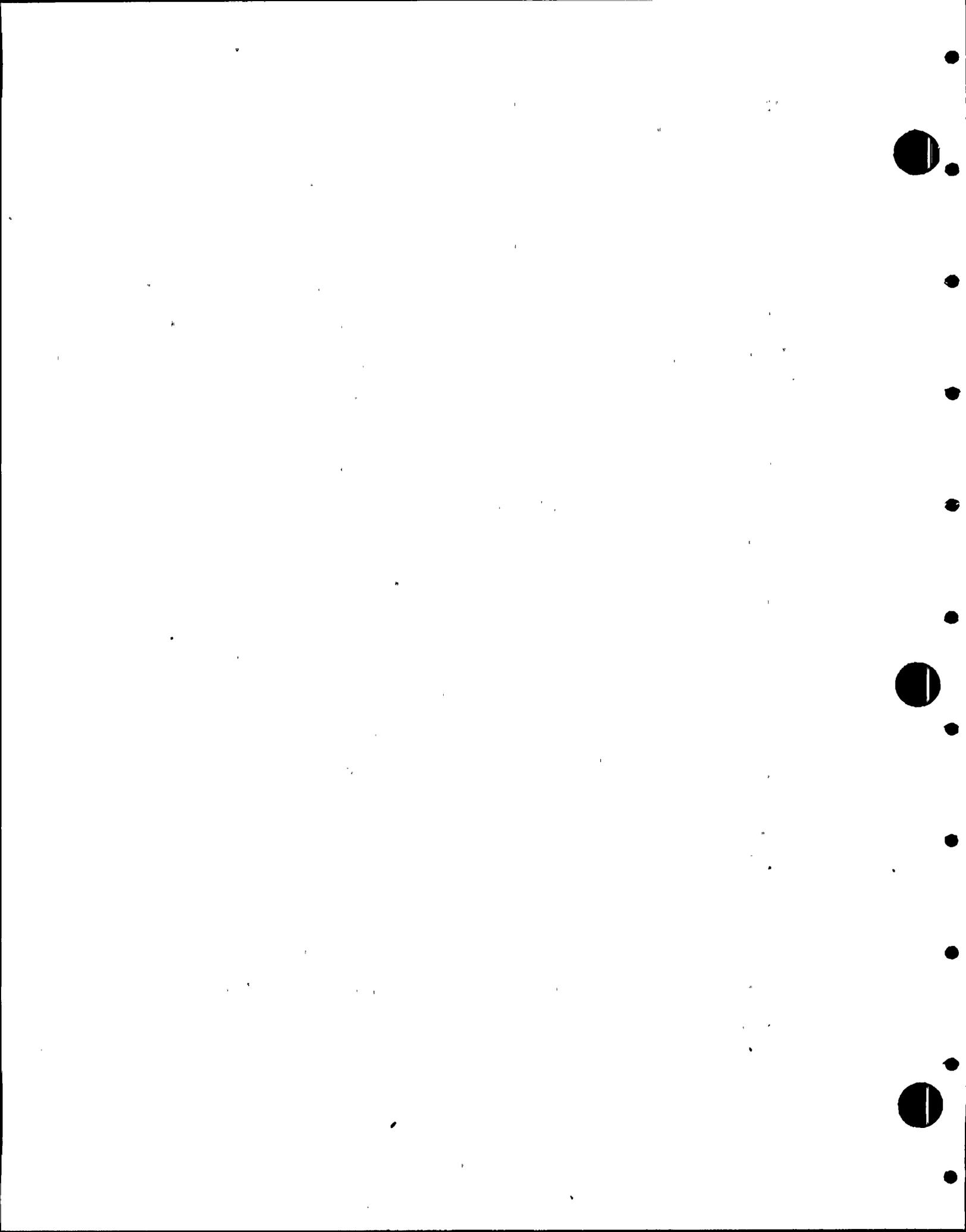
4 MR. VAN BRUNT: Is there a reasonable situation you
5 can get into where that might happen through the operator
6 inappropriate action of opening that reactor makeup tank
7 valve on a suction, because as I see it, those motor-operated
8 valves are always normally closed.

9 MR. KEITH: Ed, on our condensate storage tank, we have
10 a six-inch overflow line with a loop seal to maintain the
11 nitrogen pressure in the tank and that overflow line would
12 take care of that.

13 MR. VAN BRUNT: Okay, fine. Let's go back to Exhibit
14 2. I guess it doesn't show on this drawing, but I am looking
15 at the detailed P&ID, you have two potential sources of steam
16 supply for the auxiliary feedwater pump steam turbine. You
17 have the line from the two steam generators and then you also
18 have a line that comes from the auxiliary boiler, is that
19 correct?

20 MR. KEITH: Yes.

21 MR. VAN BRUNT: What steps or what inherent designs in
22 the system are there to ensure that somehow if I've got some
23 primary to secondary leakage which is within limits to
24 continue to operate that I don't back contaminate that
25 auxiliary steam supply system? I think this is a situation



1 that has occurred not necessarily from the aux feedwater
2 system, but where an auxiliary steam supply system has been
3 contaminated in another plant. I don't remember which one.

4 MR. KEITH: Yes, I recall there has been that case in
5 some of the recent I&E bulletins. We have a checkvalve in
6 that line plus that valve is normally closed.

7 MR. VAN BRUNT: Again we are in a situation here
8 somehow where that auxiliary feedwater turbine is running as
9 it should be and maybe I've got some primary to secondary
10 leakage, but it is within limits, so I can continue to operate.
11 Through some inappropriate operator action, could I get that
12 system messed up?

13 MR. KEITH: Well, you would have to postulate leakage
14 of the checkvalve as well as the inappropriate operator action.

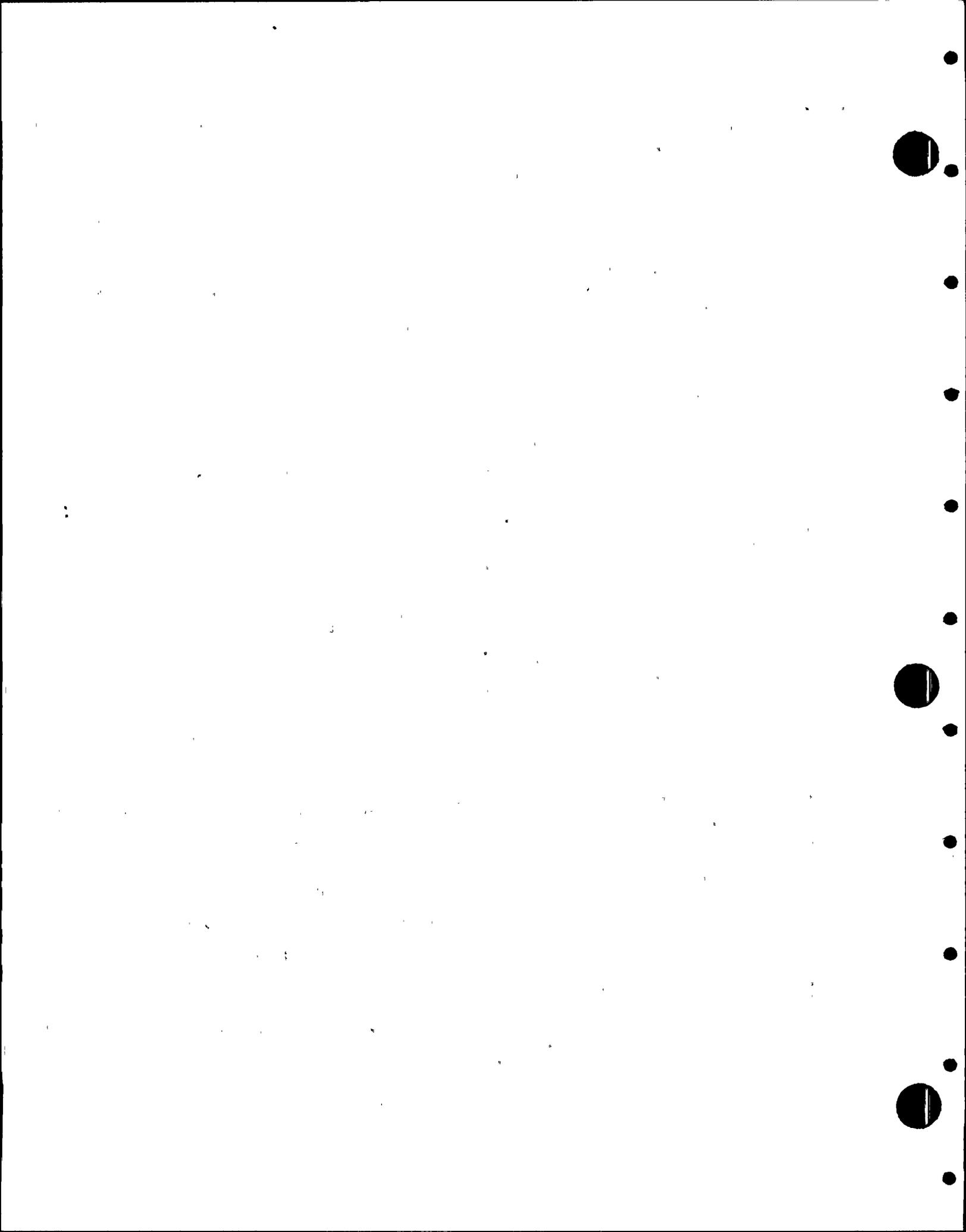
15 MR. VAN BRUNT: Checkvalves do leak.

16 MR. KEITH: That's true. It is unlikely.

17 MR. VAN BRUNT: Following along the same line, since
18 there is a possibility that the steam that is provided directly
19 to the steam turbine-driven pump off of the main steam lines
20 could be contaminated, should there not be some kind of
21 radiation monitor on the atmospheric discharge?

22 MR. KEITH: We have radiation monitors elsewhere in
23 the system to give us an indication of radioactivity in the
24 steam generator.

25 MR. VAN BRUNT: I believe you have monitors on the



1 atmospheric dumps themselves, is that correct? I am talking
2 about the main atmospheric dumps.

3 MR. KEITH: All we have right now on the steam
4 generator as far as radiation monitors are a blowdown line
5 and the condenser air ejector exhaust. As a result of the
6 Three Mile Island accident, we are looking at putting more
7 radiation monitors on the system, specifically on the safety
8 valves to monitor the safety valves and the atmospheric dump
9 valve discharge. That would be sufficient. You would be
10 getting the same activity out of this pipe as you would out
11 of those.

12 MR. VAN BRUNT: But if you didn't have an atmospheric
13 dump, would they be before the discharge or after on the
14 atmospheric dump valve?

15 Well, rather than get into designing the plant
16 right now, let me ask that an item be put on the list here to
17 look at whether there should be a radiation monitor on that
18 particular discharge.

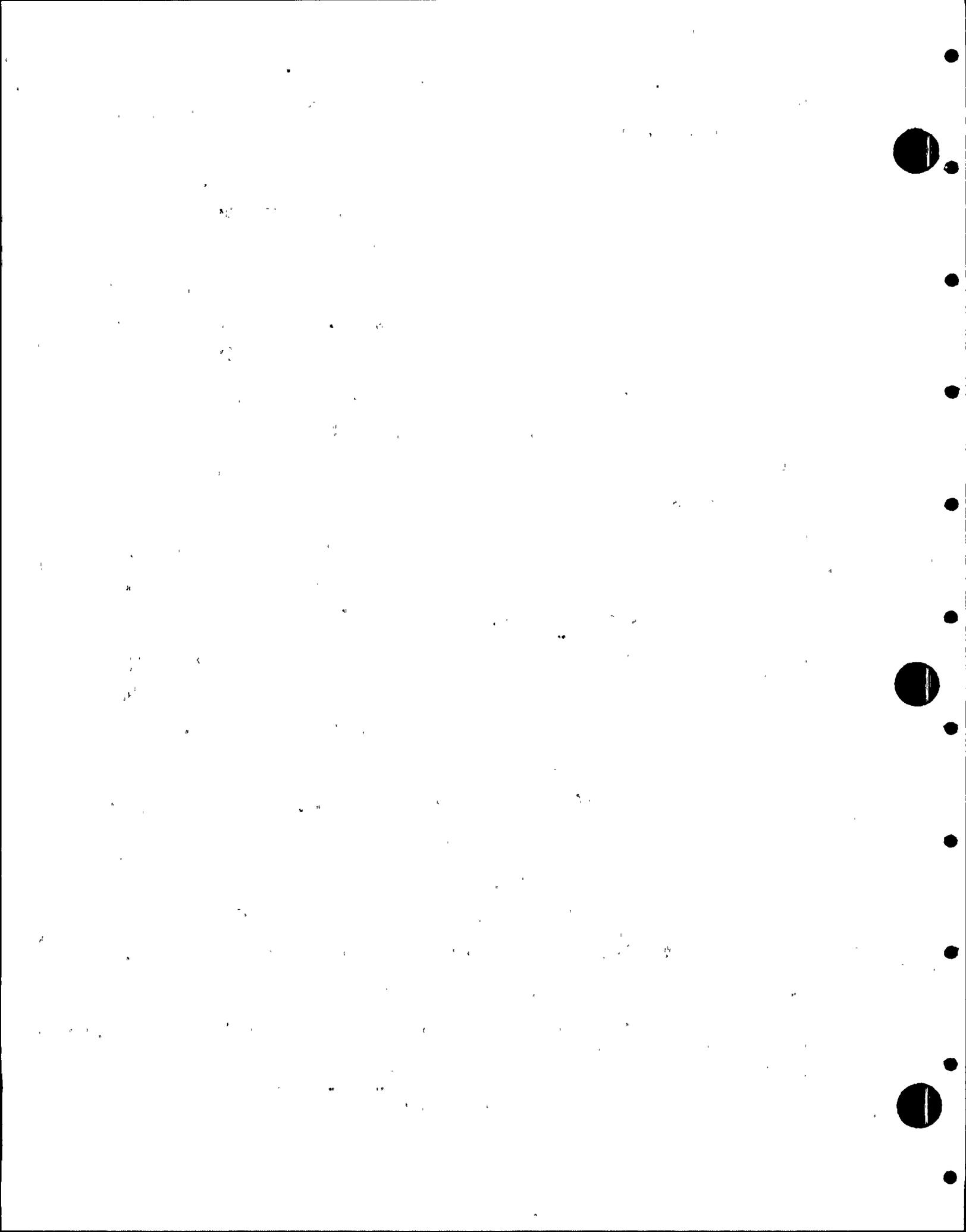
19 Let me pursue that a little bit further. Are there
20 floor drains at the aux feedwater pump rooms?

21 MR. KEITH: Yes.

22 MR. VAN BRUNT: Where do those floor drains go?

23 MR. BINGHAM: Ed, we are going to be covering that
24 under the layout section later on.

25 MR. VAN BRUNT: All right, fine. I'll lay off of that.

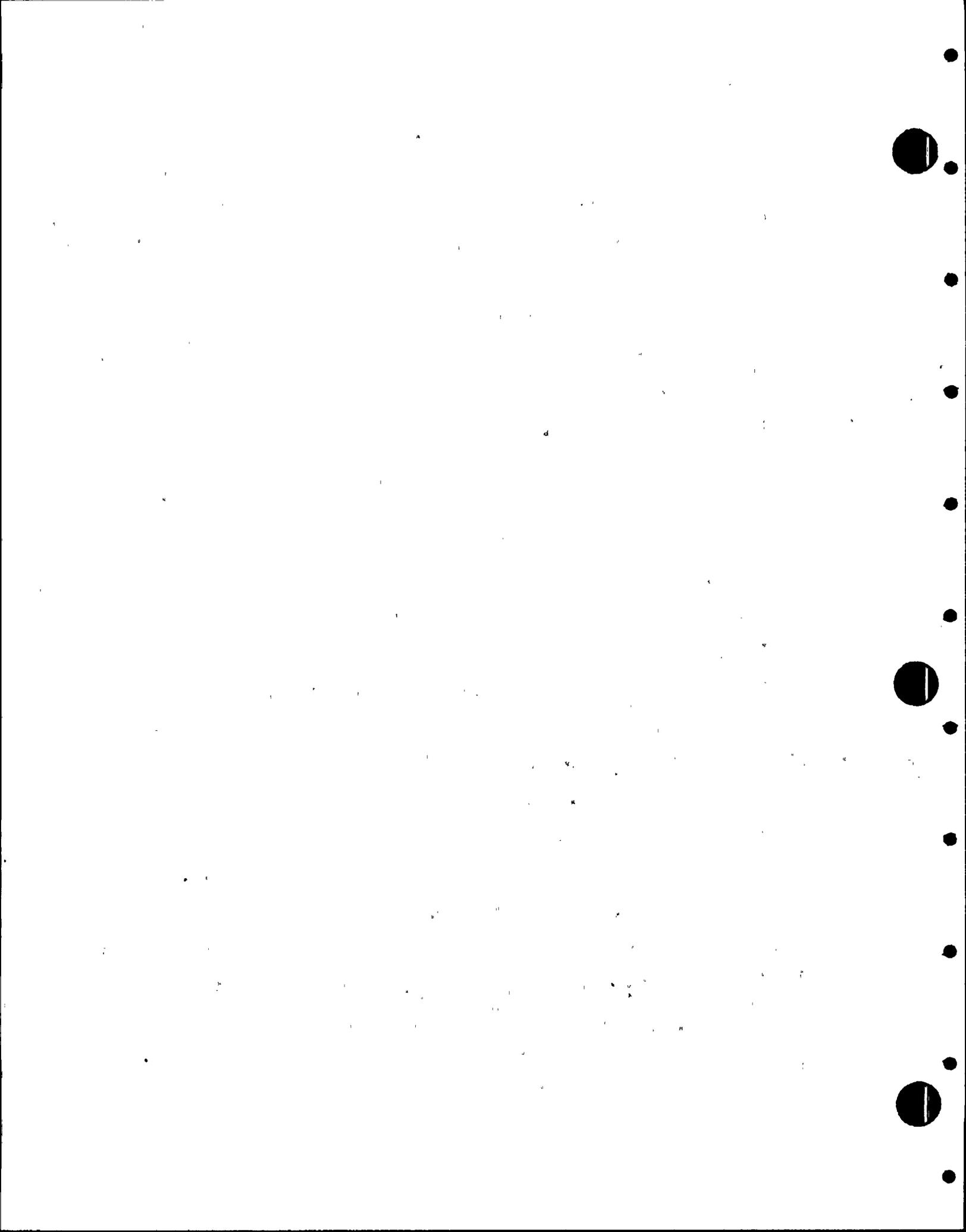


1 MR. ORTIZ: A question, Dennis, a similar question to
2 Ed's. On the steam side of the steam turbine, you answered
3 earlier that there is the possibility of makeup water from
4 the reactor refueling water storage tank or the reactor makeup
5 tank may recirculate through the minimum flow recirculation
6 line back to the condensate tank. It is along the same lines
7 as Ed is talking now to prevent radioactivity contamination.
8 Might you also consider a radiation monitor at the discharge
9 of the recirculation line to prevent contamination of the
10 condensate storage tank?

11 MR. KEITH: The reactor makeup water tank, the only
12 contaminant in there would be tritium. We know what is in
13 that tank and adding a monitor I don't think would tell you
14 any more than we already know about what we have in that
15 reactor makeup water tank.

16 MR. VAN BRUNT: Angie, could I suggest maybe like we
17 did just a minute ago, maybe we ought to take a look at that
18 as part of the question of the atmospheric contamination. I
19 think this whole area of looking at contamination and where it
20 goes, it is one of the concerns that came out of Three Mile
21 Island, is something we ought to take a look at.

22 MR. BINGHAM: Well, Ed, I think, as Dennis indicated
23 earlier, we are taking a look at some of those particular
24 items and the presentation today may be a little premature
25 for us picking up all the things that will eventually be dealt



1 with.

2 MR. VAN BRUNT: I have one other question. I will go
3 to a little different area. Could you go to Exhibit 1A-6?
4 Up at the top, you talk about the turbine-driven pump and
5 then the fact that the control system is connected to the
6 Class IE DC power system. As I remember that system, it has
7 two DC supplies associated with it and the battery chargers
8 come off of different generators in two separate trains.
9 Is the diesel generator that charges this particular DC power
10 supply the same one that powers the motor-driven auxiliary
11 feedwater pump or is it the other one?

12 MR. KEITH: It is the other one, the A diesel generator.

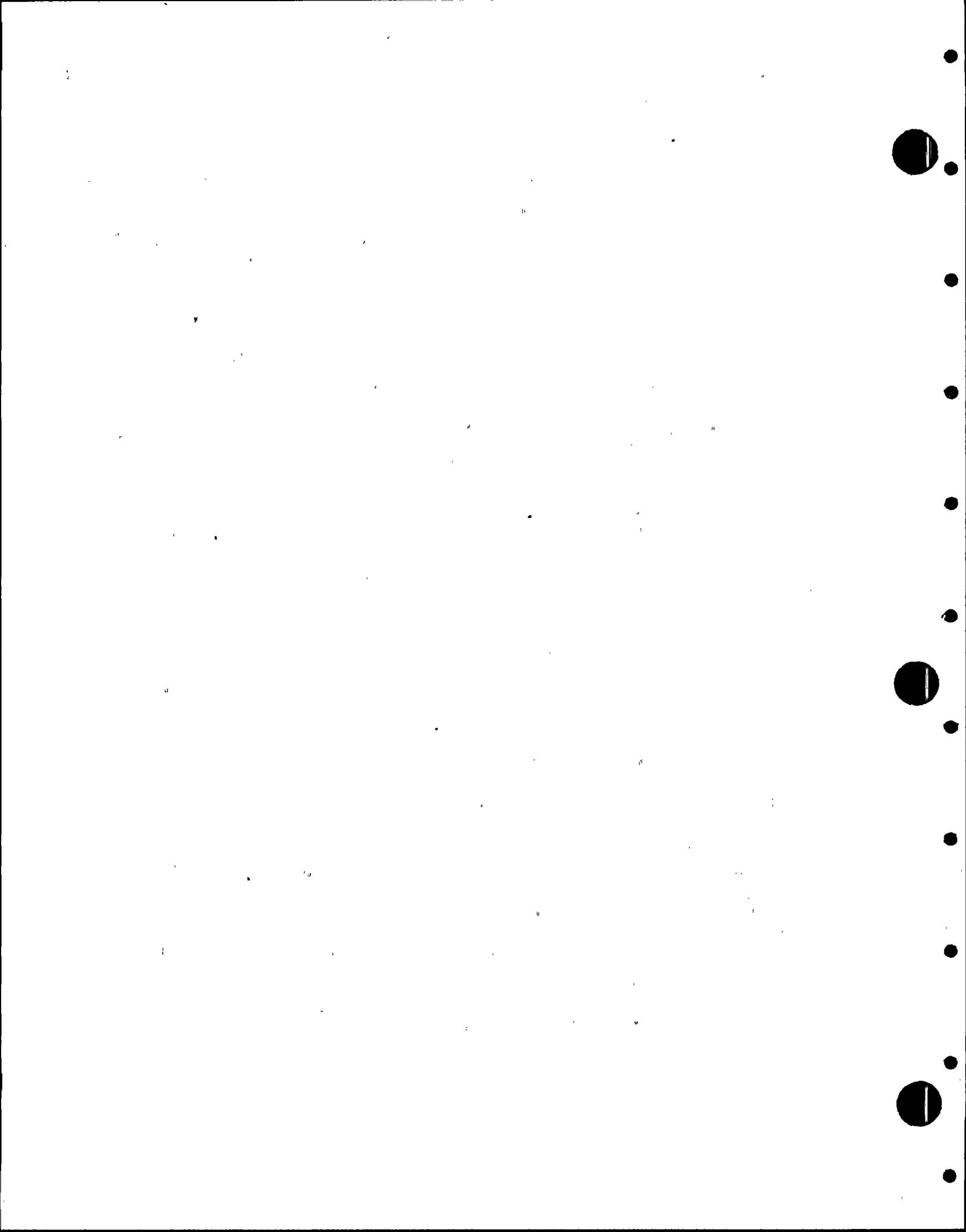
13 MR. BINGHAM: Are there other questions from the board?

14 MR. VAN BRUNT: Are there any other questions on this
15 presentation?

16 MR. ALLEN: Dennis, we take credit for the level
17 indicator low level alarm on that condensate storage tank to
18 transfer over to the alternate water source. Right?

19 MR. KEITH: That's correct.

20 MR. ALLEN: A question I asked earlier indicated it
21 was nonsafety related, so how can we assure ourselves it will
22 be available when we need it? If it is not available, you
23 might cavitate your pumps and you wouldn't be aware that the
24 level was sufficiently low and you wouldn't have the necessary
25 time to switch over to your alternate water source.

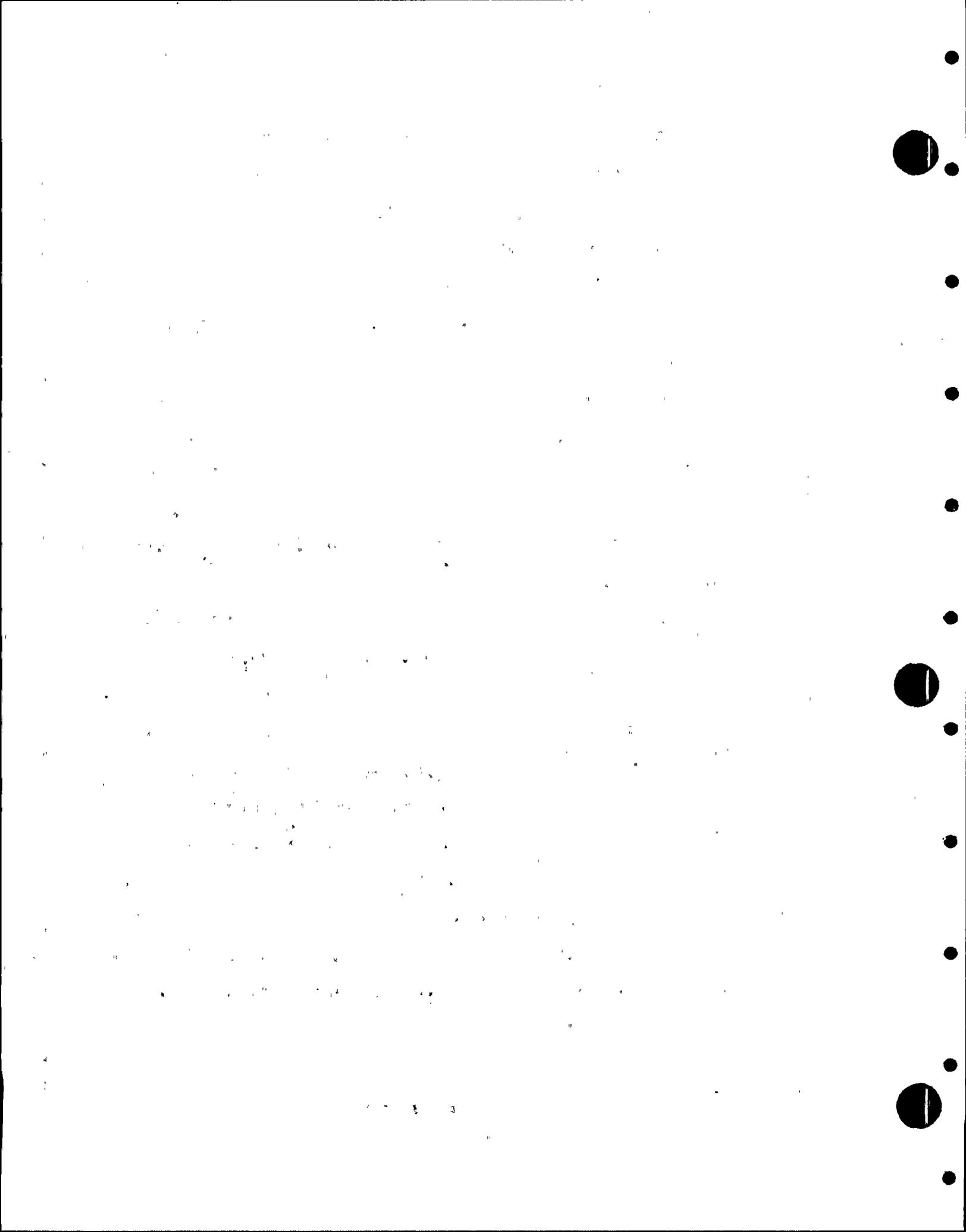


1 MR. KEITH: John, I think the original thinking on that
2 was that, since we did have a Seismic Category I tank and we
3 had enough water to give us eight hours of hot standby and
4 then enough to cool down and get us onto the shutdown cooling
5 system, that that was enough and that the alarm was kind of a
6 backup. I think it would be appropriate to leave this as
7 an item for us to look into further at this point in time. I
8 think we need to reexamine that.

9 MR. VAN BRUNT: Dennis, could I go to Exhibit 1A-8?
10 Item 18) says in the event the control room must be evacuated,
11 instrumentation and controls necessary for system operation
12 shall be provided on the remote shutdown panel. I am maybe
13 getting ahead of your presentation. I was curious as to the
14 specific location of that panel. Then I was interested in
15 what kind of security, if you like, is provided such that
16 somebody couldn't just go down there and upset your whole
17 system without anybody knowing about it and operate indepen-
18 dent in the control room. Now, maybe you are going to deal
19 with that later, or if you would like to, you could.

20 MR. BINGHAM: Ed, I notice that the time is running
21 out to start another presentation. I think we could deal
22 with this right now perhaps.

23 MR. VAN BRUNT: That's fine, go ahead and deal with it
24 now. I didn't know whether it was part of your coming
25 presentation or not.



1 MR. BINGHAM: We will touch on it, but let's go ahead
2 and deal with it now and then we can end Criteria 1A and start
3 after the lunch break with 1B.

4 MR. VAN BRUNT: Okay, go ahead.

5 MR. KEITH: The remote shutdown panel is located in
6 the 100-foot level of the control building. Our control room
7 is on the 140-foot level of the control building. There are
8 two doors into that room. Both of those doors are monitored
9 on the security system and are normally shut.

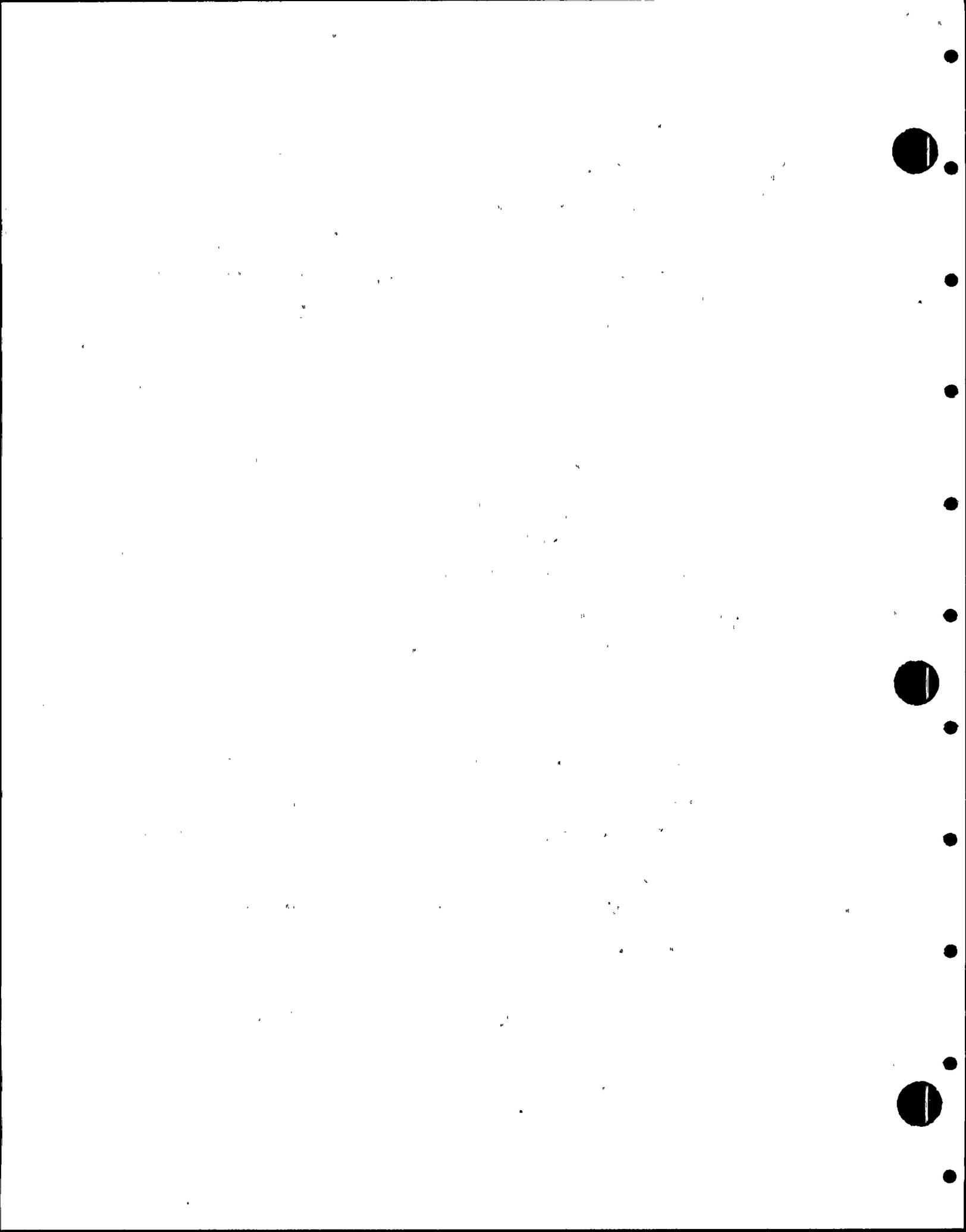
10 MR. VAN BRUNT: Just as a followup, if somehow
11 somebody could breach that security, is that panel operable
12 at all times or does there have to be some action taken by the
13 control room operator to switch control capability over to
14 that shutdown panel?

15 MR. BINGHAM: Ed, that particular issue is one that
16 we have under review right now, particularly as it affects
17 transfer switches. What I suggest that we do is give you
18 the facts later on during this meeting to give you the status
19 of where that is.

20 MR. VAN BRUNT: Okay, fine, we will address that a
21 little bit later on.

22 Bill, you might make a separate note so we will be
23 sure to pick that up.

24 That's all the questions I have. Does anybody else
25 have any questions before we take a break for lunch?



1 MR. ALLEN: Are you going to go into the HVAC systems
2 for these pumps at all in your presentation?

3 MR. KEITH: I hadn't planned on it, but I can.

4 MR. ALLEN: I would just like to verify what type of
5 HVAC we have in each room and if they are on essential cooling
6 or normal cooling.

7 MR. VAN BRUNT: Why don't you, Dennis, as part of your
8 general presentation and description of facilities deal with
9 that?

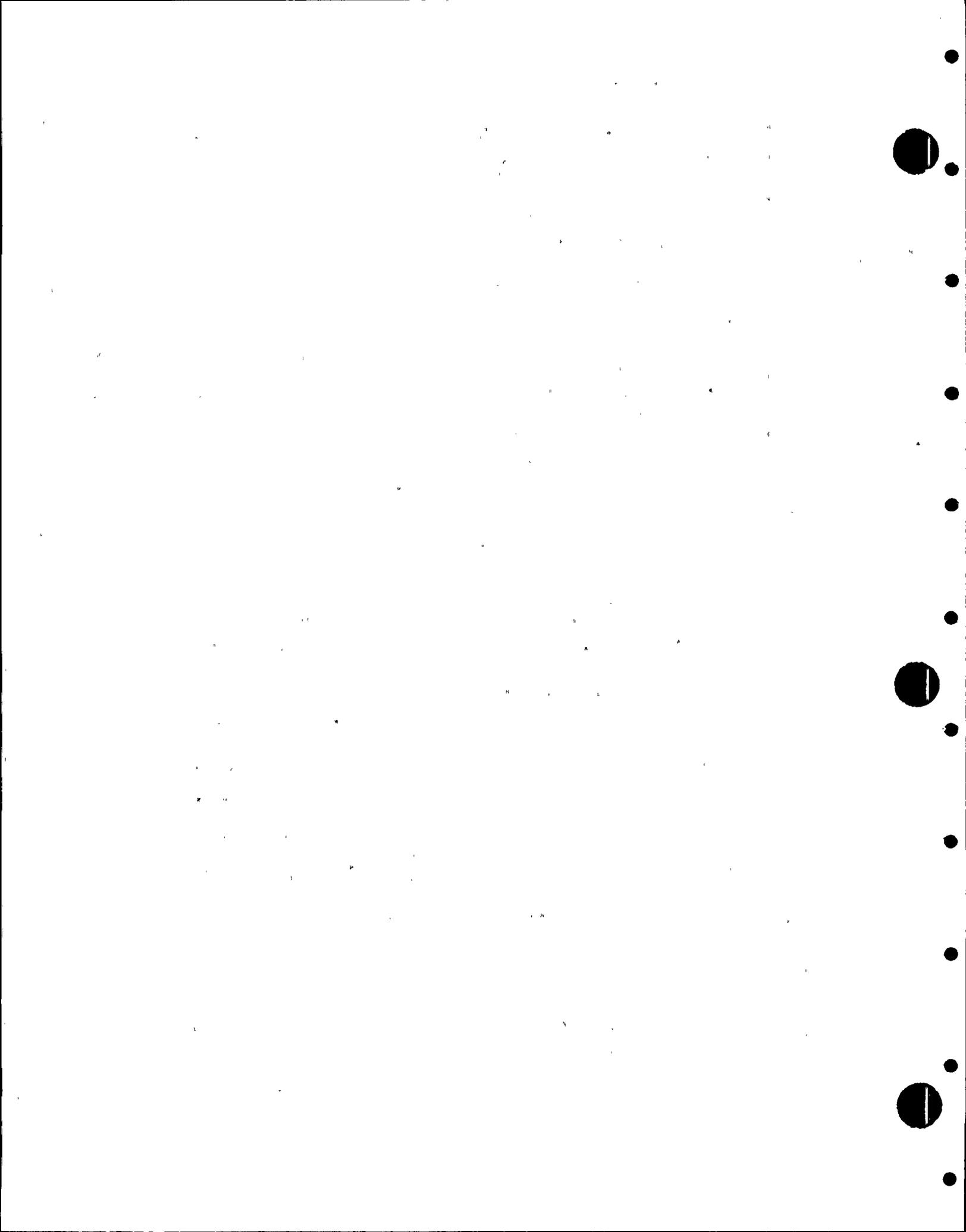
10 MR. KEITH: Okay, fine.

11 MR. VAN BRUNT: Rather than take it as an independent
12 item, I think it fits better there.

13 Any other questions?

14 MR. ROGERS: I want to go back to the very beginning,
15 I think. You talked about the design of the turbine for the
16 turbine-driven feedwater pump and you said that this turbine
17 is designed specifically for a wet steam condition or slugs
18 of water, and so forth. Our plant is a larger plant than
19 many plants before us and I am sure that our auxiliary or
20 emergency feedwater requirements are greater than many of the
21 plants in existence. Has this turbine been used on other
22 plants and has it been tested or is this a new version of the
23 turbine?

24 MR. BINGHAM: I can answer that generally. If you are
25 interested in the specifics, we can get those later, Carter.



1 In general, the pump has been tested. The turbine driver has
2 been tested. In this particular case, it is provided by
3 Terry Turbine, who I believe provides the bulk of the turbines
4 to this application. It is a design that has all the latest
5 problems incorporated into it such as cold slugs --

6 MR. VAN BRUNT: Solutions to those problems.

7 MR. BINGHAM: Solutions, sorry about that, solutions
8 to the latest problems. I don't believe that it is significantly
9 larger than one at an Arkansas plant, because there we are
10 talking I believe about a nominal 900 megawatt plant compared
11 to a 1,270 here. There may be some escalation, but I don't
12 believe it is a substantial escalation in size. However, if
13 you desire more information, we can provide that.

14 MR. ROGERS: I would like to get a specific answer on
15 this particular one if possible.

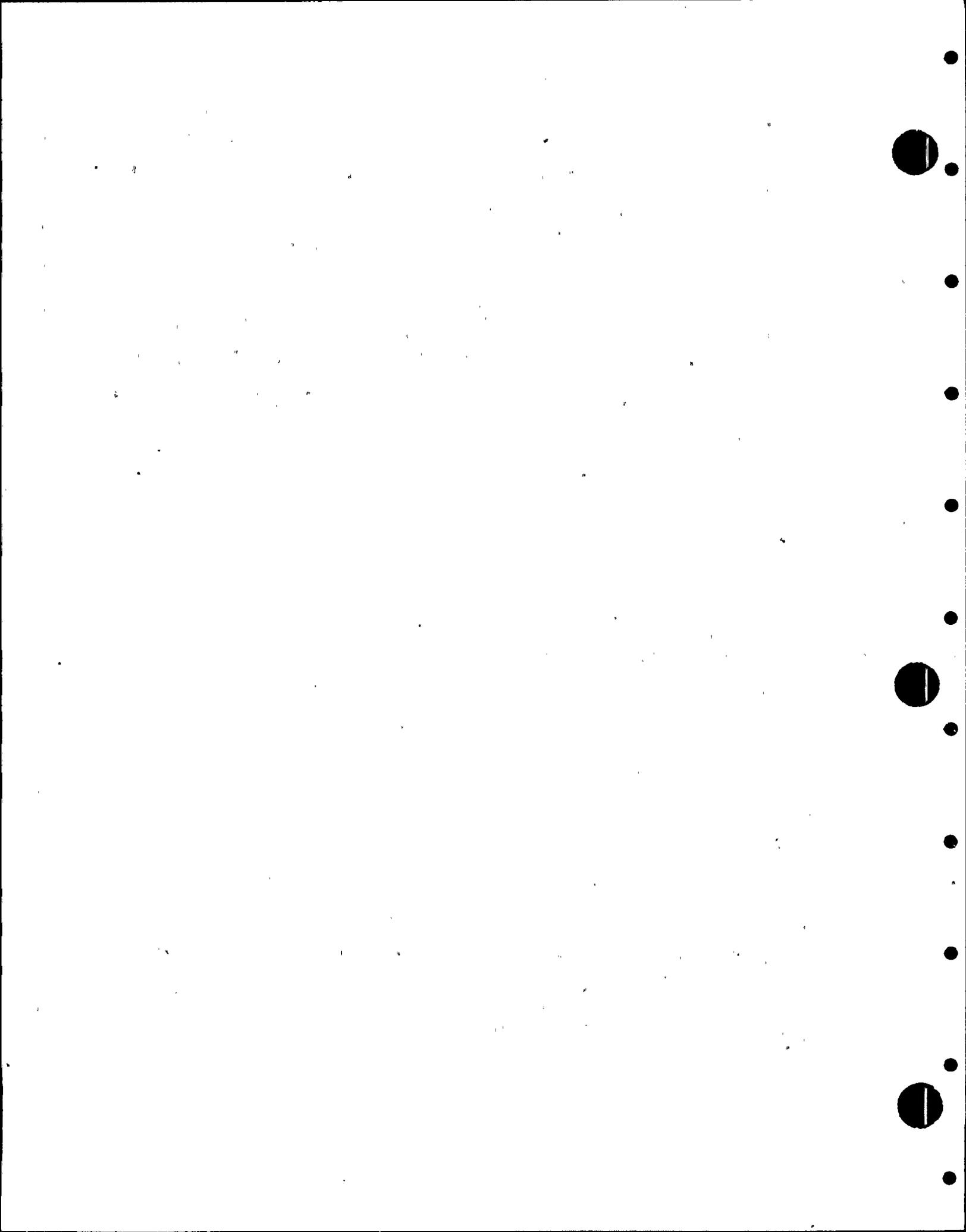
16 MR. BINGHAM: Okay. If I recall, the question was has
17 it been type tested.

18 MR. ROGERS: Has it been type tested in this model,
19 because one could presume --

20 MR. KEITH: In this specific size.

21 MR. ROGERS: Yes, in this specific size. One could
22 presume that the driver has to get 875, and that is based on
23 the heat requirements out of the reactor directly related to
24 megawatts, so you could have a ratio problem there.

25 MR. BINGHAM: We could answer that question. As I



1 recall from other discussion, I think on the AC system, we
2 indicated that there will be a functional test in the field
3 during startup that will confirm that it can deliver the
4 proper flow and pressure and temperature, so there will be a
5 field confirmation.

6 MR. VAN BRUNT: Are there any other items?

7 MR. ALLEN: Dennis, are you going to go into more
8 detail on which valves in the aux feedwater system are
9 indicated on this safety equipment status panel?

10 MR. KEITH: Yes, we will be discussing those.

11 MR. VAN BRUNT: Seeing no more hands, why don't we
12 break for lunch. It is going to be in the next room. We have
13 enough planned for everybody that is here if you so desire.
14 Why don't we plan to reconvene at 1:15.

15 (Thereupon the meeting was at recess.)

16

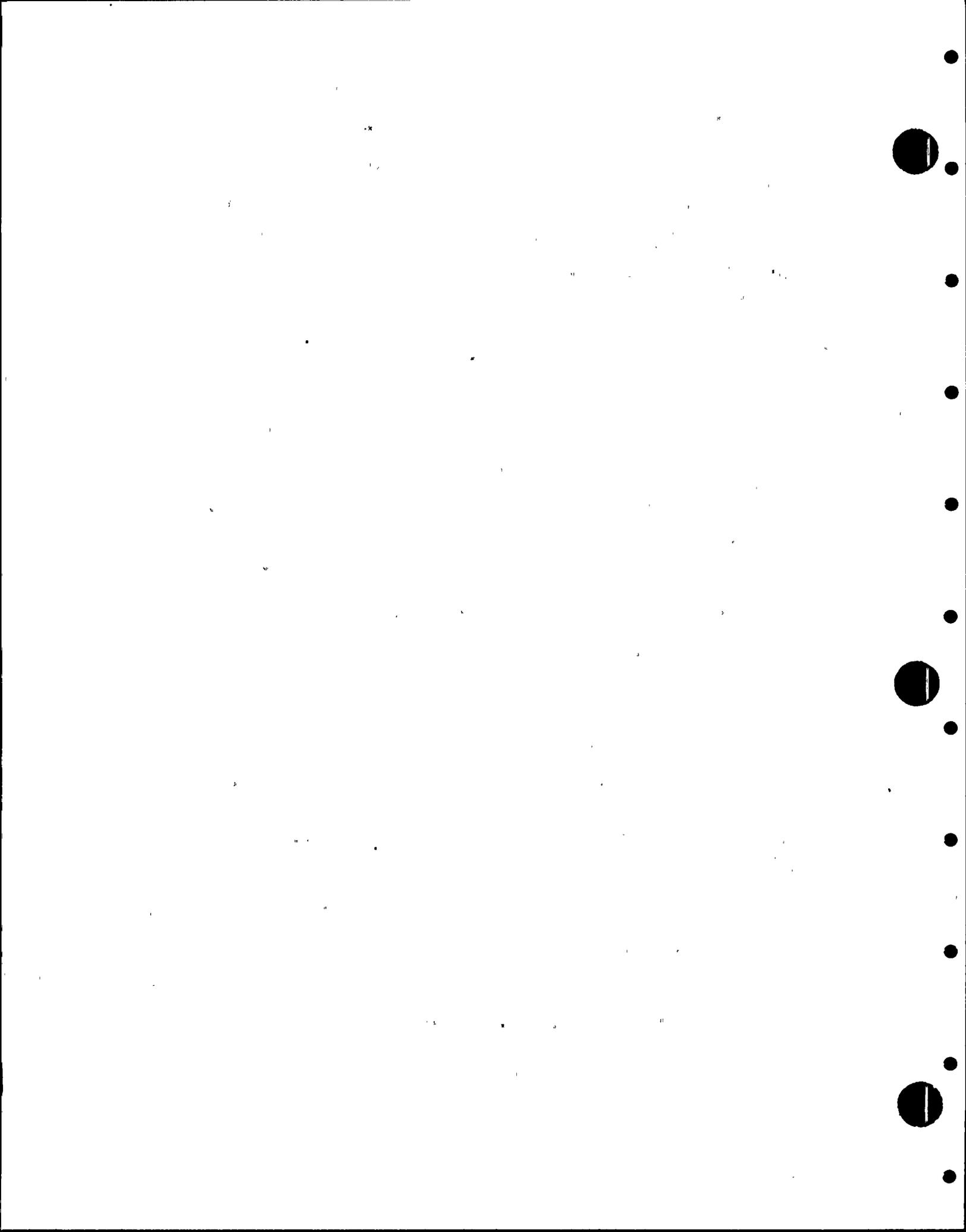
17

18 August 21, 1980
19 1:25 p.m.

20 MR. VAN BRUNT: Bill, you're back on.

21 MR. BINGHAM: At this time, Ed, we would like to
22 continue with Section 1B in our system overview, which
23 discusses the operation of the aux feedwater system.

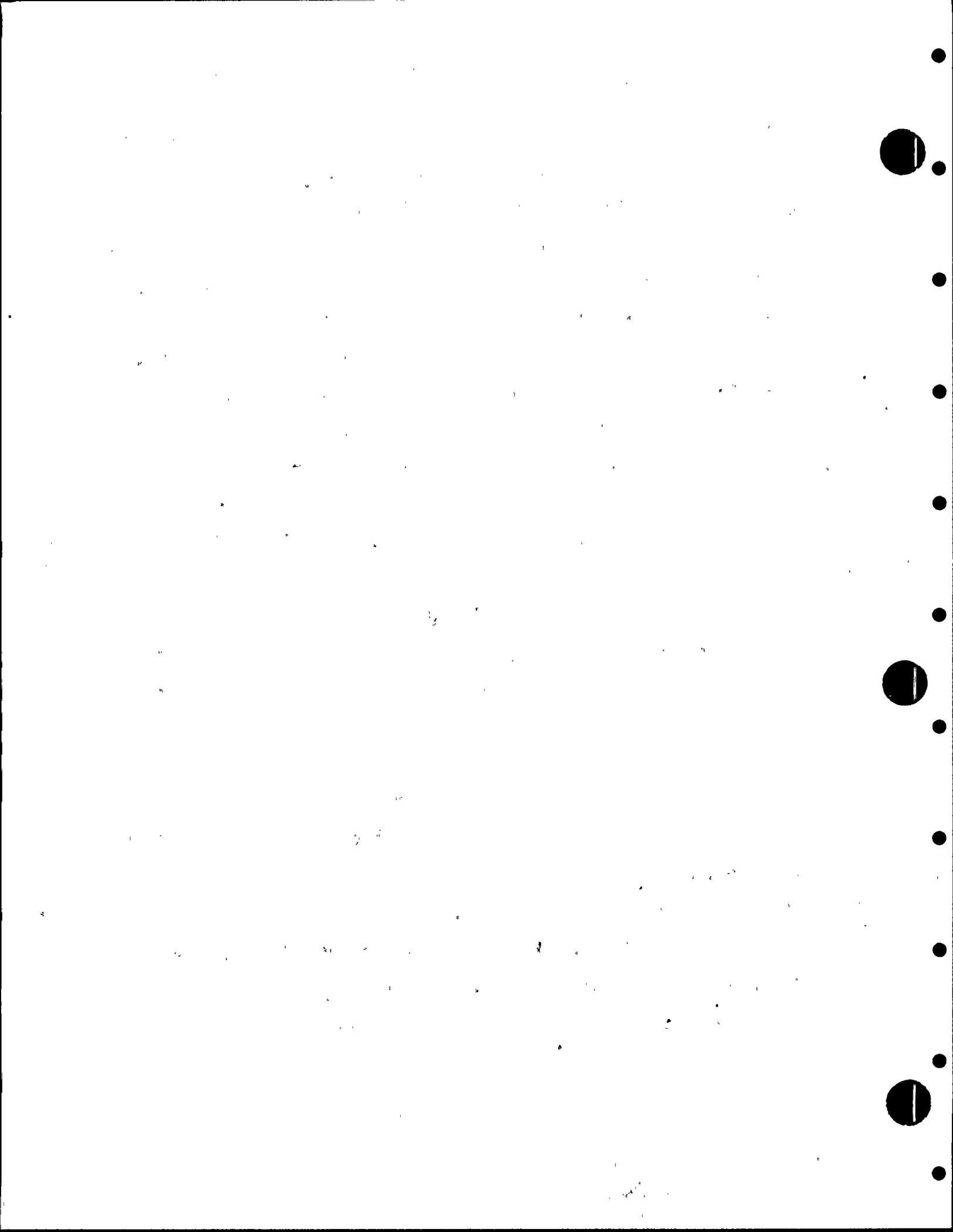
24 MR. KEITH: Exhibit 1B-1. We will now discuss operation
25 of the auxiliary feedwater system. Some of this will be going



1 over stuff you have seen. We will try and go through it
2 fairly quickly. We have seen that we do need auxiliary
3 feedwater for startup, shutdown, hot standby, and for some
4 of the design basis accidents. We have three independent
5 trains for auxiliary feedwater. We have our two emergency
6 trains, which you see right here (indicating), steam turbine
7 driven, motor driven. They take suction from our reserve
8 inventory in the condensate storage tank. They have interties
9 between the two with redundant isolation so that each pump
10 can feed both steam generators. The motor-driven pump feeding
11 generator two, we have one for that path (indicating) and
12 one for that path (indicating), and similarly for the turbine-
13 driven pump. We also have an alternate source of condensate
14 to tie in, which we will discuss, coming from the reactor
15 water makeup tank, and the turbine-driven pump, as we have
16 also stated, which receives steam from either of the steam
17 generators.

18 We have both mini-flow and full-flow recirculation
19 lines. The mini-flow has a locked open valve to prevent
20 overheating, as we discussed earlier. The full-flow lines
21 which are used for testing have a normally shut valve so that
22 we can feed the steam generators.

23 We also have our motor-driven startup auxiliary
24 feedwater pump shown down here (indicating). We have mini-
25 flow on it, and, of course, the capability to feed either

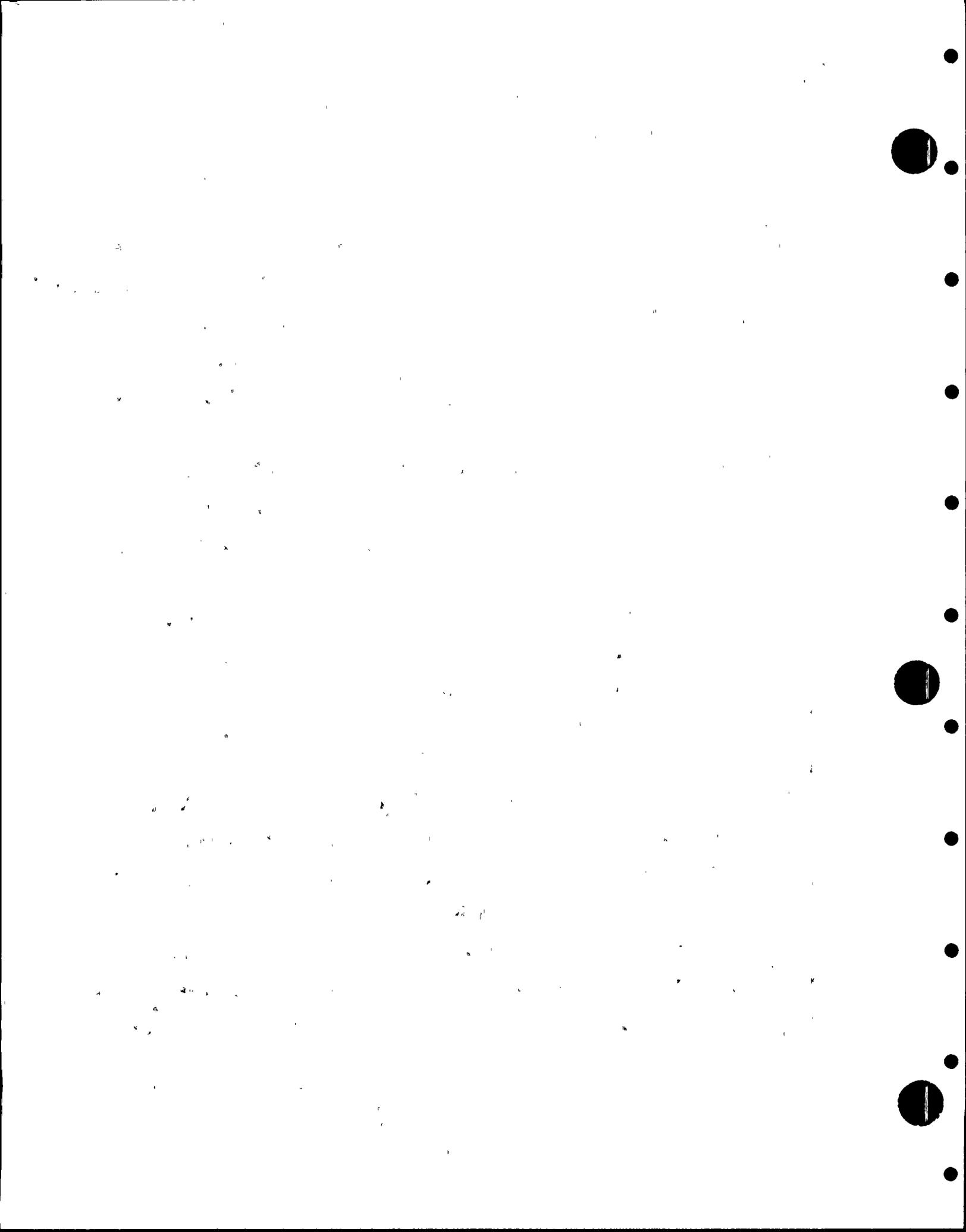


1 steam generator.

2 Exhibit 1B-2. As we have seen we have multiple
3 flowpaths.

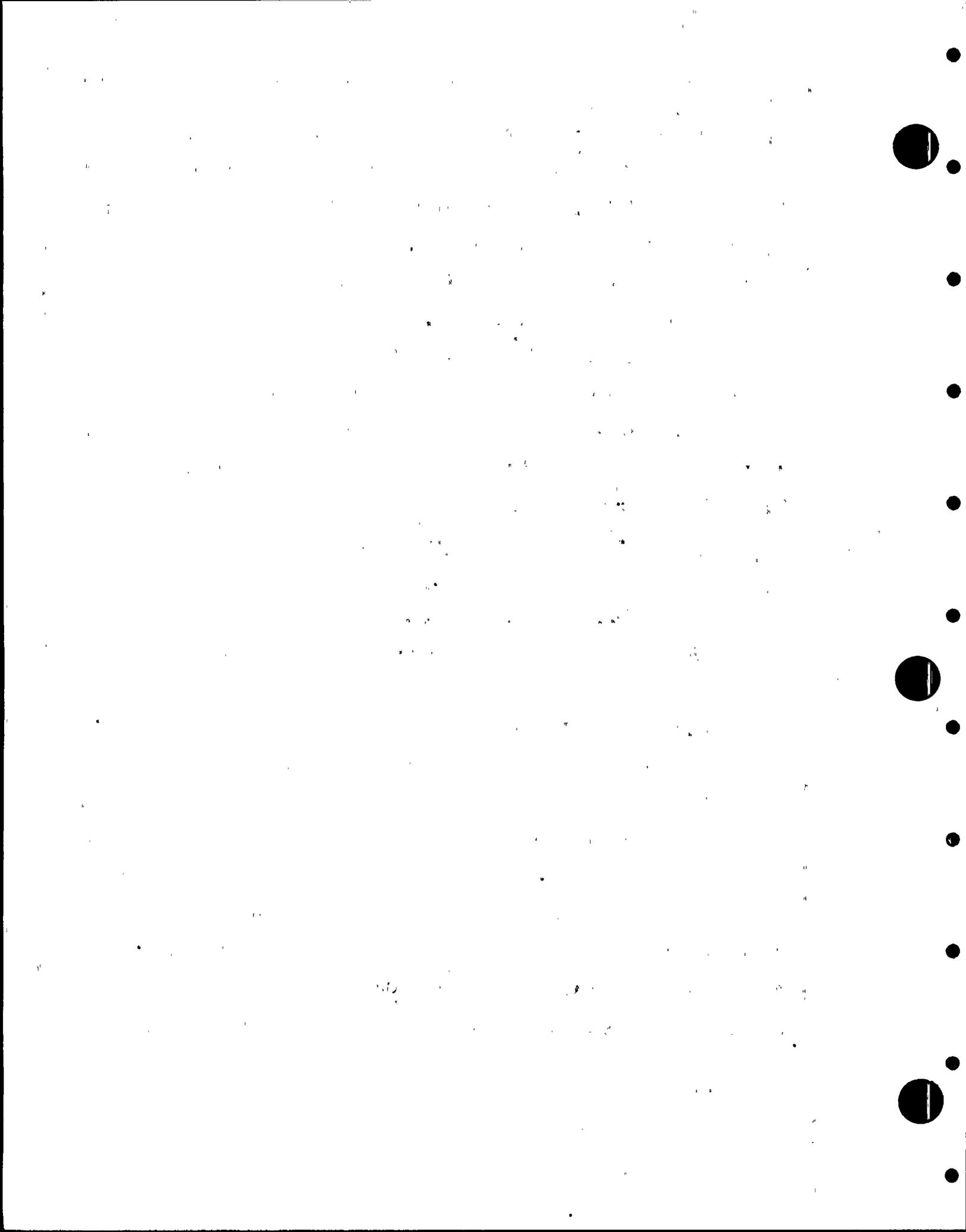
4 We talked some about the class breaks, but let's
5 just quickly go through them. This we have talked about being
6 Section II up to here (indicating) -- Section III, Class 2,
7 excuse me, up to this point (indicating) and Section III,
8 Class 3, beyond. The emergency trains are all Section III,
9 Class 3, up to these valves (indicating), which serve as
10 containment isolation valves, showing the class break going to
11 Class 2 beyond there. Our startup pump, Section III, Class 3,
12 up to this valve (indicating). Then we go to B31.1 up to
13 this valve here (indicating), and then we go to Section III,
14 Class 2, beyond that point, and similarly on the other tie-ins.
15 This (indicating) is part of the main feedwater system, and
16 then we have the main feedwater system coming in making the
17 same class break there to Section III, Class 2, from ANSI
18 B31.1.

19 Exhibit 1B-3. As we said, the startup feedwater
20 pump and its train is manually actuated. Emergency feedwater
21 trains respond to an auxiliary feedwater actuation signal and
22 they get an emergency feedwater actuation signal. The
23 emergency feedwater actuation signals, there are two of them,
24 an AFAS 1 and an AFAS 2. The first would be to feed steam
25 generator number 1 and the second would be to feed steam



1 generator number 2, so there are two separate signals. We
2 get an AFAS to steam generator number 1 upon receipt of a low
3 steam level in generator number 1 and a non-ruptured signal
4 in steam generator number 1. We generate a ruptured signal
5 in steam generator number 1 by once again having a low steam
6 generator level in number 1 by having a differential by steam
7 generator number 2 being the 120 psi higher in pressure than
8 steam generator number 1 and also upon receipt of a not-
9 ruptured signal from steam generator number 2. We have the
10 capability, also, of manual initiation of the emergency
11 feedwater trains.

12 Exhibit 1B-4. This is another slide showing a
13 little bit more of the relationship between the feedpaths,
14 the main steam isolation valves, the main feedwater isolation
15 valves. This is Figure 3. Here we show the emergency
16 feedwater tapping into the downcomer feedwater lines.
17 Normally, with the plant in operation, the plant producing
18 power, the normal feedwater comes in through this line
19 (indicating) to the economizer nozzles and through this line
20 (indicating) to the downcomer nozzles on the steam generator.
21 The emergency feedwater line ties into this line (indicating).
22 The startup auxiliary feedwater pump ties in right here
23 (indicating) as shown. Coming off of each steam generator,
24 we have two main steam lines. On each steam line, we have
25 five safety valves and one atmospheric dump valve, and then

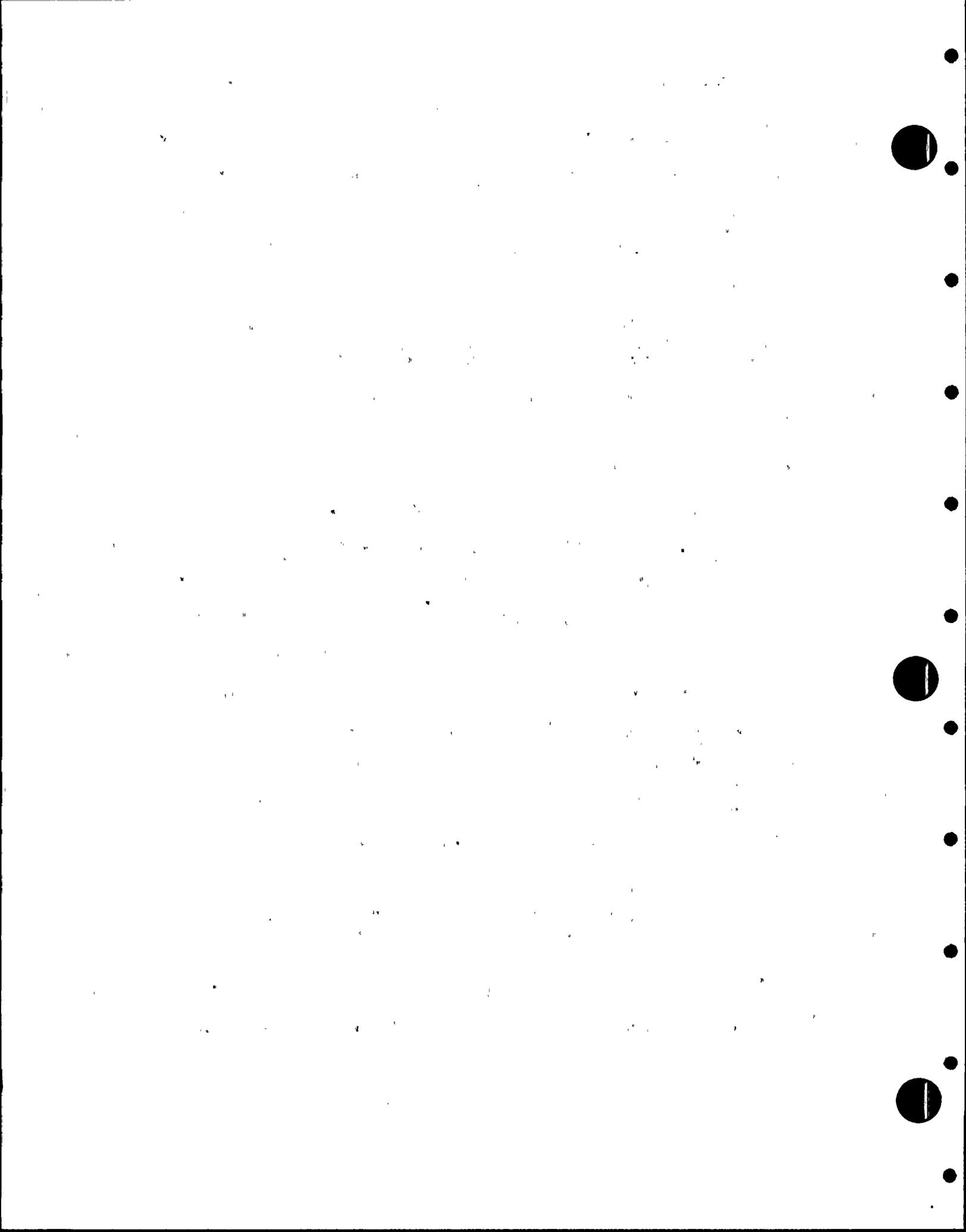


1 here (indicating) we have the main steam isolation valves on
2 each of the four lines, a bypass valve around two of the main
3 steam isolation valves, one on each steam generator, and
4 here (indicating) are lines coming off of the main steam line
5 to feed the emergency feed pump turbine.

6 Here we have the condensate storage tank, Figure 4.
7 As I stated earlier, this is a concrete tank with a stainless
8 steel liner, a steel top which is insulated, supplied by
9 nitrogen as a cover gas to minimize oxygen in the condensate.
10 We discussed the overflow line. This is normally fed from
11 the demineralized water storage tank, and we have an automatic
12 fill to the tank that maintains it at a level between 530,000
13 and 550,000 gallons in the tank normally, so we have
14 considerable leeway above our required 300,000 gallons.

15 We show here (indicating) the three feedwater pump
16 recirc lines coming in. We also show here the three suction
17 lines to the auxiliary feedwater pumps. This (indicating)
18 is the class break between the Section III, Class 3, and the
19 B31.1 piping that we have discussed going to the startup
20 feedwater pump. Condensate makeup, which is what this tank
21 is used for most of the time, comes in above -- the makeup
22 to the condenser hotwell comes in above our 330,000 gallon
23 level.

24 We show two other condensate transfer pumps, which
25 are used to make up to the condenser, are also used to



1 make up to some of our essential tanks, our diesel generator
2 cooling water surge tank, our essential chilled water surge
3 tank, and essential cooling water surge tank. All of the
4 piping of these condensate transfer pumps is AMSE Section
5 III, Class 3.

6 MR. BINGHAM: Are there any questions, Ed, from the
7 board at this point?

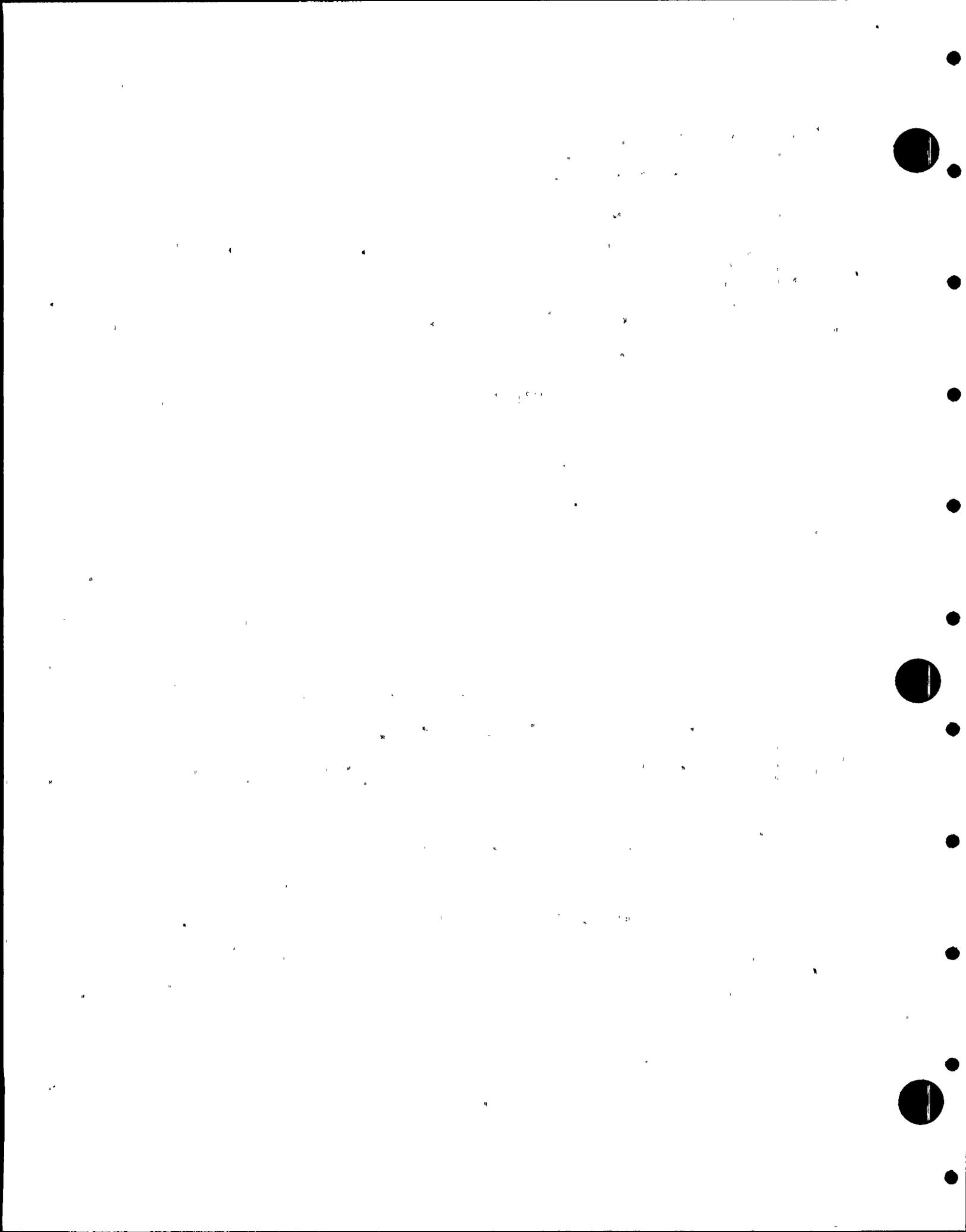
8 MR. VAN BRUNT: Does anybody have any questions on
9 this? Mike.

10 MR. BARNOSKI: I have two questions. One is on that
11 figure that is up there right now. Is the suction part to
12 the condensate transfer pumps missile protected?

13 MR. KEITH: Yes.

14 MR. BARNOSKI: The second question I had is on Exhibit
15 1B-3. I was wondering if your statement that the automatic
16 initiation of emergency feedwater precludes ruptured steam
17 generators is technically correct. It is my understanding
18 that for small breaks, the logic cannot distinguish which is
19 intact and which is the ruptured generator and for those you
20 have to wait awhile, but feed does continue in both generators.

21 MR. KEITH: That's correct. I explained how the logic
22 works and you do need that 120 psi differential to sense the
23 ruptured steam generator. So you're right and CE has done
24 analysis on this to determine what operator action is required
25 in the event of small breaks.



1 MR. VAN BRUNT: Okay, Mike?

2 MR. BARNOSKI: Yes.

3 MR. VAN BRUNT: Shelley.

4 MR. FREID: I am back on Figure 4. I guess I am still
5 concerned about the level. We have had a lot of trouble in
6 other tanks in terms of adequate volume of safety related
7 water, and in this case, we talked about other reserves. Do
8 you have a reserve for vortex formation in that tank and
9 instrument error? Are those all calculated into that 330,000
10 gallon?

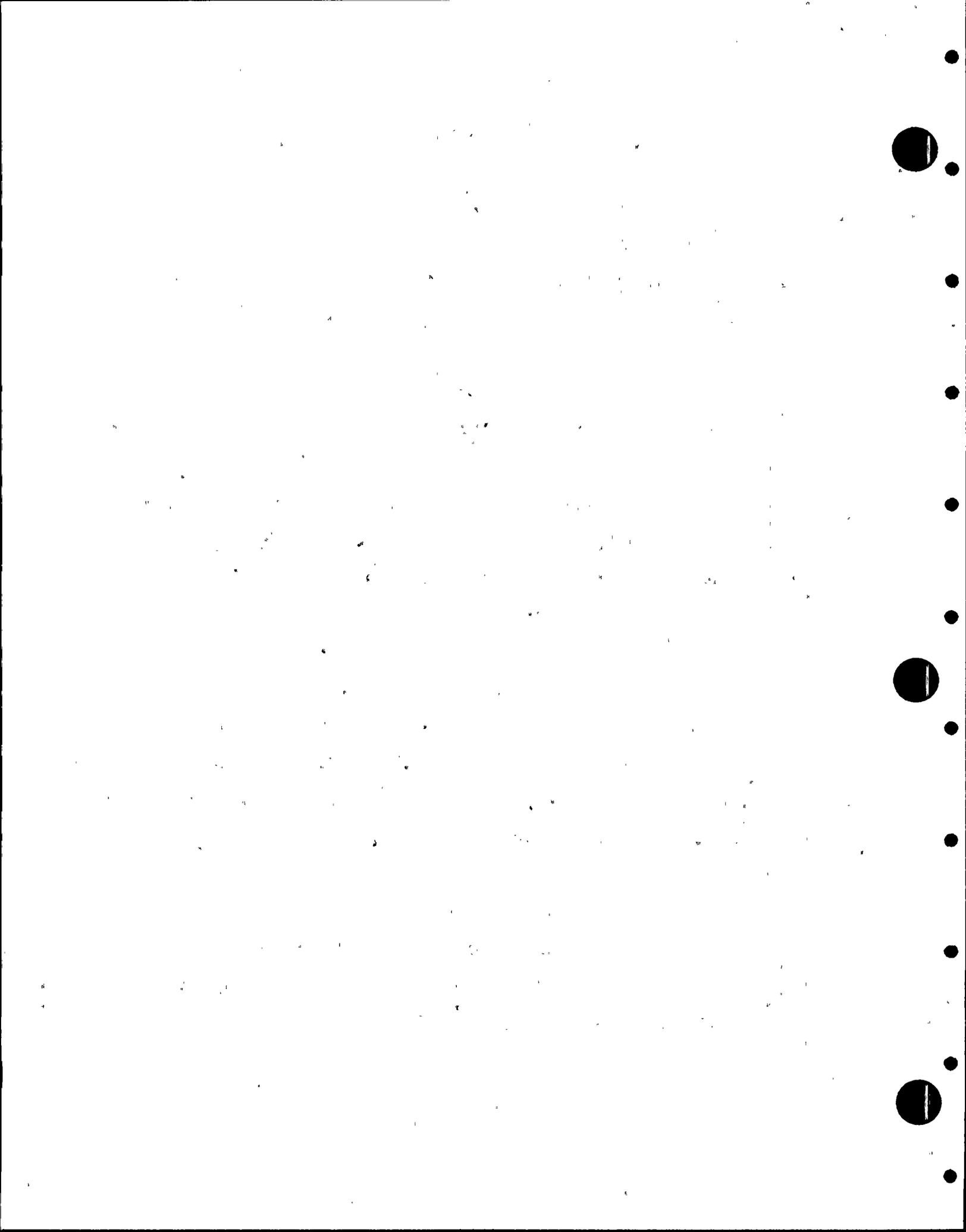
11 MR. BINGHAM: Ed, I think this ties in with a previous
12 question that Shelley asked about that. Why don't we have that
13 as an item that we can give a complete response to?

14 MR. VAN BRUNT: Okay. Ralph.

15 MR. PHELPS: I still have a question on the fact that
16 you don't have a relief valve on this tank. Have you looked
17 at all credible ways that you might over pressurize that tank
18 in some way? For example, is that a high pressure nitrogen
19 supply line that may be regulated somewhere upstream where
20 you can overpressurize with nitrogen?

21 MR. BINGHAM: Let me say, Ed, we believe that
22 everything is in order, but what we would like to do is have
23 a little time to call back and make absolutely sure.

24 MR. VAN BRUNT: Okay, Bill. Why don't you put this
25 on the list of items that Bechtel will deal with and then we



1 will either take care of it later on in the proceedings or it
2 can be one of the follow-up items that has to be taken care
3 of.

4 MR. QUINN: Will you restate that question one time?

5 MR. VAN BRUNT: Ralph, will you please restate the
6 question?

7 MR. PHELPS: Yes. I had a concern that, since there
8 was no safety relief valve on the condensate storage tank,
9 had Bechtel looked at the credible ways that it might be
10 overpressurized, for example, from the nitrogen supply line?

11 MR. KEITH: Ralph, let me tell you that this is simpli-
12 fied. We were just looking at the P&ID. This is a simplifica-
13 tion of that, and there are two safety valves plus a pressure
14 control valve that bleeds off to atmosphere the nitrogen
15 pressure to maintain it at one psi.

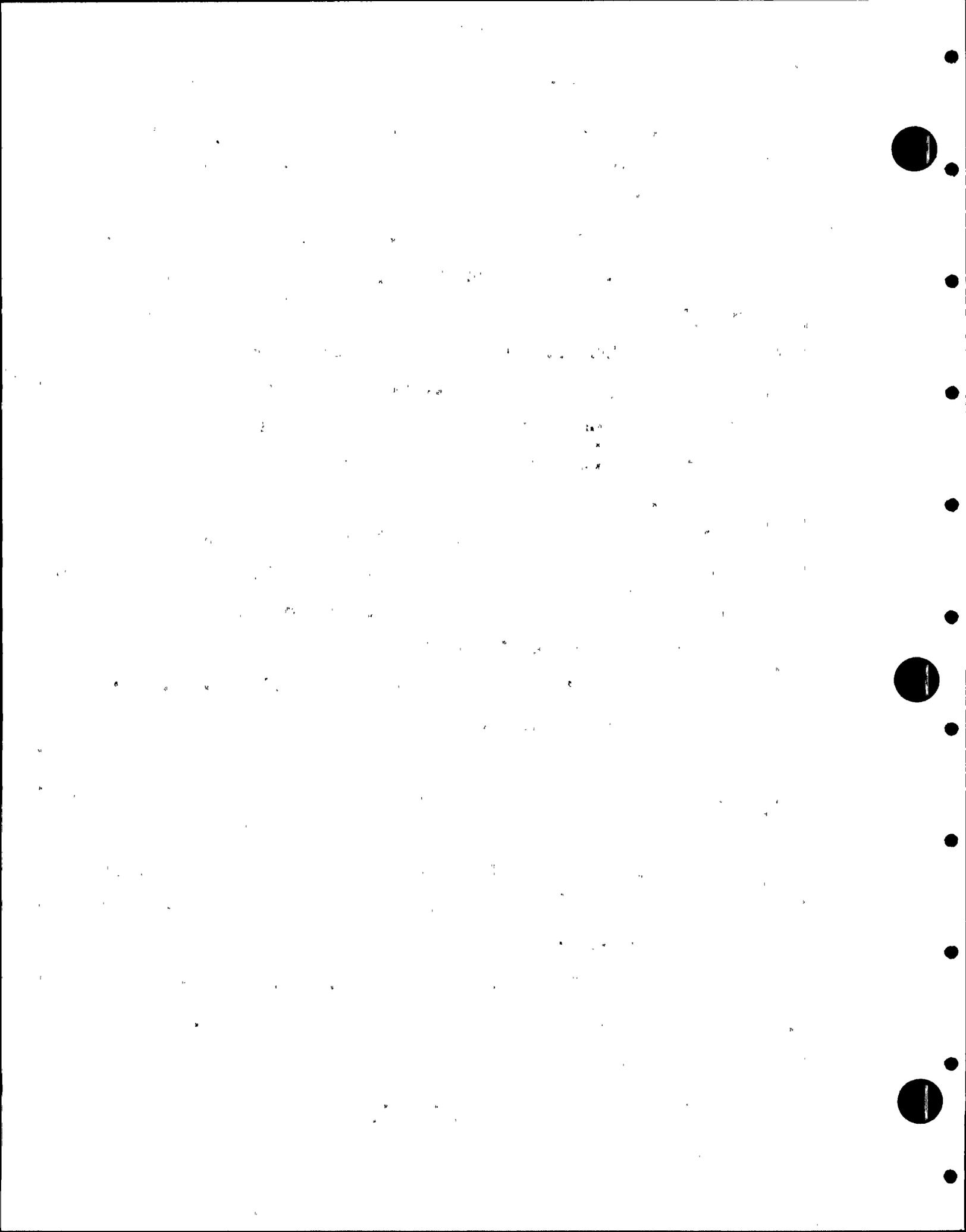
16 MR. PHELPS: You had mentioned earlier that there were
17 no relief valves, but you say that there are some relief
18 valves?

19 MR. KEITH: Yes. I was mistaken if that's what I said
20 earlier.

21 MR. PHELPS: Only they are not just vacuum breakers?

22 MR. HODGE: Dennis, would the overflow line also serve
23 as a relief valve?

24 MR. KEITH: Yes. It would blow the loop seal out.
25 What I am not sure about is is there a calc done to --



1 MR. VAN BRUNT: I was going to follow up. I guess the
2 question I would ask as a follow-up then on Ralph's question
3 would be what is the basis for the sizing of those valves?

4 MR. KEITH: Fine.

5 MR. BINGHAM: That is really what I wanted to give you
6 a complete answer on, Ed.

7 MR. VAN BRUNT: Any other questions? Rick.

8 MR. TURK: If there is isolation of the regulating
9 valve in a regulating condition and subsequently there is an
10 actuation, will those valves reopen to the full position,
11 full open position?

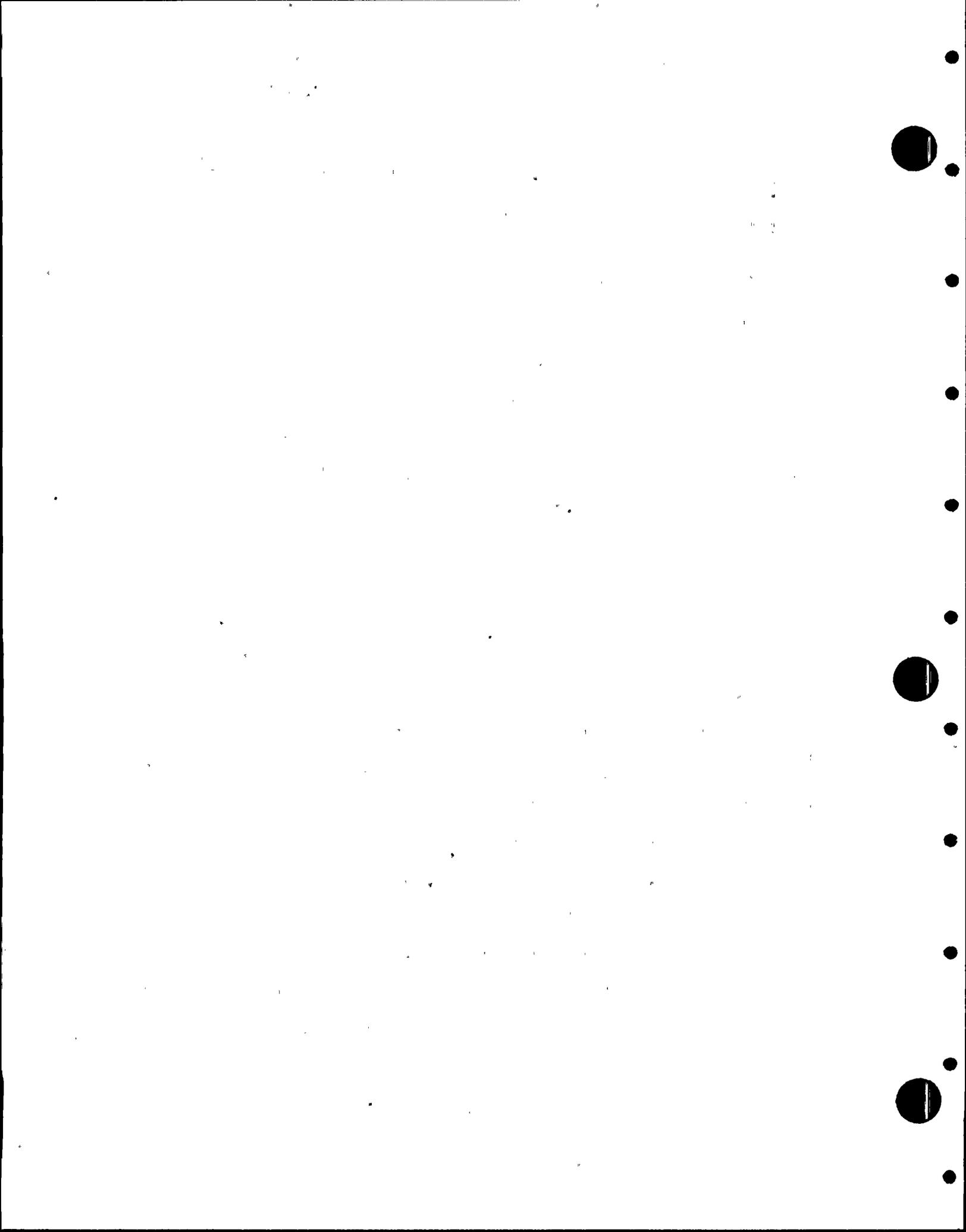
12 MR. KEITH: You are talking on the emergency feedwater
13 lines?

14 MR. TURK: Correct. In other words, the system is
15 being actuated and the valves have been turned to a regulating
16 position and then maybe the heat load has been increased
17 because the reactor coolant pumps have been restarted and the
18 water level goes down and you would get another actuation
19 signal, will those valves open to the full open position?

20 MR. KEITH: Yes.

21 MR. VAN BRUNT: Angie, you had a question.

22 MR. ORTIZ: Yes. Have you assured by analysis or some
23 other means that a failure of the blowdown line either by a
24 pipe break or a failure of the blowdown valves remaining open
25 after an initiation of the aux feedwater system will not cause



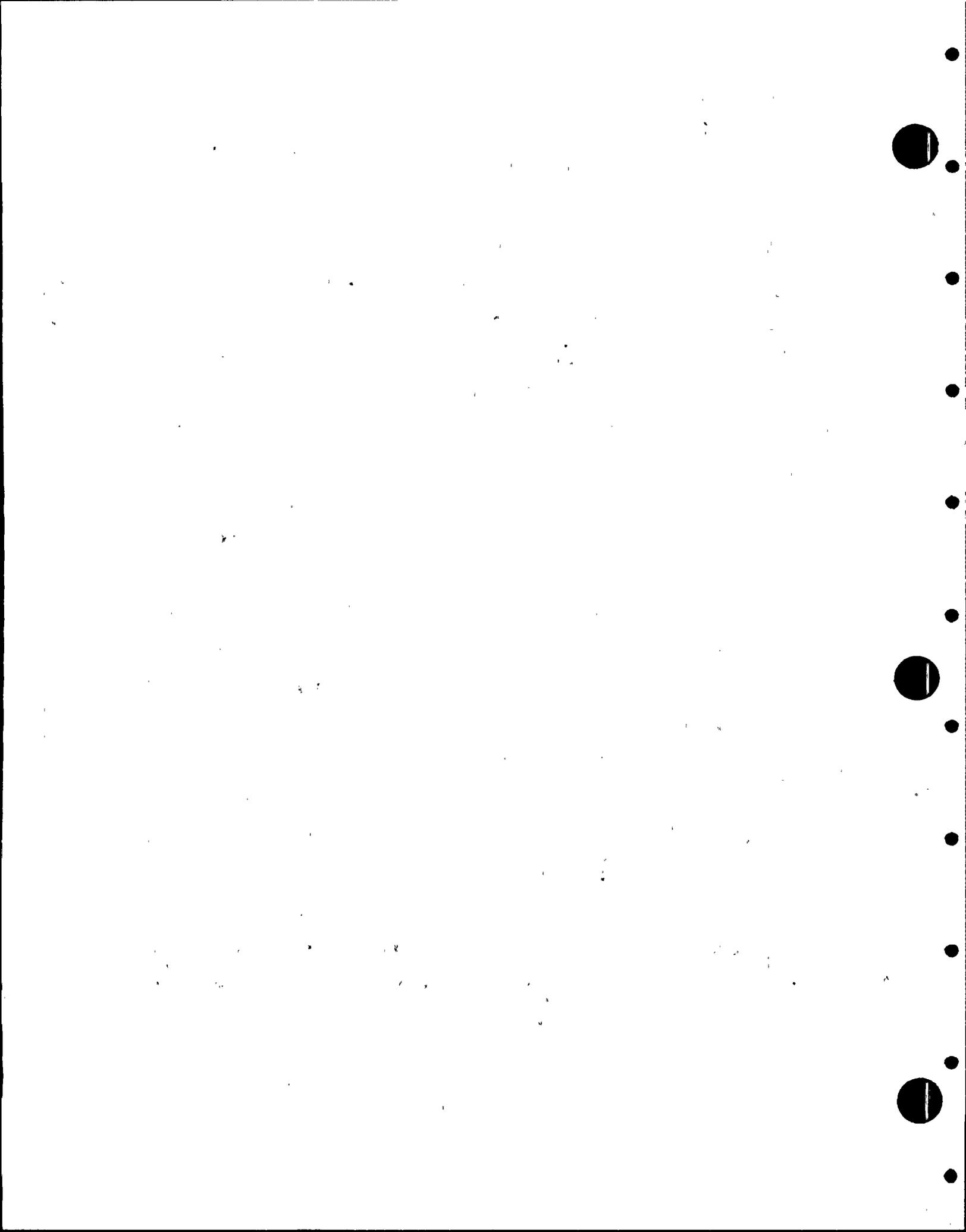
1 an accelerated drain of the aux feedwater through the blowdown
2 and thereby reduce your heat removal capacity.

3 MR. KEITH: Well, a main feedwater line break, which
4 this would fall into that category as far as the auxiliary
5 feedwater system is concerned, has been analyzed by Combustion
6 Engineering and the system does respond adequately. You know,
7 we get back into the question earlier on the accident analysis,
8 but the auxiliary feedwater system will take care of it. I
9 am not sure if I --

10 MR. TURK: The question was is the steam generator
11 blowdown line, both blowdown lines, isolated automatically on
12 an emergency feedwater actuation signal. I think you said
13 earlier it was.

14 MR. KEITH: Oh, yes. Yes, I'm sorry, I thought we
15 were getting into the breaks. As far as the actuation for
16 normal operations, yes, an AFAS shuts the steam generator
17 blowdown line.

18 MR. FREID: I think the question is is it single failure
19 proof, though. If you have one steam generator down because
20 of a break, main feed break, and you've got pumps trying to
21 feed one steam generator and that other steam generator's
22 blowdown line does not isolate with a single failure, do you
23 have enough aux flow going to the steam generator? In other
24 words, are you single failure proof on the second steam
25 generator blowdown?



1 MR. KEITH: We do have two isolation valves in those
2 blowdown lines, so we are protected against a single failure
3 in that event.

4 MR. VAN BRUNT: Did I see somebody else over here had
5 a question?

6 MR. HOEFERT: It is my understanding that the regulating
7 and the isolation valves in the auxiliary feedwater line both
8 open and close as the auxiliary feedwater signal is initiated
9 and terminated, is that correct?

10 MR. KEITH: That's correct.

11 MR. HOEFERT: Can you explain why you cycle both of
12 the valves instead of just one? It seems to me that it
13 might increase the probability of a failure.

14 MR. KEITH: Well, I think you would get into some
15 difficulties in the logic, because you are concerned, also,
16 about terminating feed to a faulted steam generator. You want
17 the signal to go into both of them to shut, so you also need
18 it to go to both of them to get it open when you need it open.

19 MR. HOEFERT: Isn't that a different signal, though?

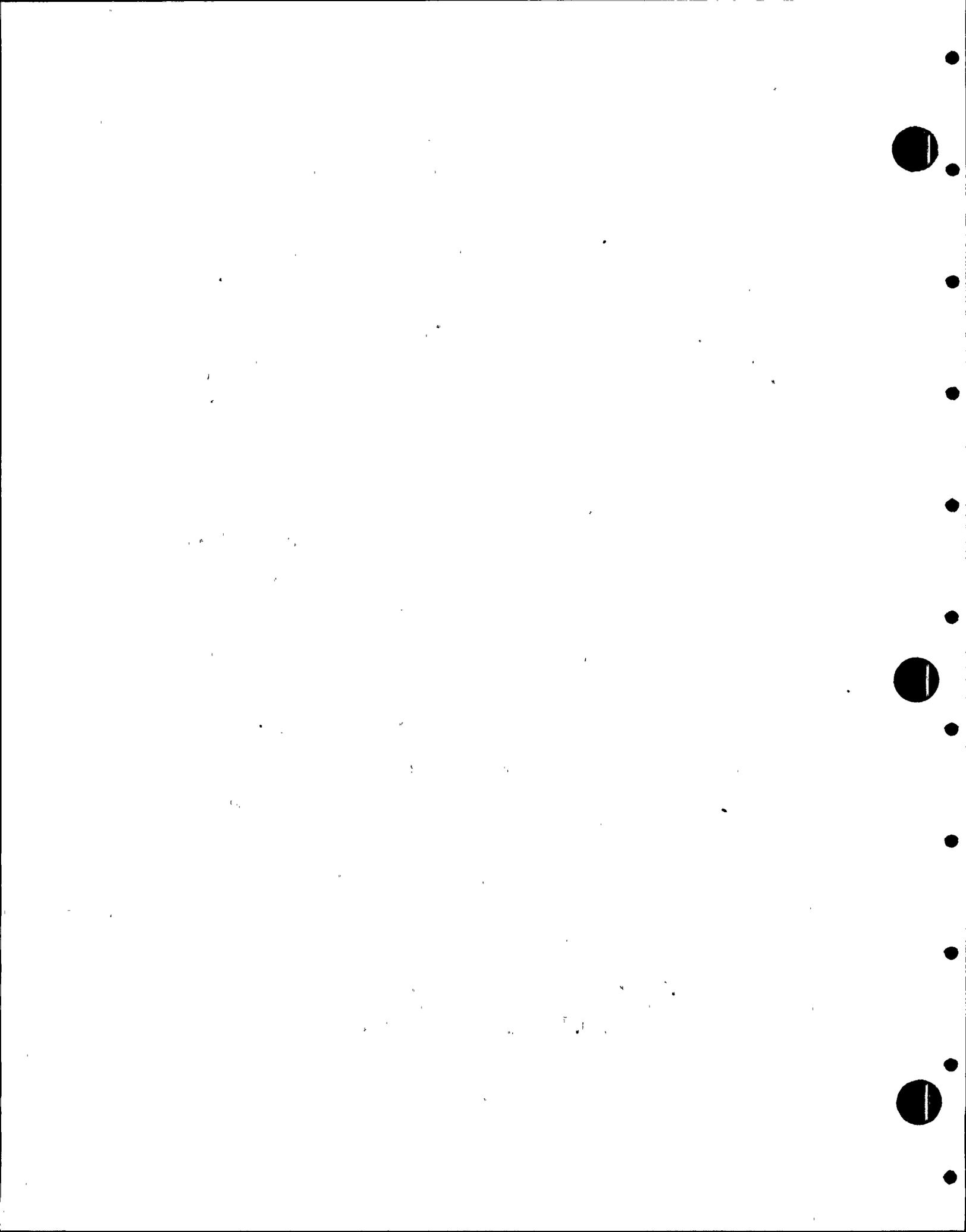
20 MR. KEITH: The same signal.

21 MR. HOEFERT: The same signal?"

22 MR. KEITH: Yes, the AFAS. It is just the AFAS is what
23 you get.

24 MR. VAN BRUNT: Okay, Norm?

25 MR. HOEFERT: Another concern on that same line is the



1 ones in the turbine-driven feedwater pump line are battery
2 operated, and doesn't it add an extra load on the batteries
3 that possibly could be done away with.

4 MR. KEITH: The batteries are sized such that we can
5 operate that turbine-driven pump for two hours, and I have
6 forgotten the exact number of cycles that is assumed for the
7 auxiliary feedwater actuation. As I recall, the difference
8 in the set point allows for 20 minutes between cycles on those
9 valves.

10 MR. HOEFERT: Has this really been looked at? In my
11 initial question, you said the logic went into the problem.
12 Is that really the case? Has it been looked at?

13 MR. KEITH: You mean have we specifically looked at
14 just actuating one valve instead of two?

15 MR. HOEFERT: Yes.

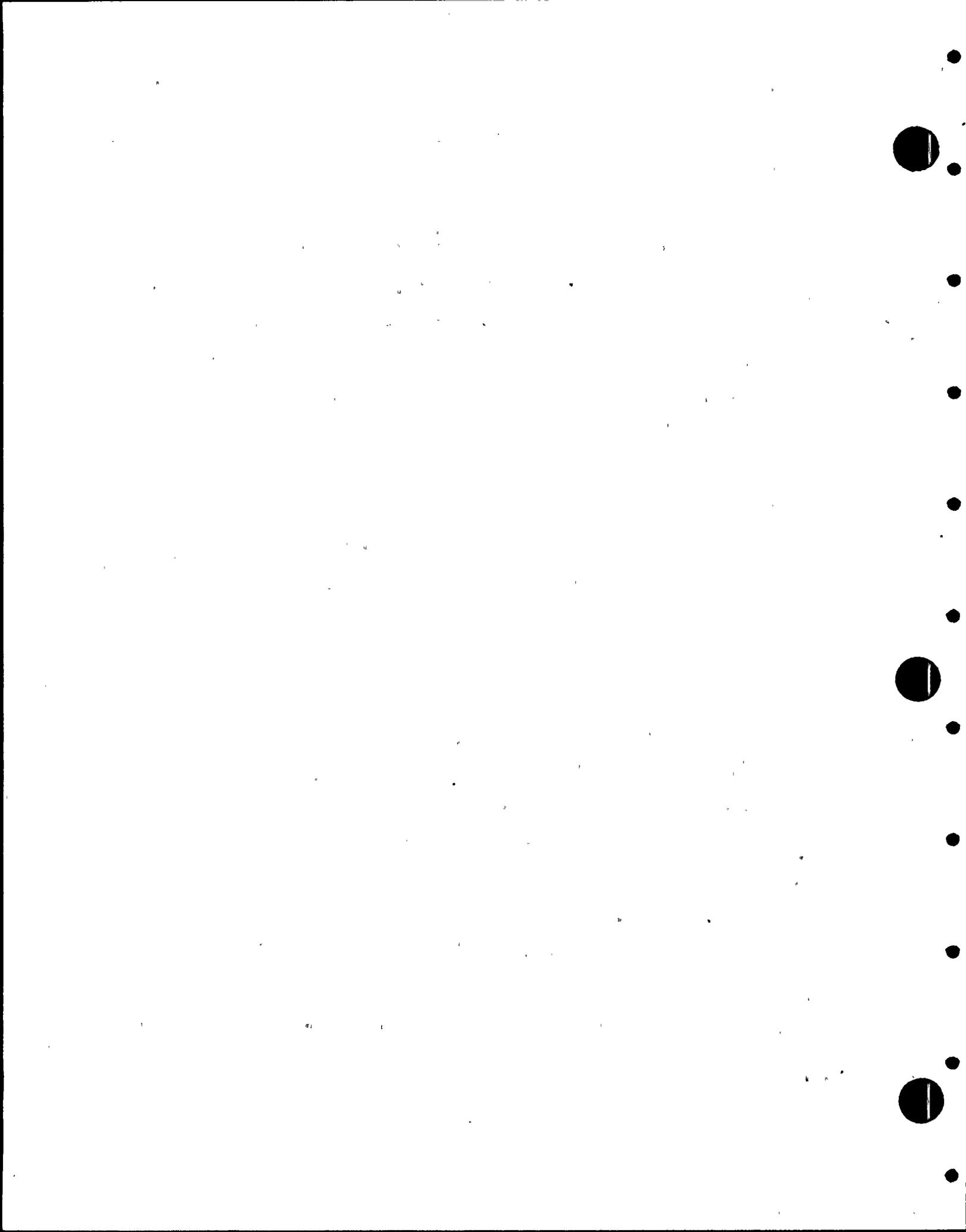
16 MR. KEITH: I don't know, Norm. We could. Do you want
17 to hold that?

18 MR. VAN BRUNT: Yes. Bill, why don't you put it on the
19 list as an item that can be verified.

20 MR. KEITH: I don't know if Combustion Engineering has
21 any --

22 MR. TURK: The isolation function action is required
23 to be single failure proof, so I don't see how you can do it
24 without requiring both valves to be shut.

25 MR. HOEFERT: Well, you could shut one valve and one



1 would still be there available to close. You don't have to
2 close it. It would still be a single failure proof system.

3 MR. KEITH: I think you would get into difficulties
4 really implementing that. It sounds nice.

5 MR. VAN BRUNT: Herm, do you have a question?

6 MR. LaGOW: On the condensate storage tank, as you pump
7 the water out, how do you maintain the pressure inside?

8 MR. KEITH: This line (indicating) has a regulator.
9 This is a normally open line from our nitrogen supply.

10 MR. LaGOW: Oh, you have a large supply?

11 MR. KEITH: Yes. So that regulator tries to
12 maintain the one psi.

13 MR. VAN BRUNT: Ralph, you had a question.

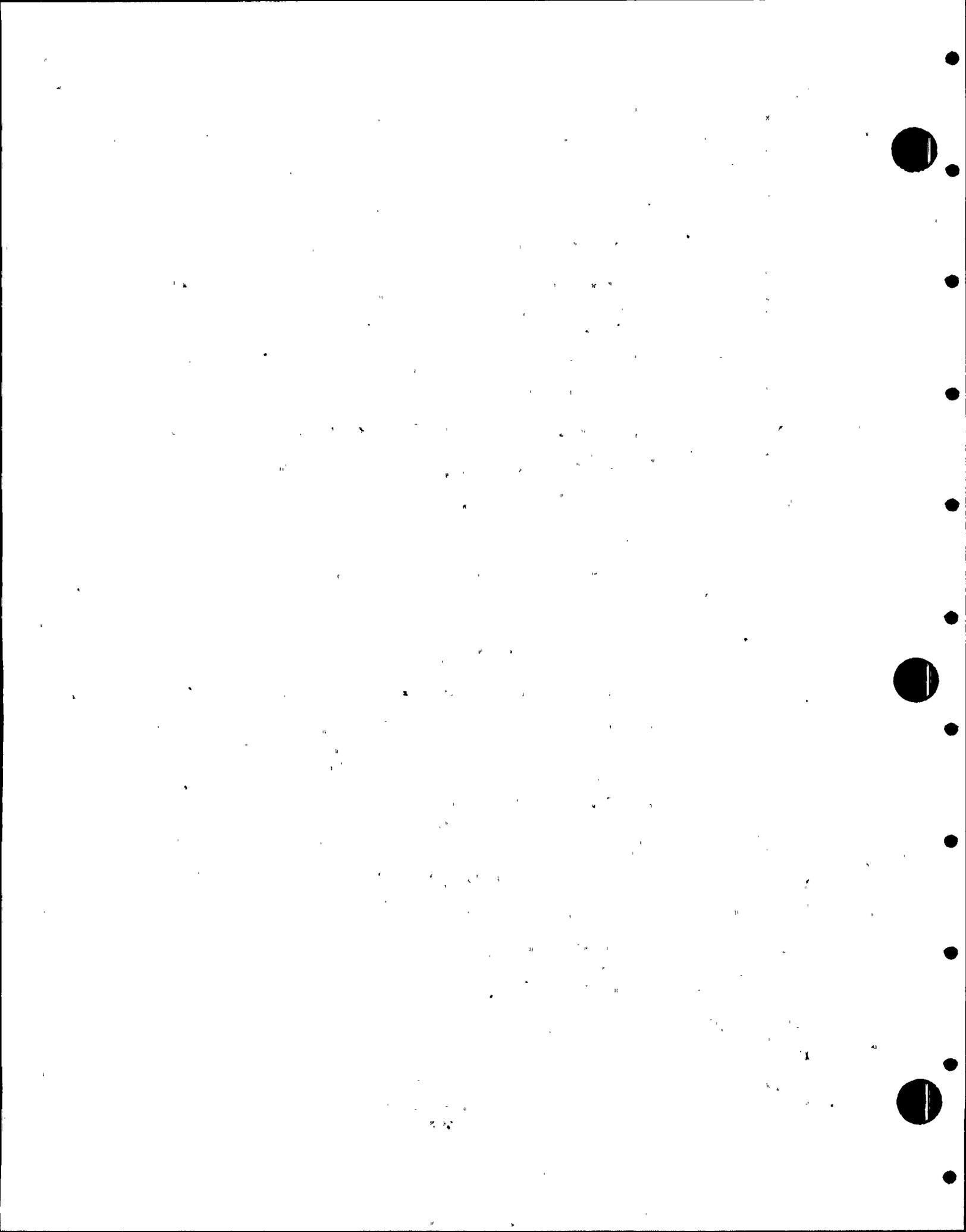
14 MR. PHELPS: I just had a comment on a previous
15 statement. One reason why you want both of those valves to
16 be cycling is with a single failure, if one was not cycling,
17 if one locked open and you had a single failure in the other,
18 you might have an overcooling problem.

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

20 MR. ALLEN: Dennis, that lock closed valve that goes
21 to the turbine building drain system, is that protected
22 against missiles and tornadoes and all that?

23 MR. KEITH: Yes, it is.

24 MR. ALLEN: Is it in the same structure as the conden-
25 sate?



1 MR. KEITH: Yes.

2 MR. ROGERS: The drawing that you have on, Figure 4,
3 shows two lines to the emergency feedwater pumps. Those lines
4 serve a redundant function. Are those lines separated by
5 separation criteria?

6 MR. KEITH: They are in the same tornado protected
7 Seismic Category I pipe tunnel. There is no separation
8 criteria as such applicable to them. I mean we are protecting
9 them. They don't need to be separated from each other.
10 Even were you to assume a crack in one, there is no way it
11 can hurt the other line.

12 MR. ROGERS: All right. What about the drains from
13 the tank? Are they separated inside the tank or is it a
14 single drain?

15 MR. KEITH: It is a single drain from the tank. I am
16 not sure I am understanding your question.

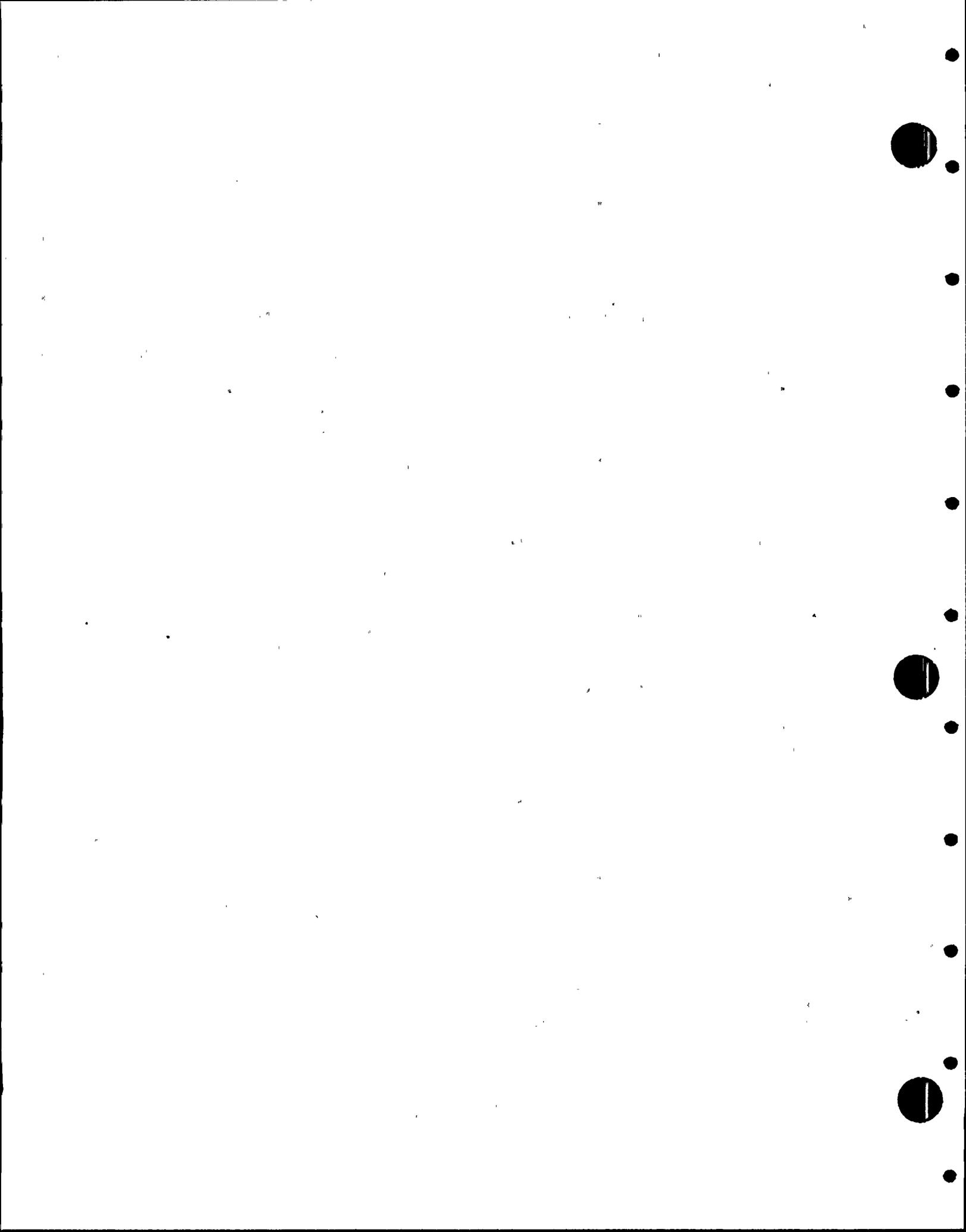
17 MR. ROGERS: It shows two lines coming from the tank.
18 I guess you could call it a suction line from the tank to the
19 feedwater pumps. Are those indeed two separate nozzles on the
20 tank?

21 MR. KEITH: Yes, they are.

22 MR. ROGERS: The lines do not meet separation criteria,
23 though, because they are low pressure?

24 MR. KEITH: Yes.

25 MR. VAN BRUNT: Are there any other questions on this



1 part of the presentation? Norm.

2 MR. HOEFERT: I guess just for my information, I note
3 on the P&ID showing the steam supply valves, one has two
4 control switches and one has four. Could you just explain
5 why that is? I am talking about Valves 134 and 138.

6 MR. KEITH: We will have to get back to you on that,
7 Norm.

8 MR. VAN BRUNT: Okay. Bill, would you put --

9 MR. KOPCHINSKI: I didn't quite understand the question.

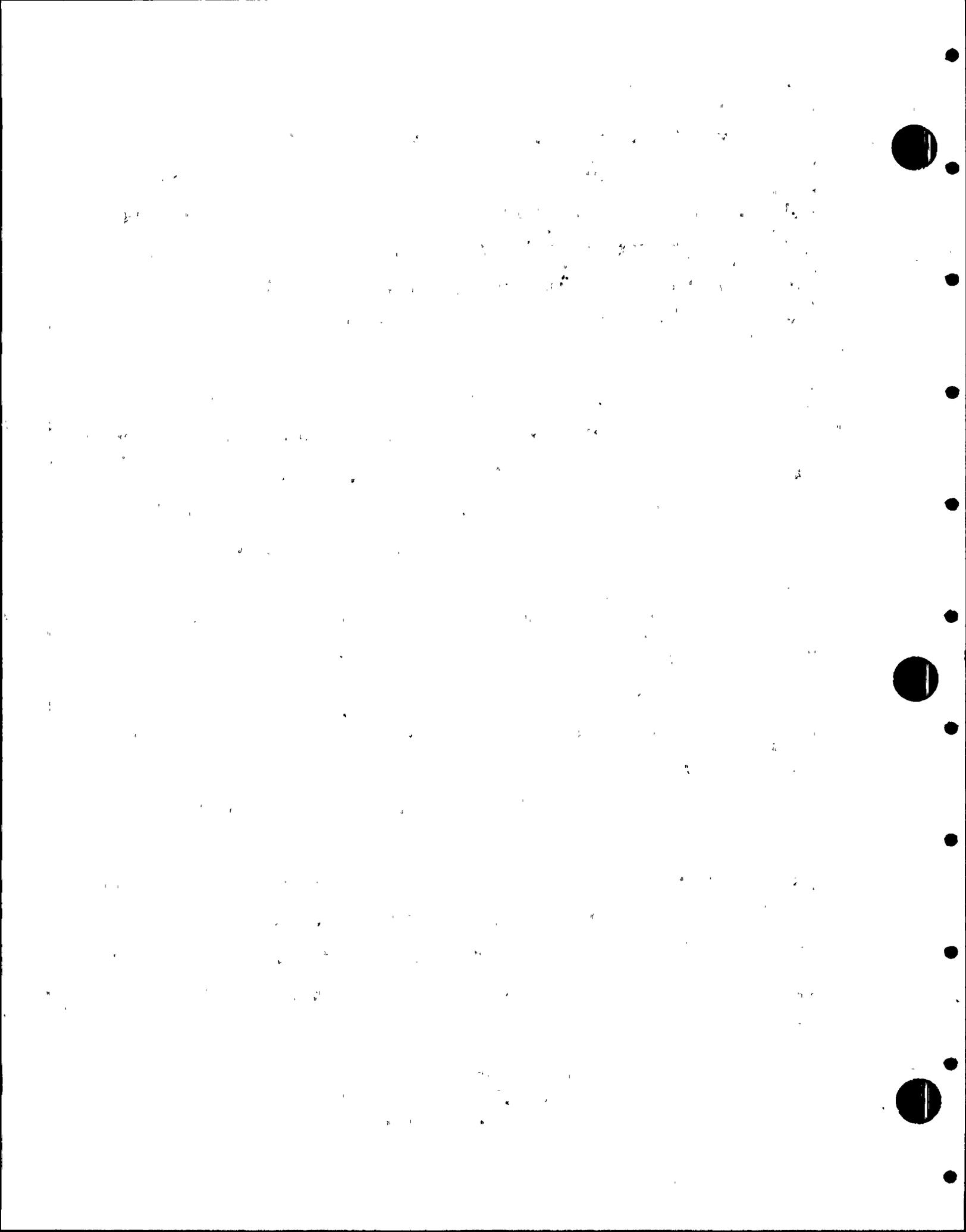
10 MR. KEITH: On the steam supply valves to the turbine-
11 driven aux feedwater pump, one valve has four hand switches
12 and another valve has two hand switches. I don't know the
13 reason.

14 MR. VAN BRUNT: Bill, if you would put that on the
15 list, then, Dennis, you can either deal with it later on
16 today or tomorrow or in the written responses.

17 MR. PHELPS: Dennis, would you be able to tell me the
18 assumptions that you used for your design basis scenario to
19 come up with your 300,000 gallons for your condensate storage?

20 MR. KEITH: That, as I said, was an interface require-
21 ment from CE, and I see by the shake of the head at the end
22 of the table that we are not ready to do that right now.

23 MR. VAN BRUNT: Bill, why don't you put that on the
24 list and we'll get that information for you. Let's repeat
25 that question again.



1 MR. KEITH: I think the question was basically the
2 basis for the 300,000 gallons.

3 MR. PHELPS: That's right.

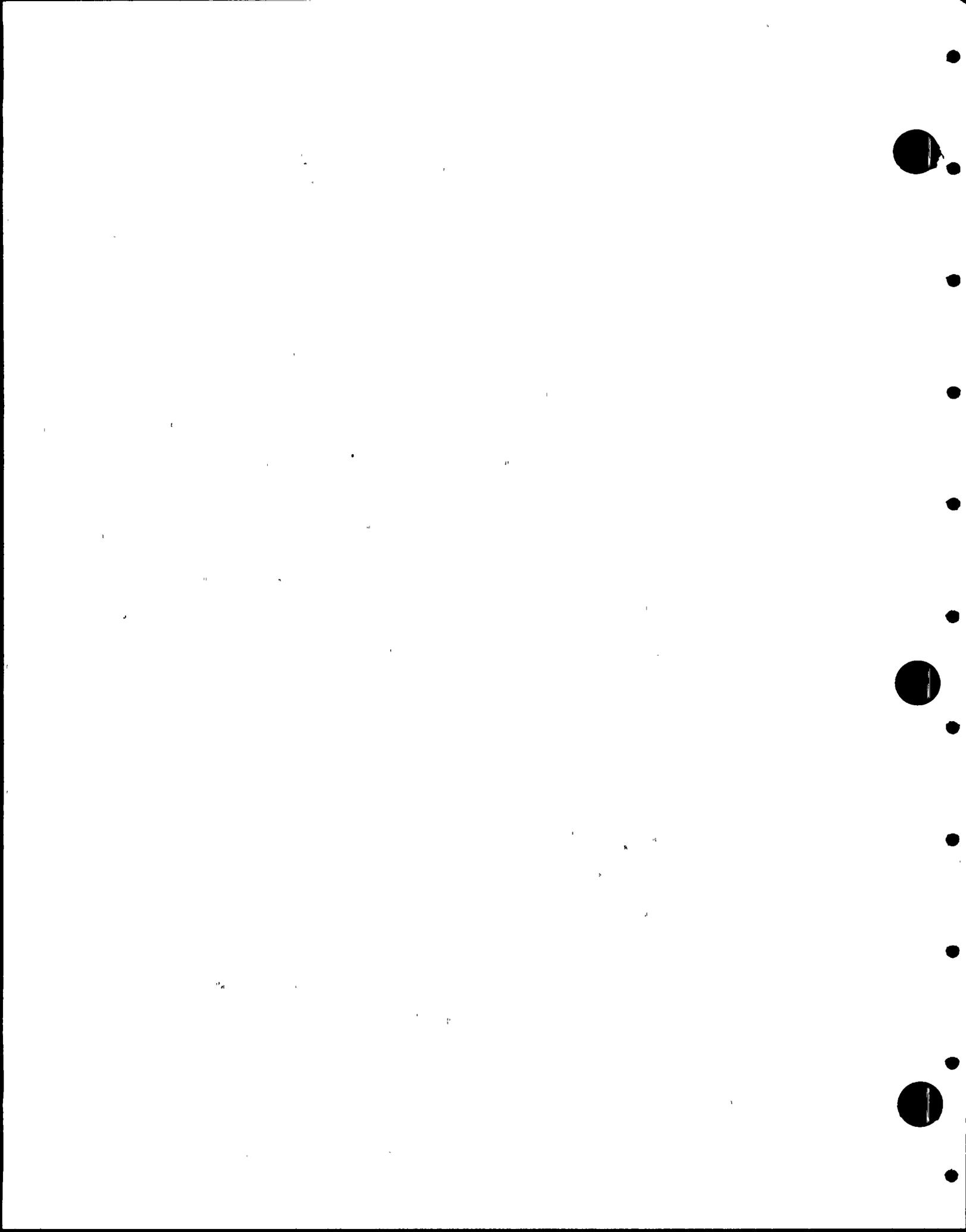
4 MR. VAN BRUNT: Are there any other questions on this
5 part of the presentation?

6 Seeing none, go ahead.

7 MR. BINGHAM: Let's move then to 1C, which is the
8 layout of the system.

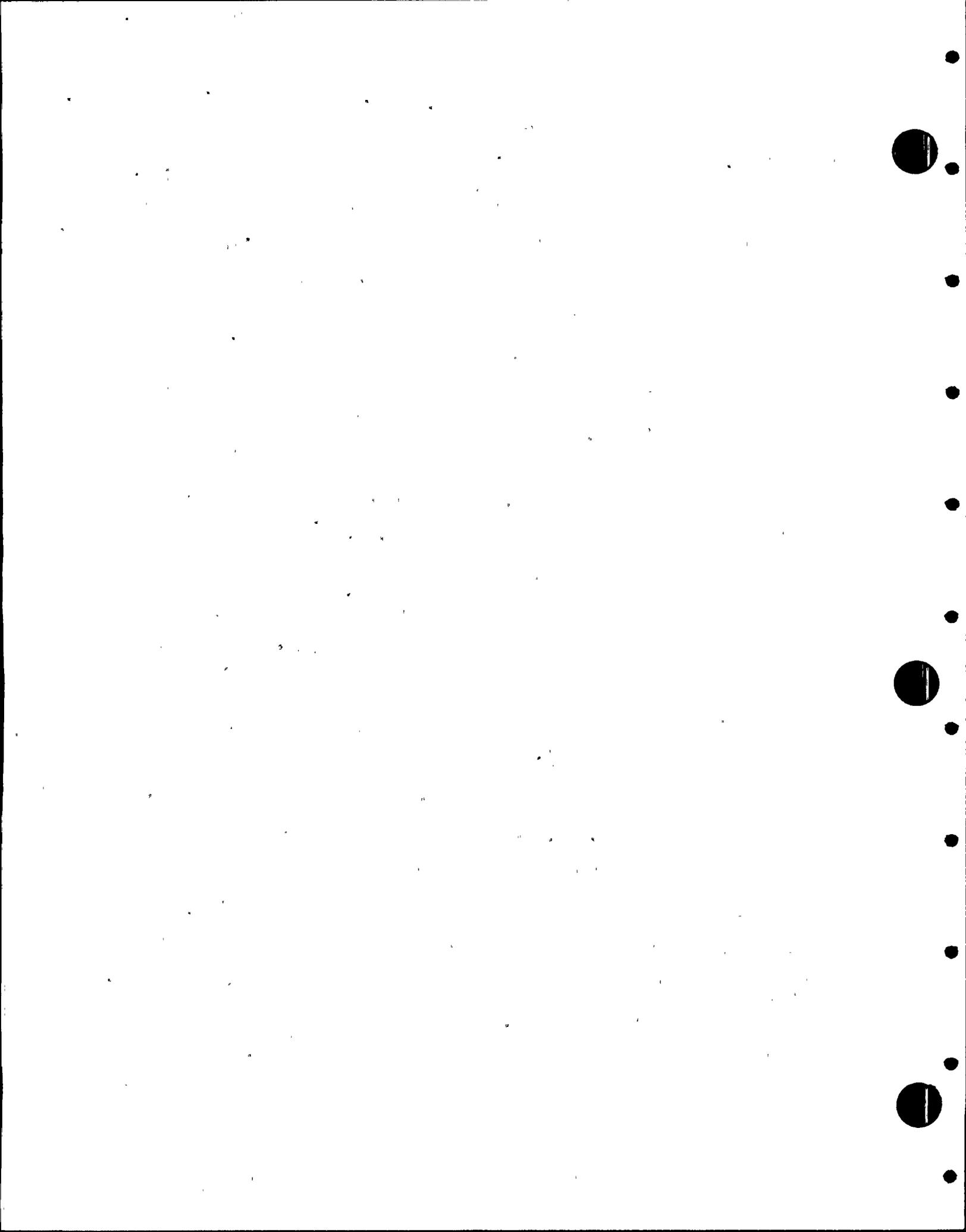
9 MR. KEITH: Exhibit 1C-1, Figure 5. The three units
10 at Palo Verde are identical units. This shows one of the
11 units. To give you a quick run-through, they are the
12 containment building, the fuel building, the main steam support
13 structure where the auxiliary feedwater pumps are -- we will
14 go into that in more detail -- the turbine building where the
15 startup auxiliary feedwater pump is, the auxiliary building --
16 it is wrapped around the containment building, -- the
17 radwaste building, the control building, the diesel generator
18 building, and this (indicating) is the reactor water makeup
19 tank here and the condensate storage tank on the other side.
20 We were just looking at Figure 5. This is Figure 6 showing
21 a plan view of the same things. Here (indicating) we have the
22 condensate storage tank and the reactor makeup water tank.

23 Figure 7. Going on to the main steam support
24 structure, this is the connection between the containment
25 building and the turbine building. This is a cross-section



1 through the structure. We are looking toward the turbine
2 building on this cross-section. We have four main steam lines
3 shown here, two main feedwater lines. Here (indicating) we
4 have the motor-driven pump and here (indicating) we have the
5 turbine-driven pump. These two pumps are in a part of the
6 structure that is basically separated from the rest of the
7 structure. We do have to assume a main steam line break in
8 this structure, but the hatches and all that we have for entry
9 down into this lower level are sealed such that a main steam
10 line break in the structure will not affect these lower
11 compartments. Similarly, these compartments are separated
12 from each other. We have a watertight door shown here
13 (indicating) to separate the two trains. We also have
14 indicated essential air conditioning units, which are powered
15 off the diesels. They are Class IE motors on the units and
16 the piping and all to them is Section III, Class 3, so they
17 are completely safety grade air conditioning units. This was
18 Figure 7 we were looking at.

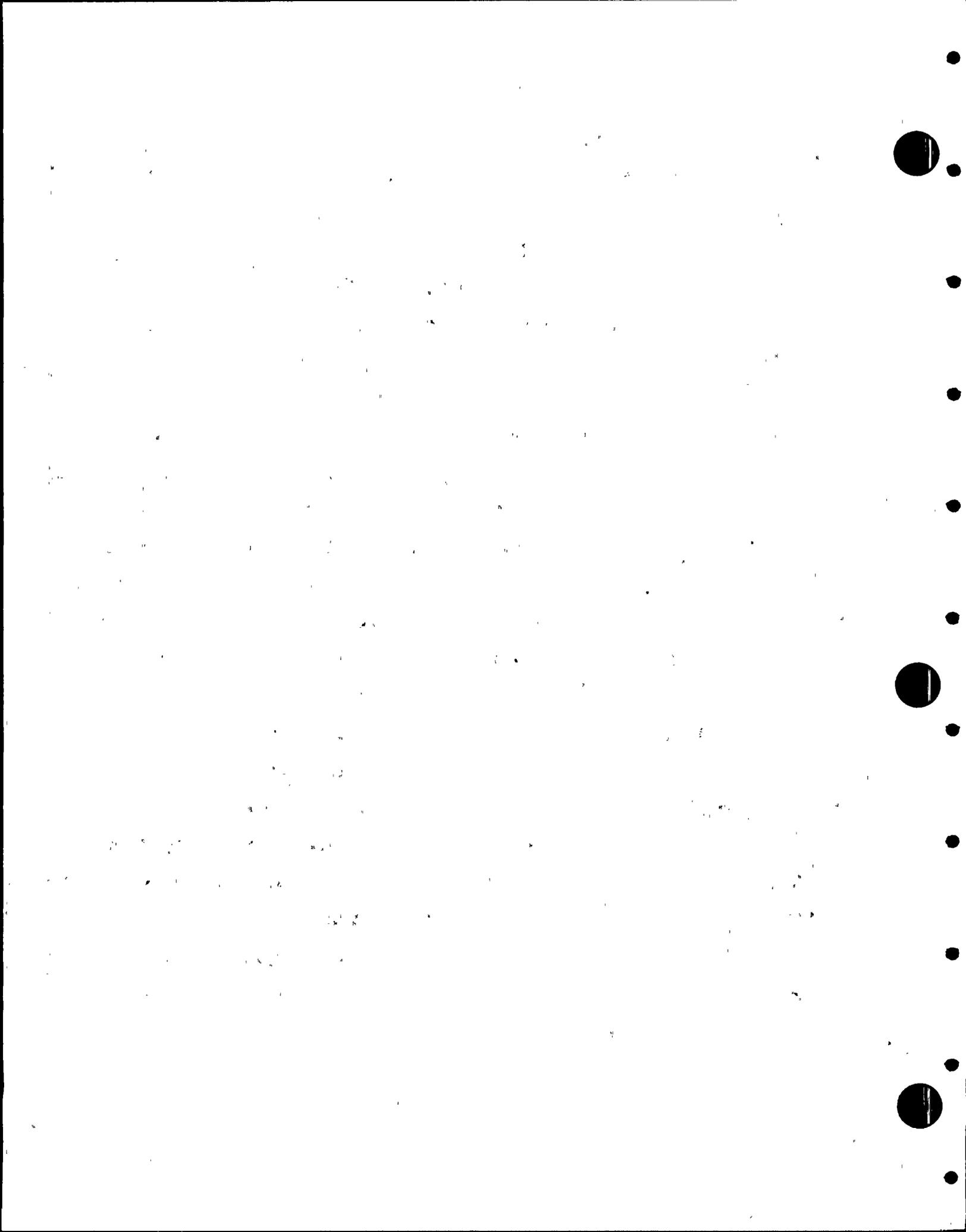
19 Here is Figure 8 showing a plan view of the lower
20 level where we have the emergency feedwater pumps, the motor-
21 driven pump here, the watertight door, as we said, turbine-
22 driven pump, essential air conditioning units shown here
23 (indicating). We have a door to the outside, missile
24 protected. This (indicating) is the pipe tunnel we have been
25 talking about which comes from the condensate storage tank.



1 Exhibit 1C-2. These are the two feedwater lines
2 shown here with the two feedwater isolation valves. We have
3 this slide, Figure 9, to show the startup feedwater pump on
4 the grade level in the turbine building.

5 Bill Bingham mentioned earlier our model that we
6 have, which is three-quarters inch to a foot, and we have
7 some shots of the model to show the main steam support struc-
8 ture. This Slide 1 is looking from the containment building
9 at the main steam support structure similar to the cross-
10 sectional drawing we saw earlier. First, let me take a minute
11 to explain a little bit about some of the color coding we
12 have here. Yellow piping indicates B31.1 piping. Orange
13 indicates ASME Section III, Class 2. We will see on some of
14 the others a lot more of a dark green, which is ASME Section
15 III, Class 3. This blue that you see here (indicating) is
16 all ventilation system ducting. This lighter shade of green
17 is all for electrical. We will see it on the motor for the
18 motor-driven pump. This is conduit here (indicating). Those
19 are the major color coding which you see here.

20 This (indicating) is the motor-driven pump here
21 down in our lower bunker, which, as I said, is separated from
22 the upper portion of the main steam support structure. The
23 turbine-driven compartment here (indicating), main steam lines
24 going through here (indicating). These (indicating) are the
25 main steam safeties. These (indicating) are the lines from

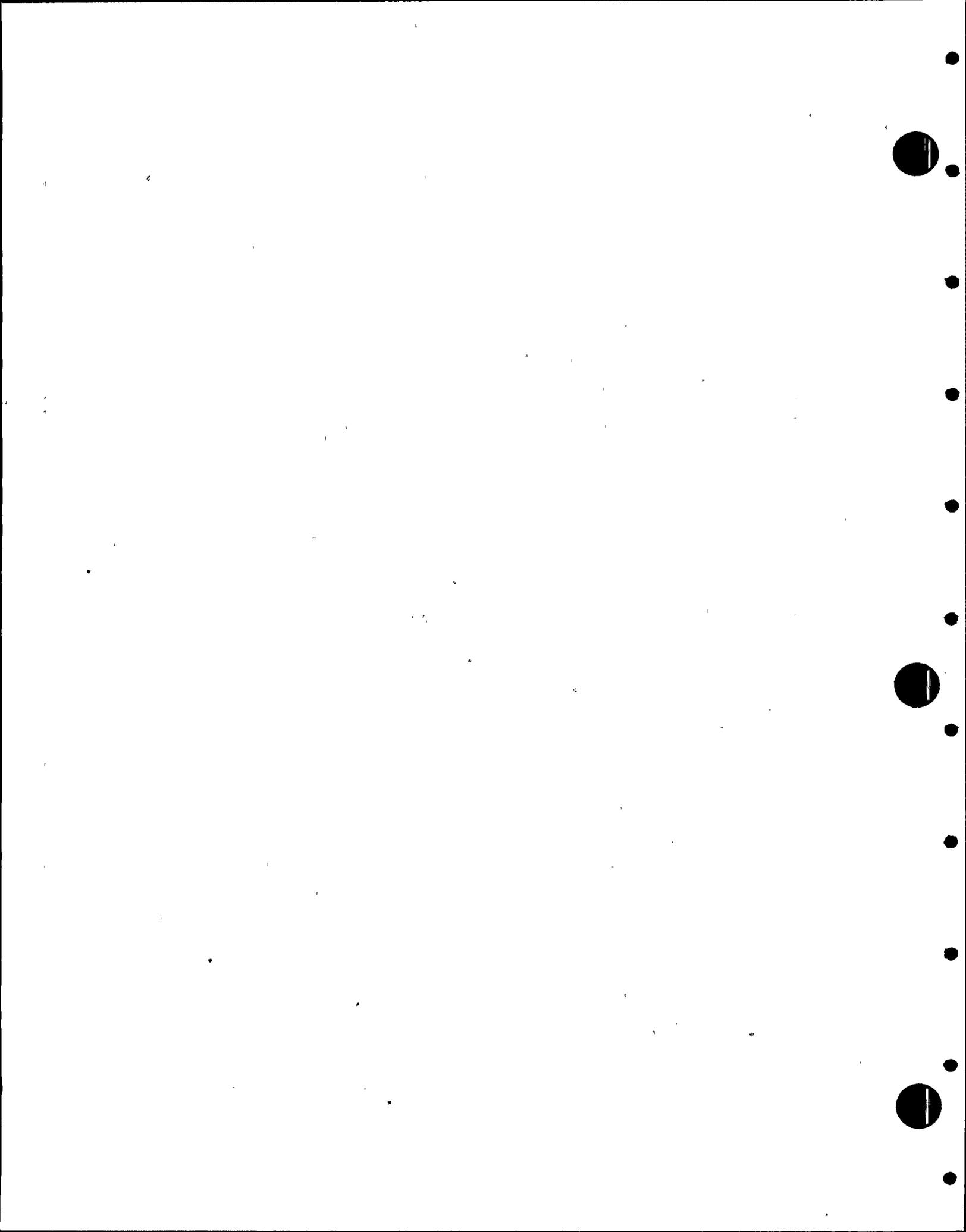


1 the atmospheric dump valve that tie in and go through a single
2 exhaust. Main feedwater lines here (indicating). The slides
3 are not numbered, so you will just have to bear with us on
4 that as far as going back over the transcript.

5 Here (Slide 2) we have a cross-section or closer view
6 of the lower level of the main steam support structure. That
7 last slide we were looking at, the model you saw there was
8 pretty close to six feet tall. We have some later pictures
9 which show a figure in there which kind of gives you a perspec-
10 tive on just the size of the model. Here (indicating) is the
11 motor-driven pump again, the turbine-driven pump here
12 (indicating). These (indicating) are the feedwater lines going
13 from the emergency feedwater pumps and entering the containment.

14 Here (Slide 3) is a plan view of the pumps. The con-
15 tainment is that way (indicating). We were looking from the
16 containment before. Here (indicating) we have the turbine and
17 here (indicating) is the motor, the two pumps. You can see
18 how much of this color green piping is on this. This is all
19 the Section III, Class 3, piping, this type color.

20 Another view (Slide 4) getting a little bit closer look
21 at the emergency feedwater line. This (indicating) is the
22 isolation valve from the turbine-driven pump and then going
23 over. It goes over to get to the other steam generator.
24 These are the lines here (indicating) with the containment
25 penetration shown feeding this steam generator. It shows



1 another one of our color codings which I neglected. This
2 kind of coral color is instrumentation.

3 MR. BINGHAM: Dennis, I think what we ought to do is
4 provide some black and white shots for the transcript and
5 perhaps we can just go through the sequence. I believe this
6 is Slide No. 5 that is shown now that we have up here, and we
7 will label those so that we have them in the transcript to be
8 looked at at a later time, so we will show it as Slide 5.

9 MR. VAN BRUNT: Bill, when you proof the transcript,
10 I think that you could dub in the first four to be sure
11 that they are in the right place.

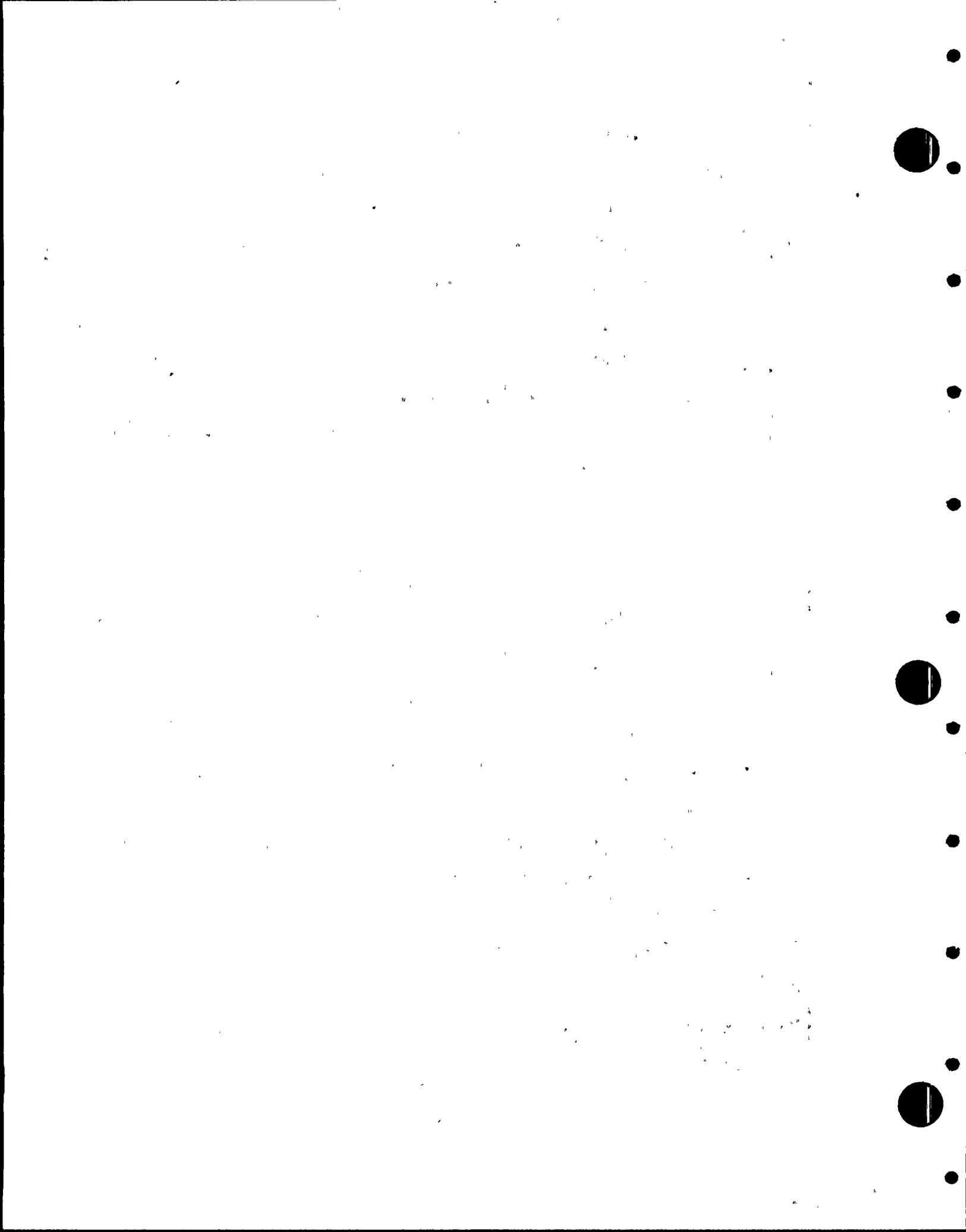
12 MR. BINGHAM: We will make sure that that is done.

13 MR. KEITH: Yes, we'll do that.

14 Slide 5 shows a shot of the motor-driven pump with
15 the feedwater lines coming from it.

16 Slide 6 is a plan view of the turbine-driven pump.
17 We've got the turbine exhaust line here (indicating), the
18 turbine steam supply coming down here (indicating) and coming
19 under, and the pump discharge line coming out from the pump
20 and up here and around and over. Here (indicating) is the
21 first isolation valve and then the second and then branching
22 off where it changes in class break from the Section III,
23 Class 3, to Section III, Class 2.

24 Slide 7 shows a plan view of the motor-driven pump,
25 similiar arrangements here, containment penetration, with the



1 steam generator on this side (indicating).

2 Here (Slide 8) is a section view of the turbine-driven
3 pump. Here (indicating) are the figures, giving you perspec-
4 tive on just how big the model is, and you get a better view
5 here of the complexity.

6 Slide 9, another one, this one showing a plan view
7 of the turbine-driven pump similar to the one we saw pre-
8 viously.

9 Another plan view (Slide 10) of the motor-driven pump.

10 Here (Slide 11) we have the turbine building pump. We
11 are into the turbine building now. You can tell by all the
12 yellow piping that we get, because we do not have any Section
13 III piping in the turbine building. This (indicating) is our
14 startup feedwater pump.

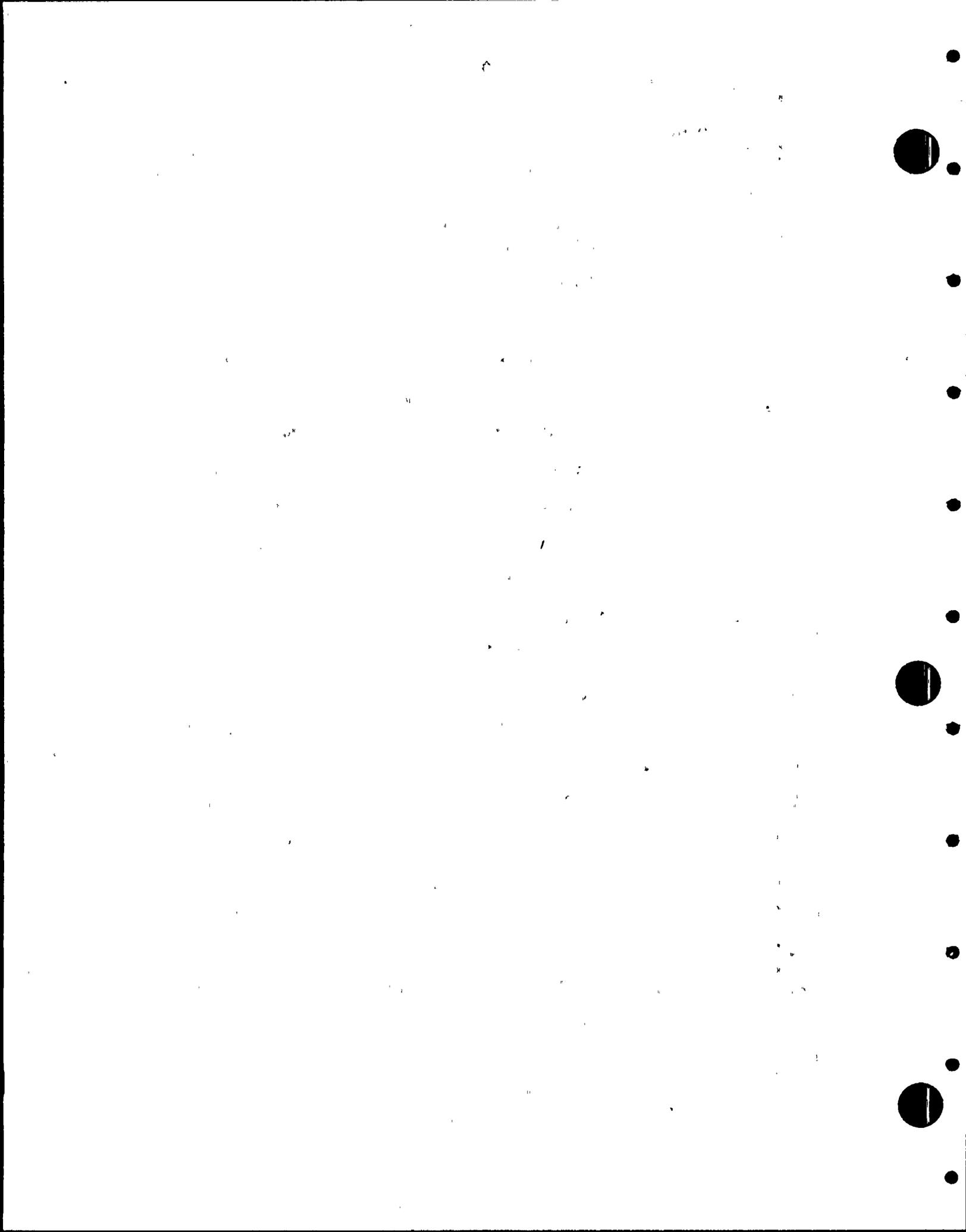
15 Another view (Slide 12) of that pump here in the
16 turbine building. Another (Slide 13) pump and motor.

17 MR. BINGHAM: That completes the presentation of the
18 layout. Are there any questions, Ed, that the board has?

19 MR. VAN BRUNT: I had one as a follow-up on a question
20 I had before. Is this the place where you were going to
21 talk about where the drains in the various rooms go?

22 MR. KEITH: We can. Yes, this would be. Those drain
23 lines both go to the auxiliary building sump.

24 MR. VAN BRUNT: They go to the auxiliary building and
25 they go into the radwaste system, also, for processing?



1 MR. KEITH: Let us check on whether that one goes into
2 the radwaste system or not.

3 MR. VAN BRUNT: My question is if you end up with some
4 primary or secondary leakage and then you get some steam
5 leakage into the room and that condenses and goes out, where
6 does that go. That is what I am really after.

7 MR. KEITH: I understand your concern. We will verify
8 whether the radwaste system does process the water in that
9 sump.

10 MR. VAN BRUNT: Dale.

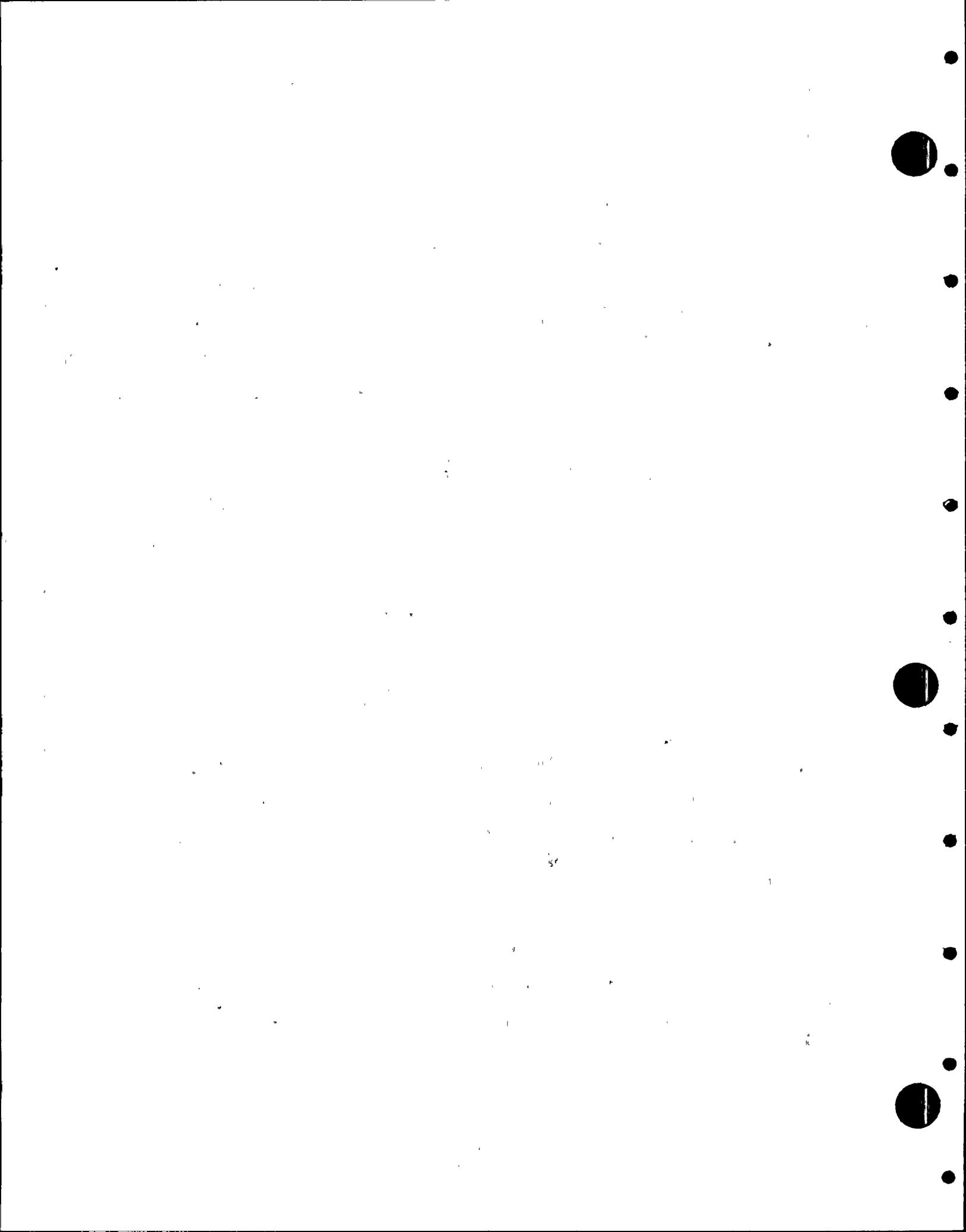
11 MR. THORNBURG: Maybe a related question. Is it
12 possible that those drains can get plugged up and flood back
13 into the pump enclosure? You said they go to the auxiliary
14 building. What happens to them over there?

15 MR. KEITH: Well, that is part of Ed Van Brunt's
16 question that we are going to check on, you know, where we
17 drain that sump to.

18 MR. VAN BRUNT: I guess just as a follow-up I would
19 ask for the design basis for the drain system. You know,
20 what is it sized for, fire protection or a break of a line in
21 there or exactly what. That is kind of a corollary to what
22 I was after.

23 I think Olan had a question.

24 MR. PARR: This morning you asked that one of the
25 questions be delayed until now on that crossover pipe, steam



1 pipe, going into the electric pump area.

2 MR. KEITH: We would like to delay that until a little
3 later, basically until we get into the discussion of the
4 high energy line break area.

5 MR. VAN BRUNT: Mike.

6 MR. HODGE: A little earlier, you said you had two
7 air conditioning units that run off of AC power, I assume.

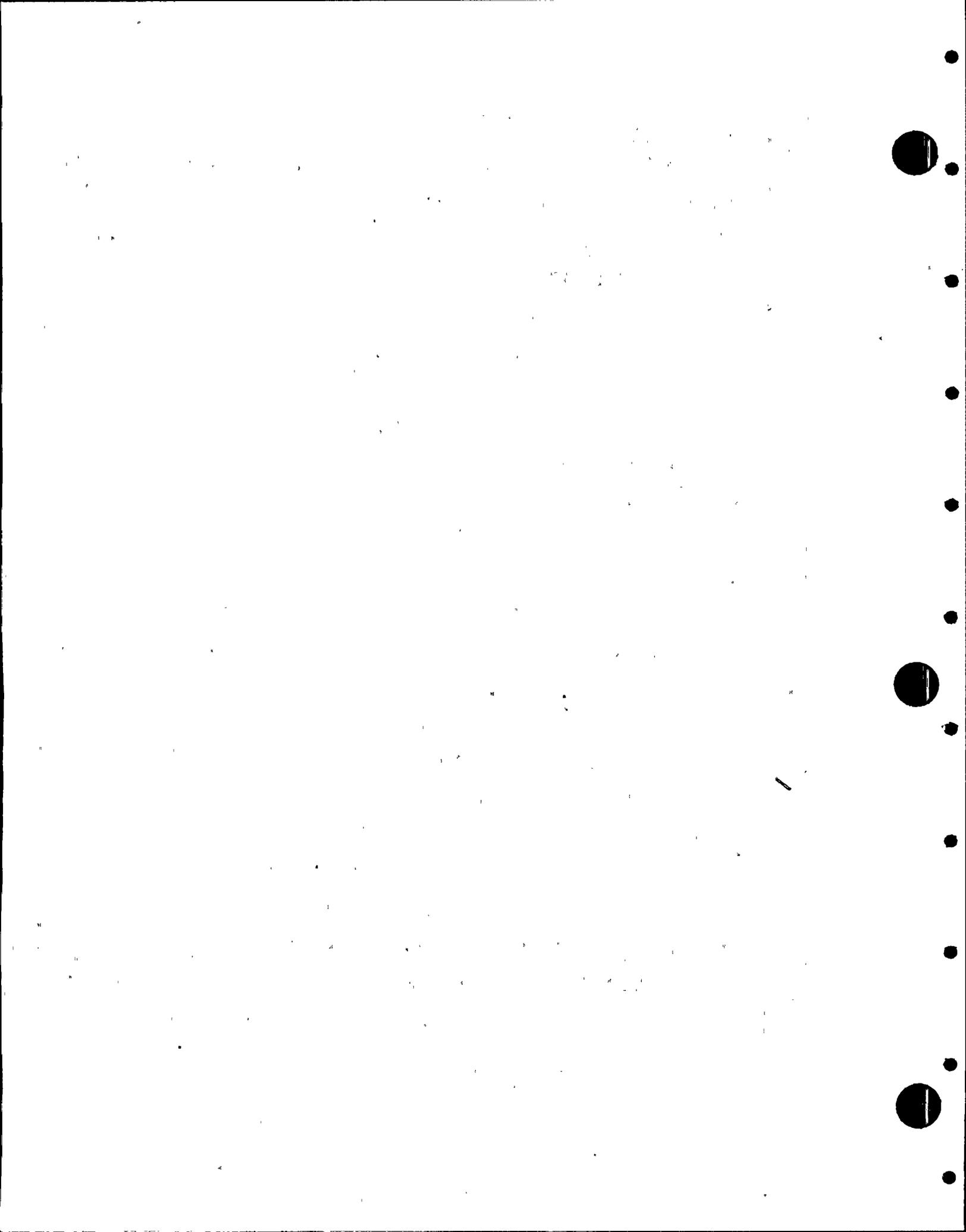
8 MR. KEITH: Yes.

9 MR. HODGE: What type of problem will we have if we
10 lose onsite AC power on a turbine pump? Would we have any
11 problems?

12 MR. KEITH: To get into the background on this, at one
13 time in the past, we did not have an essential air conditioning
14 unit in the turbine-driven pump room. We have done a calc
15 showing that when that pump is running, the room will not heat
16 up to a point where any of the components will be affected.
17 However, ACRS asked well, what if you have a steam leak in
18 that room? Well, if you have a steam leak, then eventually
19 you are going to heat up. So, as a result of that, we decided
20 to put in an essential air conditioning unit in that room to
21 take care of that. If we had a loss of all offsite and
22 onsite AC power and you had a steam leak, too,-- Well, it
23 depends once again on the size of the steam leak.

24 MR. VAN BRUNT: Shelley.

25 MR. FREID: On Figure 7, you show that watertight



1 door between the compartment and the steam admission valves
2 in that room to the turbine-driven pump. The question I have
3 is are there any high energy lines normally in that room from
4 the main steam system?

5 MR. KEITH: That is what I would like to respond to
6 later. We will get into which part of the system is high
7 energy and which is not.

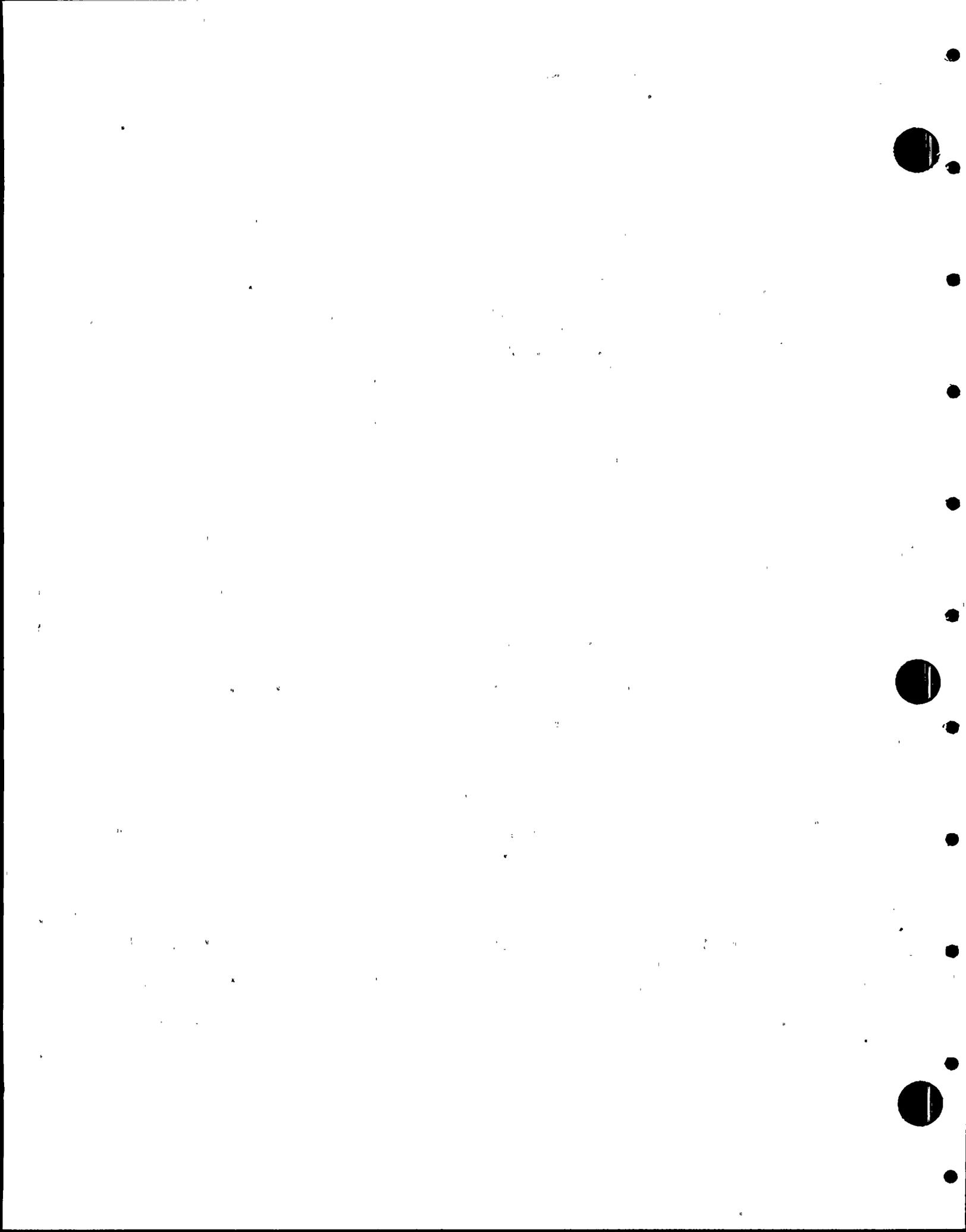
8 MR. FREID: But the question I have is is the door
9 watertight? Is it designed for the pressurization of a
10 break in there? Will you go into that later?

11 MR. KEITH: That's what I want to do later.

12 MR. VAN BRUNT: Angie.

13 MR. ORTIZ: I notice on the turbine-driven pump
14 compartment a B31.1 line going over the turbine, or at least
15 I believe I saw a yellow line going over it. Have you
16 conducted a Seismic II over I review to see that Seismic II
17 components will not affect Seismic I components?

18 MR. KEITH: Yes, we have. Well, we are still in the
19 process in some areas. As far as piping, all of our piping
20 in Seismic Category I structures is classified as Seismic
21 Category IX, which means it is hung to Seismic Category I
22 requirements so that it will not fall. That particular line
23 which you saw going over the turbine it turns out is a
24 startup spool. It was a blue and gold line, I believe, and
25 that particular one will be removed when we are in plant



1 operation, but just in general, that answers that.

2 MR. THORNBURG: How do you provide the necessary net
3 positive suction head at those pumps?

4 MR. KEITH: We have done calculations all the way down
5 to the condensate storage tank being empty. It is the head
6 on the condensate storage tank, of course, that is providing
7 that.

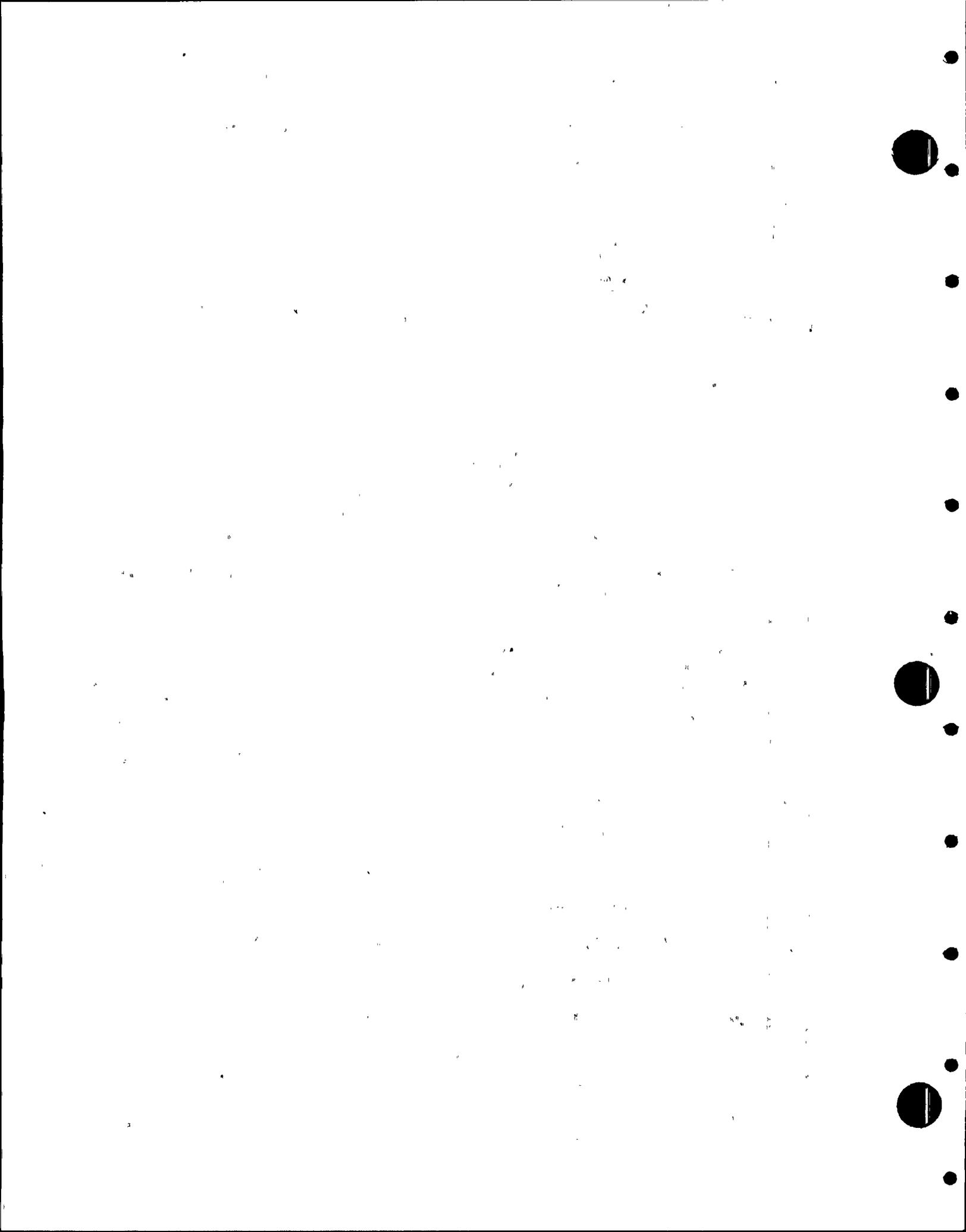
8 MR. THORNBURG: What elevation is it in that drawing?

9 MR. KEITH: The condensate storage tank is at grade,
10 which is right here (indicating).

11 MR. VAN BRUNT: Are there any other questions? Norm.

12 MR. HOEFERT: I noticed that entrance to the motor-
13 driven pump room is through the turbine-driven pump room, so
14 in the event of a fire or flooding or anything else, you could
15 not access the motor-driven pump room or exit it if you
16 happened to be in there. I am concerned about two areas. One,
17 is this violating the OSHA requirements for personnel exit,
18 and, two, it just seems inconsistent to have redundant trains
19 and then require going through one pump room to get to the
20 other pump room in case you have to manually operate a valve
21 or check the operation of the pump. Can you explain the
22 basis for your design?

23 MR. KEITH: To take care of your OSHA concerns, there
24 are hatches in both rooms for somebody to get out in the
25 event of a problem in the other room.



1 MR. HOEFERT: Are you talking about the hatches for
2 equipment access which require a crane to be removed?
3 That is the only hatch I have seen in there.

4 MR. KEITH: We will check and get the details. There
5 are ladders there and our understanding is that those are
6 such that a person can get out in the event of an emergency.

7 MR. HOEFERT: Well, if that's the case, I don't have
8 any problem.

9 MR. KEITH: For normal operation, it is not a frequent
10 thing that somebody has to get down there for manual
11 operation, so going through one room to the other seems like
12 a reasonable way to do it.

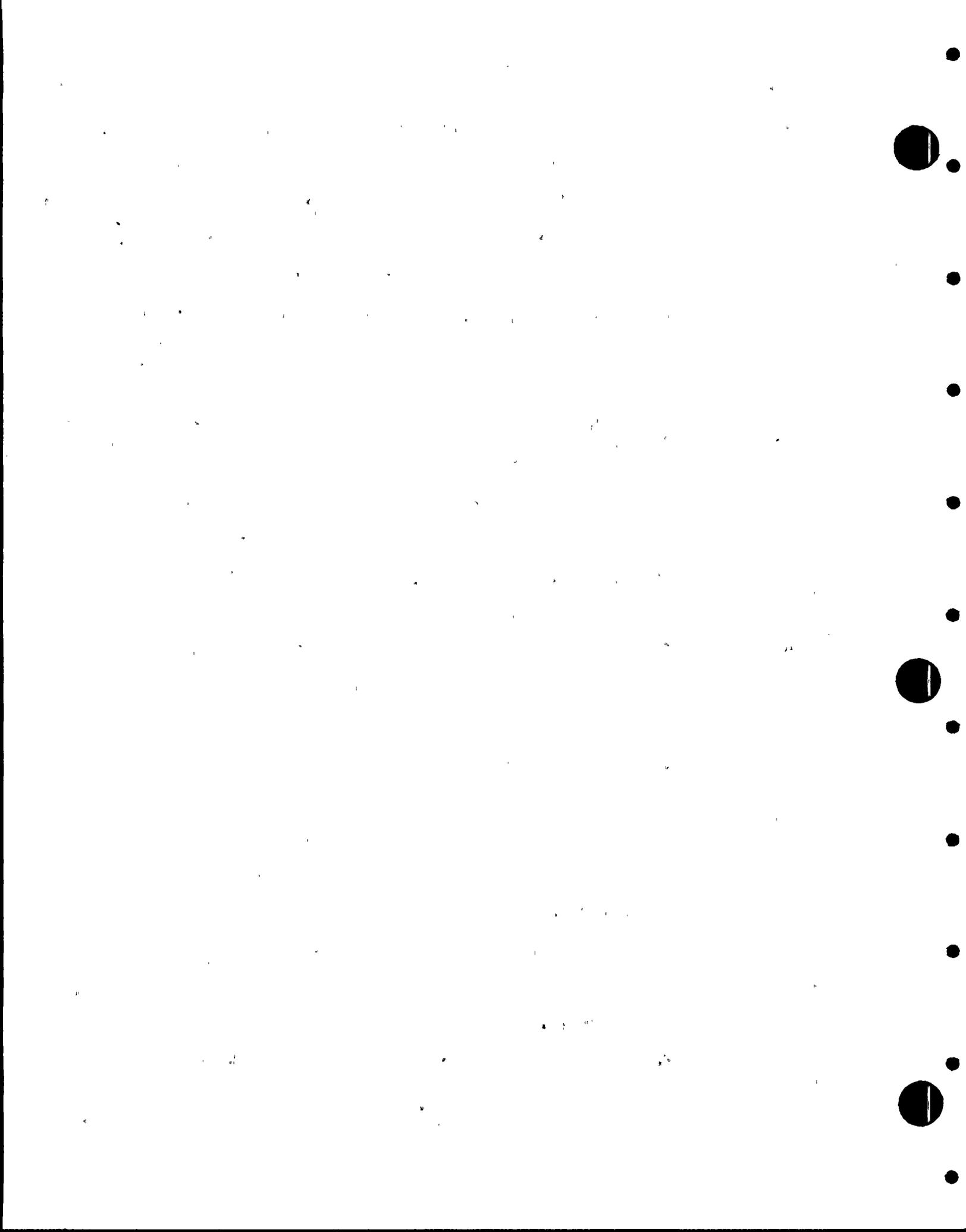
13 MR. HOEFERT: Does this violate any of the separation
14 criteria that you know of?

15 MR. KEITH: No, there is no requirement that the
16 watertight door has to be shut all the time, which is really
17 what we are talking about, so somebody going in there for
18 normal inspection or even maintenance would not violate any
19 criteria.

20 MR. FREID: To follow up on that, since I seem to be
21 asking most of the door questions, how do you know that the
22 door is closed after these maintenance operations are
23 performed or that it isn't propped open full time?

24 MR. KEITH: We will check if it is on the security
25 system. It probably is.

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



1 Quinn.

2 MR. QUINN: You mentioned you were going to check to
3 see if there was access through the hatches. You also said
4 that the hatches were to be sealed shut in case of a main
5 feedwater line break. Could you clarify how the hatches are
6 sealed shut in particular?

7 MR. KEITH: I am not familiar with all the design
8 details, Bill. I expect some rubber gasketing type material
9 or something to make them reasonably tight.

10 MR. QUINN: Would it be something with an opening
11 handle that you would open it up or bolted down?

12 MR. KEITH: As I said, I don't know the details.

13 MR. QUINN: Also, did your design take into account
14 any leakage of water through the hatch?

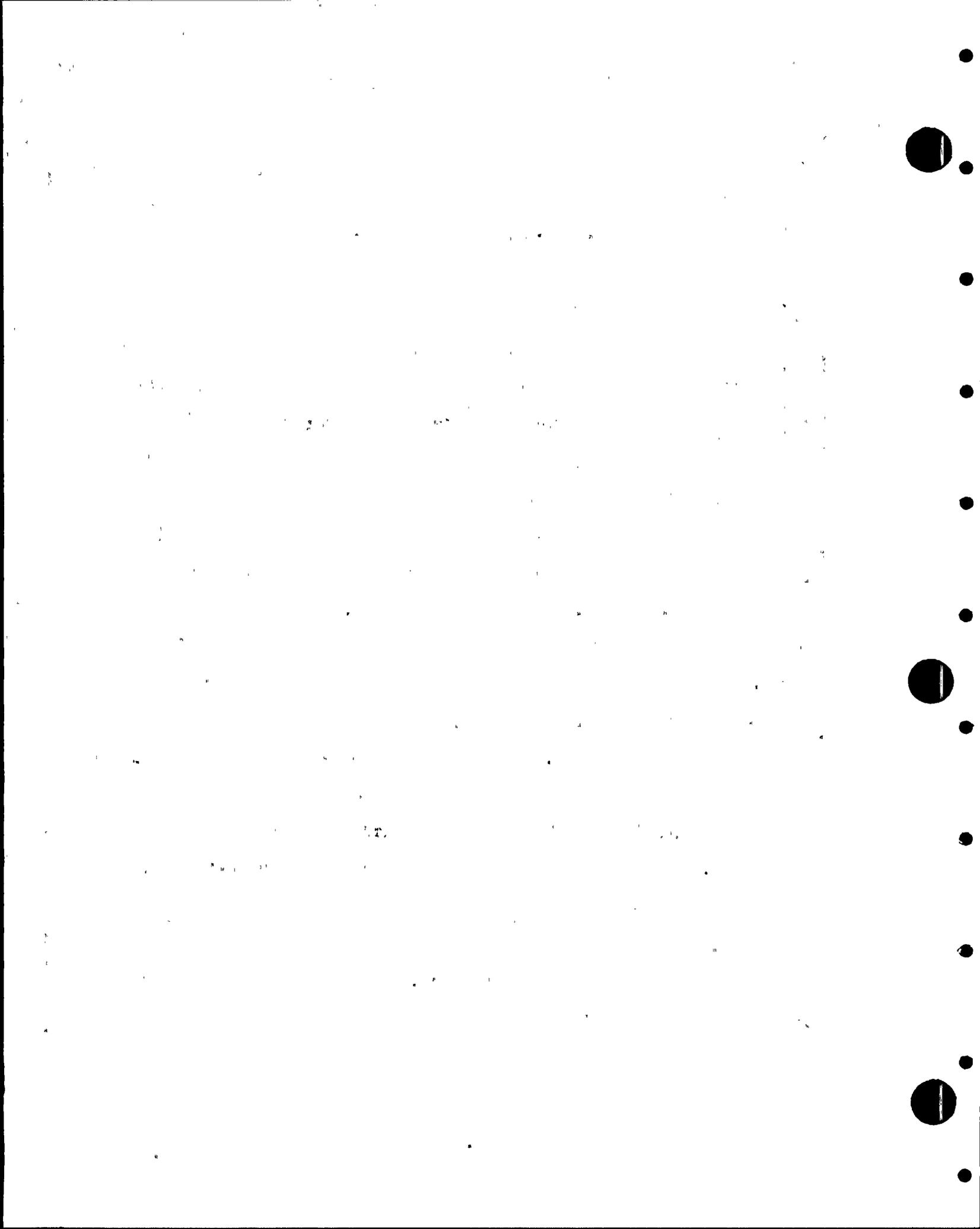
15 MR. KEITH: Well, our drains are four-inch drains,
16 which would be more than adequate to take care of any leakage
17 through the hatch.

18 MR. QUINN: Would you clarify for me then the design
19 of the particular hatch in each room?

20 MR. VAN BRUNT: Dennis, I have a follow-up question on
21 that. If I heard right, that hatch that goes down into those
22 rooms is watertight, is that correct?

23 MR. KEITH: Yes.

24 MR. VAN BRUNT: What happens if you get a feedwater
25 line break up above? How does that water get out?



1 MR. KEITH: There is a door at grade level in the main
2 steam support structure.

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

4 MR. ALLEN: Dennis, what type of fire protection do
5 they have down in there?

6 MR. KEITH: Sprinklers.

7 MR. ALLEN: Dry pipe or --

8 MR. KEITH: We'll check that, John, to confirm what we
9 have.

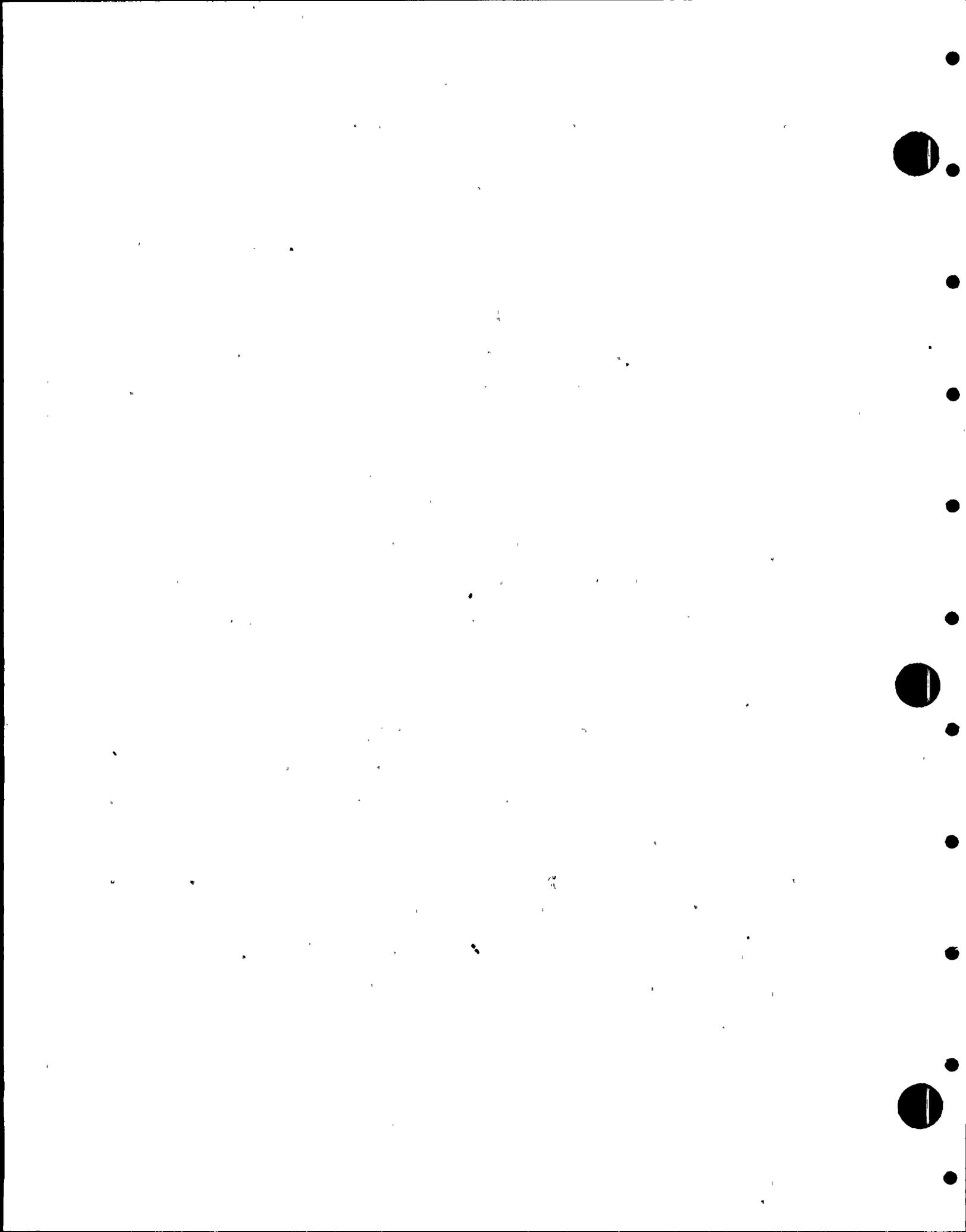
10 MR. VAN BRUNT: Any other questions?

11 Seeing none, go ahead with the next part of your
12 presentation.

13 MR. BINGHAM: That brings us to the Standard Review
14 Plan Acceptance Criteria, General Design Criteria.

15 MR. KEITH: Before we go on, to answer the last
16 question, we did confirm on the P&ID that that is a dry pipe
17 system for the auxiliary feedwater pump.

18 Exhibit 2A-1. We are going into the Standard
19 Review Plan Acceptance Criteria. We split it into three
20 different sections to give ourselves a break at some point,
21 our general design criteria, the reg guides, and then the
22 branch technical positions. Here is Figure 10 showing how we
23 split it into the general design criteria, reg guides, and
24 branch technical positions. Going through these general
25 design criteria, these regulatory guides, and these branch

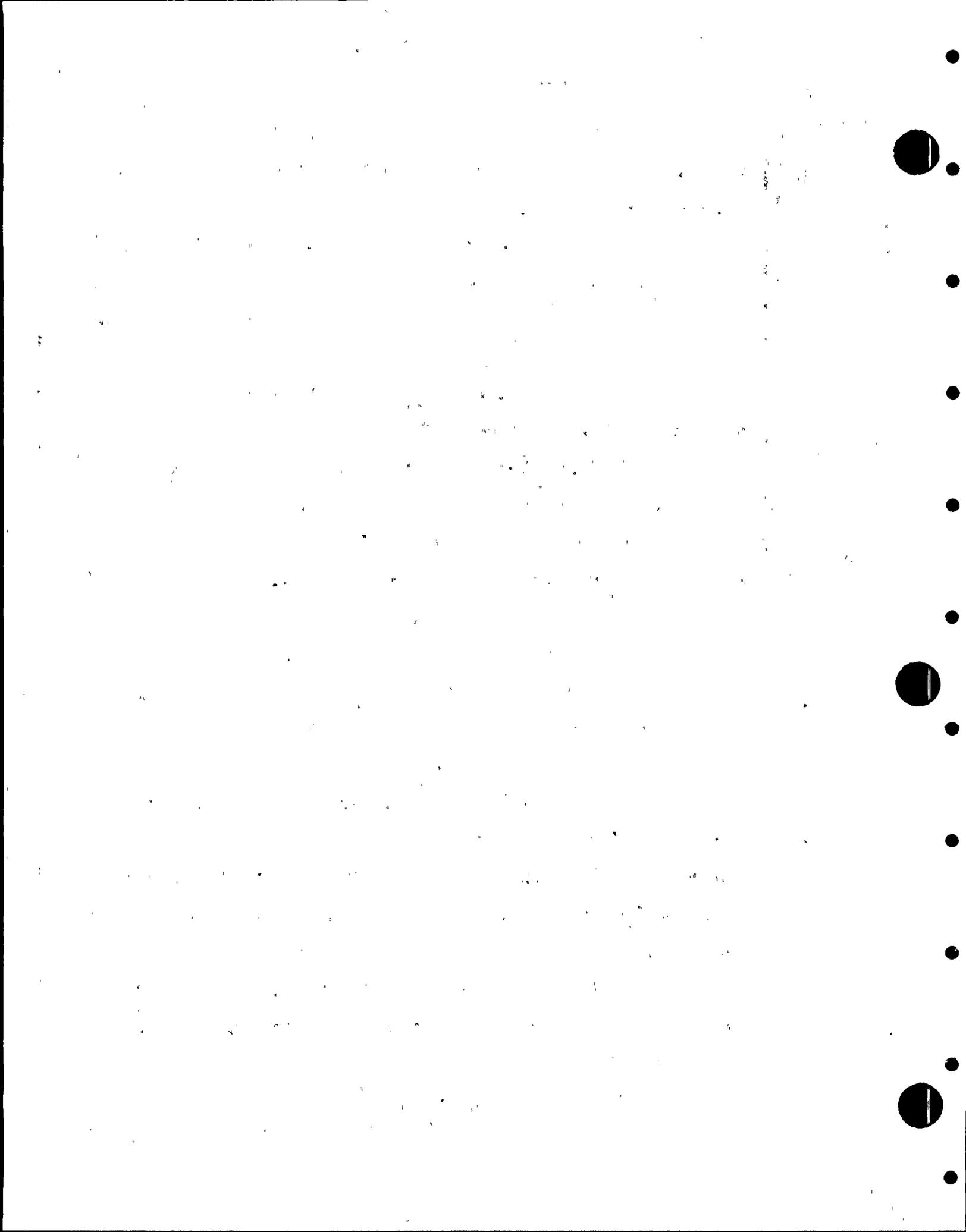


1 technical positions, Exhibit 2A-1, General Design Criterion 2,
2 Natural Phenomena, basically requires that structures and
3 systems and components important to safety be protected from
4 natural phenomena. We have gone through and talked about
5 tornado missile protection and seismic classifications, and
6 one thing we haven't talked about is flood protection. Our
7 site is located such that in the event of a design basis
8 flood, we do not get water in the power block area, so that we
9 are protected from floods, also.

10 Exhibit 2A-2. General Design Criterion 4,
11 Environmental and Missile Design, this basically requires that
12 we have redundant trains separated such that environmental
13 effects cannot affect both trains. You have seen a lot of
14 the separation that we do have in the previous slides. As we
15 say here, the redundant emergency pumps are separated by
16 missile proof and watertight wall. Startup pump is separated
17 from the other two, though it is not protected from the
18 tornado.

19 Exhibit 2A-3. General Design Criterion 5 talks
20 about shared systems between units. None of the safety
21 systems at Palo Verde are shared between any of the units.
22 That applies to all safety systems, not just the auxiliary
23 feedwater system.

24 Exhibit 2A-4. General Design Criterion 19 requires
25 that we have a control room to operate the plant and to control

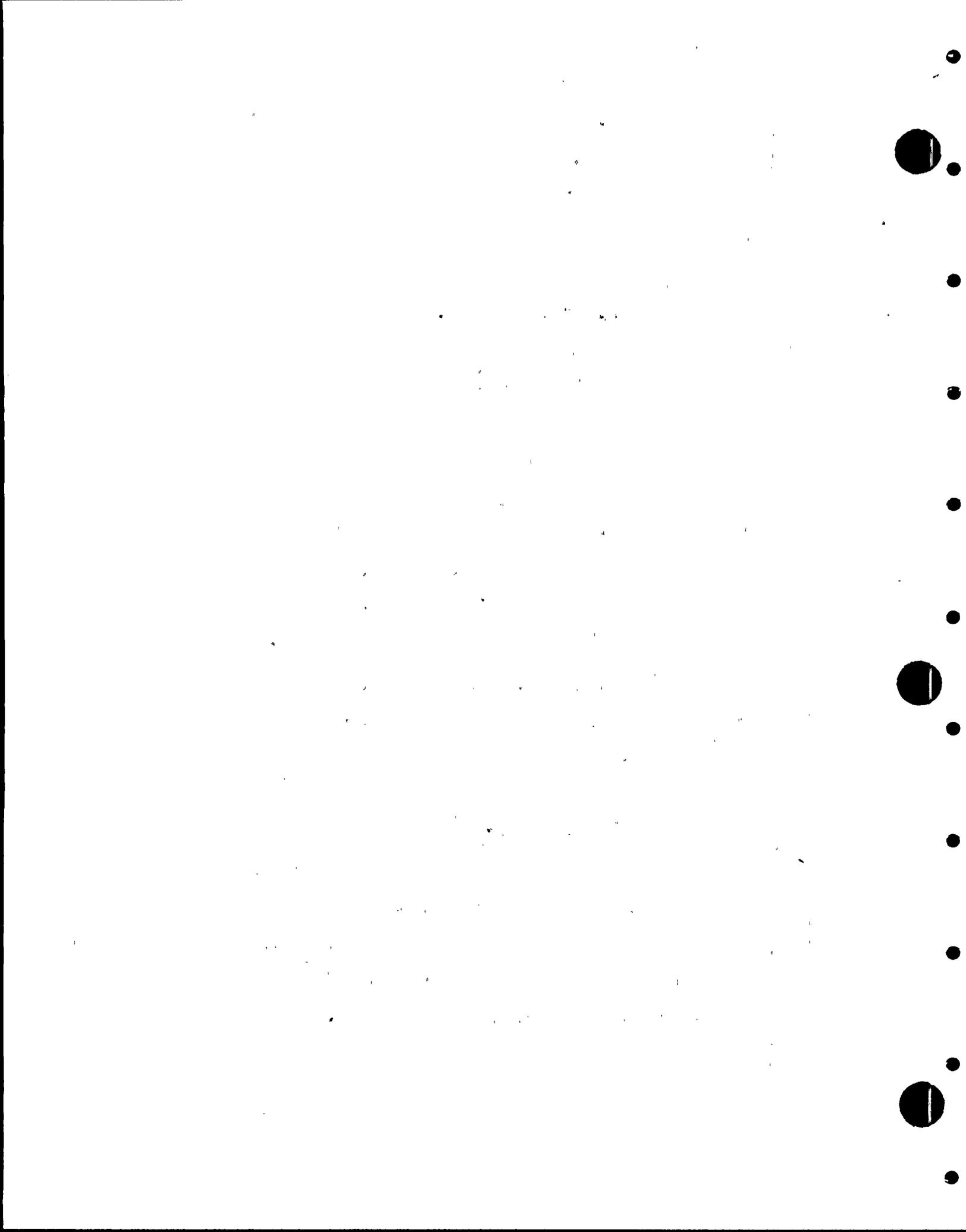


1 it and maintain it in safe shutdown condition. The emergency
2 feedwater system and the startup feedwater system can be
3 operated from the main control room and locally. The emergency
4 feedwater system can also be operated from a remote shutdown
5 panel.

6 Exhibit 2A-5. This next part of General Design
7 Criterion 19, this is Exhibit 2A-5, this part gets into the
8 requirement of being able to maintain the plant in a hot
9 shutdown condition at a remote location. On the next slide
10 we will show the indication and controls we have relative to
11 the auxiliary feedwater system at the remote shutdown panel.
12 Once again, the remote shutdown panel is located in the
13 100-foot level of the control building.

14 Exhibit 2A-6. We are also showing on this Exhibit
15 2A-6 whether it is indicated in the main control room in
16 addition to what is on the remote shutdown panel. Our low
17 pump pressure alarm is only indicated in the main control
18 room. Our flow indication also in the main control room.
19 Discharge pressure indication, main control room and locally.
20 Flow isolation valve control is in the main control room and
21 the remote shutdown panel. Similarly, position indication on
22 the main control room and shutdown panel.

23 Exhibit 2A-7 shows more of the items. All the items
24 on this slide are in the remote shutdown panel as well as the
25 main control room where we have flow control valve control,



1 steam turbine inlet valve control, steam turbine speed
2 indication, steam turbine speed control, and the main steam
3 valve control, and this is really closed only for that main
4 steam isolation valve. It goes from open to closed only I
5 guess is the way to interpret that. Let me correct. This
6 last item here on Exhibit 2A-7, main steam valve control, I
7 was interpreting it to be the MSIV's, which we can close
8 from the remote shutdown panel. However, what is meant here
9 is the main steam valve control to the turbine, and that we
10 can open and close.

11 General Design Criterion 44, Cooling Water. This is
12 Exhibit 2A-8. This criterion requires that we have a cooling
13 system sufficient to cool down the reactor and maintain it in
14 a safe shutdown condition and still meet single failure with
15 or without a loss of offsite power. Our auxiliary feedwater
16 system, of course, is an essential portion of this train of
17 cooling water systems we have to get us down to a safe
18 shutdown or a cold shutdown condition, and we have seen that
19 the emergency feedwater system can get us there assuming a
20 single failure and loss of offsite power. Similarly, our
21 other cooling water systems are so designed so that they will
22 also function in the event of a single failure and loss of
23 offsite power.

24 This is Exhibit 2A-9, General Design Criterion 45,
25 Inspection. This requires that we have capability to inspect

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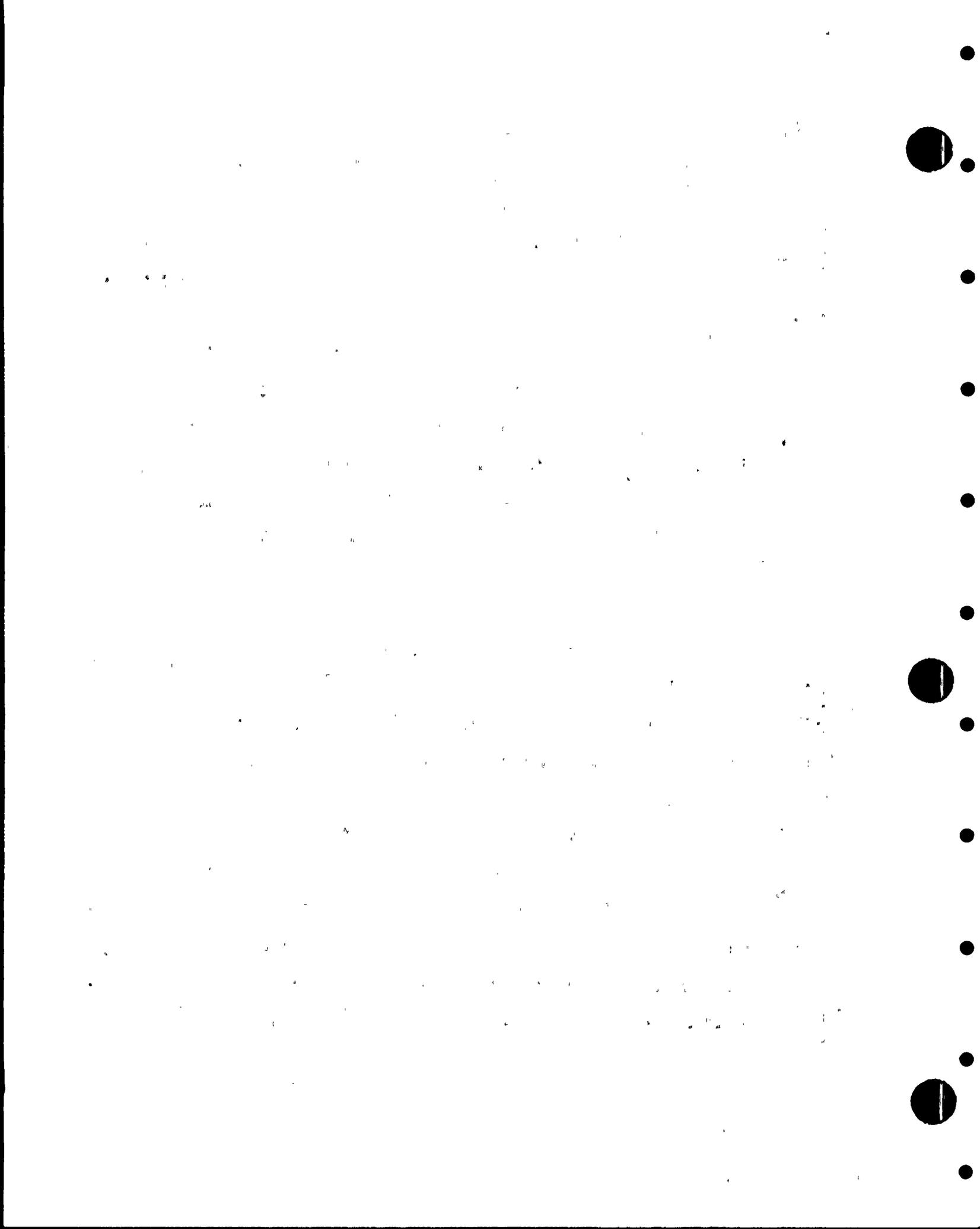
1 our safety systems so that we can determine that the piping
2 and the other components are maintaining their integrity. As
3 we have said earlier, we do meet the requirements of Section
4 XI for all our Section III piping. Similarly, our ANSI
5 piping which is not embedded can be periodically inspected,
6 also.

7 This is Exhibit 2A-10, General Design Criterion 46
8 on Testing. This is similar to the last one, a requirement
9 that all components important to safety have the capability
10 of being tested periodically. We once again have the capability
11 to perform all the tests required by ASME Section XI and
12 Section III components. We can also test the startup
13 auxiliary feedwater train.

14 MR. BINGHAM: Are there any questions, Ed, from the
15 board on the general design criteria?

16 MR. ALLEN: Dennis, on your list of instrumentation
17 back there, I didn't see any indication of flow so you can
18 verify you do have auxiliary feedwater flow to your steam
19 generators.

20 MR. KEITH: At the remote shutdown panel? Yes, that's
21 correct, John. We do not have flow indication at the remote
22 shutdown panel. We do have position indication on the flow
23 control valves, on the isolation valves, and we also have
24 the turbine speed indication for the turbine-driven pump. The
25 electric motor-driven pump will have indication at the



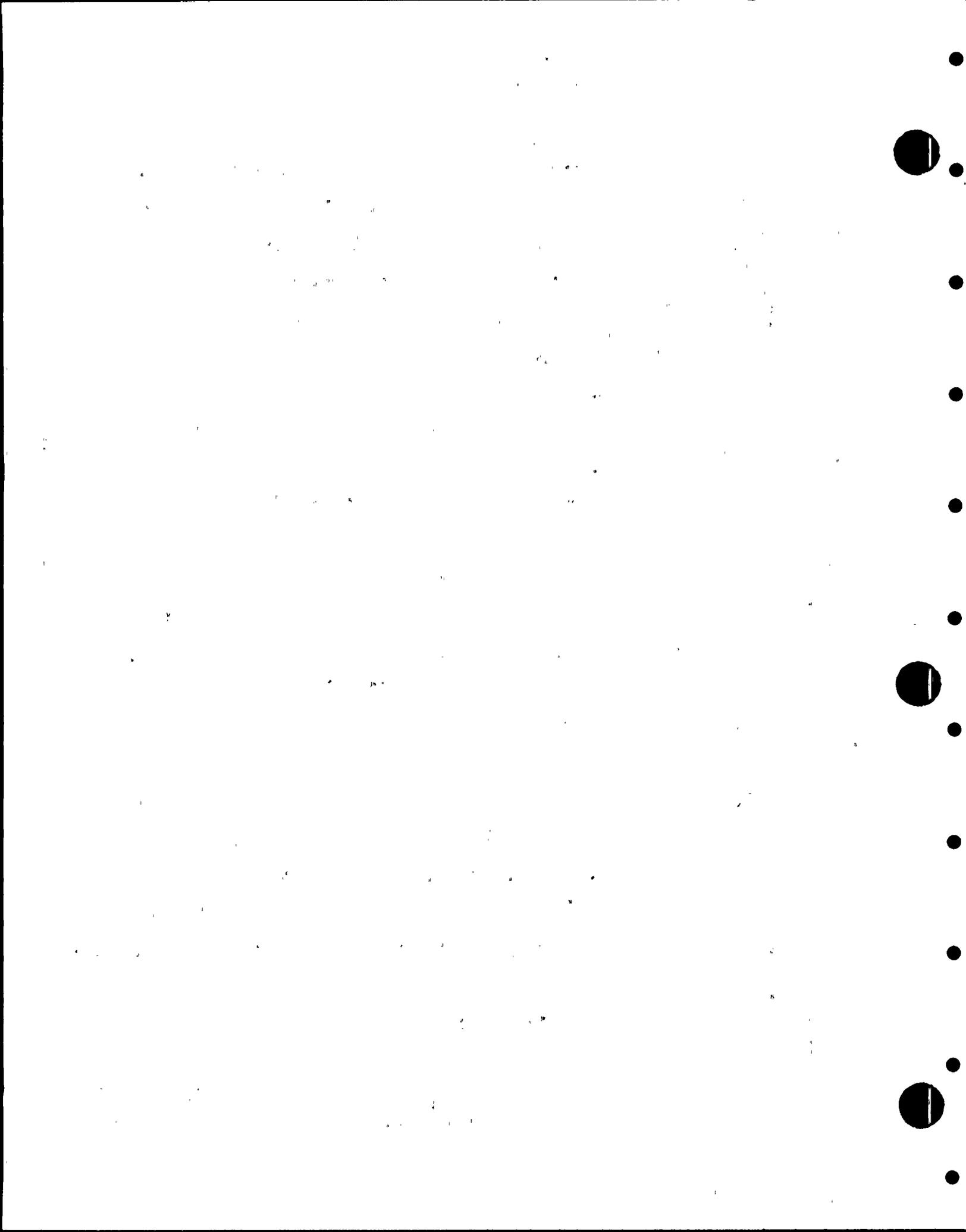
1 switch gear, which is very close to the remote shutdown panel,
2 that that is running. Also, there is a number of other
3 instruments which are on the remote shutdown panel among
4 which are steam generator level and reactor coolant temper-
5 ature, and from that you can infer whether the auxiliary
6 feedwater system is operating.

7 MR. VAN BRUNT: Jerry you had a question?

8 MR. WERMIEL: Yes. In connection with GDC-44, the
9 requirement for capability to provide heat removal in the
10 event of loss of offsite power, when I am using my auxiliary
11 feedwater system and I don't have offsite power, my decay
12 heat removal path is through the atmospheric dump valve, I
13 believe. In what position does the atmospheric dump valve
14 fail on the loss of offsite power? I think I know the answer
15 to my own question. I think it fails closed. Do you have
16 provision to remotely automatically open that valve to complete
17 the decay heat removal path or must this be done manually?

18 MR. KEITH: No, we do have on the remote shutdown
19 panel as well as in the control room, of course, we do have
20 controls for the atmospheric dump valves. Maybe a couple of
21 years ago, we added Seismic Category I accumulator tanks so
22 that we can control the atmospheric dump valves in the event
23 of a loss of offsite power, so we have the controls for those
24 at the remote shutdown panel.

25 MR. BARNOSKI: I have a question back on the table of



1 instrumentation. You said that you don't have the low aux
2 feedwater pump pressure alarm on the remote shutdown panel.
3 I think from what you said before that is the only protection
4 you have against runout destruction of the pump. I wonder
5 what your logic was for excluding that from the remote
6 shutdown panel.

7 MR. KEITH: Mike, we had only been using the remote
8 shutdown panel -- well, presumably we had only been using it
9 when the reactor was in a hot condition, so you would have
10 the pressure in the steam generator so that you wouldn't
11 have the potential for runout conditions on those pumps.

12 MR. BARNOSKI: You are assuming that by the time you
13 got down to the point where you are going to have low
14 temperature pressure in the generator that you are back in the
15 control room.

16 MR. KEITH: Or onto shutdown cooling.

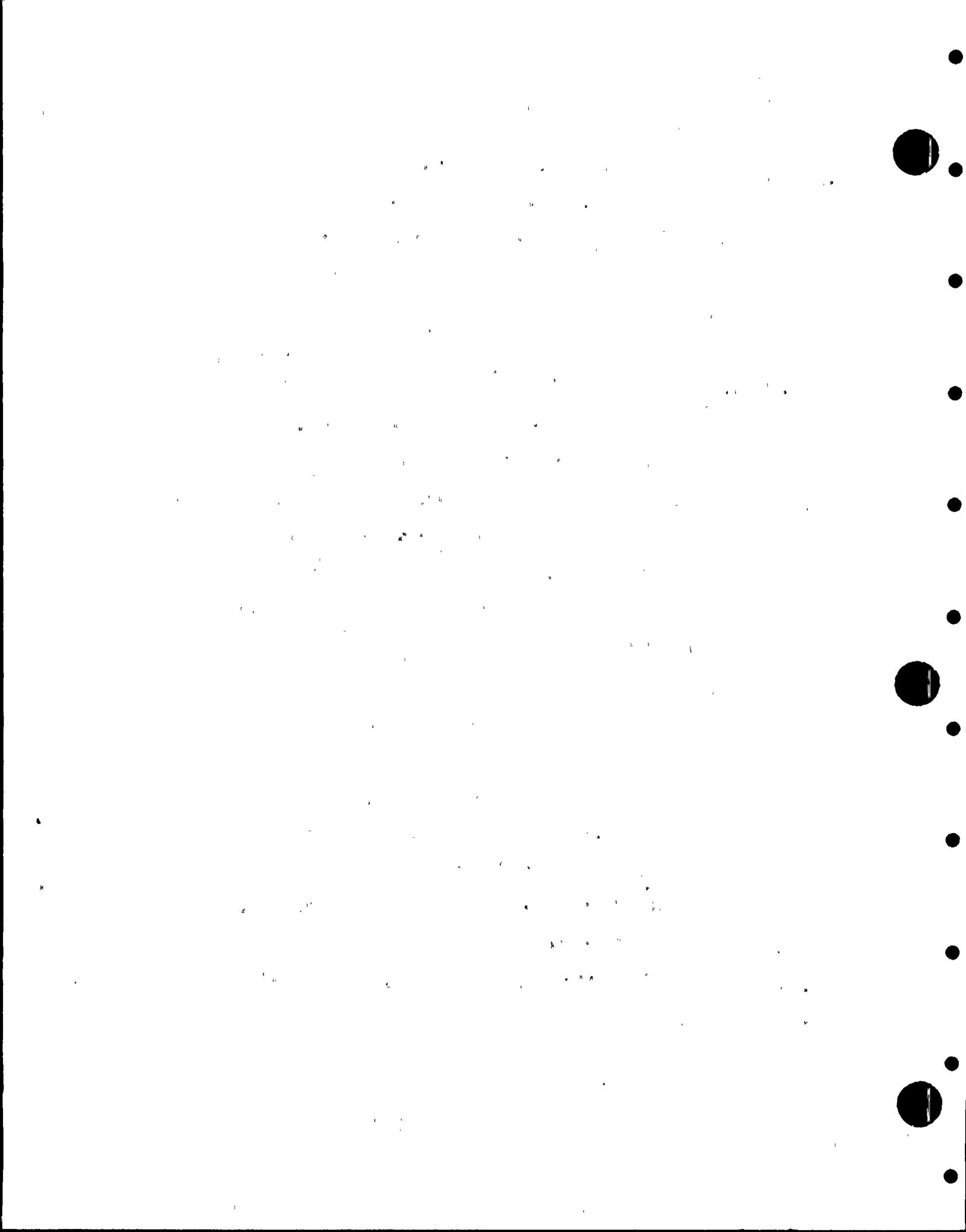
17 MR. TURK: When they get onto shutdown cooling, have
18 they passed through that pressure in the generator?

19 MR. KEITH: We have to get down to what, 400 psi?

20 MR. TURK: The generator pressure is lower than that
21 if you are down to 400 degrees.

22 MR. KEITH: Well, 350 degrees, and I think the pressure
23 is up to 300 or 400 psi as I remember it.

24 MR. TURK: That back pressure doesn't present a runout
25 problem?

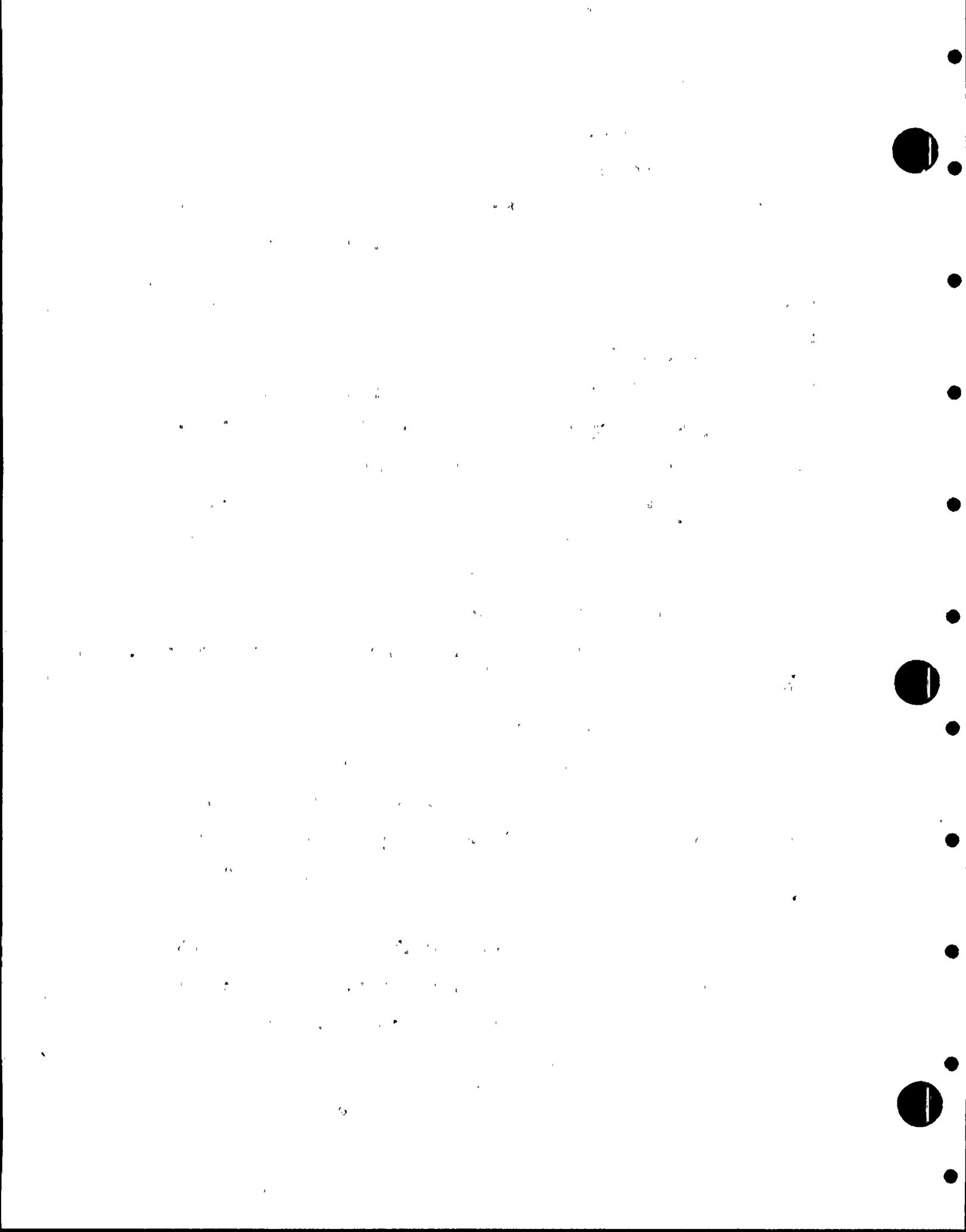


1 MR. KEITH: Rick, to answer your question, yes, there
2 would be the potential for runout at that temperature. By the
3 time you get down there, hopefully you are going to be in
4 good control. You are going to have the flow control valve,
5 the valve we talked about that you can jog, you are going to
6 have that in a position such that a runout would not be a
7 problem.

8 MR. TURK: Let me ask it this way. Have you evaluated
9 the possibility of adding a flow limiting orifice in the
10 original design, some feature, either a cavitating Venturi or
11 some feature that would inherently provide runout protection,
12 and what was your reason for not including something like
13 that?

14 MR. KEITH: Neither one of us were in on all the design
15 details way back, whether that was really ever looked at. I
16 believe in large part we started out with a Combustion
17 Engineering P&ID as a starter.

18 MR. BINGHAM: For clarification so that the board at
19 least understands, the AE will take the preliminary P&ID's
20 that come from the NSSS manufacturer and use those as a
21 starting point rather than going back with a clean piece of
22 paper and trying to redesign or restructure the whole system,
23 so when Dennis indicated that the reason you see the system
24 the way it is is because we start at a fairly complete point
25 as far as input from the particular manufacturer.



1 MR. BARNOSKI: I think we were on a little bit different
2 tack and I think there is an interface that we talked about
3 earlier to provide runout protection for the pump. The
4 question is why don't you need that protection during the
5 events when you are required to use the remote shutdown panel
6 as opposed to staying in the main control room.

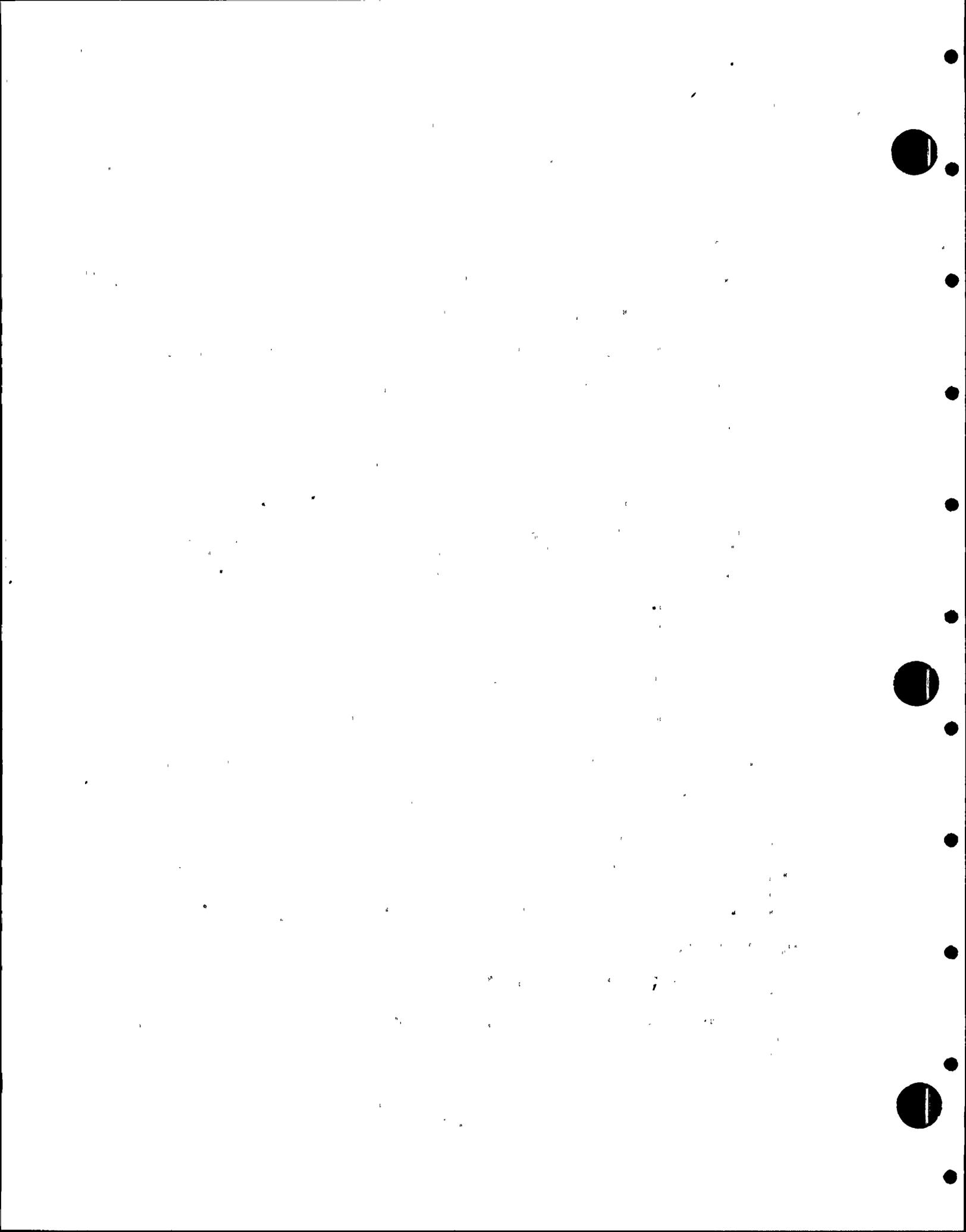
7 MR. KEITH: Mike, I think the answer I gave is that
8 whenever you are in a remote shutdown panel situation, you
9 are going to be in a pretty tight control and have a lot of
10 communications and everything else. It is not a condition
11 where everything is on automatic by any means, which is I
12 think the type of condition where you have the potential for
13 a pump running out and you not knowing about it.

14 MR. VAN BRUNT: Dennis, without belaboring the point
15 further, I think I would like to go back and take a look at
16 the particular criterion that Mike is talking about in the
17 context of the question that was asked to be sure that we have
18 in fact taken an adequate look at it and that the system as
19 designed is proper for the situation.

20 MR. KEITH: Fine.

21 MR. ROGERS: That should include information as to the
22 instrumentation readouts that are available to tell you where
23 you are.

24 MR. FREID: On the same line, are a lot of these func-
25 tions going to be supplied in the technical support center?



1 That will be an additional place where a lot of these readouts
2 are going to be supplied.

3 MR. BINGHAM: We are studying that at the present time,
4 Shelley, and when we discuss how we meet the requirements for
5 technical support centers, and so forth, we will be dealing
6 with that, but we have not yet made any recommendations to the
7 utility nor have had any final review of how we are going to
8 approach the particular problem.

9 MR. VAN BRUNT: That whole design for Palo Verde is
10 right in the process of evolving, so I don't think any of us
11 are really in a position to answer your question specifically.

12 Angie, did I see you had a question down there?

13 MR. ORTIZ: A quick one. On General Design Criterion 2,
14 Natural Phenomena, you stated that all the important
15 structures are located above the flood design level. These
16 compartments are below grade if I remember correctly.

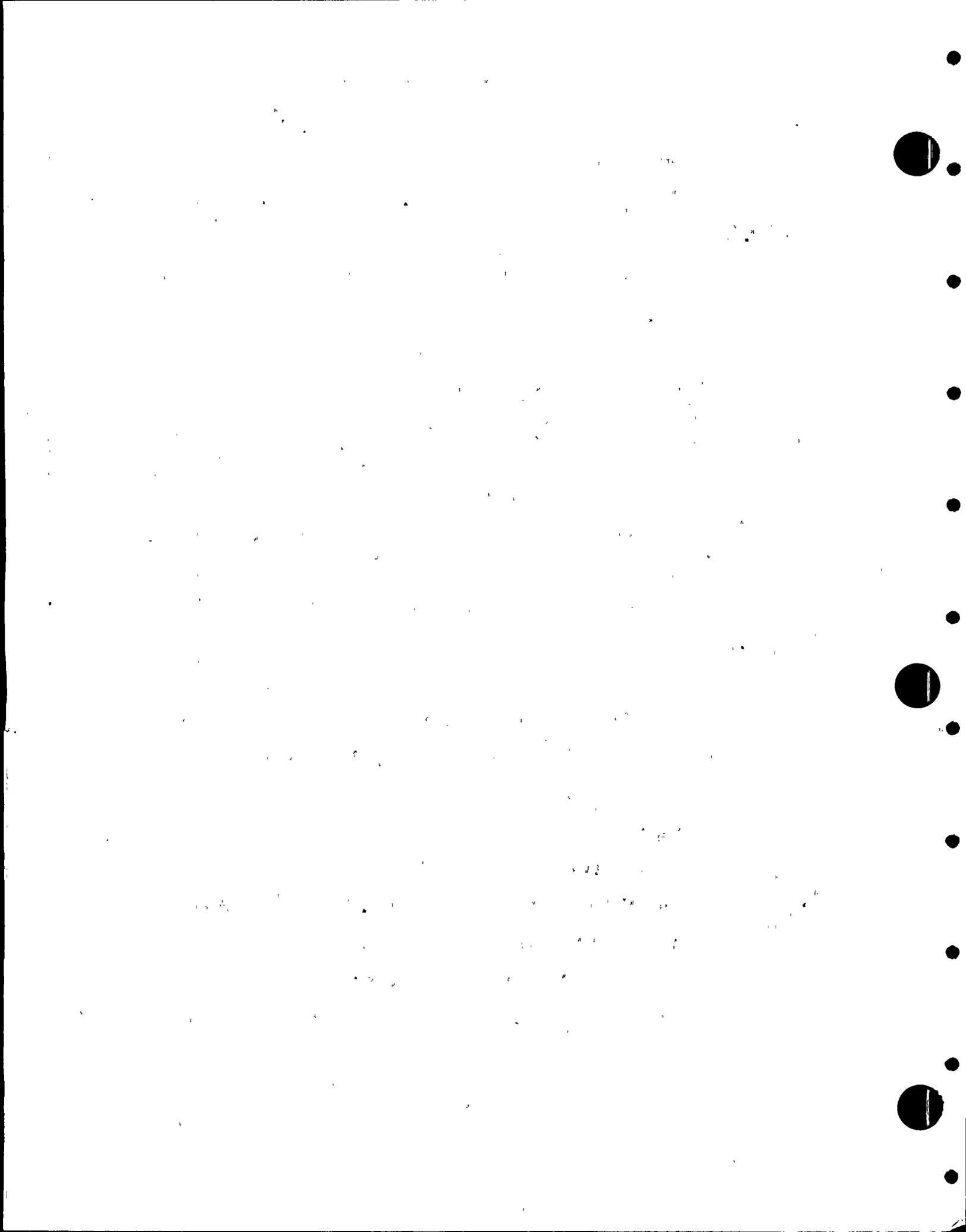
17 MR. KEITH: What I should have stated was that we do
18 not get water from a flood in the vicinity of the power blocks.
19 Just by the contour of the land around and where the water
20 is coming from and all, you do not get floodwaters from the
21 design basis there in the vicinity of the power blocks.

22 MR. VAN BRUNT: Shelley, you had a question?

23 MR. FREID: Yes, I have a few small ones.

24 MR. BINGHAM: Shelley, excuse me.

25 I'm sorry, Ed. We wanted to clarify a point that



1 was previously asked from CE about the instrumentation on the
2 remote shutdown panel.

3 MR. VAN BRUNT: Go right ahead.

4 MR. KEITH: As far as the instrumentation, I know you
5 recall, Mike, the interfaces for what goes on in the remote
6 shutdown panel. That was a P&ID from CE, some of it was
7 interface documents, some of it joint CE-Bechtel decisions.

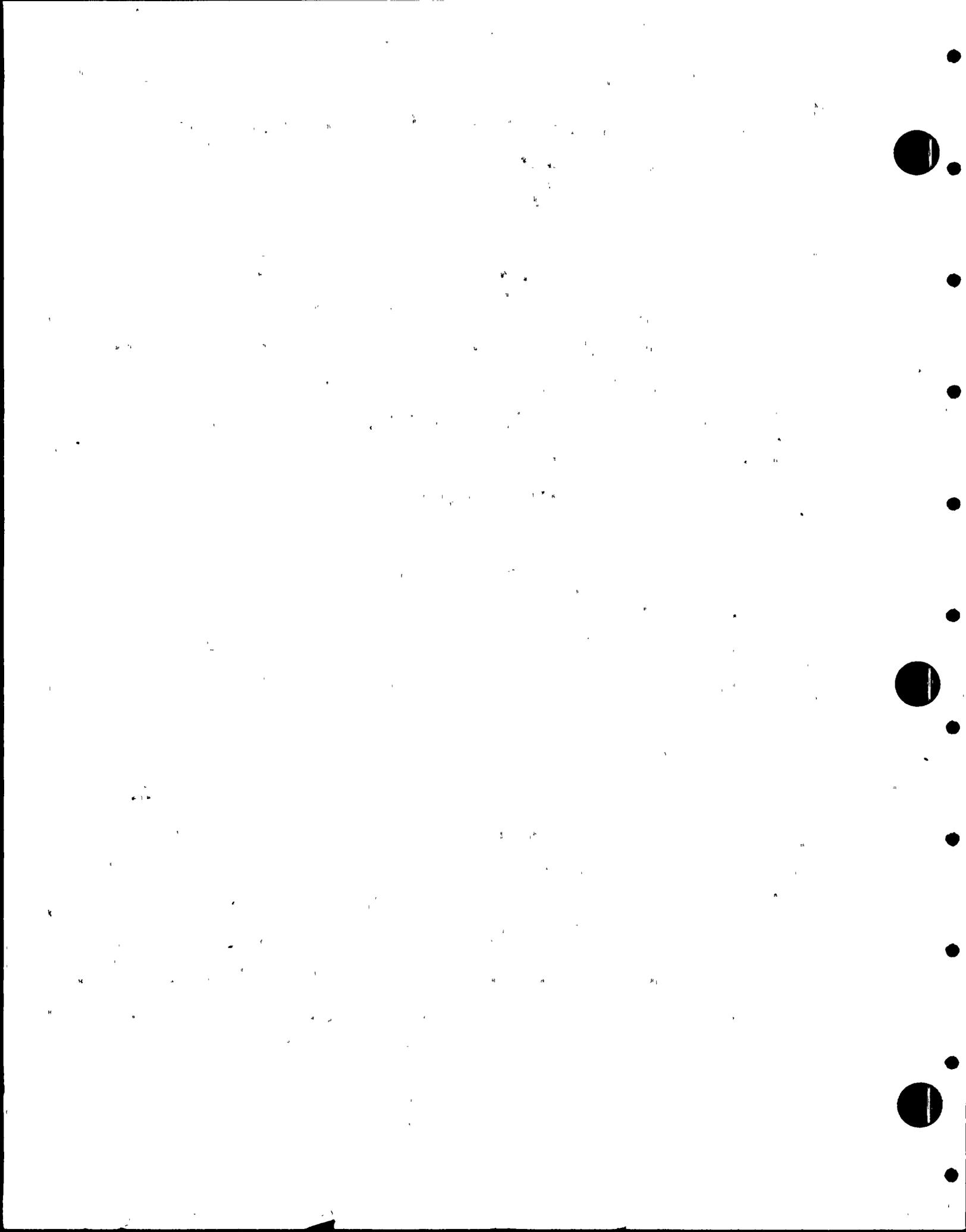
8 MR. BARNOSKI: It is not my intent that I was bound
9 by previous agreements for something that was overlooked and
10 we intended to look at it.

11 MR. VAN BRUNT: Shelley, go ahead.

12 MR. FREID: A quick one on General Design Criterion 4,
13 Exhibit 2A-2. I presume that the wall separating the motor-
14 driven from the turbine-driven pump, you have looked at them
15 as a failure of that turbine producing an internal missile in
16 that room and that the wall is adequate to handle those
17 missiles?

18 MR. KEITH: Yes.

19 MR. FREID: On 2A-7, I think you confused me with
20 your answer and I changed what you thought the open and
21 closed was, because your clarification indicated it was the
22 main steam line to the turbine, which seems to be the second
23 item on that list. Didn't you indicate that it was really
24 the steam turbine in that valve control, and now you seem to
25 indicate that that main steam valve control is the same one.



1 I guess I am confused.

2 MR. KEITH: The main steam valve is the one that we
3 have been showing on these P&ID's whereas the inlet valve
4 control is right at the turbine.

5 MR. FREID: I have one other last question. We did
6 not talk at all about this. This has to do with cooling
7 water, which made me think of it, even though it is not
8 Seismic Category I. We did not talk about any support
9 systems for the auxiliary feedwater. Are there component
10 cooling water systems for the pumps that we have not addressed
11 to assure ourselves it is single failure proof and other
12 support systems? Nowhere in the design criteria or anything
13 else have we talked about those kind of support systems.

14 MR. KEITH: Well, the only support systems as such are
15 the HVAC, which we have discussed.

16 MR. FREID: There are no other secondary cooling water
17 systems for this?

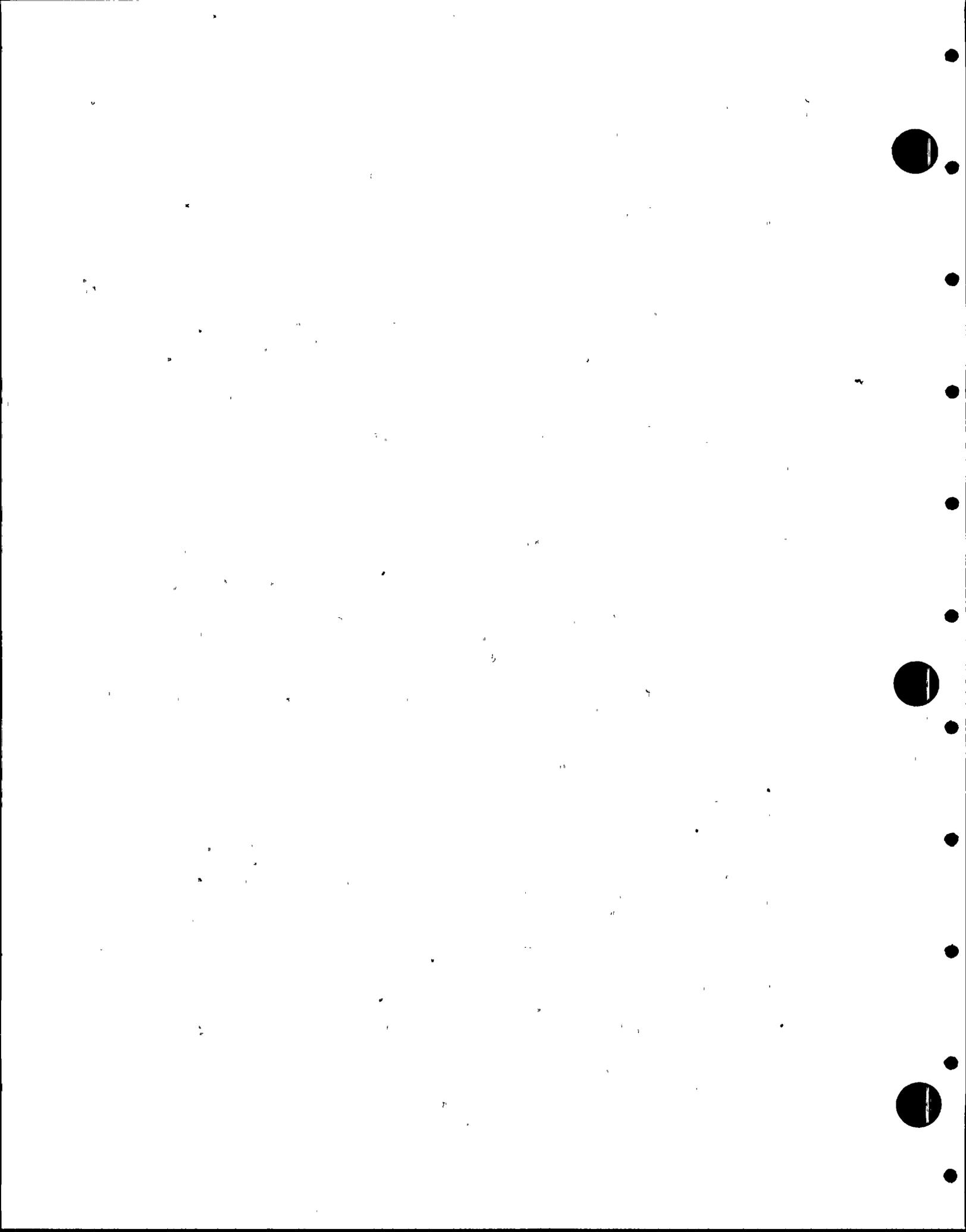
18 MR. KEITH: No. You need cooling water for the HVAC,
19 that's all.

20 MR. FREID: No, I mean for the turbine pumps or any of
21 those, there is no additional cooling water systems?

22 MR. ORTIZ: Turbine lube oil cooling.

23 MR. KEITH: The turbine lube oil cooking comes off the
24 discharge of the turbine-driven pump.

25 MR. ORTIZ: A question on your emergency shutdown panel.



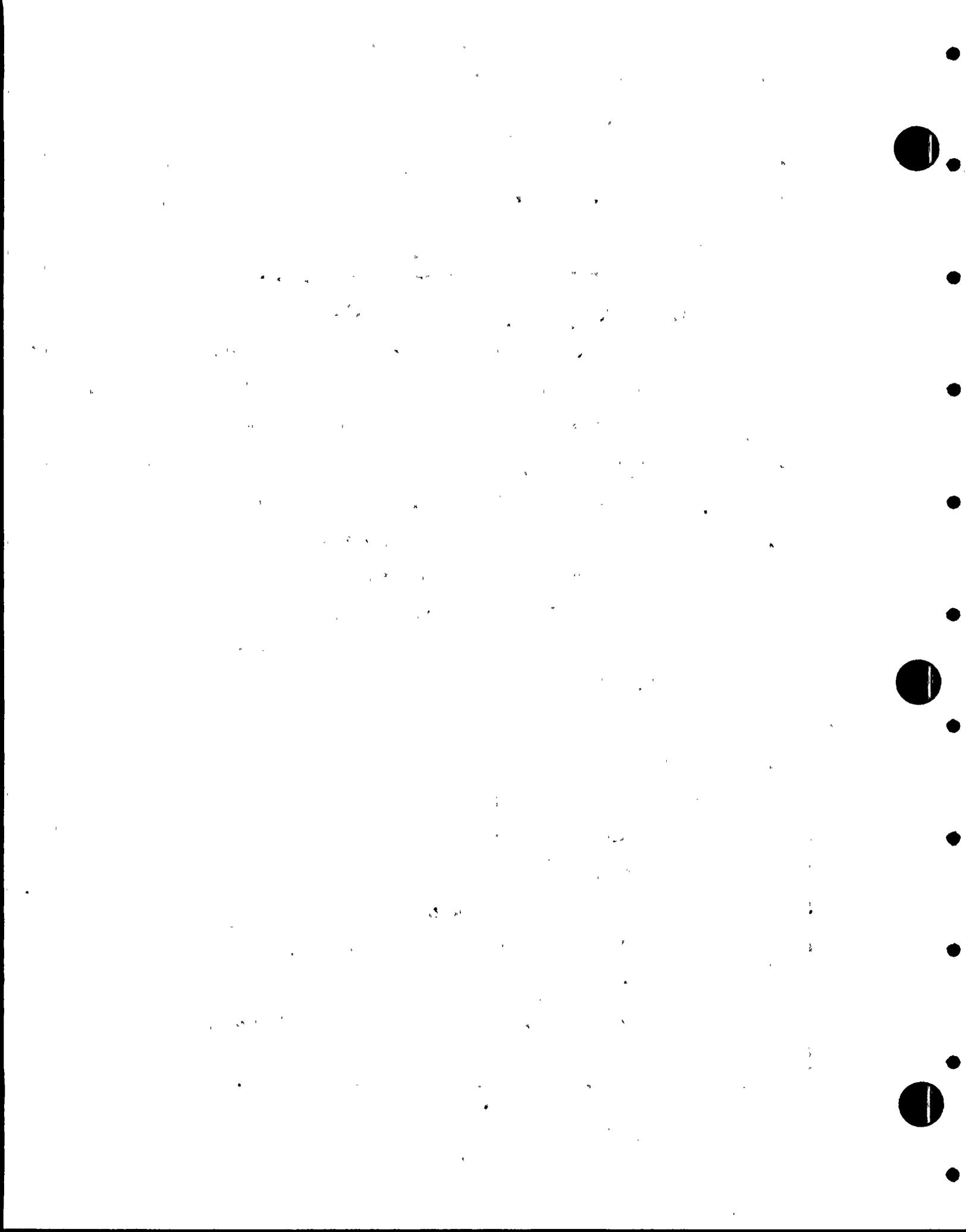
1 Have you included in your fire hazard analysis to show that
2 the operator would be able to function properly at that
3 location as far as fire is concerned or maybe radiation
4 exposure?

5 MR. BINGHAM: Ed, as you know, we have a presentation
6 that we are going to have on fire protection. If it is
7 pertinent to the particular understanding of this system, of
8 course we can get into describing it. We are in the process
9 of reviewing and rereviewing our fire protection criteria and
10 we will be presenting that probably in November. It will be
11 October or November. So if there is a particular concern as
12 it relates to this system, Angie, maybe specifically you
13 could tell us what it is and we can deal with that today.
14 Otherwise, I would suggest that these issues on fire protection
15 be discussed in detail at the next system review we have on
16 that subject.

17 MR. ORTIZ: My only question is since the location of
18 the remote shutdown panel is vital to the operation of the
19 aux feedwater system, perhaps it is premature to have it here,
20 would the operator be able to be there or act at that location
21 in the event of a fire either in that same compartment or in
22 any other adjacent compartment?

23 MR. BINGHAM: The intent is yes and the answer is yes
24 to that question.

25 MR. PARR: I guess I am not sure of the question. How



1 do you leave the control room if the fire is at the --

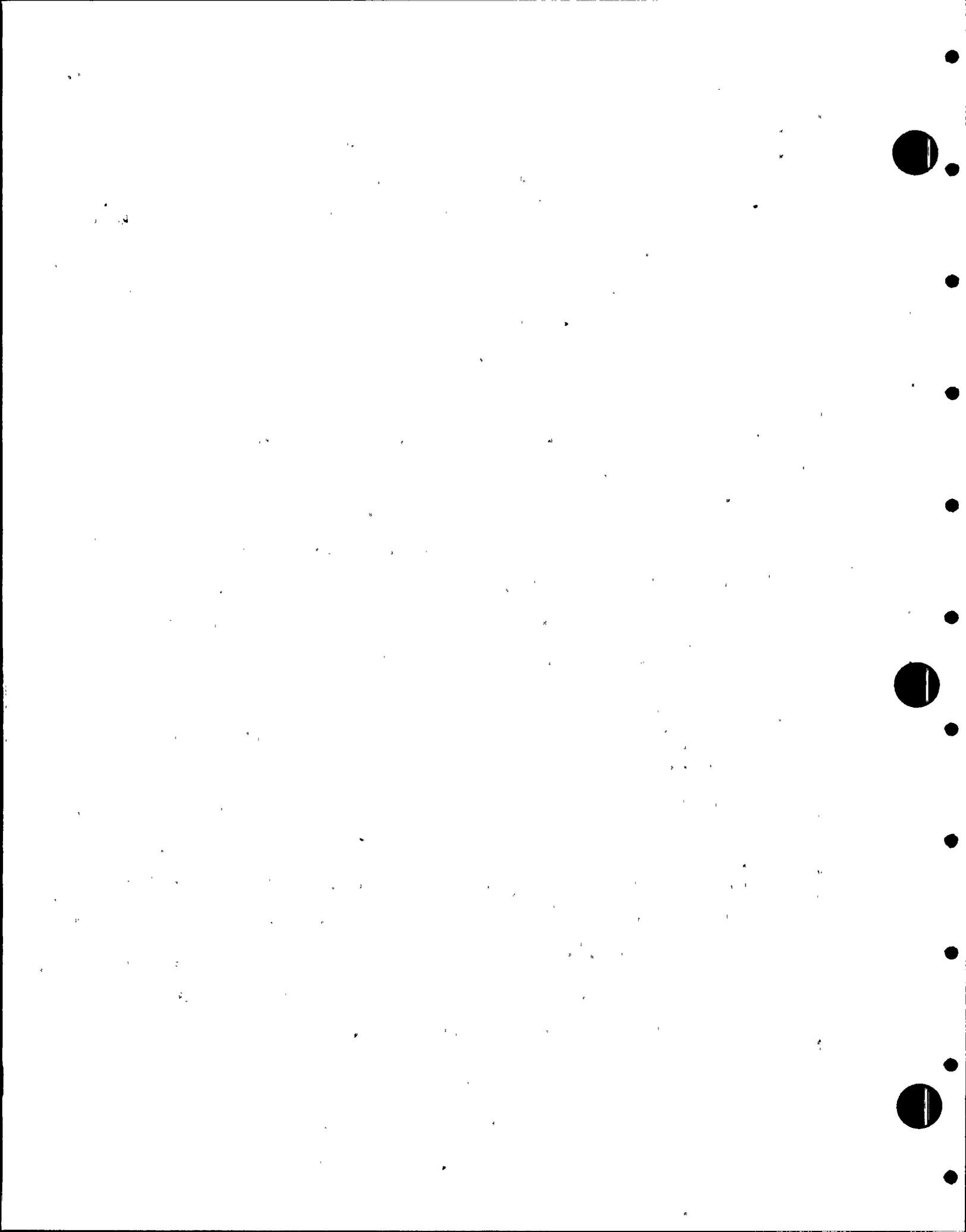
2 MR. KEITH: The design basis is that the remote shut-
3 down panel is only used if for some reason we have to evacuate
4 the control room. It is not designed to take another accident
5 in addition to the event which caused you to evacuate the
6 control room. So there is a limited scope there. We are
7 really designed to maintain the plant in a hot shutdown
8 condition at that panel. It is not designed for a post-
9 accident other than just the fact that you had to leave the
10 control room for some reason.

11 MR. VAN BRUNT: Any other questions? Norm.

12 MR. HOEFERT: You've got the steam turbine speed
13 control at three locations, the control room, shutdown panel,
14 and local. Which one overrides the other and does the
15 setting override even when you have an auxiliary feedwater
16 actuation signal?

17 MR. KEITH: I can answer the second part of your
18 question. Yes, it is overridden for an auxiliary feedwater
19 actuation signal. The first part of your question gets back
20 to an earlier one which we have left open on the priority
21 between the control room and the remote shutdown panel and the
22 use of transfer switches and things like that. We do not have
23 transfer switches. We will get back on the priority, too.

24 MR. PARR: As far as the other question, then regardless
25 of what the speed control setting is at the three locations,



1 an AFAS signal overrides any one of those and the pump goes
2 the full normal speed?

3 MR. KEITH: Yes.

4 MR. VAN BRUNT: Are there any other questions in this
5 area?

6 Seeing none, why don't you go ahead. Bill, how
7 long do you think the next section is going to take?

8 MR. BINGHAM: Were you planning a break at 3:00?

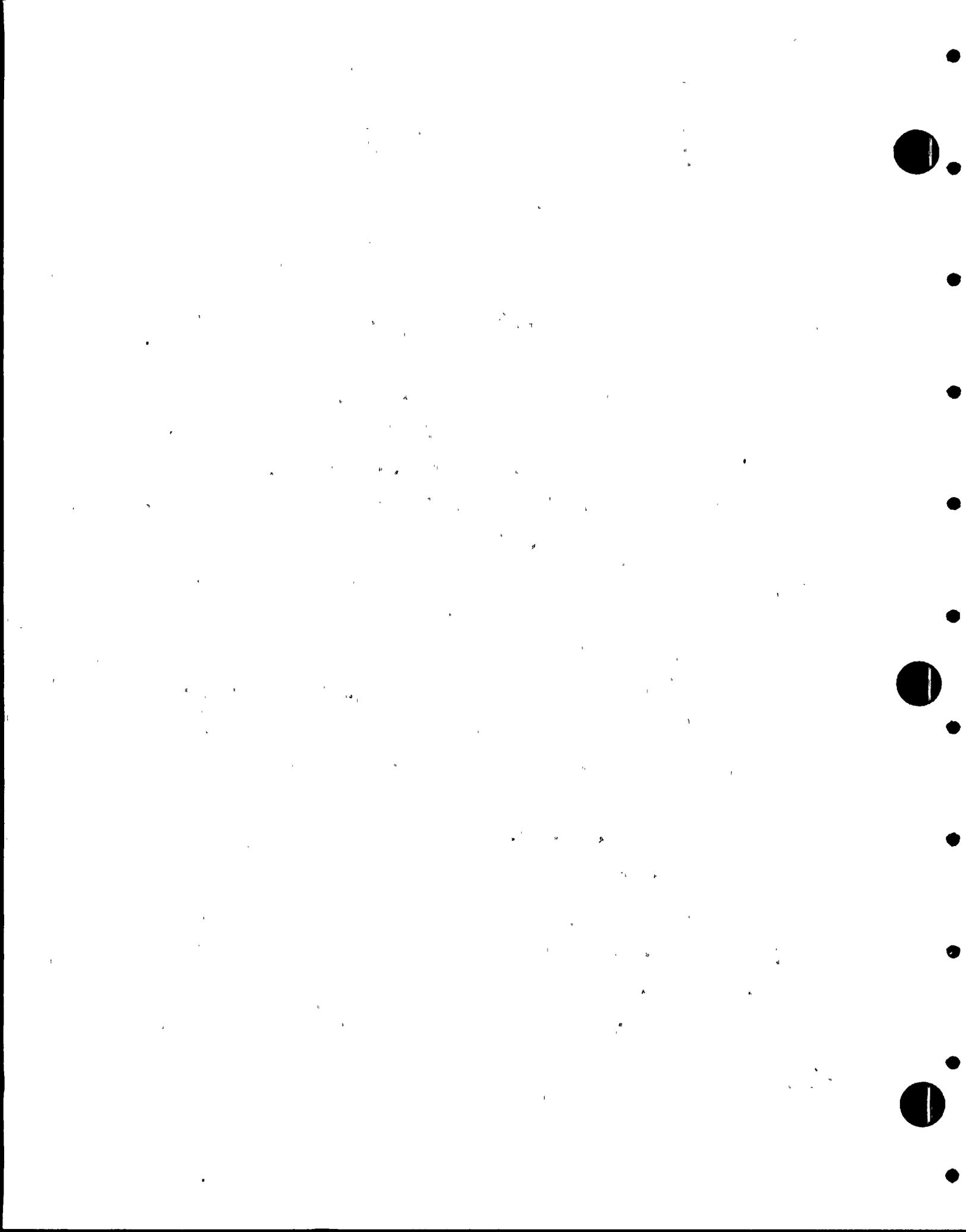
9 MR. VAN BRUNT: About 3:00.

10 MR. BINGHAM: It depends on the questions. Why don't
11 we go through and do 2B, regulatory guides, and ask questions.
12 Then you can have your break.

13 MR. VAN BRUNT: If we go too long, we can break and then
14 do the questions when we come back. Go ahead, Dennis.

15 MR. KEITH: Going through the regulatory guides, the
16 exhibit applicable to this is Exhibit 2B-1. The first one is
17 Reg Guide 1.26, and it basically tells you that the auxiliary
18 feedwater system has to be ASME Section III, Class 3, that is
19 the emergency portion of the auxiliary feedwater system, and
20 then other parts of the system which form part of the contain-
21 ment pressure boundary and are tied into the steam generator
22 all have to be ASME Section III, Class 2, and we meet that
23 requirement, as we have seen previously. That is Exhibit 2B-1
24 and Exhibit 2B-2.

25 Exhibit 2B-3. Going on to Reg Guide 1.29, which



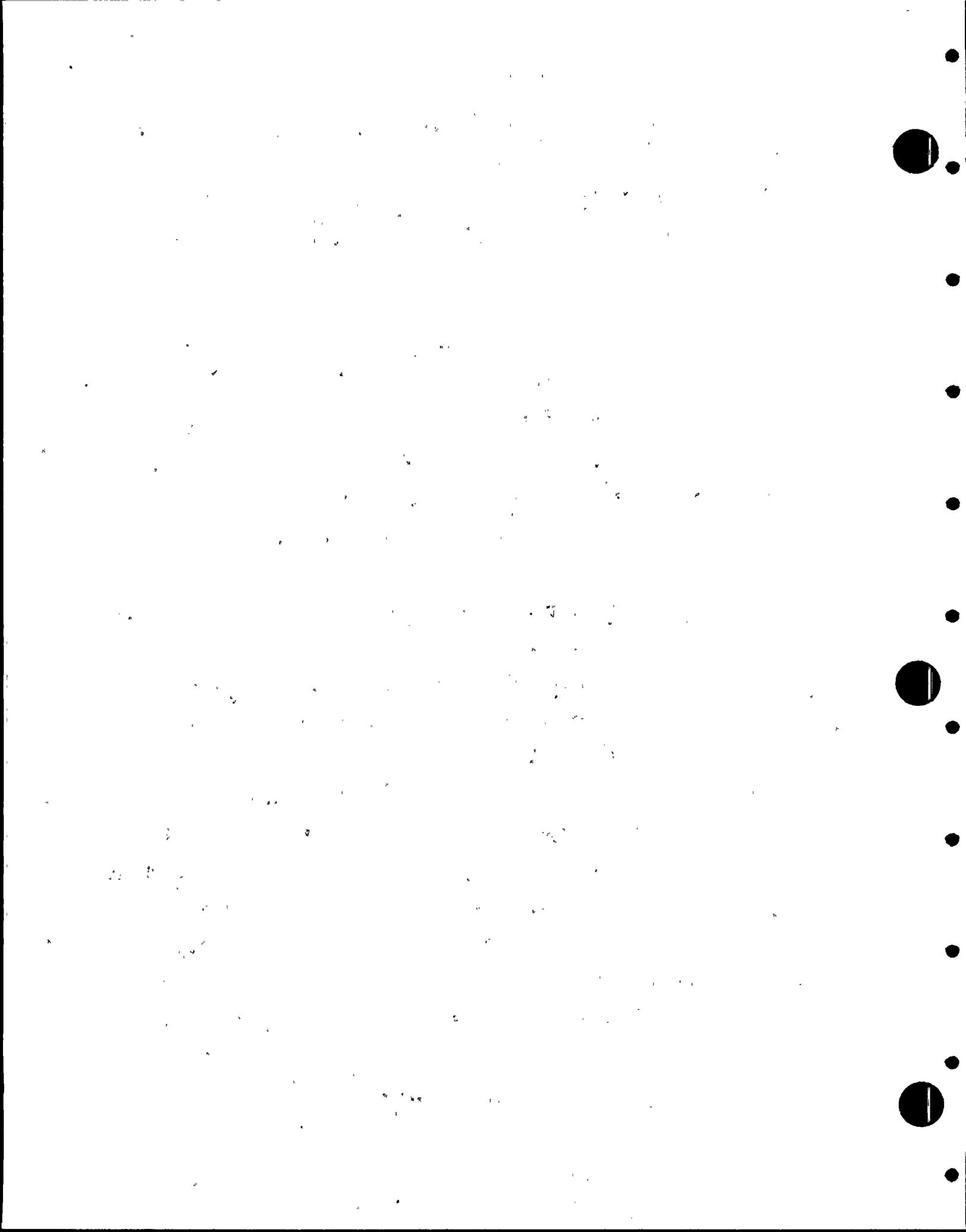
1 gives the seismic design requirements, it basically requires
2 that all the emergency portions of the auxiliary feedwater
3 system be designed as Seismic Category I requirement. In
4 addition, all supporting systems required for that system
5 be designed to Seismic Category I. As we discussed previously,
6 we do meet that requirement.

7 Exhibit 2B-4, Regulatory Guide 1.62, Manual
8 Initiation. The first requirement of this reg guide is that
9 manual initiation of the system should be possible at system
10 level from the control room and all actions which are
11 performed by the automatic signal should be performed when you
12 initiate the system from the control room, and we do meet this
13 requirement. We can initiate an auxiliary feedwater actuation
14 signal and it is just as if it were initiated automatically.

15 The next requirement is that equipment common to
16 manual and automatic initiation be kept to a minimum. The
17 only equipment which is common are the signal cabinet
18 actuation relays. The manual system does not get into the
19 AFAS logic at all. That is down at the relay level.

20 Next, Exhibit 2B-5. The requirement per Reg Guide
21 1.62 is that manual initiation actions be kept to a minimum.
22 An operator in order to initiate auxiliary feedwater to one
23 steam generator just has to turn two switches. There are two
24 actions required.

25 Exhibit 2B-6, Regulatory Guide 1.102, we have



1 already discussed this. This is flood protection. We have
2 discussed it in relation to General Design Criterion 2
3 stating that the design basis floodwaters do not reach any of
4 the three power blocks.

5 Exhibit 2B-7 on Regulatory Guide 1.117, Tornado
6 Design Classification, which requires that our safety systems
7 be protected from a tornado. As we have discussed earlier,
8 we are protected from the tornado, and once again the startup
9 feedwater train does not have tornado protection, being in the
10 turbine building, which is a metal-sided building.

11 MR. BINGHAM: Any questions, Ed?

12 MR. VAN BRUNT: Are there any questions? Shelley.

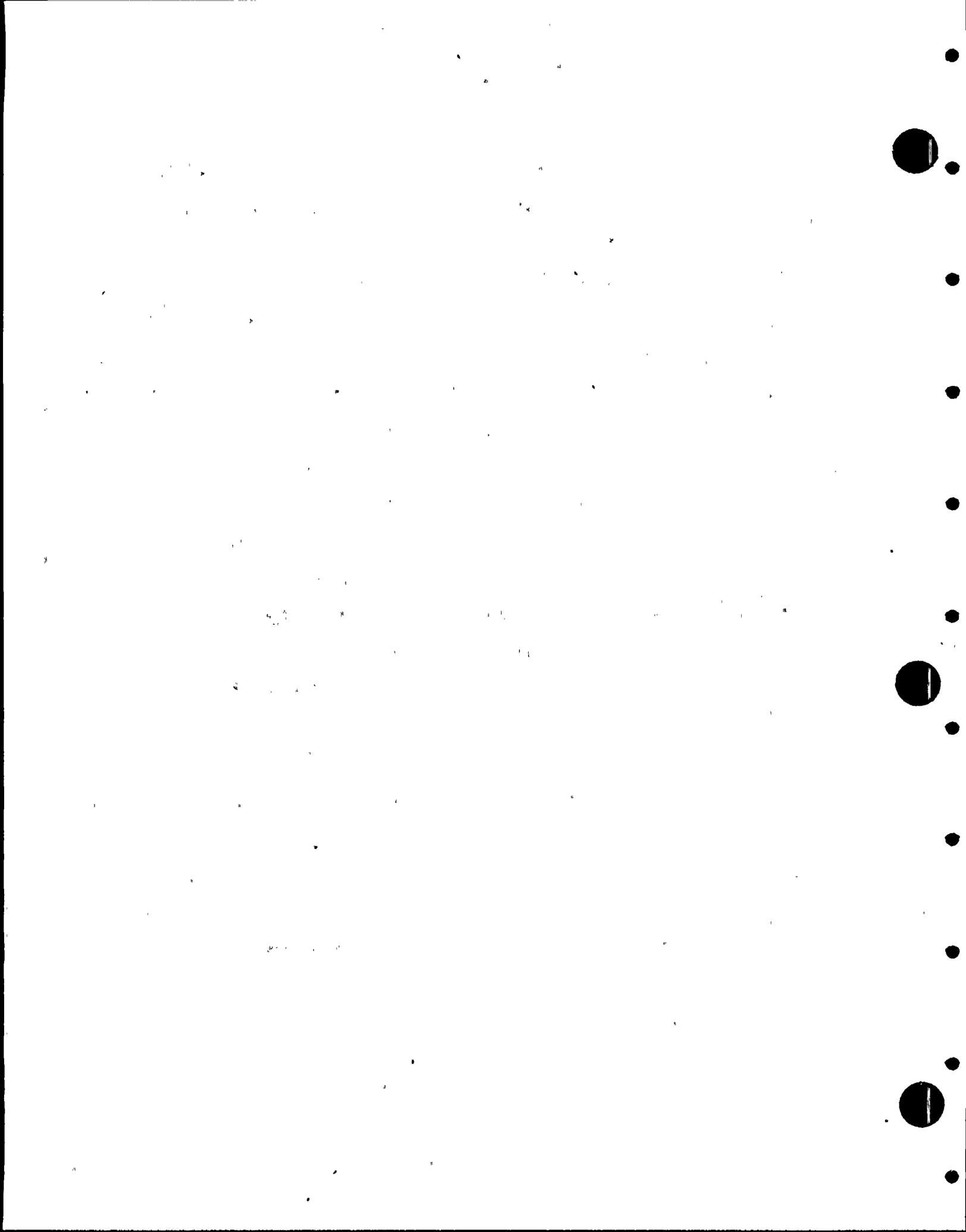
13 MR. FREID: You said on the manual startup, I am
14 referring to Exhibit 2B-4, how do you protect against
15 unintended initiation of the auxiliary feedwater system?
16 What protection do you have on the switches, for instance?

17 MR. KEITH: You have to turn two of them. That is the
18 way it is with most of the safety things in the control room.
19 You have to do two separate actions, so that an operator has
20 that protection against just bumping against something or
21 doing one thing without thinking. Presumably, hopefully he
22 wouldn't do two things without giving it the proper attention.

23 MR. VAN BRUNT: Do you have more, Shelley?

24 MR. FREID: No.

25 MR. VAN BRUNT: Are there any other questions on this



1 particular item? John.

2 MR. ALLEN: Dennis, what is the tornado philosophy
3 that we are designing against?

4 MR. KEITH: We are Region 2, I think it is a 240
5 translational and 60 rotational for a total of 300 miles per
6 hour.

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

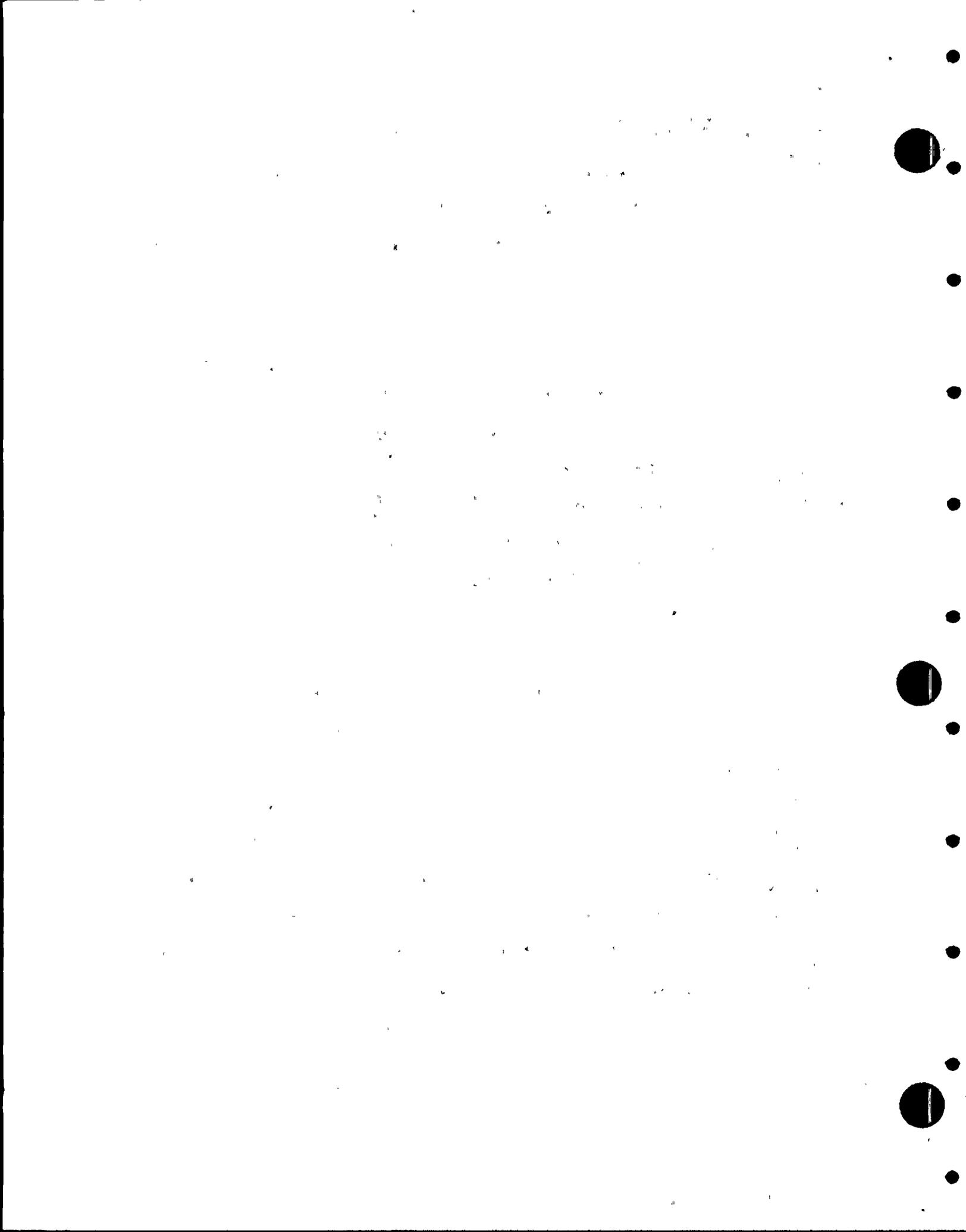
8 Okay, why don't we take about a 10- to 15-minute
9 break to about 3:00 or shortly thereafter, and we will come
10 back and finish up the last section.

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

13 MR. VAN BRUNT: Bill, go ahead.

14 MR. BINGHAM: Let's go on to 2C, the Branch Technical
15 Positions.

16 MR. KEITH: Exhibit 2C-1. As you see from the slide
17 over here, we are going to be discussing Branch Technical
18 Positions MEB 3-1, ASB 3-1, and ASB 10-1. The first two branch
19 technical positions deal with high energy line breaks, and
20 this topic is one of the most difficult to deal with in the
21 design of a power plant. I know there are loads of us who have
22 been reading these two branch technical positions for years
23 and you still have to go back and reread them to make sure you
24 got all the new answers correct and everything else. So we
25 are going to try and present a simplified version of these two



1 and how they apply to the auxiliary feedwater system.

2 First, I have to apologize for a little confusion
3 we are generating on the slides. This is Exhibit 2C-1 and
4 the headings are all reversed from what they should be.
5 Where it says ASB 3-1, it should be MEB 3-1 and vice versa
6 with the exception of this first item under here on Exhibit
7 2C-1. This first item under Definitions, all the definitions
8 are in an appendix to ASB 3-1, so this Item No. (1) happens
9 to be correct, but everything else should be reversed. We
10 have just repeated selected portions of these.

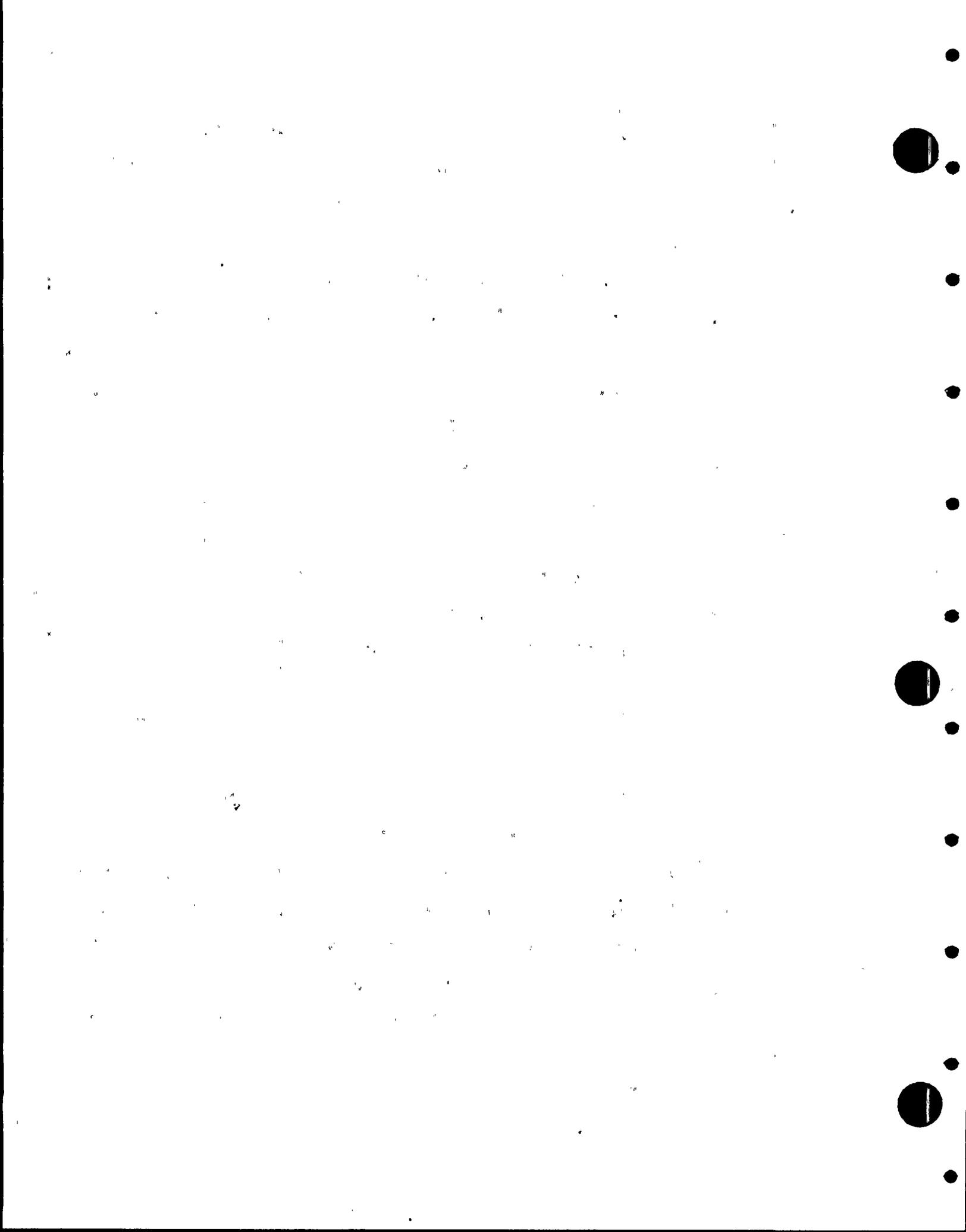
11 MR. VAN BRUNT: Dennis, excuse me, could I ask that
12 when the transcript goes out, when you send it back that
13 we could give to the court reporter a corrected version of
14 this to attach to the transcript.

15 MR. KEITH: Fine. I will confuse the transcript
16 readers with what I have just said.

17 MR. VAN BRUNT: They will know what they got from what
18 I just said.

19 MR. KEITH: As I said, we are just taking selected
20 portions of these branch technical positions. Each one of
21 them goes on for five to ten pages. The technical positions
22 themselves are found as attachments to Standard Review Plans
23 3.6.1 and 3.6.2 for those of you who are interested in more
24 detail. So with that, we will begin.

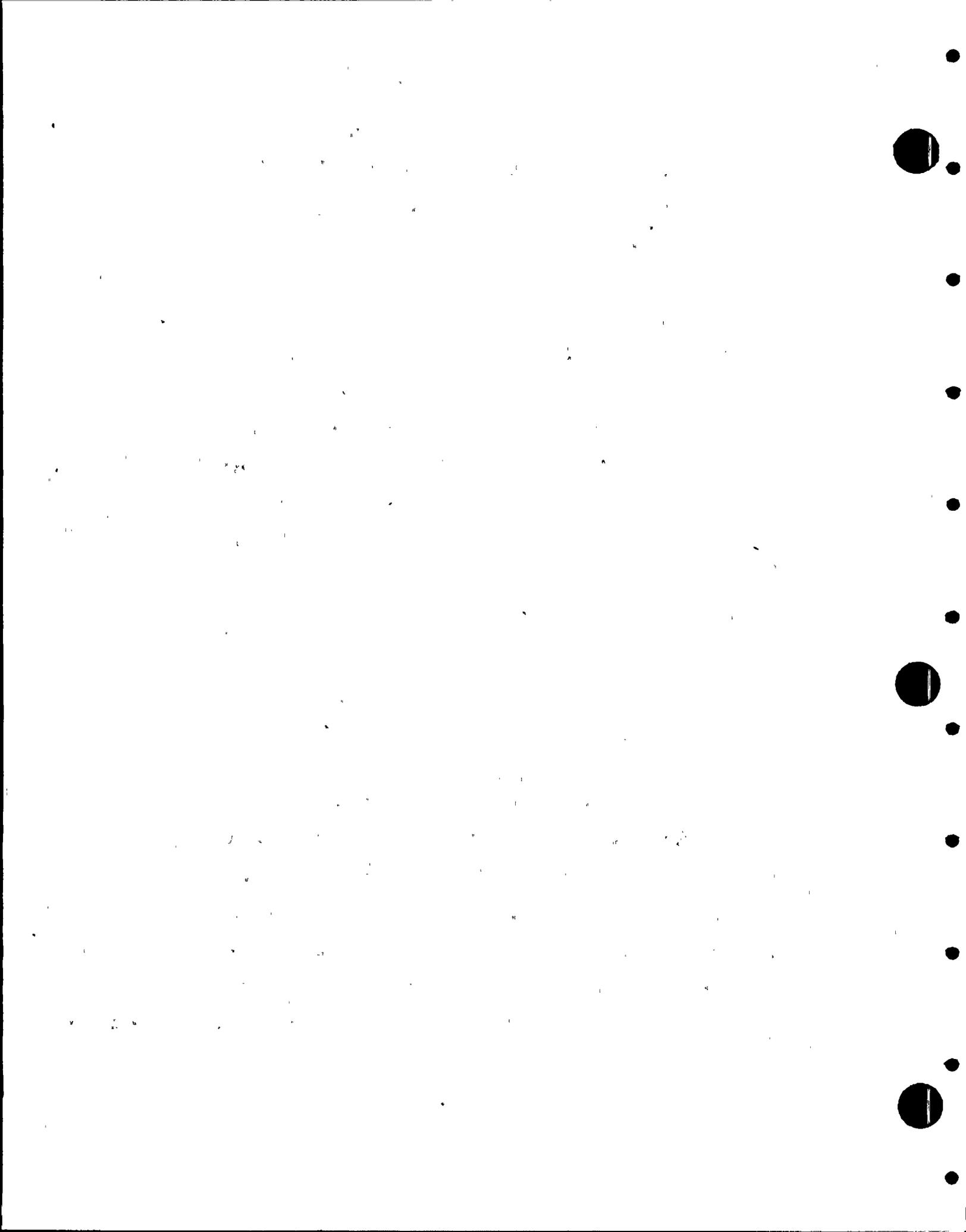
25 The first definition we are interested in is the



1 moderate-energy fluid systems, and we don't have it on the
2 slide, but by inference you also get the definition of a
3 high-energy fluid system. A moderate-energy fluid system
4 is one in which the maximum operating temperature is 200 degrees
5 or less and the maximum operating pressure is 275 pounds or
6 less. So, conversely, a high-energy system is any one in
7 which the operating temperature is greater than 200 degrees
8 or the pressure is greater than 275 pounds.

9 Now we come to an important point which really
10 isn't a definition, but it is part of the actual MEB 3-1
11 where we talk about fluid systems which can qualify as either
12 high-energy or moderate-energy systems. In those systems
13 which can qualify as either, we don't need to postulate
14 breaks, but instead can postulate through-wall cracks.

15 If we can go to the next exhibit, Exhibit 2C-2, we
16 will talk about what an operational short period is. These
17 words are repeated from MEB 3-1 and it says, "An operational
18 period is considered 'short' if the fraction of time that the
19 system operates within the pressure-temperature conditions
20 specified for high-energy fluid systems is about 2 percent of
21 the time that the system operates as a moderate-energy fluid
22 system," and, as an example, systems that qualify as a high-
23 energy system are auxiliary feedwater systems operated during
24 reactor startup, hot standby, or shutdown. From that
25 statement, we are inferring that most portions of our emergency



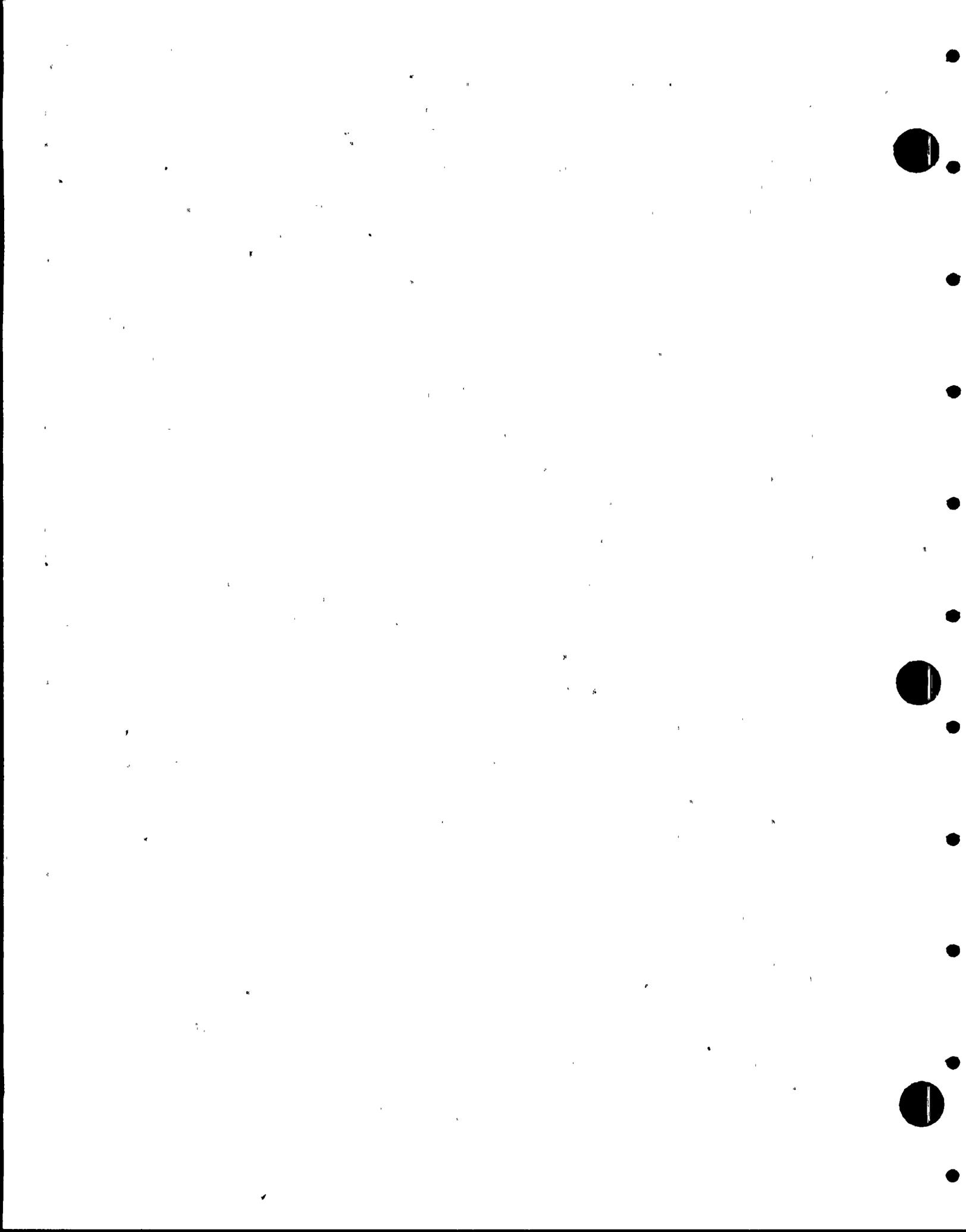
1 feedwater system are not high energy.

2 If we could have Figure 2, please. As we stated,
3 these (indicating) two trains do not operate during startup,
4 hot standby, and shutdown, and, therefore, the pressurized
5 portion of the system, if we assume no checkvalve leakage,
6 would just be this portion (indicating), and this portion
7 (indicating) would all be unpressurized. However, we will
8 discuss breaks as we get into this thing more, if we assume
9 leakage in the checkvalve, then we would say that the high
10 energy portion is from these valves (indicating) onward to
11 the steam generator.

12 Exhibit 2C-3. This is a definition of through-wall
13 leakage cracks. You postulate cracks in any piping system and
14 branch runs which exceed the nominal pipe size of one inch.
15 We comply with that.

16 Exhibit 2C-4. This is more on the definition of a
17 crack and then we get into if we do have a crack, we have to
18 assume that all the components in the compartment are wetted,
19 and as you saw from our arrangement in the lower level of the
20 main steam support structure where we have a watertight door,
21 we are separating the trains so that we can assume a moderate-
22 energy pipe break and still meet the requirement.

23 Let me just point out at this time if we could go
24 back -- This is Exhibit 2C-4. Let me go back to Exhibit 2C-1.
25 The actual words here say, "during normal plant conditions,
are either in operation or maintained pressurized," and

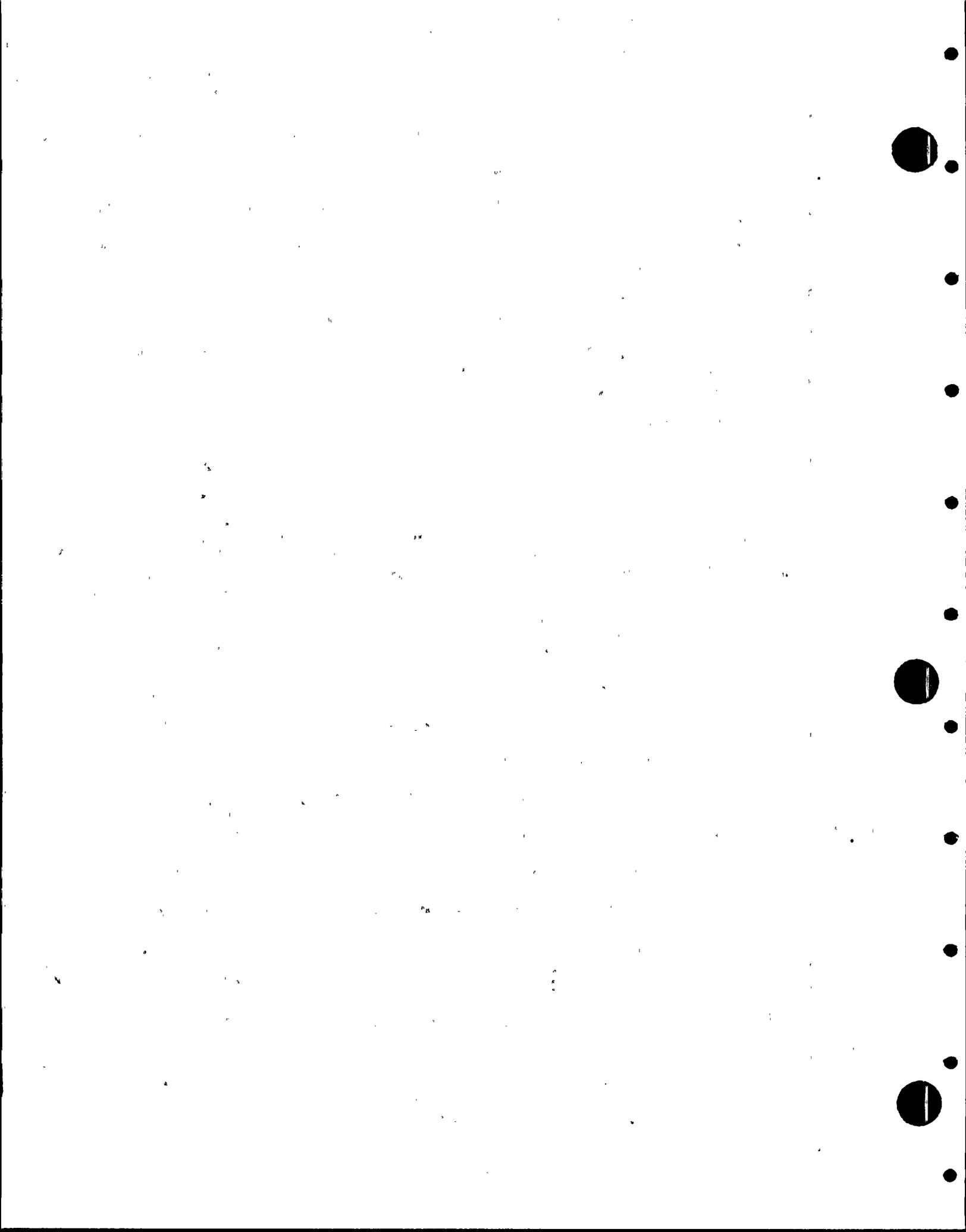


1 actually our systems, as you know, are not in operation and
2 the only pressure is the one psi plus the head on the
3 condensate storage tank, so there is some discussion there
4 on whether it really qualifies as a moderate-energy system
5 under that particular case.

6 Let's go to Exhibit 2C-5. Now we are getting into
7 ASB 3-1. The first requirement is that plant arrangements
8 should separate fluid system piping from essential systems
9 and components, and you have seen the separation we have.
10 We have also kept any piping such as blowdown piping, for
11 example -- Steam generator blowdown piping and all have been
12 kept out of the rooms where we have the emergency feedwater
13 pumps, and we are in a compartment and we are designed to
14 withstand the effects of postulated piping failures. We have
15 mentioned our bunkered concept. That slab separating the
16 emergency feedwater pump rooms from the rest of the main steam
17 support structure is designed to withstand the pressure which
18 we would see during a main steam line break.

19 This is Exhibit 2C-6. This is only included for
20 completeness. We already meet the requirements of the
21 previous slide, so this particular requirement does not apply.

22 Exhibit 2C-7, various design features which were
23 required for our systems to meet. The first one is that we
24 have to meet the seismic design requirements of Reg Guide 1.29.
25 We have already gone over that. The second one refers to



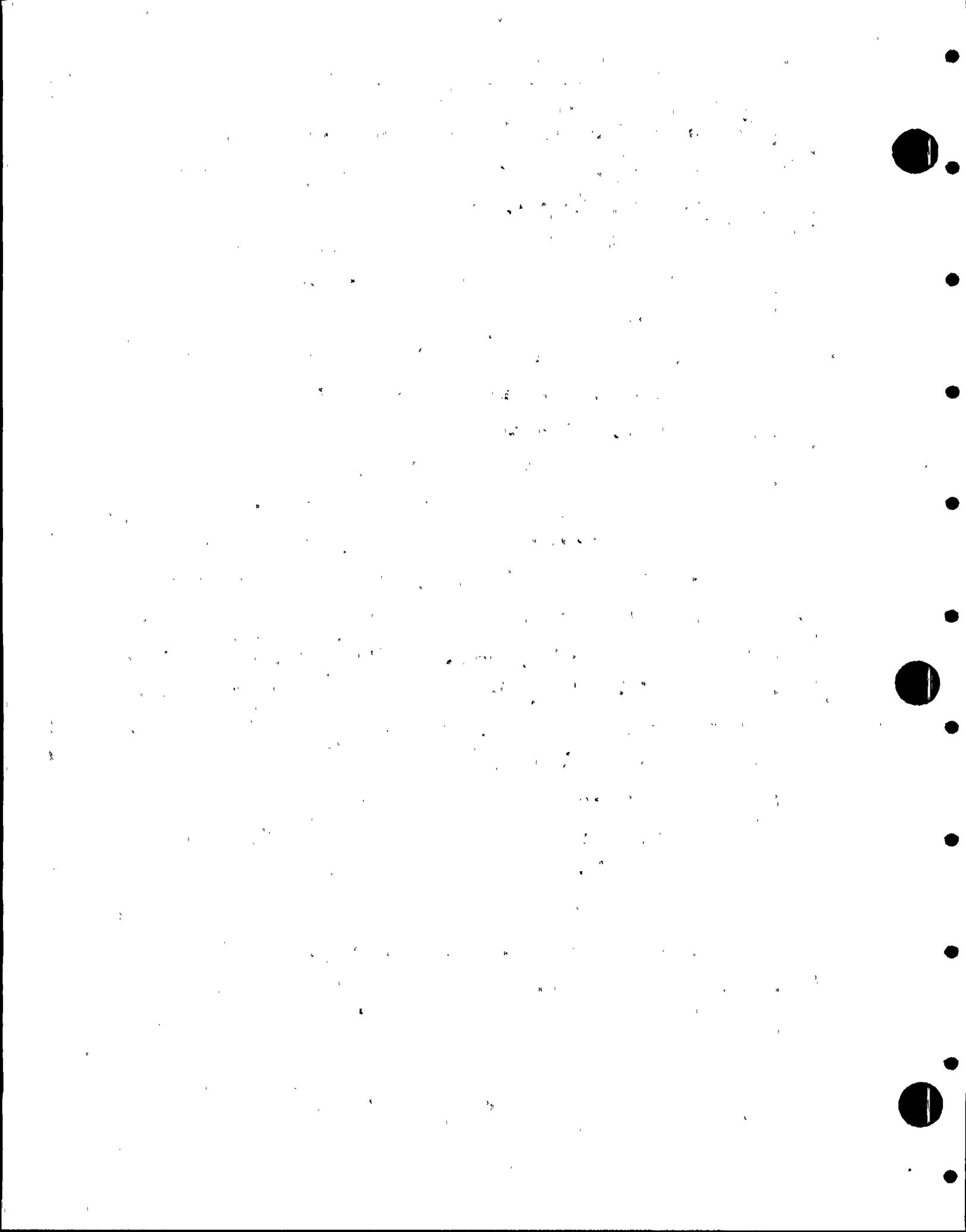
1 separations, and those compartments needed to implement
2 separations should also be designed to Seismic Category I
3 requirements. We meet that.

4 This is Exhibit 2C-8 referring to in-service
5 examination. We have already stated that we meet the
6 requirements of ASME Section XI.

7 This is Exhibit 2C-9 referring more to ASME Section
8 XI, which we are in compliance with. Then in Item 3) on
9 this exhibit, we get into what has to be assumed with a
10 postulated piping failure. Let me just say that each pipe
11 break or leakage crack in a moderate-energy or high-energy
12 system should be considered separately as a single postulated
13 initial event occurring during normal plant conditions, and
14 normal plant conditions are defined as normal reactor operation
15 of power and reactor startup, hot standby, and shutdown.

16 Exhibit 2C-10 giving a requirement on analyzing the
17 effects of postulated piping ruptures. The following assump-
18 tions should be made. The first one is that offsite power
19 should be assumed to be unavailable if a trip of the turbine
20 generator or the reactor protection system is a direct
21 consequence of the postulated piping failure.

22 Exhibit 2C-11, a single active component failure
23 should be assumed in systems used to mitigate the consequences
24 of the postulated piping failure and to shut down the reactor.
25 The single active component failure needs to be assumed in



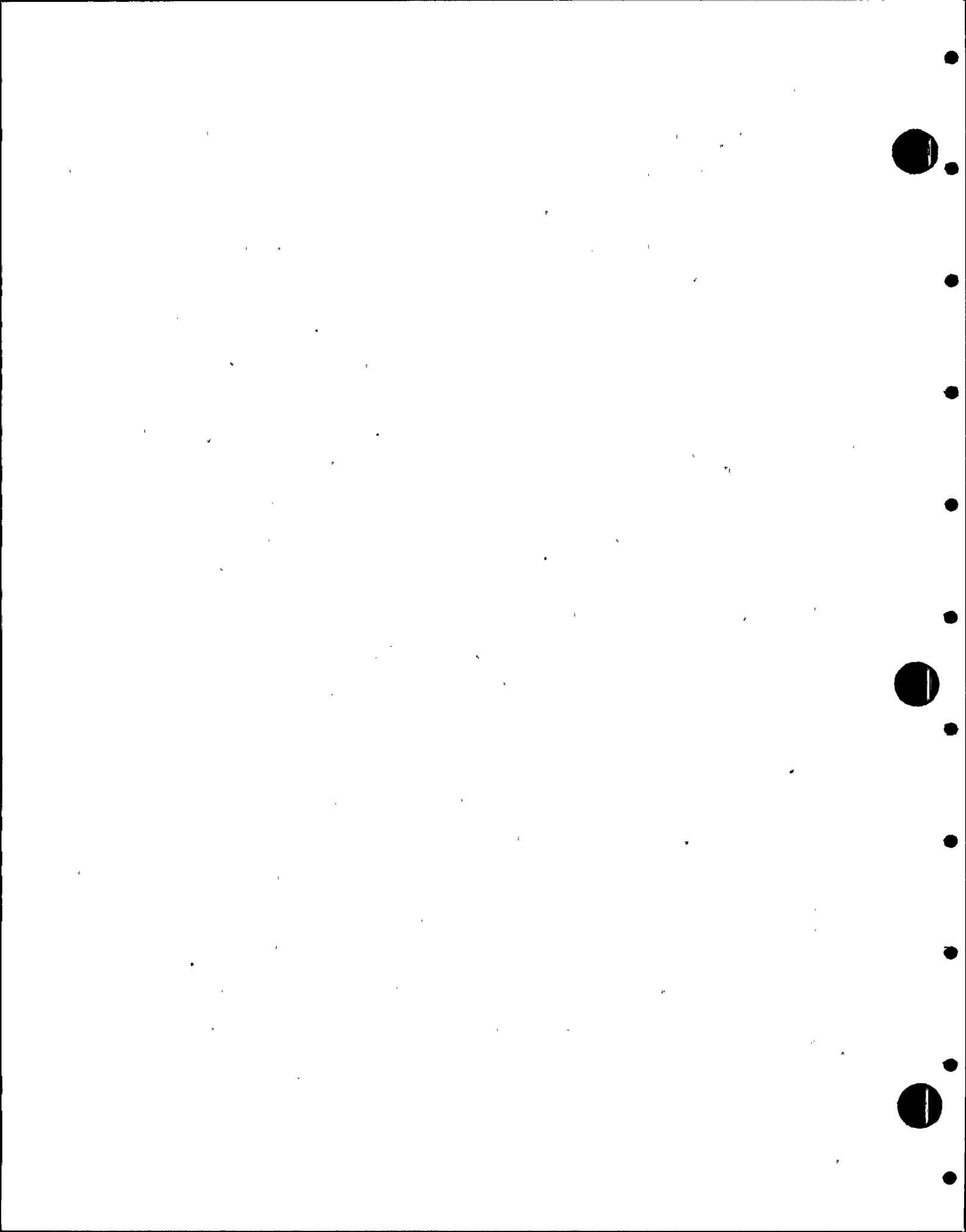
1 addition to the postulated piping failure and any direct
2 consequences of that piping failure.

3 Exhibit 2C-12, where the postulated piping failure
4 is assumed -- This particular requirement is included for
5 completeness. It does not apply to the auxiliary feedwater
6 system.

7 Exhibit 2C-13, Item (4). As part of this program,
8 all available systems, including those actuated by operator
9 actions, may be employed to mitigate the consequences of a
10 postulated piping failure. Another requirement, the effects
11 of a postulated piping failure should not preclude habitability
12 of the control room or access to other areas needed to cope
13 with the consequences of the piping failure. The control
14 room, as you have seen from the location on our plan, is not
15 affected by this, any breaks in the aux feedwater system.

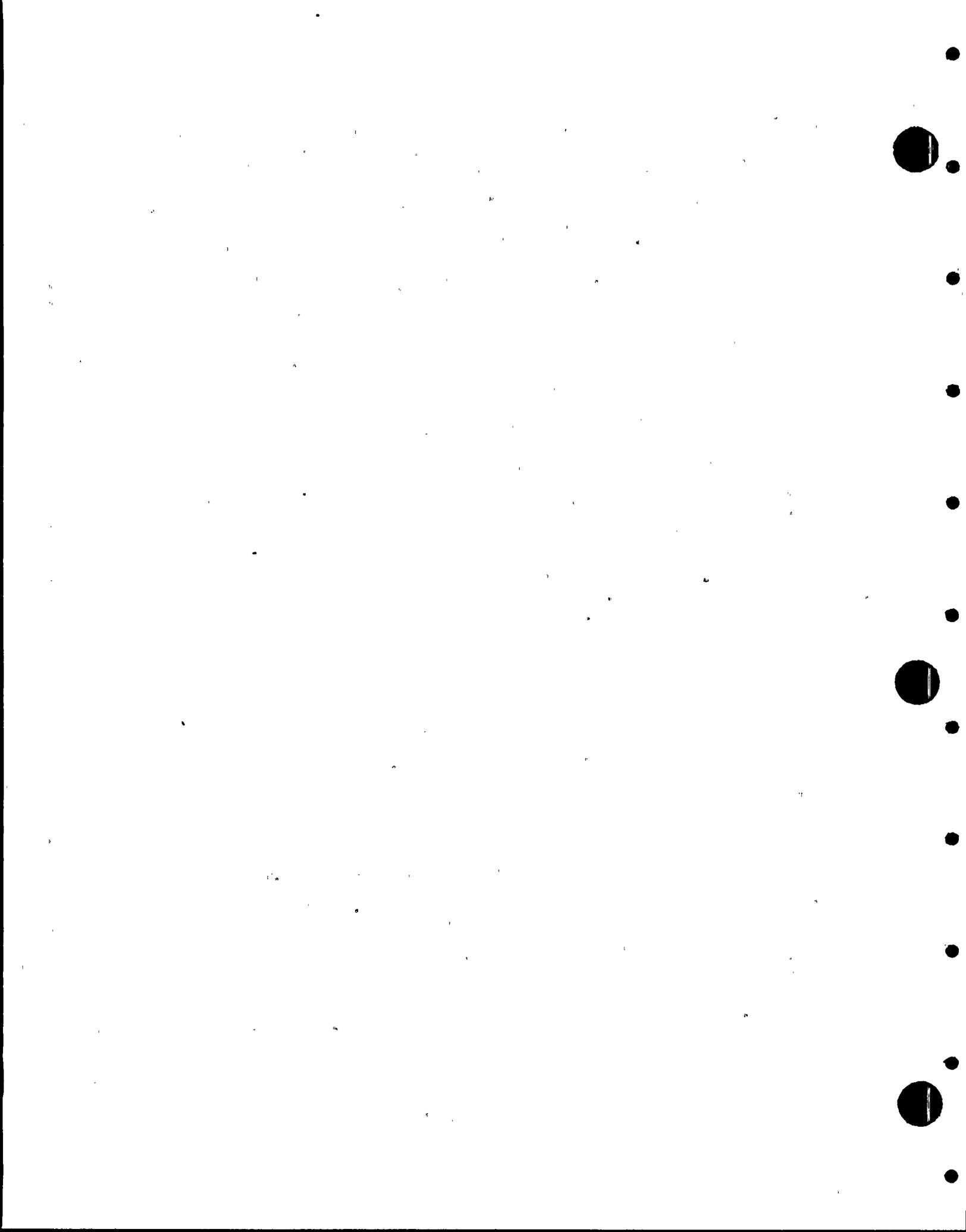
16 This is Exhibit 2C-14. This applies to piping
17 not designed to Seismic Category I. It should not result in
18 any damage to a system such that the system could still not
19 take a single active failure and function to bring the reactor
20 to a safe shutdown condition.

21 Let's talk about now our auxiliary feedwater system.
22 I mentioned first the 2% rule, which I said was high-energy
23 only up to this point (indicating), but going through the
24 requirements that we went through, under those requirements we
25 can take a line break anywhere in our emergency feedwater



1 train, and let me just amplify on that. The reason we can do
2 that is that the postulated piping failure, as you saw, is
3 assumed during normal plant conditions, so these pumps are
4 not operating and these valves are shut, so were we to assume
5 a pipe break in here (indicating), we would begin to drain the
6 condensate storage tank, we would receive a level alarm in
7 the sumps in our auxiliary feedwater pump rooms, the emergency
8 feedwater pump rooms, so that the operator would be alerted.
9 We could then go and isolate the leak, and this leakage
10 obviously would not cause a reactor trip or turbine trip, so
11 there is no consequence as such, and we would still have the
12 startup feedwater pump available. So we could take a single
13 failure in either one of the trains, depending upon where you
14 assume the break. The key points are for this particular
15 requirement that the break is assumed during normal plant
16 conditions when we do not have our pumps operating; it is
17 not assumed during another event which would require that our
18 emergency feedwater pumps be operating.

19 Let me now go on to ASB 10-1 and cover the points
20 there. This is Exhibit 2C-15. The first requirement is that
21 the auxiliary feedwater system should consist of at least
22 two full-capacity, independent systems that include diverse
23 power sources. This is a key requirement -- well, this
24 combined with another requirement which we will get to in a
25 minute requires that the turbine-driven train be completely

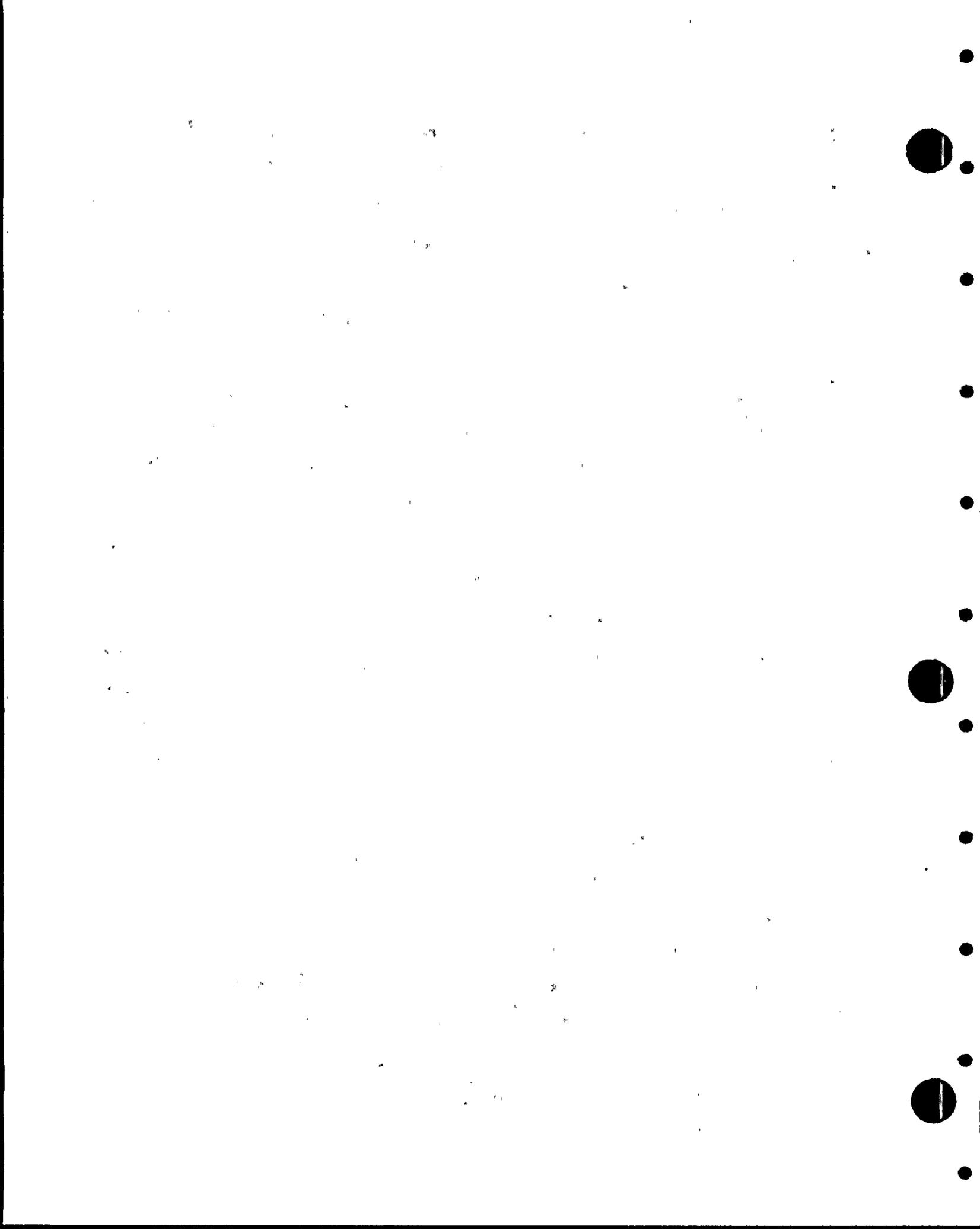


1 divorced from the onsite AC power sources and, as I have
2 said, everything in this train is powered off the DC sources,
3 so that we are diverse, and this train with the motor-driven
4 pump is powered off the AC sources off the Train B diesel
5 generator.

6 Exhibit 2C-16. This is a requirement which I just
7 stated that the two auxiliary feedwater trains be completely
8 diverse in terms of their power sources and, as I stated, we
9 do comply with that requirement.

10 This is Exhibit 2C-17. This states first that we
11 need to take into account component failure, pipe failure,
12 power supply failure, and as we have gone through, we have
13 considered all those things. Also, all the valves that are
14 required to operate, we need to have the ability to operate
15 them from the control room and from a remote control station,
16 and the power diversity principle must be applied to all
17 valve operators, and, as I have stated, we meet that require-
18 ment.

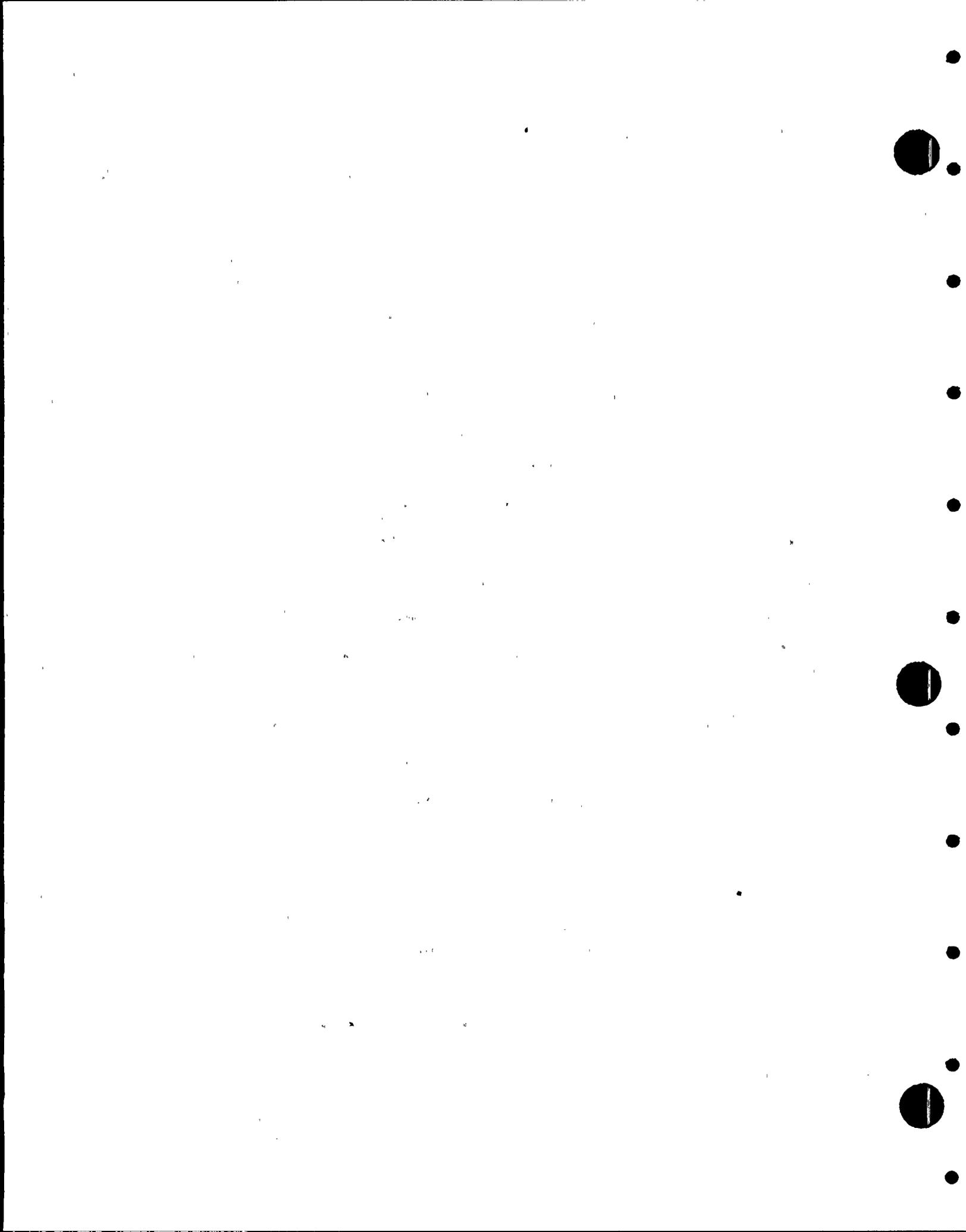
19 Exhibit 2C-18, (Item 4), the auxiliary feedwater system
20 should be designed with suitable redundancy to offset the
21 consequences of any single active component failure, and we
22 meet that requirement, as I have stated. Then we come to the
23 last requirement, (Item 5), and there are some key words in
24 here. When considering a high energy line break, the system
25 should be so arranged as to permit the capability of supplying



1 necessary feedwater to the steam generators, despite the
2 postulated rupture of any high-energy section of the system,
3 assuming a concurrent single active failure.

4 (Thereupon a brief off-the-record discussion ensued,
5 after which proceedings were resumed as follows:)

6 MR. KEITH: I am just confirming my memory. A key
7 word was left out of Item 5) here. It should state "with
8 the capability of supplying the necessary emergency feedwater,"
9 which is what is stated in the branch technical position.
10 That word "emergency" is put in. That is where the rub comes.
11 We have shown how we meet the ASB 3-1 requirements by stating
12 during normal conditions. However, if we were to take a
13 line break anywhere in this system and the single active
14 failure, as you can see, we would wipe out both trains of our
15 emergency feedwater system as stated here. So I am not sure
16 if it is really intended that we -- With the word "emergency"
17 in here, what this is really doing is making us take a pipe
18 break and a single active failure and an event which would
19 cause you to need emergency feedwater. With that type of
20 requirement, we cannot take a high energy line break anywhere
21 in the system. However, with the high energy line break
22 definition which I stated earlier of just this portion
23 (indicating) being a high energy line, I think we are okay,
24 and we will talk about that. First taking it down here
25 (indicating), we basically have a feedwater line break, and we

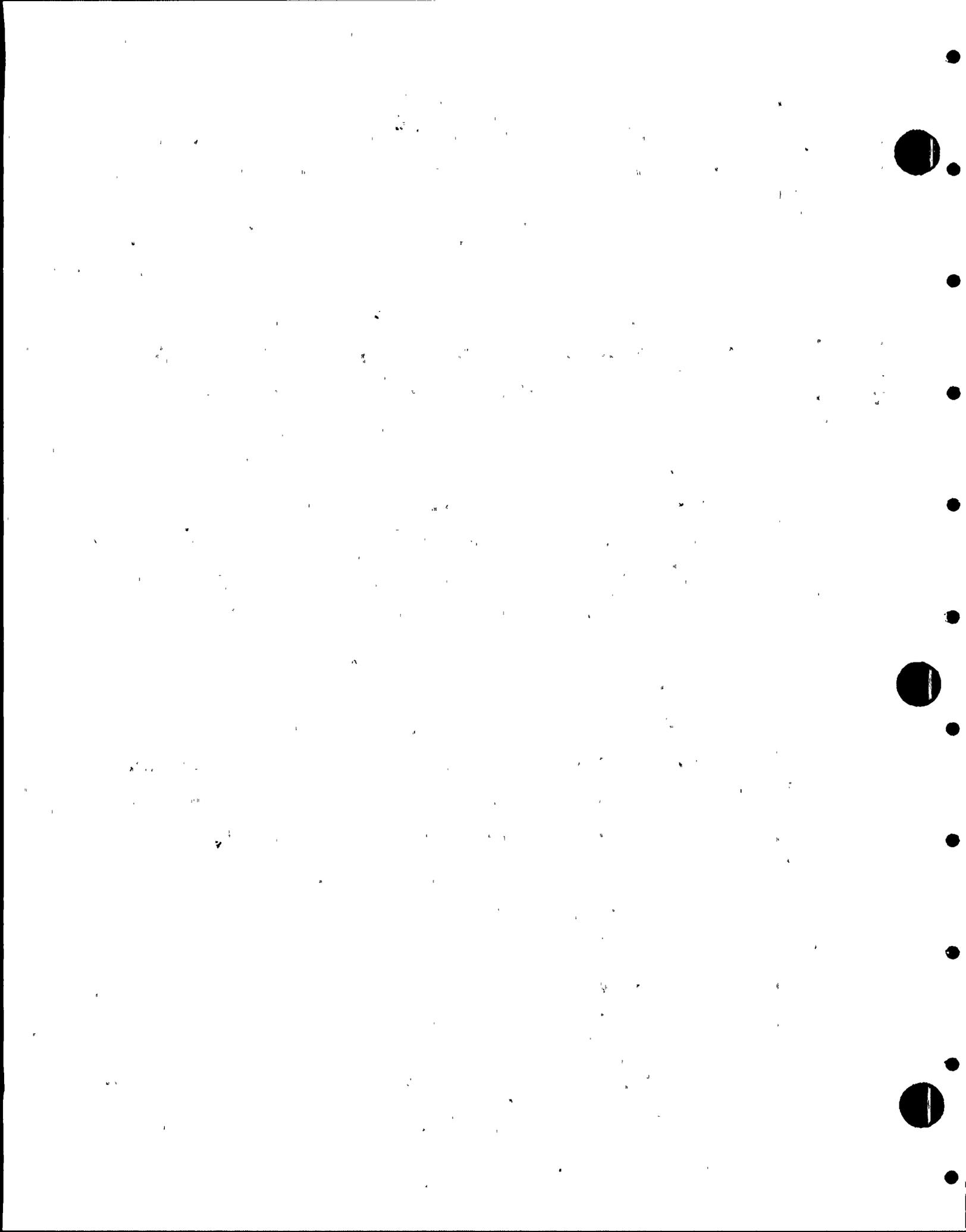


1 have seen with that we can fail one of the feed pumps
2 and the other feed pump will feed the other steam
3 generator. With our AFAS operating properly, it will
4 just affect the one steam generator, and we can take that
5 action. If I have a break here (indicating) and I am
6 not operating, I will discover that and then, knowing
7 that the break is here (indicating), I could take manual
8 control of these valves (indicating) and these valves
9 (indicating) and I would have the capability of feeding
10 the other steam generator with either pump, so I could
11 take a single active failure. Similarly, if I am
12 running, I know about the break here (indicating), because
13 I would get a no-flow indication on that steam generator,
14 so that indication would tell me to isolate these four
15 valves (indicating).

16 So with that, as I stated, to meet the
17 letter of this, which once again says "necessary emergency
18 feedwater," I do need to take just this portion (indicating)
19 of the emergency feedwater lines as being high energy,
20 which under the inference which we draw from MEB 3-1
21 that these pumps are not operated more than 2% of the
22 time, that we can do that.

23 So there it is. I will entertain questions.

24 MR. VAN BRUNT: Shelley.
25



1 MR. FREID: I wanted to take up the question I asked
2 previously before we get into this part of the system, a
3 pipe break in the turbine-driven auxiliary feedwater pump
4 room. You said that it was a watertight door. Was the door
5 also designed to be able to take the pressure resulting from
6 that steam line break there or do we have a potential for a
7 common failure?

8 MR. KEITH: Well, let me tackle this and the question
9 about the steam line that we have entering the motor-driven
10 pump room. Just as this portion of the line (indicating) is
11 the only high energy portion, we needed to assume that -- I
12 think that is the reason I was not happy about finding that
13 steam line going through our motor-driven pump room, but I am
14 sure the rationale was that this portion of the line (indicating)
15 is all low energy, that it is not high energy for the same
16 reason that the portion back here (indicating) we have taken
17 as not high energy, just because of the 2% rule.

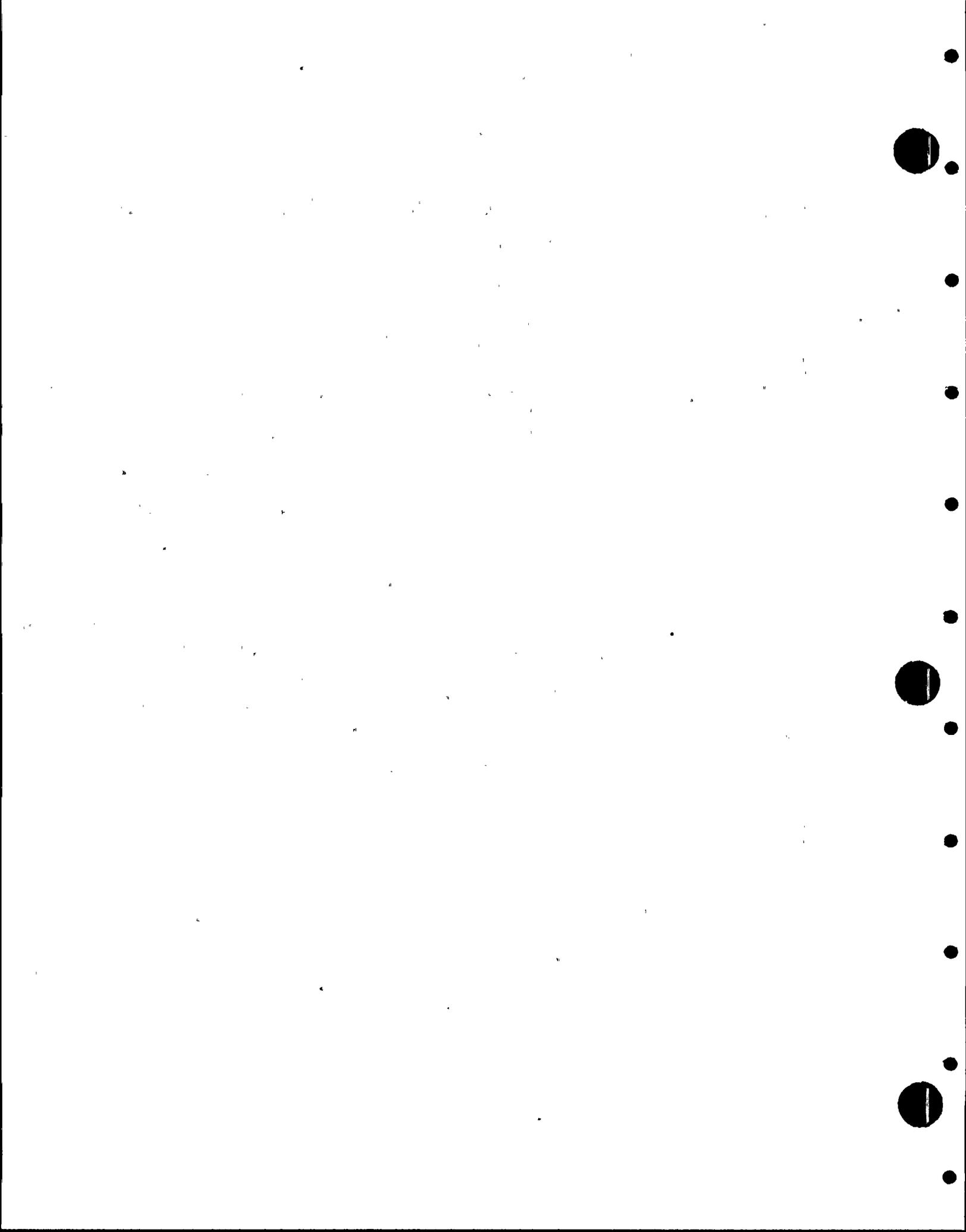
18 MR. FREID: Where are those valves located? I guess
19 if they aren't in the main steam support structure, what room
20 are they located in?

21 MR. KEITH: Above the feed pump rooms.

22 MR. FREID: Okay, they are in the feedwater area or the
23 steam line area?

24 MR. KEITH: Yes.

25 MR. FREID: If there is a problem with the other, there



1 is a problem with this.

2 MR. KEITH: Correct.

3 MR. VAN BRUNT: Are you all set, Shelley?

4 MR. FREID: Yes.

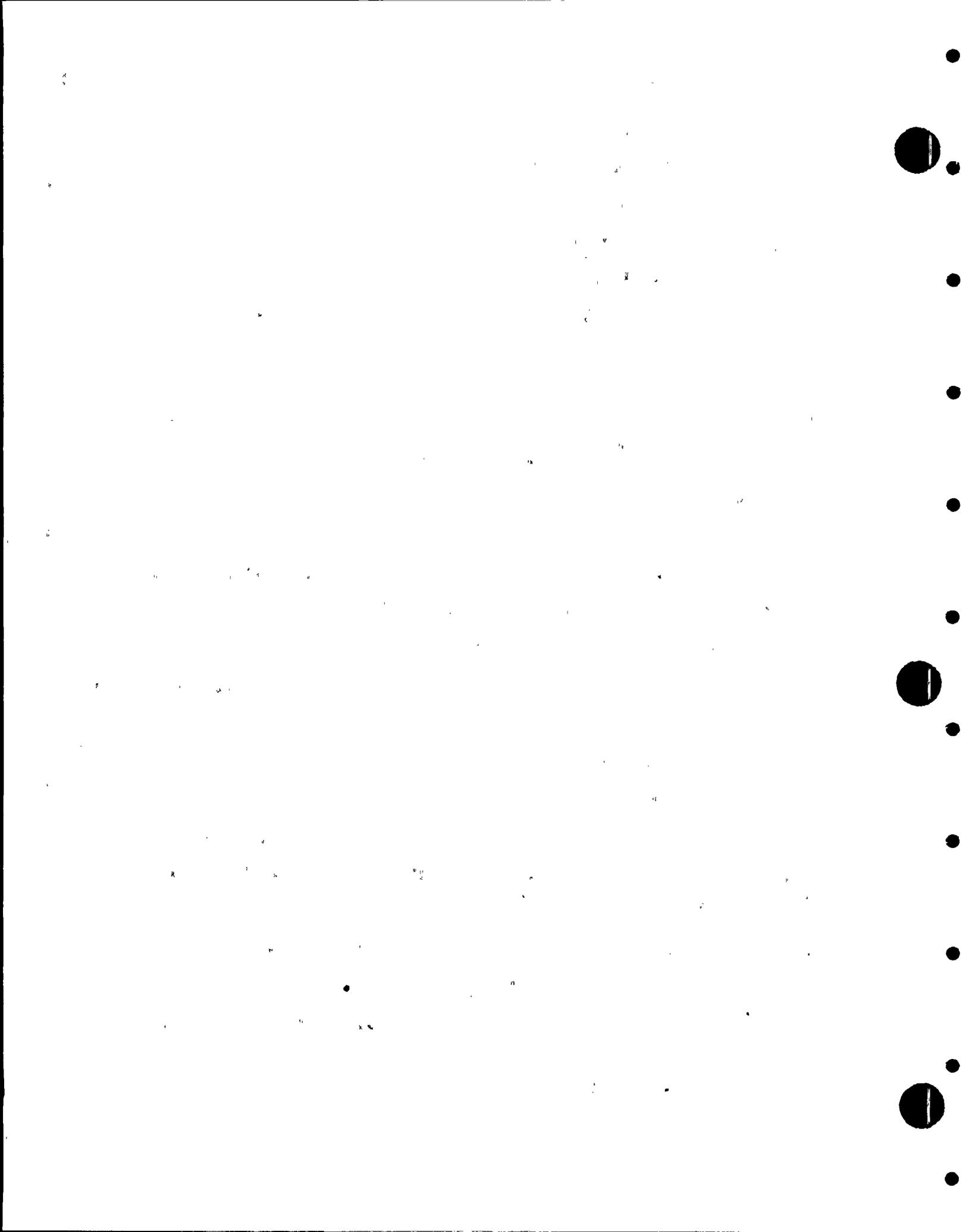
5 MR. VAN BRUNT: Rick.

6 MR. TURK: I would just like to focus a minute on the
7 one break that you said can be taken, say at the intersection
8 between the two trains on the downstream side -- yes, just a
9 break right there -- you are saying that the break occurs
10 there and the system is called to actuate, is that what you
11 are saying?

12 MR. KEITH: Yes.

13 MR. TURK: And all four valves, all eight valves,
14 actually, open wide and begin to feed the break. Since both
15 pumps are essentially seeing the same backpressure and since
16 both flow indicators are essentially seeing zero flow, how
17 does the operator know which side the break is on? What
18 indication does he have of which side the break is and can
19 switch valves to shut.

20 MR. KEITH: What we would have the operator do, to
21 get into an emergency procedures area -- you're right, I
22 wasn't complete in this description there. What we recommend
23 is shutting all four of the cross-over valves. Assuming you
24 have both pumps running, shut all of the cross-over valves,
25 and you would then see where the break was and you could then



1 take the appropriate action.

2 MR. TURK: If that pump was the single failure, then
3 how do you get your feed?

4 MR. KEITH: If this pump were the single failure --

5 MR. TURK: You would now shut the center four valves,
6 the four cross-connect valves.

7 MR. KEITH: Yes.

8 MR. TURK: He then sees that the single failure is in
9 the motor-driven pump. I guess what you are saying is he now
10 has to reopen the cross-connect from the turbine-driven pump
11 to the other generator. Is that what you are saying?

12 MR. KEITH: Yes. You know, if you would shut these
13 valves (indicating) for this pump (indicating), you would shut
14 these (indicating), and then you are postulating this pump
15 fails.

16 MR. TURK: So he's got some kind of a fault tree that
17 he is going by, see this, do this, see this, do that.

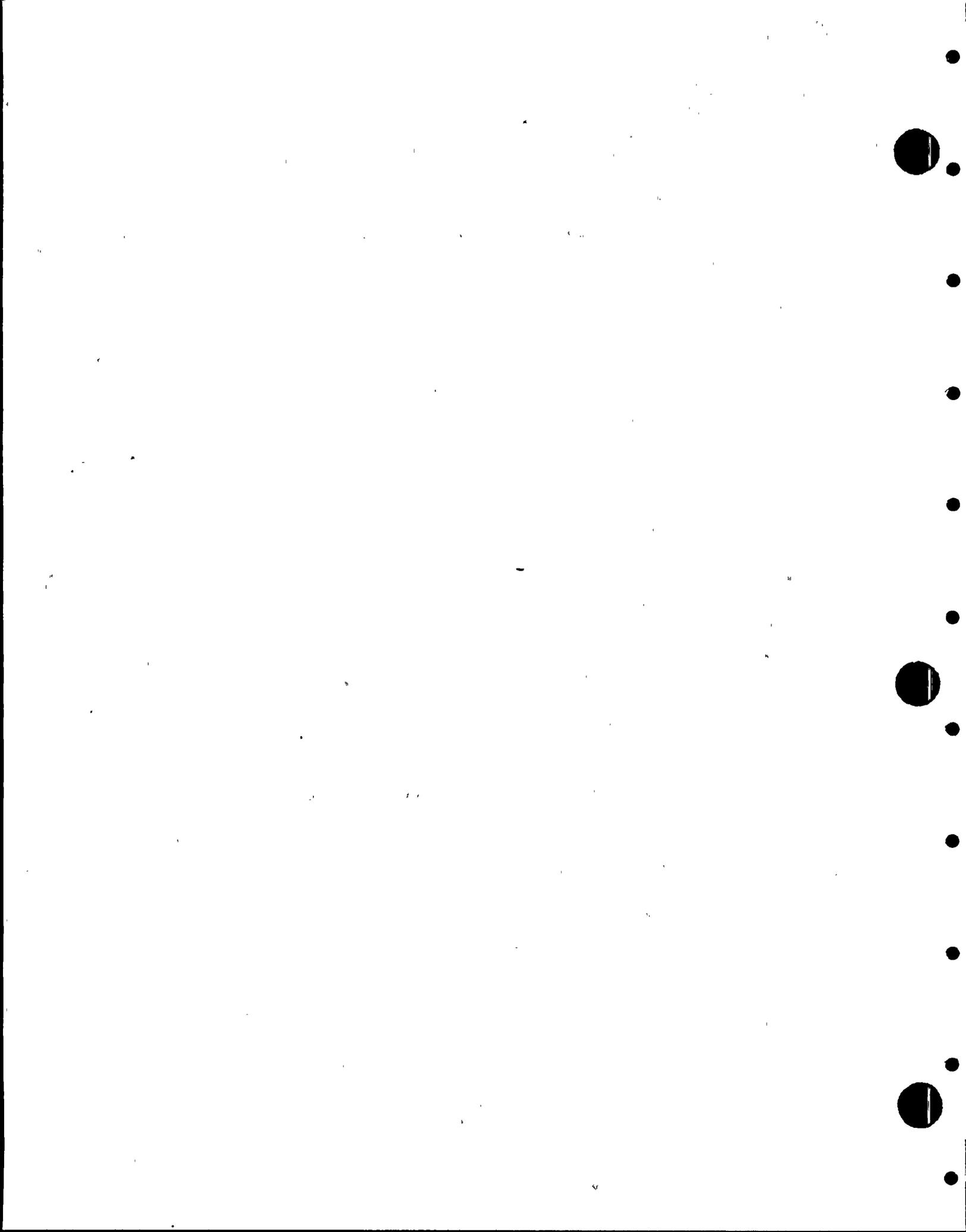
18 MR. KEITH: That's right.

19 MR. TURK: Would he have the ability to do that within
20 the time frame? Let's say steam generator boil dry time.

21 MR. KEITH: We think it is reasonable to do it in 20
22 minutes. In 45 seconds, it is not.

23 MR. TURK: Where is 20 minutes coming from?

24 MR. KEITH: Boil dry time. That is assumed in 0635 for
25 a boil dry time, and I think your calculations --



1 MR. TURK: 0635 is a boil dry time for CE's operating
2 generators, which, of course, take their low level trip off a
3 narrow range indicator. In other words, the trip and the
4 actuation come with a lot more inventory left in the generator
5 than your plant. Where the reactor trip comes off a steam
6 generator wide range level, it occurs with much less inventory
7 and your boil dry time is considerably less than 20 minutes.

8 MR. KEITH: I think you have done a calculation --
9 Well, I know you have done a calculation. I don't recall the
10 exact number.

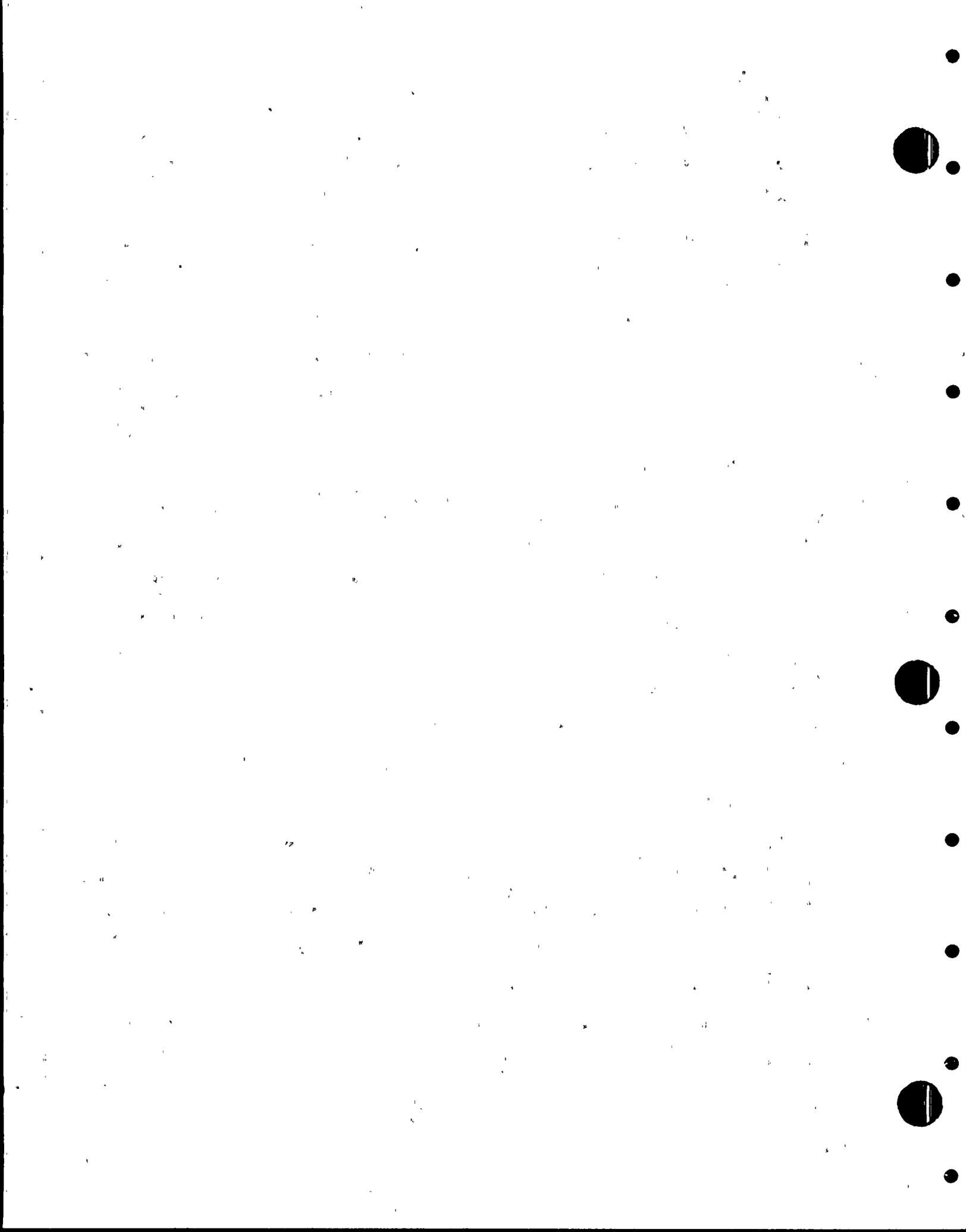
11 MR. TURK: The one done for the owner's group?

12 MR. KEITH: Yes.

13 MR. TURK: 7.5 minutes. Now, there were a lot of
14 assumptions, and I don't remember offhand what they all were,
15 but on the assumption that the steam bypass control system is
16 not available, which would be a controlled rate system, the
17 boil dry time was 7.5 minutes.

18 MR. KEITH: I think we would have to look at all those
19 assumptions.

20 MR. VAN BRUNT: Let me say for the record I think that
21 you ought to go back to Combustion and ask them exactly what
22 the boil dry time is for a System 80 under the circumstances
23 we are talking about and then, having got that, and I don't
24 know whether it is 7 or 20 or whatever it is, then take a look
25 at whether taking operator action is prudent and proper within



1 that band of time. I would add that to the list of items.

2

3 MR. TURK: I have one more I would like to follow up.
4 Not to beat a dead horse, but have you looked at the pump
5 response with both pumps coming on both feeding to that break
6 to atmosphere in terms of running out, damaging the pumps,
7 that kind of thing?

8 MR. KEITH: Well, the pumps would be run out. We have
9 talked about that earlier.

10 MR. TURK: In other words, that might be a more limiting
11 time frame with regard to the time frame that you have to take
12 operator action than generator dry out?

13 MR. KEITH: I think with the alarm you get on the pump
14 in the runout condition --

15 MR. TURK: Well, they are both alarmed.

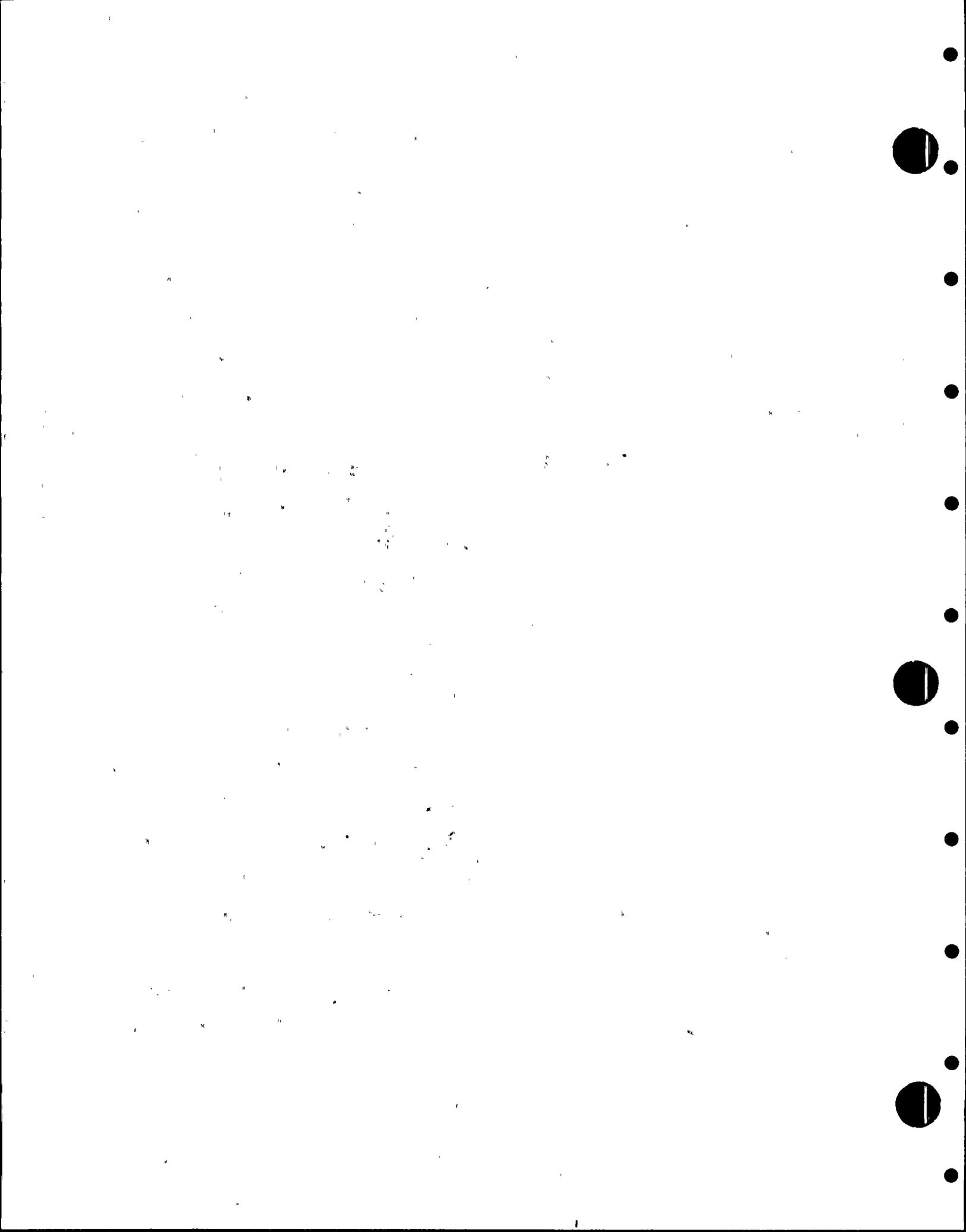
16 MR. KEITH: Well, you would be forcing the operator
17 to do something quickly anyhow, so, I don't know, it could
18 enhance the possibility of doing it fairly quickly.

19 MR. TURK: Or incorrectly.

20 MR. VAN BRUNT: Again, I think there needs to be some
21 information exchanged and the area needs to be looked at to be
22 sure in fact that we do have an adequate situation.

23 Jerry, go ahead.

24 MR. WERMIEL: I am not following something, first of
25 all. If I break the top emergency feed line to the steam



1 generator just downstream of the isolation valves -- there,
2 yes -- and I postulate a single failure in the other emergency
3 feedpump, I don't see how I get emergency feedwater to either
4 steam generator.

5 MR. KEITH: With a break here (indicating), you have
6 to shut these valves (indicating).

7 MR. WERMIEL: Well, not if I single failed the other
8 pump. How am I getting flow there?

9 MR. KEITH: Through here (indicating).

10 MR. WERMIEL: I see.

11 MR. KEITH: You close these valves (indicating) and
12 then go down here (indicating).

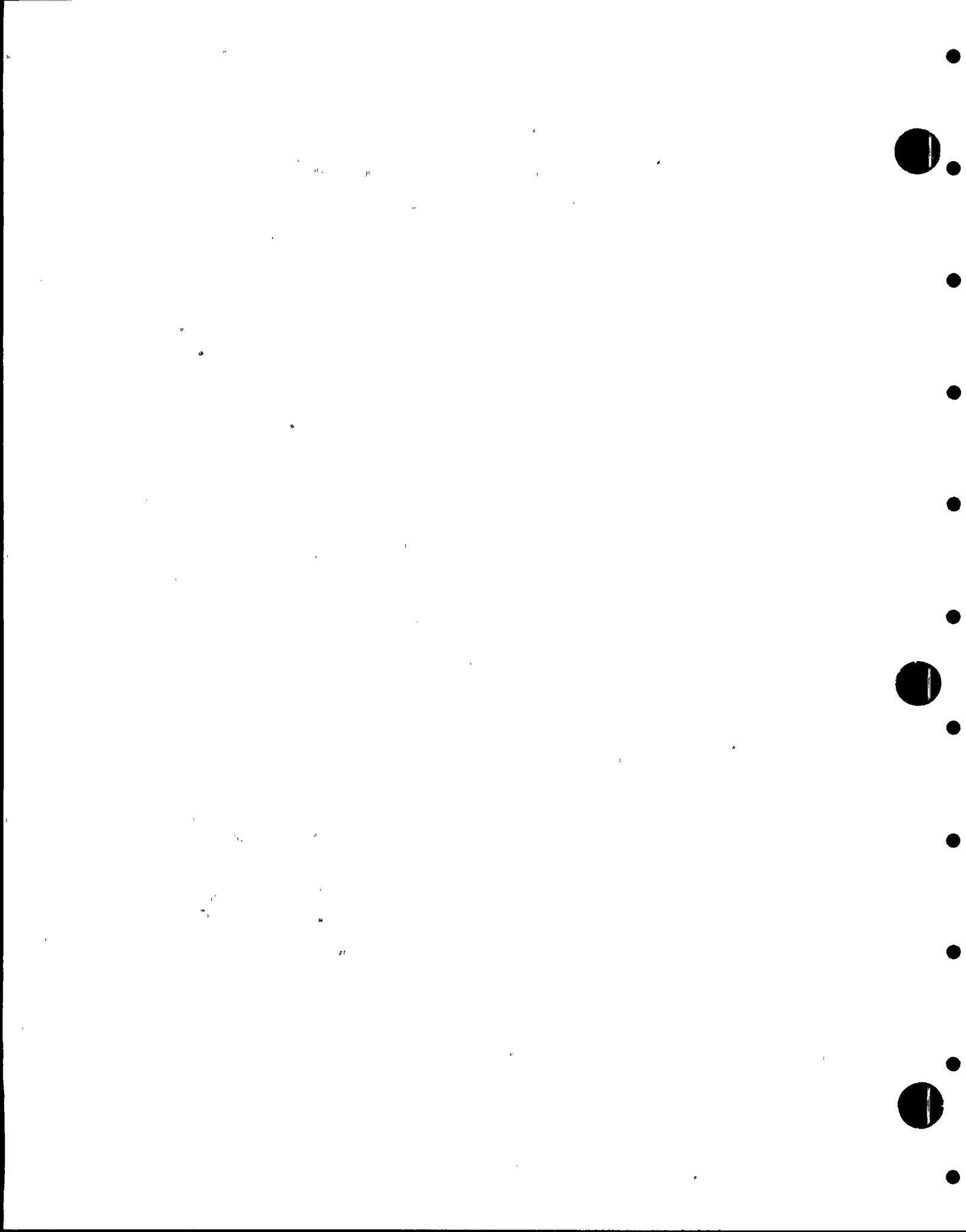
13 MR. WERMIEL: Oh, I see. I close the valves. Then
14 generally you are saying to meet the full intent of this
15 position, if we just eliminated the words "emergency feedwater,"
16 the third train would be available?

17 MR. KEITH: Yes.

18 MR. WERMIEL: You are aware, of course, that our
19 interpretation of 10-1, Position 5), has been that all three
20 trains be safety grade to assure we can meet this position in
21 the event of a loss of offsite power, and that is the
22 interpretation we have applied to all plants up to this point.

23 MR. BINGHAM: Didn't we become aware of that when we
24 sat down a few weeks ago with you?

25 MR. WERMIEL: That's right.

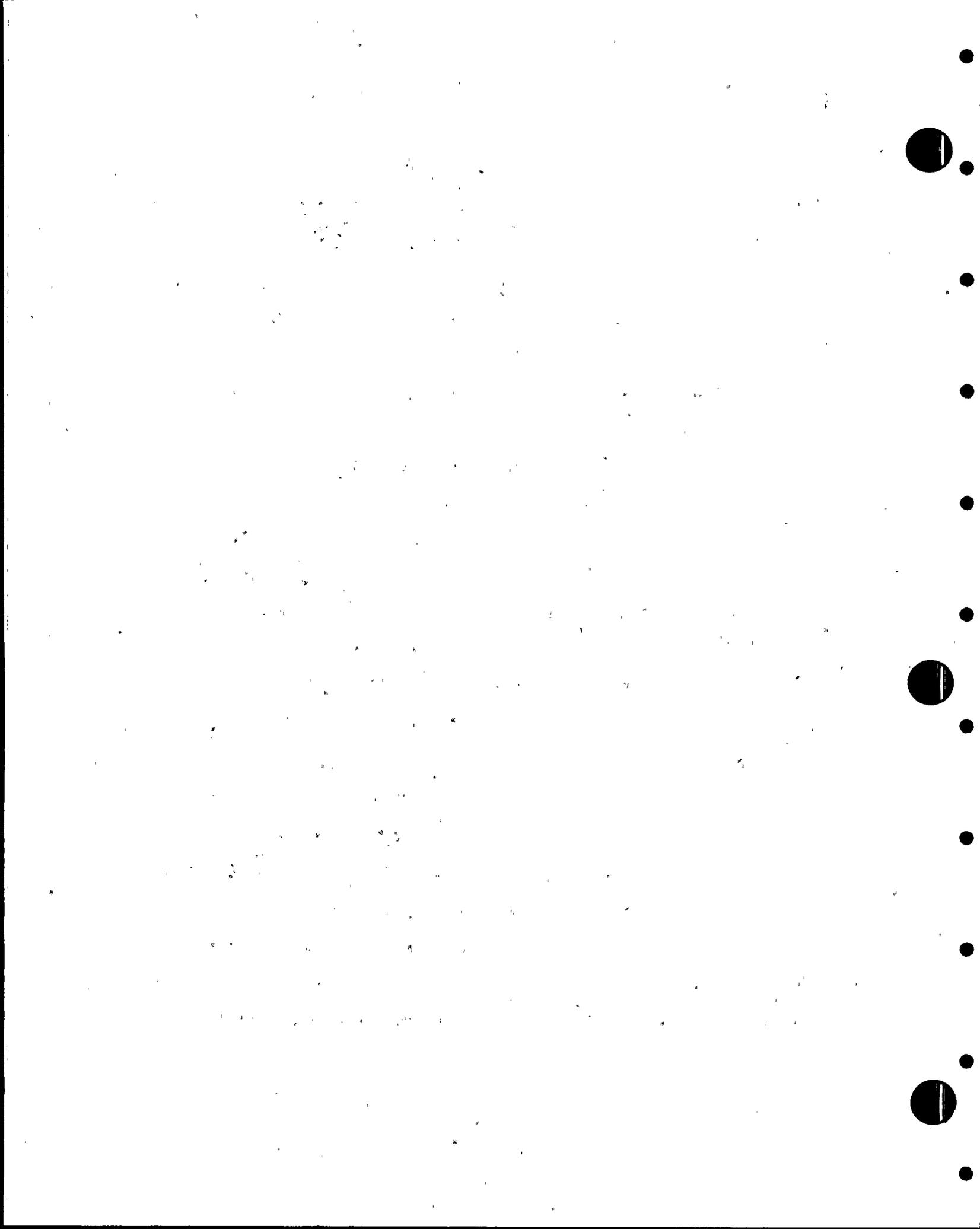


1 MR. BINGHAM: That was the first time we really had
2 become aware of that interpretation of the criterion. We do
3 understand that and I tried to indicate earlier that we
4 wanted to deal with that particular issue, because we thought
5 that the system was satisfactory for the intended purposes,
6 and tomorrow when we get into the reliability assessment based
7 on NUREG 0635, it is our intent to present the facts and
8 how this system stacks up to, say, a three or four safety or
9 five safety train kind of system.

10 MR. WERMIEL: Does anything that Mr. Turk has said
11 affect that reliability study? I believe the reliability
12 study assumes throughout that there is a 20-minute boil dry
13 time, and I am not sure how that is going to impact on
14 tomorrow's presentation; but I think we should all be aware
15 that that is the basis for it now and that it is our assump-
16 tion that there is a 20-minute boil dry time.

17 MR. BINGHAM: I wasn't under the understanding that the
18 boil dry time of 7.5 minutes was submitted to NRC.

19 ME. TURK: The 7.5 minutes was a number in response to
20 a CE TMI owner's group report that was done and it was done
21 with some basic assumptions and premises, and I don't recall
22 what those were, so I am not saying that there is a 7-minute
23 boil dry time in all cases. I don't remember what the
24 particular constraints were on that calculation, but that was
25 the same calculation that came up with numbers like 20 minutes



1 for the operating plants. It is basically a different
2 generator.

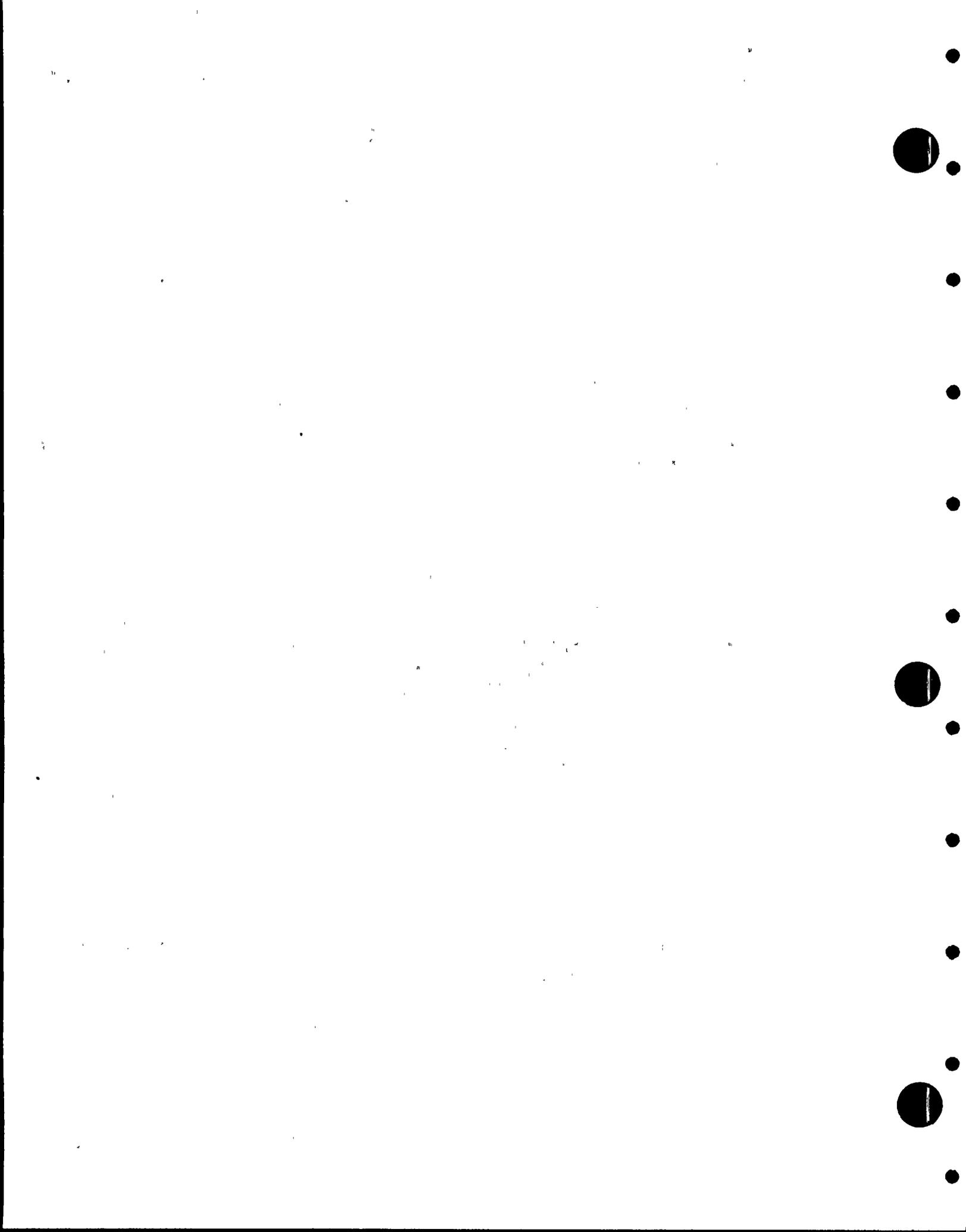
3 MR. VAN BRUNT: Jerry, I would say as far as the
4 analysis tomorrow is concerned, that would be an accident mode
5 analysis, and certainly if the analysis is incorrect, that
6 analysis would certainly have to be qualified, and if the
7 conclusions changed, then we would have to do whatever was
8 appropriate with those conclusions, but I don't think that
9 will interfere with the presentation tomorrow as far as the
10 procedures that were used and that kind of thing. If we can
11 agree on that, then it is just a matter of cranking in some
12 different numbers.

13 MR. WERMIEL: My concern I think most of all was that
14 the study itself was now not going to be negated.

15 MR. VAN BRUNT: No. I think we can go through the
16 whole study and all those things and come to an agreement or
17 at least get any issues out on the table relative to how it is
18 done. Then if we have to run it with 7.5 or 20 or 100 or
19 whatever the numbers are, we could all agree whatever the
20 answer was. So I think that, if you like, there will be that
21 little cloud over that analysis tomorrow until it is clarified
22 what the boil dry time is.

23 MR. BARNOSKI: We in the interim will also try to get
24 some additional information and try to shed some light on that.

25 MR. VAN BRUNT: Okay, Mike. Thank you.



1 Are there some other questions? Ralph.

2 MR. PHELPS: I have one hypothetical question. If you
3 consider an initiating event that requires emergency feedwater,
4 let's take, for example, a total loss of main feedwater event,
5 and your emergency feedwater system comes into operation,
6 all the valves open, and then you consider a single failure
7 that is of relatively low probability, for example, loss of
8 your DC bus, where your DC operated valves fail, that is a
9 potential for overcooling, because they won't cycle closed
10 when you hit the low level reset point. Are you going to
11 consider events like that when you look at potential for
12 overcooling?

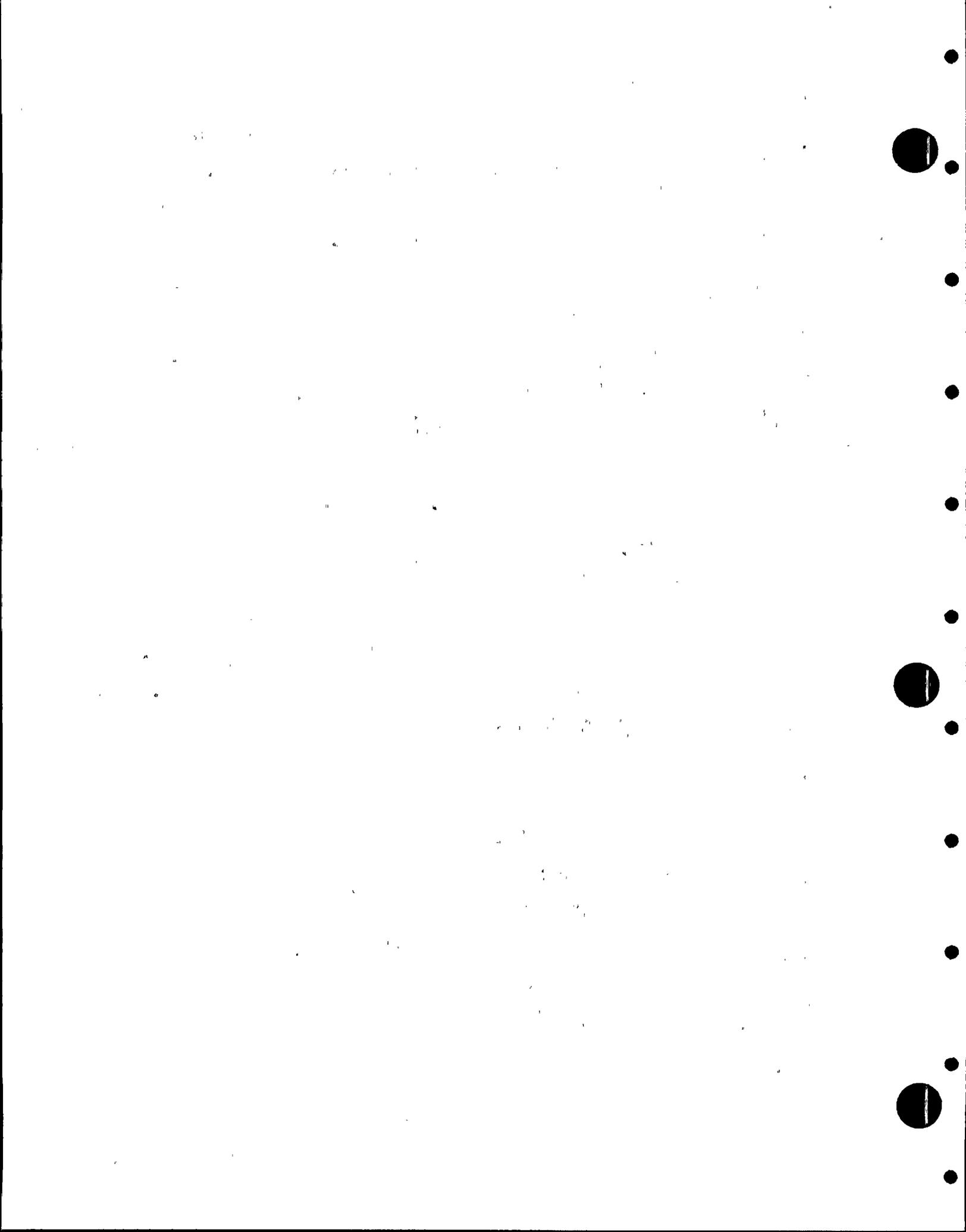
13 MR. KEITH: Yes. We have discussed this, Ralph, and
14 these valves here (indicating) are off different DC buses. We
15 have four Class IE DC buses and these (indicating) are off
16 different ones and these (indicating) are off different ones
17 because of that concern.

18 MR. VAN BRUNT: John. Excuse me, Ralph, are you
19 satisfied?

20 MR. PHELPS: Yes.

21 MR. VAN BRUNT: Okay, John, go ahead.

22 MR. ALLEN: Dennis, you indicated a moment ago if we
23 would have a pipe leak or a rupture in the auxiliary feedwater
24 pump rooms that it would be alarmed in the sumps. I thought
25 that is what you said.



1 MR. KEITH: Yes.

2 MR. ALLEN: I didn't know there were sumps in those
3 rooms.

4 MR. BOLES: There is a level switch in each of the
5 pump rooms to alert the operator in the control room by an
6 alarm that there has been a leakage in the pump room, and
7 postulated piping failure would probably be the first thing
8 that would be alarmed as well as potential low pressure on
9 the one pump discharge.

10 MR. BINGHAM: Any other questions, Ed?

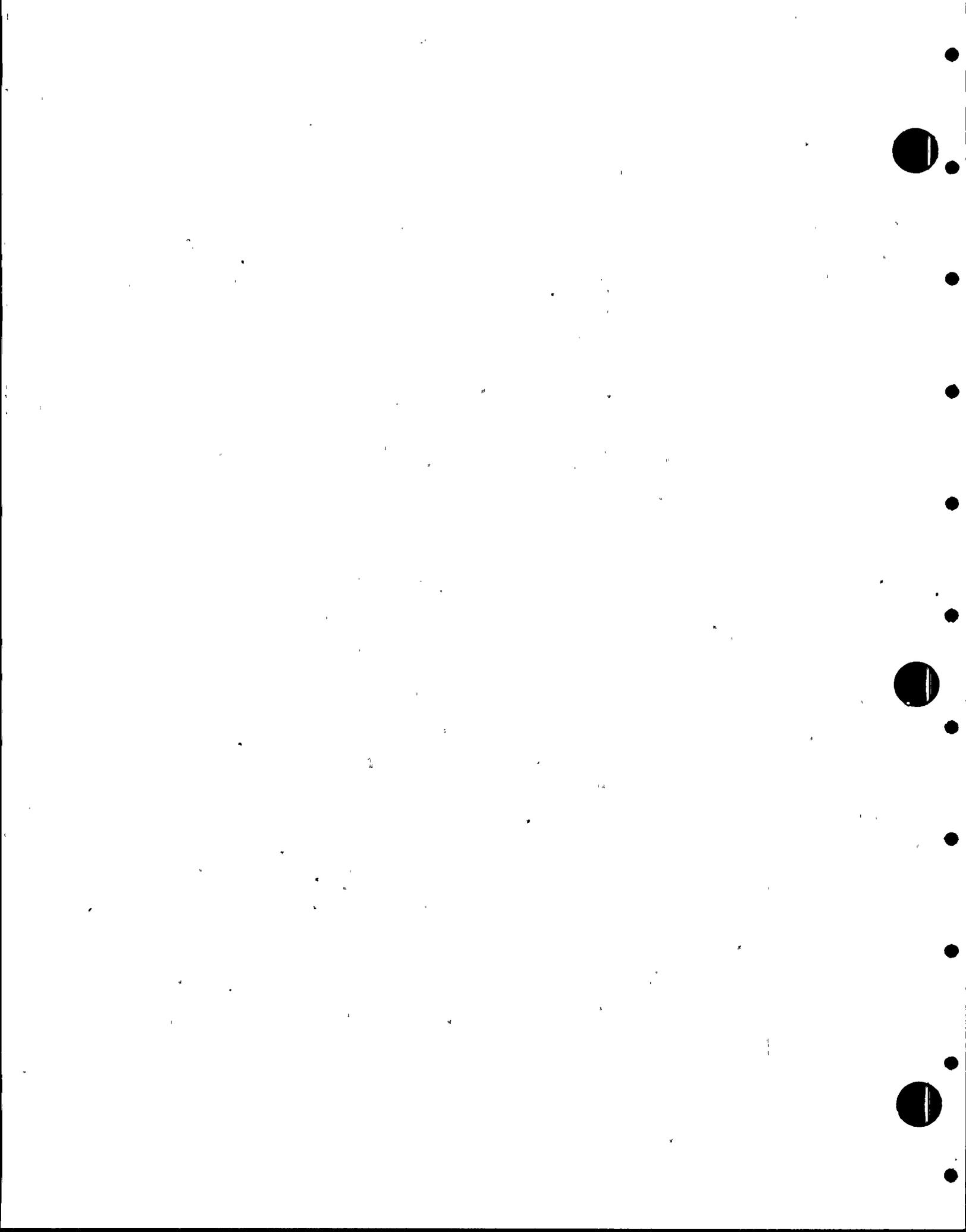
11 MR. VAN BRUNT: Olan was just talking to me on the side.
12 On that one, that's right. On the last page, 2C-18, that
13 correction to add the word "emergency" ought to be made on
14 that one as well just to be sure. Since that is a very
15 critical point in this whole discussion, I think that that
16 chart needs to be fixed as well as the others.

17 MR. BINGHAM: That should be corrected.

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

19 MR. PARR: Let me ask one question. Do you interpret
20 that word "emergency" to negate the 2% rule?

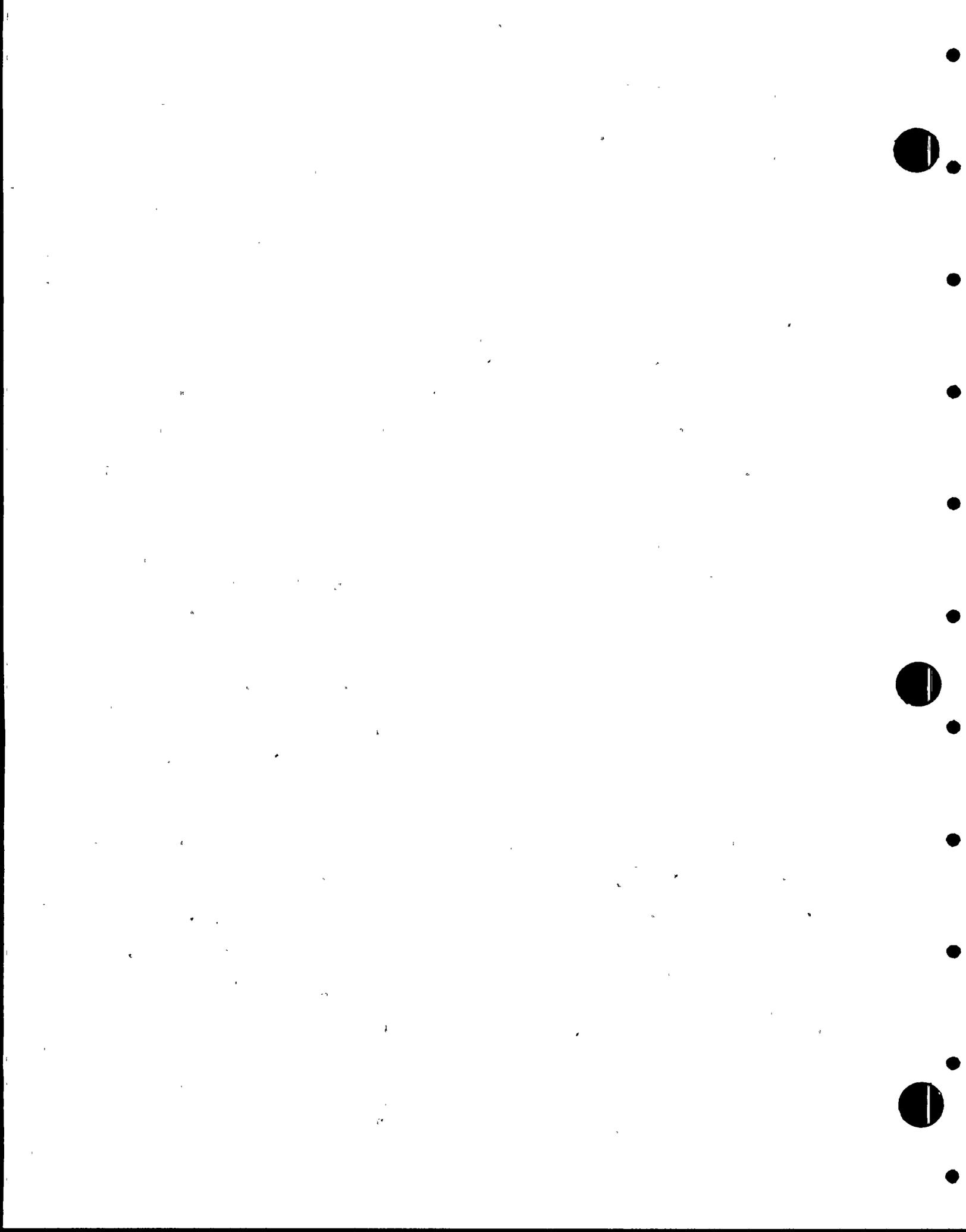
21 MR. KEITH: No. "Supplying necessary emergency feed-
22 water" I interpret to be your safety grade pumps is really
23 all it is referring to. But then you say "postulated rupture
24 of any high-energy section of the system," and we would assume
25 high energy there was defined as it is in MEB 3-1 and ASB 3-1



1 and that the 2% rule was applicable.

2 MR. WERMIEL: The interpretation as we understand it
3 is that the emergency feedwater system is high energy through-
4 out whether it is used for startup and shutdown or not, and
5 that has been the interpretation of late. I was informed,
6 and as I believe I informed you people, the 2% rule originally
7 was not intended to encompass the aux feedwater system even
8 though the words got in to the branch position that way. The
9 original intent was to only include the RHR system, and now
10 my understanding is that we honestly are trying to correct
11 that.

12 MR. BINGHAM: Yes, Jerry, we do understand the
13 difference and we are not trying to do any more today than
14 to present the bases that we have been using for so many
15 years on this particular system not only going through the
16 licensing for Units 1, 2, and 3, but not so long ago the
17 licensing of Units 4 and 5. So this foggy interpretation of
18 the requirement is new to us, but today we wanted to present
19 to you the bases and demonstrate why we believe that the system
20 is adequate as we knew and understood the criteria up until a
21 few weeks ago. That is our intent today. What we are hoping
22 to do tomorrow is to provide some more facts on how the system
23 looks from overall reliability viewpointwise to us. We
24 understand, not really perhaps necessarily related to the
25 branch positions, but I think important in demonstrating and



1 comparing perhaps this plant with other work that has been
2 done by NRC on presently operating plants to show how the
3 system falls in overall reliability, and, further, we thought
4 it very important because of the concerns that you have
5 expressed and Ed and others have expressed that we try to
6 look at some modifications to the system to demonstrate the
7 order of improvement from making certain modifications, and
8 we will present those tomorrow so that you may have some
9 better understanding for all of the boards on what they mean
10 in overall gain as far as the modifications. So with that,
11 we will finally I think be able to address the issue that
12 you have brought up as a concern of whether safety grade or
13 not. I think that is a very important issue that we will
14 talk about tomorrow in some detail.

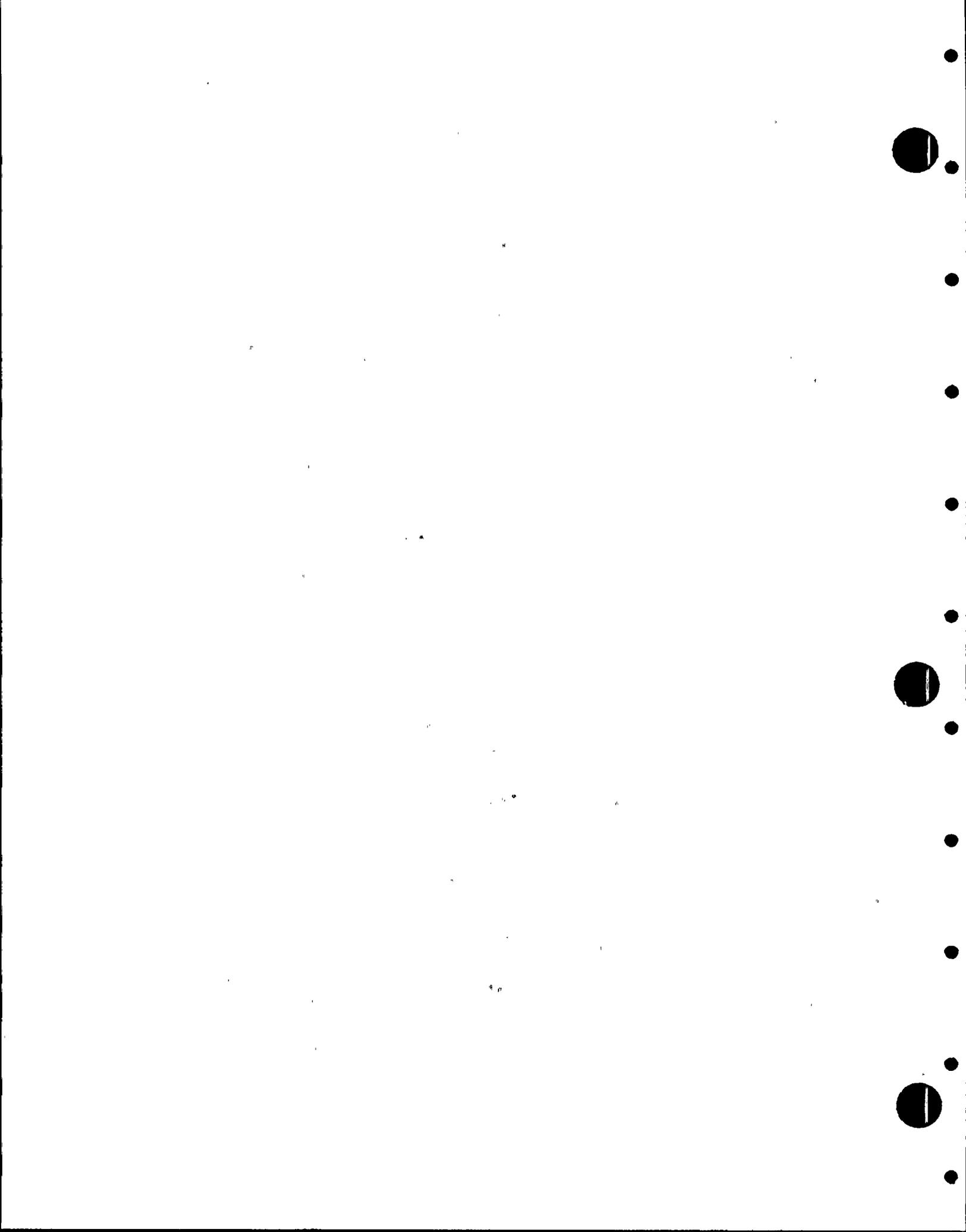
15 MR. VAN BRUNT: Are there any other questions?

16 Let me then ask that we take just a couple minute
17 break. I want to talk to the board for a second and see if
18 there is anything else that we want to raise, and then we
19 will come back and go over the open items to be sure that
20 we've got them all listed.

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

23 MR. VAN BRUNT: Let's go back on the record.

24 Bill, would you please go down the list of items
25 that you have identified and read them off one at a time, be



1 sure everybody agrees that they describe in enough detail
2 the issues so that we can deal with them at a future time.

3 MR. QUINN: Yes, Ed. As I read one question, if
4 Bechtel wants to answer that, will they be able to answer it
5 at that time?

6 MR. VAN BRUNT: They can do it right now. I think
7 that would be the easiest way to do it. Then we will give
8 them another opportunity tomorrow morning.

9 MR. QUINN: Fine. The first open item I have is to
10 verify the results of Bechtel's pipe analysis showing that
11 the auxiliary feedwater piping can withstand a thermal shock
12 of introducing the 40 degree F to 180 degree F water into the
13 hot feedwater line.

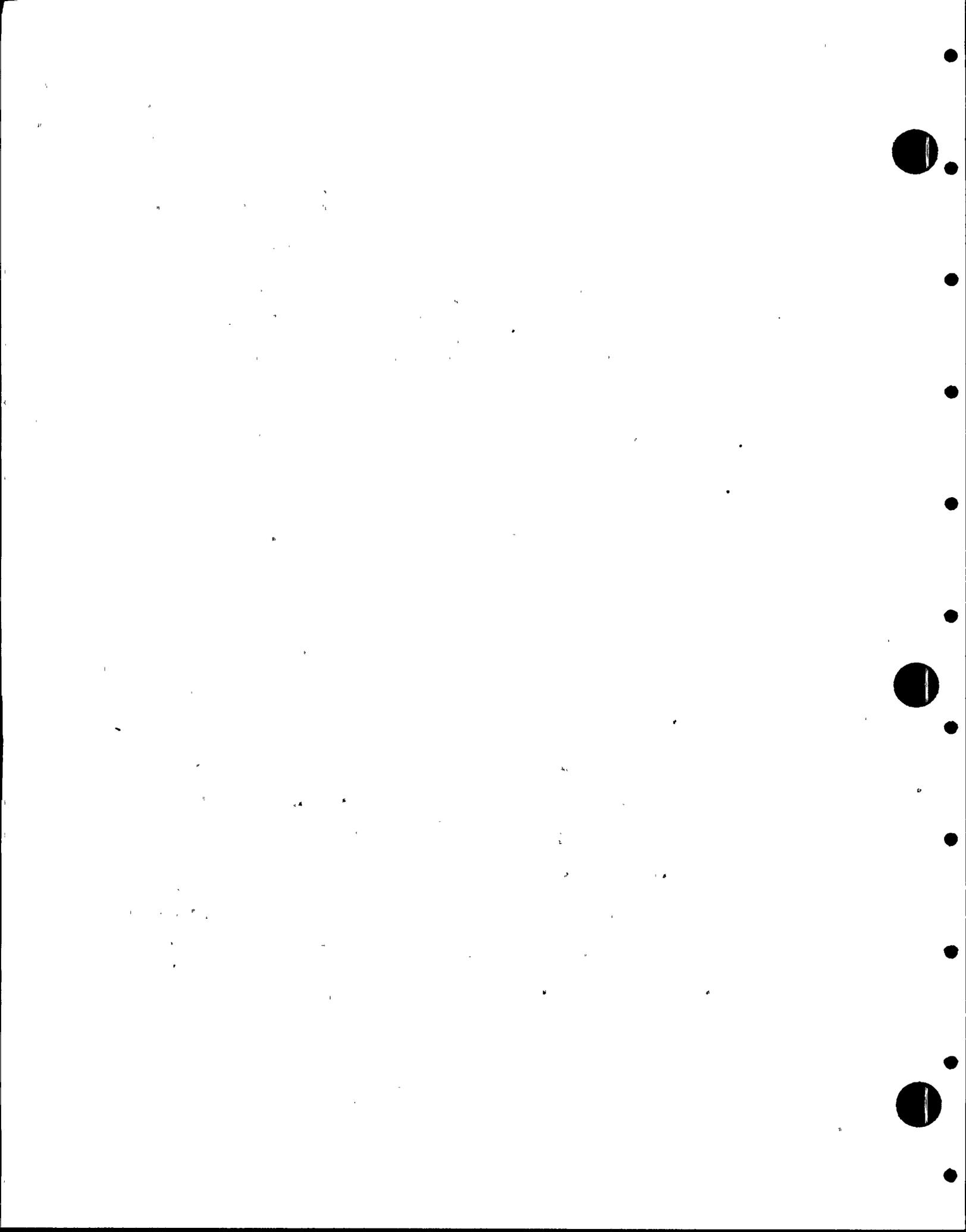
14 MR. BINGHAM: Later, Ed.

15 MR. QUINN: The second open item: Is there a steam line
16 going through the motor-driven pump room and does this
17 violate the separation criteria?

18 MR. BINGHAM: I would like to clarify that. The answer
19 to the question is there is a steam line in there. We don't
20 believe it violates the criteria, but we will respond either
21 tomorrow or later.

22 MR. HOEFERT: I just might add that, based on the
23 previous discussion, this is being considered a moderate
24 energy line, is that correct?

25 MR. BINGHAM: Norm, the intent is that in that aux



1 feedwater system that there be no high energy line breaks,
2 and that has been our criterion, the reason we bunkered it,
3 protected it, so that we had really a very safe configuration.
4 That always has been our criterion.

5 MR. WERMIEL: Well, even a crack in that line will
6 induce an unacceptable environment to the motor-driven pump,
7 won't it?

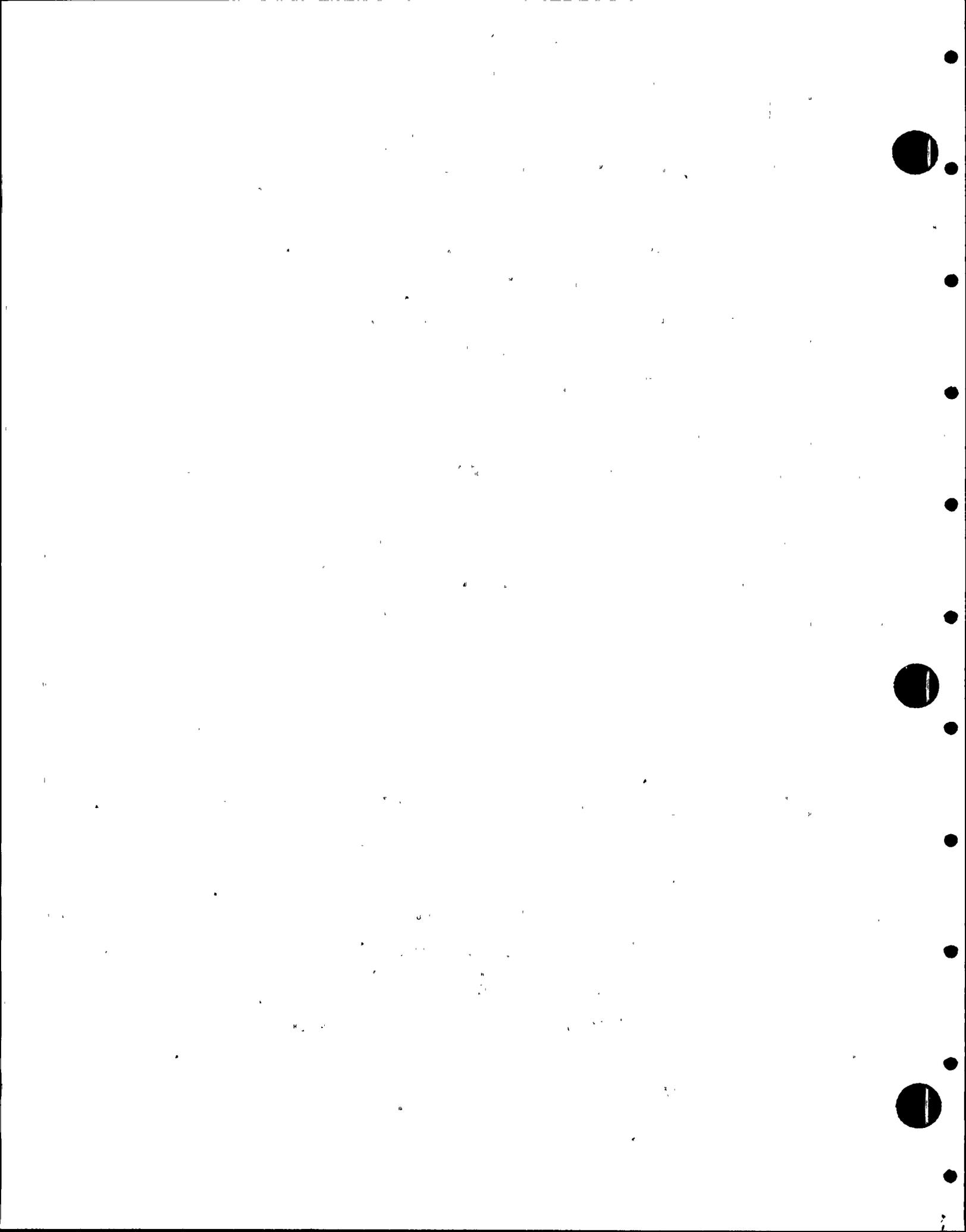
8 MR. BINGHAM: Well, let us take that under considera-
9 tion.

10 MR. VAN BRUNT: That whole area is going to be looked
11 at, Jerry.

12 MR. BINGHAM: Let me add one point here. When I say
13 we have exempted it from high energy line breaks, I believe
14 you said well, what about moderate, and then we have the
15 interpretation of whether one psi is moderate or not, and we
16 will have to come to a point where we present our rationale
17 on that. We believe that we are exempt in that particular
18 area.

19 MR. ALLEN: I would like to add one thing to it, to add,
20 also, to make sure and follow up on what Jerry said, the
21 environmental qualifications program for that electric-driven
22 motor or pump and make sure that it is covered in case they do
23 get a steam leak, what temperature can it see and not violate
24 a qualifications program?

25 MR. BINGHAM: That has been considered and we can give



1 you the information.

2 MR. VAN BRUNT: Any other comments on this particular
3 item? Bill.

4 MR. QUINN: The third open item I have; Is there an
5 interface requirement to have a checkvalve to prevent cold
6 condensate water from entering the economizer box on the steam
7 generator. That was from the aux feed pump.

8 MR. VAN BRUNT: I think that one will have to be
9 answered later, because there will have to be some verification
10 on that. Go ahead.

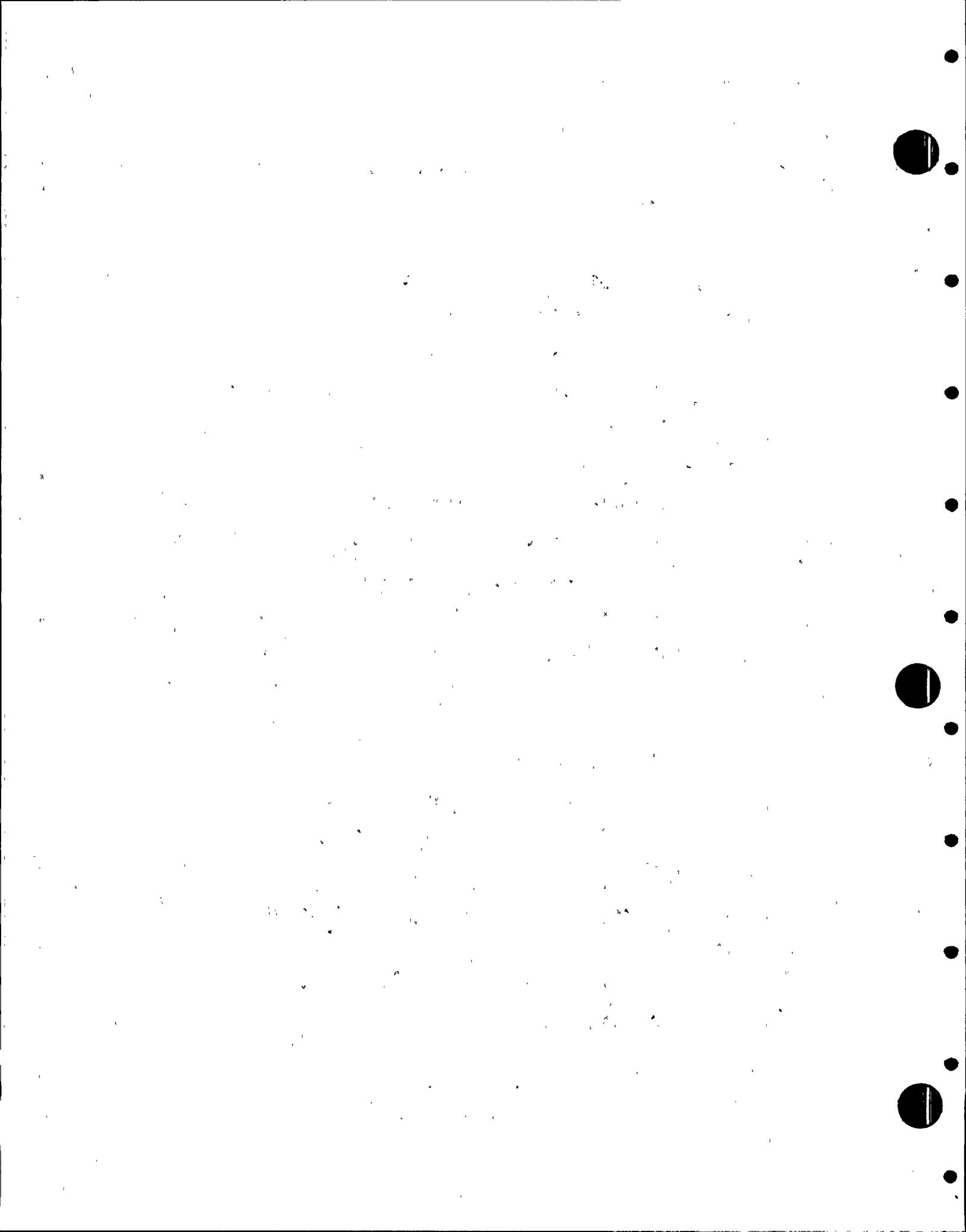
11 MR. QUINN: The fourth open item was to clarify the
12 testing plans to identify potential for waterhammer within
13 the auxiliary feedwater system, and also to verify whether
14 there are any plans to throttle back on the valves to prevent
15 waterhammer. That refers to a NUREG 0635 item.

16 MR. VAN BRUNT: I think in addition to that we asked
17 if Olan or Jerry could provide us with any additional
18 information or criteria that they have developed recently
19 that would assist us in evaluating that situation.

20 MR. QUINN: The fifth open item, and Mike Hodge may be
21 able to help a little bit on this, but he asked, was there any
22 HIS standard that allows the reducer to have the flat area
23 installed on the bottom.

24 MR. KEITH: That was responded to.

25 MR. VAN BRUNT: I think Mike wanted to get a copy.



1 MR. KEITH: The open item is to provide him a copy of
2 the standard.

3 MR. VAN BRUNT: We have not been able to get hold of
4 that standard. That is really the open item.

5 MR. KEITH: I just wanted to clarify the open item.

6 MR. VAN BRUNT: Go ahead, Bill.

7 MR. QUINN: The sixth open item that I have was to
8 clarify how you prevent feeding the isolated steam generator
9 with water from the startup pump when the plant is at zero
10 power.

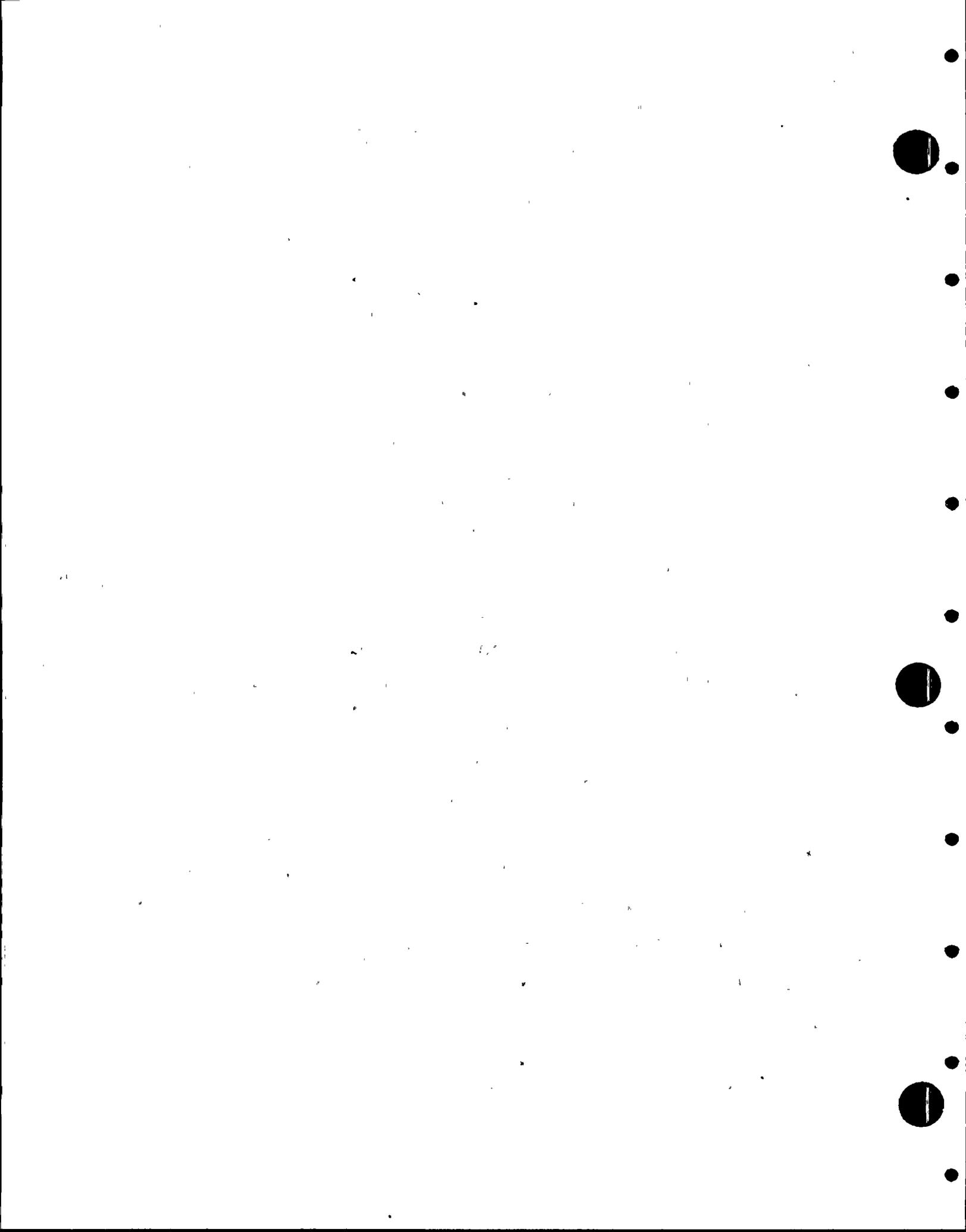
11 MR. TURK: That was Ralph Phelp's question.

12 MR. QUINN: Yes, Ralph Phelps.

13 MR. PHELPS: I discussed it with Rick Turk and I think
14 it has been answered, but I would still like Bechtel to
15 respond to that, and there is a correction in the way the
16 question was worded. It should be to the intact steam
17 generator, not the isolated.

18 MR. KOPCHINSKI: Could you clarify the whole question,
19 because I had problems with it.

20 MR. PHELPS: Let me restate it. Originally, from the
21 information that I had available to me, it appeared that when
22 you were in hot standby and operating on your startup pump
23 that if you had a steam line break in one steam generator,
24 you would continue to feed that steam generator, it wouldn't
25 be isolated, but Rick pointed out that there were valves down-
stream of the startup pump that did receive main steam



1 isolation signals, so that would answer my question, but I
2 would like Bechtel to just verify that particular scenario.

3 MR. KEITH: That there are main steam isolation signals
4 to valves downstream?

5 MR. PHELPS: Yes, of the startup pump.

6 MR. KEITH: Yes, we can verify that right now, Ralph.
7 That is correct.

8 MR. KOPCHINSKI: Is that item closed, then?

9 MR. VAN BRUNT: Go ahead, Bill.

10 MR. BINGHAM: We have a point, Ed.

11 MR. VAN BRUNT: Excuse me, I'm sorry.

12 MR. BINGHAM: We believe this item is closed.

13 MR. VAN BRUNT: If Ralph is satisfied, then I'm
14 satisfied. He was the one that originated the question.

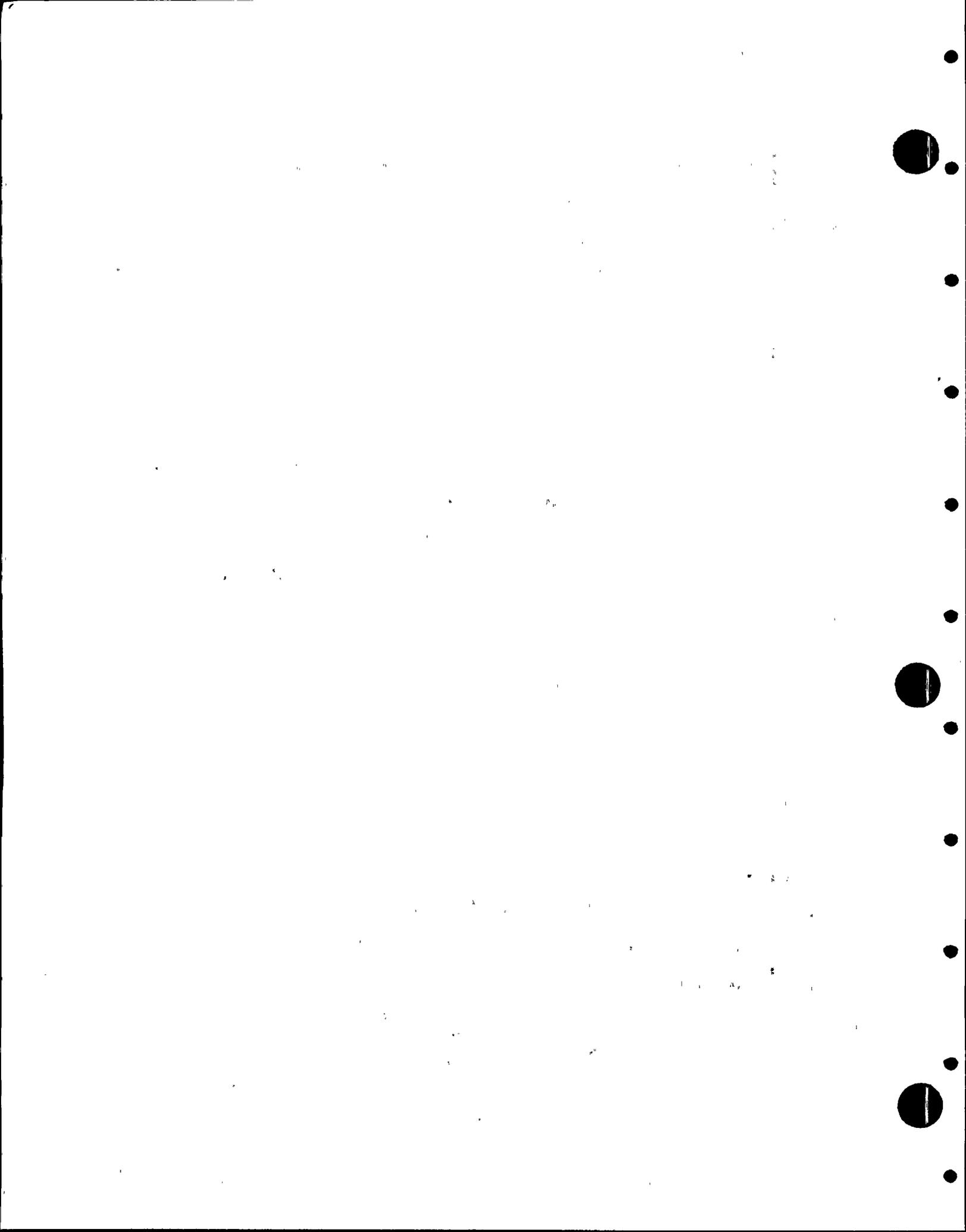
15 MR. PHELPS: I am satisfied.

16 MR. VAN BRUNT: Okay, fine. Then consider it closed.
17 Bill, go ahead.

18 MR. QUINN: The seventh open item was to clarify that
19 the Tech Specs will be clear to show that when the B diesel
20 is out and the turbine driver is out that that would be an
21 unacceptable Tech Spec condition.

22 MR. KEITH: I don't know that that is open. That is
23 an action item for APS. I think you made the commitment to
24 do that.

25 MR. ALLEN: What's that, Dennis?



1 MR. KEITH: The Tech Spec where we have the steam-
2 driven auxiliary feedwater pump out and somebody wants to take
3 a B diesel generator out, the question was could that happen,
4 and we need to make sure that the Tech Specs cover that kind
5 of situation.

6 MR. VAN BRUNT: As I remember, I requested that we put
7 an item on to verify that the Tech Specs were adequate to deal
8 with that situation or were properly worded so that there
9 wouldn't be any misinterpretation.

10 MR. KEITH: Well, I think there probably is the
11 possibility of misinterpretation now. I think we ought to
12 just make the commitment now to make sure that the Tech Spec -

13 MR. VAN BRUNT: I thought that is what we did.

14 MR. KEITH: I don't know if you want to leave it as
15 an open item.

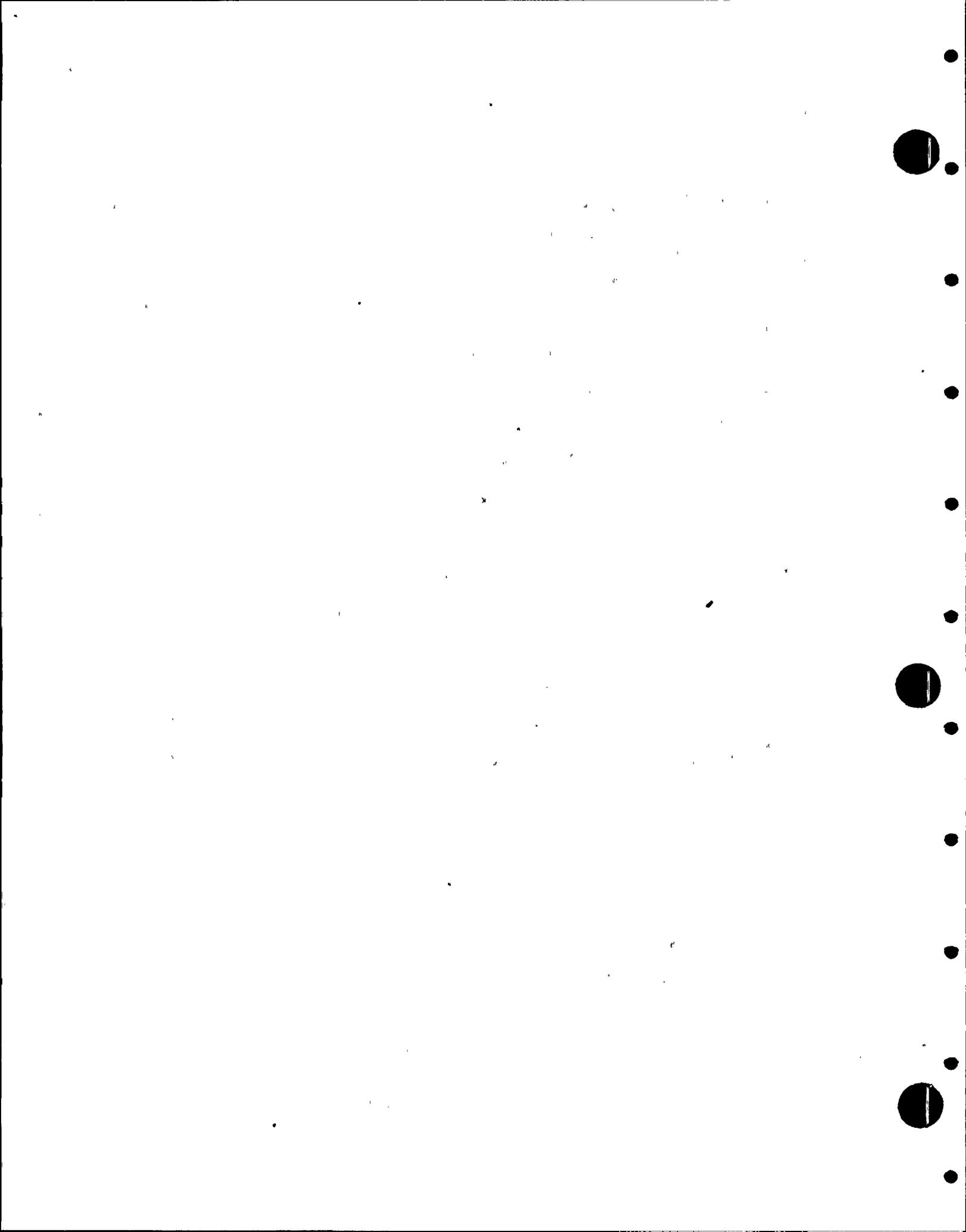
16 MR. VAN BRUNT: Well, I think the open item will be
17 how it is written to be sure that it is satisfactory, and I
18 think probably we ought to do that when we close the item.

19 MR. KEITH: Fine.

20 MR. VAN BRUNT: Okay, Bill.

21 MR. QUINN: The eighth open item was to clarify how
22 the Tech. Spec requirements and CESSAR will be applied specifically
23 to Palo Verde so that the Palo Verde Plant has its own set of
24 Tech Specs with no cross-references.

25 The ninth open item was the question: If the
135 GPM recirculation line is broken, does Bechtel's



1 condensate tank design volume meet the interface requirements
2 of having 300,000 gallons available to the intact steam
3 generators?

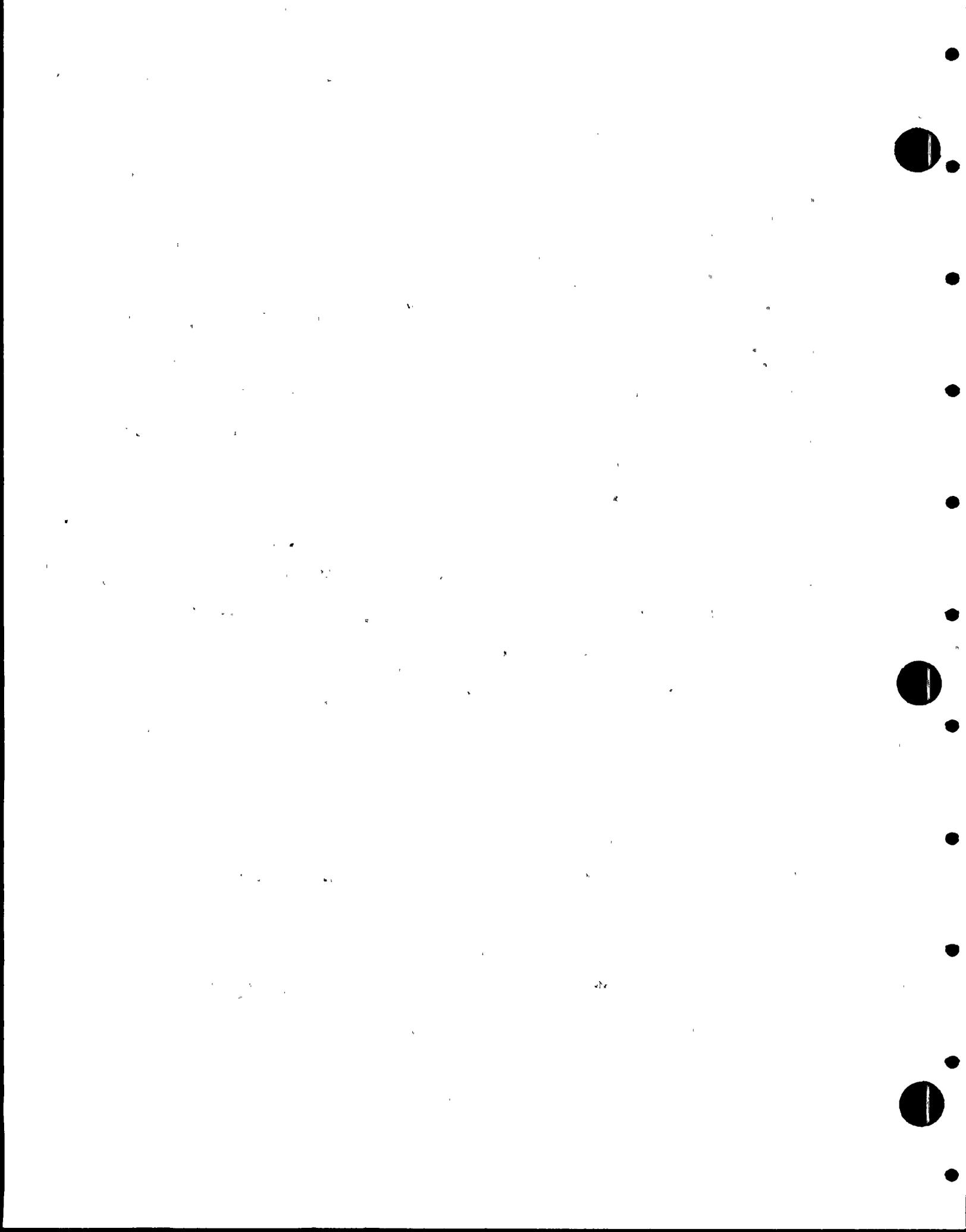
4 MR. KEITH: Well, I think I was the one that brought
5 up the recirculation line, because I had apparently a misunder-
6 standing on the sizing criteria. I think it was just kind
7 of a general thing on whether we can take a line break and
8 still meet the eight hours, and I think what we will do is
9 respond to determine just what all went into the sizing
10 criteria, or sizing calculations, excuse me.

11 MR. QUINN: The tenth open item was to clarify whether
12 there was a possibility of getting a safety injection signal
13 after aux feed flow is automatically initiated and, if so,
14 what operator action is required to prevent a safety injection
15 signal. That was Norm's question.

16 MR. HOEFERT: I think along with this is more of a
17 generic question, and that is is it acceptable for the
18 actuation of one safety system to cause the actuation of
19 another.

20 MR. BINGHAM: I am not sure, Ed, how we can respond to
21 that particular issue, and I suggest maybe the board either
22 exempt us from responding to that or rethink the best way to
23 handle the issue at hand.

24 MR. HOEFERT: I understood CE was going to provide
25 some response to that.



1 MR. VAN BRUNT: I think we would have to go back and
2 look at the transcript.

3 MR. TURK: That was the safety injection?

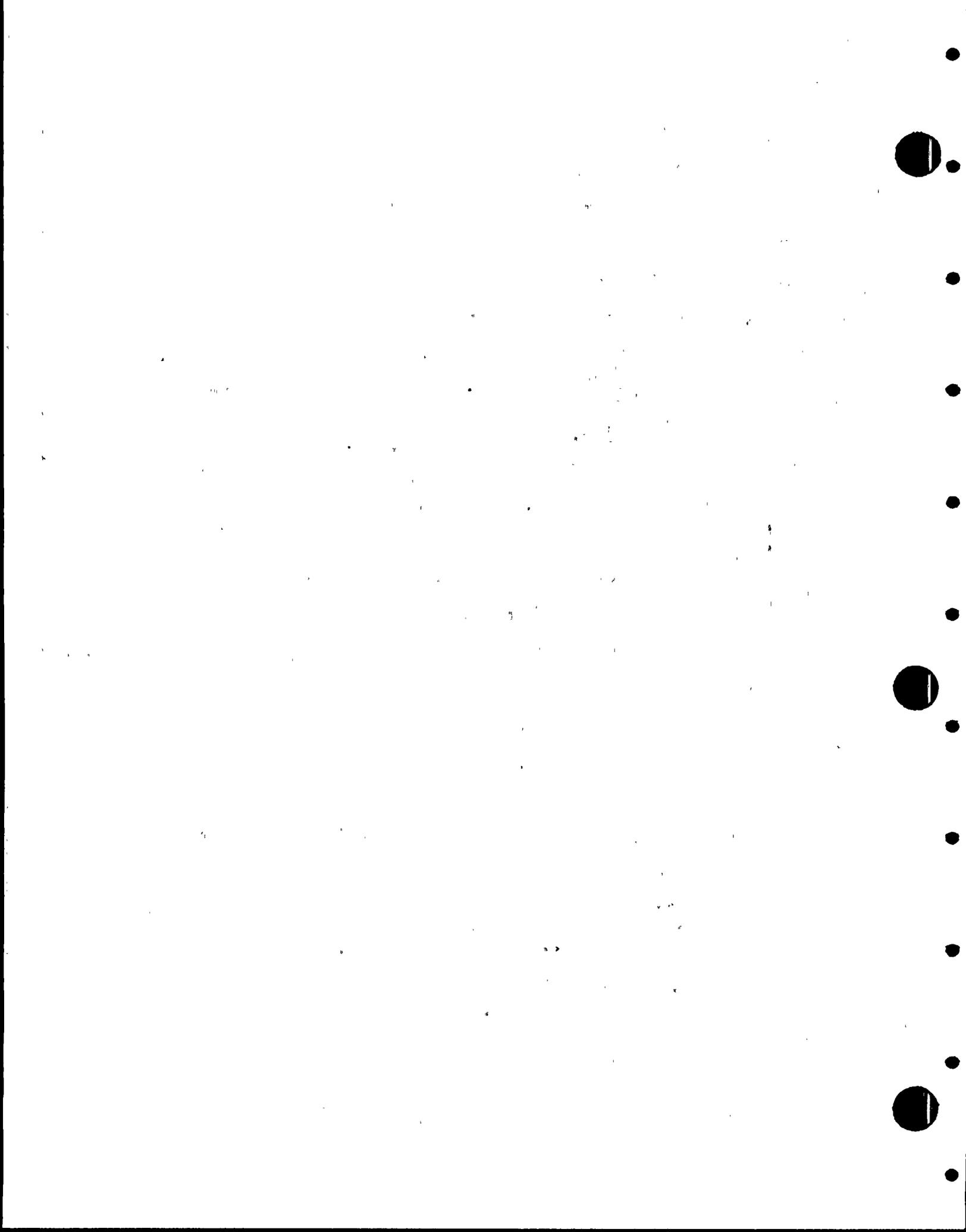
4 MR. HOEFERT: Yes.

5 MR. TURK: If it is worded is it possible, there is
6 no doubt that it is possible. There are cases where automatic
7 actuation of the aux feed system, if manual action is not
8 taken to regulate it, will cause safety injection. There
9 certainly can be cases where that is going to happen if the
10 initial conditions are such. Now, if the question was under
11 a specific set of criteria, yes, we can go back and analyze
12 and determine for a specific instance whether or not it will.

13 MR. HOEFERT: I think what we need is CE to tell us
14 when to expect this to happen so we can write our operating
15 procedures accordingly, or if it is acceptable to even have a
16 situation like this.

17 MR. KEITH: Would it make sense to just look at --
18 It seems to me like the loss of feedwater flow, if we just
19 looked at that accident -- I mean a main steam line break,
20 you are going to get both, for example, regardless of what
21 you do with it.

22 MR. TURK: The point I am making is that we can take --
23 In fact, we have done it. It was done in the TMI owner's
24 group, CEN-128, although it wasn't done for a System 80 plant.
25 That was a best estimate analysis, so it did actuate all of



1 the available emergency feed pumps, and it did it for fuel
2 decay, heat load, and the other basic assumptions.

3 MR. KEITH: On a loss of main feedwater?

4 MR. TURK: On a loss of main feedwater, and in that
5 particular case, it showed the safety injection was not
6 actuated. My point being that for the whole spectrum of
7 conditions the plant can be operating, Ed, with very low decay
8 heat or if reactor cooling pumps are lost simultaneously or
9 if the loss of feed is due to the loss of offsite power and
10 you don't have pump heat, there are certainly cases where
11 they are not going to be actuated.

12 MR. KEITH: But somehow we've got to define the
13 question such that it is answerable.

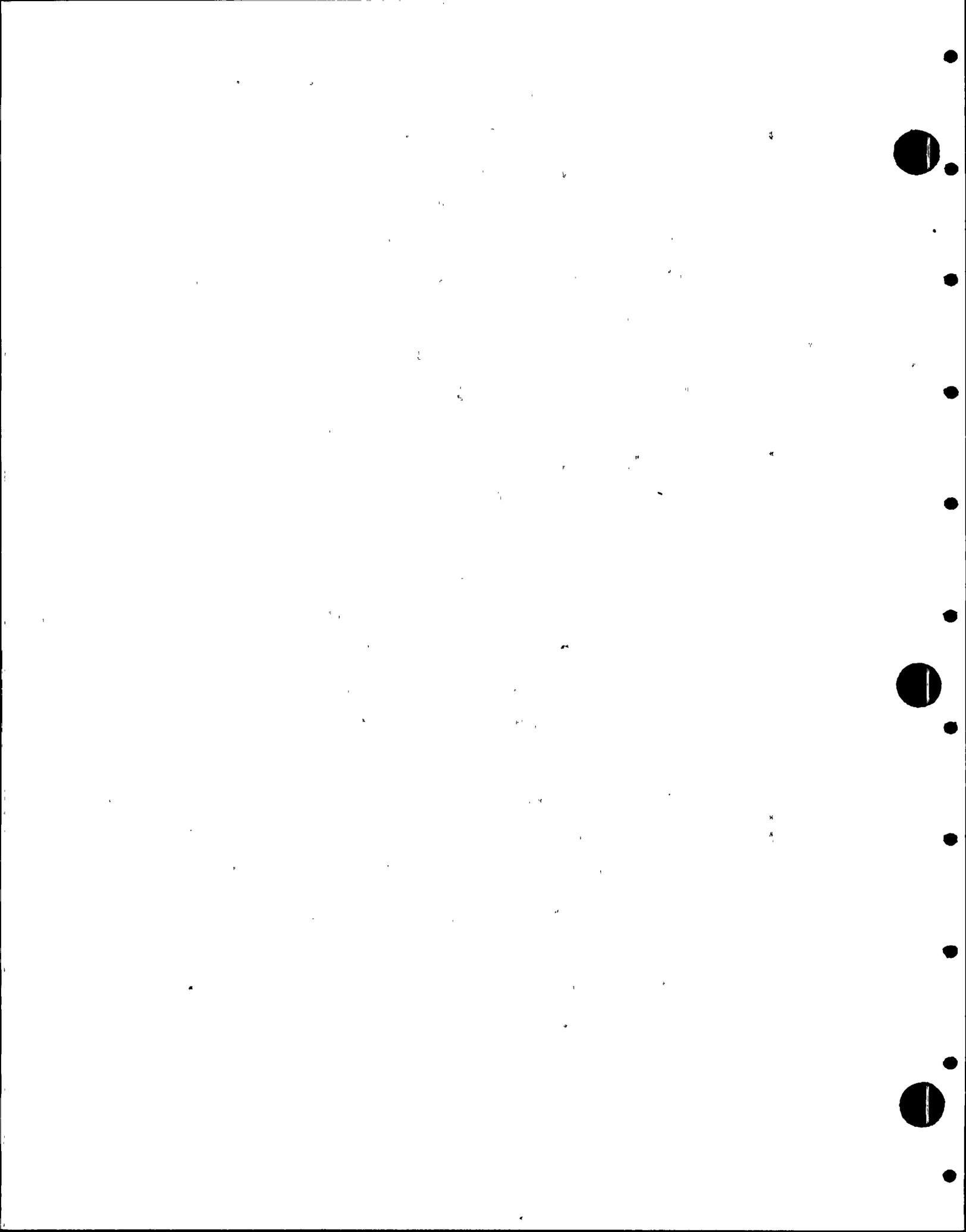
14 MR. TURK: I don't know what the answer gains you,
15 meaning we can go back and say you're right, we'll take the
16 Chapter 15 loss of feedwater and say we used two aux feed pumps
17 instead of one and see if you get safety injection and there
18 is a yes or no answer, but I am not sure what that tells you.

19 MR. VAN BRUNT: Let's go off the record for a minute.

20 (Thereupon a brief off-the-record discussion ensued,
21 after which proceedings were resumed as follows:)

22 MR. VAN BRUNT: Norm, why don't you go ahead and
23 reframe your question so that we can deal with it properly.

24 MR. HOEFERT: I would just request the criteria or
25 guidelines be provided as to when the operators can expect to



1 have to take manual action to limit cooldown by the auxiliary
2 feedwater system.

3 MR. VAN BRUNT: Go ahead, Bill.

4 MR. QUINN: Open item eleven was to determine if a
5 radiation monitor should be placed in the turbine aux feed
6 pump steam exhaust line.

7 MR. ROGERS: Or is being.

8 MR. QUINN: Open item number twelve was to determine
9 if a radiation monitor should be placed in the recirculation
10 line to the condensate tank.

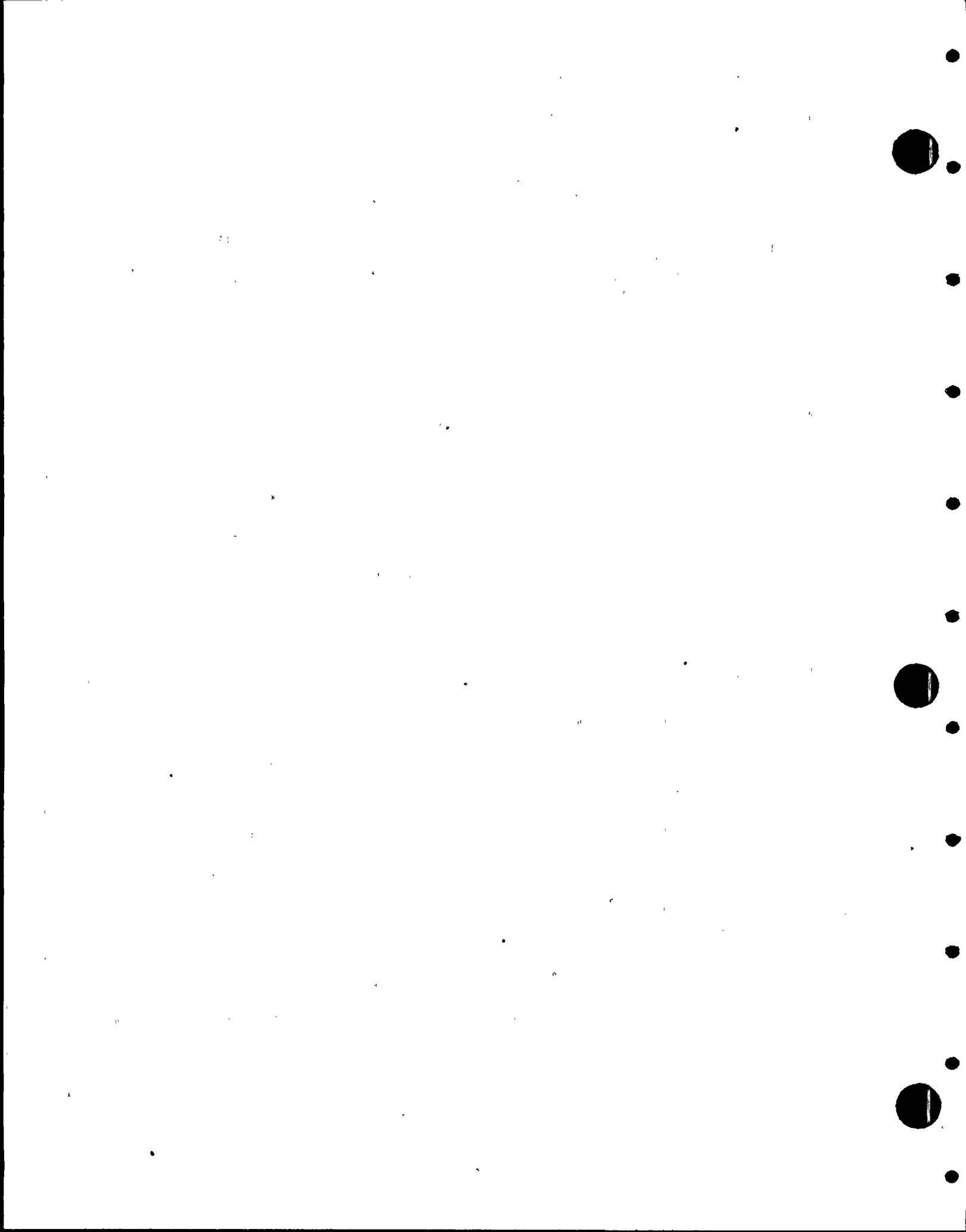
11 MR. KOPCHINSKI: I would like to say that I do not
12 think you need a radiation monitor on the recirculation line.
13 I think that the reactor makeup water tank, if it has any
14 activity in it at all, it will be tritium of such a low level
15 that its introduction into the secondary system would have no
16 effect. I just can't think of any reason why you would worry
17 about that water being introduced into the secondary side.

18 MR. VAN BRUNT: Gerry, I don't necessarily disagree
19 with you, but I think that we ought to verify for the record
20 that that is in fact the case.

21 MR. BINGHAM: May I have a clarification, Ed?

22 MR. VAN BRUNT: Sure, Bill.

23 MR. BINGHAM: We are trying to deal with these particular
24 issues, and in order to look at it, we would want to be
25 comparing it with some criteria. Have we agreed upon the



1 criteria that you will be comparing this to as far as the
2 need to have a monitor?

3 MR. KOPCHINSKI: If you want to compare, I think our
4 design criterion allows operation with some small amount of
5 steam generator tube leakage, and you could compare the
6 introduction of this water to that kind of operation.

7 MR. BINGHAM: Well, I believe what I heard was that
8 it is intuitive that that ratio would be insignificant in the
9 overall, but we can confirm that point.

10 MR. VAN BRUNT: Go ahead, Bill.

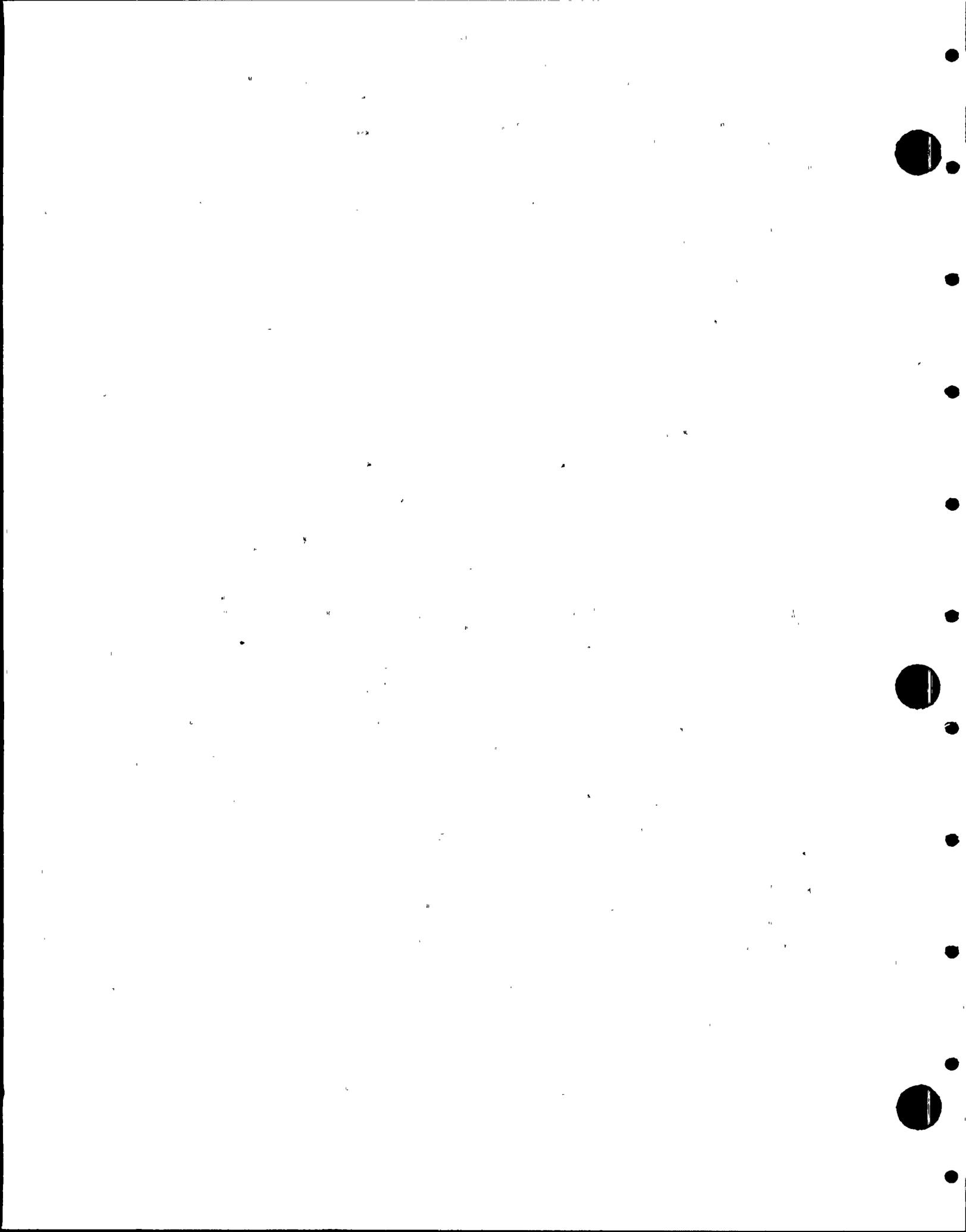
11 MR. QUINN: Open item thirteen was to evaluate whether
12 the low level alarm on the condensate storage tank should be
13 a Class IE safety-related alarm.

14 MR. WERMIEL: Could I raise a point on that? That is
15 one of the concerns, very specifically, as a matter of fact,
16 in a March 10th letter on feedwater. I believe it is Item
17 G11, where we state pretty much categorically that redundant
18 safety grade level indications should be IE on the condensate
19 storage tank, and I think you will be addressing that
20 tomorrow if I am not mistaken.

21 MR. BINGHAM: That's correct.

22 MR. WERMIEL: So if you would like, we can defer that
23 until tomorrow's discussion, I think.

24 MR. VAN BRUNT: Well, I think we can leave it as an
25 open item. We will have to take it up.



1 MR. BINGHAM: We will answer that probably tomorrow.

2 MR. VAN BRUNT: Go ahead, Bill.

3 MR. QUINN: Open item fourteen, if security was
4 breached to the remote shutdown panel doors, is it possible
5 that somebody could enter the remote shutdown panel area and
6 take control from the control room?

7 MR. BINGHAM: We will answer that tomorrow.

8 MR. VAN BRUNT: Go ahead, Bill.

9 MR. QUINN: Open item fifteen, clarify whether the
10 aux feed turbine driver has been or will be type tested.

11 Open item sixteen, determine what inputs were made
12 to arrive at the 330,000 gallon condensate storage tank
13 reserve. This was really the same question that we had
14 earlier.

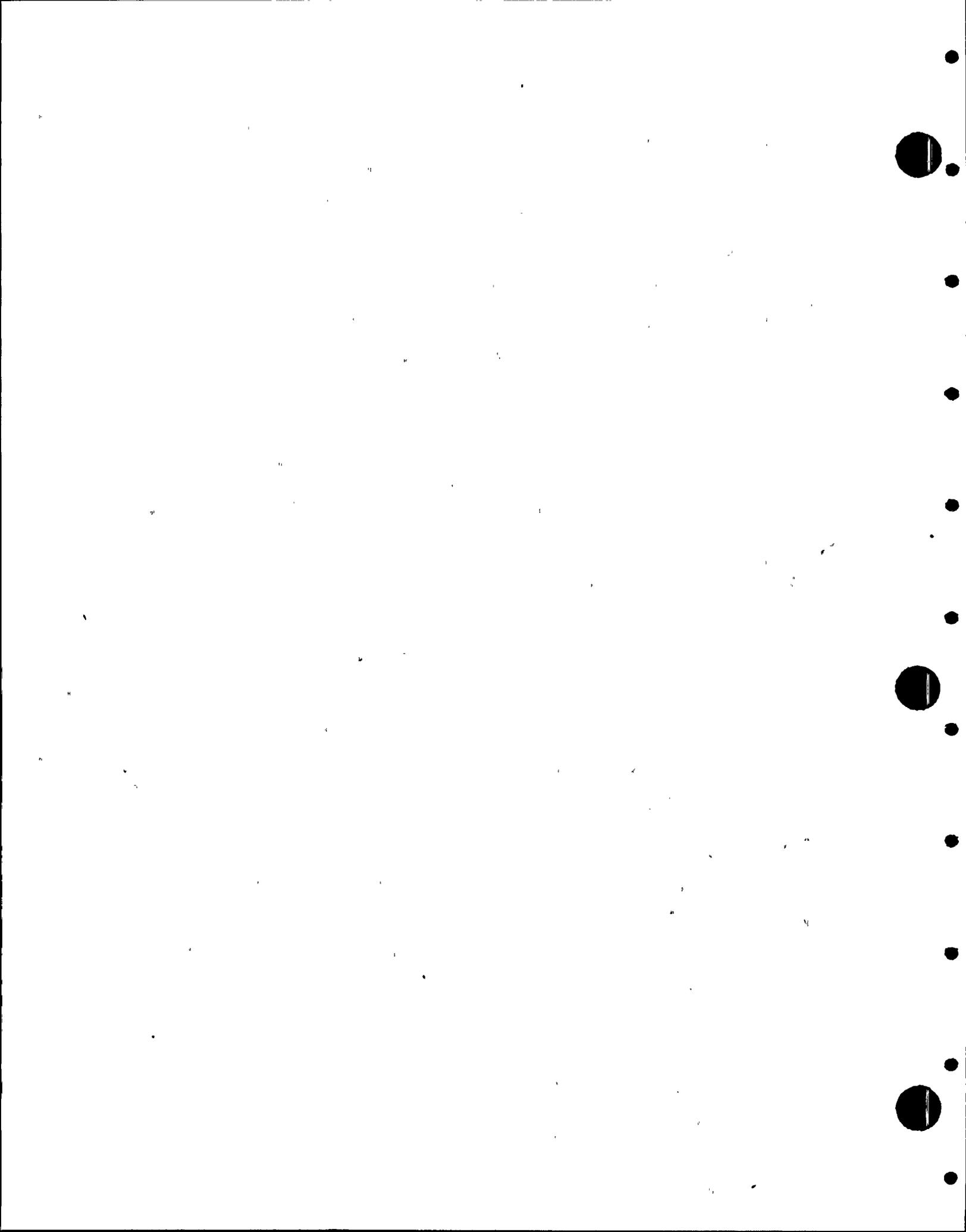
15 MR. BINGHAM: What was our earlier question?

16 MR. KOPCHINSKI: It is basically the same as item nine.

17 MR. BINGHAM: Could we hear nine again to see if we
18 can eliminate this question, Ed?

19 MR. VAN BRUNT: Bill, would you read nine again,
20 please?

21 MR. QUINN: Before I do that, there was a qualifier on
22 this question. It was Shelley Freid's question. He wanted
23 also to clarify such things as whether the level instrument
24 errors are taken into account and was vortex formation taken
25 into account.



1 MR. VAN BRUNT: Bill, I would suggest that we leave
2 them as two separate questions for the moment and we can
3 consolidate the answer if necessary.

4 MR. KEITH: Well, it sounds like one is related to
5 the CE calculation on the 300,000, the other is related to
6 our 330,000.

7 MR. VAN BRUNT: I think that is part of it.

8 Go ahead, Bill.

9 MR. QUINN: Open item seventeen was to clarify whether
10 there was safety relief valves on the condensate storage
11 tank. Bechtel did clarify that earlier.

12 MR. VAN BRUNT: I think we added to that.

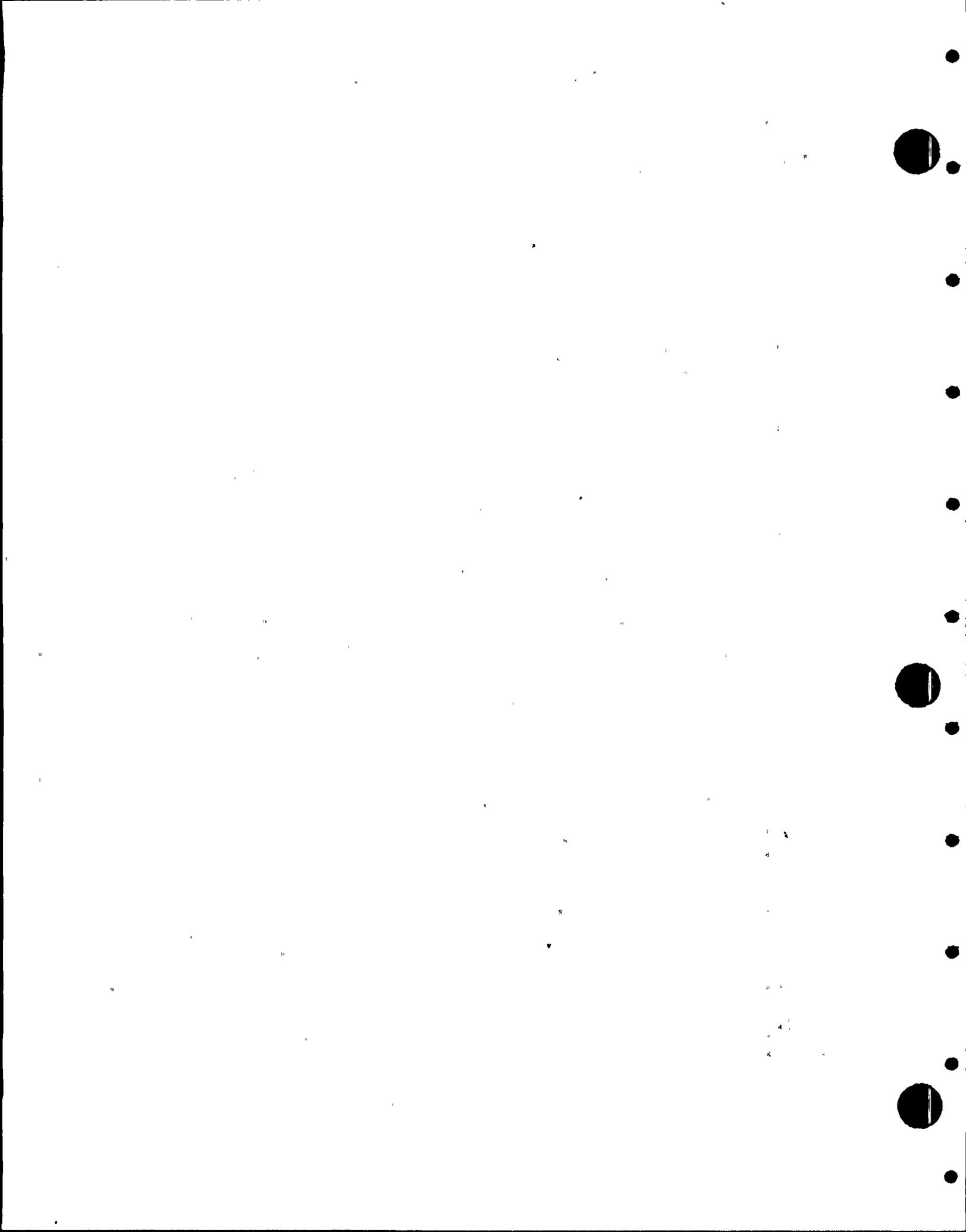
13 MR. QUINN: There was an addition to provide information
14 as to whether the tank could be overpressurized, clarification
15 also as to what was the basis for the sizing of the relief
16 valve.

17 MR. BINGHAM: We will provide that.

18 MR. QUINN: Open item eighteen was to clarify whether
19 both the regulating valve and the isolation valve need to be
20 stroked since both the valves were powered off the DC battery
21 system and stroking both of the valves provides an extra drain
22 to the DC battery system.

23 MR. KOPCHINSKI: I thought that was answered.

24 MR. KEITH: I'm sorry, would you repeat that again,
25 Bill?



1 MR. QUINN: Norm's question was, there was the
2 isolation valve and the regulating valve both powered from
3 the DC system, and why do you have to stroke both of them,
4 since that provides an additional drain off the DC battery
5 system?

6 MR. KEITH: And we did say we would look into it further
7 to see. We don't think it is a good idea, but we'll check
8 and confirm.

9 MR. QUINN: That's correct.

10 Open item nineteen was to clarify why, on the P&ID
11 for the steam supply valve for the turbine, one valve had two
12 hand switches, that was Valve 134, and the other valve had
13 four hand switches, that was Valve 138.

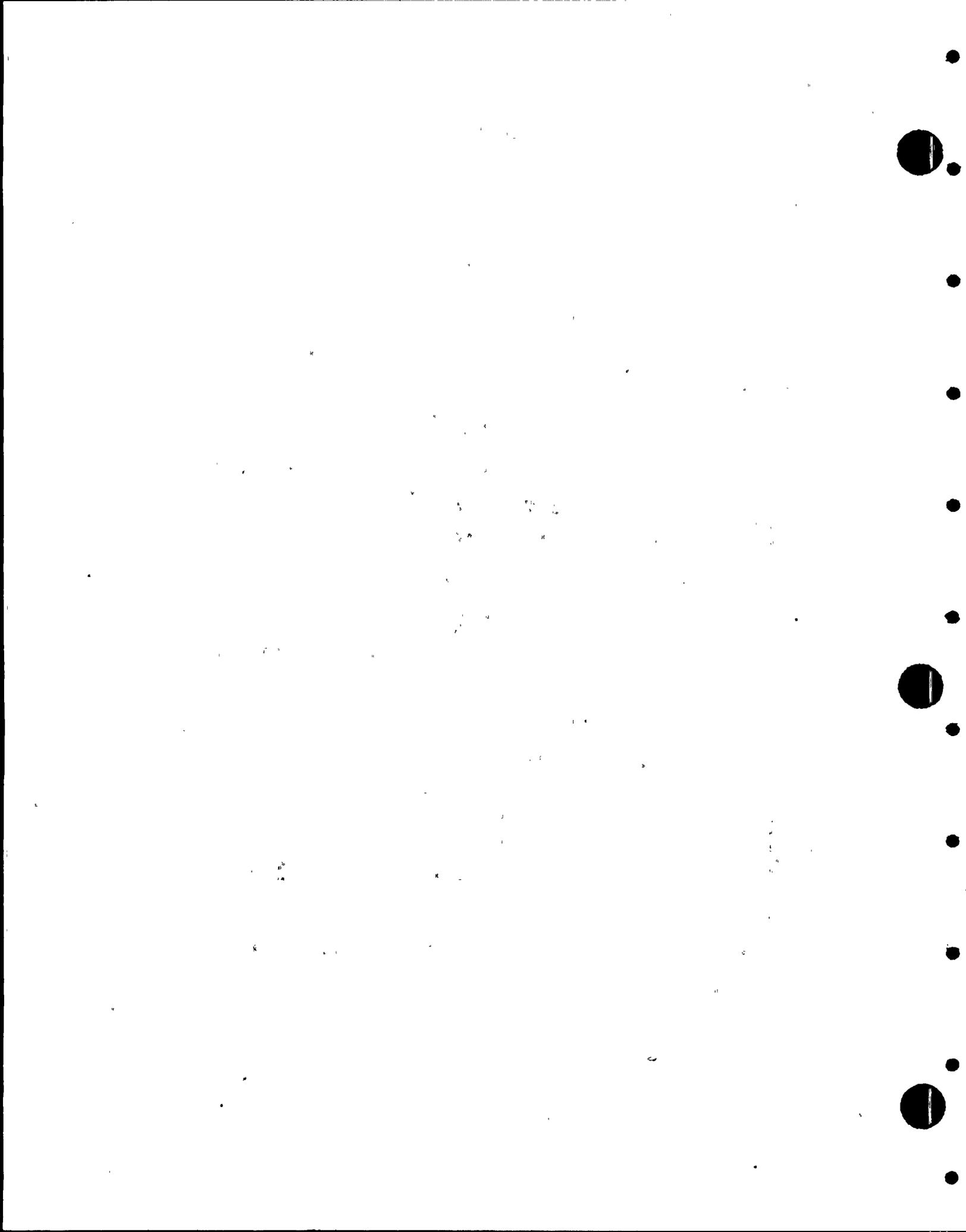
14 Open item number twenty was to clarify where the
15 floor drains in the auxiliary feedwater pump rooms flow to
16 and what was the design basis for that floor drain system.

17 MR. KEITH: We confirmed where they flow to. I think
18 the question is just the design basis.

19 MR. QUINN: Open item twenty-one was: Does having access
20 to the motor-driven pump room through the turbine pump room
21 violate any OSHA or NRC separation criteria?

22 MR. KEITH: We responded to that. What we committed
23 to do was look at the emergency hatches going out from both
24 rooms.

25 MR. HOEFERT: Right.



1 MR. KEITH: We may have a later one on that looking at
2 their leak tightness as well as just the capability to use
3 them.

4 MR. QUINN: Open item twenty-two was to clarify --

5 MR. KOPCHINSKI: Bill, did you miss twenty-one or was
6 that twenty-one?

7 MR. QUINN: That was twenty-one. Open item twenty-two
8 was to clarify why a low flow indication on auxiliary feed-
9 water pumps is not required to provide runout protection for
10 those pumps when the plant is in a condition where the remote
11 shutdown panel is required.

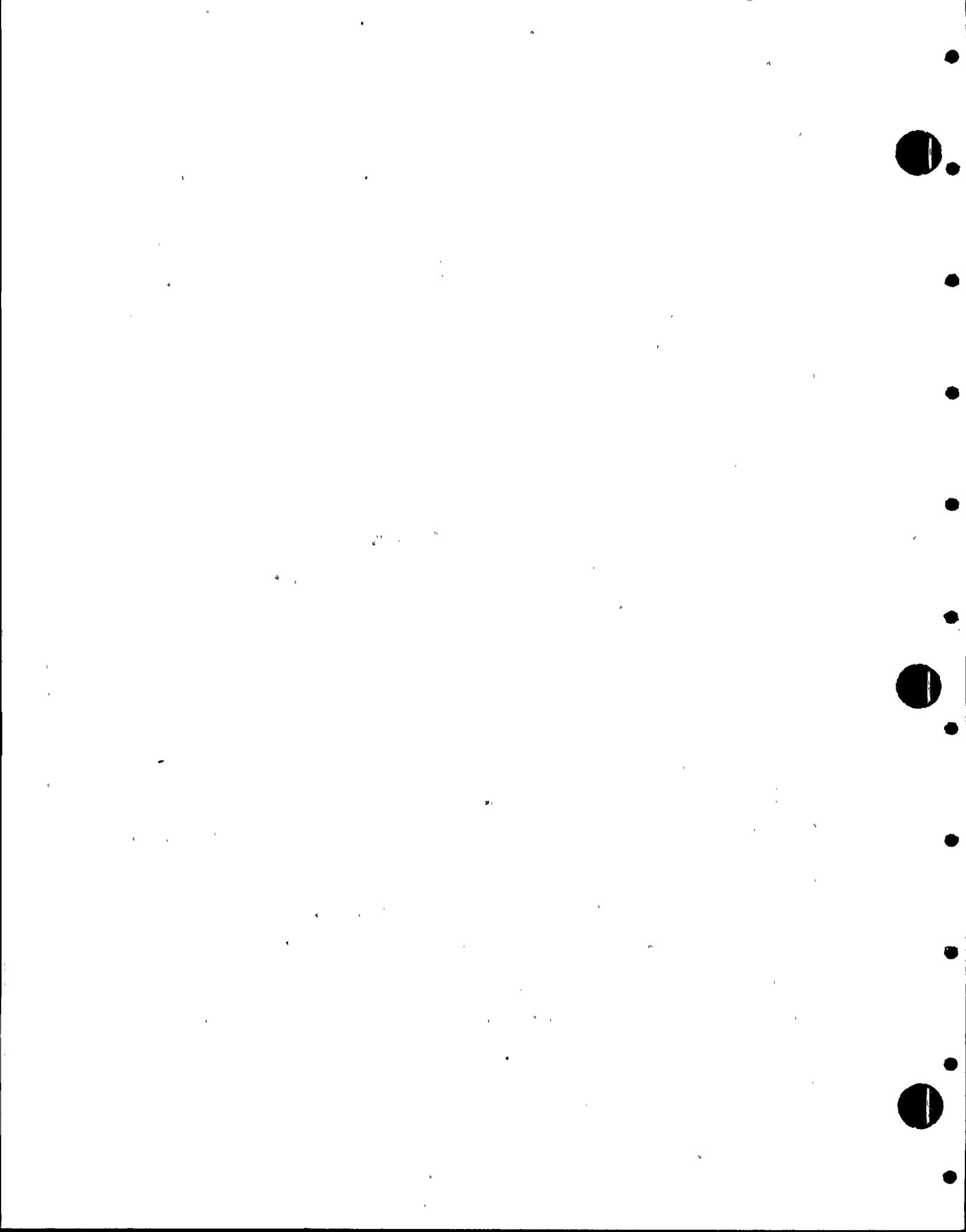
12 Open item twenty-three was to clarify the steam
13 generator boil dry time for a System 80 steam generator to
14 determine if required operator action can be accomplished for
15 a pipe break downstream of the isolation valves with an aux
16 feed pump failure.

17 Open item twenty-four was to make a correction to
18 Exhibit 2C-18. That was adding the word "emergency."

19 Open item twenty-five was to make the correction to
20 Exhibits 2C-1 through 2C-14 where the MEB versus the ASB was
21 reversed.

22 MR. BINGHAM: May I make a comment, Ed? I think we
23 agreed for the record that we would make that change. I don't
24 believe that really falls as an open item to respond to.

25 MR. VAN BRUNT: I guess you are probably right, except



1 we've got to be sure that we do in fact fix it. We have to
2 change the attachment that will go with the transcript.

3 MR. BINGHAM: That applies also to the error in the
4 other slide where there was a word left out.

5 MR. VAN BRUNT: That's right.

6 MR. BINGHAM: It was not intentional to leave the
7 word out.

8 MR. QUINN: That was the extent of the open items that
9 I had listed.

10 MR. KOPCHINSKI: I have one or two that you missed.
11 One of them was CE provide the limiting events in the criteria
12 for the 300,000 gallons. That again relates back to a
13 similar question that was more specific, perhaps.

14 MR. KEITH: I think that is encompassed in the other
15 question.

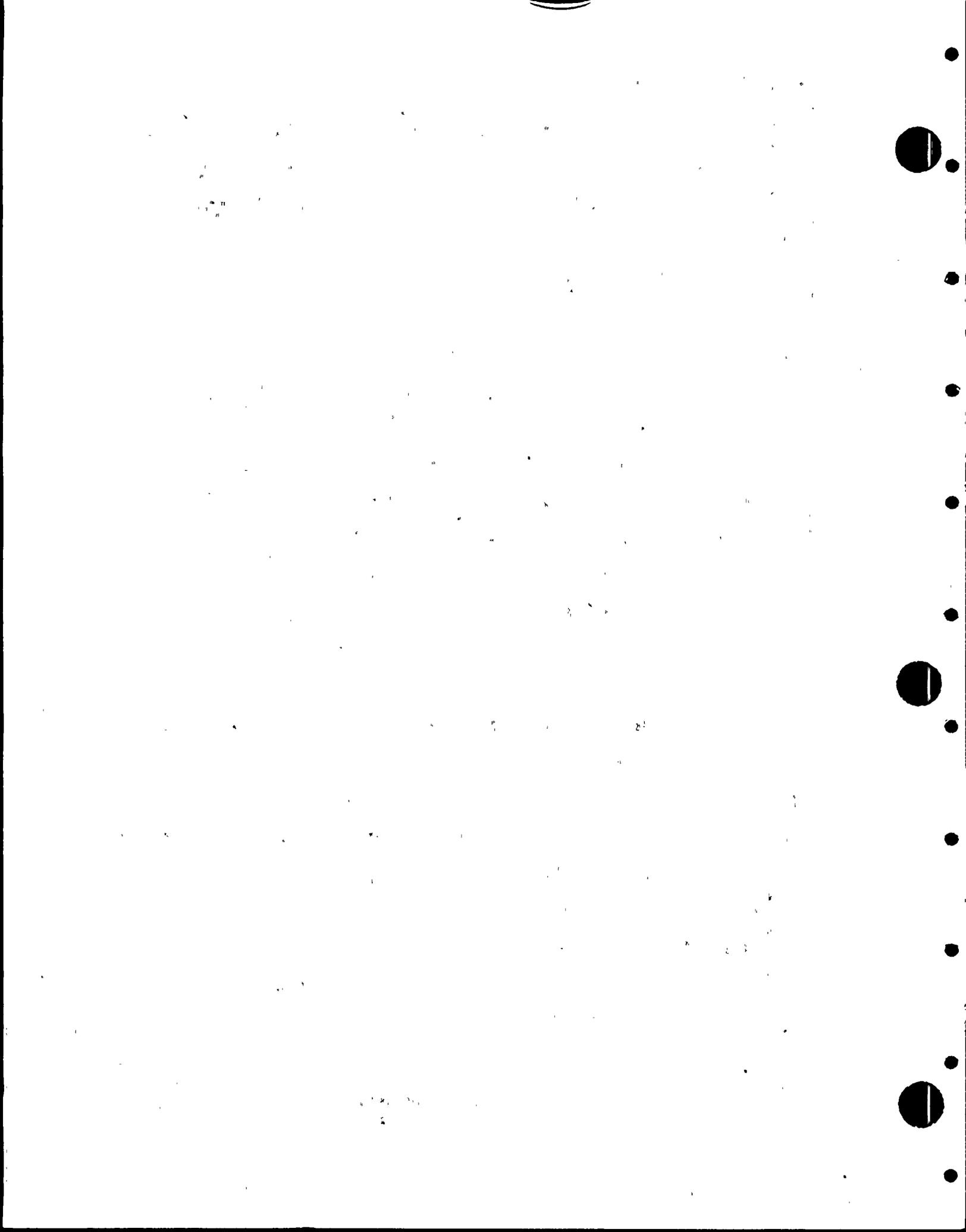
16 MR. VAN BRUNT: I think you can consolidate that part
17 along with I think it is question nine. I forget what the
18 other number was.

19 MR. KOPCHINSKI: Yes, it relates to question nine.

20 The only other one I had was the turbine driver
21 speed control. Which has priority, the control room, the
22 remote shutdown panel, or the local control? Why don't we
23 call that twenty-six.

24 MR. VAN BRUNT: Do you have any others, Gerry?

25 MR. KOPCHINSKI: No.



1 MR. ROGERS: Bill, did you have the one on the
2 operating experience with the feed pump turbine driver? Was
3 that in your list?

4 MR. QUINN: Yes.

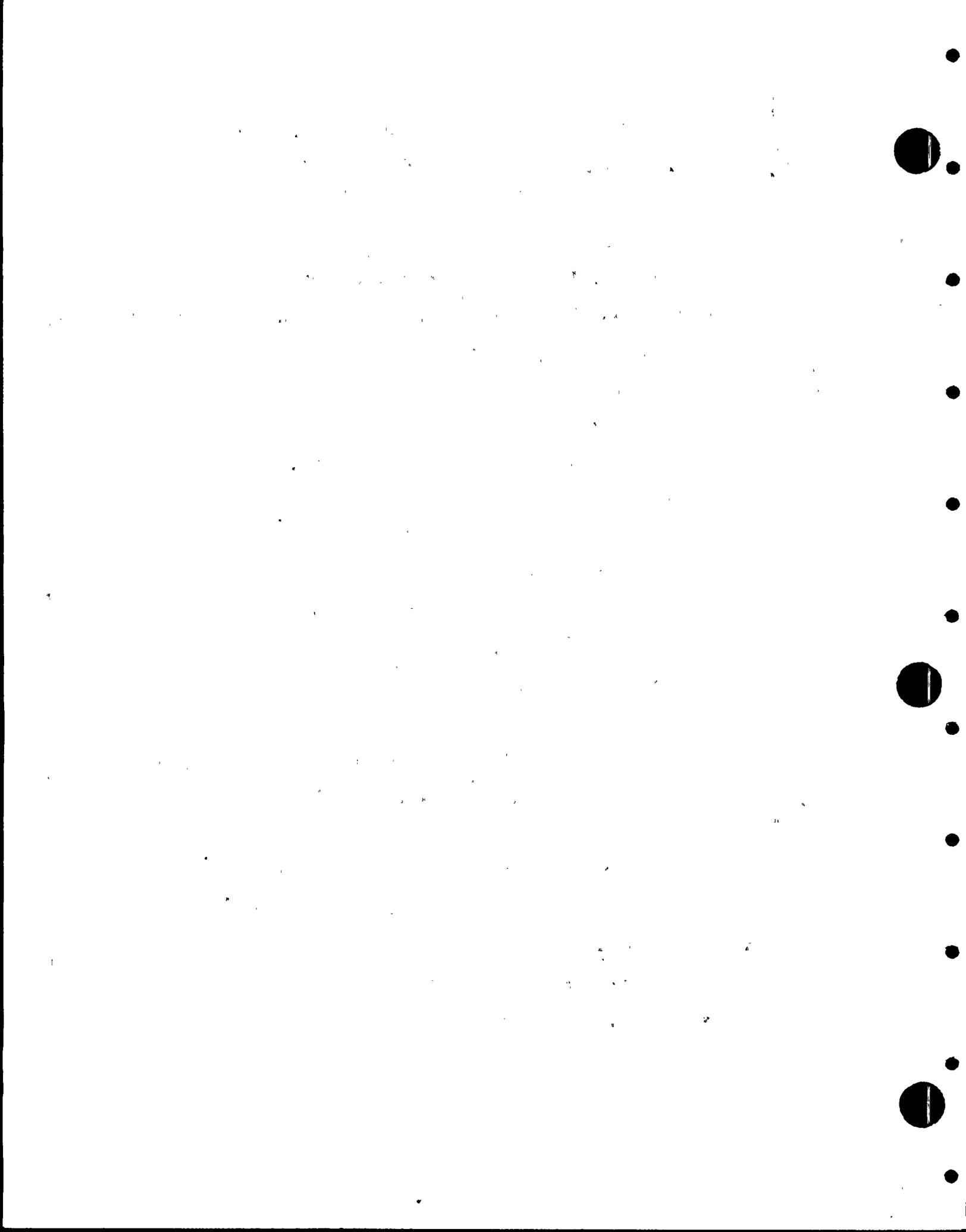
5 MR. BINGHAM: Could we get a clarification on Jerry's
6 comment on the IE classification or requirement for the
7 level indicators on the tank?

8 MR. WERMIEL: I was just looking at this. On the
9 level indicators on the condensate storage tank, it is not
10 GLI. At least, not as presented in the letter. I can recall
11 in our reviews of the operating plants specifically as an
12 outgrowth of NUREG 0635 and 0611 requiring redundant safety
13 grade level indication for the condensate storage tank, and
14 I have been trying to put a handle on where this is coming
15 from, and I haven't yet.

16 MR. TURK: I know for CE plants, it was listed as
17 specific requirements on the plants that didn't have it.

18 MR. WERMIEL: This may be where it is coming from. I
19 know on Westinghouse plants, they required the same thing.
20 I am told that it was a separate requirement that never really
21 had a label one way or the other, but we have applied it to
22 operating plants and I would assume we are going to apply it
23 to OL's as well.

24 MR. KEITH: We covered it in the additional short term
25 for indication, but nothing about whether it is Class IE or



1 not.

2 MR. WERMIEL: That's right. The wording there is not
3 the same as we have been applying. I think the words there
4 are merely redundant.

5 MR. BINGHAM: That's right. We were just looking at the
6 paragraph here and we wanted to find out where he was coming
7 from.

8 MR. WERMIEL: It is listed here as additional.

9 MR. VAN BRUNT: Are you satisfied with that clarifica-
10 tion?

11 MR. BINGHAM: Well, I am not sure.

12 MR. KEITH: I think Jerry wants to get back and confirm
13 that it is.

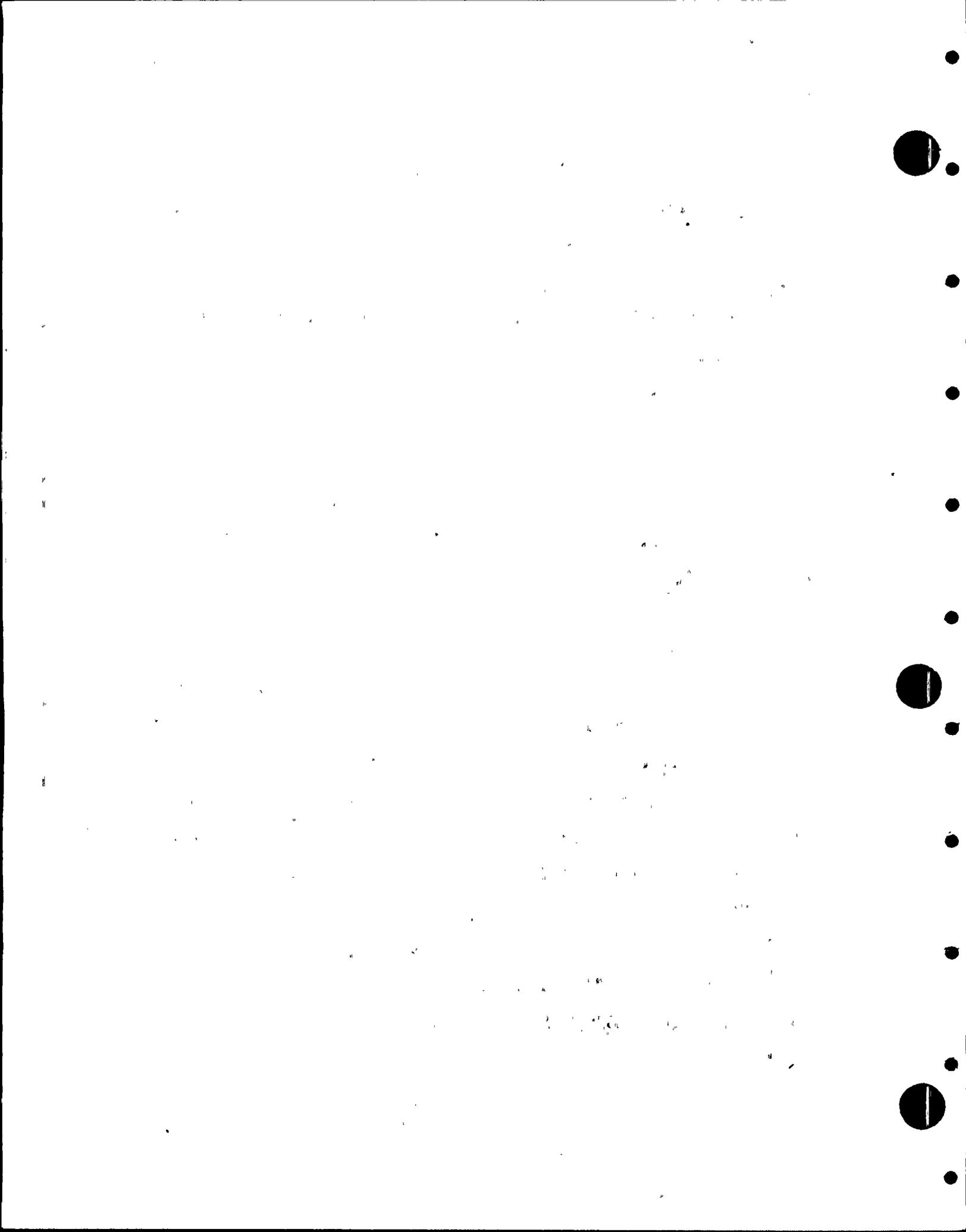
14 MR. VAN BRUNT: Maybe I could ask you if you could
15 clarify this for us.

16 MR. WERMIEL: We have expanded the interpretation
17 presented in the March 10th letter to go beyond the words here
18 to require that the indication not only be merely redundant,
19 but safety grade as well with the redundant IE power circuits.

20 MR. PHELPS: It does show up in the Proposed Draft 2
21 of Reg Guide 1.97 that they want that indication to be Class
22 IE.

23 MR. VAN BRUNT: Are there any other items that you want
24 to raise, Bill? Dennis?

25 MR. BINGHAM: No items.



1 MR. VAN BRUNT: Anybody on the board have any other
2 items they want to raise?

3 (No response.)

4 MR. VAN BRUNT: Then I declare this meeting closed.
5 We will get back here tomorrow morning at 9:00, the same room,
6 and we will have the same arrangements tomorrow.

7 (Thereupon the meeting was at recess.)
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