Bethlehem Steel Corporation

BETHLEHEM, PA 18016

A. E. MOFFITT, JR., Sc. D.
MANAGER OF
ENVIRONMENTAL HEALTH

BETHLEHEM STEEL

DOCKET NUMBER
PROPOSED RULE PR-20 (39)
(45 FR 20493)

June 24, 1980

DOCKETED
USNRC
JUN 26 1980
Office of the Secretary
Docketing & Service
Branch
mdv

Secretary of the Commission
U. S. Nuclear Regulatory Commission
Washington, DC 20555

Attn: Docketing and Service Branch

Dear Sir:

This is in response to the Advance Notice of Rulemaking on Certification of Personnel Dosimetry Processors, published in the March 28, 1980 Federal Register, Volume 45, page 20493.

Bethlehem Steel Corporation requests that the attached comments regarding this proposed rulemaking be included in the hearing record and that they be given serious consideration in the development of any permanent rulemaking on this matter. Our written comments are significantly different from those presented at the May 28, 29, 1980 public meeting and should be carefully reviewed to obtain a complete understanding of Bethlehem Steel's position on this matter.

Sincerely yours,

A. E Moffitt Jr

A. E. Moffitt, Jr., Sc.D.
Manager of Environmental Health

Enclosure

Acknowledged by card. 6/26/80. mdv..

2-4-1, Pt. 20

8007150004

Concerning the U. S. Nuclear Regulatory Commission's Advance Notice of Rulemaking on Certification of Personnel Dosimeter Processors as published in the Federal Register on Friday, March 28, 1980, Pages 20493-20496

Bethlehem Steel does not believe that the Nuclear Regulatory Commission has adequately demonstrated that a need exists for a personnel dosimetry testing and certification program. If adopted, this program would have negligible impact on the reduction of worker exposure which is, after all, the purpose of the regulatory process, but it would significantly increase monitoring costs.

The traditionally accepted philosophy of personnel monitoring, which has been developed by both the ICRP and NCRP, is that the results of monitoring are estimates of surface exposure which permit a reasonable assessment of skin dose, and to a lesser accuracy, internal organ dose. Personnel monitoring was never intended to be a highly accurate dose determining methodology as is possible through the techniques used in radiobiological dosimetry. This is evident from the acceptability of rather crude quality factors used by health physicists for personnel monitoring purposes, as compared to the more accurate RBE's used by the radiobiologist. Thus, to cite the improper use of personnel dosimetry data in epidemiological studies as an argument in favor of the proposed rulemaking is invalid.

NCRP recommendations speak in terms of $\pm$30% accuracy at dose levels in the range of 400 millirem a month and $\pm$ 100% accuracies in the range of 100 millirem a month. ICRP recommendations speak in terms of accuracies of $\pm$ 1000 millirem at dose levels of less than 2000 millirem ($\pm$ 50%).

The results of the University of Michigan Pilot Study indicate that only 19% of the dosimeter results in all intervals of the category tests were within the $\pm$ 30% criteria and only 32% were within the $\pm$ 50% criteria. No estimates were made for the $\pm$ 100 % range.

An important question at this point concerns the major reasons for the apparent poor results. The Nuclear Regulatory Commission has chosen to place the major portion of the blame on the processors. We suggest that the answer is not that simple. In the above referenced Federal Register notice, the Nuclear Regulatory Commission lists four major causes:

1. Inadequate calibration sources;
2. Variability in the TLD chips;
3. Clerical errors;
4. Lack of effort on the part of processors to make the changes necessary to pass the tests.

We feel this is a simplistic response to a many faceted question.

The University of Michigan, in an impact report on the Pilot Study, also suggests four major causes from which, we assume, the Nuclear Regulatory Commission developed the above listing. Our comments on these major causes are presented below.

1. The calibration sources chosen in the proposed ANSI Standard, which would be adopted by the proposed rulemaking, were not typical of those in use throughout the industry, and are not typical of the sources of exposure to which monitoring badges are routinely exposed. Consequently, calculated correction factors had to be developed, which were subject to error. Some examples of such errors are those associated with secondary high energy electron irradiation of a dosimeter due to the close irradiation geometry of the Cobalt 60 source. This is not a factor where Cesium 137 is used as the calibration source. The high beta energy of the Strontium-Yttrium source can be misinterpreted as a gamma exposure by many badges. The Californium neutron source is atypical of the neutron spectrum experienced by most badges worn around reactors.

Furthermore, good routine personnel dosimetry mandates that processors know both the type of radiation and the energy range of the radiation to which each badge has been exposed. This permits a more accurate estimation of personnel dose. If processors have developed systems of dosimetry which are based on the good health physics practice of knowing the type of radiation and the energy range of the radiation, it is both illogical and unfair to demand that the type of radiation and the energy range not be identified to the processor. The proposed ANSI Standard requires that the energy range and the type of radiation not be made known to the processor.

Additionally, it should be understood that estimation of depth dose does not involve a high degree of accuracy. It is analogous to a surveyor developing a topographical map and recording elevations to the nearest one-one hundredth of a foot. A mere pebble will change the elevation by several one-hundredths of a foot.

A personnel dosimetry badge is only a part of a total radiation control program. It is used primarily as a signal to trigger a response in the program when exposures to badges exceed predetermined action levels which are much lower than the regulatory dose limits.

The variations present in the dosimeter itself, the environment, the geometry of exposure, and the energy degradation of the radiation due to scatter have little in common with dosimeters irradiated under uniform conditions in a laboratory at a fixed distance and geometry. A requirement that correction factors developed under laboratory conditions must be applied to field exposed dosimeters is not only unrealistic but poor health physics practice. Furthermore, correction factors have been developed for specific types of radiation at discrete energies; whereas there are no realistic data for correction factors for mixed radiation fields having a mixed spectrum of energies. It is, therefore, meaningless to attempt to use the factors presented

in the draft ANSI Standard to evaluate actual exposures.

2. A conclusion drawn from the Pilot Study was that individual TLD chips do not respond uniformly from batch to batch and that individual calibration factors must be determined for each dosimeter if the accuracies of the proposed ANSI Standard are to be met. This is a problem that must be considered by dosimeter processors, as well as such manufacturing quality control defects as incorrect phosphors.

Consideration must also be given to the degree of hazard associated with the doses being monitored, and whether or not the degree of risk justifies the significantly increased costs that will be required by the program proposed by the Nuclear Regulatory Commission. The NCRP states in Publication 43:

> "The NCRP continues to hold the view that risk estimates for radiogenic cancers at low doses and low dose rates derived on the basis of linear (proportional) extrapolation from the rising portions of the dose-incidence curves at high doses and high dose rates, as described and discussed in subsequent sections of this report, cannot be expected to provide realistic estimates of the actual risks from low level, low-LET radiations, and have such a high probability of overestimating the actual risk as to be of only marginal value, if any, for purposes of realistic risk-benefit evaluation."
>
> and
>
> "Before considering any further restriction of radiation protection standards, it is important to attain realistic values for risks and benefits, for weighing risks and benefits in decision-making, and for the most effective application of the principle of 'lowest practicable level'. This approach is important in order to avoid the expenditure of large amounts of limited resources of society to reduce very small risks still further with possible concomitant increase in risks of other hazards or consequent lack of attention to existing greater risks."

In the above statement, it is clear that the NCRP was not restricting its comments to the reduction of exposure limits, but rather, was addressing

the entire standards development process.

While we recognize the NCRP caution concerning risk benefit analysis, we are also aware that this is the only process available which can show the excessive cost impact of the proposed rulemaking. Therefore, the following is presented as an example of the cost-benefit imbalance.

On the basis of EPA published data of average annual occupational exposure levels (.35 Rem), an assumed exposed population of 1,300,000 workers and using a leukemia incidence rate of 2 cases per year per million man Rem as suggested in BIER and UNSCEAR reports, one can arrive at a total of less than 1 leukemia per year (.91). It follows that one would expect to find 36 excess leukemia cases over a 40-year period in a population which is expected to develop 13,320 cases of spontaneous leukemia not associated with radiation exposure. The 36 excess cases are within the normal limits of variability, since one standard deviation of the 13.320 leukemia cases, assuming a Poisson distribution, is 115 cases. Thus, it can be concluded that no excess leukemias would be evident in the workforce due to average occupational radiation exposure.

Under the proposed Nuclear Regulatory Commission testing and certification program, Bethlehem will be forced to increase its costs from about $6500 per year in manpower and capital costs to about $48,000 the first year, and $10,000 on a recurring annual basis. This amounts to almost tripling our personnel monitoring costs when these expenses are evaluated over a 5-year period; a very significant cost increase ($11,100 per year average) especially when considered in the light of very negligible increases in benefits to our employees. It must also be kept in mind that these added costs would be in addition to the large expenditures already required for Bethlehem Steel to comply with the magnitude of governmental regulations already in effect.

Let it be assumed that changes in the radiation control program resulting from compliance with the testing and certification program caused worker exposure to be reduced by 90% which is an unrealistically high assumption for the purpose of maximizing the calculated benefit. Bethlehem presently has approximately 570 workers receiving less than 100 millirem per year and approximately 30 workers receiving less than 1000 millirem per year. These doses would be reduced to 10 and 100 millirem per year, respectively which result in a total of 8.7 man Rem. Using BEIR and UNSCEAR data, it can be calculated that a total of 1.7×10^{-5} leukemia per year would result due to the 8.7 man Rem. Taking the projected increased annual cost due to the certification program ($11,100), it can be shown that the cost per leukemia prevented is $650,000,000. The Nuclear Regulatory Commission cannot justify program costs with this degree of economic impact.

3. Clerical errors were found in the reporting of doses, especially accident doses. The Nuclear Regulatory Commssion staff has attempted to make this type of error seem horrendous. When our employees have a likelihood of even approaching an annual whole body dose of 5000 millirem, they are required to wear self-reading pocket dosimeters with a maximum range of 200 millirem. This being the case, we would know in advance that a worker had a potentially high exposure because of his pocket dosimeter reading. In the case of the University of Michigan Pilot Study, processors were operating totally in the dark. If anything, this situation points out the need to provide the processor with additional necessary information such as the expected dose range and the energy or type of radiation.

4. Bethlehem did not make an attempt to calibrate for accident doses. This was due to the fact that participation was in a voluntary study to evaluate the adequacy of the draft ANSI Standard. Spending funds for a calibration source with the necessary activity to irradiate dosimeters with doses of 10-800 Rem could not be justified, when it was possible that this requirement would be changed. This is especially significant when we do not experience these doses in our program. Bethlehem's highest annual cumulative exposures are less than 1 rem, with 95% of the annual exposures being less than 100 millirem. Therefore, a separate program would be required to adequately estimate doses at higher ranges. While bare TLD may have a linear dose response, we have found that TLD in our specific badge does not. The University of Michigan Pilot Study asked that we accurately estimate doses which are foreign to our program and dosimetry requirements.

High range exposures may also leave a residual dose on TLD dosimeters which would result in erroneous exposure evaluations on future personnel exposures, or require destroying dosimeters which cost $6.00 each.

It is obvious from our experience that there are understandable reasons why some processors chose not to make costly changes to comply with a draft ANSI Standard in a pilot study being conducted to test the adequacy of the draft Standard.

The Nuclear Regulatory Commission staff in the Federal Register notice uses the argument that because (a) one processor, through changes made in his program, was able to greatly improve his performance, (b) at least one processor passed each category, and (c) one processor passed all 8 categories, general conformance with the standard is attainable.

Such a conclusion is questionable on several points. First, the primary goal of the

University of Michigan Pilot Study was to test the draft ANSI Standard. The Nuclear Regulatory Commission staff consistently ignores this point throughout the Advance Notice. The fact that only 35% of the category tests were passed in the second part of the study, and only one processor was able to pass all categories should indicate potential deficiencies in the draft ANSI Standard. Second, hopefully, the goal of the Nuclear Regulatory Commission is not just to have processors make laboratory changes so that they can comply with a standard; but, rather to upgrade the meaningfulness of recorded personnel exposures. As we have pointed out, the correction factors proposed by the draft ANSI Standard do not reflect the conditions normally encountered in the field.

We, therefore, recommend that a testing and certification program for personnel dosimetry processors should not be promulgated by the U. S. Nuclear Regulatory Commission. We suggest instead that the required regulatory needs can be adequately met through the normal inspection program of licensees.

Existing regulations (10 CFR 20.401) require that licensees maintain certain records pertaining to personnel monitoring. . simple amendment to these regulations could be promulgated which would require licensees to maintain an up-to-date description of their processors' personnel dosimetry procedures, including such items as:

1. Type and manufacturer of dosimeters,
2. Calibration procedures, including a calibration quality assurance program,
3. Distribution methods,
4. Analysis procedures, including a quality assurance program of the analysis procedures,
5. Dose assignment procedures, including a description of the program to assure that the doses are assigned accurately both quantitatively and individually.

This would have a minor impact on in-house processors. For licensees using commercial processors, the commercial processor could file his program with the Nuclear Regulatory Commission and have it generically approved or, provide the licensee with a

description of the program for the licensee's files.

Our recommended approach to this matter would result in more effective personnel dosimetry procedures, and at the same time generate the least cost impact on processors and the Federal Government.