SUMMARY OF SUBMISSIONS AND RESPONSES
DRAFT CODE OF PRACTICE AND SAFETY GUIDE FOR THE SAFE USE OF RADIATION GAUGES

It should be noted that Section 2 Radiation Management Plan as it appeared in the public comment version of the draft Code has been moved to become Schedule A and all other Schedules moved back one position accordingly. All references to the Radiation Management Plan in the Code now refer to Schedule A. Some changes to the introductory wording of Schedule A have also been made to reflect the change.

SUBMITTER	COMMENT	RESPONSE
01 I McIntosh Possession licensee for industrial gauging Queensland Alumina Ltd Gladstone QLD 4680	The following comments on the draft code are submitted in response to the invitation from the ARPASA Secretariat issued by email on 29 August 2005. The comments are made from the perspective of one who has been a Responsible Person as defined by the code, with 25 years experience in the management of fixed gauges in industrial environments. **Comments** **Clause 1.4** states that the term 'fixed radiation gauge' covers the whole of the device. The term is used in many clauses in the code, where the intent of the clause is applicable (or should be applicable) only to the radiation source. Some specific clauses are discussed immediately below. It is suggested that, for the entire code, each usage of the term 'fixed radiation gauge' be reviewed to make clear if reference to the whole of the device, or to only the radiation source, is intended. **Clause 3.3.3 (c), Clause 3.3.10 (b), Clause 3.5.1, Clause 3.5.3 (b), Clause 6.1.2** Each of these clauses requires a regulatory approval for persons to interact with a fixed gauge in its entirety. A fixed gauge consists of a radiation source plus additional electrical/electronic components for signal detection and processing. There is no reason to require a regulatory approval for persons to interact with these non-radiation components. Installation, repair, testing, calibration, adjustment, modification, maintenance of these components does not require direct interaction with the radiation source and, in many cases, might occur in the total absence of a radiation source. It is illogical to require that these activities can only be performed with a regulator's approval. The regulatory aspect should be limited to the safe use of the radiation source. It is therefore suggested that these clauses be reworded so that they are specific to interaction of persons with the radiation source only. **Clauses 6.1.1** and **line 1817** definition of a service technician What differentiates 'routine maintenance' from 'maintenance other than routine maintenance'?	The WG felt that the definition SHOULD apply to the whole of the device. Someone doing work on a detector should be appropriately authorised as they might unknowingly be exposed to the beam or change something that could cause inadvertent exposure of themselves or other workers. Above comment applies A definition of "non-routine" maintenance was added and all occurrences of simply "maintenance" (as opposed to "routine

	It is suggested that routine maintenance is any maintenance activity performed on the non-radiation components and that non-routine maintenance is any maintenance activity performed on the radiation source that affects, or has the potential to affect, the safety integrity of the radiation source. **Clause 3.3.15 (b), Clause 6.5.4 (b)** It is suggested that these clauses be reworded such that audits are sent to the regulator only if so required by the regulator.	maintenance") were changed throughout the document. "Non-routine maintenance" is defined as: work intended by the manufacturer of a fixed radiation gauge to be performed by a service technician or other person authorised by the relevant regulatory authority. 6.5.4 was deleted. 3.3.15(b) (now 2.2.18(b)) amended as per this suggestion.
02	**CONFIDENTIAL SUBMISSION**	
03 **Keith Terry** **Radiation Wise Pty Ltd**	I have the following comment on the Draft Code of Practice and Safety Guide for the Safe Use of Fixed Radiation Gauges. All personal radiation monitors require to be approved by the relevant regulatory authority, whether they be (photographic) film badges, thermoluminescent dosimeters, optically stimulated luminescent dosimeters (Luxels), integrating electronic dosimeters or any other type. The second paragraph of Section 4.1 of the Safety Guide implies that film badges and thermoluminescent dosimeters can be used without approval. I suspect the intent of this paragraph is to indicate that other monitors, apart from those normally supplied by approved personal radiation monitoring service providers (film badges, thermoluminescent dosimeters, optically stimulated luminescent dosimeters) may also be permissible subject to regulatory approval. The paragraph needs rewording to clarify this point.	The paragraph was removed. This is consistent with the similar section in the PDMG Code.
04 **Robert Armstrong** **BlueScope Steel Port Kembla Steelworks Occupational Hygiene Services.**	It can be viewed that the **greatest potential** hazard in regards to fixed radiation gauges, is redundant sources (storage of) and the radiation gauge source disposal path; both these issues are related. **Disposal Path** • Most sources do not have a disposal path ie return to the manufacturer/ supplier - they simply do not now exist for sources in the order of 15yrs age. • Source disposals can be arranged through Service Providers who can obtain approval from the relevant regulatory authority. Although disposal approval is granted by the relevant regulatory authority the source receiver may not respond after source delivery to regulations as expected in Australia and hence the required documentation can be difficult to obtain. • Disposed source transport movements border to border may not be possible	Noted. Noted. Noted.

	in certain areas of the world and as a consequence sources could be stranded.	
	• The Responsible Person is totally reliant on the Service Provider after source disposal approval from the relevant regulatory authority is granted.	Noted.
	3.1.5, *advise the purchaser of their obligations in relation to disposal* - following this advise, would suggest – find an alternative method of measurement, as no one can predict the exact pathway after approx 15yrs installation.	The WG felt that this is an awareness issue. The purchaser needs to be made aware that they will have to dispose of the source at the end of its life and not just abandon it. Despite that, the wording of clause 2.1.6 (previously 3.1.5) was modified.
	3.3.3, (a) - *proposed disposal pathway* – as above, no one can predict the exact source pathway approx 15yrs installation.	Agreed, however a purchaser needs to be aware of the current situation relating to disposal and if it changes in future, then so be it.
	3.3.17, 6.3.,1 *the approval of the relevant regulatory authority* - approval does not accredit the recipient of the source, but the process to send. We live in hope that the recipient of the source will do the right thing.	Noted.
	The whole source disposal path situation should be expanded, developed further and prescribed exactly in the code and guideline.	Noted. Sections 6.2, 6.3 and 6.4 were changed to include a prohibition on abandonment and a new clause (6.3.1) was added to give effect to that prohibition.
	Stored Sources.	
	2.3 Procedures to Avoid Loss of a Source. Gauges can be isolated if a production line is offline (seasonal, strike, semi closure etc) for various unspecified periods prior to yearly audits etc. It is during this time that the potential for loss, misadventure is at its greatest. Consideration should be given to the possibility of a reportable occurrence eg if a gauge is proposed to be offline for greater that 3 months, it should be taken off line and stored therefore reportable to the relevant regulatory authority.	The WG felt that the security of sources while in storage was covered by item 2.1(l) of the Safety Guide, which would, in turn, be incorporated into the Radiation Management Plan.
	A prescriptive suggestion for gauge operation is the introduction of a permit: the responsible person signs off on the proposed operation of a gauge/gauge source at the beginning of the year and every year of operation, including notification of impending storage/end of useful life. This could be an <u>operational</u> permit administered by the relevant regulatory authority annually for each gauge.	
	Comments re Emergency Procedures	

	2.2 (b) (ii) -should read – assess the emergency. Then apply time, distance and or shielding. 2.2. (b) (vii) – it is not possible to remove a radiation source from a fixed radiation gauge and or fixed radiation gauge from an emergency site. 2.2 (b) (ix) – assuming a contamination incident has occurred? *A dislodged source* – does this refer to a laboratory emergency?	Agreed. Two clauses added into Emergency Procedures. Disagree. Sources have become separated from housings in the past. Not necessarily. This is referring to a dislodged source.
05 **Frank A Galea** **R & X Nuclear Services Pty Ltd**	These are my comments on new Code of Practice for the safe use of Radiation gauges. Under Section 3. 3.1.3 A person not supply an FRG with out a licence. This should state a company/supplier must hold a licence. In NSW all companies must hold a licence to sell. 3.3.15 In NSW their is no need to send annual audit reports to the EPA. These reports are part of our registration requirements, the EPA will audit them on their site visits. Section 5 Is their a maximum dose levels to any person travelling in the vehicle? Ie. 20 µSv/hr. B.1.9 Brazed joints will not pass the heat test and is not considered an appropriate bonding medium for this type of equipment (FRG's). B2.5 Distances should not be in metres (0.05m) from the surface, this is confusing. It should be stated in cm (5cm) from the surface. Is there going to be an operational control section, ie regularly occupied area with dose rates indicated for regular occupancy? Thank you for allowing me to comment on the draft code.	 “Person” means an individual or a corporation. Covered above. This is covered by the Transport Code and does not need to be repeated here. Clause 5.1.1 requires compliance with the Transport Code. Disagreed. Brazed joints *will* pass the heat test in some circumstances (eg, when they are internal to the gauge housing). Disagreed. “cm” was changed to metres in other parts of the Code for consistency. No. The WG felt that the Working Rules (Sn 2.1 of the Safety Guide) and Annex C cover this issue. In turn, these will be elements of the Radiation Management Plan.

06 Mr L Dahlskog Secretary Radiological Council, WA	Thank you for the opportunity to comment on the above Draft Code of Practice. Council members have now had an opportunity to review the document and the following comments are provided. **Pg C4, Section 1.4** **Lines 140 – 143** *"Although designed to be installed at fixed locations, this does not preclude them from having component parts that are designed to move during the normal operation of the gauge."* This explanation should be amended to ensure it is clear that the Code is applicable to gauges mounted on dredges or other vessels, and on industrial structures that themselves move, for example, mineral sand mining equipment that steadily moves across the landscape. **Pg C6, Section 3.1.5** The supplier might also be obliged to inform the purchaser of *options* provided by the supplier (or manufacturer) for eventual disposal. **Pg C20, Section 5.1.4** It would be beneficial to define, perhaps within Section 5.1 of the Safety Guide, what is "near" with respect to explosives, combustibles, corrosives or photographic or x-ray film. This might reference the dangerous goods legislation in the respective jurisdiction. **Pg C20, Section 5.3.1** **Lines 803 – 805** *"Fixed radiation gauges containing radioactive sources must be transported so that no person associated with transport is exposed to any risk as a result of inadequate packaging of fixed radiation gauges."* This should be amended such that, rather than not being exposed to **any** risk, the risk is minimised. **Pg C21, Section 5.3.6** Should also require that any necessary manual handling is minimised. **Pg C22, Section 6.3.1** **Line 907** The approval from the regulatory authority should be prior and "written approval" (this also probably applies to many other matters requiring	Agreed. Section 1.4 amended accordingly. A slight amendment to the proposed wording included into Sn 1.4 should clarify this. Disagreed. Obligations are the important aspect. The options might well change over the lifetime of the gauge. ADGC guidance was included in section 5.2 of the Safety Guide. This paragraph was deleted. This is covered in paragraph 1 of Sn 5.2 of the Safety Guide. The Transport Code will cover the mandatory requirements. Whether or not "written" approval is required should be up to the relevant regulatory authority.

	approval). **Pg C23, Section 6.5** The records should also include evidence of initial and ongoing radiation safety training of personnel. **Pg C24, Table 1** Header should be "isotopes" and not "isotope". **Pg C30, Schedule B2.4** Some users have insisted that there are security and process safety issues if gauges cannot be locked "on". Provision should be made for exceptions approved by the regulatory authority. **Safety Guide** Note that there is no numbering for odd pages. **Pg S3, Section 2.1** Protocols for training personnel in radiation safety on induction and at regular intervals should also be included (perhaps as part of (h)). **Pg S10, Section 4.2** The section also needs to address the use of appropriate survey meters for x-ray gauges. **Pg S11, Section 5.1** **Lines 2356 – 2357** Although reasonable, this section appears to allow other materials to be stored with radioactive gauges, which is apparently in conflict with 5.1.3(g) of the Code. **Pg S11, Section 5.1** See also comment on Page C20, Section 5.1.4, above. **Page S13, Section 6.1** **Lines 2423 – 2425** With a number of users believing the opposite, it is necessary to state the obvious. Suggest replacing: *"Further, the registration/licence requirements for fixed radiation gauges may differ between jurisdictions."*	 Agreed. New clauses (2.1.13 and 2.2.13) were added. Also, a section on training (Sn 2.4) was added to the Safety Guide. Done. Disagreed. Other access control situations should be employed. The WG felt that locking a gauge on could lead to dangerous situations in some circumstances. Will be formatted for publishing. A section on training (Sn 2.4) was added to the Safety Guide. A new paragraph was added to Sn 4.2 of the Safety Guide to cover X-ray measurements. Disagreed. The WG felt that it was clear enough. For example, a store could have a common wall with a category 6 dangerous goods store.

	with: *"Further, the registration/licence requirements for <u>the possession and use</u> of fixed radiation gauges may differ between jurisdictions. <u>Licences or other types of authorisations granted in one jurisdiction only apply within that jurisdiction.</u>"*	Done. The second paragraph of this Sn was also amended slightly to clarify the situation.
07 **Nicole Roocke** **Executive Officer** **Safety & Health** **The Chamber of Minerals and Energy of WA**	Thank you for providing the Chamber of Minerals and Energy of WA (CME) with the opportunity to review and provide comment on the Draft Code of Practice and Safety Guide for the Safe Use of Fixed Radiation Gauges (the 'Code'). The content of the draft document is considered to be very comprehensive. However, there are a couple of concerns that have been identified by members which are highlighted below. <u>*Personal Monitoring Devices*</u> Section 4.1 of the Code discusses the requirement for Personal Monitoring Devices to be provided to employees who work on or around fixed radiation gauges. Specifically, CME expresses concern over 4.1.1 (c) and the obligation to provide monitors to each person who, 'where required by the relevant regulatory authority, works in an area around a fixed radiation gauge'. While CME agrees there will be situations where this is required. However, within the WA minerals industry there are tasks which are performed for short periods of time around isolated gauges, such as periodical maintenance 'shut-downs'. This process requires a vast number of employees on site at any one time (100+). Application of the Code with its current wording would potentially require each person participating in the shut down in the area to be issued with a personal monitoring device. This is requirement is not practical. In comparison with the 1982 version of the Code, the degree of flexibility for operators has been removed i.e. if a person works around isolated gauge for 5-10 minutes, a personal monitoring device will have to be issued. To address this concern, CME recommend the insertion of a statement to the effect of: "in the opinion of the radiation safety officer, will exceed exposure levels of 10µSv/h while working around a fixed radiation gauge."	The wording of this clause was changed to remove the "where required by the relevant regulatory authority". The clause now specifies who would require personal monitoring.

	To provide further guidance on this matter, inclusion of an example in Annex C, Section C.1 of the Safety Guide could be provided to highlight good practice radiation monitoring where work is required to be undertaken in the area around fixed radiation gauges for short, irregular periods of time. CME is concerned that if this matter is not addressed appropriately, there will be an impost on industry to purchase and maintain monitors where exposure levels are below the level considered acceptable. *Automatic Shutters* The Code introduces the requirement for automatic shutters. It has been brought to CME's attention that a number of WA operations have manual shutters and concern has been expressed over the requirement for automatic shutters. It is noted that in Annex B, Section B.3 provisions are provided for instances where use of manual shutters can be justified. CME requests that Section B1.4 be modified to reflect that manual shutters are appropriate where certain conditions are met. While CME appreciates the recent extension of the submission closing date, it was unavoidable as CME was not aware of the released drafts until the 13th October 2005 – one day before the closing date. Due to the late notification there was not sufficient time for CME to obtain and collate members comments within the originally proposed timeframe. CME would like to take this opportunity to re-iterate the importance of open communication between ARPANSA and CME. Given CME's previous interest in radiation matters it was surprising that a request for public comment was not circulated to CME.	This was amended through earlier comments. Noted.
08 **Ken Smith**	**Comments on Regulatory Impact Statement Draft 2** ***Page 1. Item 2.*** My preferred replacement for sentence 1 is; "Many industries use FRGs to measure important process parameters. These industries include; petroleum production, mining and mineral processing, food and beverage production, timber processing and paper production, as well as other important industries."	Agreed. RIS amended. Done.

	Page 2. Item 8. add comma after improperly.	
	Page 4. footnote. ..Is hard to understand. How about; "Cost-benefit analysis requires all costs and benefits associated with the options to be measured quantitatively in common units (either monetary or physical units). In situations where full quantification is not possible a comprehensive list of the costs and benefits, together with a strong qualitative analysis, can often provide a simple but still compelling case. The latter approach is preferable to a quantitative analysis based on broad assumptions which may be questionable in their accuracy"	Agreed, footnote amended.
	Page 12. item 40. Make this consistent with Page 1. Item 2. Change sentence 2 to; "Many industries use FRGs to measure important process parameters. These industries include; petroleum production, mining and mineral processing, food and beverage production, timber processing and paper production, as well as other important industries."	Agreed. RIS amended.
	Comments on Code of Practice and Safety Guide	
	C17 4.2.1 and C38 D2.2 should say "X-Ray and Gamma radiation"	Done. A footnote has also been added in Schedule D.
	What about Low energy X-Rays, Alphas and other types of radiation? Should we prescribe that appropriate meters are available.	Done.
	Training is one of the most important ways of maintaining radiation safety. Training should be referred to on page C Radiation Management plan. Also, in the safety guide S3 we should consider adding a section 2.4 with recommendations for training.	A section on training was added into the Safety Guide as 2.4.
	Page C3, section 1.2 Para 2 Include "composition" as one of the parameters measured.	Done.
	Page C14, 3.3.17 (b) Put comma after radioactive source in first line.	Done.
	Page C24 The term "high committed effective dose per unit of intake activity" is a hard term to remember. Can we still use "radiotoxicity" by placing it in brackets after	Done.

	the full definition?? ie. “high committed effective dose per unit of intake activity (radiotoxicity)” We should then include “high committed effective dose per unit of intake activity” in the glossary definition of “radiotoxicity” on page C44. ***Page C26 A4.4*** I am not sure that a tritium target could ever be strong enough to meet ISO 2919. However I guess A4.4 (b) covers this situation adequately. ***Page S10 4.2 Survey Meters*** In practice many people do not own a neutron dosemeter and do routine safety checks with a gamma meter. This works because for FRGs there is always gamma radiation associated with the neutron radiation. However it MUST be understood that the gamma reading may underestimate the total dose rate by more than five time in some cases. Estimating total dose rates from gamma only is tricky and will depend on the type of source and the geometry and type of shielding in use. So we could strengthen the wording as follows; “Radiation survey meters that are primarily sensitive to gamma radiation will not accurately indicate the total dose rate near a fixed radiation gauge that also produces neutron radiation. The radiation dose rate around a fixed radiation gauge that contains both a neutron and gamma ray source should be determined by measuring the neutron and gamma ray dose rates separately *using appropriate survey meters. The dose rates may then be added together to give the total dose rate. In certain specific cases* the dose rate measured by a gamma survey meter may be used to estimate the total dose rate. It is important to note though, that the gamma reading might not indicate the total neutron and gamma dose rate unless the conversion factor used has been shown *to be correct far the specific case.* The relevant regulatory authority should be consulted in relation to such estimations. The regulatory authority might also approve the use of gamma ray measurements for checking whether the radiation pattern around a radiation gauge has changed. A change of gamma ray pattern could indicate damage to the shielding. If other types of radiation are present though, it should be noted that the true dose rate *could be several times higher* than that indicated by the gamma ray survey meter.” ***Page S26 Annex E item (f)***	Done. Done. Noted. Suggested paragraphs inserted. Done.

	The code regulates dose rates at 0.05m and I lm from the gauge surface (see page C7) so we should use the same distance and units here. Also we should remove the word "approximately" from item (f).	Done.
09 **Lorraine Plues** **Environment & Conservation NSW**	The Department of Environment and Conservation (DEC) and the NSW Radiation Advisory Council have reviewed these two documents and the draft regulatory impact statement (RIS) and comments are provided in the attachment to this letter. As you may see from the comments provided, both the Code and the Safety Guide would benefit from extensive revision of content and format. In particular, the information contained in both the Safety Guide and the Code shows some degree of duplication and overlap. Both documents would benefit if the Code contained mandatory provisions so that the Safety Guide may then provide information to the users to assist with compliance with the requirements of the Code. The RIS uses some questionable assumptions in the discussions of the three options and fails to use data on the costs associated with accidents involving orphan sources. These latter costs could be obtained by recourse to contact with a metal recycling company in Australia, such as Metalcorp. I look forward to the opportunity to assess the revised versions of the Code, Safety Guide and RIS. **General Comments** There is a degree of duplication and overlap between the current drafts of the Code and Safety Guide that should be eliminated. The Code should contain the mandatory material with the background guidance material being supplied in the Safety Guide. The use of the words *'safe use'* in the title is also misleading in that these gauges are not 'used' by persons but are installed in a fixed position and are applied without the need for intervention by a person. Although the draft contains a wealth of useful information, its layout is not in the best form for the user and the Safety Guide is not comprehensively different from the Code. The content of the Code would be more comprehensible in assisting users to comply if it were organised in the	 Noted. Noted. Disagreed. The Code also covers service technicians. The title describes safety in all aspects related to fixed radiation gauges and is therefore is considered acceptable. The layout was previously agreed by RHC in template form.

	following way: • Part A: Requirements common to all; • Part B: Requirements for suppliers of gauges and sources; • Part C: Requirements for users; and • Part D: Requirements for maintenance personnel and repairers. There already exists comprehensive documentation and standards covering such issues as: • Exposure limits; • Radiation monitoring; • Device construction and testing; • Transport; etc. These should be referenced in the draft documents rather than the information being included. This would also have the added advantage that revision and updating of the material already containing the above issues would be less likely to require this Code and Safety Guide to be reviewed. In addition, the term *'radiation worker'* used in the Code is not consistent with its use in NSW and in other ARPANSA documentation. The definition of a radiation worker should be restricted to only those persons who are directly involved in the use of radiation. **Code of Practice** 3.3.3(a): *Details of the proposed disposal pathway to be supplied to RRA before installation.* This is useful information if available to the Responsible Person. However, there appears to be no provision in the current draft of the Code to require the Supplier to provide proposed disposal options to the Responsible Person. The Responsible Person may therefore not be able to comply with this provision. Also, most sources have a 15 year recommended working life, so a disposal option in 2005 may not exist in 2020. The requirement is desirable but should not be mandatory. It should be deleted or moved to the Safety Guide as a recommendation. 3.3.3(b): *Information to be supplied to the RRA before installation or relocation.* This is already addressed by the safe installation of gauges covered by the Code and Safety Guide and the system of certifying inspections by third	This is an RHC agreed structure. This is an RHC agreed structure. Radiation worker was only used in the "Health Effects" annex. A change to "occupationally exposed persons" was agreed by RHC at its meeting of March 2006 and Annex H was modified accordingly. Clause 2.1.6 (formerly 3.1.5) requires a supplier to provide the information to the purchaser. Later option comment handled earlier ie, a purchaser needs to be aware of the current situation relating to disposal and if it changes in future, then so be it. Disagreed. The WG felt that this is not covered elsewhere in the Code and would most likely be information provided in any licence/registration submission to the RRA.

	party certification. This requirement should therefore be deleted.	
	3.3.4: *Appointment of a Radiation Safety Officer (RSO).* Not all companies utilising gauges require an RSO as some of these have one or two gauges. The requirement should be amended to *'...where required by the RRA the Responsible Person must ensure a Radiation Safety Officer is appointed...'*	Following discussion at the RHC meeting of March 2006, Radiation Safety Officer was removed from the Code. The duties formerly attributed to the RSO were assigned to the Responsible Person where appropriate. Section 3.3 of the Safety Guide "suggests" that these duties can be carried out by an RSO and typical duties of an RSO, if appointed are contained in Annex G of the Safety Guide.
	3.3.14(j): *Records to be kept.* This should be amended to *'manufacturers recommended working life expiry date'*.	Agreed. "s**ource"** added before "manufacturers … "
	3.3.15(b): *Supply of annual audit report to the RRA.* Although annual audits are important, they are usually covered by licence and/or registration conditions and it is not necessary for the RRA to be supplied with all such reports. This requirement should be amended so that they are supplied only where required by the RRA.	Already amended by previous comment.
	There should also be a requirement for the Responsible Person to keep these reports for a defined period of time, such as 6 years.	Disagreed. This is the role of the RRA to define the length of record keeping. Could also be covered by Aust Stds.
	4.1.2: *Persons involved in installation, removal, routine maintenance, service or repair of a fixed radiation gauge must wear a RRA approved personal monitoring device (PMD).* This provision should be addressed directly in the National Directory for Radiation Protection by listing these professionals as being required to wear PMDs.	Disagreed. The NDRP can only address the use of personal monitoring devices on a general basis. It is important that individual Codes cover the specifics of who should wear personal monitoring and who should be exempt for a particular vocation. To include the specifics within the Code means that a stakeholder would not need to go to a second document to find whether they need to wear personal monitoring. The WG believes that the intention of the Code will actually be weakened by removing this clause.
	4.2.2: *Where neutron monitoring is required by RRA and a neutron monitor is not available, RRA approval is required to estimate neutron levels from gamma measurements.* This may be better achieved by the inclusion in the Code of a reference or table providing the necessary information on how to estimate the neutron levels. The requirement should be amended to delete the RRA approval requirement and a reference or table, which provides the necessary information, should be included.	Disagreed. Gamma estimation can only be done on a case-by-case basis. Other changes to this section resulting from earlier should clarify the situation.

	5.1.3: *Store Used for FRGs.* The term Fixed Radiation Gauge is not appropriate for the sealed radioactive sources removed from these devices or for the gauges themselves when they have been removed from their fixed position. This part of the Code should be reworded to reflect this.	Removal of sealed sources now covered in section 5.1 of the Safety Guide. The Scope of the Code covers a gauge when it is not in a fixed position ie "… that are *designed* for installation …"
	5.1.3(a): *A store used for storage of fixed radiation gauges must not be used without the approval of the RRA.* This should be reworded to say that it must meet any requirements of the RRA and the following (5.1.3(a) – (h)).	Disagree. The RRA will not approve it if it does not meet their requirements.
	5.1.3(d): *to be under the control of a RSO or other specified person.* This requirement should be made more specific with regard to 'other specified person', for example, 'in control of a person nominated by the Responsible Person'.	Agreed. Change effected.
	5.3.7(b)(ii): *If a source container is, or appears to be, damaged in transport RAA approval is required to re-use the source container.* All Australian jurisdictions refer to the ARPANSA Transport Code. The Transport Code (paragraphs 510 and 511) specifies the required actions in the case of damaged or leaking packages and does not require the approval of the RRA with regard to the re-use of damaged packages. This requirement should be deleted from the Code.	Disagreed. The Transport Code only covers transport containers and not necessarily the gauge housing.
	6.3.1; 6.4.1 & 6.5.3: *The Responsible Person must not dispose of (reuse or relocation, and transfer of ownership) any fixed radiation gauge without RRA approval.* There should be a general statement for all these three that the Responsible Person must seek approval from the RRA, where required, in each jurisdiction.	Disagreed. The WG felt that each criteria were separate enough to warrant separate clauses. A RP in a given jurisdiction has no legal obligation to the RRA of another jurisdiction. The WG felt that 6.1 of the SG covers the situation anyway.
	6.5.4(b): *Copy of audit report to be supplied to RRA.* The same comment applies here as that for 3.3.15(b).	Done.
	6.5.5: *Failure to account for a radiation source.* This is a requirement of the legislation in most jurisdictions and so it is already accounted for. The requirements in the Code relating to this should not contradict existing legislative provisions.	Noted.
	A1.2: *RRA approval is required for the supplier to use one or more of the radioactive materials listed in Table 1.* This requirement is covered by the application of conditions of licence and should be addressed as such. If there is a need to restrict the use of these particular radioactive substances, then this	Disagreed. This is a guide for the designer of a gauge and a licence condition would be too late in the process.

	should be made part of the conditions of licence.	
	B1.3(a): The words *'only be fitted by the manufacturer or authorised service representative'* are too limiting. For example, the case of a manufacturer who has gone out of business so that there are no *'authorised service representatives'*?	Agreed. Changed to "… or service provider authorised by the relevant regulatory authority;"
	B1.16: *The gauge must not be modified or altered in any way without the approval of the RRA.* This should be qualified to require RRA approval only in cases where any radiation safety feature of the gauge may be compromised by the modification or alteration. For example, this should not be required if a variation of a radiation warning light is fitted, but should be in the case of a change from mechanical to electro-mechanical operation of the shutter mechanism. This requirement should also cater for third party accredited persons to assess or approve, as indicated in the NDRP.	Disagreed. As the FRG is approved as a whole unit, any change should, at the very least, be advised to the RRA. Also, a third party assessor does not give the FINAL approval, only a recommendation to the RRA.
	B2.8: *The gauge must not be loaded, reloaded or used with a radioactive source:* *(a) for which it was not designed unless approved by RRA* *(b) if any safety features of the gauge are deactivated, defective or showing signs of significant deterioration, unless approved by RRA* *(c) that has exceeded its recommended working life, unless approved by RRA*	Agreed in part. There might be times where a safety feature needs to be deactivated to work on the gauge, but this must only be done by a person authorised by the RRA. Defective or deteriorated safety features on a gauge must result in it not being used in any circumstances. (b) has therefore been split to reflect this.
	In the case of (b), loading a source into a defective gauge should not be allowed under any circumstances. These requirements should also cater for third party accredited persons to assess or approve, as indicated in the NDRP.	As above, a third party assessor does not give the FINAL approval, only a recommendation to the RRA.
	B2.9(c): *Defects with safety implications to be repaired without delay.* This sentence is imprecise. There is no further information on who or where these defects are to be reported to. The term *'without delay'* should also be further qualified and a time frame specified either prescriptively or in a general sense.	Disagreed. Clause C2.8(b) requires it to not be used anyway.
	<u>Glossary</u> *Supplier:* This term covers the design, manufacture, production or construction of a source or gauge but does not appear to include the vendor.	Agreed. "**supply"** added into the definition of supplier.
	Transport Code, the: The wording should be changed to *'the document published by Australian Radiation Protection and Nuclear Safety Agency*	Disagreed. Wording was agreed previously.

	entitled Code of Practice for the Safe Transport of Radioactive Material, as in force from time to time'.	
	Safety Guide	
	Annex D Radiation warning labels and notices:	
	In laying out the mandatory requirements for warning labels, etc., the Code refers the reader to Annex D of the Safety Guide for the types of warning labels, etc., to be used. The background to the Safety Guide (section 1.2) explicitly states that the measures included in the Safety Guide are not mandatory. The information in Annex D should be transposed to the Code in the form of a schedule and all necessary references changed accordingly.	Disagreed. The *use* of a sign is required in various parts of the Code but the form of the sign is not.
	Regulatory Impact Statement	
	In general, the regulatory impact statement (RIS) contains some questionable assumptions and figures that do not help to argue the case for a review of the Code and Safety Guide. For example, the figure of $20 per hour for the preparation of a Radiation Safety Plan is not realistic. That there is a need to review the 1982 Code is self evident and the case for this is not really enhanced by the content of the current RIS.	This figure was based on older data although it was not considered unreasonable that someone receiving $40,000-50,000 pa ($20-25 per hour) would be involved in the preparation of a Radiation Management Plan. The figure has, however, been amended to $35 per hour (approx $70,000 per annum) and the total costs involved amended accordingly.
	The argument that the dose limits given in the 1982 MH&MRC Code are different from those that currently apply in radiation safety documents, and hence would be likely to lead to the current dose limits being exceeded, is specious. A clearer proposition is that, because the dose limits in the 1982 NH&MRC Code are now out of step with current requirements with regard to annual dose limits, then it lacks credibility and is clearly redundant.	Comparison of a proposed Code against the existing 1982 Code is an important consideration. The 1982 Code has NOT been repealed and is still being used by several jurisdictions. The dose limits specified in the 1982 Code are clearly out of step with current radiation protection philosophy. To clarify the intention, the final sentence of paragraph 11 of the RIS was amended to remove "… limits being exceeded" so that the sentence reads "As such, the 1982 NHMRC Code needs to be reviewed to ensure that the dose limits are consistent with current radiation protection practice." Further, "By being out of step with the current annual dose limits, the 1982 NHMRC Code lacks credibility and is clearly redundant." was appended to that paragraph.
	Page 15, paragraphs 60 & 61: Data from incidents involving orphan sources from all types of radiation gauges could have been used here to back up these arguments. There have been incidents in Australia involving significant costs	The US data was used as it was available at the time of preparation of the RIS and there was no obvious Australian data to be used. It is felt that the US figures are indicative of

	associated with orphan sources and these could have been used in this RIS.	the possible costs of an incident. It was noted however that the statement "While in Australia, no significant costs have been incurred due to incidents involving FRGs," was not only misleading, but was probably wrong. The sentence was amended to read "While there is no readily available published information on the costs that have been incurred due to incidents involving FRGs in Australia, …".
	Page 16, section 62 *Security of sources:* Security concerns are a separate issue to all other costs and are to be addressed in other legislative instruments.	The public has a right to believe that a Code will improve security over what self-regulation could do. This paragraph was simply an observation in the RIS. For clarification however, a footnote was added to this paragraph to the effect that a separate Code of Practice was being prepared to cover security of sources and that that Code would, in turn, be subject to the preparation of an RIS.
	Page 19, paragraphs 78 – 80. The case where these conditions are applied though licensing and registration is not here explored. This would be a much more cost-effective way of implementation.	Agreed. These paragraphs were exploring a "worst case" scenario of amending legislation. Using a more cost-effective method of implementation would actually decrease the cost of implementation of a new Code, thereby making it a more desirable option. Amendments was therefore made to this paragraph noting that more cost-effective alternatives, such as amending authorisation conditions, were available to the regulatory authority and were likely to be used in several jurisdictions.
	Page 22, paragraph 91. There is information available on the loss of sealed sources from gauges and the effects on such operations as scrap metal recycling, and the associated costs. The company Metalcorp should be contacted for further details.	Again, no figures were available at the time of preparing the RIS. The US figures were therefore used as a basis for the discussion in para 91. There is no reference to "Metalcorp" in the Australian Radiation Incidents Register. No-one involved in the preparation of the RIS was aware of any incident involving Metalcorp, or who at that company should be contacted (there are 59 Australian locations for Metalcorp listed on their web site, including 18 in New South Wales). Despite that, a new paragraph outlining the potential costs per day to an Australian metal recycling plant in the event of a shutdown due to contamination was included into the RIS.
10 **Craig Walters** **Business Systems**	I am currently in the process of documenting our Radiation Management Plan to comply with the 'Draft Code of Practice and Safety Guide for the Safe Use of Fixed Radiation Gauges' and thus offer the following comments for	Noted, comments accepted.

Manager **Australian Vinyls**	consideration (if it is not too late for I am aware that comment closed mid October). We operate a Major Hazard Facility for which we have Business Management System (BMS) complying with quality management system standard ISO 9001, OH&S management system standard AS 4801, and laboratory management system standard ISO 17025. It is a mature system with documentation well structured, approved by various department managers and accessible through a topic based electronic index or functionally based hardcopy manuals. The difficulty I have with the draft code is that it expects the Radiation Management Plan to be an all embracing document addressing the various topics detailed in the Code. For us this is impractical, as our BMS addresses the topics through a multitude of documents such as an Emergency Response Plan, calibration procedures, permit to work procedures, confined space entry forms, specific radiation procedures, auditing procedures, position descriptions etc. In order not to duplicate information already existing in our BMS, our concept of the Radiation Management Plan is that it contains not only some specific management requirements, but also extensively references our other BMS documents (which in an electronic format will then hyperlink to them). My suggestion is that the Code be written to acknowledge that in addressing the required topics, the Radiation Management Plan can simply reference an organisation's existing documents. The responsibilities of the Responsible Person also presents a similar problem for their responsibilities are wide, varied and detailed. In our organisation, these responsibilities are executed by a number of positions that include the Risk Manager, Manufacturing Manager, Radiation Safety Officer, Reliability Manager and myself. I am presently thinking that the Radiation Management Plan will simply detail who has been assigned each particular responsibility.	A footnote was added in to Schedule A and an extra item, A1.2, also to deal with other safety documentation and work practices within the organisation. See above modification. See above modification. The definition of "Responsible Person" signifies who is legally responsible for the administration of the Code within the organisation. There is nothing preventing that person from delegating the duties but the Responsible Person must retain legal responsibility under the Code.
11 **E.T. Parrott** **Analogue & Digital Measurements Pty Ltd**	**SECTION 3 RESPONSIBILITIES AND DUTIES** Section 3.1.1 states that: "*The supplier of a fixed radiation gauge must ensure that all persons under the supplier's care follow and comply with the Radiation Management Plan formulated under section 2.1.*" **This section places extreme emphasis on the detailed construction and implementation of a robust Radiation Safety Management Plan. We**	The authorisation (licence) is issued by the RRA and the RRA will ultimately decide when a RMP plan will need to be in

	believe this should be a prerequisite to obtaining an approval to install a gauge. **Section 3.3.3 states that:** **"***The Responsible Person must ensure that.* *1 (a) before a new gauge is installed, the relevant regulatory authority is provided with details of the proposed disposal pathway of the gauge or source(s)"*	place in order to issue that authorisation.
	It is not feasible to provide accurate details of the proposed disposal pathway of the gauge or source at the time of commissioning. This information becomes available only at the time of disposal when an available pathway becomes available. (the pathway for disposal is usually propriety information and we would provide this information to the required regulator on the proviso that it is in confidence) The lifespan of a disposal window is typically in the order of weeks or months, not years and the opportunity is often missed due to the delay in obtaining DISPOSAL approval. Section 3.3.3 states that: "*(h) a periodic wipe test is carried out on those gauges that contain one or more radioactive sources, using the method and the time intervals between tests approved by the relevant regulatory authority."*	This comment is partially handled earlier. In relation to the propriety information, "pathway" was removed from 2.3.3(a). The WG only intended that the RP be made aware that a source would need to be disposed of at a later time. "when it is no longer required" was also added to the end of the clause for clarification.
	A standard should be formulated for time intervals between wipe tests. This could become a part of section 3.3.15 where the responsible person must ensure that an annual audit inspection is carried out. It would be appropriate to conduct a wipe test during the annual audit inspection. **SECTION 5 STORAGE AND TRANSPORT** **Section 5.1.2 states that:** *"When a fixed radiation gauge is placed in storage:* 1. *(a) the gauge must be clearly labelled as containing a radioactive source; and* 2. *(b) the source control or shutter mechanism must be locked or otherwise secured in the 'beam off' position; and* 3. *(c) the gauge must be monitored to ensure that the useful beam is properly attenuated with the shutter or source control mechanism in the `beam oft' position. "*	2.2.3(i) was changed to allow for wipe testing at intervals not exceeding 36 months. The WG felt that with this modification, 2.2.17 (formerly 3.3.15) did not need to be changed.

	We suggest that as the Source Holder is not Bolted Down it must be stored in a position such that no destructive harm can occur. e.g. Gauges in excess of 10Kg should be stored on the ground. **SCHEDULE B, RADIATION SOURCE CONTAINMENT** Section B1.10 states that: **"***The gauge must be constructed of materials that.* 1. *(a) are physically and chemically compatible with each other and, where applicable, the materials of the radioactive sources that it is designed to contain; and* 2. *(b) can withstand the effects of prolonged irradiation without significant deterioration of any physical properties necessary for the safety of the gauge; and* 3. *(c) are resistant to corrosion or other physical or structural damage which may occur during the use, transport and storage of the gauge."* **We would recommend that point 3 be strengthened to highlight the more important point relating to materials of construction that is compatibility with the chemistry of the environment into which the gauge is to be subjected.** **Our experience as a disposer highlights the problems of Mild Steel Fabricated Lead Filled Holders with the environment and the extent of corrosion that can occur even in a low level radiation field.** Section B1.4 on the shutter mechanism states that**:** *"Unless otherwise approved by the relevant regulatory authority, an automatic shutter, a means of moving the source to a safe position, or a means of de-energising the radiation source must be provided.'* **This paragraph assumes a moving Source All but one of our source Holders us a fixed Source and moving Shutter. this paragraph should read "move the Source or Shutter to the Safe Position"** Section B2.2 States that*: "The shutter or source control mechanism must be*	A clause "the gauge must be stored so that the likelihood of damage[1] to the gauge is minimised" was added to Schedule G1.2. A footnote describing the types of possible damage was also added. The WG felt that C1.11(c) covers this point adequately. An earlier amendment to the draft Code handled this problem. A further amendment now covers fixed source and moving shutter gauges.

[1] Damage to a gauge in storage could result from a fall, collision, corrosion etc.

	designed so that it is fail safe regardless of whether it is manually operated or power operated (i.e. electrical or pneumatic).” **It is confusing to the absolute meaning of FAIL SAFE MANUAL SHUTTER. For years I have been arguing that Fail Safe and Manual are incompatible, If this paragraph is to be enforced there is not a source holder that I know of that will meet this criteria.** **However with some inventive thinking we have developed a method by which this can be achieved, we can close a shutter in the case of Fire, Fall, excessive Vibration, excessive corrosion. and it can be designed to retrofit to other manufacturers.** **SCHEDULE C TESTS FOR SOURCE CONTAINERS** Section 3.1 states that: *“The requirements of the thermal test are that:* 1. *(a) the heat input to the loaded source container will be at least that which would result if exposed uniformly, for at least 30 minutes, to a temperature of 800° C; and* 2. *(b) the average emissivity coefficient of the exposure environment will be at least 0.914”* Section 3.2 States that: *“In determining the effect of this test, artificial cooling is not permitted or assumed for at least three hours after the heat input, unless it can be shown that the internal temperature has begun or would begin to fall before the end of this period.”* **There are many Currently Approved Source holders that would not pass this test as they use Lead as the attenuating material around the Source and the lead is not contained if it melts and shielding is compromised. In addition there are Source holders that are lead filled and they vary from totally filled to partially filled to allow for expansion of the lead. All of these units have been allowed to be used as the 1982 Code states** Section 3.1.5 States that: *It shall be constructed that any primary shielding material if of a melting point less than 800DegC, shall be entirely enclosed within a metal vessel, the melting point of which exceeds 800DegC In addition*	This section was amended so that only automatic shutters of source moving systems need to be fail safe. Shutterless gauges and gauges with manual shutters however are subject to specific authorisation from the rra, which would only be issued subject to justification for their use being made. The WG noted these statements.

	annexe 111 describes the tests that the source holder must be subjected to, under Thermal Test the description of the test states 800degC for 1/2 Hr	
	In neither the 1982 Code or the Draft code does it say that the molten material must stay within the vessel, I believe that the intent of the code is that the shielding integrity is not compromised by the testing. There are many Source Holders that have been approved by "Reasoned Argument" (and the argument is flawed.) That will not survive this heat test. This can be verified by discussion with personal at the loading bay at A.R.I.	The WG felt that it is not always practical to physically do all of the tests. Clause 2.1.8(c) allows calculation or reference to other test results in determining whether a gauge is suitable for use. A regulator would need to ensure that any such calculations or reference to other tests were appropriate before approving that gauge for use.
	This criteria was established 15 years back before the regulators were fully aware of the full ramification of the testing and having made a decision were not prepared to withdraw approval once the flaws were exposed. With a new code there is an opportunity to correct this flaw as the current situation makes a mockery of the intention of the Code and victimises the Manufacturers that use either more expensive materials of construction or alternatively they have had their Lead Filled Holders Destructively Tested. I believe that these Holders Should no longer be Allowed,	The WG felt that that the Code contains sufficient information to allow the regulator to make an informed decision.
	We are prepared to demonstrate the above assertions.	
	ANNEX D, SOURCE HOLDER LABELLING	
	A comment to D4.1, the example of a suitable warning label for attachment to a fixed radiation gauge containing a radioactive source.	
	Our experience as a Disposer shows a lack of detail on the traditional label that is required to clearly identify a source capsule years after supply. However the data suggested for the Source Holder Label is excessive and should only be increased to that which is absolutely necessary, a balance between total identity and sufficient for unambiguous identity is required. We suggest the following. **1. Manufacturer** **2. Source Holder Model No.** **3. Source Holder Serial No.** **4. Source Capsule Serial No.** **5. Isotope** **6. Activity** **7. Field strength at 1 Meter**	Date of manufacture added to the example label. Nothing was removed from the label as the WG felt that this information should be included for reference.

	8. Date of Source Holder Manufacture **While there is further detail that will help to maintain full identity (as identified in 3.3.14) it is of little use on a routine basis and we believe the following detail should be maintained on a database held by the Regulatory Authority and form part of the Approval and Application Procedure. The data being held by the responsible person as specified in 3.3.14 has not worked in the past for a variety of reasons and unless audited, via a mandatory Radiation Management Plan, will fail in the future.** **1. Name of Owner** **2. Application** **3. Location within the Plant** **4. Asset No.** **5. Tag No.** **6. Registration No.** **7. Source Holder Manufacturer** **8. Source Holder Model No.** **9. Source Holder Serial No.** **10. Field strength at 1 Meter** **11. Capsule Manufacturer** **12. Isotope** **13. Activity** **14. Source Capsule Serial No.** **15. Manufacturers Order Code** **16. Capsule Model No.** **17. ISO Classification** **18. IAEA Special Form Number** **19. Date of Manufacture** **20. Date of Measurement** **21. Date of Supply** **22. Name of Importing Company**	Sections relating to record keeping that were previously in Part 5 were moved to the Section relating to the Responsible Person (2.3). The WG believes that the points raised were dealt with albeit in a less prescriptive manner.
	This data base would require a registration 1 Identification system and a means of access. We have added to our Source Holders an I.D. tag buried in the body under Epoxy resin that gives a Unique Number that identifies it direct onto our Data Base. We suggest such a system should become universal.	Source housing and source records requirements have now been added into the Supplier obligations. A statement relating to the durability of the label was added to Annex D of the Safety Guide.
	The integrity of some labels is poor. We believe a standard Format should	Agreed. This information has now been added into Annex D

	be adopted and only markings that will stand the test of time be allowed. The label should be manufactured from 316 Stainless Steel. The Text and Tri-Foil should be acid etched and filled with an Epoxy Paint The Data should be put on using Impact Stamps or Rotary tool engraving, Diamond, Laser or Burr engraving are not deep enough to stand the rigors of aggressive environments.	of the Safety Guide.
	A2.2 - ANNEX A, RECOMMENDED WORKING LIFE	
	A great deal of attention is devoted by the various Regulatory Authorities to RECOMMENDED WORKING LIFE. In the case of Cs137 Capsules as used in industrial Gauging I believe this is an over statement while commercially good for us suppliers it is an impost on industry.	"corrosion of the source containment" was included in 2.2.3(j).
	Attention Should be placed on the integrity of the Source Holder, as alluded to in B2.8(d). Most of the designs we have encountered, the integrity of the capsule is retained even after the Holder itself is rusted beyond reasonable recovery as the Capsule is usually further sealed within a Stainless Steel retainer. (This is not universal as there is one manufacturer that only has a film of Sylastic between the environment and the capsule).	"approved by the RRA" removed from C2.8. Also, recommended working life clause (d) was removed.
	We would recommend that a program of holder integrity be incorporated into the act to ensure the Holder is not compromised, if the holder is in good order it follows that the source is in good order. But if the Holder is in Poor condition it is likely that the Capsule could be coming under attack from the environment and should be inspected. (this can occur in as little as 1 year with poor selection of materials of construction). To wait 15 years to the end of the capsules recommended working life is irresponsible.	The WG felt that item 2.2.3(g) covers regular inspection of radiation gauges.
	Recommended Working Life is just that, a recommendation, and cannot take into account the Source Holder Design and application.	Done. C2.8(d) was removed.
	For designs that further enclose the capsule, the probability of a Capsule Failure is remote. But for those that have poorly protected capsules the chance of Failure before the Recommended Working Life is reached is high.	Noted.
	Where a source is fixed the dynamic forces are different to designs where the source moves. This could affect the vibration integrity of the capsule	Noted.

	(e.g. over the years we have encountered examples of a Source Arm being compromised, but never a fixed source problem, due to vibration.) **ANNEX X TABLE A,1** We believe the ISO Clasification of the capsule should be the same or higher than the rating of the Source Holder to maintain Source integrity to the design Specification of the Holder. The majority of sources used in industrial applications use Cs137 sources to ISO Classification 66646. This means that the capsule is rated to the same temperature standard as the Source Holder (i.e. 800°C). To use lower classifications should require clarification and explanation with regulatory exemption based on the application, Many capsules used in specialised applications do not have a high rating due to the specific design of the capsule with consideration given to the characteristics of the Isotope. e.g. Ameraham's KAC-23 Kr 85 Source only has a Test rating of 33221.	Agreed, this section was amended and the full ISO table was included.
12 **Len Potapof** **NSW Department of Environment and Conservation**	The 10 - 11 November 2005 meeting of the Radiation Health Committee discussed comments received by ARPANSA from the public release period from 29 August to 14 October 2005 of the draft Code of Practice for the Safe Use of Fixed Radiation Gauges. Included in the attached papers for Agenda Item 2.8 of this meeting were the comments provided by the NSW Department of Environment and Conservation and ARPANSA's responses to those comments. Since the time of the Radiation Health Committee meeting I have been able to review ARPANSA's responses and I provide further advice in relation to these responses in the attachment to this letter. Attachment **COMMENTS ON THE RESPONSES BY ARPANSA TO DEC COMMENTS ON THE FRG CODE** Since the numbering of the sections of the revised draft of the Code of Practice have altered since the review of the original draft by DEC, the section numbering referred to below are those from the previous comments provided by DEC and do not follow the numbering in the current draft, except where stated otherwise. 1. The use of '*radiation worker'*. The NSW Radiation Advisory Council provided this comment here and it is sensible. Notwithstanding that it is used in	Again, the ***only*** time that 'radiation worker' was used in the Code (or Safety Guide) was in the Health Effects Annex. As

	the "Health Effects" annex, or that it would require change at the RHC level - we should continue to request the change as it is not a correct use of the term. Also, the Health Effects annex does not give any definition of a radiation worker or help the definition in any way. The term *'radiation worker'* should be consistent with other documentation and the Working Group should refer it to the RHC for a resolution.	this was an RHC agreed addition in all ionizing radiation Codes, the WG could not amend it without RHC approval. The WG recommended that RHC consider the wording at its meeting of 29-30 March 2006. Following discussion at that meeting, the phrase was changed to "occupationally exposed persons" and the Annex amended accordingly.
	2. Personal monitoring devices. The Working Group argument that the NDRP cannot address the use of PMDs because of exclusions (e.g. "someone working nearby") is not convincing. What is complicated about transferring the wording *'Persons involved* in *installation, removal, routine maintenance, service or repair of a fixed radiation* gauge' to an annex of the NDRP? This is the current wording.	**(Original comment amended)**
	3. Details of the *proposed disposal pathway*. The Working Group has referred to clause 2.1.5 here. They state that clause 2.1.5 requires that the supplier provide the purchaser with *'details of the proposed disposal pathway'* [to be supplied to the RRA before installation]. However, clause 2.1.5 does not state this. It actually requires that the supplier must *'..advise the purchaser of their <u>obligations</u> in relation to the disposal of the* gauge *or source(s)..*' Either the wording should be made compatible or the requirement should be moved to the Safety Guide as a recommendation, as we have requested.	"pathway" was removed from clause 2.2.3 resulting from an earlier comment.
	4. Appointment of a RSO. Our comment pointed out that many companies would not have more than one or two gauges and the need to appoint a RSO would therefore be too great a burden. The Working Group has responded by simply stating that an RSO would be needed to carry out the duties listed in the Safety Guide (3.2 Duties of the RSO). However, it is precisely these duties that are the problem. It is difficult to see how a company with one or two FRGs could easily appoint someone to carry out these duties without a great deal of expense. A better solution is for small businesses to obtain the advice from an external expert, such as a Consulting Radiation Expert, who would be able to advise on all of these duties on a fee for service basis. The ultimate responsibility for compliance rests with the employer and/or owner and they should be free to chose the method of compliance that best suits their needs.	While the WG believed that an RSO must always be appointed, RHC concluded at its March 2006 meeting that this need not necessarily be the case. All reference to RSO in the Code and Safety Guide was subsequently removed and any relevant duties reallocated to the Responsible Person where appropriate
	5. *The inclusion of a reference or table for conversion of gamma measurements to neutron levels*. ARPANSA has rejected this on the basis that these conversions can be done only on a case by case basis by the RRA. DEC does not agree with this because there are a limited number of neutron emitting isotopes in gauges and, even though the measurement of gamma radiation from	Disagreed. Many FRGs that use neutron sources are becoming increasingly common on belt elemental analysers and commonly use californium-252 sources with a reasonably high radiation output. The neutron dose rates are typically several times higher than the gamma dose rates and the neutron

	the neutrons may be subject to other variations, the production of a conversion table for this reason should be reasonably simple.	gamma ratio is quite variable. For this reason, it is believed that routinely estimating neutron dose rates from gamma dose rates could result in unacceptably large errors in the prediction of radiation exposure of personnel.
	6. *The storage of FRGs. NSW* does not need to approve all of the stores that may be used for FRGs on a permanent or temporary basis. If these stores have specific requirements then the Code should specify these so that the Responsible Person may act on these requirements. The RRA should be free to chose its own methods of implementation of these conditions.	Following advice from the RHC at its November 2005 meeting relating to deleting "RRA approval" clauses, the RRA approval clause was deleted. The subsequent sub-clauses detail what requirements need to be met for a store.
	In addition, the Code requires that the radiation levels outside of the store do not result in a dose exceeding 10 µSv/hr (section 4.1.3 (c) (i) of the current draft). Then at the current section B2.5 (b) there is also a requirement that the radiation levels at any point 1 m from the gauge surface should not exceed 10 µSv/hr.	Noted.
	7. *The Responsible Person must not dispose of (reuse or relocation, etc).* The Working Group response that *'A RP in a given jurisdiction has no legal obligation to the RRA of another jurisdiction'* is a misinterpretation of the DEC comment. The reference to *'each jurisdiction' is* about the requirements in each jurisdiction and not between jurisdictions.	This comment is noted however the disposal clause (6.3.2) refers to a FRG (including an X-ray gauge). The "re-use or relocate" clause (6.4.1) refers to a radioactive source from a FRG.
	8. *The RIS.* DEC's original comments on this document still hold – as a cost-benefit analysis it is really inadequate in terms of quantitative data.	The modifications to the RIS outlined for respondent 9 are understood to have made the RIS acceptable to NSW.
13 **John Sved** **Managing Director** **NSD-Fusion GmbH** **Germany**	My company is the newest manufacturer to emerge publicly with an industrial grade neutron generator product. Please refer to the www.nsd-fusion.com web site.	
	The primary comment is concerned with the references to a "target" and specifically the implication that all neutron generators have a solid target within which Deuterium or Tritium is impregnated.	Agreed. References to "Each tritium target …" in the Code changed to "Each form of tritium storage …".
	The NSD neutron generator is of the Inertial Electrostatic Confinement type which has no solid target.	
	The reactant gas (D or T) is stored in solid solution within a getter pump sintered alloy component. At elevated temperature of typically 500 degree C, the partial pressure of the Hydrogen isotopes will be in the 10^{-2} mbar (10^{-4} Pa) range. This is suitable for glow discharge operation whereby ions are accelerated and decelerated within a concentric electrostatic field. The cathode	A modified version of this text was added to Annex A.4 of the Safety Guide.

	is at some negative voltage in the typical range of 20 to 100 kV. The anode is at ground potential and usually forms the vacuum vessel wall. The cathode is not a target for fusion grade particle collisions. Please look at the animation shown on the NSD-Fusion web site. The text discusses in briefest terms the ion kinetics that are generally attributed to IEC fusion devices. Therefore I respectfully recommend that the wording in the Draft Code of Practice and Safety Guide for the Safe Use of Fixed Radiation Gauges be amended slightly to acknowledge that there is also a type of commercially available sealed tube neutron generator which generates neutrons without a solid target. It is fair to state that the reactant gas is essentially stored in solid solution form within a getter pump solid state device that is built into the sealed tube assembly. The getter pump is located away from the plasma zone. For your information the classification of the NSDNG sealed tube reaction chamber as a transportation contained for less than 400 GBq of Tritium as IAEA Class 7, UN2911 has been agreed by the German BAM authority. As a start-up company, we have not yet made a sale to any Australian customer although we have been in contact with such potential customers for many years. Since I am an expatriate Australian, it is most lamentable that the really great industrial class NSD neutron generator has not yet been adopted by those Australian companies or research institutions who should. Should you need additional information please contact me. If changes similar to my comments have already been implemented, please let me know. Can you please indicate if there is an importation or licensing procedure that my company, as opposed to the end customer, must observe when a first importation, and perhaps re-export, becomes necessary.	
14 **Paula Veevers** **Queensland Health**	2.2.4 There may be a grammar issue in 2.2.4(c) "accompanied by appropriate documentation of:.....". Is 'of' the correct word? 3.2.2 This states "where neutron monitoring is required…". Where is this requirement made? 3.2.3 This states "where beta monitoring is required…". Where is this requirement made? 2.4.9 In this clause, and in clause 2.3.3(h), the wipe test should be carried out "in accordance with ISO9978:1992(E) Radiation Protection – Sealed	"of" changed to "that includes". Also, "testing certificates" changed to "test certificates" in sub-clause 2.1.12(c)(iv). A footnote was added to describe general circumstances where neutron monitoring is required. A footnote was added to describe general circumstances where beta monitoring is required. An example of a wipe test procedure was added as Annex F of the Safety Guide.

	radioactive sources”. 5.1.4 We have no problems with this clause being deleted – but we need a statement somewhere requiring the responsible person to keep records of the repairs and maintenance conducted (in additional to the radiation safety status as specified in clause 2.4.6). Schedule C (3rd para “the relevant reg authority..”) I think this should stay in, but that it should become one of those matters which will require immediate reporting to the RHC as per other exemption matters in the NDRP. D2.2 and D2.3 I do not think “an equivalent overseas National Standard of air kerma” is permitted by the National Measurement Act 1960.	This is now covered under 2.2.3(l). Disagreed. The Schedule specifies the criteria for testing. Any exemption will, presumably, be discussed by RHC and where approved, be reflected in an amended version of the Code. Schedule D2 was amended to recognise overseas standards and foreign reference standards.