

UNITED STATES  
NUCLEAR REGULATORY COMMISSION

Washington, D. C. 20545

AUG 11 1983

MEMORANDUM FOR: Carlyle Michelson, Director  
Office for Analysis and Evaluation  
of Operational Data

FROM: Harold R. Denton, Director  
Office of Nuclear Reactor Regulation

SUBJECT: CARBON DIOXIDE SYSTEMS USED FOR FIRE PROTECTION  
IN OR ADJACENT TO CRITICAL AREAS - MEMORANDUM  
DATED JULY 28, 1982

The items identified in the subject memorandum and those in the attached memorandum to R. Vollmer and E. Jordan, dated January 28, 1982, were discussed during an August 24, 1982 meeting attended by K. Seyfrit and F. Ashe of your office and the following from NRR: W. Johnston, V. Benaroya, R. Ferguson, J. Stang and F. Nolan.

As a result of our review and this meeting, we have the following comments relative to the issues you have raised. First, with respect to the four items identified in your July 28, 1982 memorandum:

1. Recognizing the force developed in the Grand Gulf event, was missile generation considered during the reviews of CO<sub>2</sub> use in areas containing equipment required to prevent or mitigate reactor accidents or in areas adjacent to such locations?

NRR Branch Technical Position (BTP) CMEB 9.5.1, Item C.5.3 states that consideration should be given to the "conflicting requirements for venting during CO<sub>2</sub> injecting to prevent overpressurization versus sealing to prevent loss of agent." Applicants and licensees are aware of BTP CMEB 9.5.1 and should therefore consider this potential problem during the design of such systems. However, we do not require or receive the level of detail in the design information submitted by the applicant to allow a meaningful review of the potential of missile generation during CO<sub>2</sub> injection.

The Grand Gulf event is the first incident of this type that we became aware of. As part of our review of Grand Gulf, we did not audit whether the applicant had considered overpressurization in the areas where CO<sub>2</sub> was used as a fire suppressant.

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2. Has the degradation in the performance of solid state devices resulting from exposure to the cooling effect of CO<sub>2</sub> been reviewed? (Many solid state devices are rated for service only to 0°C. The melting point of CO<sub>2</sub> is -56.6°C.)

Item C.5.e of BTP CMEB 9.5.1 also states that consideration should be given to the "possibility of secondary thermal shock (cooling) damage" in conjunction with the planned use of CO<sub>2</sub> suppression systems. The impingement of cold CO<sub>2</sub> on solid state devices and other instrumentation in some tests has generated spurious signals but we are not aware of any component failures. This potential problem has been brought to applicants' attention verbally on several occasions, however, it has not been part of our official audit review.

3. Has the effect of rapid abandonment of the control room in the event of CO<sub>2</sub> actuation been reviewed? Can accidents resulting from the need for CO<sub>2</sub> operation (or perhaps caused by it) be adequately controlled in such cases?

NRR has not, as yet, approved CO<sub>2</sub> fire suppression systems for use in the general control room area. Our current guidelines prohibit such use in the future. However, the use of a CO<sub>2</sub> fire suppression system is under consideration at the Perry facility for application in enclosed instrument cabinets, panels and cable chases located in the control room floor and walls (PGCC system). In these applications, some limited leakage of CO<sub>2</sub> into the control room is expected to occur. For us to approve this system, the applicant has to demonstrate that the concentration of CO<sub>2</sub> will meet the guideline of Regulatory Guide 1.78, "Assumptions for Evaluating the Habitability of Nuclear Power Plant Control Room During Postulated Hazardous Chemical Release," and our guidelines delineated in BTP CMEB 9.5.1, paragraph C.5.3.

4. Has the possibility of CO<sub>2</sub> entry into the ventilation system and its effect on personnel in other plant areas been considered?

CO<sub>2</sub> suppression systems may be approved for application in many areas, such as, diesel generator rooms, MG room, battery rooms or computer room. In these applications, the licensee needs to demonstrate that leakage from such rooms will not affect the habitability of those adjacent areas of the facility. With regard to personnel entry into confined rooms that employ automatic CO<sub>2</sub> suppression systems, BTP 9.5.1, Item C.5.e, recommends a predischARGE alarm system and a CO<sub>2</sub> discharge delay to permit personnel egress. These features are a part of our review process for approval of CO<sub>2</sub> systems.

In summary, items 1 and 2 have not been a part of our review of fire protection features. In the future, however, we will determine if these potential hazards have been considered in the fire protection design process. Items 3 and 4 are part of our review where CO<sub>2</sub> systems are used.

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Finally, in your January 28, 1982 memorandum you identified concern over the potential inadvertent activation of liquid fire suppression systems and subsequent loss of or damage to safety related equipment. We have reviewed licensee event reports relating to system interaction occurrences that were experienced over the past several years. Based on this review, it appears that some licensees have not implemented our guidelines properly, and thus have designs that have the potential for such interactions. We are developing a document appropriate for use as an IE bulletin or circular which will discuss these events and recommend steps to prevent future such occurrences. This effort is expected to be completed in the near future. We will send you a copy at that time.



Harold R. Denton, Director  
Office of Nuclear Reactor Regulation

Enclosure:  
Memo to R. Vol'ner and E. Jordan  
Dated Jan. 28, 1982