COMMENTS FROM THE MEMBER STATES ON THE DRAFT SAFETY GUIDE DS453 OCCUPATIONAL RADIATION PROTECTION

Table of Resolution

COMMENTS BY REVIEWER Reviewer : NRA(RASSC,WASSC Country/Organization: **JAPAN** Date:13/6/2014			Page 1 of 3	RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	Section5 General	Present contents in this section had been improved due to removal of the texts regarding remediation itself. However some texts, for example such as in Remediation Programme are deemed not directly relevant to occupational exposure. The contents regarding remediation itself should be carefully deleted.	To streamline the contents for clarification.			R	Remediation Programmes are relevant to occupational exposure. Less relevant paragraphs (around 20) were already removed from the document.
2	5.6/(2)	Some examples should be added to the text, such as policeman, fire fighter.	Clarification.			R	It applies to much more general workplace situations, not just policemen and fire fighters.
3	Sub-subsection “Reference levels” (p.67)	Sub-subsection “Reference level” should be changed to “Reference level in the exposure due to radon”.	Clarification. According to para. 5.26-31 of BSS, in occupational exposure, only in the case of exposure due to radon, a reference level is necessary.			R	Reference level applies generally, not just to Radon.
4	5.21	Reference levels are generally expressed in terms of annual effective dose ~~to the representative person in the range 1–20 mSv~~. However, reference levels for exposure to radon are expressed in terms of annual average radon	The dose range 1-20 mSv is the band of reference level for the public.			R	This sentence comes straight out of BSS: paragraph 5.8. Also see para.5.25 of the BSS.

		concentration in air.					
COMMENTS BY REVIEWER Reviewer: Page 2 of 3 Country/Organization: JAPAN/NRA(RASSC,WASSC) Date:13/6/2014				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
5	Subsection "EXPOSURE ARISING FROM REMEDIAL ACTIONS IN AREAS CONTAMINATED WITH RESIDUAL RADIOACTIVE MATERIAL" (p.67)	Add a new paragraph to the position just after the title "EXPOSURE ARISING FROM REMEDIAL ACTIONS IN AREAS CONTAMINATED WITH RESIDUAL RADIOACTIVE MATERIAL" as follows. "A relevant Safety Guide [32] addresses several aspects of remediation mentioned below, such as regulatory framework, planning of remediation including justification and optimization of remedial measures, and operational aspects of remediation."	WS-G-3.1 is cited only in paragraph 5.25 and 5.28. Since WS-G-3.1 addresses overall aspect of remediation, some explanation should be added to the beginning of the subsection.			R	The current text adequately addresses the concern from this comment
6	5.60/3-4	the reference level for workplaces should not exceed an annual average radon concentration of 300~~1000~~ Bq/m^3 [2]. This value corresponds to an annual effective dose of the order of	Editorial error. Consistency with BSS 5.20(a).			R	These levels from the current text are consistent with the BSS

		10 mSv, assuming an equilibrium factor of 0.4 and an annual occupancy period of 7000~~2000~~ h.					
COMMENTS BY REVIEWER Reviewer: Page 3 of 3 Country/Organization: JAPAN/NRA(RASSC,WASSC) Date:13/6/2014				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
7	5.83(a),(b)	(a) The relevant authority should establish a framework that includes an appropriate reference level — a reference level of about 5 mSv might be considered as reasonable — and a methodology for assessing doses and keeping records of occupational exposure to cosmic radiation. (b) Where the dose of aircrew members is likely to exceed the reference level, ~~The~~ employers of aircrew needs to assess the doses, keep records and make each worker's dose record available to that individual.	Consistency with BSS 5.31 and 5.32.			R	5.83 needs to be considered together with 5.84. Together it is consistent with the BSS, but it is giving more explanation and realistic guidance

8	7.110/1-2	In terms of para. 3.73(c) of the BSS [2], the regulatory body is responsible for the authorization or approval of service providers for individual monitoring and calibration services.	Consistency with BSS 3.73(c).		A		"the regulatory body is responsible for the authorization or approval of service providers for individual monitoring and for calibration services."

COMMENTS BY REVIEWER Reviewer: Nik Mohd Faiz bin Khairuddin, Atomic Energy Licensing Board Page 1 of 1 Country/Organization: MALAYSIA Date: 12/06/2014				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1.	Whole draft	-	The draft to much wordy and a lot of cross reference need to look at.			R	Not a specific comment
2.	Table 3 [Page 60]	Dose Criterion for ADFoetus is 1Gy	Dose criteria for ADFoetus may change to 1Gy and not 0.1 Gy			R	Current value is consistent with BSS
3.	Para 4.6(d) [Page 57]	-	Does the word "workers" include emergency workers?				This includes all types of workers as defined in the Safety

							Glossary

COMMENTS BY REVIEWER Reviewer: G. Balčytis - Radiation protection centre Page.29 of 262. Country/Organization: **LITHUANIA** Date: 03 June 3, 2014				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	3.27	Delete the words ,,set separately for each source under control and" in para 3.27.	The sentence in para 3.27 ,,Dose constraints are set separately for each source under control…" is too strict and contradicts with statement in para 3.29: ,,The objective of a dose constraint is to place a ceiling on values of individual dose — from a			R	It does not seem to contradict This will be fixed in anyway during the IAEA editorial process.

			source, a set of sources in an installation, a practice, a task or a group of operations in a specific type of industry — that could be considered acceptable in the process of optimization of protection for those sources, practices or tasks."				

Draft Safety Guide DS453 "Occupational Radiation Protection" (Version 3.3 dated 10 February 2014)
Status: STEP 8 – Submission to the Member States for comments

Note: Blue parts are those to be added in the text. ~~Red parts~~ are those to be deleted in the text.

	COMMENTS BY REVIEWER Reviewer: **Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB)** (with comments of GRS) Page 1 of 13 Country/Organization: **GERMANY** Date: 2014-06-10				RESOLUTION			
Rele-vance	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
3	1	1.6	"This safety guide updates the guidance given in five previous safety guides: … and The Management System for Technical Services in Radiation Safety (IAEA Safety Standards Series No. GS-G-3.2),	Please use uniform citation of publications issued in the IAEA Safety Standards Series.	A			

			which are hereby superseded."					
3	2	2.47	"… conversion coefficients for converting from the basic physical quantity kerma to the directional dose equivalent $H'(3, \Omega)$."	Editorial correction. Any statement of the directional dose equivalent H' should include a specification of the reference depth d and the direction Ω of the radiation (see Para 2.45).	A			
3	3	2.51	last sentence: "For occupational exposure of apprentices and students between the ages of 16 and 18 years, τ is the time to the age of 70 years."	Editorial (missing word).	A			
2	4	2.66	In practice, the progeny will rarely, if ever, be in equilibrium, and the PAEC will therefore be some fraction of the equilibrium value. This fraction is called the equilibrium factor, F : F=PAEC/PAEC (equilibrium)	Inclusion of the formula for the equilibrium factor F for clarification. This was already accepted during the review by committees (Draft Version 3.2), but not included in the current draft.	A			The editors can decide if this is redundant or not
3	5	2.67	Equation (11): PAEC = (~~0.558~~ 0.588 × 10^{-9} × 75) + … PAEC = ~~2.37~~ 2.40 × 10^{-7} J/m^3	Typing error. According to Table 1, the potential alpha energy per unit activity is 0.588 × 10^{-9} J/Bq for ^{218}Po.	A			
3	6	2.68	Equation (13): F = ~~2.37~~ 2.40 × 10^{-7} / 5.56 × 10^{-7} F = ~~0.426~~ 0.432	Consequential error resulting from Equation (11) in Para 2.67.	A			
3	7	2.70	The choice between potential alpha energy exposure and equilibrium equivalent exposure is not important, since these two quantities are simply related by a constant factor of 5.56 × 10-9 J•h•m-	The value of the exponent should be in the same line as its mathematical sign. If possible, place the value and the unit in the same line.	A			See answer to comment 4 Sweden

			3 per Bq•h•m-3					
2	8	2.71	When adopting this approach, an appropriate value for the equilibrium factor F has to be assumed. The use of a default value of 0.4 is usually adequate for ~~this purpose~~ indoor Radon in dwellings and similar workplaces.	The F factor strongly depends on the room size and also humidity of the air. This was already accepted during the review by committees (Draft Version 3.2), but not included in the current draft.			R	Current text is consistent with BSS requirements on occupational exposure
2	9	3.10	"Optimization of protection and safety needs to be considered at all stages ~~of~~ in the lifetime of equipment and ~~installations~~ facilities, as well as for the entire duration of activities, in relation to both exposures from normal operations and potential exposures. For a facility, these stages usually include design, construction, commissioning, operation and decommissioning (or closure). Consequently, all of them ~~As a consequence, all situations from design, through operation to decommissioning and waste management~~ should be considered in the optimization procedure."	According to the IAEA Safety Glossary (2007 Edition), the term 'facilities' is more comprehensive and includes 'installations'. The term 'activities' includes 'radioactive waste management' (i.e. all administrative and operational activities involved in the handling, pretreatment, treatment, conditioning, transport, storage and disposal of radioactive waste). With respect to facilities and installations, it is more accurate to refer to stages in the lifetime rather than to situations.				This will be considered during the editorial process.
3	10	3.53	1st sentence: "The prior radiological evaluation should describe, as precisely as necessary, the situation involving	To be in line with the title of the related subsection as well as with the wording used in Paras 3.52 and	A			

			occupational exposures."	3.54–3.56.				
3	11	3.59 (g)	"The provision of personal protective equipment, if applicable (see paras 3.92 and 9.52–~~9.60~~9.63);"	Use of personal protective equipment is dealt with in Paras 9.52–9.63.	A			
3	12	3.92	last sentence: "Further details on the use of personal protective equipment are given in paras 9.52–~~9.60~~9.63."	Use of personal protective equipment is dealt with in Paras 9.52–9.63.	A			
3	13	3.128	4th sentence: "… for *N* monitoring periods per year, the recording level RL_j (in becquerels) for intake of radionuclide *j* in a given monitoring period …"	Completeness and consistency with the definitions of 1. the investigation level IL_j for intake of radionuclide *j* provided in Para 3.124 and 2. the critical value Mc_j for intake of radionuclide *j* provided in Para 7.198.	A			
1	14	3.161	"As a result of the criteria in paras 3.158 and 3.160, the following industrial activities are, or may be, subject to the requirements for planned exposure situations [22]: … (10) Production of tin, copper, aluminium, zinc, lead, and iron and steel; (11) Production of cement (maintenance of clinker ovens); (~~11~~12) Combustion of coal; (~~12~~13) Water treatment~~.~~; (14) Geothermal energy production."	A number of industries that require mining or processing of highly mineralised waters (like coal mining or geother-mal energy production) are dealing with residues with activity concentrations far above 1 Bq/g. Annex VI of the new European BSS (Council Directive 2013/59/EURATOM of 5 December 2013) identifies another two industrial activities involving NORM,			R, but some modific ations propose d	The 2 additional industrial activities are not included because of lack of published exposure data, but some text is added reflecting this: "As a result of the criteria in paras 3.158 and 3.160, and taking

				namely geothermal energy production and cement production. With regard to the new items (11) and (14), reference to the Council Directive is strongly recommended. Usage of geothermal energy requires drilling boreholes and inserting pipes for pumping high-temperature fluids from the rock ground. The rocks may also contain minerals which tend to form a scale inside the pipes and production equipment. In the presence of radionuclides such as radium, the mineral scale, production sludges and waste water will contain NORM. The primary radionuclides produced with the geothermal fluids are Ra-226 and Ra-228.				into account current published measurements of occupational exposure, the following industrial activities are, or may be, subject to the requirements for planned exposure situations [22]: “
3	15	4.3	last sentence: “Protection of workers who are accidently exposed … should be in line with BSS [2] and ~~in~~ GSR Part 7 [28].”	Editorial.	A			
2	16	4.15	Table 2: Guidance values for restricting exposure of emergency workers	The content of Table I.1 of GSR part 7 was changed		A		The final table will be available

				for Rev. 6.0 (16. April 2014). Please change this table accordingly.				in GSR part 7 and will be changed accordingly. This will be considered during the editorial process.
2	17	4.22	"Female workers who are aware that they are pregnant or breast-feeding should~~, in order to provide adequate protection for the embryo or foetus,~~ notify the appropriate authority and should be excluded from emergency tasks listed in Table 2, in order to ensure that the embryo, foetus or newborn child ~~and or the infant are~~ is afforded the same broad level of protection as is required for members of the public (para 3.114 of the BSS and para I.4 of the GSR Part 7)."	Clarification in order to improve the readability and comprehensibility of the whole sentence. The original statement is difficult to understand because the second clause "and or the infant are afforded the level of protection …" does not really fit to the first clause. For Rev. 6.0 of DS 457, in I.4 a limit of 50 mSv for the full period of in utero development of the embryo and fetus was introduced.	A			
2	18	5.42	2nd sentence: "This includes responsibility for protection and safety during the transport, processing, storage~~, predisposal waste management~~ and disposal of the radioactive waste arising from the remediation."	According to the IAEA Safety Glossary (2007 Edition), the term 'predisposal management' includes any waste management steps carried out prior to disposal, such as processing (i.e. pretreatment, treatment and conditioning), storage and	A			

				transport activities.				
2	19	5.49	Indoor radon concentrations in private dwellings differ between countries because of differences in geology, climate, construction materials, construction techniques, type of ventilation provided (natural or otherwise) and domestic habits. Within individual countries, there may be marked regional variations. Data on indoor radon concentrations around the world are given in Ref. [34]. The arithmetic mean values for various countries vary from 7 to 200 Bq/m^3. Arithmetic mean values in high background areas vary from 112 to 2745 Bq/m^3. In some parts of northern Europe, maximum values of up to 84 000 Bq/m^3 have been reported. The population weighted worldwide arithmetic mean is 39 Bq/m^3.	Clarification that data for private dwellings are used. For Bavarian water treatment facilities, indoor radon concentrations exceeding some 100.000 Bq/m³ had been reported. This was already accepted during the review by committees (Draft Version 3.2), but not included in the current draft.			R	Rejected to be consistent with UNSCEAR document (reference 33)
2	20	6.91 (a)	1st sentence: "Sometimes, when itinerant workers perform maintenance services, changes are made to the default settings of the system (e.g. fluoro modes in which the X ray beam is pulsed rapidly on/off)."	Explain the meaning of 'fluoro modes' as some readers may not be familiar with the imaging modes of digital X ray fluoroscopy.		A		(e.g. fluoro modes in which the X ray beam is pulsed)
3	21	7.10 (a)	"… in comparison with Table A.41 in ICRP Publication 74 [8]);"	Editorial (missing parenthesis).	A			
2	22	7.21	Delete: "on the wrist, or"	The correction factors for dosimeters on the wrist are very high for inhomogeneous fields. The	A			

				factor and the associated uncertainties are often not considered. This was already accepted during the review by committees (Draft Version 3.2), but not included in the current draft.				
3	23	7.105	2nd sentence: "More frequent periodic checks (routine testing – see paras ~~7.88~~7.89–7.92) …"	Routine testing of personal dosimetry systems is dealt with in Paras 7.89–7.92.	A			
3	24	7.182	last sentence: "The individual relative bias ~~statistic~~ B_{ri} for the i^{th} measurement in a ~~category (~~series~~)~~ with respect to the correct value of the measurand is defined as: … where A_i is the value of the i^{th} measurement in the series being tested."	Clarification and consistency with the terminology used in Para 7.183.	A			
2	25	7.198	2nd and 3rd sentence: "… where $e(g)_j$ is the dose coefficient for ingestion or inhalation of radionuclide j, as appropriate (in sieverts per becquerel), and $m(t_0)_j$ is the fraction of the intake remaining in the body or in the excretion sample after an elapsed time period t_0 between the intake and the time of sampling. The intake is usually assumed to occur at the mid-point of the sampling period, in which case Eq. (21) applies for t_0."	Correct description of all parameters in Equation (33). Compare with Para 3.130.	A			
3	26	7.210	last sentence: "Biokinetic m~~M~~odels for these routes	Adjust wording to be more specific with regard to the	A			

			of exposure are described in Appendix IV."	kind of models.				
3	27	7.214	1st sentence: "… reference models (i.e. … and a geometric standard deviation (GSD) of 2.5~~)~~ [131])."	Editorial (superfluous parenthesis).	A			
3	28	7.223	2nd sentence: "Examples of analyses performed after the administration of the chelating agent Ca-DTPA (Calcium salt of diethylene triamine pentaacetic acid) in cases of accidental intakes of actinides …"	The abbreviation Ca-DTPA is introduced in Para 7.223 for the first time, but is explained afterwards in Para 10.34. Move the explanation to this place.		A		"Examples of analyses performed after the administration of the chelating agent Ca-DTPA (calcium salt of diethylene triamine pentaacetic acid) in cases of accidental intakes of actinides …"
3	29	7.228	1st sentence: "High levels of exposure of accidentally exposed workers may be associated with nuclear or radiological emergencies such as a nuclear emergency at a nuclear power plant, a criticality accident at a nuclear fuel cycle facility, an accident at an industrial irradiation facility, or a radiological emergency involving a lost or stolen source."	Reference to a typical case should be provided. Within the last 40 years, most criticality accidents occurred during process operations with fissile material in solutions or slurries at nuclear fuel cycle facilities. Details are provided in the following publication: Los Alamos National Laboratory, A Review of		A		Accepted to add the reference, but there is no need to add the additional text

				Criticality Accidents, 2000 Revision, LA-13638, May 2000.				
2	30	8.4	"The management system of a service provider using radiation should be in accordance with all relevant IAEA safety standards, namely GSR Part 3 [2], GS-R-3 [5] and GS-G-3.1 [6]."	For completeness, the relevant IAEA safety standards should be specified here.			R	GS-R-3 is under revision; "The management system of a service provider using radiation should be in accordance with the relevant IAEA safety standards" - editorial
3	31	8.10 (e)	"Engagement of relevant management--."	Editorial (remove space).	A			
1	32	8.24 (h)	"~~Ensuring~~ Establishing and implementing an integrated management system that includes safety, health, quality, environmental, security, social and economic aspects ~~as appropriate~~ so that safety is not compromised."	1.) It is not clear what the phrase "ensuring … aspects as appropriate" does mean. Clarification is required. It seems that this item relates to Para 4.1 of the Draft Safety Requirements DS456 "Leadership and Management for Safety" (revision of GS-R-3, version dated 13 July 2013). 2.) Social elements, such as communication with the public and other interested parties, should also be considered in the		A		"… safety, health, quality, environmental, security, societal and economic aspects as appropriate. " The whole document is to enhance safety. This will be considered during the editorial process.

				integrated management system (compare with Para 4.1 of DS456).				
2	33	9.10	last sentence: "The design philosophy of a ventilation system for radioactive areas in a facility or activity ~~sometimes~~ is to contain and confine radioactive materials by: a) Maintaining adequate negative pressure with respect to the atmospheric pressure; b) Directed flow of air from potentially ~~lower radioactive~~ less contaminated areas to potentially ~~higher radioactive~~ more contaminated areas, i.e. a pressure drop from the "clean areas" (higher pressure) to the "dirty areas" (lower pressure); c) …"	In our opinion, the term 'sometimes' causes an unintentional weakening of the statement provided. If there are other noteworthy design philosophies of a ventilation system for radioactive areas, they should be addressed in this paragraph as well. Item b): It seems to be more precise to refer to the potential contamination/activity level as the term 'radioactive areas' usually stands for 'controlled and supervised areas'.		A		Modified as: "The purpose of the primary ventilation system in a facility is to provide fresh air to the workplaces to remove airborne contaminants generated by the operations. Careful attention should be given to the design of the ventilation network, including the calculation and verification of rates and velocities of air flow, to ensure that it is adequate for controlling airborne contamination. In many facilities control of airborne contamination is achieved by: a) Maintaining adequate negative pressure with respect to the atmospheric pressure b) Providing an adequate or prescribed number of air changes in the workplace; c) Providing the appropriate exhaust

								air off gas cleaning systems (including scrubbers and/or HEPA filtration) so that the discharges from the facility will be within authorized limits. The discharge of the exhaust air should be through a stack of appropriate height to provide the necessary dilution for the releases to protect members of the public.”
2	34	9.12	Delete the items (a)–(g) and modify the wording of this paragraph as follows: “The ventilation officer in a mine should: have the functions specified in para 3.176 (a)–(g).”	The functions and responsibilities of a ventilation officer in a mine are already addressed in Para 3.176, the corresponding items (a)–(g) are nearly identical in wording. Avoid unnecessary doubling of information.		A		Ok to refer to paragraph 3.176: “The ventilation officer in a mine should: have the responsibilities specified in para 3.176.” 3.176 changed to: The ventilation officer has the following responsibilities: (b) Ensuring the proper operation of the ventilation systems (including auxiliary ventilation

								systems which, in underground mines, may be prone to rapid deterioration), initiating any necessary modifications and ensuring that any deficiencies are addressed promptly; (g) Being familiar with the properties of radon and its progeny, where applicable
3	35	9.14	1st and 2nd sentence: "The proper functioning ~~operation~~ of the primary and auxiliary ventilation systems throughout the operating phase of the facility should be ensured. ~~The healthiness of the systems should~~ and, if necessary, be indicated as audio-visual alarms in the control room/RPO display panel, so that prompt action for the protection of the workers can be initiated."	1.) Modify wording to avoid a circular phrase ("operation … throughout the operating phase"). 2.) The ventilation systems should trigger alarm signals only in case of demand, i.e. for airborne contamination exceeding the safe working levels.	A			
3	36	9.40	3rd sentence: "… special cylindrical form beta detectors (see para. ~~[~~9.36~~]~~)."	Editorial (delete brackets).	A			
3	37	9.66	2nd sentence: "Any NORM that cannot be contained effectively within the process and	For completion. The paragraphs mentioned in parentheses provide		A		"Any NORM that cannot be contained

			becomes airborne should be controlled by means of a good ventilation system in order to prevent the release of contaminants and to minimize occupational exposure (see also paras 9.10, 9.13, 9.14 and 9.16).”	further useful guidance with respect to the ventilation system for mineral processing operations.				effectively within the process and becomes airborne should be controlled by means of an ~~good~~ adequate ventilation system ~~in order~~ to remove ~~prevent the release of~~ airborne contaminants and to minimize occupational exposure (see ~~also~~ paras 9.10, 9.13, 9.14 and 9.16).”
3	38	App. II, II.32	“Neutrons with energies below 10 eV can be detected through interaction with the nitrogen nuclei of the gelatine resulting in the production of recoil protons based on $^{14}N(n,p)^{14}C$ reactions.”	For completeness.		A		“Neutrons with energies below 10 eV can be detected through interaction with the nitrogen nuclei of the gelatine resulting in the production of recoil protons from $^{14}N(n,p)^{14}C$ reactions.”

3	39	App. II, II.50	3rd sentence: "The operating principles of criticality dosimeters need to be different ~~than~~ from those ~~for~~ of the routine neutron dosimeters because …"	Grammar.		A		"The operating principles of criticality dosimeters need to be different ~~than~~ from those ~~for~~ of routine neutron dosimeters because …"
3	40	App. III, III.5	2nd sentence: "… intended to measure ambient dose equivalent $H^*(10)$, and often directional dose equivalent $H'(0.07, \Omega)$."	Editorial correction. Any statement of the directional dose equivalent H' should include a specification of the reference depth d and the direction Ω of the radiation (see Para 2.45).	A			
3	41	App. III, III.6	2nd sentence: "Installed instruments designed for use where beta and low energy photon radiation are not expected often have large (of the order of ~~5 L~~ 5000 cm^3) steel walled chambers filled with argon at high pressure."	For direct comparison with hand held instruments designed for use at normal occupational dose levels, the same measuring unit as in the 1st sentence should be used here.	A			
3	42	App. III, III.25	3rd sentence: "For beta and low energy photon radiation measurements, thin sensitive layer silicon diodes are suitable for $H'(0.07, \Omega)$ evaluation, …"	Editorial correction. The measuring quantity is the directional dose equivalent.	A			
3	43	App. III, III.26	1st sentence: "A good beta dose rate monitor for $H'(0.07, \Omega)$ can be made using …"	Editorial correction. The measuring quantity is the directional dose equivalent.	A			
2	44	App. IV,	1st sentence:	1.) The term 'adsorption'	A			

		IV.1	"Intakes of radionuclides can occur via various pathways, ~~viz.,~~ namely inhalation, ingestion, injection and dermal a~~d~~bsorption (through the intact skin or a wound)."	needs to be replaced by 'absorption', in order to provide a correct designation of the relevant physico-chemical process and to maintain consistency with the terminology used elsewhere in this document (compare with Paras 7.202, 7.210 and IV.21). Additional clarification provided in parentheses is recommended. 2.) Avoid usage of Latin abbreviations, if possible.				
2	45	App. V, V.24	"For intakes of tritiated water, the concentration of tritium in urine is the same as in body water and can be used to assess body content and dose rate without reference to an excretion model. Direct dose assessment for intakes of tritiated water is provided in Annex VI of Ref. [238]." Please include new Ref. [238] in the list of references: "INTERNATIONAL ATOMIC ENERGY AGENCY, Methods for assessing occupational radiation doses due to intakes of radionuclides, Safety Reports Series No. 37, IAEA, Vienna (2004)."	With respect to the direct dose assessment for intakes of tritiated water, the IAEA Safety Reports Series No. 37 provides further guidance. A reference to this publication is therefore recommended.	A			

3	46	App. V, V.39 (e)	5th sentence: "… (more than about 3 mg/m^3~~m3~~) …"	Editorial.	A			
3	47	Ref. [26]	"… Radiation Protection and Management of NORM Residues ~~Management~~ in the Phosphate Industry, …"	Correct title of the IAEA Safety Reports Series No. 78.	A			
2	48	Annex, A-15	"The technique most commonly used is single colour FISH (sFISH), which enables the detection of inter-exchanges, such as dicentrics and translocations. In order to assess induced translocations among different labelled chromosomes, multi-colour FISH (mFISH) and, for whole genome analysis, multiplex FISH (M-FISH) have been developed. M-FISH is the method of choice for studying complex interchromosomal rearrangements. It is a 24-colour technique to identify and evaluate the size, shape, and number of chromosomes in a sample of body cells."	1.) To avoid ambiguities, each of the three FISH techniques mentioned in this Para should be labeled with the dedicated acronym commonly used in scientific publications. 2.) Please include a short description of M-FISH for the sake of completeness.	A			
2	49	Annex, A-31	Include new last sentence: "… the detection limit is expected to be in the range 0.5–1 Gy. In cases where the external radiation field has both a gamma and a neutron component (e.g. as a result of a criticality accident), in vivo EPR spectroscopy of teeth essentially provides information on the dose received from the gamma	Essential amendment in order to highlight the limitation of low-frequency in vivo EPR measurements for mixed gamma/neutron radiation fields. Further details to this issue are provided in the following publication: M. Zdravkova et al.,			R	In the EPR section criticality accidents should not be mentioned as this is not specific for criticality accidents

			component of the radiation exposure.”	Retrospective Dosimetry after Criticality Accidents Using Low-Frequency EPR: A Study of Whole Human Teeth Irradiated in a Mixed Neutron and Gamma-Radiation Field, Radiat. Res. 160 (2003) 168–173.				
3	50	Annex, A-32	1st sentence: “The basis for luminescence techniques in retrospective dosimetry is the same as that described in ~~Annex I~~ Appendix II for luminescence techniques in prospective dosimetry.”	Such an Annex does not exist in the document. We assume that this statement should refer to Appendix II (for luminescence techniques in prospective dosimetry, see Paras II.10–II.24).	A			
3	51	Ref. [A-25]	“… Use of Electron Paramagnetic Resonance Dosimetry with Tooth Enamel for Retrospective Dose Assessment, …”	Editorial (missing letter).	A			

DS-453 “Occupational Radiation Protection”

COMMENTS BY REVIEWER Reviewer: BAPETEN/BATAN Page 23 of 2 Country/Organization: INDONESIA Date:20 June, 2014				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection

COMMENTS BY REVIEWER Reviewer: BAPETEN/BATAN Page 23 of 2 Country/Organization: INDONESIA Date:20 June, 2014				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1.	2.57	--- It needs to specify when and in what circumstances the formula (6) can be applied.---	- The document should be able to provide sufficient information for the readers.			R	This is just information on future developments.
2.	4.17	When military personnel are designated as emergency workers, every effort should be made so that they are protected in the same way as other emergency workers. In this case a voluntary basis may be excluded. The voluntary basis for response actions in which the doses received might exceed 50 mSv by emergency workers is usually covered in the emergency response arrangements.	We need to ensure that the personnel involved in the emergency response team are equally protected and also to keep the statement is flexible in accordance with the GSR Part 3. The proposed text is aimed to maintain flexibility as in several countries the military matter may not be that simple.			R	If the military are designated as emergency workers than they should be treated as any other emergency worker and this is covered in 4.23
3.	6.41	---Definition of qualified expert should be clearly clarified ---	- If qualified expert should be always included, does it mean that the personnel should need to be certified? It may be a great burden to some licensees. In some cases the qualified experts have been accommodated by			R	The qualified expert is defined in the BSS. No glossary can be included in the Safety Guide

COMMENTS BY REVIEWER Reviewer: BAPETEN/BATAN Page 23 of 2 Country/Organization: INDONESIA Date:20 June, 2014				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			the ministries. - We may need to correlate with the RPOs.				
4.	-	--- Values of WR and WT (Radiation weighting factor and Tissue weighting factor) should be stated within the document.---	- The readers will find it easy to refer.			R	It is a policy not to duplicate the definitions from other IAEA documents. The values are in the BSS
5.	-	We propose that several important definition can be defined in a separate section within the document	- It will be easier for the readers to understand			R	No glossary can be included in the Safety Guide
6.	Annex	---We need to add Generic Criteria to the annex for protective action and other response action in emergency exposure situation to reduce the risk of stochastic effects as stated in GSR Part 3---	It will be easier for the readers to understand the whole context of the document			R	To avoid duplication to the extent possible.
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COMMENTS BY REVIEWER Reviewer: Representative to the RASSC Country/Organization: **BELGIUM**			Page 1 Date: 2014/06	RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	6.6 6.10 6.11	Comment : As stated in the BSS, the unborn or breast-fed infant or child should be afforded *the same broad level of protection than other members of the public.* This "*broad level*" should lead to the interpretation that the complete system of radiation protection measures should also apply to these individuals: justification of the exposure, optimisation and finally dose limitation. It is therefore insufficient to only look at the respect of the dose limit for members of the public to deal with their protection. In judging on justification of their exposure, there may evidently be a potential conflict of interest with the "right to employment" of the mother, but the "right to protection of the child" should nevertheless be considered also, as when justifying	Considerations should be taken into account when dealing with pregnant or breast-feeding women, who are or might be occupationally exposed to ionizing radiation, in order to provide adequate protection for their unborn or breast-fed infants or children.			R	Considering practicalities, the current text seems to be appropriate. For more information refer latest ICRP recommendations (Reference 39 and 40 in the draft guide).

		any other planned exposure situation. With regard to the dose limit, account should be taken of the fact that the normal duration of pregnancy in humans is roughly 9 months, not one year. If we would judge child-to-be as "general public", then the dose limit for the complete duration of pregnancy should not exceed the value of .75 mSv. But if we are to provide a "*same level of protection*" to the unborn, infant or young child, as the BSS requires us to do, then account might need to be taken of their well-documented greater radio-sensitivity, as compared to the public in general, i.e. a public of mixed age composition. One could think of an "age-related sensitivity factor" which would apply in these cases, by which to divide the (general)public dose limit for these vulnerable individuals. If, for example, a factor of 5 would be judged appropriate, then the dose limit for the entire duration of pregnancy would only be .15 mSv. And finally, the principle of optimisation should also be applied: it may be useful to remind that					

		radiation protection is not restricted to keeping exposures below the applicable dose limit, but that ALARA also applies here.					

COMMENTS BY REVIEWER Reviewer: KOZLODUY NPP Page 1 Country/Organization: **BULGARIA** Date: 2014/06				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	7.198/3	"…the critical value MCj (in bequerels) for **the measured body content** of the radionuclide.."	The word "intake" should be replaced by "the measured body content". The text contradict the formula (33)		A		Retain the word intake, but substitute " for the intake" by "associated with the intake'
2	7.198/5	***to*** is the elapsed time period	"$m(t_0)$" should be replaced by "t_0" The text contradict para 2.49, page 13.	A			See comment 25 from Germany

COMMENTS BY REVIEWER Reviewer: Scientific and Engineering Centre for Nuclear and Radiation Safety State Atomic Energy Corporation, ROSATOM Page 1 Country/Organization: **RUSSIAN FEDERATION** Date: 2014/05/06				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	7.166	The detection limit DL can be evaluated for a given radionuclide and measurement procedure before the sample measurement takes place. It specifies the minimum activity in the sample (for indirect methods) which can be detected with a specified probability β of a false negative. The DL allows a prior decision to be made as to whether a measuring method is suitable for the given monitoring programme. ***Decision of the presence of the radionuclide in the sample or in the body is not to be taken for comparing the measurement result with the DL.***	It should be specified that a posteriori decision must be based on the DT criteria, not the DL.			R	Covered by 7.167
2	4.29	More detailed guidance on exposure	The impact of the factors		A		Instead: add

		assessment in emergencies is given in paras 7.222, 7.223 and 7.228-7.243.	mentioned in paras 7.222 and 7.223 most often (if not almost always needs to be considered in the case of emergencies. The section "EXPOSURE ASSESSMENT" (paras 4.25-4.29) of the draft does not provide a clear recommendation of the necessity to consider these factors.				sentence: "The guidance given in 7.222 and 7.223 may also be relevant for emergencies."

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: 2			Page 1				
Country/Organization: **RUSSIAN FEDERATION**			Date: 2014/06/01				
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	2.29	It is necessary to clearly indicate that Wr… -				R	
2	2.30	It should be mentioned that effective dose is ony the calculated values as noted in ICRP103				R	(already addressed)
3	Section4	Table 3 and 4.6 doses not agree to Table 2 and 4.15. We suggest to delete 4.16 completely including Table 3			A		Table 3 deleted. Para 4.16 modified.
4	7.20	7.20 is written incompletely and non-understandable way			A		This will be considered in the editorial process.
5	7.24	7.24 correctly notes that individual dosimeters of neutrons have limited				R	The guidance provided in the

		range of energy. Suggested measurement of spectrum at the workplace is labor consuming and is not a very exact procedure. We suggest to make calibration of such dosimeters at workplaces using ambient dose dosimeters (detectors of thermal neutrons in moderator)					text is sufficiently detailed

TITLE: Occupational Radiation Protection, DS453 Version 3.3 of 10 February 2014

COMMENTS BY REVIEWER Reviewer: Sorin Mancas (RASSC corresponding member appointed in January 2014) Page..1.. of...1. Country/Organization: ROMANIA / CNCAN Bucuresti Date: 5 June 2014				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	Para 7.14 / letter (d) (see page 105)	*Delete:* ..."continuous and"…	- Contradicts letter (a) - If not deleted, dose assessments on the basis of routine workplace monitoring results would be not feasible where it is usually justified and approved: *e g* in dental radiology, osteodensitometry, mammography. Continuous monitoring in such workplaces is practically not			R with modifications	"(d) Where individual doses are assessed on the basis of routine workplace monitoring results, that monitoring should be continuous and representative of all

			necessary.				working areas within the workplace.”

Draft Safety Guide : DS453 Occupational Radiation Protection : WNA Members Comments

COMMENTS BY REVIEWER Reviewer: WNA’s Radiological Protection Working Group Page Country/Organization: **World Nuclear Association** Date: 2014-06-13				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
WNA 1 (General)	These comments should be read in the context of our general comments submitted for the draft DS457 document, with a view to review the series of documents holistically, not in isolation. Also, the publication timescales need to be considered based on the order of publications both within IAEA and also considering outputs from external organisations, such as the ICRP. As an example, the IAEA Fukushima report has not been published, and this safety guide needs to fully consider outputs from that.						
WNA 2 (General)	Appendix III is incomplete. The appendix focusses for workplace monitoring only on instruments for the assessment of external exposure. Surface contamination monitoring as well as air contamination monitoring are important factors to define protective actions at workplaces in order to avoid contamination or incorporation. → Add these types of instruments and change the title accordingly.						

	Reject: all necessary information is present in Section 9 and Appendix V. Moving such information to Appendix III would involve structural changes to the document which are not feasible at this late stage						
WNA 3	3.25 (b)	Identify all relevant economic, social, radiological and non-radiological factors ~~(sometimes non-radiological factors as well)~~ for the particular situation under review that distinguish between the identified options, e.g. collective dose, distribution of individual dose, impact on public exposure, impact on future generations, investment costs;	The existing wording may lead to misinterpretation that non-radiological factors are of less concern; this is not necessarily the case.		A		Identify all relevant economic, social, radiological and, where appropriate, non-radiological factors for the particular situation under review that distinguish between the identified options, e.g. collective dose, distribution of individual dose, impact on public exposure, impact on future generations, investment costs;
WNA 4	Adding new Para (after para3.47)	SPECIAL CIRCUMSTANCES 3.#1 In special circumstances, provided that a practice is justified and is designed and conducted according to good practice, and that radiation protection has been optimized but occupational exposures still remain above the dose limits, and that it can be predicted that reasonable efforts can in due course bring the occupational exposures under the limits, the Regulatory Authority may exceptionally approve a temporary change in the dose limit. Such a change shall be approved only if formally requested by the registrant or licensee, if the Regulatory Authority determines that the practice is still justified and is satisfied that appropriate consultation with the workers	As an example, at the restoration stage after the nuclear power plant accident, it can be foreseen that workers/helpers on and off site may receive relatively high doses. Fukushima is a prime example where this may be the case. A more flexible approach to occupational dose limits may be more effective during these situations in comparison with the dose limit during the routine operation of nuclear power plants. This may allow			R	This part is no longer in the BSS

		concerned has taken place. 3.#2 Should special circumstances exist which require a temporary change in some dose limitation, the registrant or licensee may apply to the Regulatory Authority for such a temporary change. 3.#3 No temporary change in a dose limitation requirement shall be made without approval by the Regulatory Authority. 3.#4 . The registrant or licensee shall, in any application for a temporary change in a dose limitation: (a) describe the special circumstances requiring the temporary change; and (b) provide evidence to demonstrate that: (i) all reasonable efforts have been made to reduce exposures and that protective measures and safety provisions have been optimized; (ii) the relevant employers and workers, through their representatives where appropriate, have been consulted and their agreement obtained on the need for a temporary change and on the conditions of the temporary change; (iii) all reasonable efforts are being made to improve the working conditions to the point where the dose limits specified in para. 3.33 ; and (iv) the monitoring and recording of the exposures of individual workers are sufficient to demonstrate compliance with the relevant requirements of this guide and are sufficient to facilitate the transfer of exposure records between relevant employers. 3.#5 Any temporary change in a dose limitation shall: (a) be in accordance with the dose limitation for special circumstances given in following para.3.#6;	workers/helpers to carry out plant restoration work after an accident more effectively. It may be very important in specific situations, for example, where skilled workers who have experience of the work carried out during early stages of an accident are able to continue to engage in follow-up restoration work. Specifically, as shown in the left column, it is reasonable, under exceptional circumstances, to permit the dose averaging for up to 10 consecutive years, such that the total effective dose received in full working life would be prevented from exceeding about 1Sv received moderately uniformly year by year, as shown in the ICRP recommendation. The concept of "dose limitation in the special circumstances", is a matter prescribed in BSS(1990) and RS-G-1-1(1999).				

		(b) be for a limited period of time; (c) be subject to annual review; (d) not be renewable; and (e) relate to specified work areas. 3.#6 When, in special circumstances, a temporary change in the dose limitation requirements is approved pursuant to para.3.#1 to para.3.#5: (a) the dose averaging period mentioned in para. 3.34 may exceptionally be up to 10 consecutive years as specified by the Regulatory Authority, and the effective dose for any worker shall not exceed 20 mSv per year averaged over this period and shall not exceed 50 mSv in any single year, and the circumstances shall be reviewed when the dose accumulated by any worker since the start of the extended averaging period reaches 100 mSv					
WNA 5	4.6 - first sentence	The emergency plan should include the following considerations regarding the protection of emergency workers:	Point out that it is only part of the content of an emergency plan			R	It is not adding any value
WNA 6	4.15 - Table 2	Leave out "This value may be…"	Even if the table is a copy paste from GSR part 7, the readability would improve if the text in the right column "This value…" is left out. The text is found in with the same formulation in the para 4.15 (last sentence) just above the table.				We have to take the Table as it is. The final table will be available in GSR part 7. This will be considered in the editorial process.
WNA 7	4.16/Table 3	AD_{Fetus}…AD (delta')$_{Fetus}$	Use the same spelling	A			Editorial
WNA 8	4.17	Leave out	If military personnel take part in the emergency work and therefore are part of			R	If the military are designated as emergency workers

			the emergency organization, there is no reason to specifically address them here.				than they should be treated as any other emergency worker
WNA 9	4.21	Leave out	The information in the paragraph is already in the draft. a repetition of part of 4.19 (a) implicit from 4.19 repetition of text in 4.19 (a) and (b) Already in 4.14			R	It is not entirely covered in 4.19 and 4.14
WNA 10	8.1	The services provided by technical service providers might, but not limited to, fall into two categories:	Not to exclude and limit new possibilities			R	No other categories have been identified to date
WNA 11	8.4	The management system of a service provider using radiation shall comply with national requirements and should be in accordance with all relevant IAEA safety standards.	National requirements are to prevail and normally incorporate the IAEA standards			R	See comment 30 from Germany. National requirements are not to be mentioned in this guide
WNA 12	8.10	For a service provider, safety culture can be established by: ….. For a service provider same safety culture recommendations apply as for the facility operator.				R but with modifications to the text	Facility operators are not mentioned anywhere in the document. However we would recommend following addition to the text of 8.10(e): “Engagement of the relevant management and staff”

WNA 13	8.14	The management system documentation is often contained in a quality manual that includes or makes reference to the supporting documents,14 including: … Emergency preparedness plans; Calibration data and traceability, inter-comparisons etc; Dosimetry.				R	The list is not meant to be exhaustive. It is also addressed in 8.103 and 8.109
WNA 14	8.14	(b) Management documents;	Does that include the follow up of requirements compliance, periodical reviews of the management system and non-conformity management?		A		Management documents, for instance documents relating to some of the topics covered in paras 8.56 to 8.75
WNA 15	8.17	~~The form and layout of the management system documentation should fit into the internal communication culture of the organization.~~	Unnecessary details	A			
WNA 16	8.29	… (f) perform periodic (usually annual) review of the management system.	Missing responsibility on reviews		A		(f) perform periodic (usually annual) reviews of the management system.
WNA 17	8.31	Human resources include all the people in the organization ~~who are involved in achieving the objectives.~~	Does that mean that staff not involved in work directly linked to the objectives is not human resource?		A		Delete the whole of the first sentence
WNA 18	8.37	With regard to the working environment, consideration should be given to how best to combine the consideration of human factors and physical factors with	Does not seem appropriate that IAEA goes into this area of competence.		A (do not include additional text)		The proposed additional text does not match section heading

		achieving the goal of enhancing the performance of the organization. ~~Attention to workload, stress factors, social structure within the organization, internal communication, workplace safety, ergonomics, lighting, ventilation and many other factors can all be combined to enhance the overall effectiveness of the organization in achieving its objectives. The organization should develop descriptions of minimum criteria for the workplace conditions necessary to achieve the various objectives.~~ Radiological protection should be integrated with Health and Safety as well as Environmental management.					(Infrastructure and working environment)
WNA 19	8.40	In the planning schedule, account should also be taken of the need for planning for ensuring the traceability of measurement results to the SI system and for establishing information on uncertainties for these measurement results.	Since this paragraph deals with the development process, it might be reasonable to place this recommendation in the corresponding paragraph "Planning" after 8.26.			R	Current location is more appropriate
WNA 20	8.48	… (a) Repeated tests (possibly done using different instruments for analysis); (b) Checks on introduced blank or test samples; (c) Plausibility tests on the results, done by applying expert knowledge, etc.	Actions described are more validation of the results then control of the process.			R	Current text is more appropriate

		The results of these measurements should be recorded as proof of the ~~control of the production process~~ validation of the final product.					
WNA 21	Independent assessment	Independence to perform the audits can be achieved by creating a cross-audit department which works across functions (where resources allow). The mandate and scope of the auditing team/person should be clarified and communicated.	Since the chapter is called independent assessments, but deals mainly with internal audits, it could be useful to describe how the independency within the organization can be achieved	A			Proposed text to be inserted as a new paragraph after 8.59.
WNA 22	8.66	… (d) Actions that were planned, the persons responsible for the actions and the time schedules that were decided upon, the date for follow up of decisions; …				R	Already covered by the expression "time schedules"
WNA 23	Management system review	Management system reviews are to be prepared by… with the purpose of….. and carried out at least …..	Description on what it is, purposes, how often and who is responsible is missing.			R	Covered in GS-R-3, no need to repeat here
WNA 24	8.68	For services in radiation safety, non-conformances could include: … (f) incorrect output data used for analysis (g) Incorrectly performed sampling or sample treatment		A			
WNA 25	9.48 Line 3	In general, water ~~and steam are~~ is the preferred decontamination agent~~s~~	Steam is not a preferred decontamination agent. By using steam the risk generating airborne contamination (aerosols) should not be	A			

			underestimated.				

IRPA collected comments from its associated members – provided as follows.

COMMENTS BY REVIEWER Reviewer: Italian Association of Radiation Protection Page.... of.... Country/Organization: IRPA/ AIRP Date:				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	General	The comments we have received within AIRP about the document under consideration, show a very positive judgment about the objective of such document: to guide on meeting the requirements of the BSS for occupational radiation protection. It has been appreciated the idea of having an integrated and unified document, which at the same time, presents an update of the five guidance related to the Occupational Radiation Protection. In this way, the document is providing a general guidance on the development of occupational radiation protection programs, with attention to both monitoring and assessment of workers' exposure due to external radiation sources and from intakes of radionuclides. It gives also guidance on the requirements for the radiation protection of workers involved in the mining and processing of raw materials,					General comment, no specific proposal

		and focusing on technical service provided in radiation safety. Many appreciations, as expected, have been obtained for some of the concepts, already present in the guidance RS-G-1.1 and covered again in the present draft, such as in the introduction, at 1.5: *" ... that radiation protection is only one component that should be addressed to protect the overall health and safety of the worker. The RPP should be established and managed together with other health and safety disciplines, such as industrial hygiene, industrial safety and fire safety. "* and at 1.8: *" . . .to provide an integrated approach to the control of exposure, including potential exposure, due to external and internal irradiation from both artificial and natural sources of radiation. "* ; concepts, which are reinforcing the idea of an integrated approach both internally to Radiation Protection and in a wider and more general health and safety protection. We have also seen some comments concerned about the extension and length of the present draft, which is considerable and such to make its full consultation quite hard and its use also difficult. On the other hand, we have also had comments on specific topics, like the internal exposure, stating that the coverage of this matter was not adequate and not sufficiently complete. The					

		complexity of this topic may require a more in depth drawing up of the text for a better and more significant contribution to the objective of meeting the requirements of BSS.					
2	Para 2.8	To remove: In general				R	
3	Pag. 6 and 7	For the sake of clarity, take into consideration to cite the corresponding requirements (of the BSS) in all of the 4 parts on REPONSABILITIES, and not only in the last two parts. That is consider to cite the corresponding requirements (of the BSS) related to paras 2.15, 2.16, 2.17 (of this draft DS453). In particular consider to cite in para 2.15, the Requirement 2 of the BSS, which is specific for Responsibilities of the government and includes the articles here cited in this DS453 as paras 2.13-2.28 of the BSS. With the same intention, consider to cite: in para 2.16 the Requirement 3, which is specific for Responsibilities of the regulatory body (paras 2.29-2.38 of the BSS); in para 2.17, the Requirements 19 (para 2.69-2.72 of the BSS) and the Requirements 20 (para 2.73 of the BSS) specific of the regulatory body to the occupational exposure. Consider it could be more useful and convenient to refer to specific requirement rather than to paragraphs.				R	This has already been considered very carefully during the preparation of the document under consideration of the general policy of keeping repetitions from the BSS to a minimum.

4		It could be proposed here, for the DS543 text, to avoid the use of the word management to define the set of employers, registrants and licensees, and to use the three terms by leaving them separated and if necessary, by repeating them every time is needed. By doing that, the readers of the document, can easily and clearly understand with whom the responsibility lies and they can clearly identify who among the three principal parties is responsible for the commitments for protection and safety. As an alternative, it may be proposed to use a single word, different than management, like for instance 'principal parties ', as already used in the recent TECDOC 1731 (2013) on Implications for Occupational Radiation Protection of the New Dose Limit for the Lens of the Eye which at 3.1 recites " ... *The principal parties (e.g. employers, registrants and licensees) are required to promote and maintain a safety culture…"* by recalling para 2.51 of the BSS. Again, instead of using the single and simple word "management", a possibility is to use the word management combined with a word defining that better "management" as 'management body' or 'management	In RS-G-1.1. (1999) 'Occupational Radiation Protection', within para 1.6. dedicated to the description of the objective of the Guide is reported: *" ...The recommendations given are intended for regulatory authorities, but this Safety Guide will also be useful to employers, licensees and registrants, to management bodies and their specialist advisers, and to health and safety committees concerned with the radiation protection of workers. ..."* . In the same guide, para 2.35 qualifies that : *" In summary, registrants, licensees and employers of workers are responsible for ensuring that exposures are limited (...), that protection and safety is optimized (...), and that appropriate radiological protection programs are set up and implemented (...). The implications of the fulfillment of these responsibilities are developed in a number of places in this Safety Guide. These responsibilities shall*			R	The term "management" is clearly defined in 2.18. The specific meaning of the term "management" is clear from the context. This issue will in any case be considered by the IAEA editors.

		team'.	*be placed on the management within the organizations of registrants, licensees or employers. For simplicity, the term 'management' will be used to denote 'registrants, licensees and employers' in the following sections of this Guide, except where there is a need to specify which entity is concerned."* In BSS (2011) the terms: registrants, licenses and employers (the terms are present all together and not singled out), are cited in 11 of the 52 requirements and in particular in Requirement 4, 14, 19, 20, 21, 23, 24, 25, 26, 27, 28 over the text, mainly in the part dedicated to occupational exposure. In the present draft DS534, in para 2.18 : *"In planned exposure situations, employers, registrants and licensees (hereinafter referred to simply using the term 'management') are responsible for ensuring that protection and safety is optimized, that applicable dose limits are complied*				

			with, and that appropriate RPPs are established and implemented." The question and the object of this comment concerns the facts that the text of the DS534 quite extended (three times more pages than the text of RS-G-1.1. 'Occupational Radiation Protection') and at the same time, integrating as many as 5 documents, we can find different uses of the word 'management'. As an example, in the BSS text, the term 'management' is always used with the same meaning and in expressions such as: management of risk, of the exposed situations, of spent fuel, for protection and in expressions like waste management and as management system. On the contrary, in the DS543 the introduction of "management = employers, registrants and licensees" may generate some confusion giving different meanings to statements where the word "management " is used with				

			different significations.				
5	2.29 and 2.30	to use the expression " definition of equivalent dose" and "definition of effective dose" instead of the "determination" as it is in the draft. The same in the case of para 2.33, change the expression "The determination of RBE weighted absorbed dose.."				R	Determination is the more appropriate word.
6	2.34	The suggestion is to define and introduce this quantity elsewhere in the DS453 draft, as an example in the part dedicated to Optimization.	The collective dose should be used and understood as an instruments for optimisation, as well indicated in 2.34. It is a sort of subsidiary quantity and not a dosimetric quantity.			R	Already defined in the safety glossary. To avoid too many duplications.
7	2.36	*" ... the equivalent dose received by any small area of the sensitive layer of the skin is less than ten times larger than the effective dose, the radiation is said to be strongly penetrating. If the equivalent dose is more than ten times larger than the effective dose, the radiation is said to be weakly penetrating. "* Even if this statement is strictly taken directly from the original version of ICRU 39 (1985), the following more clear statement could be better to use: the equivalent dose received by any small area of the sensitive layer of the skin <u>is lower than</u>				R	The current text is adequate. This issue will in any case be considered by the IAEA editors.

		ten times the effective dose, the radiation is said to be strongly penetrating. If the equivalent dose is larger than ten times the effective dose, the radiation is said to be weakly penetrating. In this way, the expression which may create misunderstanding 'less than ten times larger that' could be avoided.					
8	2.47	*" For exposure of the lens of the eye, the recommended depth is 3 mm, but there are at present no published conversion coefficients for converting from the basic physical quantity kerma to the directional dose equivalent H'(3). "* it is very clear. However there is the suggestion to consider to add some comments on this, also in the view of ICRP 116, *"(64) In the case of monitoring the dose to the lens of the eye, the operational quantity H'(d, Ω) with d = 3 mm was recommended for use by ICRU. However, if the monitoring device is not designed to measure H'(3, Ω), H'(0.07, Ω) may be used as a surrogate."*. Moreover, it could be considered to add a table/scheme summarizing the uses of the operational dose quantities in monitoring external exposures (as an example, it could be Table 2.4 in ICRP 116).			A		The following sentence added at the end of paragraph 2.47: *However, if the monitoring device is not designed to measure H'(3, Ω), H'(0.07, Ω) may be used as a surrogate.* Introduced here the reference to ICRP Publication 116 and to IAEA TECDOC 1731 Table is not necessary.

9	3.15	In para 3.15 related to optimization of protection and safety, attention is given on the dose to the lens of the eye referring to worker in medical field and it is mentioned that when dealing with X ray machines the optimization process involves local rules. In this sense, when the part on local rules is treated e.g. in para 3.86, a proper attention could be here renewed with a specific reference, and moreover in para 3.88 the use of goggles (protective glasses) could be remembered, in the general view of protective clothing				R	Paragraphs 3.86 and 3.88 are general in nature and such level of detail is not necessary.
10	3.51	It could be added some consideration on the doses received by workers in interventional procedure, in view of the new limits for the lens of the eye.				R	Paragraph 3.51 is general in nature and such level of detail is not necessary.
11	3.92	take into consideration that the 'new' attention to the limit of the lens of the eye is really 'new' also in RPP and to the worker and in this sense it could be worth to put the proper evidence on it. The concept expressed in para 9.53 It is a very good example of a concept which could be expressly introduced and added also in chapter 3 at the level of optimization or of radiation protection program (e.g. within paras	Para 3.95 of the BSS does not explicitly mention the case of protective glasses.			R	Paragraph 3.92 is general in nature and such level of detail is not necessary. Details are given in the quoted cross-references.

		3.8 -3.86), instead of simply mentioning that the use of personal protective equipment are given in paras 9.52-9.60.					
12	3.95	The suggestion is to take into consideration cases in which there is a short time available for making decisions and thus not sufficient time to follow all the RWP preparation procedure, by adding at the end of para 3.95, the following sentence: *"For tasks which need special radiological precautions, a RWP based on a short approval process by the RPO, could be considered sufficient, specifically for the tasks characterized by the availability of short time for the decision to undertake a specific radiation work (e.g. the need of prompt maintenance of an accelerator; tasks related to short half lived radio nuclides)."*				R	This opens the door to possible misuse of the RWP concept.
13	3.119	it is written *"...The objective should be to establish as comprehensive a record as is reasonable of credible, formally assessed exposures. Account should be taken of the factors affecting the accuracy of the assessment. ..."* and it looks like an unclear and difficult to understand statement.					Editorial This will be taken care of by IAEA editors.
14	3.124	it is written *" ... the expected levels and variability of the quantities being*		A			Replace "*measured*" by "*determined*"

		measured (e.g. effective dose, intake) and the type and frequency of monitoring. …" but the quantities such as effective dose is not measurable.					
15	5.88	it is suggested to include also the ICRP Publication 123, Assessment of Radiation Exposure of Astronauts in Space, published in 2013.		A			
16	7.45	The suggestion is to pay attention to Eq.24 (DS543) and add some note when considering the differences with previous formulation in RS-G-1.3. Moreover consider if it is useful to specify $H_1 = H_0$ in both the parts ($H_1 \leq H_0$ and $H_1 \geq H_0$) of the Eq. 24, since for $H_1 = H_0$ it is unequivocally $[1\text{-}2\ H_0 / (H_0 + H_1)]=0$.	In para 7.45., by referring acceptance level of uncertainty and the allowable accuracy interval, the upper limit R_{UL} and the lower limit R_{LL} are given by the Eq. 23 and 24. The same point is treated in RS-G-1.3 'Assessment of Occupational Exposure Due to External Sources of Radiation' where lower limit and upper limit were given by the Eq.2 and Eq. 3 respectively. By comparing the formulation of the equations, we can see that the equations for the upper limits are the same in the two documents, while the equations for the lower limits look different in the two documents.	A			Formula has been checked; it is correct as it is in the current version
17	7.47	In para 7.47 for *H*p(10), *H*p(0.07)			A		The text can be

		and *H*p(3) the indication in given of H_0 (the lowest dose that needs to be measured) in relation to a monitoring period of one month. Moreover the accuracy intervals for *H*p(10) and *H*p (0.07) are shown graphically (as already shown in IAEA RS-G-1.3). The accuracy interval for *H*p(3) is missing. If this information for *H*p(3) is not available it could be useful to mention it, or for example, put a reference to para 7.16, if this is the case: *" … dosimeters designed specifically for Hp(3) are not yet widely available …".*					modified as suggested: "The accuracy intervals for Hp(10) and Hp(0.07), the most widely used quantities, are shown graphically in Fig. 4".
18	10.5	to modify the first part, as follow: "The occupational physician, including any private occupational physician employed on a part time basis, should be knowledgeable, through training and retraining where necessary, on at least the radiation physics and biological effects of radiation exposure, the means of control of external and internal exposure, and the interpretation of exposure data and dosimetric assessments [156]. In order to ensure that the occupational physician is able to perform all the relevant tasks, a recognition of his/her capacity to act in that respect should be done by the competent authority. With the support of specialists where				R	The extra details provided are regarded as too prescriptive to cover different situations.

		appropriate, the occupational physician should be in a position to use this knowledge not only in the implementation of the workers' health surveillance programme . . . . ."					
19	Appendix IV	In Appendix IV, related to Biokinetic models for internal exposure assessment, in the part related to ingestion and in the part related to inhalation, it could be useful to remember that BSS includes in Schedule III respectively the table III-2B and the table III-2C with the list of compounds and values of gut transfer factors f_1 used to calculate committed effective dose per unit intake via ingestion and via inhalation for workers.				R	Already given in the main text (Para. 7.201)
20	IV.16	In para IV. 16, when mentioning the ICRP Human Alimentary Tract Model, this model is referred for 2 times as 'new model' and moreover is underlined that it has 'now' been developed in ICRP Publication 100. One comment is that ICRP 100 dated 2006 and the suggestion is just to erase the word 'now' in the expression 'has been developed'.		A			
		Errata corrige a) X ray is written as: X ray, X-ray, X Ray b) In para 2.52. is written $H_T(g)$ but it has to be changed in $h_T(g)$		A			a) The correct way is X ray b) c) d) accept

		c) update reference 106 as 'EURADOS Report 2013-01, IDEAS Guidelines (Version 2) for the Estimation of Committed Doses from Incorporation Monitoring Data'. d) Pag. 230 in reference [15] it is correct to write 23 February 2012 and not 2013					

COMMENTS BY REVIEWER Reviewer: Page 1 of 11 Country/Organization: USA/IRPA Date: May 29, 2014				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	2.1(iii)	Delete "Existing exposure situations include situations of exposure to natural background radiation".	Even high background radiation areas around the world present doses too low to observe adverse effects. What "need for control" exists?			R	Quotation from the BSS
2	2.4	Delete, "Examples of excluded exposures are those from ^{40}K in the body and from cosmic rays at the Earth's surface".	The examples of ^{40}K in the body and cosmic rays at the Earth's surface should be exempt from this standard not only because they are unamenable to control, but			R	Those reported are actually examples of excluded.

			mainly because they cannot be demonstrated to carry any hazard. Exposure to cosmic radiation could be reduced by banning high altitude flight, and evacuating areas of human habitation at altitudes above sea level. We don't take these measures because they are unwarranted in the absence of demonstrable risk.				
3	2.10	Delete "and diagnostic".	Why are diagnostic medical exposures exempted from the requirement for optimization? As proposed by ICRP Report No. 105 and ICRU Publication 74, diagnostic medical doses should be optimized too, so that doses are as low as reasonably achievable while maintaining diagnostic value.		A		Delete the text "except for therapeutic and diagnostic medical exposures".
4	2.34	"These quantities take~~s~~ account"	Delete "s" from "take" to be grammatically correct.		A		
5	3.6	The text states "Exemption or clearance is the appropriate regulatory option if the radiation risks are too low to warrant regulatory control or if the imposition (or retention) of regulatory control would yield no net benefit…"	How is "net benefit" to be calculated? Use of a linear, no-threshold model of radiation risk, assumed by regulation, predicts that risks are reduced all the way down to zero dose, so how is it possible that a dose reduction results in no net benefit under			R	It is the reglatory control, not the dose reduction, that can produce no net benefit.

			this assumption?				
6	3.7	"…for bulk material containing radionuclides of natural origin, the 10 μSv criterion is not appropriate since it is one or two orders of magnitude below the normal variations in exposure to natural background radiation".	If the criterion for appropriateness is being below normal variations in exposure to background radiation, why is this only applied to NORM? The body doesn't care where the radiation originated.			R	The existing text is consistent with the BSS. Unlike the case of NORM, background levels of artificial radionuclides are almost zero.
7	3.12(b)	The process of optimization should take account of: The distribution of individual and collective exposure among different groups of workers;	Why? If a linear, no-threshold model of radiation risk is assumed, as required by regulation, what difference is 0.1 mSv received by 10 individuals, or 1 mSv received by 1 individual in terms of population risk? This assumes all individuals are below applicable dose limits. How is this issue to be considered in practice?			R	Collective dose is merely a tool for optimization. For radiation protection individual dose is the important quantity.
8	3.25(c)	Identify all relevant economic, social and radiological factors (sometimes non-radiological factors as well) for the particular situation under review that distinguish between the identified options, e.g. collective dose, distribution of individual dose…	Why consider distribution of individual doses? If a linear, no-threshold model of radiation risk is assumed, as required by regulation, what difference is 0.1 mSv received by 10 individuals, or 1 mSv received by 1 individual in terms of population risk? This assumes all individuals are			R	We cannot ignore the possibility of high individual doses received by a small proportion of the workers.

			below applicable dose limits. How is this issue to be considered in practice?				
9	Figure 3		The significance of the two colors of bars should be explained either in the title of the graph, or in a footnote to the graph.			R	The text in the figure is self-explanatory.
10	3.162(d)	"…doses are always expected to be well below the threshold for deterministic health effects, and that there is never any real prospect of a radiological emergency."	This text seems to be implying that a radiological emergency cannot exist as long as doses are below the threshold for deterministic effects. If that is the case, why did the Fukushima situation require the evacuation of thousands of people, all of whom were expected to receive doses well below deterministic thresholds? While I agree that a radiological emergency is highly unlikely for the activities listed, pegging it to deterministic thresholds is puzzling.		A		Modification to the text: "The recognition that doses are always expected to be well below the threshold for deterministic health effects; In addition, there is never any real prospect of a radiological emergency."
11	4.14(c)	When undertaking actions to avert a large collective dose.	According to the LNT risk model assumed to apply to the exposed population, as required by regulation, exposing a worker to a dose in excess of 50 mSv would be justified as long as the			R	The current text does not imply that the worker's exposure "would be justified as long as the collective dose averted is >50 mSv" .

			collective dose averted is >50 mSv. This is not a very large collective dose.				
12	4.15, Table 2	The value of 500 mSv should be exceeded only under circumstances in which the expected benefits to others clearly outweigh the emergency worker's own health risks	500 mSv is still below the threshold for deterministic effects listed in Table 3, so according to the LNT risk model assumed as required by regulation, to apply to the exposed population, exposing a worker to a dose in excess of 500 mSv would be justified as long as the collective dose averted is >500 mSv.			R	The final table will be available in GSR part 7 and will be considered in the editorial process.
13	5.76	Exposure to cosmic radiation at ground level is regarded as unamenable to control and is therefore excluded from the scope of the BSS.	Cosmic rays at the Earth's surface should be exempt from this standard not only because they are unamenable to control, but mainly because they cannot be demonstrated to carry any hazard. Exposure to cosmic radiation could be reduced by banning high altitude flight, and evacuating areas of human habitation at altitudes above sea level. We don't take these measures because they are unwarranted in the absence of demonstrable risk.			R	The text is consistent with the BSS
14	5.81		Given that maximum doses to aircrew is on the order of 6.5			R	These questions are addressed elsewhere

			mSv – over a factor of 10 below the level where cancer risks are detectably increased even for acute exposures, and given the absence of consistent evidence of increased risks in epidemiological studies of flight crews, when is it deemed warranted to monitor these doses? Furthermore, what remedial actions are practical to lower these doses?				in this section.
15	5.85		This section is eminently sensible, and the logic used here should be used throughout.	A			
16	7.242	The biodosimetry methods may not be appropriate for low dose exposures less than 50–100 mSv.	The lower limit of detection for biodosimetry techniques depends not only on dose, but on dose-rate, age, and time since exposure. Sensitivity is also a function of the number of (typically lymphocytes) cells scored and the fraction of the genome stained or painted per cell.				No specific change proposed.
17	7.251		Are records of medical imaging exams required as a condition of employment (e.g. an entrance, exit, or			R	Direct quotation from the BSS.

			periodic chest X-ray) also a mandatory part of the occupational exposure record?				
18	8.37	With regard to the working environment, consideration should be given to how best to combine the consideration of human factors and physical factors with achieving the goal of enhancing the performance of the organization. Attention to workload, stress factors, social structure within the organization, internal communication, workplace safety, ergonomics, lighting, ventilation and many other factors can all be combined to enhance the overall effectiveness of the organization in achieving its objectives. The organization should develop descriptions of minimum criteria for the workplace conditions necessary to achieve the various objectives.	I don't disagree that these factors are desirable for technical service providers (and any employer), but I question the appropriateness and necessity of including this text in a document on radiation safety.	A			Comment already taken into account (WNA comment #18)
19	8.54	Communication in an organization providing services in radiation safety can be achieved by: (a) Organizing regular meetings of key personnel; (b) Using communication tools (electronic billboards, intranet, etc.); (c) Having similar methods of internal communication.	I don't disagree that these factors are desirable for technical service providers (and any employer), but I question the appropriateness and necessity of including this text in a document on radiation safety.			R	This guidance is considered to be needed.
20	9.64	In workplaces where there are areas	According to the LNT risk			R	The reduction in

		with potential for high levels of radiation exposure, when no other practicable means of control are available, job rotation may be considered as an administrative control to restrict the exposure of individual workers. However, the use of this method should be kept to a minimum, and job rotation should never be used as a substitute for the development and use of appropriate methods of individual exposure control.	model assumed by regulation to apply to the exposed population, this recommendation makes no sense, as long as all workers are kept below regulatory limits. Spreading dose over larger numbers of workers does not change the collective dose.				individual doses achieved by job rotation is an important consideration.
21	10.29		If the initial, periodic, or exit medical exam requires radiological imaging exams as a condition of employment, records of these exams, and the radiation doses they deliver, should be maintained.			R	Unnecessary level of detail and in any case it relates to medical exposures.
22	I.3(ii)	"…the annual effective dose expected to be received by the worker would range from 2 mSv per year (250 Bq/g × 0.008 mSv per Bq/g) to 10 mSv per year (250 Bq/g × 0.04 mSv per Bq/g). This would suggest that, in terms of the graded approach, the exposure situation would be of fairly significant concern for protection and safety".	I question the characterization of this exposure scenario as "fairly significant concern for protection and safety". Even at acute doses of about 100 mSv (10-50 times higher than postulated here), there is no detectable increase in cancer risk. This exposure scenario involves chronic exposure, so is of even less concern.			R	The dose of 10 mSv is half the annual dose limit for workers, and consequently of fairly significant concern.
23	II.34	One disadvantage of nuclear track emulsion is its high rate of fading.	Section II.6 did a good job of making it clear that signal		A		One disadvantage of nuclear track

			fading is only an issue prior to development of the film. This section should do the same. Fading is not an issue after the film is developed.				emulsion is its high rate of fading before being processed.
24	A-6	Cytogenetic damage in peripheral blood lymphocytes (PBL) includes dicentric chromosomes, chromosome aberrations, micronuclei and translocations.	The listing of chromosome aberrations in this sentence is not strictly correct. Dicentrics, micronuclei, and translocations are examples of chromosome aberrations. Other examples include rings, multicentrics, and Robertsonian fusions.			R	Reject unless inconsistent with original reference.
25	A-7	Dicentric frequencies in PBL show a clear linear quadratic dose–effect relationship up to ~5 Gy for acute photon exposures.	This is true only if the analysis is performed promptly after exposure. The frequency of dicentrics declines fairly rapidly after exposure, particularly if doses are high enough to induce lymphocyte turnover.		A		Dicentric frequencies in PBL can show a clear linear quadratic dose–effect relationship up to ~5 Gy for acute photon exposures.
26	A-15	In order to assess induced translocations among different labelled chromosomes, multi-colour FISH and, for whole genome analysis, M-FISH have been developed.	This text implies that multi-colour FISH and M-FISH are different techniques. The acronym M-FISH stands for multi-colour FISH. Spectral karyotyping is a similar technique to paint each chromosome pair with a unique signal.			R	See answer to the comment #48 of Germany
27	All		My most significant comment is that the				

			dedication of any resources to the control of exposures as low as 1 mSv per year is ill-advised. This is well within the range of natural background variability. Even acute doses 100 times higher than this level have not been reliably associated with increased cancer risks, let alone deterministic effects. And finally, directing attention to doses this low contributes to rampant radiophobia, which exaggerates hazards from low radiation doses far out of proportion to other hazards, and to the hazards of controlling doses this low. The prolonged evacuation of Fukushima residents – which has led to over a thousand deaths from stress other mental health issues – is a prime example.				
28	All		Although I have serious objections to using the LNT assumption for low dose risks and regulatory policy, this is not the place for that debate. Nonetheless, if LNT is to be assumed by				

			regulation, then the regulations should at least be consistent with the stated assumption. Several of my previous comments relate to this disconnect between specific recommendations and the LNT assumption. While a de minimis dose level makes eminent sense (see comment 28), no such level has been recognized or stated. It should be, and the recommendations referred to here would be consistent with such a policy.				
29	Table 6, Summary of testing		Periodic testing frequency is stated as annually or more frequently. In the US, the calibration standard for portable survey instruments (ANSI N323A and B) and air monitoring systems (ANSI N42.54 draft) are currently undergoing revisions. The two portable instrument calibration standards have been combined into a single standard and is approved awaiting publication. This standard incorporates new protocols that allow for extending the calibration			R	The recommendations in Table 6 are a reflection of current practice.

			interval beyond one year by performing and documenting simple testing between calibrations. These protocols will be beneficial to users that are operating remotely from a calibration facility (e.g. military) or have either limited use or limited resources such as emergency response organizations (e.g. police and fire departments). The periodic operability checks are intended to demonstrate consistency of operation between calibrations.				
30	Table 7, Surface Contamination Probe Sensitivities		The instrument types described and the associated "calibration factors" appear to be based on the probe response to the 60Co beta particle with a maximum spectrum energy of 0.310 Mev. In the US, "calibration factor" (also referred to as detector efficiency) for the detector probe is stated as detector response as counts output for each nuclear particle that intersects the detector probe window (e.g. cps/dps). The values in Table 7 are comparable to the			R	Table 7 is just an illustration of the fact that the sensitivity of the instrument increases with the surface area of the probe (see Text in 9.39).

			detector response to a 2π surface emission source (ISO-xxxx, etc.) with the exception of the ZnS+scintillator detector, which appears to be approximately a factor of 3-4 too low. As such, the table values are not appropriate for converting a field measurement to the equivalent surface source activities stated. To obtain the surface activity in units of Bq/cm2, surface attenuation (e.g. films, paint, etc.) and surface backscatter. Consider the following algorithm for converting detector response to equivalent surface activity. S0(Bq/cm2) = (RD - RB)/εiεs(1 - fb)WD Where: RD – detector response (cps) RB – background (cps) εi – detector efficiency (cps/dps) εs – surface attenuation effects (film, coating WD - detector window area (cm2) Note: the values for				

			"calibration factor" in Table 7 are equivalent to the detector efficiency parameter in the above equation.				

COMMENTS BY REVIEWER Reviewer: Donna Newman Director Professional Practice ISRRT Page...1. of.... Country/Organization: ISRRT - IRPA Date:5/28/2014				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	Page 4 of 262	I. INTRODUCTION..... ..... 1 II. FRAMEWORK FOR OCCUPATIONAL RADIATION PROTECTION ..... 3 III. EXPOSURE OF WORKERS IN PLANNED EXPOSURE	To avoid confusion between chapter and page number			R	In conformance with style guidelines for IAEA publications.

		SITUATIONS ..... 18 IV. EXPOSURE OF WORKERS IN EMERGENCY EXPOSURE SITUATIONS ....56 X WORKERS' HEALTH SURVEILLANCE 185					
2	Page 12	RESPONSIBILITIES **The government** 2.15. The responsibilities of 2.39. For monitoring of the lens of the eye, a depth of 3 mm is recommended by the ICRU [7],					
	Page 17	3.15. The optimization of protection and safety should be considered at the design stage of equipment and installations, when some degree of flexibility is still available. The use of engineered controls should be examined….Add to the section that with the advancement in technology every piece of equipment needs to be optimized and appropriate shielding used when it doesn't hinder the quality of the images				R	Unnecessary details
	Page 21	3.17. Management should record information on the…..add a) Quality Assurance and administrative procedure….	Reason Quality assurance should be included in all components of optimization for occupational exposure			R	Unnecessary details

		Add d)_Verification of training, education and competency of workers	and also the training plays into the optimization				
	Page 21	3.18. **The primary responsibility for optimization lies with management. Commitment to an effective protection and safety policy is essential at all levels of management, but particularly at the senior level**. Change sentence to read The primary responsibility for implementation and oversight lies with t management				R	The existing text is more appropriate
	Page 24	**3.34. In terms of Schedule III of the BSS, the dose limits for occupational exposure of workers over the age of 18 years, are:** Subpart C--Occupational Dose Limits**20.1201 Occupational dose limits for adults.** (a) The licensee shall control the occupational dose to individual adults, except for planned special exposures under § 20.1206, to the following dose limits. (1) An annual limit, which is the more limiting of-- (i) The total effective dose equivalent being equal to 5 rems (0.05 Sv); or (ii) The sum of the deep-dose equivalent and the committed dose equivalent to any individual organ or	Please consider the occupational dose limits from the NRC in the US as a basis for the safety standard series section 3.34. I have included the information for a reference. The proposal is too strict with regards to the limits they wish to impose which the institutions have to compile with if this document and limits are accepted. The burden on the individual's institutions would be too great. The limitations subsequently imposed upon individuals in the workforce who work with radioactive material s			R	The paragraph is in line with current BSS

		tissue other than the lens of the eye being equal to 50 rems (0.5 Sv). (2) The annual limits to the lens of the eye, to the skin of the whole body, and to the skin of the extremities, which are: (i) A lens dose equivalent of 15 rems (0.15 Sv), and (ii) A shallow-dose equivalent of 50 rem (0.5 Sv) to the skin of the whole body or to the skin of any extremity. (b) Doses received in excess of the annual limits, including doses received during accidents, emergencies, and planned special exposures, must be subtracted from the limits for planned special exposures that the individual may receive during the current year (see § 20.1206(e)(1)) and during the individual's lifetime (see § 20.1206(e)(2)). (c) When the external exposure is determined by measurement with an external personal monitoring device, the deep-dose equivalent must be used in place of the effective dose equivalent, unless the effective dose equivalent is determined by a dosimetry method approved by the NRC. The assigned deep-dose equivalent must be for the part of the body receiving the highest exposure.	would also be too great and too limiting. The NRC looked at this and have already concluded that the current radiation limits are more than satisfactory. 5rem/ yr is body limit for occupation exposure is low enough and further limiting to 2 rem/yr is to limiting and so we should consider switching this out to the NRC standing.				

		The assigned shallow-dose equivalent must be the dose averaged over the contiguous 10 square centimeters of skin receiving the highest exposure. The deep-dose equivalent, lens-dose equivalent, and shallow-dose equivalent may be assessed from surveys or other radiation measurements for the purpose of demonstrating compliance with the occupational dose limits, if the individual monitoring device was not in the region of highest potential exposure, or the results of individual monitoring are unavailable. (d) Derived air concentration (DAC) and annual limit on intake (ALI) values are presented in table 1 of appendix B to part 20 and may be used to determine the individual's dose (see § 20.2106) and to demonstrate compliance with the occupational dose limits. (e) In addition to the annual dose limits, the licensee shall limit the soluble uranium intake by an individual to 10 milligrams in a week in consideration of chemical toxicity (see footnote 3 of appendix B to part 20). (f) The licensee shall reduce the dose that an individual may be allowed to receive in the current year by the					

		amount of occupational dose received while employed by any other person (see § 20.2104(e)).					
	Page 31	3.73. The accountability system for radiation generators and radioactive sources should include an inventory that contains records of the location and description of each radiation generator or radioactive source and the activity and ….. Please add to this paragraph the following In addition the system should include leak testing of the source before it is first used then periodically after to ensure no removable contamination or leaking has occurred.	> NRC Regulations (10 CFR) > PART 35—MEDICAL USE OF BYPRODUCT MATERIAL **PART 35—MEDICAL USE OF BYPRODUCT MATERIAL** 35.67 Requirements for possession of sealed sources (2) Test the source for leakage at intervals not to exceed 6 months or at other intervals approved by the Commission or an Agreement State in the Sealed Source and Device Registry			R	The proposed additional text is not related to accountability
	Page 32	3.77. Work with unsealed radioactive sources can result in contamination of the air and surfaces, and this in turn can lead to intakes ……. Add a sentence that states consideration in design to include negative pressure to rooms and fume hood with negative pressure to decrease intake of radioactivity in the air	Add to the support to reduce exposure			R	Not related to classification of areas
	Pg 36	Add G) to evaluate adjacent room when new equipment is installed to ensure exposure are correct to the	To clarify when new fusion technology is installed and shielding is			R	Unnecessary detail

		public or worker	correct				
	Pg 38	Add Conversely, workers handling radionuclides…. As well as other medical personal that are caring for the patient when they are housed in the hospital may need to be monitored as well.	Add information regarding inpatient i-131 treatment in hospital setting to provide monitoring for all personal that is involved			R	Detailed guidance on occupational exposures in medical practices will be included in DS399
	Pg 39	e) add to end of sentence to include personal that are caring for the I-131 treatment patient such as nursing staff ect.	To ensure you have a monitoring program for all essential personal included in procedure that may receive radiation exposure			R	Detailed guidance on occupational exposures in medical practices will be included in DS399
	Pg 46	3.141. It is the management's ……. radiation protection information and training add on a annual basis and ensure competency	To establish that education needs to be ongoing not just once			R	Covered by 3.140(a).
	Page 59 of 262 TABLE 2. guidance values for restricting exposure of emergency workers [28]	Write [a] and [b] in the form of two different paragraphs For example: A. Guidance value These values apply for: (a) the dose from exposure to external penetrating radiation. .....and (b) the total dose (effective dose or equivalent dose ..... as appropriate. B. *H*P(10) *H*P(10) is the personal dose equivalent *H*P(*d*) where *d* = 10 mm. *Hp*(10) also represents *Hp*(3) ..... (see para. 5.71 of GSR Part 7).	Too much text for a reference			R	GSR Part 7 final table will be considered in the editorial process.

	Page 60 of 262 TABLE 3. criteria for preventing or minimizing severe deterministic effects [28,29]	**Divide the table in two. For exemple:** TABLE 3.1. criteria for preventing or minimizing severe deterministic effects **External acute exposure (<10 h)** TABLE 3.2. criteria for preventing or minimizing severe deterministic effects **Internal exposure from acute intake (Δ = 30 d)d**	Too many references on the same page			R	Table taken from existing standard and cannot be changed
	No. Appendix F p. 71	Fundamentals C. Hazards of exposure to radiation (1.) Verify patient identification (2.) Explain/Provide patient instructions	The patient should come first in an exam			R	Not identifiable in this document
	Appendix J i. p.80	Move (I.) to the top of the list: Verify patient identification and provide patient instructions	Same as above			R	Not identifiable in this document
	Appendix K	6. Facilities must provide radiation safety education annually to all patient care personnel.	All allied medical personnel need to practice good radiation hygiene for themselves and patients.			R	Not identifiable in this document
	Pg.83	6.11 Please consider below information to be incorporated in this paragraph……. The Nuclear Regulatory Commission's (NRC's) regulations on radiation protection are specified in 10 CFR Part 20, "Standards for	Provided the refereence for us Nuclear regulatory limits for pregancy wondering if these were looked at also. Wondering how determined			R	Based on ICRP recommendations and existing IAEA standards

		Protection Against Radiation"; and 10 CFR 20.1208, "Dose to an Embryo/ Fetus," requires licensees to "ensure that the dose to an embryo/fetus during the entire pregnancy, due to occupational exposure of a declared pregnant woman, does not exceed 0.5 rem (5 mSv)." Section 20.1208 also requires licensees to "make efforts to avoid substantial variation above a uniform monthly exposure rate to a declared pregnant woman." A declared pregnant woman is defined in 10 CFR 20.1003 as a woman who has voluntarily informed her employer, in writing, of her pregnancy and the estimated date of Other sections of the NRC's regulations also specify requirements for monitoring external and internal occupational dose to a declared pregnant woman. In 10 CFR 20.1502, "Conditions Requiring Individual Monitoring of External and Internal Occupational Dose," licensees are required to monitor the occupational dose to a declared pregnant woman, using an individual monitoring device, if it is likely that the declared pregnant woman will receive, from external sources, **a deep dose equivalent in excess of 0.1 rem** (1 mSv). According to Paragraph (e) of 10 CFR	The existing language is redundant and the over use of the words “management and manager” are confusing. Listing duties makes them stand out better. In this section in pg you don’t say deep dose is this what you mean should include it if so otherwise confusing				

		20.2106, "Records of Individual Monitoring Results," the licensee must maintain records of dose to an embryo/fetus if monitoring was required, and the records of dose to the embryo/ fetus must be kept with the records of dose to the declared pregnant woman. The declaration of pregnancy must be kept on file, but may be maintained separately from the dose records. The licensee must retain th					
	Pg 102	7.8 a) add after research, nuclear medicine, PET/CT , Nuclear Pharmcies b) add after interventional, cardiology/radiology and nuclear medicine, PET/CT and Nuclear Pharmcies	To technology where highest emitting radition found (Cyclotrons and pet depts)			R	Covered by existing text
	Pg 152	8.10 add k) enviorment where employee are encouraged to raise concerns and concerns review promptly and with feedback given in timely manner			A		Already covered in modified (e)
	Management System for Providers of Technical Services p. 158 8.29	8.29 The organization providing radiation safety services often recommend the organization appoint one person, who in addition to their regular duties, will act as the management system coordinator. The coordinator should have appropriate experience in the tasks for which he or she is appointed and have	The existing language is redundant and the over use of the words “management and manager” are confusing. Listing duties makes them stand out better.				Editorial -will be considered during the editorial process.

		the authority assigned in writing to do the following: (a) Develop and coordinate the Management system, which includes but not limited to: 1.) performing activities designed to ensure compliance with relevant standards; 2.) harmonizing procedures and documents; 3.) reviewing operations; 4.) identifying and reporting any non-conformance (i.e. the non-fulfillment of a requirement) to the management ; 5.) conduct training in awareness of the management system for the staff; 6.) other duties as assigned					
	p.160 8.40	The planning schedule should ensure traceability of measurement results to the SI system and establish information on uncertainties for these measurement results.	Existing statement is wordy and redundant.				Editorial -will be considered during the editorial process.
	p.161 8.47	For consultancy services measurements may include:	No comma required, replace “could” with “may” which indicates giving permission. Same as above.				Editorial -will be considered during the editorial process
	8.48	(a) For measurement and calibration these services these checks may include:manage					Editorial -will be considered during the editorial process
	p.162	Customers’ property, including	Redundant use of term				Editorial

	8.52	intellectual property , should be safeguarded throughout all the production processes. This property and methods to protect it should be specified in advance. For example……..					-will be considered during the editorial process
	p.164 8.66	(a) The person(s) involved in the review; (b) Factors considered; (c) Decisions reached; (d) Actions planned, the person(s) responsible for the actions and time schedules decided upon	Clear and concise Identifies one or more person may share responsibility.				Editorial -will be considered during the editorial process
	8.70	A corrective action procedure is initiated: a.) following a complaint; b.) negative feedback received; from a customer; c.) discovery of non-conformance by staff; D.) and/or during an audit.	Easier to read				Editorial -will be considered during the editorial process
	8.71	A preventative action may follow a corrective action or be taken alone during the development of new testing or management procedures due to a decision made…	Grammatically cumbersome				Editorial -will be considered during the editorial process
	8.72 p.165	……. The finding will determine if an informal or extensive formal investigation may result.	Less redundant				Editorial -will be considered during the editorial process

DS453

COMMENTS BY REVIEWER Reviewer: Page.... of.... Country/Organization: IRPA/Japan Health Physics Society Date: 30 May 2014				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	After 3.47 (Addition of new paragraphs)	SPECIAL CIRCUMSTANCES 3.#1 In special circumstances, provided that a practice is justified and is designed and conducted according to good practice, and that radiation protection in the practice has been optimized but occupational exposures still remain above the dose limits, and that it can be predicted that reasonable efforts can in due course bring the	In the restoration stage after the nuclear accident, the recovery workers in the accident site are forced to be exposed to relatively high radiation dose. In such situation, a flexible application of dose restrictions for workers should be necessary to carry out the restoration				Already answered (see comment #4 of WNA)

		occupational exposures under the limits, the Regulatory Authority may exceptionally approve a temporary change in a dose limitation. Such a change should be approved only if formally requested by the registrant or licensee, if the Regulatory Authority determines that the practice is still justified and is satisfied that appropriate consultation with the workers concerned has taken place. 3.#2 Should special circumstances exist which require a temporary change in some dose limitation, the registrant or licensee may apply to the Regulatory Authority for such a temporary change. 3.#3 No temporary change in a dose limitation requirement should be made without approval by the Regulatory Authority. 3.#4 The registrant or licensee should, in any application for a temporary change in a dose limitation: (a) describe the special circumstances requiring the temporary change; and (b) provide evidence to demonstrate that: (i) all reasonable efforts have been made to reduce exposures and that protective measures and safety provisions have been optimized;	work after accident reasonably practical. It will be essentially important that the skillful workers who have experience of the work in early stage after an accident are allowed to continue the restoration work within a certain period of time. The general principles for the radiation protection of workers in accident and emergency situations have been provided in ICRP Publ. 75, which says: - In accident and emergency situations, doses may exceed the dose limits. (para.60) - If continued exposure is permitted, it would be appropriate for the management, in consultation with the worker, and subject to any requirements of the regulatory agency, to establish a formal dose limitation regime to be applied for the remainder of the control period. A				

		(ii) the relevant employers and workers, through their representatives where appropriate, have been consulted and their agreement obtained on the need for a temporary change and on the conditions of the temporary change; (iii) all reasonable efforts are being made to improve the working conditions to the point where the dose limits specified in para. 3.34 ; and (iv) the monitoring and recording of the exposures of individual workers are sufficient to demonstrate compliance with the relevant requirements of this guide and are sufficient to facilitate the transfer of exposure records between relevant employers. 3.#5 Any temporary change in a dose limitation should: (a) be in accordance with the dose limitation for special circumstances given in para.3.#6; (b) be for a limited period of time; (c) be subject to annual review; (d) not be renewable; and (e) relate to specified work areas. 3.#6 When, in special circumstances, a temporary change in	temporary dose restriction based pro-rata on the remaining period of time to which the dose limit relates might be appropriate. (para.61) - Consideration also needs to be given to the subsequent management of a worker who as a result of an accident has received a significant exposure but whose total dose for the relevant period has not exceeded the relevant dose limit. In those situations where continuation of normal working practice during the remainder of the period may lead to the total dose exceeding the relevant dose limit, management may decide to change the worker's duties to avoid this happening. While recognizing the legal status that regulatory agencies have given to the dose limits, the Commission recommends that such situations should be dealt with in a flexible manner. (para.62)				

		the dose limitation requirements is approved in pursuance with para.3.#1 to para.3.#5: the dose averaging period mentioned in para. 3.34 may exceptionally be up to 10 consecutive years as specified by the Regulatory Authority, and the effective dose for any worker should not exceed 20 mSv per year averaged over this period and should not exceed 50 mSv in any single year, and the circumstances should be reviewed when the dose accumulated by any worker since the start of the extended averaging period reaches 100 mSv.	- The doses received in emergency situations should not compromise the further employment of the worker in work with ionizing radiation. (para.148) The additional text is proposed on the basis of the prescriptions given in Appendix I and Schedule II in the Safety Series 115 (previous BSS) regarding the dose limitation in special circumstances.				
2	4.12	The initial phase of a response to a nuclear or radiological emergency is characterized by a lack of information about the event, a scarcity of materials for implementation of protective measures and the need for urgency in implementing protective actions. Therefore, there is little or no scope for applying the optimization process when managing the protection of emergency workers during this initial phase. Efforts should be aimed at reducing any exposures as far as practicable taking into account the difficult conditions of the evolving emergency.	In our experience after the nuclear accident in Fukushima, there was a serious shortage of protective tools.	A			

3	5.21	Reference levels are generally expressed in terms of annual effective dose ~~to the representative person in the range 1–20 mSv~~. However, reference levels for exposure to radon are expressed in terms of annual average radon concentration in air.	Section 5 describes exposure of workers in existing exposure situations including exposures from remedial action in a contaminated area, ^{222}Rn and ^{220}Rn, and cosmic radiation to aircrew and space crew. However, the dose range 1–20 mSv is the band of reference level for the public.			R	Consistent with BSS paragraph 5.8 and 5.25
4	7.221	Add specific examples of parameters for calculating the equivalent dose to a tissue or organ, or the committed effective dose.	Clarification.	A			The use of modelling parameters specific to the individual (e.g., the transfer rates of the systemic biokinetic model)

COMMENTS BY REVIEWER Reviewer: The Romanian Society for Radiological Protection (office@srrp.ro) Page 1 of 4 Country: IRPA/ROMANIA Date: 23.05.2014				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	3.128 , last line	Add: An alternative is to use a recording level established during authorization of the monitoring system.	GENERAL COMMENT Due to mobility of the radiation workers , a general agreement should exist on the recording and			R	Existing text is sufficient.

			reporting levels used by several services !!				
2	3.129	How to apply this , if the minimum level of detection is used as recording level ?	How to apply this , if the minimum level of detection is used as recording level ?			R	Issue addressed in paragraph 7.257
3	3.132 , first line	As part of authorization process, the management….	All should be decided within the process of authorization of the planned exposure situation , in agreement with the regulatory authority.			R	This is a management responsibility.
4	3.36 , line 1	Average dose over 10 cm2.	Discrete radioactive particles contamination events produce relatively large doses to very small area of skin , but they are known to results in insignificant health detriments. It was recognized that the shallow dose equivalent calculated for 1 square centimeter was overly conservative for Discrete Radioactive Particles contamination events. The assigned shallow-dose equivalent must be the dose must be the dose averaged over the contiguous 10 square centimeters of skin receiving the highest exposure. The arguments for this statement are presented for example in NUCLEAR REGULATORY			R	Text is consistent with BSS

			COMMISSION 10 CFR PART 20 , RIN 3150-AG25 , Revision of the Skin Dose Limit , which provides a documented justification for using average dose of 10 cm2 , instead of 1 cm2.				
5	7.113 , al.(b) , line 1	Accreditation by a relevant authority of….	Authorization should be done by regulatory body based on several documents emited by other relevant authorites for Authorization and Certification.			R	These are not responsibilities of the regulatory body.
6	7.113 al.(c) line 1	Certification by a relevant authority that….	See above			R	These are not responsibilities of the regulatory body.
7	7.254 , line 3	..workplace monitoring and health surveillance.	Coordination of dose records also with data from health surveillance is very important.			R	Covered by 10.29, and noting that medical records are confidential.
8	Page 6	Add : **Other relevant authority** 2.17 The responsibilities with regards the protection and safety of other relevant authorities , e.g. medical , emergency , accreditation , a.s.o. , should be clear defined	See : Ministry of Public Health – Health Surveillance of Radiation Workers. National Accreditation Body – accrediatation of the management system of doimetry service , audits			R	Other relevant authorities do not have responsibilities for radiation protection (if they do, then they are themselves the regulatory body)
9	7.3 line 3	Hp(3) and/or Hp(0.07)	To avoid confusions. Depending on several factors, only one or two of them may be….necessary	A			

			(not all !).				
10	7.10 , al.(b) , line 1	..eye lens dosimetry is a suitable….(delete “usually the only”)	For a separate lens dosimetry , the conditions from 7.7. and 7.8 should be met. It was mentioned in the text above (7.10) and below (“b” , (ii)) that , actually , for dose determinations in photon radiation, other methods are available too (not only the separate”…!).			R	Comments is covered by the use of the word “usually”
11	10.2 , line 1	….in the proximity of the workplace , suitable facilities and access for…	Actuall , a small workplace in the vicinity do not need…a suitable medical facility. It is enough to have access to an appropriate facility (located in the proximity).			R	Current text is more appropriate
12	10.5 , line 2	Delete “where necessary”	All mentioned topics are always …necessary.		A		through training and, when necessary, retraining
13	10.18 , line 2	Put “ophtalmological examination” , instead of “visual testes”	Only by this type of examination the len’s opacities can be detected	A			
14	10.29	It would be useful to preserve all worker records in agreement with 7.269	It would be useful to preserve all worker records in agreement with 7.269			R	Existing text is adequate

COMMENTS BY REVIEWER Reviewer: Swedish Radiation Safety Authority, Sweden Page 1 of 7 Country/Organization: SWEDEN Date: 2014-06-22				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		GENERAL The document is well written and is relevant and useful – particularly when considering the generational shift in the radiation protection field. The scope of the safety guide covers all aspects of occupational exposure as presented in the International BSS - GSR Part 3. However, the protection of "volunteers" in emergency exposure situations (as pointed out in 4.4) is not covered in this safety guide. The advice of the drafted guide covers the consensus in the field and has been updated to include the developments and valuable references from the last 10 years (recommendations, ISO-standards, development in dosimetry, other measuring technology etc.) without being too detailed.					
1.	Page 3, 2.1, (i)	Change the end to read: "…operating procedures and by training."	The end quotation mark is missing at the end of 2.1 (i)			R	It is an ongoing quotation.
2.	Page 10, 2.34	Instead of: "*The term collective effective dose…´´*and *…expressed in the special name 'man-sievert*	ICRP still refers to collective dose as a 'quantity' measured in the		A		Reference to ICRP103 not necessary.

		(man Sv)' consider using, compatible with ICRP; *The quantity collective effective dose* (ICRP 103, B.5.9)… and *…in the unit with the special name 'man-sievert' (manSv)*	unit 'mansievert' (and also continues to warn against summing up radiation exposures over a wide range of doses, over very long time periods and over large geographical regions, and to calculate on this basis radiation-related detriments).				
3.	Page 15, 2.60	The last sentence: ***By definition, 2000 DACh corresponds to an intake of*** $I_{inh,L}$ could be confusing.	It seems somewhat conflicting to (8) since the numerical factor 1.2 for the standard breathing rate (m^3/h) is missing.	A			The sentence is not conflicting to (8), but it is actually confusing and is deleted.
4.	Page 17, 2.70	Suggests changing the last sentence to: *…are simply related by a constant factor of 5.56 x* 10^{-9} *J/Bq.*	For clarity (units are used a bit incoherent in (15) and (16) – consider review when units are used and not.	A			
5.	Page 20, 3.13	The formulation seems a bit negative. Consider using a more neutral formulation, such as: *Considered options in the optimization of protection of workers should not lead to undue exposure of others or, in the medical field, unacceptable reduction in the protection of the patient or the efficacy of the clinical procedure.*	The statement as written could be read that the protection of the worker is less important than the protection of the patient and the clinical outcome. These factors must be considered at the same time?			R	Current text is considered appropriate
6.	Page 21, 3.15	Delete the word more in: *In the nuclear industry, situations are more complicated, and a ~~more~~*	There is no logical reason way an approach is less structured just because it is	A			

		structured approach is needed….	simpler?				
7.	Page 22, 3.25	Consider deleting the word more in the beginning of the sentence: A ~~more~~ structured approach to the selection….	Same argument as above but also the word (more) is not needed here if referral is not made to something that is less structured….	A			
8.	Page 30, 3.64 (f), and (g)	It is not clear that Industrial Safety and Industrial Hygiene only relates to radiation protection? If this is not the case the qualifications of the experts in these areas might not be solely be determined in the RPP? Clarify!				R	Current text is clear and appropriate.
9.	Page 36, 3.94 (j)	Change from (j) *Conventional safety* to (j) *Co-ordination with protective measures for conventional safety*	For clarity - although the work with planning and implementing protective measures is usually integrated at facilities and registrants, the BSS is about RP?	A			
10.	Page 41, 3.116	The second sentence: *An assessment should certainly be conducted if the total annual effective dose is expected to exceed 5 or 6 mSv for instance* seems odd? This kind of considerations seems more appropriate when controlled and/or supervised areas are set up.	The BSS states that "*For any worker who regularly works in a supervised area or who enters a controlled area only occasionally, the occupational exposure <u>shall be assessed</u> on the basis of workplace monitoring or individual monitoring, as appropriate*" this would seem to mean that an		A		The second sentence can be removed.

			assessment is needed regardless of the expected effective dose (assuming that the ones regularly working in controlled area have individual monitoring)?				
11.	Page 47, 3.146	Suggest changing the last sentence: *…, a qualitative discussion of the ~~trivial~~ risk from the ~~minimal~~ exposure they may receive and specific directives regarding prohibited, required or recommended actions.*	Avoid using these value judgements since even if in most cases the incurred doses indeed are low they could be significant (why otherwise give advice?)	A			
12.	Page 51, 3.162 (a)	It is stated that the adoption of the graded approach to regulation is particularly important for industrial activities involving NORM because of : (a) The economic importance of many NORM industries This is a very surprising statement and should be deleted or better explained.	It is difficult to see that this is something special for NORM industries? Nuclear power production, hospitals, the use of radiation sources in industry etc is also important for national economy (and a graded approach should by the way better be applied also there)?			R	NORM industries differ from the other industries mentioned in the examples, because the issue of regulation is often borderline.
13	Page 55, 3.178	It is stated that: *In situations where the radionuclide activity concentrations in the materials being handled are moderate, it is important to recognize that the silica content of the airborne dust is likely to be of greater concern for occupational health than the radionuclide content.*	For clarity – we presume that the protective actions against silica would be beneficial also to radiation protection and that this was the intended message?			R	Suggested changing does not improve clarity.

		Suggest changing this to: *In situations where the radionuclide acitivity concentrations in the materials being handled are moderate, the silica content of the airborne dust could still require that protective actions are required from an industrial safety point-of-view (e.g. protective masks, ventilation) which also would reduce any intakes of radioactive material.*					
14.	Page 56, 4.2 – 4.4		We appreciate that IAEA finally realizes that the introduction of the term *emergency worker* did not cover all workers exposed during *emergency exposure situations*. This improve on the limited thinking of GSR Part 3. As written in 4.4, "volunteers" are not covered by the guide and this is regrettable.			R with modificati ons	Helpers in emergency are members of the public and may be more appropriate for GSR part 7. However, footnote3, modified in line with the GSR Part7.
15.	Page 59-60	Retain the original Table IV-2 and Table IV-1 from the BSS or remove the guidance values for fetus under live saving actions and actions to prevent severe deterministic effects: $H_{fetus} < 100\ mSv$ (e.g. harmonize with recent updates of GSR Part 7).	It would seem more proper to retain the original Table IV-2 and Table IV-1 from the BSS since these are the ones agreed and published in the GSR Part 3?? It is questionable if new tables should be included in the guide? In any case it seems not				We have to take the Table as it is. BSS table will be retained, however, the final table from GSR Part7 will be considered during the editorial process.

			proper have pregnant women to carry out such work!?				
16.	4.28, Page 63	4.28 is identical with 4.19 in International BSS but the "shall" statement of the GSR Part 3 is changed to a "should" statement. We suggest to keep the formulation of the requirement document and to quote 4.19 of the BSS "within brackets" as done in many places of chapter 3 of the guide.	In this way also the important latter part of 4.19 will be kept, e.g. *However, qualified medical advice shall be obtained before any further occupational exposure if a worker has received a dose exceeding 200 mSv or at the request of the worker.* In general we think it is not advisable to change "shall-statements" from the Safety Requirement document into "should statements" in the Safety Guide . – check this in the full text!		A		4.28 can be eliminated, as it is not relevant for dose assessment and is already covered by 4.30.
17.	4.30, Page 63	Change the last sentence to read: *However, qualified medical advice should be obtained before any further occupational exposure if ~~an~~ a ~~emergency~~ worker ~~or accidentally exposed employee~~ has received a dose exceeding 200 mSv or at the request of the worker.*	The Safety guides is about workers (occupational exposures) and any exposure during work is defined as occupational exposure according to GSR Part 3 (BSS)			R	Current text is adequate.
18.	4.31, Page 63	The last sentence of 4.31 is very strange. Either a referral is made to	It seems desirable to use the structure of IAEA:s			R	Publication of GSR Part 7 is anticipated

		GSR Part 3 (this is apparently a guide to GSR Part 3) or to another guide if the word should is used! If referral to GSR Part 7 (GS-R-2?) should be made the word shall should be used: *….protective actions and other response actions shall be taken in accordance with GSR Part 7*	standards (requirements with shall statements and guides with should statements). GSR Part 3 is decided and accepted by all co-sponsors - GSR Part 7 is still a draft document not decided on.				in the near future. The issues raised will be in any case addressed during the IAEA editorial process.
19	Page 65, 5.9 (b)	The IAEA BSS (GSR Part 7) defines regulatory body as *an authority or a system of authorities designated by the government of a State as having legal authority for conducting the regulatory process, including issuing authorizations, and thereby regulating nuclear, radiation, radioactive waste and transport safety.* The footnote 6 is not in coherence with this definition – use regulatory body!	Follows the GSR Part 3 definition and the IAEA Glossary.			R	
20	Page 71, 5.42 (b)	The term "*good engineering practice*" seems a bit judgmental – could this be written in another way?				R	It is a widely accepted term.
21	Page 92, 6.63 (d)	*Waivers?* – Please explain in what way this constitutes a compensatory measure?	Does only seem to be a way of not taking responsibility in a legal correct way?		A		Delete (d)
22	Page 107, 7.25	Something seems wrong with the sentence: *The choice of a dosimeter for use in a particular set of radiation field*	Do not understand how one can use a dosimeter in "*a set of radiation field parameters*"?		A		*The choice of a dosimeter for use in a particular ~~set of~~ radiation field ~~parameters~~ may*

		parameters may require a particular normalization factor to be applied in order to minimize errors in the measurement of $H_p(10)$ and in the estimation of effective dose.	Furthermore, how can a "*particular normalization factor*" minimize errors? Please explain!				*require a ~~particular~~ normalization factor to be applied in order to minimize ~~errors~~ uncertainties in the measurement of $H_p(10)$ and in the estimation of effective dose.*
23	Page 133, 7.163	Suggest changing the second sentence: *Such a laboratory may also be used for measuring environmental samples, but high level measurements (e.g. measurements of reactor water chemistry) ~~and low level measurements (e.g. bioassay or environmental sample measurements)~~ should be performed in separate laboratories.*	In order to make the sentence clearer – it is otherwise a bit confusing!	A			
24	Page 137, 7.188(b)	The identification of "rogue data" – please explain the meaning or choose another word	The term "rouge data" seems too technical to be generally understood – perhaps an explanation should be included in a footnote?		A		Replace "rogue data" with "outliers" IAEA editor will fix in the final editing.
25	Page 139, 7.195	Consider introducing a reference to page 13! *…according to the scheme presented in Fig. 2 (page 13)* and paras 2.49-2.54.	For clarity.			R	Not necessary
Final			We find the material in Appendices I-V to be most useful and appreciate its inclusion in the draft Safety Guide!	A			

COMMENTS BY REVIEWER Reviewer: Ondrej Kvasnicka, Radim Figalla Page 1 of 1 Country/Organization: CZECH REPUBLIC Date: 2014-05-26				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	3.15/4-6	In image guided interventional procedures, for example, where there is potential for workers to receive a significant dose to the lens of the eye, attention should be paid to the installation of fixed shielding and to the selection of equipment.	To minimize the dose to the lens of the eye is in direct contradiction to optimization principle.	A			Accept new proposed text for 3.15

2	3.116/4-5	An assessment of the exposure of individual workers should be considered in normal and foreseeable abnormal conditions if, for any single component of the exposure (e.g. strongly penetrating photon irradiation, neutron irradiation, internal exposure), the corresponding annual effective dose is expected to exceed 1 mSv. Consideration should also be given to the likelihood and possible magnitude of potential exposures.	The combination should certainly – for instance doesn't support comprehensibility of the text.	A			See comment 10 from Sweden.
3	9.16	For the effective operation of primary and auxiliary ventilation systems in a facility: (b) Ventilation is an important safety related system. For the safety of the workers, all important systems such as fans, blowers, HEPA filter systems etc should have stand-by systems for use during maintenance activities. All such sensitive systems should be operable with alternate power supply (like diesel generators) where necessary so that process systems can be shut down safely while all monitoring systems will continue to work.	This is generally very difficult to implement. Most of the "ventilation" paragraphs are describing the situation in mines, although explicitly it is stated only by few of them.		A - includes response to UK comment 52		b) Ventilation is an important safety related system. For ~~the safety of the workers, all important~~ equipment such as fans, blowers, HEPA filter systems, consideration should be given to the provision of ~~etc should have~~ stand-by systems including ~~All such sensitive systems should be operable with~~ alternate power supplies (like diesel generators) where necessary. In this

							way process systems can be shut down safely during maintenance activities while all monitoring systems will continue to work. Consideration should also be given to real time indicators of system performance to alert operators of exhaust system failure or malfunction.

COMMENTS BY REVIEWER **Country/Organization:** **IRAQ** / Ministry of Science & Technology (MoST)/ Radiation & Nuclear Safety Directorate (RNSD) **Date:**				**RESOLUTION**			
Comment No.	**Para/Line No.**	**Proposed new text**	**Reason**	**Accept**	**Accepted, but modified as follows**	**Reject**	**Reason for modification/rejection**
1	Para. 5.78 Line 1	6100-12200 m	We should cancel space between the numbers			R	Editorial: Conformance with Agency style
2	Para 5.79 Line 2,6	9000-12000 m 7500-10000 m	We should cancel space between the numbers		A		Editorial: Conformance with Agency style, The space in "9 000" should be deleted
3	7.2 Line 1	Where individual monitoring of workers is to be performed, each worker before monitoring should be provided with an integrating personal dosimeter.	To be more clarified			R	This change is not needed
4	7.4 Line 4	And can give information on dose rates and determine the type of radiations. Such a dosimeter can be useful for optimization purposes.	To be more clarified			R	Proposed text is not correct
5	7.5 Line 1	While an active dosimeter is usually used for purposes of dose control, and an indicator for the presence of radiation in the region, it can also be used with prior approval from regulatory body.	To be more clarified			R	Proposed text is not correct
6	7.6 Line 1	In certain cases	To be more clarified			R	"In most cases" is correct

Occupational Radiation Protection (DS453)

Country/Organization: Iraq/ Ministry of Science & Technology (MoST)/ Radiation & Nuclear Safety Directorate (RNSD) Date:				RESOLUTION			
Comment No.	**Para/Line No.**	**Proposed new text**	**Reason**	**Accept**	**Accepted, but modified as follows**	**Reject**	**Reason for modification/rejection**
7	7.7 Line 3	— for example in medical uses of radiation, where protective clothing such as lead aprons can be used and the thickness of lead aprons is known to receive the dose allowed by the use of suitable algorithms —it is advisable to use one dosimeter under the protective clothing and one on an unshielded part of the body. The readings from the two dosimeters can then be combined to give an estimate of the total effective dose. There are many algorithms available, and the accuracy depends on many factors such as the thickness of any lead apron worn, the use of a thyroid shield, and exposure parameters. Further information on the use of such algorithms can be found in Refs [42–44].	To be more clarified			R	Proposed text is not correct
8	7.10 Line 16	(i) If the radiation field is inhomogeneous, the dosimeter should always be located near the eyes, and in contact with the skin and facing toward the radiation source;	To be more clarified			R	Proposed text is not correct
9	8.31	Process of equipping and update individuals with the understanding, skills and access to information, knowledge and training that enables them to perform effectively	Human resources			R	This level of detail is unnecessary
10	2.24	management system That are needed to achieve the goals, provide the means to meet all requirements and deliver the products of the organization shall be identified, and their development shall be planned, implemented, assessed and continually improved.	management system			R	Covered by 2.26

Review of IAEA DS453 Occupational Radiation Protection

COMMENTS BY REVIEWER Reviewer: CANADA Page 1of 3 Country/Organization: **CANADA** Date: June 20, 2014				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
Red strikethough are recommended deleted text. Green are proposed additional or new text. See previous sub-version for original industry comments and my proposed edits (MM).							
1	2.3.4	Replace "man-sievert" in the following text with "person-sievert": *The term collective effective dose may be used as an instrument for optimisation, for comparing radiological technologies and protection procedures. These quantities takes account of the exposure of all individuals in a group over a given time period or during a given operation executed by this group in designated radiation areas. The collective effective dose is calculated as the sum of all individual effective doses over the time period or during the operation being considered and expressed in the special name 'man ~~person~~-sievert (person-Sv)'.*	Replace "man-sievert" in the current text with "person-sievert", as it more accurately describes the modern work force consisting of men and women			R	ICRP still uses man-Sievert
2	3.5	A fuller description and perhaps clarification of paragraph 3.78 of the BSS would enhance Draft Safety Guide DS453.	Acknowledging that paragraph 3.78 of the BSS describes the concept that employers, registrants and			R	Present text is clear

			licensees must ensure that workers exposed to radiation from sources within a practice that are not required by or directly related to their work are afforded the same protection against such exposure as a member of the public, the document may benefit from further clarification on this concept.				
3	3.110	Proposed revised text for this paragraph: *For visitors making short and infrequent visits to controlled areas, individual monitoring may be performed but is not necessarily required. However, a record of the radiological conditions of the controlled areas visited (for example, data from workplace monitoring or from individual monitoring of the visitors' escort) and the length of time spent in these areas during the visits must be retained.*	As currently written, the text in 3.110 is contradictory, in that it is stated that individual monitoring and record keeping is not necessary for visitors making short and infrequent visits to controlled areas. But, it is then further stated that essentially some record to support the assumption that there was no likelihood of a significant exposure must be made. This, in turn, is a form of ascertaining and recording a dose to the visitor in this instance. Also, "significant exposure" is not defined in		A		*For visitors making short and infrequent visits to controlled areas, individual monitoring may be performed but is not necessarily required. However, a record of the radiological conditions of the controlled areas visited (for example, data from workplace monitoring or from individual monitoring of the visitors' escort) and the length of time spent in these areas during the visits should be retained.*

			the current text, so it is not clear how to base the decision for not performing individual monitoring and record keeping.				
4	7.270	Delete clause 7.270 and add ‘personal monitoring equipment to clause 7.272.	The primary record of interest is the dose assignment record. The maintenance of calibration records for personal monitoring equipment for an extended period may impose a significant operational burden with limited added safety value. Challenges or investigations of individual dose assignments are usually timely and within a few years. Recommend use of a retention period for personal monitoring equipment which is aligned with that of calibration records for workplace monitoring equipment..			R	It is important to keep the calibration records for personal monitoring for longer periods
5	Section 9.56(j)	Delete the indicated text below. Respiratory protective equipment should be examined, fitted and tested as appropriate by a competent person before being issued for use ~~and at least once every three months when in use;~~	Staff should be trained and fit tested for respiratory protection; this is aligned with “(b) Management should ensure that the respirators fit and are used properly.”		A		(j) Respiratory protective equipment should be examined, fitted and tested as appropriate by a competent person before being issued for use and ~~at least once every three months~~ periodically during use; the results of

		~~the results of these examinations and test and details of any repairs should be entered in a permanent register, which should be kept for the period specified by the regulatory body.~~	If the end user examination finds that the protective equipment is defective, then the item should be segregated and returned for maintenance. The increase operational burden of registering the examinations performed by the end user and the record retention do not provide increased safety. Maintenance records, including repair, should be kept when appropriate.				these examinations and tests and details of any repairs should be recorded ~~which should be kept for the period specified by the regulatory body;~~
6	Section 10, Workers' Health Surveillance	It is recommended that this be worded such that the management has the responsibility to see that the following health surveillance services are provided either directly by the employer or indirectly by State or governmental institutions.	In many jurisdictions, health surveillance is independently performed and provided by management and governmental bodies.			R	The present formulation is adequate

COMMENTS BY REVIEWER					RESOLUTION		
Reviewer Country Organisation: **UNITED KINGDOM**			Date: 19 May 2014				
Comment Nr	Para Nr. & Line	Proposed new text	Reason	Accepted	Accepted modified as follows	Rejected	Reason if modified/rejected
1.	Relevance and usefulness — Are the stated objectives appropriate, and are they met by the document?	Not Applicable	Relevance and usefulness — Are the stated objectives appropriate, and are they met by the document? – Yes				

2	Scope and completeness — Is the stated scope appropriate, and is it adequately covered by the document?	Not Applicable	Scope and completeness — Is the stated scope appropriate, and is it adequately covered by the document? – Yes.				
3	Quality and clarity — Do the requirements/ guidance in the document represent the current consensus among specialists in the field, and are they expressed clearly and coherently?	Not applicable	Quality and clarity — Do the requirements/ guidance in the document represent the current consensus among specialists in the field, and are they expressed clearly and coherently? – Yes.				

4	General	Not applicable	This document provides sensible information and guidance on the “Occupational Radiation Protection”. The document is longwinded in achieving its objectives and certain sections are very detailed, but the guidance generally appears to be sound.				
5	General	Not applicable	The scope and content of the document in some places is at a very detailed technical level which may be better reproduced elsewhere.				
6	Efforts should be made to limit the degree of contaminatio n and the size and number of contaminated areas within a facility.	Replace 'limit' with 'optimised'	Should be 'optimised' rather than 'limited' as UK designate on potential as internal doses are informally restricted to nil i.e. zero tolerance concepts on intakes		A		9.29: “ Efforts should be made to control contamination and the size and number of contaminated areas within a facility. “
7	2.2	…and some exposures due to natural sources and residual activity resulting from man-made events…	Existing and planned exposure situations are not limited to natural sources			R	These are just examples

8	2.10,3.20	Clarification for medical practitioners	need clarification about medical practitioners using equipment as opposed to those undergoing treatment.		A		See comment 3 from USA/IRPA
9	2.18	…are responsible for ensuring that protection and safety is optimized by application of constraints and dose limits, and that appropriate RPPs are established and implemented.	Constraints are a component of optimization (see 3.8 (b))			R	Optimization is separately addressed elsewhere
10	2.23	For occupational exposure in planned situations and some existing exposure situations, the principle party is the employer.	Scope of statement should include existing exposure situations			R	This would introduce confusing: existing exposures are covered in the second sentence
11	3.11(b)	process with the following sequence: planning, setting objectives, assessment of potential hazards, implementing the necessary controls, monitoring…	Additional components of optimization approach			R	The additions are not examples of the “management by objectives” process

12	3.18	Management has the responsibility to ensure that adequate resources are available to enable satisfactory execution of the RPP.	Essential component of management commitment		A		The commitment of management should be demonstrated by written policy statements that make radiation protection criteria an integral part of the decision process, and by provision of adequate resources, and clear and demonstrable support for those persons with direct responsibility for radiation protection in the workplace.
13	3.19,3.59	Observation	Given the IRPA initiatives on ethics, Stakeholder engagement and RP Culture, could a section be added on these?				Stakeholder engagement and safety culture are covered in the relevant sections
14	3.25	Observation, additional bullet point as a) use checklists to generate options	John Croft (formerly NRPB/HPA/PHE) has carried out work with the EU on ALARA ‘ALARA . I suggest some of his ideas could be incorporated into the section e.g use of checklists to generate options or refer out to his book			R	Unnecessary detail
15	3.38(b)	An equivalent dose to the lens of the eye of 15mSv in a year;	To be consistent with the dose limits in Article 11, paragraph 3(a) of Council Directive 2013/59/Euratom.			R	Consistency with BSS
16	3.43	…the single year effective dose limit of 50 mSv…	For clarification		…		Editorial – will be considered in the editorial process
17	3.44	to keep within the effective dose limit of 100 mSv	For clarification				Editorial – will be considered in the editorial process

18	3.54(f)	An assessment of potential public exposures in uncontrolled or unrestricted areas and resulting from effluents from the facility	To address the potential of unauthorized individuals not considered radiation workers			R	Unnecessary detail
19	3.56	A radiological evaluation should be conducted prior to any new or modified operations as part of a comprehensive health and safety management of change process.	Management of change is a critical component of radiation protection programs			R	Comment is not relevant here, and it is covered in 3.58
20	3.63	…depending on the size of the organization, as well as the size and complexity of radiological operations, to create a specific advisory committee…	The need for an advisory committee is commensurate with radiological operations		A		3.63. In order to coordinate decision making concerning the choice of measures for protection and safety, it may be appropriate, depending on the size and complexity of the facility, to create a specific advisory committee with representatives of those departments concerned with occupational exposure.
21	3.70	The appointed expert should be consulted for review of any proposed changes to facilities, operations and personnel with potential impact on radiation protection.	Changes with radiation protection impact require review by qualified expert		A		3.70. Management should consult the appointed qualified experts as appropriate on aspects of the RPP, including the designation of controlled and supervised areas, the preparation of local rules, the provision of personal protective equipment and the arrangements for monitoring of the workplace and workers, and on any subsequent changes having a significant impact on protection and safety.

22	3.73	This inventory has to be updated and verified periodically.	Verification is required to ensure accountability	A			
23	3.81	…physical barriers involving locks and interlocks may be practical to install and operate and may be required already for security reasons and to control access to unattended sources and radiation emitting equipment.	Additional emphasis to address exposed sources and active equipment in unattended situations			R	Unnecessary detail
24	3.88	(m) Emergency response	For completeness		A		(m) Emergency preparedness and response, where appropriate
25	3.93	When work is to be conducted during which significant radiation or contamination levels may be encountered…	The term "significant" is subjective and needs to be quantified for clarity, for example three tenths of the relevant dose limit.		A		"The RPO should take part in the planning of the work ~~involving significant exposures~~, and should advise on the conditions under which work can be undertaken in controlled areas. "
26	3.106	Clarification,	Bulk Pu has an external dose rate			R	It is an example which is not specifically referring to bulk Pu
27	3.113	Corrective actions should be taken as necessary and documented.	For completeness			R	It is covered in (e)

28	3.118	…whether there is a potential for significant individual exposure…	The term “significant” is subjective and needs to be quantified for clarity, for example, three tenths of the relevant dose limit.			R	What is significant is a local judgement
29	3.144	Where work involving significant exposure to radiation is to be undertaken…	The term “significant” is subjective and needs to be quantified for clarity			R	What is significant is a local judgement
30	3.150	Formal records of each worker’s training and testing should be maintained, and retained for three years after cessation of employment	Is this a minimum requirement? Some local regulation may require longer retention		A		“Formal records of each worker’s training and testing should be maintained, and retained for an appropriate period after cessation of employement.”
31	3.176	…a suitably qualified ventilation expert..	The term “officer” is overly prescriptive (and an odd wording) when in most locations only a qualified expert is needed			R	Ventilation officer is a standard term
32	4.15	Observation	Use ICRP 60 dose values to 'save plant' and advert public exposure			R	Follow GSR7, see previous comments

33	4.16 table 3 .	Clarification, Observation	Although the acute radiation effects syndrome and other effects at doses > 1Gy are difficult to estimate, and as a rough order of magnitude guidance is useful, the scientific basis for actinides having a lower dose for this effect needs consideration as there has been one case of exposure to an alpha emitter (^{210}Po) where deterministic effects have been observed at organ level			R	Follow GSR7, see previous comments
34	5.6(2)	Workers exposed during planned operations as part of the existing exposure situation…	Planned and existing exposure situations may overlap in some scenarios			R	The overlap applies only to 5.6 (1)
35	5.41 :	Observation	As part of ethics and stakeholder engagement, need to consider involving public e.g. get buy in (learning from Chernobyl and Fukashima Dachi)			R	Already addressed in the paragraph: “parties affected“

36	5.60	In general, the reference level for workplaces should not exceed an annual average radon concentration of 300 Bq/m3 [2]. This value corresponds to an annual effective dose of the order of (would need amending if reference level was reduced), assuming an equilibrium factor of 0.4 and an annual occupancy period of 2000 h.	To be consistent with the dose limits in Article 54, paragraph 1 of Council Directive 2013/59/Euratom.			R	Current values are consistent with BSS
37	5.60	Editorial comment – footnote number 3&7 appear inconsistent				R	Footnote 3 is on emergencies
38	5.77	Exposure to individuals to cosmic radiation above ground level is not considered occupational exposure when the exposed individual is travelling by air for business purposes.	For clarification			R	This can be occupational exposure but not necessarily warranting control
39	6.38	(f) Details of controls that are the responsibility of the facility to ensure optimization of exposure	For completeness		A		(a) Details of any radiological hazards and associated controls, and an estimate of the maximum radiation doses likely to be received by the contractor's employees during the contract;

40	6.64	h) Changes in facilities, operations or work practices	For completeness		A		h) Any changes in facilities, operations or work practices
41	6.87	Training should be provided to address the need to avoid exposure of the dosimeter while it is not being worn, including inadvertent exposure to sources or radiation equipment and exposure to security x-ray while left in a checked bag during travel.	For completeness			R	Too much details, and does not apply only to itinerant workers
42	7.21	It is preferable to prevent localized exposure to the extremities by avoiding direct handling of sources and by employing appropriate shielding and remote handling devices.	To address situations, such as nuclear medicine and nuclear pharmacy where it is difficult to assess extremity dose due to direct handling of sources			R	Not relevant for this section
43	7.142	Particle size of the contaminant to be sampled must be considered to ensure selection of the appropriate filter.	This is critical to proper air sampling of particulates			R	Particle size is adequately covered in different sections
44	7.193	(n) Differences in quenching between sample and calibration standard	For liquid scintillation counting		A		(n) For liquid scintillation counting, differences in quenching between sample and calibration standard

45	7.232	For extremity dosimetry in emergencies, especially for the hand, a simple, single element dosimeter should be sufficient. For the best accuracy in measuring low energy beta radiation, the detector should be thin and filtered by a thickness of tissue substitute such that the dose at a nominal depth of 40 mg/cm2 (or 0.4 mm) can be assessed (see para. 7.230(c)).	A depth of 0.07mm is a more standard assessment of equivalent dose to the skin and extremities as recommended in ICRP 116 and therefore dosimetry measuring $H_p(0.07)$ is readily available. While a depth of 0.4mm may be seen as an appropriate assessment for emergencies, are dosimeters measuring $H_p(0.4)$ readily available for use in emergencies? If not, can an alternative be given in this guidance e.g. would $H_p(0.07)$ or $H_p(10)$ be a suitable substitution (as with lens of the eye dose measurements in paragraph 7.230(b))?		A		Additional text added: However, if such dosimeters are not readily available, suitable alternate methods using $H_p(0.07)$ or $H_p(10)$ dosimeters may be used.
46	9.8 and 9.9	Guidance and/or a reference is needed here on elsewhere in this TECDOC regarding shielding requirements for beta emitting materials	To address needs for shielding beta particles		A		9.9. Shielding should be considered in work involving X rays, gamma rays, neutrons and other high energy particles (which may include high energy beta particles).

47	9.9	Observation It is common practice for dose rates to be restricted such that, for an assumed annual exposure period of 2000 h, the annual doses would not exceed 5 mSv in contact with the shield and 1 mSv in the vicinity of experimental hutches along the beam lines.	Need to demonstrate ALARP rather than specific cases			R	No specific proposal given
48	9.23	Any spillage of radioactive material should be cleaned up as soon as practicable in order to minimize the spread of contamination. The area should be decontaminated by the removal of all loose radioactive contamination and contaminated materials as much as practicable. Replace 'practicable' with 'reasonably practicable'	consider use of reasonably practicable as opposed practicable as in the event of a spill, consideration should be given to control of incident, appropraite PPE/RPE for cleaning up spill and dose associated			R	“Practicable “ already conveys the required meaning
49	9.8 and 9.9	Guidance and/or a reference is needed here on elsewhere in this TECDOC regarding shielding requirements for beta emitting materials	To address needs for shielding beta particles				See 46

50	9.9	Observation It is common practice for dose rates to be restricted such that, for an assumed annual exposure period of 2000 h, the annual doses would not exceed 5 mSv in contact with the shield and 1 mSv in the vicinity of experimental hutches along the beam lines.	Need to demonstrate ALARP rather than specific cases				See 47
51	9.10(d)	…(including scrubbers, adsorbers and/or HEPA filtration)…	To include media used to collect some airborne gases	A			
52	9.16(b)	Ventilation systems should be fitted with real-time indicators of system performance such as photohelics and flow rate monitors with alarm capability.	Needed to alert operators of exhaust system failure or malfunction		A		See comment 3 from Czech Republic

53	9.18	When ventilation is used to control airborne contamination, the local operating instructions should specify the actions to be taken in the event of a failure of the ventilation system	This paragraph is too specific as other situations may require actions to be taken if the ventilation fails e.g. in fuel cooling ponds, even though it is a wet environment, ventilation may be required to control airborne activity due to evaporation from contaminated objects causing activity to become resuspended.		A		9.18. In some situations, such as in an underground mine or inside a building where the dry processing of radioactive minerals is carried out, the local operating instructions should specify the actions to be taken in the event of a failure of the ventilation system

54	9.31	Because skin contamination by certain radioisotopes, such as tritium, cannot be reliably detected by currently available hand held or automated monitoring instrumentation, individual checking is not an appropriate means of detecting such skin contamination. When individual exposure to such contamination hazards is possible, additional emphasis should be placed on bioassay programmes and routine contamination and air monitoring programmes. **(New paragraph)** If background radiation levels or other local conditions at the exit point preclude the performance of personal contamination detection, the exit point should be moved to an alternative location, for instance to an area with lower background levels. If relocation of the exit point is not practicable, individuals should proceed directly from the exit point to an appropriate area to perform the necessary checks.	This paragraph is describing two different situations and therefore should be split into two separate paragraphs to avoid confusion i.e. (1) actions to be taken if measurement is not possible due to the nature of the radionuclide and (2) actions to be taken if measurement is not possible due to external factors such as high background. 118/193	A			

55	9.35	Objects within potentially contaminated areas should always be monitored prior to removal.	For completeness 119/193		A		Added in 9.30: 9.30 Exits from contaminated areas should include provisions to facilitate retention of contamination in the area and for monitoring of individuals and the area to ensure control has been maintained. Individuals exiting contaminated areas should be monitored, as appropriate, for the presence of surface contamination. At a minimum, individuals exiting contaminated areas should perform a check, using either portable or automated monitoring devices, as appropriate. Where the only contaminated areas are laboratory bench surfaces or fume hoods, or where contamination potential is limited to specific portions of the body, the checking should concentrate on affected areas. On removal from contaminated areas, all objects including tools, materials, equipment and personal items, should be monitored by competent personnel. Workers should be made aware of the necessity for such monitoring. Include additional text according to comment #83 of France. (from 9.31) If background radiation levels or other local conditions at the exit point preclude the performance of personal contamination detection, the exit point should be moved to an alternative location, for instance to an area with lower background levels. If relocation of the exit point is not practicable, individuals should proceed directly from the exit point to an appropriate area to perform the necessary checks.

56	9.36	Detailed guidance needs to be added here or elsewhere in the TECDOC to address the use of wipe samples where needed to detect and measure removable surface contamination.	Detailed guidance is needed regarding the use of wipe samples for detection and measurement of removable contamination. Guidance inAppendix V.45 and V.46 is inadequate.			R	No more details needed on wipe samples
57	9.43	apply cosmetics	missed off the list		A		9.43. No person should eat, drink, chew gum or tobacco, smoke, ~~or~~ take snuff or apply cosmetics in working areas where radioactive material could be ingested.
58	9.44	The employer should provide – at locations outside of working areas where contamination may exist and that are reasonably accessible to every worker…	There should be no eating in contaminated areas	A			

59	9.49	Guidance and/or a reference is needed here on elsewhere in this TECDOC regarding contamination of hair, eyes, mucous membranes, etc, in addition to skin and wounds	For completeness				9.49. Personal contamination includes contamination of personal clothing, skin, hair, eyes, mucous membranes and wounds. In this context, personal clothing includes work clothing provided by the employer, but does not include protective clothing provided solely for contamination control purposes. 9.50. When contamination is detected, the RPO should be informed, in order to ensure adequate characterization of the potential for significant dose by assessing the extent of the contamination, retaining samples of the contamination as necessary to perform a detailed dose assessment and to initiate decontamination procedures. Levels of contamination that trigger the need for dose assessments and decontamination methods should be established for site-specific radionuclides. 9.51. Intrusive decontamination methods, such as tissue removal, require medical assistance. In the case of skin contamination by contaminants such as radioactive iodine, decontamination by washing or using detergent may not be effective; in the event of serious contamination, medical advice should be sought immediately. 9.52. Contaminated personal clothing should be decontaminated by laundering or other appropriate method, monitored, and returned to the owner or, if necessary, disposed of as radioactive waste.

60	9.50	Observation	large organisations have dedicated units for this				--
61	9.55	If levels of airborne contaminants exceed the safe working levels (Derived Air Concentration – DAC) specified by the management of the facility, appropriate respiratory protective equipment should be worn by those persons undertaking actions to correct the situation	To simplify this type of assessment each known supervised or controlled area could have its defined DAC for each nuclide used in the area, then following a survey prior to any potential release RPE would be defined against that nuclide.			R	Unnecessary detail
62	9.56	n) Proper fit of respirators requires the removal of facial hair to ensure an adequate seal.	For completeness			R	This is covered by (b)

63	9.58	Where there is the potential for contamination, individuals should wear appropriate protective clothing to prevent the contamination of their personal clothing, working clothing and skin. In some cases it may be appropriate for personal clothing and working clothing to be removed before donning protective clothing. The employer will specify appropriate protective clothing requirements in each case, based on the level of risk, and will also specify cases where individuals are required to shower on leaving contaminated workplaces. The employer should provide suitable clothing storage facilities	In line with world best radiological control practice it is EDF Energy policy to minimise the extent of potentially contaminated working areas at its sites and to maintain contamination levels within those working areas ALARP through good practice and housekeeping. As a result temporary potentially contaminated areas are often established for the duration of a task and are declassified, following radiological survey and any necessary decontamination, on completion of the task. Such temporary potentially contaminated working areas are often not served directly by change and shower facilities and protective clothing is removed, and personnel are monitored for contamination, at local barriers. Operating experience at EDF Energy sites indicates that the use of protective clothing over personal clothing and working clothing is generally adequate to prevent personal contamination. A graded approach is used in the specification of protective clothing requirements, and the need to shower following work, based on the level, and nature, of any potential contamination in the working area.The requirement to remove personal clothing and working clothing for all work in potentially contaminated areas, and to shower on each occasion following work in such areas, at EDF Energy sites would require significant changes to plant layout and to established radiological control practices with no real benefit to radiological		A		Replace paras 9.57-9.60 with the following: 9.57. Where there is the potential for contamination, the employer should specify appropriate protective clothing requirements, based on the level of risk. The employer should provide the necessary overalls, head coverings, gloves, boiler suits and impermeable footwear and aprons (including lead shielding aprons, where appropriate) in accordance with the risks of external and internal exposure and as appropriate for the working conditions. Work clothes including gloves and footwear should be provided to every worker whose personal clothing is likely to become contaminated during the course of work. 9.58. The employer should also specify cases where individuals are required to shower and change clothes on leaving contaminated workplaces, and should provide suitable clothing storage facilities and washing facilities. 9.59. Individuals should wear the specified protective clothing. In some cases it may be appropriate for personal clothing and working clothing to be removed before donning protective clothing. Personal clothing and working clothing should be changed in suitable locker rooms, where appropriate with a washroom in between, to control the spread of radioactive contamination. 9.60. When contaminated work clothes are stored, laundered or otherwise decontaminated, or disposed of, the employer should put in place measures to prevent the spread of contamination to other persons or workplaces and to minimize the exposures of individuals and the release of contaminants to the environment. The employer should provide suitable laundry facilities, boot washes, vacuum systems or other means of

64	9.61	When the exposure is predominantly due to penetrating radiation (gamma or X rays), consideration should be given to the use of protective glasses containing lead.	This would be required to be considered during a risk assessment and would form part of possible control measures.			R	Not appropriate in this location, it is covered elsewhere
65	9.64	JOB ROTATION In workplaces where there are areas with potential for high levels of radiation exposure, when no other practicable means of control are available, job rotation may be considered as an administrative control to restrict the exposure of individual workers. However, the use of this method should be kept to a minimum, and job rotation should never be used as a substitute for the development and use of appropriate methods of individual exposure control.	Suggest noting that justification would be required i.e. demonstration that no other control measures have been identified during the assessment process.			R	Comment already covered in present text
66	10.4	(e) To administer agents to prevent or reduce update such as prophylactic agents (such as KI for radioiodine) and chelating compounds.	These agents should be administered by or under the authority of a qualified physician			R	Covered in 10.34, and 10.4 is on health surveillance programmes

67	10.13	Medical examinations of workers should be performed before the start of employment, periodically thereafter, and at the termination of employment.	Are termination medicals a proposed NEW requirement? Not currently part of UK arrangements.			R	This is guidance, not a requirement
68	10.24	In a medical examination at the termination of employment, any work related impairment should be identified and, if necessary, arrangements should be made for further periodic and follow-up examinations by the worker's physician after employment has ceased. This is line with a specific recommendation of the ILO [158], which states: "the competent authority should ensure that provision is made for appropriate medical examinations or biological or other tests or investigations to continue to be available to the worker after cessation of the assignment…"	See above (10.13)			R	See above comment 67
69	10.34	Examples of such therapies include.. administration of KI to block the thyroid from radioiodine uptake…	To include a particularly important example			R	It is not a therapy applied to overexposed workers

70	Appendix II 11.10, 11.19, 11.23, 11.25	Need to indicate in each section the types of radiation for which the monitoring method is appropriate.	Clarification			R	Already specified in the headings
71	Appendix II II.27	Although the majority of these dosimeters are useful as alarm dosimeters for use in controlled areas and for short term radiation control of workers' exposures, they are not all suitable for use as official or legal dosimeters. This is mainly because some dosimeters do not measure beta radiation as well as photons and some have too high an energy threshold for photons. Other important factors are reliability and the risk of data loss [175]. Furthermore, most devices have difficulties in measuring pulsed radiation. Some active personal dosimeters do not record both $H_p(10)$ and $H_p(0.07)$, therefore two different types of dosimeters may be required to be worn.	This paragraph implies that a legal dosimeter must be able to record both $H_p(10)$ **and** $H_p(0.07)$ doses. Can a dosimeter not be considered 'legal' for one type of dose assessment i.e. $H_p(10)$ **or** $H_p(0.07)$, recognising that two dosimeters may be required to be worn e.g. EPD for whole body dose and TLDs for extremities, if both types of dose assessments are required for the task being undertaken. In certain situations however, having one dosimeter recording only one type of dose may be all that is required e.g. when only strongly penetrating radiation is present.	A		.	

72	Appendix III III.12	…use of GM counters in pulsed radiation fields, such as some diagnostic x-ray equipment, may lead to…	Clarification		A		Correct spelling of X ray Editorial – will be considered in the editorial process
73	Appendix IV IV.9.	An AMAD of 5 µm is considered to be the most appropriate default particle size for radionuclides in the workplace [131], whereas an AMAD of 1 µm is used as a default for members of the public.	Does the AMAD of 5um apply to all persons in the workplace, non-classified workers-contractors-visitors and young person's 16-18yo?			R	AMAD is related to the workplace, not to the individual
74	Appendix V V.39	(f) Sampling for alpha-emitting radionuclides other than NORM materials will require a delay between sample collection and counting to enable decay of short-lived Rn-222 progeny that would contribute to sample counts.	Completeness		A		(f) For alpha emitting radionuclides other than those in NORM a delay between sample collection and counting may be needed to enable the decay of short-lived ^{222}Rn and ^{220}Rn progeny that would contribute to sample counts.

COMMENTS BY REVIEWER Reviewer : CAEA Page 1 of Country/Organization: **CHINA** Date: 20/6/2014				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	1.1 line3	Radioactive sources and irradiation installations or radiation generators	Irradiation installations or radiation generators include X ray machine and so on			R	The list is not intended to be exhaustive
2	2.33 Line 4/5	Besides equivalent dose, the recommended dosimetric quantity is the RBE weighted absorbed dose AD_T in tissues or organ T.	It could match 2.13, 2.29, 4.15, 4.16 and avoid misunderstanding or confusion			R	It is more confusing when it is added
3	3.21 Line 3-4	the regulatory body should inspect the implementation commitments for optimization and evaluate the effect periodically	It might be more practical and effective than enforcement only			R	is already covered
4	3.22 Line 3	particularly senior management	It could match 3.18			R	“including” is the correct word
5	3.24 Line 9-10	Confirm decision aiding techniques are quantitative or qualitative.	It is inconsistent with para 3.23 “The process of optimization of protection and safety measures may ranges from intuitive qualitative analyses to quantitative analyses using decision aiding techniques”		A		For clarification 3.23 is adjusted : 3.23. The process of optimization of protection and safety measures using decision aiding techniques may range from intuitive qualitative analyses to quantitative analyses, but has to be

							sufficient to take all relevant factors into account in a coherent way so as to contribute to achieving the following objectives:
6	3.25	with account being taken of both exposures from normal operations and potential events:	A verbal adjustment		A		3.25. A more structured approach to the selection of appropriate protection and safety measures should include the following steps, with account being taken of ~~both~~ exposures from normal operations and of potential exposures:
7	3.92	When engineered and administrative controls are…	A verbal adjustment	A			
8	3.128 Line 12-14	Suggestion: Describe the definition of "recording level" explicitly in the case of individual monitoring for external exposure	Whether "the minimum level of detection" refers to the instruments in minimum detection level which is conflict with para 3.129 "Even if the measured dose, exposure or intake is below the recording level, the measurement result should always be maintained in the dose record for the workplace and/or the individual." It is impossible to detect data below the instruments minimum detection level.		A		3.128: no changes 3.129. For internal dose assessment, if the dose or intake is below the recording level, the measurement result should always be maintained in the dose record for the workplace and/or the individual.

9	3.160	Suggest to modify: The ^{222}Rn progeny referred to in (a) and (b) are ^{218}Po, ^{214}Pb, ^{214}Bi and ^{214}Po. The ^{220}Rn progeny referred to in (a) are ^{216}Po, ^{212}Pb, ^{212}Bi, ^{212}Po and ^{208}Tl.”	^{220}Rn is not referred to in (b) but in (a)	A			
10	7.231	…and the radiation weigthing factor W_R for neutron….	A mistake	A			

COMMENTS BY REVIEWER Reviewer: **National Nuclear Regulator, Radiation safety section** Page 1 of Country/Organization: **SOUTH AFRICA** Date: May 2014				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	1.8	N/A	The Radiation Protection Programme (RPP) is the useful tool in monitoring and managing occupational exposure, therefore guidance provided on the development of the occupational RPP is most appropriate and it is well addressed in the guide.				
2	1.8	N/A	The intended integrated approach to the control of occupational exposure, by addressing both technical and organizational aspects was found to be relevant adequately addressed by the guide.				
3	5.75	If, on the other hand, exposures of	The intention is to emphasise			R	Actually the comment

	(second last sentence of paragraph)	concern are identified, the government should ensure that exposures in workplaces are incorporated into an overall national action plan for indoor radon *or if it is because of the result of an authorized action, that appropriate steps are taken in that workplace to decrease the radon activity concentration by the party responsible.*	that the Government must identify the responsible party (persons or organizations) to characterize exposure and establishing an action plan.				relates to 5.56. This issue is already covered by 5.61-5.62.
4	Para 1.7	N/A	In according to the stated objective of the draft, the guide is intended primarily for the regulatory body. This however, is not reflected in the contents of the document. The contents are directed mainly to the registrants, licensees and employers. The document does not give clear guidance on the establishment of the regulatory system for ensuring protection and safety.			R with modification	The purpose of this document is not to establish a regulatory system (this is covered in a specific document of the agency). To be consistent with the current Safety Guide, "*primarily"* should be deleted.
5	2.19	N/A	Clear guidance (example) on how the regulatory body should enforce the requirements on workers (Requirement 22 of GSR Part 3) is not covered explicitly by the guide.			R	The purpose of this document is not to establish a regulatory system (this is covered in a specific document of the agency).
6	2.52	To derive the value of committed equivalent dose to a tissue or organ, the intake is multiplied by *HT*(*g*), the	A comma replaced by colons. Colons make it clear that everything that comes after			R	Will be in case addressed by IAEA editorial office

		committed equivalent dose per unit intake for ingestion or inhalation, as appropriate, by the group of age *g*.	*HT*(*g*) is a definition of it. This is not so clear when a comma is used.				
7	2.53	Same comment as for 2.52	Same comment as for 2.52			R	Will be in case addressed by IAEA editorial office
8	3.59(e)	The classification of the radiological areas	This will be consistent with the paragraph 3.74 the Management to consider classifying the working areas whenever there is occupational exposure to radiation.			R	Current formulation is adequate and consistent with BSS.
9	3.113 (c)	Give details of radiation surveys, e.g. level of activity concentrations in air, date, time, location, radiation levels, instruments used, surveyor, or other comments;	The position of the phrase "e.g." has being changed to include "level of activity concentration" as part of examples of details of radiation surveys.		A		Give details of radiation surveys, e.g., date, time, location, dose rate, airborne activity concentration, instruments used, surveyor, or other comments;
10	3.160	The ^{220}Rn progeny referred to in (a) are ^{216}Po, ^{212}Pb, ^{212}Bi, ^{212}Po and ^{208}Tl."	^{220}Rn is referred to in (a), not (b)	A			Already addressed in previous comments
11	4.8 (b)	Providing instructions immediately before their use to those emergency workers not designated as such in advance2 - on how to perform their specified duties under emergency conditions and how to protect themselves ('just in time training');	To indicate the break between the two parts of the sentence. The original sentence was incomprehensible.	A			
12	5.35	The legal and regulatory framework, supported where necessary by guidance material, should provide for adequate protection of individuals (including workers) and the environment when	The sentence is rephrased for grammatical purposes.	A			This refers to para 5.31 and not 5.35.

		remediation is undertaken.					
13	6.58	Some itinerant workers will work in professions that require qualification or certification schemes to demonstrate competence" has to be rephrased for grammatical purposes.	Operate was replaced by require, to make the sentence more comprehensible.		A modified		Replace "*operate"* with "*have"*.

COMMENTS BY REVIEWER Reviewer: R. Bly, STUK, Page.... of.... Country/Organization: **FINLAND** Date: 16th June 2014				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
	1.1	…with different stages of the nuclear fuel cycle; the use of radiation in medicine,… …radionuclides of natural origin or exposure to cosmic rays.	The use of radioactive sources and x-ray machines in medicine does not cover use of accelerators, cyclotrons or BNCT (neutron beams). Cosmic rays covered in 5.73-5.75.		A		Occupational exposure to radiation can occur as a result of various human activities, including work associated with the different stages of the nuclear fuel cycle; *the use of*

							radiation in medicine, scientific research, agriculture and industry; and occupations that involve exposure to *natural sources*. ~~materials containing elevated concentrations of radionuclides of natural origin~~.
	1.5	The RPP should be established and managed together with other health and safety disciplines, such as medical hygiene, industrial hygiene, industrial safety and fire safety.	In nuclear medicine laboratories medical hygiene requirements have to be reconciled with radiation protection requirements, especially concerning ventilation.		A		such as industrial hygiene, medical hygiene, industrial safety and fire safety.
	4		Exposure of workers in emergency exposure situations should be checked to be in line with safety requirements DS 457.	A			
	4.15 Table 2		Table 2 should be modified to be in line with the DS 457.	A			Editorial – will be considered in the editorial process
	4.16 Table 3		Table 3 with footnotes should be modified to be in line with the DS 457.	A			Editorial – will be considered in the editorial process

	4.19		Categories should be in line with the DS 457 (in which there are emergency workers and helpers).				– will be considered in the editorial process
	5.63	If, despite all reasonable efforts by the employer to reduce radon concentrations in the workplace, such concentrations remain above the reference level, the relevant requirements for occupational exposure in planned exposure situations will apply (see para. 3.160(b)). This outcome is ~~**highly unlikely**~~ except in some underground mines where there might be practical limitations on restricting the entry of radon into the air and on the amount of ventilation that can be provided (see para. 3.175)	It is not very clear, which is the reference level (300 or 1000 Bq/m3) referred here. As stated in 5.60, in buildings with high occupancy factors for members of the public such as kindergarten, schools, hospitals etc exposure of all occupants is controlled using the reference level for dwellings i.e. 300 Bq/m3 (?). Therefore, it may not be "highly unlikely" that the reference level is exceeded. Instead "unlikely" expression can be used.	A			
	7.206	~~Higher values, based on biokinetic and dosimetric modelling, are now being proposed by the ICRP [129] 5.9 mSv per mJ·h·m-3 for indoor radon and 3.0 mSv per mJ·h·m-3 for radon in mines."~~	There is a reference to a draft document ([129] *INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION, Occupational Intakes of Radionuclides, Part 3, Draft Report for Consultation, ICRP Ref. 4838-4528-4881, 20*		A		*ICRP is now recommending the use of dose coefficients based on biokinetic and dosimetric models [reference to ICRP statement on radon is added].*

			September 2012). It would be more transparent if only reports available to everybody were cited. The status of the new biokinetic and dosimetric modeling is rather unclear and confusing. Therefore, referring to it should be considered to be left out from the Safety Guide.				

TITLE : DS 453

COMMENTS BY REVIEWER Reviewer: Country/Organization: **FRANCE** Date: 2014/06/20				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accep	Accepted, but	Rejected	Reason for modification/rejection

				ted	modified as follows		
1.	PREFACE/ Line 30	… It updates the guidance given in six previous safety guides: (list to be completed with NS-G-1.13 "Radiation Protection Aspects of Design for Nuclear Power Plants")	In the frame of NPP New Builds or replacements of large components for the Long Term Operation of existing plants, a chapter on nuclide source term minimization through material selection (e.g. corrosion product inventory) and plant operation (e.g. coolant chemistry, purification means) should be added to this safety guide, in accordance with other requirements in IAEA Safety Standards SSR-2/1 "Safety of Nuclear Power Plant: Design" (e.g. requirements 50 and 81) and subsequent Safety Guides (in particular NS-G-1.13 "Radiation Protection Aspects of Design for Nuclear Power Plants").			R	Outside the agreed scope of the document
2.	1.2/ Line 6	Text to be completed with IAEA Safety Standards SSR-2/1 reference	According to comment No.1			R	Outside the agreed scope of the document

		"Safety of Nuclear Power Plant: Design"					
3.	1.6/	Text to be completed	According to comment No.1			R	Outside the agreed scope of the document
4.	2.10	~~Except for therapeutic and diagnostic medical exposure~~	It would be better to delete the part of sentence which is confusing because occupational exposure in the medical field shall also be optimized	A			Already covered by the resolution to comment #3 of IRPA/USA
5.	2.22	"The government or the regulatory body shall determine which practices or sources within practices are to be exempted from some or all of the requirements of these Standards. The regulatory body shall approve which sources, including materials and objects, within notified practices or authorized practices may be cleared from regulatory control."	This paragraph may refer to the RS-G 1.7 dealing with exclusion and clearance			R	RS-G-1.7 is not completely consistent with BSS
6.	2.25	The management system must also address human factors by supporting good performance and good practices to prevent human and organizational failures, with attention being given to the design of equipment, the development of operating procedures, limits and conditions as appropriate, training and the use of safety systems to reduce the consequences of human error.		A			
7.	2.33	The dose limits (for effective and equivalent doses) are such that	The lens of the eye is not considered in the definition			R with	The dose limits are such that deterministic effects will not occur ~~for~~

		deterministic effects will not occur for the organs and tissues included in the definition of effective dose **and for the lens of the eye**.	of effective dose			modif.	~~those organs and tissues included in the definition of effective dose~~.
8.	2.34	The term collective effective dose may be used as an instrument for optimisation, for comparing radiological technologies and protection procedures. **a dose estimate may be defined for tasks with significant exposure, including the latest state-of-the-art in terms of source term reduction measures and work organization.**	The safety guide should include common best practices for all plant operators and/ or subcontractors. The dose estimate is in accordance with optimization principle, as recalled in sections 3.11 (b) or 3.31.			R	Unnecessary level of detail
9.	2.48	Delete the box “dose rate” in fig 2	The dose rate is not used to calculate intakes from individual measurements			R	The figure is consistent with Ref. [8] and the calculation is technically possible.
10.	2.63/table 1	Correction of half-life : 218Po half-life = 3.07 min 214Pb half-life = 26.9 min 214Bi half-life = 19.8 min 214Po half-life = 162.3 µs	Half-life and energies values need to be corrected taking into account the work of the BIPM : Table of radionuclides (Vol.7-A=14 to 245 (2013)			R with modifications	IAEA follows the NuDat database (Brookhaven National Laboratory – NuDat 2.6) and Reference added in Table 1. 218Po corrected as per the latest database to 3.098 min. Other radionuclides – no change
11.	2.70	PAEC (in J/m^3)= **5.66** 10^{-9} EEC	5.66 instead of 5.56			R	Values consistent with those adopted in the resolution to comment 10.
12.	2.71	~~However, workplaces such as~~	This sentence may be			R	Values consistent with those adopted in

		~~underground mines or water treatment facilities may show significantly lower *F* values.~~ **The higher the air renewal rate is, the lower the equilibrium factor F is.** **+ Replace 5,56 by 5.66 in formula 17** **+ Replace the result 4.45 by 4.53**	confusing. Basically, the higher the air renewal rate is, the lower the equilibrium factor F is **Table 1 is duly amended at the end of the document.**				the resolution to comment 10. (see also resolution to comments 5-7 of Germany)
13.	2.72	"Thoron is not normally of concern in workplaces, except where material with a ~~***high***~~ thorium content is processed or stored,	"high" is too restrictive. "high" should be defined precisely in term of activity of thorium.			R	Current text is adequate.
14.	2.72	In such instances, a similar approach to that for 222Rn progeny can be followed **except for the equilibrium factor that is not a relevant quantity for thoron**.	The equilibrium factor can be used for radon because its half-life is much longer than the half-life of the progenies of interest. But for thoron chain that is not the case, the half-life of the parent, the thoron gas, is shorter.			R	The existing text already covers the issue of the short-life of thoron and the equilibrium factor.
15.	2.72	~~The short lived progeny of thoron are likely to be out of equilibrium with the parent~~.	Better not to talk about equilibrium for thoron and its progenies (that are all short lived). The thoron half-life being much shorter than the half-life of 212Pb and the following progenies, the thoron will vanish long before those			R	The existing text already covers the issue of the short-life of thoron and the equilibrium factor.

			progenies appears				
16.	2.72	~~The assessment of an equilibrium factor and~~ For dose assessment purposes, an approach based on the measurement of thoron progeny concentration is ~~easier~~ usually chosen.	Remove "The assessment of an equilibrium factor" because this has no physical meaning. It is not possible to make the same assumption that those made for the radon because the half-life of the radon is far higher than those of its short lived progenies			R	The existing text already covers the issue of the short-life of thoron and the equilibrium factor.
17.	2.72	One could add: a measurement of thoron in order to take into account the deposition of the first progeny, the ^{216}Po, in the lung that can deposit because of the short half-life of thoron	That is the big difference between radon and thoron, radon does not have the time to disintegrate so much in the lung but thoron has.			R	The existing text in paragraph 2.73 already covers the issue of the short-life of thoron and the equilibrium factor.
18.	2.72	Because thoron will be normally found close to its source (thorium or radium), the measurement of thoron progenies (212Pb, 212Bi and 212Po) should be enough for dose assessment.	The thoron measurement cannot be used to evaluate 212Pb, 212Bi and 212Po activity concentration but to evaluate 216Po only.			R	The existing text in paragraph 2.73 already covers the issue of the short-life of thoron and the equilibrium factor.
19.	3.6	, including materials and objects **and generators,**	Ionizing radiation sources may often be X Ray generators or accelerators especially in the medical field			R	Generators will be exempted rather than cleared and this issue is covered in 3.7
20.	3.10	Optimization of protection and safety needs to be considered at all stages of the life of equipment and installations, in relation to both exposures from	A reference to NS-G-1.13 "Radiation Protection Aspects of Design for Nuclear Power Plants"			R	See resolution to previous comments

		normal operations and potential exposures. As a consequence, all situations — from design **(Ref NS-G-1.13)**, through operation to decommissioning and waste management — should be considered in the optimization procedure.	should be added. In a future version of this present guide, the relevance to add some provisions from NS-G-1.13 eventually applicable to other types of facilities than NPPs may be studied.				
21.	3.12	(e) Good practices in relevant sectors. **(f) Economic aspects**			A		(f) Social and economical aspects
22.	3.24	To be added: In any case, a record-keeping of the ALARA decision making process and conclusions should be provided at each major step of the project through engineering reports.	These reports have to be made available to authorities to ensure that an optimization process with continuous improvement was performed.			R	Covered by 3.17
23.	3.25	*(b)* Identify all relevant economic, social and radiological factors (sometimes non-radiological factors as well) for the particular situation under review that distinguish between the identified options, e.g. collective dose, distribution of individual dose, **liquid and gaseous releases,** impact on public exposure, **amount of wastes,** impact on future generations, investment costs;	Releases and wastes could also be relevant in the decision-making process.			R	Already covered in the existing text.
24.	3.43	(b) The employer and the regulatory body, in consultation with the worker			A		(b) The employer and the regulatory body, in consultation with the worker

		(through his or her representatives where appropriate) **and the occupational physician**, agree on a temporary dose restriction and the period to which it applies.					(through his or her representatives where appropriate) **and the occupational physician where appropriate**, agree on a temporary dose restriction and the period to which it applies.
25.	3.48	The general objective of the RPP is to implement the application of the management responsibility for **radiological** protection ~~and safety~~ through the adoption of management structures, policies, procedures and organizational arrangements that are commensurate with the nature and extent of the **radiological** risks. The RPP therefore should cover all the main elements contributing to **radiological** protection.	The scope and content of the as-described RPP seems too wide. If the purpose of the RPP is for control, then it should be restricted to radiation protection management, ALARA programme and measures, as the safety aspects are already included in the Safety Analysis Report. Operational information on risks (radiological, mechanical, safety, fire…) to individuals in charge of the works usually is in other types of documents (e.g. Radiation Work Permit, see section 3.95).			R	Follow IAEA Saftey Glossary
26.	3.55	To be added: **(x) Use of experience feedback of comparable facilities or systems already implementing best practices (source term minimization, organization of**	This kind of information is very important and useful for new builds and changes in a facility		A		Added to (b): Use of literature data *and information from comparable facilities.*

		work)					
27.	3.80	Add : For instance**,** **,** it may be appropriate to designate as a controlled area for practical purposes.	Useful to address different types of facilities other than mines		A		For instance, for practical purposes, in some underground uranium mines it may be appropriate to designate as a controlled area the entire underground area, and similarly in some diagnostic medical facilities the entire examination room.
28.	3.88	**m/ Use of personal and collective protective equipment**			A		Change (c) to *(c) Use of personal protective equipment*
29.	3.145	(e.g. designers, engineers, planners, technicians of maintenance, etc.)				R	Not an appropriate example
30.	3.167	~~involving external exposure to gamma radiation emitted from process material~~ involving external exposure to radiation emitted from process material	Beta radiations may be also considered.			R	This is a section on NORM. Additionally, the paragraph considers the most likely exposure situations
31.	6.10	…attributable to occupational exposure will not exceed 1 mSv/y. Modifications of the monitoring programme for internal exposure might be needed because some radionuclides might ~~be~~ **have characteristics** more relevant for foetal doses than for maternal doses.	Newborn child may be breast-fed for more than 1 year “Characteristics” is suggested to precise what is relevant	A		R	Following ICRP recommendations; *after declaration of pregnancy, such that it is ensured that the additional dose to the fetus would not exceed about 1 mSv during the remainder of pregnancy*
32.	7.246		‘hot particles’ has to be defined.				This will be fixed during editorial process.
33.	8.6	Where a service provider is part of a larger organization, the organizational				R	Unnecessary emphasis.

		arrangements should be such that departments that may have conflicting interests, such as production, commercial marketing or financing departments, do not adversely influence the service providers' ability to comply with the requirements of their management system, especially those for the quality of the service provided.					
1.	8.10		This section on safety culture is very weak compared to the expectations set in DS456			R	All relevant and key points have been covered. More text will further limit the usability.
34.	8.10 d)	~~Periodically evaluating the observance of these rules and procedures;~~ **Periodically analyzing difficulties in the application of these rules and procedures**	For safety enhancement, it is more interesting to understand why rules and procedures are not applied rather than to evaluate observance of rules.		A		*Periodically evaluating the implementation and effectiveness of these rules and procedures;*
35.	8.10 i)	Dissemination and promotion of knowledge of actual incidents and accidents, **but also of weak signals like recurrence of events,** to learn from their occurrence and to improve the safety culture	Incidents and accidents are of course a powerful mean of learning, but it is important to pay attention to events without consequences but that give information on the robustness of the organization.		A		Dissemination and promotion of knowledge of actual incidents and accidents, to learn from their occurrence*, and any reocurrence,* and to improve the safety culture
36.	8.20	Add a bullet …This should include the identification of: (a) Customer requirements;	Technical requirements have to be identified. They may or not be covered by customer requirements or			R	Implicit in (a) and (b)

		(b) Related statutory and regulatory requirements; (#) technical requirements (c) Organizational resources necessary; (d) Requirements for communication with the customer.	regulatory requirements…				
37.	8.21	To this end, the management should establish a monitoring process under the management system that is designed to assess and analyse all customer reactions so as to enable the organization to take actions designed to result in the continuous improvement of effectiveness and safety.	Improving safety is also a goal.	A			
38.	8.29	In ~~a~~ large organization that provides services in radiation safety, it is often the case that the top manager appoints one person as management system manager to act on his or her behalf regardless of other duties.	Not true for small companies with a few staff… Consider deletion as the appointment of a management system manager is only a footnote in GS-G-3.1 (footnote 3).			R	Current text is appropriate
39.	8.31	Replace the chapter by: **The human resources should be adequate to meet the pre-determined man power requirements. This requires a prevision of future needs due to staff renewing and workload evolution.**	It is necessary to integrate a dynamic view of resources because they are not stable and the requirements are also changing.			R	Existing text is adequate

40.	8.32	The ~~infrastructure~~ requirements of each process, including the ones derived from regulatory requirements, should be reviewed to identify the resources that will be required for the successful accomplishment of the stated objectives.	Clarifications			R	Existing text is adequate
41.	8.32	~~For calibration and testing laboratories, where the workplace environment could influence the quality of the results, the regulatory body may impose additional requirements such as special authorities to be used for calibration services to ensure the correct certification and calibration of equipment.~~	Not specific to the calibration and testing labs… See previous comment on 8.32 for taking into account regulatory requirements.			R	Existing text is adequate
42.	8.33	~~The objective of the~~ process to control monitoring and measuring devices ~~is~~ should be implemented to establish an effective means of ensuring, with a high degree of confidence,…	Clarification		A		~~the~~ *The* process *for the* control *of* monitoring and measuring devices ~~is~~ *should be implemented* to establish an effective means of ensuring, with a high degree of confidence,…
43.	8.34	Combine 8.34 and 8.33	Same topic			R	No longer necessary if changes to 8.33 are adopted.
44.	8.37	… Attention to workload, stress factors, social structure within the organization, internal communication, workplace safety~~,~~ (including ergonomics, lighting, ventilation) and many other factors can all be combined to enhance the overall effectiveness of the organization in	Clarification as lighting and ventilation, as well as ergonomics, contribute to workplace safety.	A			Deleted this part as per the WNA comment 18.

		achieving its objectives.					
45.	8.37	Additional paragraph: **For people working at sites away from permanent facilities, or in associated temporary or mobile facilities, an analysis of working conditions, especially coactivity risks, should be completed before the beginning of the work.**	It is important to have specific arrangements for people who work in different places.			R	Not necessary (working environment include the addressed issue)
46.	8.42	In monitoring the performance of its processes to ensure that the processes remain effective and that customer satisfaction is provided, a service organization should review the following: (a) Timeliness ~~— reaction to the customer as influenced by the process structure~~; (b) Capability ~~— amount of throughput for the process~~ (ability to meet the requirements relevant for the service) ; (c) Efficiency — resources allocated to the process and the possibilities for their reduction without compromising compliance with regulatory requirement and quality.	Clarifications		A		In monitoring the performance of its processes to ensure that the processes remain effective and that customer satisfaction is provided, a service organization should review the following: (a) Timeliness ~~— reaction to the customer as influenced by the process structure~~; (b) Capability ~~— amount of throughput for the process~~ *(ability to meet relevant requirements)*; (c) Efficiency — resources allocated to the process and the possibilities for their reduction *without compromising quality and compliance with regulatory requirements*.
47.	8.47	8.47. For consultancy services, these ~~measurements~~ arrangements could be: (a) Additional calculations using other algorithms; (b) Checks on data entry;	Clarification (to be consistent with suggested change to 8.45/8.46)		A		Change *measurements* to *measures* (also in 8.46).

		(c) Comparison of the results with previous experience.					
48.	8.48	8.48. For measurement and calibration services these checks could be: (a) Repeated tests (possibly done using different instruments for analysis); (b) Checks on introduced blank or test samples; (c) Plausibility tests on the results, done by applying expert knowledge, etc. ~~The results of these measurements should be recorded as proof of the control of the production process~~.	Clarification (to be consistent with suggested change to 8.45/8.46) Last sentence to be moved up to 8.46		A		Change *checks* to *measures*. Retain the last sentence but delete *of these measurements.*
49.	8.52	Create a headline before 8.52 : "proprietary information"	Clarification	A			
50.	8.55	~~Organizational changes in service-providing organizations rarely have a direct impact on safety. If they do, the guidance in Ref. [6] should be followed to ensure that there is no adverse effect on product or service quality.~~ **Should organizational changes be contemplated in service-providing organizations, the guidance in Ref. [6] should be followed to ensure that there is no adverse effect on product or service quality.**	The postulate that organizational changes have rarely impact on safety is not consistent with lessons coming from the experience feedback from industrial accidents.. the sentence is too affirmative		A		*Should organizational changes be contemplated in a service-providing organizations, the guidance in Ref. [6] should be followed to ensure that there is no adverse effect on product or service quality.*
51.	p 162	Modification of the title	Characterization is larger		A		*Performance m*easurement, assessment

		Characterization, assessment and improvement	than measurement that is only covering quantitative data on the functioning of the organization.				and improvement Add "performance" also to 8.57.
52.	8.57 (b)	(b) Application of basic statistical methods (histograms, distributional analysis, mean values, etc.) **or qualitative analysis methods** to monitoring data on customer satisfaction, the performance of equipment, measurement throughput and similar indicators of the effectiveness of services provided to the customer;	All indicators cannot be quantitative. It is necessary to also consider qualitative data that will allow analyzing causes of evolutions of quantitative indicators.	A			
53.	8.73	Some questions that should be considered when determining root causes of a problem include:	Causes with an s, because there could be different root causes.	A			
54.	8.73	Complement the list : **(i) Does the working environment changed?**	It is necessary to investigate whether some changes in the working environment contributed to the event.		A		*(d) Has the working environment changed?* Change the lettering accordingly
55.	8.75	Delete 8.75	Too general and not safety oriented			R with modif.	It addresses the issue of Performance improvement Change paragraph as suggested: ~~*Correction of errors and prevention of losses are two ways to make improvements within an organization.*~~ *It should review its performance and events that took place and identify and*

							implement improvements.
56.	8.76	In some States, organizations providing calibration or testing[19] services seek accreditation by third parties to internationally recognized standards such as ISO/IEC standard 17025 [86]. Such accreditation is recommended ~~The guidance provided here will help such organizations to develop a management system that could be accredited if there is a strong business case for pursuing accreditation.~~	It is not the purpose of an IAEA guide to explain how to succeed in an ISO accreditation. However, such accreditation may be recommended by IAEA.	A			
57.	8.77	Delete 8.77	See comment on 8.76. It is not the purpose of an IAEA guide to explain how to succeed in an ISO accreditation.	A			
58.	8.78	Delete 8.78	See comment on 8.76. It is not the purpose of an IAEA guide to explain how to succeed in an ISO accreditation.	A			
59.	8.82 8.83	Rearrange 8.82 and 8.83 as follows: 8.82. Laboratories proposing to subcontract tests and calibrations should inform the affected clients of the arrangements in writing and, as appropriate, gain the approval of the client, preferably in writing. For calibration and testing laboratories, subcontracting means placing work within the scope of its	More logical order		A		Fine with moving original text of 8.83 to the top of 8.82. The text for 8.83 is modified as follows: ~~*Subcontractors should be required to demonstrate the same level of competence as is the accredited laboratory that is serving as the prime contractor. This can be accomplished either by:*~~

		accreditation with a third party outside the immediate control of the primary contracting laboratory. It does not include, for example, contracting with a reference laboratory to provide intercomparison samples, contracting with an employment agency to provide supplementary support workers, or similar activities. 8.83 Subcontractors should be required to demonstrate an adequate ~~the same level of~~ competence as is the accredited laboratory that is serving as the prime contractor. This can be accomplished either by the subcontractor holding an equivalent accreditation in its own right or by the prime contractor completing a quality system audit of the subcontractor's operation. ~~8.83. Laboratories proposing to subcontract tests and calibrations should inform the affected clients of the arrangements in writing and, as appropriate, gain the approval of the client, preferably in writing~~.	Subcontractor may have a better level of competence…				*The level of competence of the subcontractor should be adequate for the technical services to be provided. This can be demonstrated either by….*
60.	8.84	Delete 8.84	The para gives conflicting positions for who is responsible so it is better to delete it.	A			
61.	8.88	Delete 8.88	Duplicates 8.70		A		Deleted the heading « Customer

							feedback » together with 8.88 and change Paragraph 8.70 as follows : *A policy and procedure for the resolution of complaints received from clients or other parties should be in place. A corrective action procedure is started after a complaint is made by, or feedback is received from, a customer, or upon the discovery of a non-conformance by staff or during an audit. Corrective actions should be commensurate with the magnitude of the problem and the associated risks. Records should be maintained of all complaints and of the resulting investigations and corrective actions.*
62.	8.90	Transform 8.90 into a footnote	8.90 weakens 8.89		A		Delete 8.90 and change 8.89 as follows: With regard to technical records, the laboratory should retain, *to the extent practicable,* the records of original…
63.	8.93 8.94	Delete 8.93 and 8.94	8.93 and 8.94 duplicate 8.60 and 8.61		A		Move 8.93 to after 8.61, with the modification indicated below, and leave 8.94 untouched. ~~*8.93*~~ *8.62* The internal audit programme should address all the elements of the management system. ~~*, including testing or calibration activities.*~~
64.	9.1 to 9.5	Locate 9.1 to 9.5 in the subsection				R	The text in 9.1-9.5 covers more than just

		dealing with ventilation (after 9.9)				with modif.	ventilation. Paragraph 9.2 and 9.3 to be changed as follows *9.2 Appropriate monitoring should be performed to determine the adequacy and effectiveness of engineered controls. For instance, when engineered controls such as ventilation, vacuum cleaners or containment devices are used to reduce or maintain radionuclide activity concentrations in the work environment, the air quality should be monitored.* Generally… 9.3 Temporary engineered controls, *such as temporary shielding*, containment devices and portable or auxiliary ventilation may need to be used during non-routine operations such as maintenance, modifications, and decontamination and decommissioning.
65.	9.1	~~Additional~~ engineered controls using facility systems and components ~~are~~ should be used to protect individuals ~~when the physical design features of a facility do not provide sufficient containment of radioactive material.~~ For example,…	Clarification (no need to speak about additional features)		A		~~when~~ *Where the physical design features of a facility do not provide sufficient containment or shielding of radioactive material, additional* engineered controls using facility systems and components ~~are~~ *should be* used to protect individuals. For example, …
66.	9.4	Temporary containment devices may be particularly useful in controlling the spread of contamination when	Clarification			R	It could be foreseeable

		unforeseen leakages occur in the normal containment system or when maintenance work requires the containment system to be opened.					
67.	9.5	"should be equipped with high efficiency particulate air (HEPA) filters or iodine filters if radioactive vapors are produced"	HEPA are not efficient in filtering radioactive vapors.		A		should be equipped *either* with high efficiency particulate air (HEPA) filters *or with adsorbers, as appropriate.*
68.	9.8	… At the design stage, adequate thickness of the shield material is provided to give acceptable level of protection to the workers during normal as well as abnormal situations. **As far as possible, appropriate and easily available materials are used for permanent shielding purpose: water, polyethylene, normal concrete (density 2.35), lead-glass and iron.** The design of shielding should ensure that the individual external dose in normal working condition is lower than the dose constraint. Additional local shielding should be ~~provided~~ **avoided by design; they can be provided later on** to reduce the radiation field as needed. Passive area monitors …	To avoid non usual and expensive shielding materials To avoid by design heterogeneous shielding thickness and/ or necessity for local shielding transportation and storage in radiation zones			R	
69.	9.9	Locate 9.9 before 9.8	9.9 set the need for			R	Existing order of paragraphs is correct.

			shielding and 9.8 how to shield…				
70.	9.9	~~It is common practice for dose rates to be restricted such that, for an assumed annual exposure period of 2000 h, the annual doses would not exceed 5 mSv in contact with the shield and 1 mSv in the vicinity of experimental hutches along the beam lines.~~ … It is common practice for *the shielding thickness* to be optimized such that, for an assumed annual exposure period of 2000 h, the upper dose or dose rate of the applicable local radiation zoning in contact with the shield is not exceeded, also given the radiation sources of surrounding rooms.	More general definition and pragmatic way to define shielding thickness.		A		Remove the whole sentence.
71.	9.10 (d)	Providing the appropriate exhaust air off gas cleaning systems (including scrubbers and/or HEPA filtration **and/or iodine filters**) so that the discharges from the facility will be ALARA and as per the authorized levels. The discharge of the exhaust air should be through a stack of appropriate height to provide the necessary dilution for the releases to protect the members of the public.	HEPA are not efficient in filtering radioactive vapors. Clarification stressing the need to be ALARA and not only below limits			R	Already addressed in the resolution on comment #51 of UK.
72.	9.15	Locate 9.15 before 9.11	This para is general and should appear before the			R	Current structure is adequate.

			specificities addressed in 9.11 to 9.14				
73.	9.17	Locate 9.17 before 9.13	General expectations should appear prior to specific expectations			R	Current structure is adequate.
74.	9.18		Why is this recommendation limited to underground mines or buildings where dry radioactive material is processed ? This would also be true in several rooms of an NPP…				Already addressed in the resolution to comment #53 of UK
75.	9.22	The employer should establish standard operating procedures (SOPs), including procedures for the cleanup of spillages, restricting access to the area, implementing contingency plans, monitoring of affected persons, advice from RPO or Qualified Expert, management of waste arisings, and where relevant notifications to relevant authorities, to be followed in the event…	Reporting criteria to the regulator are to be set by the regulator…		A		management of waste arisings, notifications to relevant authorities *as required*, to be followed in the event…
76.	9.23	Any spillage of radioactive material should be cleaned up as soon as practicable in order to minimize the spread of contamination after determining the extent of the contaminated area. The area should be decontaminated by the removal of all loose radioactive contamination	Clarification			R	Unnecessary level of detail.

		and contaminated materials as much as practicable.					
77.	9.25 (a)	(a) Specific design features aimed at ~~containment of~~ confining radioactive material to prevent it from causing surface contamination in the first place;	Clarification	A			
78.	9.26	Especially during non-routine work such as equipment maintenance, design features such as those mentioned in para. 9.25(a) and (b) may be the primary methods of preventing and controlling workers' internal exposures from inhalation	Prevention should be emphasized			R	Existing text is adequate
79.	9.26		In the bullet list, recommendation to use charcoal filter may be added to the recommendation of HEPA		A		Add "*or adsorbers*" (see previous resolutions)
80.	9.28	To control the spread of contamination and restrict individual exposures, ~~a graded, multiple tier system~~ provisions such as erection of physical barrier (with change of footwear), cordoning of the affected areas, should be used in and around contaminated areas.	Unclear recommendation with reference to "multiple tier approach"	A			
81.	9.29	Control of workers' exit from contaminated areas ensures that radioactive material is not inadvertently ~~removed~~ transferred from the area by personnel or equipment.	Clarification	A			

82.	9.30	Necessary monitoring of tools or other material and equipment should be performed by trained ~~radiological control~~ personnel.	No reason to restrict task to radiological control personnel.			R	See resolution to comment 55 of UK
83.	9.31	Transfer the end of 9.31 (if background radiation… necessary checks) at the end of 9.30	Same topic	A			See resolution to comment 55 of UK
84.	9.34	A contamination monitoring programme should be carried out as part of the prior radiological evaluation and ongoing safety assessments, and to verify the effectiveness of the measures for preventing and controlling surface contamination.	Prevention should be emphasized	A			
85.	9.35	The instruments and techniques used for contamination monitoring should be appropriate for the types, levels and energies of the radiation encountered. **Contamination control devices should be located in areas with a low radiation background**. Instruments should be regularly maintained…	Otherwise, the detector is influenced and contamination might not be detected.			R	Not necessary details
86.	9.36	Locate 9.36 after 9.39	More logical order			R	Existing structure is adequate.
87.	9.37	~~The measurements, in counts per second, need to be converted to units of becquerels per square centimetre. Some surface contamination meters are programmable. The user sets the instrument's likely response to the radionuclide in use and obtains a~~	Not a recommendation			R	Existing text is adequate.

		~~direct measurement of surface contamination (in becquerels per square centimetre).~~					
88.	9.38	Merge 9.38 with 9.37	Same topics			R	Existing structure is adequate.
89.	9.40	Locate 9.40 after 9.41	More logical order			R	Existing structure is adequate.
90.	9.41	These tests ~~are~~ <u>should be</u> conducted by qualified experts using calibrated, uniformly contaminated plaques with an active area of similar dimensions to the detector.	Clarification	A			
91.	9.42	To minimize the spread of contamination, the employer should provide<u>, in addition to personal protective equipment,</u> washing facilities for all workers,	Clarification		A		*To prevent inadvertent intakes by workers*, the employer…. Move 9.44 to after the end of 9.42, delete "*to prevent the intake of radioactive material*" and add "*toilet facilities*".)
92.	9.43	No one should eat, drink, chew gum or tobacco, **urinate**, smoke or take snuff in working areas where radioactive material could be ingested.				R	Not appropriate here
93.	9.48.	Other cleaning agents should be selected based upon their effectiveness, hazardous properties, amount of waste generated, compatibility with the contaminated surface and other systems or items that may be contaminated (including protective clothing and waste handling systems), and ease of disposal **(see ISO 8690:1988 Decontamination of radioactively contaminated surfaces -- Method**		A			Reference to the two ISO standards added.

		for testing and assessing the ease of decontamination and ISO 9271:1992 Decontamination of radioactively contaminated surfaces -- Testing of decontamination agents for textiles)					
94.	9.52	Personal protective equipment should be selected with due consideration of the hazards involved. The equipment should not only provide adequate protection but also be convenient and comfortable to use. If the user must wear more than one personal protective equipment, a special care should be drawn on the compatibility between them.	Interfaces between them may be the weakest point of the protection provided to the user.			R	Details already contained in
95.	9.58	Where there is the potential for contamination warranting such provisions: - personal clothing and working clothing should be changed in suitable locker rooms, where appropriate with a washroom in between, to control the spread of radioactive contamination ; - Individuals should shower and change clothes on leaving contaminated workplaces.	Showering is not systematic and lockers room may be limited to a few hangers…			R	Already addressed in comment #63 of UK
96.	9.64	However, the use of this method should be kept to a minimum, and job rotation should never be used as a	Clarification			R	Job rotation is aimed to reduce individual dose (already in text), not collective dose.

		substitute for the development and use of appropriate methods of individual and collective exposure control to maintain individual and collective dose ALARA.					
97.	10.7	**The occupational physician, including any private occupational physician employed on a part time basis, should be knowledgeable, through training and retraining where necessary, on the medical effects of radiation exposure, the means of control of exposure, and the interpretation of exposure data and dosimetric assessments** The occupational physician should take responsibility for case management in the event of a suspected overexposure.				R	Already covered in 10.5
98.	10.23	In special circumstances where workers who smoke have experienced lengthy exposure to dusts and/or radioactive gases and particulates, the occupational physician may need to consider instituting a programme of sputum cytology	What is the purpose and the interest of sputum cytology in this case?, give a reference or delete the paragraph (lung cancer screening using sputum cytology have not be demonstrated to influence lung cancer mortality)	A			Delete 10.23 (it's the physician who decide)
99.	10.27	The occupational physician should be informed when it is suspected that an accidental intake **may** exceed a limit specified by the regulatory body	If the limit is in term of dose, the assessment could take several days or months. In this case, the			R	Redundancy (covered by the word "suspected")

			occupational physician should be informed before the assessment is performed.				
100.	Appendix I 1.1	This is because the dose is quite strongly influenced by the types of radionuclide and the activity concentrations in the material, reflecting the underlying linear relationship between these two parameters.	The sentence is not clear. It is mathematically incorrect to state the existence of a linear relationship between a quantitative variable ("activity concentration") and a qualitative variable ("types of radionuclide").	A			This is because the dose is quite strongly influenced by the *radionuclide activity concentrations* in the material, reflecting the underlying linear relationship between these two parameters.
101.	Appendix II.41	A dosimeter based only on PADC has an energy threshold of about 100–150 keV, but its low energy response can be improved **for example** by the use of a plastic filter which contains nitrogen. Low energy neutrons react with nitrogen by the capture process to produce protons with an energy of about 0.5 MeV. Its angular response is not **always very** good but if the mean response is averaged over angles of 0°, 20°, 40° and 60°, ~~a response that is flat to within ± 30% is obtained in the 0.15–14 MeV region~~ **an acceptable response can be achievable.** The use of the nitrogenous plastic filter also produces a satisfactory response from neutrons in the energy range from thermal to 10 keV. This type of	Performances of the recoil track detectors depend of many parameters (quality of the material, material used for the detector container, specificities of the chemical treatments and of the optical means used to read the tracks, methods to analyze the tracks). So, Characteristics and achievable performances given in this paragraph are not general enough for all recoil track detectors.		A		, ~~mSv~~ *can go as low as 0.1 mSv*. ~~**with a high-level tuning**~~**.**

		detector is not sensitive to photons, it does not suffer much from fading and the dose threshold ~~is 0.2 mSv~~ **can go as low as 0.1 mSv with a high level tuning.**					

Table 1 :

Radionuclide	Half life (s)	keV	alpha energy (J)	Yield (%)	PAE J/Bq
218Po	3,07	184,2	6002 9,6152E-13	100	5,88987E-10
214Pb	26,9	1614			2,92192E-09
214Bi	19,8	1188			2,15071E-09
214Po	162,3	0,0001623	7833 1,25485E-12	100	2,93822E-16
				sum	**5,66162E-09**

DS453 Occupational Radiation Protection (10 February 2014)
ENISS Comments

Reviewer: ENISS Page: 1 of 19 Country/Organization: **ENISS** Date: 27 05 2014				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
General comments		In general we welcome the publication of this Safety Guide. It seems reasonable to gather the guidance regarding occupational exposure for all types of exposure situations in one document. The document is, however, difficult to read due to its length, the structure is not very convenient for the reader and it is often not easy to identify the kind of facilities or activities concerned. The guide seems to be mainly written for complex facilities and small users may have difficulties to find out what is useful for them. It also appears to be difficult to use the guide with respect to specific topics, for example, the individual monitoring from external exposure is very fragmented between sections and appendices (idem for the monitoring from internal contamination). The document could benefit from a reduction of pages trying to eliminate all the redundancies and simplifying or eliminating parts not adding much to the scope of the document (eg appendix biokinetic models). Chapter 4: is to quite a large extent (about half of the para) copied from BSS and GSR Part 7. Therefore little further guidance is given (or references to such guidance). The references to GSR Part 7 are questionable since this is only a draft. Chapter 8: when services are provided at the customers site, the relation of the service provider's management system and the					GSR Part 7 is in advanced stage of approval. This will be considered during the editorial process.

		customer's one need to be clarifies. Also the relation and application of sub-contracting companies is not mentioned in the chapter (apart from the accreditation part). Chapter 6: more clarity would be needed on the share of responsibilities between employers of a facility and contractor for itinerant workers in regard to: dose assessment, dosimetry, records, training and health surveillance. A lot of examples are used that create confusion. Chapter 7: the wound model of ICRP 156 is not mentioned. There should be a point in the section: "Interpretation of measurements and dose assessment". Chapter 9: problems with the ventilation is mentioned only in regards to the mines but not for the nuclear cycle facilities where ventilation is also essential (for example, reprocessing plants and installations where alpha emitters are handled). Detailed proposals for changes are marked in red.					
1	2.27	**Protection Quantities (before 2.7)**	Add subtitle *Protection Quantities* before requirement 2.7 as following paragraphs address this issue.	R			Already explained in the text
2	2.34	~~The term collective effective dose may be used as an instrument for optimisation, for comparing radiological technologies and protection procedures. These quantities takes account of the exposure of all individuals in a group over a given time period or during a given operation executed by this group in designated radiation areas. The collective effective dose is calculated~~	The collective dose is not a protection quantities. It makes more sense to explain its use in optimization section for example after the concept of dose constraint (3.32)		A		Already addressed in resolution to comment #6 of Italy (IRPA/AIRP)

		~~as the sum of all individual effective doses over the time period or during the operation being considered and expressed in the special name 'man sievert (man Sv)'.~~					
3	2.47	For exposure of the lens of the eye, the recommended depth is 3 mm, but there are at present no published conversion coefficients for converting from the basic physical quantity kerma to the directional dose equivalent $H'(3)$. However, if the monitoring devices is not designed to measure $H'(3)$, $H'(0.07)$ may be used as surrogate as reported in ICRP 116 [85]. Table 2.4. Operational quantities for monitoring external exposures. Task / Operational dose quantities: Area monitoring / Individual monitoring Control of effective dose: Ambient dose equivalent $H^*(10)$ / Personal dose equivalent $H_p(10,\Omega)$ Control of doses to the skin, hands, wrist, and feet: Directional dose equivalent $H'(0.07,\Omega)$ / Personal dose equivalent $H_p(0.07,\Omega)$ Control of dose to the lens of the eye*: Directional dose equivalent $H'(3,\Omega)$ / Personal dose equivalent $H_p(3,\Omega)$ *If the monitoring devices are not designed to measure $H'(3,\Omega)$ or $H_p(3)$, $H'(0.07,\Omega)$ and $H_p(0.07)$ may be applied.	Ref. ICRP 116				Already addressed in previous resolution to comment #8 of Italy (IRPA/AIRP)
4	2.52.	To derive the value of committed equivalent dose to a tissue or organ, the intake is multiplied by $h_T(g)$ ~~$h_T(g)$~~, the committed equivalent dose per unit intake for ingestion or inhalation, as appropriate, by the group of age g. For routine occupational exposure evaluation adults group of age is considered except for apprentices.		A			
5	2.58	~~In situations of exposure to a single radionuclide by inhalation or ingestion, with no external exposure,~~ the limit on	The proposed text is unclear and may create confusion			R	Original text is clear and needs to be retained.

		intake I_L corresponding to the limit L on effective dose is defined as ~~given by~~: (7)) $I_L = L/e(g)$ where $e(g)$ is the applicable value of the committed effective dose per unit intake. ~~When there is internal exposure to a range of radionuclides and/or external exposure, the total effective dose should be calculated by summation of the individual contributions and compared with the relevant limit on effective dose.~~					
6	3.15 (a) New	New: A RPP is not necessarily a single document. It may be the sum of documents issued for an application for a license, a operational manual or a simple user guide, especially for registered practices.	For clarification to avoid bureaucracy.			R	Not relevant
7	3.23	The process of optimization of protection and safety measures may range from intuitive qualitative analyses to quantitative analyses using decision aiding techniques~~, but has to be sufficient to take all relevant factors into account in a coherent way so as to contribute~~ to achieving the following objectives:	Too much sophisticated			R	Existing text is adequate.
8	3.25	(a) Identify ~~all~~ practicable protection options that might potentially reduce the occupational exposure; (b) Identify ~~all~~ relevant economic, social and radiological factors	Exaggerated, not needed and not practice.			R	The existing text is necessary.

		(sometimes non-radiological factors as well) for the particular situation under review that distinguish between the identified options, e.g. collective dose, distribution of individual dose, impact on public exposure, impact on future generations, investment costs; (c) Quantify, where possible, the relevant factors for each protection option; (d) Compare ~~all~~ options and select the optimum option(s);					
9	3.26	These techniques must be seen as tools to help structure problems in order to compare the relative effectiveness of various possible protection options, to facilitate the integration of ~~all~~ relevant factors and to improve the coherence of decisions taken	Not necessary			R	See previous comment
10	3.27	Dose constraints ~~are~~ may be used for optimization of protection and safety, […] Dose constraints ~~are~~ may be applied to occupational exposure and to public exposure […] Dose constraints are set separately for ~~each~~ a source under control	Dose constraints are not a requirement but an option. Not each source needs to have a dose constraint, only if appropriate.			R	Text from BSS.
11	3.28	~~After exposures have occurred, t~~The dose constraint may be used as a benchmark for assessing the ~~suitability of the optimized strategy for~~	Otherwise in contradiction with 3.30 last sentence			R	Text from BSS.

		protection and safety that has been implemented ~~and for making adjustments as necessary~~					
12	3.29	It is necessary to ensure that ~~dose constraints are set such that~~ dose limits for occupational exposure are complied with when workers incur exposures from multiple sources or tasks.	To reach that objective dose constraints are not needed. It can simply be controlled by personnel dosimetry.		A		The setting of any dose constraints should be such that dose limits for occupational exposure are complied with when workers incur exposures from multiple sources or tasks.
13	3.59	~~(c) The integration of occupational radiation protection with other areas of health and safety such as industrial hygiene, industrial safety and fire safety;~~	Outside the scope of a RP standard			R	RPP cannot be developed in isolation
14	3.63	In order to coordinate decision making concerning the choice of measures for protection and safety, it may be appropriate in large facilities, ~~depending on the size of the organization~~, to create a specific advisory committee with representatives of those departments concerned with occupational exposure. The main role of this committee would be to advise senior management on radiation protection ~~the RPP~~. Its members should therefore include management staff from the relevant departments and workers with field experience. The functions of the committee should be to delineate the main objectives of radiation protection ~~the RPP~~ in general, and operational	The objective is radiation protection. An RPP, if there is one, is only one tool.			R	Current text is appropriate

		radiation protection in particular, to validate the protection goals, to make proposals regarding the choice of measures for protection and safety and to give recommendations to management regarding the resources, methods and tools ~~to be assigned to the fulfilment of the RPP~~.					
15	3.64	The ~~RPP~~ management should specify the need for and designate qualified experts in the relevant fields, such as: (a) Radiation protection; (b) Internal and external dosimetry; (c) Workplace monitoring; (d) Ventilation (in underground mines, for instance); (e) Occupational health; ~~(f) Industrial safety;~~ ~~(g) Industrial hygiene;~~ (h) Radioactive waste management.	See above Outside the scope		A		Retain RPP Accept delete (f) and (g)
16	3.65	Management should ensure that the relevant services of qualified experts are provided ~~and that the persons providing such services relating to radiation protection work in close cooperation and maintain close working contacts with persons responsible for the control of non-radiological hazards.~~	Outside the scope			R	Current text needed.
17	3.70	Management should consult the appointed qualified experts as appropriate on aspects of radiation	It is RP and not the programme that is essential.			R	

		protection ~~the RPP~~,					
18	3.73	The accountability system for radiation generators and radioactive sources should include an inventory that contains records of the location and description of each radiation generator or radioactive source and the activity and physical/chemical form of each radioactive source. This inventory has to be updated periodically. In addition, consideration needs to be given to keeping records on any special instructions for each radioactive source held and details of the storage ~~disposal~~ of any such source	Disposal is a word dedicated to the long term underground disposal			R	
19	3.76	An area should be designated as a controlled area when management considers that there is a need to adopt procedural controls ~~to ensure an optimized level of protection and compliance with the relevant dose limits~~ [..] ~~Such an approach may still be appropriate, but it should not be used without careful radiological evaluation. For instance, account should be taken of the length of time for which the dose rate remains at or above the defined level and the risk from potential exposures~~	Deleted text may give a wrong impression of the features of RP.			R	Text important
20	3.83	~~The essential purpose of a supervised area is to identify those parts of the~~	Wrong interpretation of the purpose of a supervised			R	Follows the BSS

		~~workplace that should be subject to regular review of the radiological conditions to determine whether the status of the area should be changed as a result, for example, of circumstances that were not foreseen in the prior radiological evaluation or whether there has been some breakdown of control, either in the design features or in the procedures that operate in any adjacent controlled area.~~	area. To avoid misinterpretation, reference should be made to the definition of the concept of supervised area provided in the COUNCIL DIRECTIVE 2013/59/EURATOM of 5 December 2013: *"supervised area" means an area subject to supervision for the purpose of protection against ionising radiation;*				
21	3.85	~~Although it may be appropriate in many cases for~~ It is not necessary for the boundaries of supervised areas to be marked with caution signs, ~~this may not always be necessary or productive. For example, it may be necessary to designate supervised areas in parts of hospitals to which members of the public may have access; signs at the entrances to such areas may cause unnecessary concern.~~	There is no need to mark supervised areas and this should be clearly stated.			R	Consistent with IAEA BSS
22	3.87	The local rules and procedures should correspond to the design and objectives of the facility concerned and should be designed to aid ~~the optimization~~ of protection and safety.	The important and overruling objective is protection and safety.			R	
23	3.88	The local rules and procedures should	The local rules there are			R	There are no procedures in supervised areas

		describe the organizational structures and the procedures to be followed in controlled and supervised areas and may include some or all of the provisions for various components of the RPP, such as:	also in supervised areas				
24	3.92	When engineered and operational controls are not sufficient to provide an optimized level of protection for the tasks to be performed, management is required in terms of para. 3.95 of the BSS to provide suitable and adequate personal protective equipment that has been properly maintained and tested, as appropriate.	Not all protective equipment have to be protected beforehand.			R	
25	3.93	When work is to be conducted during which significant radiation or contamination levels may be encountered, or when the work is complex (involving several groups of workers and numerous activities), advance work planning is one of the most important means of achieving optimization of protection and safety. The RPO should take part in the planning of work involving significant exposures, and should advise on the conditions under which work can be undertaken in controlled areas. ~~The situations which warrant the use of detailed work plans and work permits are generally encountered in the~~	Out of scope			R	Current text is appropriate

		~~nuclear industry, but may also be found in non-nuclear industries (e.g. in the maintenance or dismantling of accelerators).~~					
26	3.93	The situations which warrant the use of detailed work plans and work permits are generally encountered in the nuclear industry, but may also be found in non-nuclear industries (e.g. in the maintenance or dismantling of accelerators). Additional guidance on the use of work planning for optimization has been published by OECD/NEA [19] [xx].	The last publication of the NEA on work management and optimization is :"Work Management to Optimize Occupational Radiological Protection at Nuclear Power Plants - OECD 2009 NEA No. 6399." It could be included in the references		A		Replace Ref[19] with the more recent one
27	3.94	(d) Operation state of the plant (e.g. for a nuclear power plant, cold or hot shutdown, operation at full or decreased power); ~~(j) Conventional safety.~~	Out of scope.			R	
28	3.95	The RWP is issued by ~~the persons in charge of the planning of the operations, in collaboration with~~ the RPO. (d) An estimate of individual and collective exposure ~~for each work step;~~	Radiation work permit is exclusively the competence of the RPO. Too detailed			R	
29	3.99	The monitoring programme should be designed by ~~management~~ qualified expert on the basis of the prior radiological evaluation discussed in paras 3.53–3.55, with due account	It is the qualified expert which is competent for that, not the management.		A		..designed in consultation with an appropriate qualified expert….

		being taken of regulatory requirements.					
30	3.122	They should be defined by management ~~in the RPP~~, their purpose being to facilitate the control of operations and exposures.	They can be defined elsewhere.			R	RPP is the logical place
31	3.123	Investigation levels should be used in a retrospective sense only ~~and should not be confused with dose constraints~~	Dose constraints will with high probability be used as investigation levels.			R	Not a valid reason
32	3.129	~~Even if the measured dose, exposure or intake is below the recording level, the measurement result should always be maintained in the dose record for the workplace and/or the individual.~~	Results below the recording level are Zero-values.			R	See Comment 2-IRPA/Romania See comment no.8, China Modified to cover internal exposure
33	3.137	The dose records should be easily retrievable ~~and should be protected against loss.~~ Such protection ~~is usually~~ may be obtained by maintaining duplicate sets of records in well separated locations, so that both copies cannot be destroyed in a single incident.–	Dose records are maintained by the operator and the dosimetry service organization, so they are already duplicated.			R	
34	3.141	It is the management's responsibility to ensure that workers who may be occupationally exposed to radiation and persons with assigned responsibilities in the RPP receive general radiation protection information and training. ~~This should include training of workers' representatives and members of relevant safety committees where appropriate.~~	Too vague			R	Text is clear

35	3.142	Senior management should be trained in the risks associated with radiation, the basic principles of protection and safety, their main responsibilities regarding radiation risk management and the principal elements of the ~~RPP~~ RP-regime.	To be in line with the practice.			R	
36	3.150	~~Formal records of each worker's training and testing should be maintained, and retained for three years after cessation of employment~~.	Too heavy workload for a small added value.			R	Modified in response to comment X from country X
37	3.153	The ~~regulatory body~~ licensee should ~~provide guidance on~~ establish qualification requirements for each category of job. ~~This guidance should address~~ the minimum educational level, minimum training and retraining requirements and minimum experience for each job category should be determined. ~~In addition, the regulatory body should enforce requirements concerning the recognition of qualifications relating to certain duties and responsibilities, such as those of RPOs~~. ~~Alternatively~~, The regulatory body should review and approve, if appropriate, proposals regarding training requirements made by licensee's management	Establishing the training path is not the responsibility of the regulatory body. Furthermore the RPO is not assumed to be qualified by the regulatory body.			R	Consistent with the relevant IAEA standards
38	4.6/first sentence	The emergency plan should include the following aspect regarding protection of emergency workers:	Point out that it is only part of the content of an emergency plan		A		With regard to the protection of emergency workers, the emergency plan should include….

39	4.15/Table 2	~~This value may be…"~~	Even if the table is a copy paste from GSR part 7, the readability would improve if the text in the right column "This value…" is left out. The text is found in with the same formulation in the para 4.15/last sentence just above the table.				Editorial This will be considered during the editorial process.
40	4.16/Table 3	AD_{Fetus}…AD (delta')$_{Fetus}$	Use the same spelling		A		editorial This will be considered during the editorial process.
41	4.17	~~When military personnel are designated as emergency workers, every effort should be made so that they are protected in the same way as other emergency workers.~~	If military personnel take part in the emergency work and therefore are part of the emergency organization there is no reason to specifically address them here.			R	No necessarily in all cases
42	4.21	~~Tasks should be assigned depending on the category of emergency worker as follows: (a) Category 1 emergency workers should carry out actions to save life or prevent serious injury and actions to prevent severe deterministic effects and actions to prevent the development of catastrophic conditions that could significantly affect people and the environment; (b) Category 2 emergency workers should not be the first choice for~~	The information in the 178aragraph is already in the draft. A repetition of part of 4.19 (a) implicit from 4.19 repetition of text in 4.19 (a) and (b) Already in 4.14			R	4.21 relates specifically to tasks. Any repetition will be addressed by the IAEA editors 4.2 replace "to" by "that may " Emergency workers, who have specified duties

		~~taking life saving actions;~~ ~~(c) Category 1 and Category 2 emergency workers should carry out actions to avert a large collective dose3.~~ ~~(d) Category 3 emergency workers should carry out those actions in which they will not receive a dose of more than 50 mSv.~~					
43	4.26	The degree of accuracy required for any exposure assessment should increase with the level of exposure likely to have been received by the worker. Some pre-established guidance may help in the management of exposures of emergency workers in Category 1 and Category 2, expressed in terms of dose and directly measurable quantities such as dose rate or air concentration.	Also the workers of category 2 can receive high dose values			R	The proposed additional text is not necessary.
44	4.28	~~Workers should not normally be precluded from incurring further occupational exposure because of doses received in an emergency exposure situation.~~	Article is not needed because covered by Art 4.30		A		Relocate 4.28 to after 4.23 and move 4.24 to after 4.21 Modify para 4.30 as follows : *Although, an emergency worker or accidentally exposed employee who receives doses in nuclear or radiological emergency should normally not be precluded from incurring further occupational exposure, qualified medical advice should be obtained before any further occupational exposure if an emergency worker or accidentally exposed employee has received an effective dose*

							exceeding 200 mSv or at the request of the worker.
45	5.19	A reference level is an important tool in the optimization process. It represents a level of dose ~~(or risk in the case of potential exposure)~~ above which it is judged to be inappropriate to plan to allow exposures to occur. In considering the various possible remedial or protective actions, a reference level serves as an upper bound on the range of options considered; this will ensure that the optimized protection strategy will be aimed at reducing doses to some value below the reference level.	The potential exposure is only defined for planned exposure situation	A			
46	5.88	Monitoring and dose assessment are essential inputs to the ongoing optimization process. Further guidance is provided in Refs [37, 38, xx].	It can be added between the references publication ICRP 123: Assessment of Radiation Exposure of Astronauts in Space	A			
47	8.1	The services provided by technical service providers might, but not limited to fall into two categories:	Not to exclude and limit new possibilities		A		…may be divided into two categories
48	8.4	The management system of a service provider using radiation should be in accordance with national requirements and all relevant IAEA safety standards.	National requirements are to prevail and normally incorporate the IAEA standards			R	This is upto national authorities….
49	8.10	For a service provider, safety culture can be established by:	The same safety culture recommendations should			R	Not necessary

		….. For a service provider same safety culture recommendations apply as for the facility operator.	be used by all organisations involved				
50	8.17	~~The form and layout of the management system documentation should fit into the internal communication culture of the organization.~~	Unnecessary details	A			
51	8.31	Human resources include all the people in the organization ~~who are involved in achieving the objectives.~~	Does that mean that staff not involved in work directly linked to the objectives, is not considered as a human resource?	A			See modification based on previous comments
52	8.37	With regard to the working environment, consideration should be given to how best to combine the consideration of human factors and physical factors with achieving the goal of enhancing the performance of the organization. ~~Attention to workload, stress factors, social structure within the organization, internal communication, workplace safety, ergonomics, lighting, ventilation and many other factors can all be combined to enhance the overall effectiveness of the organization in achieving its objectives. The organization should develop descriptions of minimum criteria for the workplace conditions necessary to~~	Does not seem appropriate that IAEA goes into this area of competence.		A		See modification based on previous comments Already addressed.

		~~achieve the various objectives.~~ Radiological protection should be integrated with Health and Safety as well as Environmental management.					
53	8.40	In the planning schedule, account should also be taken of the need for planning for ensuring the traceability of measurement results to the SI system and for establishing information on uncertainties for these measurement results.	Well, since this para deals with the development processs, it might be reasonable to place this recommendation in the corresponding para "Planning" after 8.26.				See WNA19
54	8.48	… (a) Repeated tests (possibly done using different instruments for analysis); (b) Checks on introduced blank or test samples; (c) Plausibility tests on the results, done by applying expert knowledge, etc. The results of these measurements should be recorded as proof of the ~~control of the production process~~ validation of the final product.	Actions described are more validation of the results then control of the process.				See WNA20
55	9.8	[…].~~The adequacy of the shielding for the proposed work program should be approved by the regulators and any breach of shielding causing exposure of the workers should be communicated to the regulators~~	There is no rationale to put a special attention on the shielding. Shielding is one of the 3 pillars of ALARA. It is not the current practice to make the shielding means submitted to the approval of the regulatory body and there is no rationale that it should	A			

			be from now.				
56	9.34 → 9.41	**Surface contamination monitoring** *It is proposed to scratch those article or to summarize to only one and link to an appropriate safety guide*	Those articles deal with the characteristics and use of the contamination measuring equipments. This paragraph does not fit really in the scope of the DS453 as this is a radiation protection expertise domain in its own, that deserve a comprehensive treatment in dedicate safety guidance. The proposed articles from 9.34 to 9.41 are necessarily incomplete. These should be addressed in a separate guidance document.			R	Useful guidance
57	9.47	~~The employer should ensure that workers are provided with first aid training that is specific to the job~~	Scope of DS453 is radiation protection			R	relevant
58	9.52	Personal protective equipment should be selected with due consideration of the hazards involved. The equipment should not only provide adequate protection but also be convenient and comfortable to use. Attention will be brought to the benefit of wearing the protective equipment on the overall exposure. In particular one should avoid any increase of exposure caused by the additional constraints of the protective equipment.	Application of the optimization principle ALARA.		A		Personal protective equipment should be selected with due consideration of the hazards involved. The equipment should not only provide adequate protection but also be convenient and comfortable to use Consideration should also be given to the possibility of an increase in exposure caused by the additional constraints of the protective equipment.

59	9.55	If levels of airborne contaminants exceed the safe working levels (Derived Air Concentration – DAC) specified by the management of the facility, appropriate respiratory protective equipment should be worn by those persons undertaking actions under those circumstances ~~to correct the situation~~. While corrective measures are being undertaken, the area should be monitored to estimate possible exposures [...]	It is industrial reality that a work other that the one here mentioned (*to correct the situation*) has to be performed under poor air quality, requiring respiratory protection.	A			
60	9.56	[...] (m) ~~The programme for respiratory protection should be acceptable to the regulatory body and the respiratory protective equipment should be as per the quality requirements set by the regulatory body~~	Same remark as for the shielding (9.8) : there is no rationale providing a special focus on the respiratory protection program.	A			

COMMENTS BY REVIEWER Reviewer: Peter Colgan on behalf of Radiation Health Committee Page..4 of.6. Country/Organization: **AUSTRALIA**/ARPANSA Date: 30 June/2014				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	General	**Overview of the Document**: The document would benefit from either a new structure where the duplication between sections is reduced or potentially the document be separated into a number of smaller documents for each exposure situation. For an operator or user of the resulting documents, it is unlikely they would want all exposure situations and would prefer a document with focuses on the area of specific importance.				R	Duplication between sections is not excessive. The structure and content of the document are in accordance with the approved DPP.
2	General	**Depth of the Document**: The document in some ways tries to combine the function of a Safety Guide with that of a reference text. The depth to which the science is delved into is far more than would normally be expected in a safety guide. It also is beyond the level which would be required by most users of the guide and this excess				R	The structure and content of the document are in accordance with the approved DPP.

		of knowledge will detract from the usability of the document for most operators. A lot of the scientific information should not be included in the main text and could either be served by appropriate referencing or by the use of technical appendices to separate the scientific detail from the more practical implementation material. The major concern is that a user of the Safety Guide will not be able to fully use the document and as such the effectiveness will be decreased. A Safety Guide should not try and replace a reference text on radiation protection but should provide the guidance to the basic information and how it can be applied.				
3	General	**Breadth of the Document**: The document has an extremely large breadth and attempts to cover all aspects of occupational radiation protection. Although commendable, this desire to cover all bases means that not all aspects apply to all operations. For an operation to determine what would be applicable requires considerable effort and non-consideration may require additional work to justify the rejection of the component. The use of flowcharts or some other manner for navigating the document for different scenarios might be a method to improve the usability of the document.			R	The structure and content of the document are in accordance with the approved DPP.
4	General	**Use of the Document**: The document, as a Safety Guide, is not intended to be a regulatory instrument and is intended to provide a supporting document to the Basic Safety Standards (BSS) which may be utilised within a regulatory format. However, experience has shown that IAEA documents often are used for regulatory purposes even when this is not the intended use. In some regulatory regimes, IAEA documents have actually been given legal status and this can cause difficulties and legal issues with such a comprehensive document. In some ways this confusion on its regulatory status is increased due to the frequent referencing to the BSS and this can make it difficult for the reader to distinguish between BSS and guidance recommendations. A direct statement that the Safety Guide should not be considered a regulatory document should be			R	This draft Safety Guide is part of the Safety Standards and its legal status (or, rather, lack thereof) is no different from that of other Safety Guides.

		added into the scope.				
5	General	**Assessment of Occupational Exposure**: The section on Assessment of Occupational Exposure could be a separate safety guide which just concentrates on this aspect. Although its inclusion in the document does provide completeness, the sheer amount of information raises the question whether it would actually be used. This section would be better served by either being a separate document or a technical appendix with the overview provided in the main body.			R	The structure and content of the document are in accordance with the approved DPP.
6	General	**Worker Health Surveillance**: The health surveillance of radiation workers is an area which is often difficult to manage and also has the potential for raising the risk profile of radiation beyond the actual risk. Although most of the information may be appropriate for large facilities, the applicability of it to smaller areas of radiation use may be problematic. Recommendations that the occupational physician should be familiar with the work area and take control in an overexposure situation is unlikely to be practical for most smaller operators. This type of specialised knowledge, capabilities and close relationship to an operation only exists in the minority of operations and trying to apply to all workers is unlikely to be successful.			R	For smaller areas of radiation use, the amount of specialized knowledge of the working conditions on the part of the occupational physician will be correspondingly lower, so it shouldn't be problematic.
7	General	**Conclusion:** Although the Draft Safety Guide is extremely comprehensive and goes into considerable scientific depth, this actually works against the usability of the document. It is strongly recommended that the structure of the document be re-examined to improve the usability of the document. This could be done by further use of scientific appendices, the greater use of technical references, the highlighting of the key points, or the separation of the document into smaller components which are more targeted for as individual exposure scenario (planned, existing and emergency). The current document seems to be attempting to combine the usefulness of a Safety Guide with a reference text. As such calling it a Safety Guide is inappropriate and the document is more representative of a			R	The structure and content of the document are in accordance with the approved DPP.

		Technical Report and should be referred to in this format. This decreases the usability of the document and hence the need for separation of the deep scientific information from the guidance material. Finally the scope of the document needs to be more clearly define to prevent the use of the document as a quasi-regulatory legal instrument				
8	Specific	The term 'radiation protection and safety' is evident in the early chapters of DS453, referring to radiation protection of persons and the radiation safety of sources. However by Chapter 8 (Management Systems) the term is almost exclusively 'radiation safety'. Suggest the entire document be checked for consistent use of terminology	A			The problem occurs only in Section 8 (paras 8.1, 8.2, 8.19, 8.29, 8.38, 8.41, 8.45, 8.54, 8.65, 8.67, 8.68). For consistency with the rest of the document, the word "safety" in these paras have been replaced by "protection and safety"
9	Specific	As DS453 is a guideline document and not a requirements level document, the normal practice is not to use the terms 'shall' or 'must'. It is suggested that the document be checked for the incorrect use of such terms - for example in 5.8.3(c) where in line 6 it states 'the employer must adapt the working conditions..' when referring to pregnant aircrew.			R	These terms are only used where there is reference to a Requirements document.
10	Specific	References to lower level IAEA documents should not be made in IAEA Safety Guides as a matter of IAEA policy, and attention is drawn to three ERP documents at references 30, 31 and 146. These references should be removed, and the use of footnotes employed to indicate to the reader the existence of information that, whilst relevant, has not undergone any Member State peer review process as is normally employed for IAEA publications.			R	It is acceptable for lower level IAEA documents to be referenced.
11	Specific	There is a lack of discussion on procedures for managing			R	In principle, the

		occupational exposures associated with the management of wastes and residues. In mineral extraction and processing the generation and management of wastes and residues is an integral part of the extraction and processing.				procedures are the same, regardless of the source of exposure.
12	Specific	There is no guidance on procedures for compiling records of occupational exposure for emergency workers or itinerant workers in a national registry.			R	A national dose registry is not used in all countries.
13	Specific	FIG 3 – clarification is needed. This highlights a more general issue of how planned and existing exposure situations are defined by the ICRP and in GSR-3. These definitions say nothing at all about radionuclide concentrations, and are quite simple to apply. However, in DS453, the definitions have been (effectively) changed, and are now based on radionuclide type and concentration. • For example, uranium mining is a planned exposure situation; regardless of the radionuclide concentration. For other natural radionuclides, the situation is planned or existing based on whether the activity concentration is greater than or less than 1 Bq/g. This has the potential to cause considerable confusion, particularly when it is combined with the statements in GSR-3 that mineral extraction and processing is a planned exposure situation and waste management may be (depending on radionuclide concentrations), but use of commodities containing natural radionuclides is automatically an existing exposure situation.			R	Fig. 3 is merely an illustration to show that many minerals are around 1 Bq/g or less. Uranium mining is treated no differently from any other type of mineral-related activity although, due to the generally high activity concentration, is more likely to be subject to the requirements for planned exposure situations. The text is entirely consistent with the BSS in this regard.
14	Specific 7.3	7.3 – When discussing the requirements a regulatory body should place on the service provider of a dosimetry service prior to approval of that service, the requirement to supply dosimeters capable of measuring $H_p(3)$ is made so as to assess the dose to the lens of the			R	This para. has already been addressed in response to

		eye. Such a suggestion is inconsistent with guidance in numerous other places in the document, including 7.10 and 7.16(d), where it is acknowledged that 'such dosimeters are not yet widely available'. It is suggested that all comments relating to $H_p(3)$ dosimetry measurements and requirements be checked for consistency and accuracy.				comments from other countries.
15	Specific 9.8, 9.9	9.8 and 9.9 - SHIELDING, along with reducing time and increasing distance, is one of the main principles for reducing radiation exposure in occupational situations. However the amount of shielding guidance provided in DS453 (two paragraphs 9.8 and 9.9) is considered inadequate, particularly when compared to the seemingly excessive detail provided on monitoring measurements and monitoring instruments (including also two appendices). As a minimum it is suggested that references to the publications of the NCRP be made for the shielding design calculations. *NCRP Report 151 - Structural Shielding Design and Evaluation for Megavoltage x- and Gamma-ray Radiotherapy Facilities*, which addresses the structural shielding design and evaluation for medical use of megavoltage x- and gamma-rays for radiotherapy, is widely used in the radiation protection community. For shielding calculations s related to x-ray therapy installations of less than 500 kV and for brachytherapy, NCRP Report No. 49, *Structural Shielding Design and Evaluation for Medical Use of X Rays and Gamma Rays of Energies Up to 10 MeV*, which was issued in September 1976, is still relevant. NCRP Report 147 *Structural Shielding Design for Medical X-Ray Imaging Facilities* presents recommendations and technical information related to the design and installation of structural shielding for facilities that use x rays for medical imaging – including therapy simulators			R with modifications	This para. was already addressed in response to comments from other countries. As shielding design is dealt with in detail by other publications the current text is appropriate. However, new reference SSG-8 which is radiation safety of gamma, electron and x irradiation facilities (this document references the indicated NCRP publications and others such as BS 4094 parts 1 and 2 on shielding for gamma and X-radiography) has

						been added.
16	Replace 7.110, 7.111, 7.112, and 7.113 (Approval of dosimetry services) with:	**Requirements of dosimetry services** 7.111. Dosimetry service providers should be technically competent, able to generate technically valid results and have adequate administrative, technical and management systems. 7.112. A service provider should be able to provide an acceptable degree of accuracy in the assessment of dose, to achieve and maintain a high level of reliability, to communicate the results of routine dose assessments to the employer and/or the regulatory body in a reasonable time and to rapidly communicate the results of dose assessments made in the event of an accident, occurrence or incident. In addition to satisfying technical requirements, a service provider should satisfy relevant management system requirements (see Section 8). 7.113. The service provider should: (b) Have an accredited management system in accordance with a relevant international standard such as ISO/IEC 17025 [86]; (c) Be able to certify that the dosimetry system is traceable to the appropriate national standard and is based on conversion coefficients for	The certification of accuracy and the appropriateness of the quality management system could be undertaken by an outside body and not only the regulator or a government body.			R	The existing text does not specifically require the certification of accuracy by the regulatory body. The service provider only has to demonstrate the necessary competencies.

		the operational quantities in accordance with international recommendations and standards;					
17	7.265/line 2	Delete: '*compiled by the dosimetry service providers*'	There are methods other than dosimetry service providers for compiling dose records; records can be collected by a regulatory body or employer and passed on to the national registry.	A			
18	I.1 and I.2	Add: When dealing with bulk materials the exposure scenario can be as important as (or more important than) the type of radionuclide and the activity concentrations in determining dose.	This approach can be misleading, especially when dealing with bulk materials. Asserting that the dose is strongly influenced by the types of radionuclide and the activity concentrations ignores the fact that the exposure scenario is also extremely important. For the same material and the same activity concentrations, changing the exposure scenario can significantly change the dose.			R with modificati on already agreed for I.1 in response to comments from elsewhere.	With the agreed modification, the text now makes sense. The Influence of the exposure scenario is addressed by quoting the wide ranges of doses.
19	I.3	Add: These examples should only be regarded as guidance. They should not be taken as applying in all workplaces.				R	This is covered by the existing text, particularly the use of the words "broad

							indication" in I.1 and "indicative" in I.2
20	III.29	May need clarification	Is the dose equivalent range 20-200 mSv/h or 20-200 µSv/h? This may be a typographical error.		A		Corrected. "covers the dose equivalent range 30 µSv/h–100 mSv/h, with an energy response of ±30% over the energy range from thermal to 10 MeV".