

Health Physics of the NTS

Neutron Personnel Dosimetry at the NTS

Impact of Changes to 10 CFR 835
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Health Service Partnership
NNSA

Health Physics of the NTS

- What is the impact of the new radiation weighting factors/quality factors?
- Method of evaluation
- Implementation

Objectives

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Health Physics of the NTS

Changes in Radiation Weighting Factor (Radiation Protection Quantity, Effective Dose)
Changes in Quality Factor (Operational Quantity, Dose Equivalent)

Major Points

- E cannot be measured
- Hp(10) approximates E (most of the time)
- H* approximates E (most of the time)
- H* for Control, Hp for dose recording

10 CFR 835 Changes

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"Before the weighting factors for radiation quality are further discussed, a question concerning the computation and measurement of effective dose needs to be considered. This is whether E is merely a personal quantity, or whether it can be used also as a quantity defined in terms of a phantom. Primarily E is related to the body of a specific person whose exposure is quantified. Depending on the type of radiation, the numerical value of E can then vary substantially with the orientation, but especially with the size of the person. Nevertheless, as is the case with many other quantities, the use of E depends on circumstances. Rough approximations, for example in terms of ambient dose equivalent, H*, will be adequate in some cases."

Why E Cannot Be Measured

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- w_R relates to protection quantities
- QF relates to operational quantities

Radiation Weighting Factor and Quality Factor

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ICRP 91 and ICRP 74 Hp(10) Dose Conversion Coefficients

Changes in DCCs

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 NASA

Needs Summary of the RTD

- Decrease Dosimeter Calibration Factor by 21% (to indicate 21% greater dose per mR* than before)
- Decrease Remmeter Calibration Factor by 21% (to indicate 21% greater dose rate per count rate than before)

Actions

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Field Service Technology
NASA

Needs Summary of the RTD

- One calibration factor for neutron dosimeter; based on bare ^{252}Cf
- Remmeter
Represents control philosophy, not dose philosophy, so raise all readings by same value (calibrations performed by vendor)
Measurement error is usually greater, so conservatism accounts for error

Justification for Changes

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Needs Summary of the RTD

- Dosimeter Calibration gives 21% higher doses
- Remmeter Calibration gives 21% higher dose rates
- Early evaluations indicate no effect on current posting
- If field calibrations are required in future, adopt field measurements based on reference measurements or Monte Carlo (as being done at SRS)

Conclusions

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Field Service Technology
NASA

Technical Summary of the NTE

- 10CFR835 - Occupational Radiation Protection
- ICRP-51, Data for Use in Radiological Protection Against External Radiation
- ICRP-74, Conversion Coefficients for Use in Radiological Protection
- ISO-8529-1:2001, Reference neutron radiations - Part 1: Characteristics and methods of production
- IAEA-318, Compendium of Neutron Spectra and Detector Responses for Radiation Protection Purposes
- IAEA-403, Compendium of Neutron Spectra and Detector Responses for Radiation Protection Purposes, Supplement to Technical Reports Series No. 318
- Veint 2008, Impact of the Revision of 10CFR835 with Regard to Neutron Field Surveys, Operational Radiation Safety, Vol. 95, Supplement 2, August 2008.
- HPJ Note, On the Effect of an Error in a Standard D₀-Modulated ²⁵²Cf Energy Spectrum (HPJ Note - probably November or December)
- HPJ Article, The Neutron Energy Response of the Panasonic Model 809 Personnel Dosimeter (HPJ - probably March or April)

References

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