

System of Radiation Protection

Sharon Paulka

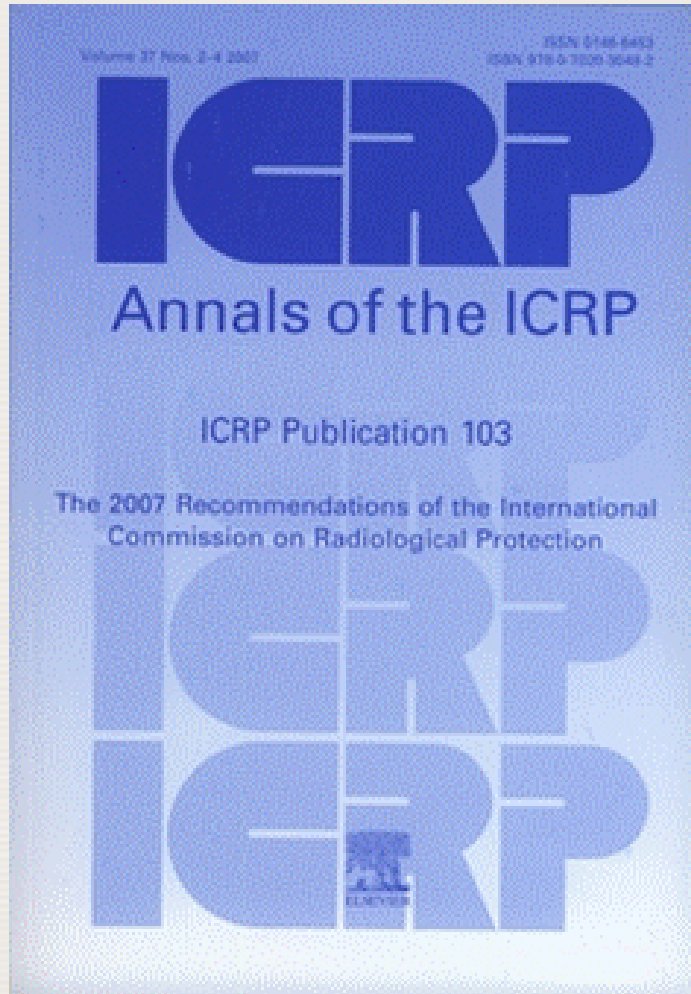
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IAEA

International Atomic Energy Agency

International Commission of Radiological Protection



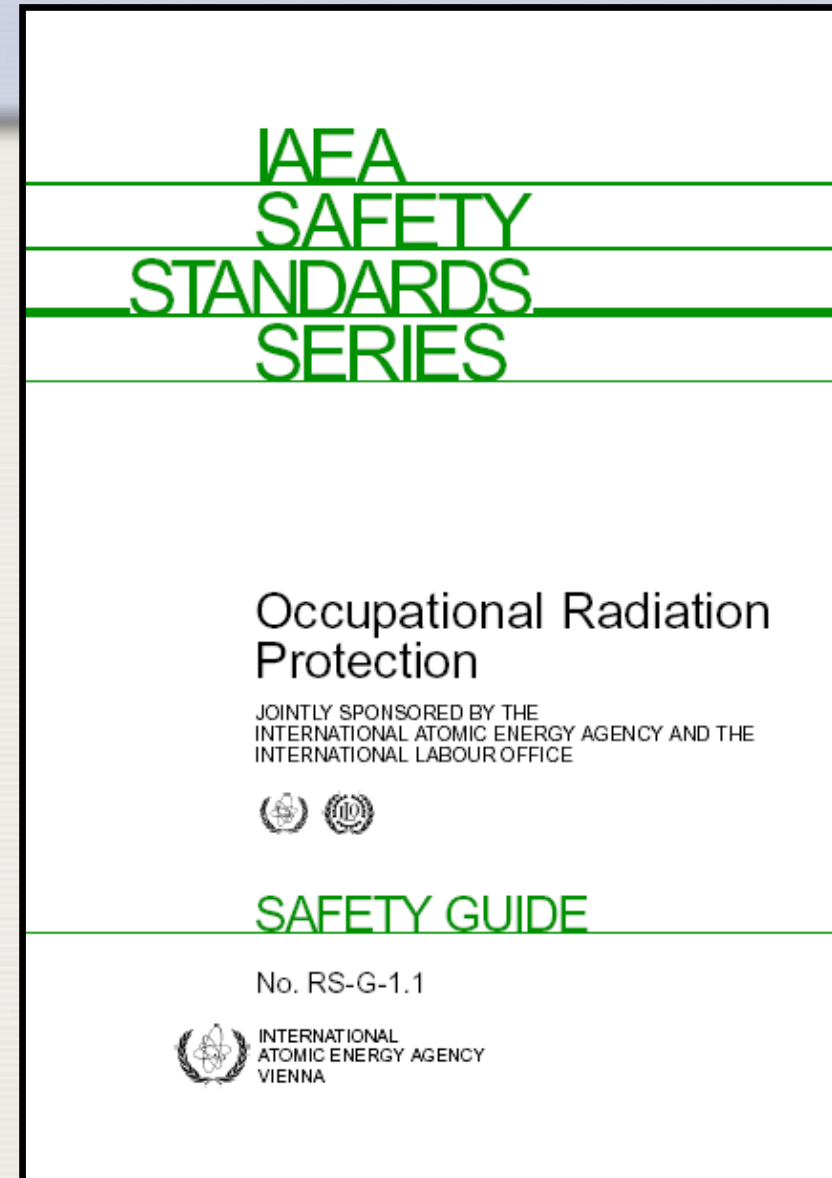
- Publish general recommendations
- Latest version 2007
- Chapter 5
 - System of Radiation Protection in humans
- Three main principals
 - Two source related and apply to all exposure situations
 - One individual related applies to planned exposure situations
- ICRP recommendations feed into IAEA BSS

Radiation Protection Principals

- The principle of **justification**:
 - Any decision that alters the radiation exposure situation should do more good than harm.
- The principle of **optimisation** of protection:
 - the likelihood of incurring exposures, the number of people exposed, and the magnitude of their individual doses should all be kept as low as reasonably achievable, taking into account economic and societal factors. (ALARA)
- The principle of application of **dose limits**:
 - The total dose to any individual from regulated sources in planned exposure situations other than medical exposure of patients should not exceed the appropriate limits recommended by the Commission.

IAEA Safety Guide

- Three principals are outlined well in the IAEA Safety Guide
 - Occupational Radiation Protection
 - Follow BSS and old recommendations
 - Fundamentals remain the same



Justification (BSS)

- “No practice or source within a practice should be authorized unless the practice produces sufficient benefit to the exposed individuals or to society to offset the radiation harm that it might cause; that is: unless the practice is justified, taking into account social, economic and other relevant factors.”

Justification

- Basically its a Cost vs Benefit analysis
 - Where cost includes risk to health and environment
 - And Benefit includes economic and social
- Undertaken as part of initial project approval process
- Should also be considered for significant changes to process

Justification Summary

- No Planned exposure situation should be introduced unless it produces significant net benefit to the individual or community to offset the radiation detriment

Dose Limits (BSS)

- “The normal exposure of individuals shall be restricted so that neither the total effective dose nor the total equivalent dose to relevant organs or tissues, caused by the possible combination of exposures from authorized practices, exceeds any relevant dose limit specified in Schedule II”

except in special circumstances provided for in Appendix I, section I.50

Dose Limits

- Occupational Exposure
 - Effective dose of 20mSv/year averaged over 5 years
 - Not to exceed 50mSv in any year
 - Dose to lens of the eye 150mSv/year
 - Dose to extremities (skin) 500mSv/year
 - Last two not relevant for Uranium Mining

Dose Limits

- Apprentices 16 to 18 years
 - Effective dose of 6mSv/year averaged over 5 years
 - Dose to lens of the eye 50mSv/year
 - Dose to extremities (skin) 150mSv/year
 - Last two not relevant for Uranium Mining

Dose Limits

- Member of the Public
 - Effective dose of 1mSv/year
 - In special circumstances up to 5mSv/year as long as average over 5 consecutive years is 1mSv/year
 - Dose to lens of the eye 15mSv/year
 - Dose to extremities (skin) 50mSv/year
 - Last two not relevant for Uranium Mining

Dose Limits

- Pregnant Workers
 - Classified as member of the public
 - This is due to the foetus being considered a member of the public, have not chosen to work
 - All female workers must be advised to notify RSO of pregnancy ASAP (though cannot make them)
 - Work modifications may need to be made for duration of pregnancy

Optimisation (BSS)

- “In relation to exposures from any particular source within a practice, except for therapeutic medical exposures, protection and safety shall be optimized in order that the magnitude of individual doses, the number of people exposed and the likelihood of incurring exposures all be kept as low as reasonably achievable, economic and social factors being taken into account, with the restriction that the doses to individuals delivered by the source be subject to dose constraints.”

Optimisation

- Applied to planned exposure situations that have been previously justified
- Aimed at achieving the best level of protection under the circumstances
- Forward looking iterative process
 - Evaluating the exposure situation (current or potential)
 - Selecting appropriate dose constraint
 - Identification of possible protection options
 - Selection of best option
 - Implementation of option

Optimisation

- Takes into account both technical and socio-economic developments
- Requires both qualitative and quantitative judgements
- It is a frame of mind
 - Always questioning if the best has been done
 - Whether or not everything reasonable has been done to reduce doses
 - Requires a commitment from organisations at the highest level

Optimisation

- Not necessarily a minimisation of dose
 - Review of all options, often the best option for the circumstances is not the lowest dose
 - This occurs when social and other factors are taken into account with the entire assessment

Dose Constraint Definition

- Prospective and Source related restriction on the individual dose from a source in planned exposure situations which serves as an upper bound on predicted doses in the optimisation of protection for that source
- Generally set for:
 - Member and the public doses
 - Occupational doses

Dose Constraints in Practice

- First part of the optimisation process
- Normally lower than the dose limit
- Set such that doses in excess are deemed to not be optimised
- Effectively optimised doses will always be less than the dose constraint

Optimisation in Practice

- Can be divided into two sections
 - Optimisation as part of initial design
 - Ongoing optimisation of the radiation protection program

Optimisation in Design

- Best method of Optimisation
- Getting in early can ensure good engineering controls
- Can save costs in the long term
- Need to commence in very early design phase
- Best achieved as part of risk assessment workshops

Optimisation in Operations

- Only method for existing operations
- Also important for new operations to conduct regular (annual) reviews for continual improvement
- Steps include:
 - Identify the higher exposed workgroups/areas
 - Conduct complete review of doses
 - Identify where improvements can be made

Hierarchy of Controls

- Implementation of improvements should be according to the hierarchy of controls
 - Elimination (eg remove)
 - Substitution (eg. alternate)
 - Engineering (eg. controls/guards)
 - Administration (eg. standard operating procedures, training)
 - Personal Protective Equipment (PPE) (eg. Respirators, overalls, gloves)

Next

- Discuss how we put in place these controls for the different exposure pathways

Questions?



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