



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS  
WASHINGTON, D. C. 20555

August 18, 1982

Honorable Nunzio J. Palladino  
Chairman  
U. S. Nuclear Regulatory Commission  
Washington, D.C. 20555

Dear Dr. Palladino:

SUBJECT: CONTROL ROOM HABITABILITY

During its 268th meeting, August 12-14, 1982, the Advisory Committee on Reactor Safeguards met with the NRC Staff and representatives of the nuclear power industry to discuss the subject of control room habitability. Emphasized in these discussions were the associated heating, ventilating and air conditioning (HVAC) systems as well as supporting air cleaning systems. These matters had previously been the subject of a meeting of our Reactor Radiological Effects Subcommittee on May 14, 1982. Through means of this letter, we want to acquaint you with our observations and to offer several recommendations for action.

In the early 1970's, the U. S. Atomic Energy Commission arranged to have an extensive onsite inspection and review conducted of air cleaning systems in commercial nuclear power plants. The findings of these efforts, which indicated a number of deficiencies relevant to control room habitability, were published as report WASH-1234. Similar reviews and observations of deficiencies were subsequently reported by the Electric Power Research Institute (see EPRI Report NP-309, March 1977, entitled, "Human Factors Review of Nuclear Power Plant Control Room Design"). Through the impetus of evaluations conducted as a result of the TMI-2 accident, licensees are currently being required to conduct reviews of these and related systems. These reviews, as well as supplemental evaluations conducted by private contractors and consulting organizations, have revealed that control room engineered safety feature HVAC systems continue to exhibit a wide range of deficiencies.

Examples of the problems noted include excessive leakage in air ducts, nonfunctioning and/or leaky air regulating dampers, inadequate access and lighting for system testing, improper air-flow distribution, inoperable equipment for monitoring system performance, and access doors without proper seals and locks. It should be noted that many of the deficiencies observed as a result of the reviews by private organizations are not of a type that require issuance of a Licensee Event Report, although reports of these problems are being written and submitted to plant officials.

Some of these deficiencies could lead to inadequate protection of plant operating personnel in case of an accident. The Committee was told that, in some instances, knowledge of this possibility may have caused an erosion in

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the confidence that plant operators have in the anticipated response and performance of HVAC systems and associated air cleaning equipment in the event of an emergency. This situation could, in turn, lead to impaired performance on the part of these personnel under such circumstances. Compounding these problems is a shortage on the part of both licensees and the NRC staff of personnel who are knowledgeable about HVAC systems, in general, and about nuclear air cleaning technology, in particular.

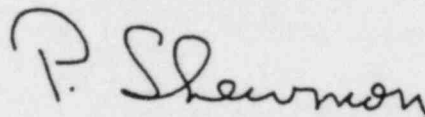
To correct these problems, we recommend the following actions:

1. We urge the implementation of an improved program for testing the adequacy of air flow rates and the leak tightness of control room engineered safety feature HVAC systems. For example, efforts should be made to incorporate into such procedures recently developed improved field testing methods. The assessments should cover the performance of HVAC systems under postulated accident conditions, including measurements in control rooms and other vital areas of the rates of temperature increases and the maximum temperatures that would be reached in case of inadequate air flow.
2. We recommend that laboratory or field tests be conducted to obtain the data necessary for defining the proper locations of control room air intakes and for evaluating the location and performance under emergency conditions of existing control room air intakes for operating nuclear power plants. Such data would appear to be mandatory in the case of standard plant applications. The required studies could be similar to those conducted in conjunction with the manufacturing license application for the Floating Nuclear Power Plant.
3. Because of the potential problems associated with the release of hazardous chemicals near nuclear power plants, studies should be conducted to assess the possible benefits of increasing the minimum thickness and number of layers required in charcoal adsorption beds used in the protective air cleaning systems for control rooms. Such requirements should be closely tied to the precise nature of the anticipated hazards and the characteristics of specific sites.
4. To increase the number of qualified people available to evaluate control room HVAC systems, we recommend that additional members of the NRC Staff be provided technical training in this subject area. The NRC should take steps to assure that similar training is acquired by personnel involved in the design, testing, maintenance, and operation of nuclear power plants.

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5. We recommend that, to the extent possible, steps be taken to make available to the NRC Staff the reports of tests conducted by private industrial and consulting organizations on control room HVAC systems. There appears to be a wealth of useful data available, and we are convinced that the NRC Staff would benefit through having access to it. To expedite this process, consideration might be given to requesting the assistance of an outside organization such as the Institute of Nuclear Power Operations.
6. Data presented to the Committee revealed a wide range in the quality of HVAC components as manufactured and delivered to licensees. This is particularly true with respect to HEPA filters. We believe that the NRC should reconsider its policy not to have the certification of such filters confirmed by one of the test facilities operated by the U. S. Department of Energy.
7. Consideration might also be given to evaluating the degree of prescription that should be included in requirements for the design, construction, maintenance, and operation of control room habitability systems. In this regard, we note that there are no criteria related either to the response time or leak tightness for fire dampers. Similarly, there are no requirements on the reliability of smoke and fire detectors used in control rooms.
8. Lastly, some effort should be directed to conducting failure modes and effects analysis for all systems related to control room habitability. The results of such analyses might prove useful in assigning priorities to the correction of the types of problems noted above.

Sincerely,

P. Shewmon  
Chairman