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To: S. Basu, US NRC Office of Nuclear Reactor Regulatory Research

From. P.L. Lagus, Ph.D. CIH

Subject: Comments on Draft Regulatory Guide DG-1087

I have reviewed the above mentioned Draft Regulatory Guide and find that the portion dealing with air inleakage into control rooms does not take into account the most current information regarding this issue. An ASTM Standard (ASTM E741) that uses tracer gas techniques to quantify air exchange under actual operating conditions has been in existence since 1980. This ASTM standard and the associated technology have been used extensively in diverse fields of endeavor to quantify actual air exchange rates in many hundreds (and perhaps, by this time, thousands) of structures.

Over the course of the last ten years seventeen nuclear power plant control rooms have been tested for unfiltered air inleakage using tracer gas techniques with the control room emergency ventilation systems in operation. Upon initial testing no emergency ventilation system exhibited a value of unfiltered inleakage less than or equal to that assumed in the respective plant habitability analyses for radiation dose.

Coincidentally five plants have measured air inleakage when operating in a recirculation mode. One of these plants consisting of two physically separated control rooms also has had its air inleakage measured when operating in normal mode. The measured data are summarized in the attached Table 1. As can be seen, these data are inconsistent with the values for air exchange presented in Table 2 of the Draft Guide. There does not appear to be any physical basis for the air exchange values provided in Table 2. Contrary to the statement in Table 2, based on the measured data, an air exchange of 0.06 for Type B control rooms is *not* typical of the control rooms measured to date.

Further, it is unlikely that many of the current crop of control rooms could possibly be Type A. An air exchange rate of 0.015 in a 50,000 cubic foot control room implies 12.5 CFM of fresh air. If 12 persons occupy the control room, only 1 CFM of fresh air per person is being delivered. During the time the majority of existing plants were constructed the ASHRAE guidance for outside air varied between 5 CFM and 20 CFM per person. At the very least CO2 buildup becomes a concern at these low rates.

As a first estimate for a Type C control room (normal mode, non-isolated) one can use the measured normal makeup (fresh air supply) flowrate per hour divided by the volume of the control room envelope.

Thus in all three cases, reference to Types A, B, and C should be eliminated and more realistic values used.

E-RIDS = ADM-03
Add = S. BASU (SXB2)
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In Section 3.4, the use of a 1/8 inch differential pressure to calculate inleakage is suggested. No guidance is provided as to how one calculates inleakage. Often inleakage is engendered in sections of ductwork that experience differential pressures in excess of 1 in. w.g. Thus, the use of 1/8 in w.g. is unrealistic. Further, use of the 1/8 inch pressure is useless unless some estimate of leakage area is also available. No guidance is given as to how a value for this area can be obtained. Both the available leakage area and the distribution of leakage area can influence the actual air inleakage. Note that the differential pressures that may cause air inleakage during operation in the Recirculation Mode are not solely unidirectional, but can be both positive and negative with respect to the control room depending on the operating characteristics and physical location of the control room emergency ventilation system as well on the operation of adjacent ventilation systems. This entire discussion is naïve and unrealistic and does not belong in a Regulatory Guide.

Note also that the ASTM Standard that deals with the use of pressurization testing (ASTM E779) explicitly states that one cannot obtain natural air exchange rates from pressurization measurement data. Thus not only is there no technically defensible *calculational* method to use a 1/8 inch pressure differential to obtain air exchange, there is no technically defensible *measurement* technique that will provide these data.

Further in Section 3.4 and again in the appendix it is suggested that periodic testing be undertaken for control rooms that exhibit air exchange rates of less than 0.06. No guidance is provided as to how this testing is to be accomplished. Further in this section it claims that an air exchange of less than 0.06 is considered low, yet in Table 2 an air exchange rate of 0.06 is considered typical. The wording does not appear to be consistent. Is one to assume that once a control room passes below 0.06 it changes from typical to low?

At the very least, reference should be made to the ASTM Standard that is presently used to characterize air inleakage rates under actual operating conditions of ventilation systems. Data obtained from periodic testing (or any type of testing) based on standardized techniques is preferable to data that are obtained using an ad hoc and unrealistic test such as is implied in the Draft Guide.

Table 1

Measured Air Exchange Rates for Control Rooms Operating in the Recirculation Mode

| Plant | Air Exchange Rate (ACH) |
|---|---|
| A | 0.076 |
| A | 0.087 |
| B | 0.001 |
| C | 0.74 |
| C | 0.70 |
| D | 0.192 to 0.338* |
| E | 0.072 |
| E | 0.082 |
| F (normal mode) | 0.62 |
| F (normal mode) | 0.61 |

* Differing values obtained by varying adjoining room pressure conditions.