RECORD #168

TITLE: Enforcemtn of 10 CFR 20.401

FICHE: 68723-278

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

January 13, 1987

Bob —
interpretations
file
Jim

MEMORANDUM FOR: Phillip F. McKee, Chief
Operating Reactor Programs Branch
Division of Inspection Programs
Office of Inspection and Enforcement

FROM: James Lieberman, Assistant General Counsel
for Enforcement
Office of the General Counsel

SUBJECT: ENFORCEMENT OF 10 C.F.R. § 20.401

In your recent memorandum you asked for our views on the enforceability of certain aspects of 10 C.F.R. § 20.401, specifically whether the regulation requires a licensee to follow the instructions on Form 5 which is referenced in the regulation.

> Section 20.401(a) of 10 C.F.R. Part 20 provides that:
>
> Each licensee shall maintain records showing the radiation exposures of all individuals for whom personnel monitoring is required under § 20.202 of the regulations in this part. Such records shall be kept on Form NRC-5, in accordance with the instructions contained in that form or on clear and legible records containing all the information required by Form NRC-5.

These records are required to establish compliance with 10 CFR 20.101(a), which provides that:

> ...no licensee shall possess, use, or transfer licensed material in such a manner as to cause any individual in a restricted area to receive in any period of one calendar quarter from radioactive material and other sources of radiation a total occupational dose in excess of the standards specified in the following table:
>
> REMS PER CALENDAR QUARTER
>
> 1. Whole body; head and trunk; active bloodforming organs; lens of eyes; or gonads.....1¼

2. Hands and forearms; feet and ankles.....$18\frac{3}{4}$

3. Skin of whole body.....$7\frac{1}{2}$

Item 5 on form NRC-5 requires the licensee to indicate whether the dose being recorded is for the whole body or another category; other sections of the form require the period of exposure, the specific type of dose received and a running total for the calendar quarter.

The instructions for Item 5 on the back of the Form NRC-5 state that the dose to the whole body "shall be deemed" (in accordance with 10 C.F.R. § 20.101) to include any dose to the lens of the eye. The instructions go on to indicate:

> Unless the lenses of the eyes are protected with eye shields, dose recorded as whole body dose should include the dose delivered through a tissue equivalent absorber having a thickness of 300 mg/cm^2 or less. When the lenses of the eyes are protected with eye shields having a tissue equivalent thickness of a least 700 mg/cm^2, dose recorded as whole body dose should include the dose delivered through a tissue equivalent absorber having a thickness of 1,000 mg/cm^2 less.

(Emphasis added.) It may be noted that use of the word "should" is not confined to the instructions for Item 5. Elsewhere, for example, the instructions state "The period of exposure should specify the day the measurement of that exposure was initiated and the day on which it was terminated."

The question of whether a licensee is required to follow these instructions was raised when NRC inspectors found that a licensee, in circumstances where lenses of eyes were not shielded to the extent of the protection factor specified in the Instructions to Form 5, were still calculating exposures as if the lenses of the eyes were so protected. After reviewing the licensee's records, the NRC inspectors determined that using the licensee's method to calculate exposures, for the worst case, the whole body dose could have been underestimated by 12 percent.

The licensee was cited for not accurately recording whole body doses as required by 10 C.F.R. § 20.401. The licensee disputed the violation, asserting that although dose to the lens of the eye is required to be measured as a whole body dose, use of the word "should" in the two sentences of the instructions for Item 5 make these methods of ensuring compliance optional rather than mandatory.

In our view, the position taken by the Region in citing the licensee in this case is supportable. 10 C.F.R. § 20.401 requires that a licensee maintain records of radiation exposure of all individuals for whom monitoring is required. Although not stated, implicit in this requirement is that the records maintained accurately reflect the dose received by an individual. The instructions on Form 5 dealing with exposure to the lens of the eye are alternative descriptions of what constitutes an exposure to the lens of the eye depending upon whether shielding of a specified protective factor has been used. If eye shields of the specified amount are not used by the licensee, but the licensee still calculates that the dose to the lens of the eye is that which occurs if such protection is used, then the licensee is not developing and maintaining accurate records of exposure as required by 10 C.F.R. § 20.401, and potentially, is not limiting exposures to workers as required by 10 C.F.R. § 20.101. Consequently, the citation made by Region II in this case would be correct.

We have provided a few comments on the draft Information Notice included with your memorandum.

James Lieberman, Assistant General Counsel
for Enforcement
Office of the General Counsel

Attachment:
As stated

DRAFT

SSINS No.: 6835
IN 86-XX

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
WASHINGTON, D.C. 20555

August , 1986

IE INFORMATION NOTICE NO. 86-XX: NRC FORM-5 INSTRUCTIONS FOR ASSESSMENT OF WHOLE BODY EXPOSURES

Addressees:

All nuclear power reactor facilities holding an operating license (OL) or a construction permit (CP).

Purpose:

This notice is provided to alert licensees to a problem in the methodologies used by some licensees to evaluate dose to the whole body from ionizing radiation as measured by personnel monitoring devices. When assessing whole body exposures, some licensees are not considering that, unless properly shielded, the lens of the eyes may be the dose limiting part of the whole body (as defined by 10 CFR part 20). This information is intended to assist licensees in properly determining the tissue equivalent thickness at which whole body dose should be determined.

It is expected that recipients will review the information provided for applicability and consider actions, if appropriate, to preclude similar problems with their dosimetry programs. Suggestions contained in this Information Notice do not constitute NRC requirements, and, therefore, no specific action or written response is required.

Description of Circumstances:

10 CFR 20.401(a) requires each licensee to maintain records showing the radiation exposures of all individuals for whom personnel monitoring is required by 10 CFR 20.202, and that such records be kept on Form NRC-5 or equivalent in accordance with the instruction contained in that form. Form NRC-5, Item 5 requires that unless the lenses of the eyes are protected with eye shields having a tissue equivalent thickness of at least 700 mg/cm^2, dose recorded as whole body dose should include the dose delivered through a tissue equivalent absorber of 300 mg/cm^2 or less. When the lenses of the eyes are protected with eye shields having a tissue equivalent thickness of at least 700 mg/cm^2, whole body dose should include dose delivered through a tissue equivalent absorber having a density thickness of 1000 mg/cm^2 or less.

~~Recent NRC inspections have identified a number of cases in which nuclear power plant licensees have assessed whole body dose to ionizing radiation through a tissue equivalent absorber having a density thickness of 1000 milligrams per square centimeter (mg/cm²) when the lenses of the eyes were not shielded with material having a density thickness of a least 700 mg/cm². Such practices may lead to a significant underestimation of whole body dose assigned a worker.~~

Inspections have indicated that some licensees have assessed radiation worker whole body exposure as delivered through a tissue equivalent absorber of 1000 mg/cm² when shielding provided for the lenses of the eyes did not meet the 700 mg/cm² criterion stipulated by Form NRC-5 instructions. The licensee believed that if their personnel were required to wear safety glasses while in the Radiation Control Area of the facility, the lenses of the eyes were adequately shielded from beta radiation.

Discussion:

In general, the density thicknesses of safety glasses fall considerably short of the 700 mg/cm² required by Form NRC-5. The same is true for respirator face lenses, for while having a density thickness usually greater than safety glasses, they still fail to meet the specified criterion.

Some licensees have also failed to recognize this problem due to an assumption that since their own or contractor TLD processor was accredited under the National Voluntary Laboratory Accreditation Program (NVLAP) dose assigned from TLD readings met regulatory requirements. The NVLAP tests involve interpretation of the response of irradiated personnel monitoring devices to assess the shallow and deep absorbed dose at 7 mg/cm² and 1000 mg/cm². No tests are included for the dose equivalent at the nominal depth of the lenses of the eyes (300 mg/cm²). ANSI N13.11-1983, American National Standard for Dosimetry - Personnel Dosimetry Performance - Criteria for Testing, Appendix C, Paragraph C2.2 states: "The choice of assigning skin and deep-seated organ dose equivalent (or absorbed dose) only partially satisfies the requirements of the Nuclear Regulatory Commission. The reason is that, for radiation incident on the face of a worker, the dose equivalent (absorbed dose) to the lenses of the eyes, located at a nominal depth of 0.3 cm, may be underestimated below approximately 40 kiloelectronvolts when obtained as deep dose equivalent (absorbed dose)."

The density thickness at which whole body exposure is assessed is further complicated by the fact that some manufacturers of thermoluminescent dosimetry (TLD) systems do not normally provide an appropriate density thickness of shielding material in the TLD badge for assessing dose delivered through a 300 mg/cm² absorber. In such circumstances, the licensee must develop other means for insuring that the worker's whole body dose is assessed in accordance with Form NRC-5 instructions.

The whole body dose contribution measured between 300 mg/cm² and 1000 mg/cm² derives primarily from two sources, high energy beta radiation and low energy gamma radiation. A number of licensees have initiated studies to characterize the unique beta spectrum at their facility. Results from these studies have shown that while the majority of the beta radiation field is attenuated by an absorber of 300 mg/cm², a significant and readily measurable component of the beta field penetrates to a density thickness greater than 300 mg/cm² and, consequently, will contribute to whole body dose. It is expected that the extent of the contribution from this fraction will vary from facility to facility and from component to component within a facility since it is known that radionuclide distributions are not constant. Some examples of radionuclides with maximum beta energy capable of penetrating a density thickness greater than 300 mg/cm² are cesium-134, cesium-137, cobalt-60, strontium-89 and strontium/yttrium-90.

While the ideal situation may be one in which the TLD is capable of providing whole body dose at 300 mg/cm², this may be economically impractical or even undesirable for licensees who already have TLD systems in operation. Methods other than direct measurement are acceptable provided it can be demonstrated that a worker's whole body exposure is being determined in accordance with the instructions of Form NRC-5.

No specific action or written response is required by this information notice. If you have any questions about this matter, please contact the Regional Administrator of the appropriate regional office or this office.

Edward L. Jordan, Director
Division of Emergency Preparedness
and Engineering Response
Office of Inspection and Enforcement

Technical Contact:

Attachment: List of Recently Issued IE Information Notices