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SUBJECT: Forwards comments on NUREG-0659, staff suppl to human engineering guide to control room evaluation draft rept.

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J. KRAMER

APR 20 1981

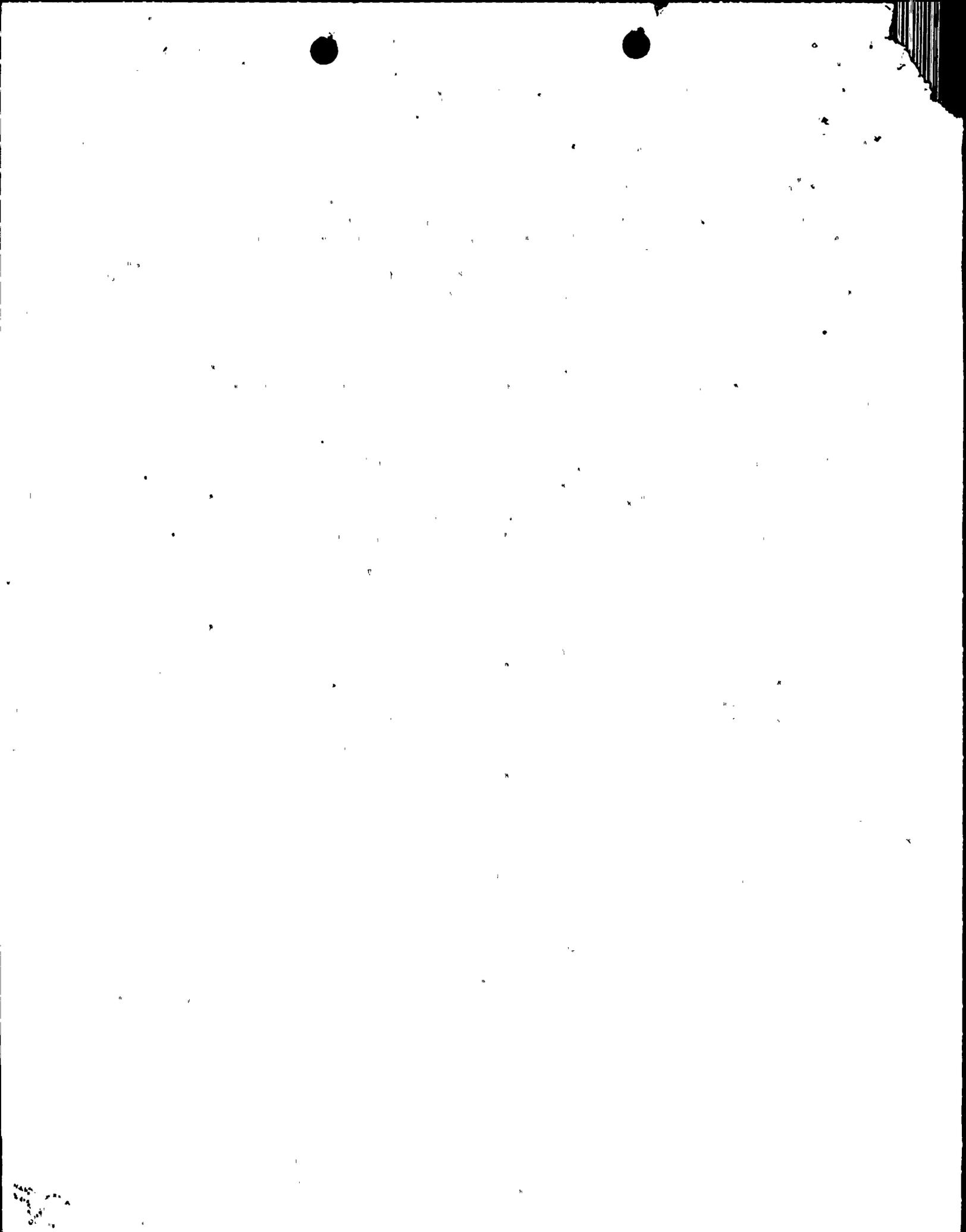
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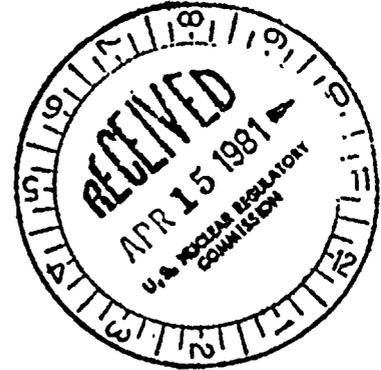
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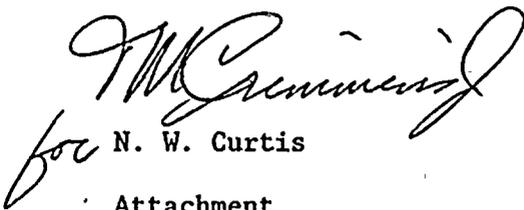
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Mr. Joel Kramer  
Deputy Director  
Division of Human Factors Safety  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555

SUSQUEHANNA SES  
COMMENTS ON NUREG 0659  
ER 100450 FILE 841-2, 227-10  
PLA-717

Dear Mr. Kramer:

Enclosed you will find our comments on NUREG-0659, Staff Supplement to the Human Engineering Guide to Control Room Evaluation Draft Report.

*for*   
N. W. Curtis

Attachment

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J. KRAMER 11

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### General Comments

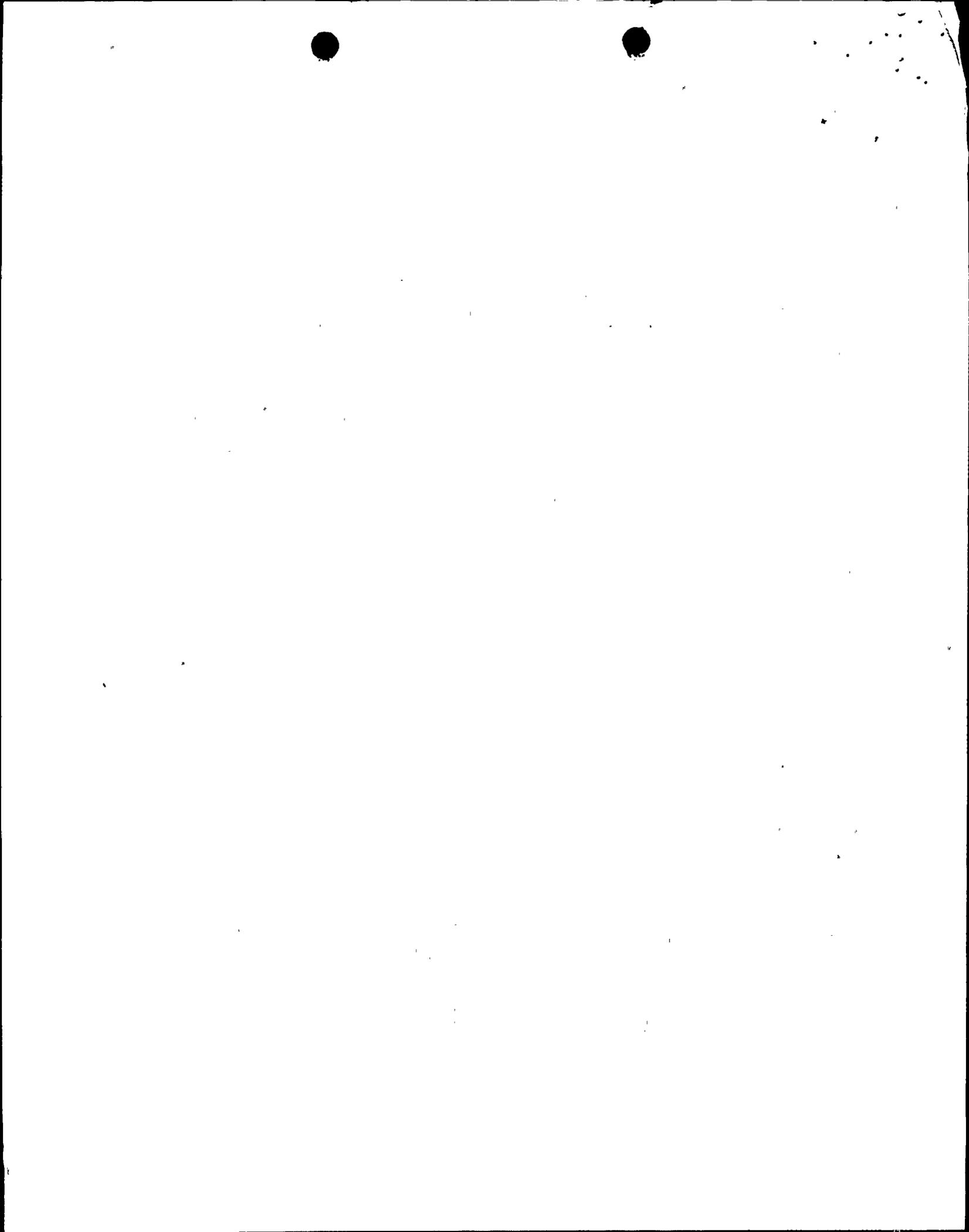
PP&L strongly agrees that the emphasis of NUREG 700 should be towards enhancements. The approach taken for control room reviews is quite practical for plants not yet designed. However, care should be taken not to apply individual criteria to make massive changes to installed equipment without making a thorough investigation of the effect of the change.

Control room reviews can be effectively carried out using the checklist approach. Based on the findings of our short term review, the subsections chosen for the checklist provide for an effective review.

Many sections of the guidelines are missing: We appreciate the opportunity to comment on what is in 0659, and hope we will get ample opportunity to comment on what was left out.

PP&L feels some good human engineering went into the original design of our control room. With the completion of the NUREG 0694 short term review items we should have a well human engineered control room. It is not clear the depth of additional work required to complete NUREG 700 type requirements. We would like some clarification concerning the completion of HED's identified in the NUREG 700 review we would perform. We have a unique position in terms of scheduling and significant changes could impact our fuel load.

The Susquehanna control room was laid out in part based on the results of an "operability analysis". In simple terms, this review consisted of plant, A/E and NSSS supplier taking operating procedures from a similar plant and using them to lay out controls on a mock up of our control panels. We feel that a simple procedure walk through is a great benefit and we support the concept. However, the detailed systems review is much too complex for plants already designed. The danger of second guessing control placement at this stage is very real. Additionally, there is not enough guidance (event if it is possible) to resolve the complexity of laying out a complex nuclear control room so that control placement serves normal and emergency operation. A simpler approach emphasizing the observation of operators going through procedures would be just as effective for completed control rooms.



## GENERAL COMMENTS

1. Under the section on Operating Experience Review (p. IV-3), the personnel survey component is relatively clear. With respect to the records examination component, what structure should be used to organize the content of Licensee Event Reports? Are there limits on the number of LERs that must be reviewed? Are there records other than LERs that should be included?
2. On page IV-8, all plant operating systems and subsystems are to be identified. To what extent should systems and subsystems not under direct control by control room personnel be included? Is nominal mention sufficient except in those cases in which a system or subsystem is found at a later date to bear inclusion? Should nonsafety-related systems be included?
3. The identification of operating events/modes would seem to be a crucial step whereby representative scenarios should be chosen. The potential for generation of an enormous quantity of functional sequence and task analytic tables behoves a careful focus on failure events and normal operations that cover the spectrum of behavior but do not significantly overlap. Particularly at the operator task identification and analysis stage (p. IV-13), an exhaustive and representative set of operator tasks should be included. Should the same procedures that are to be videotaped be subject to subsequent task analyses? Some guidance in terms of an outer boundary for expansion of these analyses should be specified. Limitation of the number of procedures or events will be a step in this direction, however limits should also be placed on the detail of analyses. For example, a subset of events reviewed may be candidate for the level of detail given in Figure 4-3 (p. IV-15) without sacrificing thoroughness. This is especially needed, if general items addressed on p. IV-17 such as workload, arrangement of instrumentation, and task timing are also to be evaluated in walk-throughs at the operator task performance validation stage. The actual observation of videotaped or live scenarios will provide clarification at each step of the analysis from the function identification through operator task performance and procedure performance validation (see Figure 4-1, p. IV-9). To adequately address the entire

system, guidelines should limit the over-analysis at a detailed level to the exclusion of analysis at a global level.

Further, in cases in which procedures provide the starting point for a task analysis care must be taken that the procedures do not bias the analysis such that inadequacies are overlooked at the procedure performance validation step downstream. In other words, when we establish performance criteria based in part on already written procedures for the control room personnel, with later evaluation of the same procedures in mind, we run the risk of circular logic, i.e., committing mistakes already made. This is addressed somewhat on page IV-11.

4. How will design requirements, (p. B-10) be refined to yield performance criteria, i.e, will NRC define techniques to be used to establish performance criteria?

For example, will event trees need to be developed with weighted responses in those cases in which two or more actions could be chosen by the operator (see p. B-15)?

5. How detailed will the human-error analysis be (p. B-25)? This would seem to be a monumental undertaking in view of probabilistic risk assessment models although a simpler approach may be implied.

6. Appendix B in its current form does not clearly describe the scope of systems analytic techniques necessary for the planned control room evaluation.

7. The standards forwarded in NUREG-0659 are generally adequate. However, on occasion the reviewer is forced to make interpretive and judgmental decisions. For example, should all anthropometric data to be used in an evaluation be typical of a 50th percentile male or a 5th percentile female? Shall the reviewer always assume a worst-case condition in evaluating operating conditions? For example, shall alarm levels be 10dB higher than the worst-case ambient noise level? Failure to resolve these questions will result in a variation of reviewing techniques.

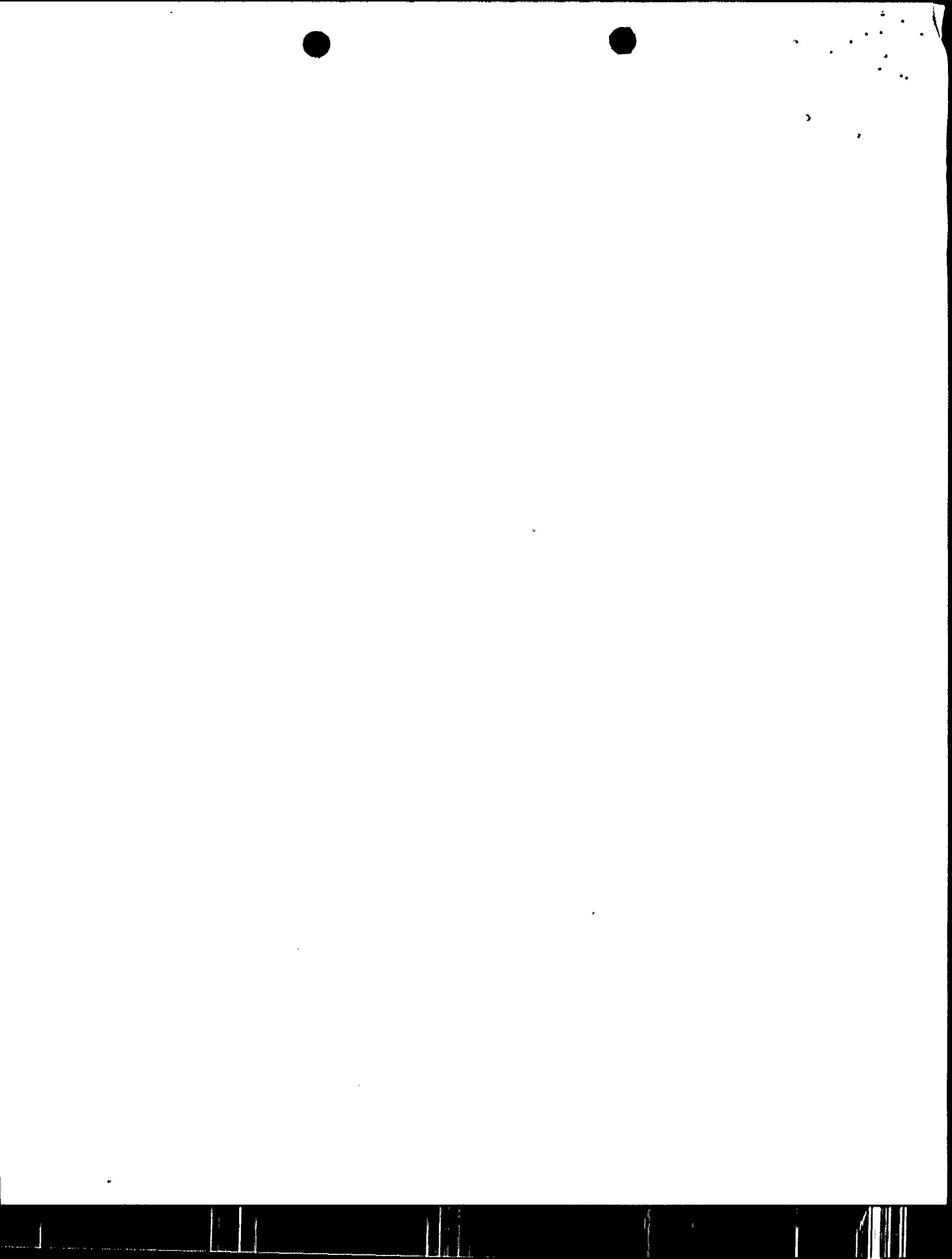
REFERENCE: Standards/Guidelines Conflict

PAGE, ITEM: II-3, B

POSITION: Agree

COMMENTS:

Standards conflict is an important consideration in the development of guidelines. For example, separation requirements oftentimes conflict with control display integration guidelines.



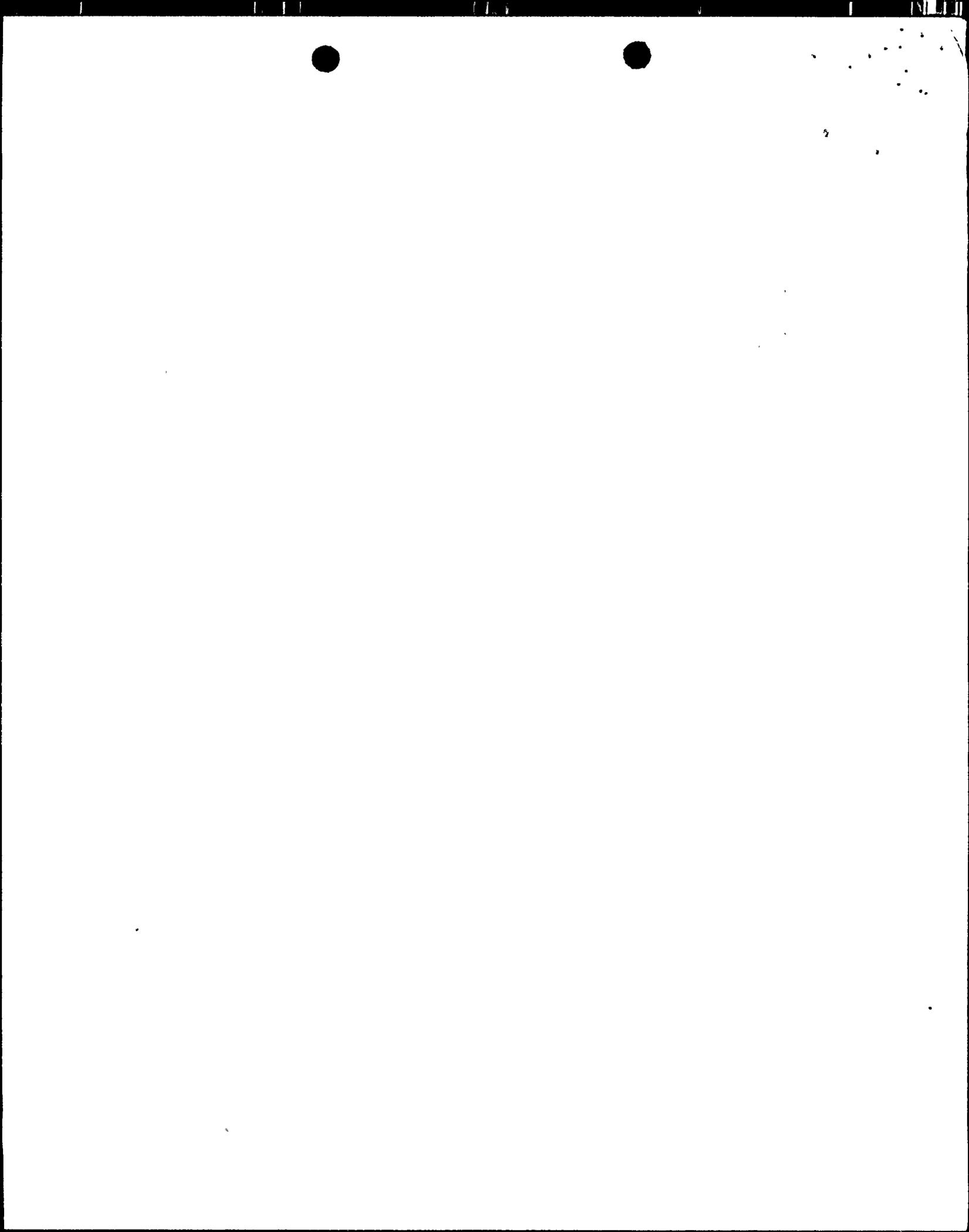
REFERENCE: Extended Guidelines Applications

PAGE, ITEM: II-3, C

POSITION: Agree

COMMENTS:

Utilization of guidelines in other areas (TSC,ERF) is warranted and necessary.



REFERENCE: Review Process Efficiency

PAGE, ITEM: II-6, I

POSITION: Agree

COMMENTS:

Efficiency is desirable in this time-consuming (and correspondingly high-cost) process.

REFERENCE: Review Process Methodology

PAGE, ITEM: II-7, A

POSITION: Disagree

COMMENTS:

It is absolutely essential that specific methodologies for data collection be spelled out in detail to avoid conflicts in interpreting end results. There can be great variation in the data when different methodologies and/or equipment are utilized in the control room review process. While it may not be necessary to specify apparatus by manufacturer, model and serial number, perhaps the necessary specs could be provided and the review team could choose the apparatus that meet these specs.

REFERENCE: Backfit Phase Sequencing

PAGE, ITEM: II-7, B

POSITION: Agree

COMMENTS:

This is the most appropriate sequence especially in terms of satisfying the clients in regard to time and money considerations. It allows operations and engineering inputs into the process, resulting in a discrepancy fix that has been reviewed by all concerned parties.

REFERENCE: Continuous vs. Discrete Review Process

PAGE, ITEM: II-8, C

POSITION: Agree

COMMENTS:

This is an appropriate response; having an "open-ended" review process would probably result in the deferment of deficiency corrections to the last minute.

REFERENCE: Standardization of Evaluation Techniques

PAGE, ITEM: II-9, H

POSITION: Agree

COMMENTS:

This is an appropriate response; the standardization of evaluation techniques may inadvertently preclude the utilization or search for newer and better techniques.

REFERENCE: Definition/Inclusion of Sensory Overload

PAGE, ITEM: II-10, A

POSITION: Agree, See Comment

COMMENTS:

"Sensory overload" should be defined as are the rest of the listed errors.

REFERENCE: Task Analysis Coverage

PAGE, ITEM: II-12, F

POSITION: Agree

COMMENTS:

This comment brings up a good point. The number of operations should be specified; emergency, normal and abnormal operations should be included in this list.

REFERENCE: Videotape Utilization

PAGE, ITEM: II-14, E

POSITION: Agree

COMMENTS:

The excessive use of videotape is questionable, at least until some concrete and specific recommendations are made as to exactly what should be done with the resulting tape.

REFERENCE: Use of Simulator

PAGE, ITEM: II-14, F

POSITION: Disagree

COMMENTS:

Does the simulator have to be an absolute, 100% match in order to be an effective tool in the control room review process? Perhaps the simulator/control room discrepancies could be noted and factored into the data collection process. The videotaping procedures are especially disruptive to the "natural" control room environment; this disruption tends to decrease the realism of the walkthroughs.



REFERENCE: Generic HED's and Generic Solutions

PAGE, ITEM: II-17, B

POSITION: Agree, See Comment

COMMENTS:

Putting emphasis on generic problems may lead to the overlooking of specific detailed problems.

REFERENCE: Prioritization of HED's

PAGE, ITEM: II-17, C

POSITION: Agree

COMMENTS:

The prioritization of HED's should not be done by HFE's independent of operations and engineering inputs. Perhaps the last sentence in the response should take into consideration the interaction of experience and disciplines.

REFERENCE: Color Convention

PAGE, ITEM: II-22, F

POSITION: Agree, See Comment

COMMENTS:

Many color-code conventions (i.e. mimics) are industry derived and are based upon system content (steam, H<sub>2</sub>O, etc.).

REFERENCE: Glare Reduction

PAGE, ITEM: II-25, B

POSITION: Agree

COMMENTS:

Diffusers are probably the most practical and effective means of glare reduction in the CR.

REFERENCE: Maintenance Materials Storage Space

PAGE, ITEM: II-28, H

POSITION: Agree

COMMENTS:

Maintenance materials/equipment storage is indeed a very relevant topic in the control room evaluation.

REFERENCE: Control Coding

PAGE, ITEM: II-35, E

POSITION: Agree, See Comment

COMMENTS:

Shape-coding could also be used to I.D. functionally similar controls.

It would be next to impossible to put all functionally-related controls together in the control room context. If all pump controls were located in one area, and all valve controls were located in another area, the control board layout would not be optimized.

REFERENCE: Control/Display Integration

PAGE, ITEM: II-38

POSITION: Agree

COMMENTS:

The comments and NRC response in this section address a classic conflict: strict hardware engineering concerns vs. HFE considerations. Not much else need be said that the staff response did not mention; their position is clear and correct.

REFERENCE:       Workspace Temperature

PAGE, ITEM:       III-11, 6.2.1.1

POSITION:       Disagree, See Comment

COMMENTS:

Temperature ranges for equipment maintainability should be considered.

REFERENCE: Emergency Lighting

PAGE, ITEM: III-14, 6.2.2.3a

POSITION: Agree

COMMENTS:

Emergency lighting standards should be developed for two cases:

- 1) Where continued operation of the plant is required, the normal lighting levels shall be maintained.
- 2) Where emergency evacuation of the plant is required a lower level of illumination maybe adequate.

Reference: Keyboards

Page/Item: III-47/6.9.1.4d

Position: Disagree

Comments: Equipment suppliers generally provide a standard "QWERTY" arrangement. Not all of these keyboards have the exact dimensions shown, yet are quite easy to use. Ease of use, lack of confusion should be the primary criteria.

Reference: Recording Materials

Page/Item: III-52/6.10.1.0-i, j

Position: Disagree

Comments: Many modern recorders have ink pads or ribbons that would be difficult and costly to modify to give a "positive indication" of "remaining supply". Periodic checking of operability of this equipment is a more reasonable approach.

Reference: Annunciator label size

Page/Item: III-60/7.3.1.1-(4)

Position: Disagree

Comments: The 1 inch height requirement is too strict. Label size should be a function of reading distance among other things. (Some annunciators are designed for use on sitdown panel systems, others are to be viewed across panels etc.) Clearly each control room should be looked at regarding the use of annunciators and label size determined accordingly.

