NUCLEAR SERVICES DEPARTMENT MEMO DRP-80-14

TO: R. A. Hill M/C 682
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FROM: D. R. Pankratz M/C 884
Startup Test Operations

SUBJECT: Comments on NUREG/CR-1580, Draft Report
Human Engineering Guide to Control Room Evaluation

DATE: September 26, 1980

REQUIRED RESPONSE DATE: N/A

FOR: ACTION [X] R. W. FROELICH
DECISION [ ]
INFORMATION [ ]

Whereas this document is intended to be a guideline for control room evaluation, the single most important items, the checklists, are missing. These checklists, along with the evaluation process, should form the basic document for public review and comment. Without checklists, which are as stated in section 3.4 "the primary means for comparing panel design to established human engineering practices", this document falls short of its basic objective of providing specific detailed guidelines for control room evaluation.

What has been provided is merely a compilation of assorted HFE standards, criteria and guidelines which are useful only as a starting point in developing a practical survey checklist. Since this material is generally directly reproduced from existing HFE references, there is no assurance that all control room concerns are adequately addressed. Essex states that "unless a guideline is totally irrelevant to control room design operations, it was included in the guidebook". As a result, while all guidelines provided appear to be valid HFE concerns, not all are pertinent to the task at hand.

To guarantee adequacy and completeness of the checklists, precise selection criteria need to be defined as an objective, documented method of development. This would ensure that all items addressed by the checklists are within the scope of the required survey and would provide a standard against which the assembled checklists could be measured to determine if they adequately accomplish the intended function.

The preface states "the report is a suggested set of guidelines and procedures for control room evaluation, but as such does not directly address all of the design review factors specified in Task I.D of NUREG-0660". The preface further states that final review guidelines will be issued as NUREG-0700. This strongly implies that the final guidelines will be issued containing material not contained in these guidelines that will not have been issued for public review and comment.

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Essex states that "Part I suggests a procedure for applying the guidelines .... and should not be considered as an NRC requirement". With this qualification, there is nothing in Part I that is unacceptable. Detailed comments follow:

1.0 Introduction

The statement that "results show that 15 to 66 percent of plant safety failures are attributable to human failure" is so generalized that it would imply that a determination of specific cause, when operators are involved, is difficult at best. The references used to determine this error rate indicate human error can be ascribed with more certainty.

To state "most of the control rooms designed prior to the TMI accident were not in compliance with human engineering standards and principles" prior to review and evaluation against a minimum established standard may be an unacceptable generalization. An acceptable degree of compliance needs to be established.

2.0 Control Room Evaluation Planning

Extensive advice is provided on necessary preplanning, and is, in general, good. However, the size of the team recommended seems unnecessarily large and employs an unwieldy bureaucracy. A smaller team would be entirely adequate and have less impact on utility operations. The preparation of evaluation material is generic and can be standardized beforehand for a particular product line. To perform a walkthrough of all procedures is unnecessary; a representative sample should suffice.

The team should include both inexperienced, entry-level and experienced, knowledgeable operators to ensure a representative cross-section of personnel is obtained. Operators should also check the task analysis for validity, as well as completeness.

The photographic support is excessive. A mockup is not necessary if a proper evaluation process is prepared. A large, detailed photographic library is not necessary, especially in both color and black-and-white, to accomplish an effective review. A simple photograph of the identified deficiency is sufficient.

3.0 Control Room Evaluation

3.1 Use of a separate evaluation for generic problems is redundant. Items of concern should be incorporated into the main checklists.

3.2 The requirement to interview all operators is excessive; a sample should be sufficient.

The method used to document operator comments for further considerat :n is not well defined. Also, to consider only itemsfrequently mentioned is inadequate. Every concern of every operator interviewed should be addressed and incorporated into the evaluation of the specific checklist items that apply.

Anonymous input should not be recommended.

3.3 Extremely detailed surveys of lighting, noise, etc. are excessive. A more general review is sufficient in which emphasis is placed on effect on operator performance.

A videotaped sequence of donning anti-Cs is not pertinent. An estimate of man-minutes based on Technical Specifications is not meaningful. A better approach would be to first determine habitability requirements based on the control room design as related to defined operator functions.

3.4 The actual checklists, of great significance to the survey process, were not included as previously discussed.

A yes/no evaluation of a checklist leaves no allowance for degree of compliance.

Since the guidelines are derived from several different references, much overlap, redundance and contradiction exists. These questions should be resolved in formulating the actual checklists.

Overemphasis is given to actual numerical values of many specifics such as torque values, panel radii , sound absorption coeffecients and liminance ratios. These are more appropriately considered in the design phase; emphasis should now be placed on their effect on operations.

The sample given in 3.4.3 does not agree with referenced checklist item 9. "System requirements" are not necessarily the same as "provide you with information that is as accurate as you need". The latter can be very subjective.

3.5 The walkthrough need not be performed for all emergency and abnormal operating procedures; a representative sample should be sufficient.

A count of the number of times a component is used is inaccurate at best. A component used only once may have a greater impact on safety than one used numerous times.

The value in videotaping the walkthrough is questionable. The walkthrough should be evaluated against the Task Analysis at the time the walkthrough is performed.

To have the control room operator describe the event prior to its performance will not result in a natural walk-through and demonstrates a lack of understanding on the part of the analysts.

To require a procedure to contain a complete complement of all equipment used could excessively clutter a procedure and detract from its intended function. Only equipment necessary to the task at hand should be included. Guidelines for procedure preparation are necessary.

4.0 Evaluation of Human Engineering Discrepancies

The method of data reduction suggested is overly complex, unwieldy and involves much unnecessary paperwork. Requiring an individual report to be filled out on every discrepancy and delaying judgment on relevance produces a mass of paper. The effect of each item on operation can easily be determined prior to the survey, thereby eliminating unnecessary paper work.

The guidelines require backfit for all items which are safety-related, with decreased emphasis on those which are reliability related. While a categorization of some sort is called for as a basis for modification requirements, the method of division proposed is over-complicated and leaves some doubt as to its efficacy. How can a determination be made of what items in control room are safety-related in all conceivable situations? Are not all control room interfaces safety-related?

Only those items that are both non-compliant and have a high degree of potential for contributing to operator error need to be considered for corrective action.

Cost-effectiveness is more a function of design and engineering than the HED Review Committee.

5.0 Reporting

If properly prepared, items identified as deficiencies in the generic problem analysis and operator interview will have been included in the evaluation of that item in the checklists.