

## Model Work Health and Safety Regulations for Mining - Public Comment Response Form

<b>Individual/Organisational name: Nick Tsurikov, Calytrix Consulting Pty Ltd</b>	
<b>Regulations Chapter 9: Mines</b>	
Part 9.1	
<b>Regulation</b>	<b>Comment</b>
	none
Part 9.2	
<b>Regulation</b>	<b>Comment</b>
	none
Part 9.3	
<b>Regulation</b>	<b>Comment</b>
	none
<b>Other Comments</b>	
none	

<b>Codes of Practice</b>	
Roads and Other Vehicle Operating Areas	
<b>Section/page number</b>	<b>Comment</b>
	none
<b>Managing Naturally Occurring Radioactive Materials in Mining</b>	
<b>Section/page number</b>	<b>Comment</b>
Front page	<p><b><u>No.1 - Overall</u></b></p> <ul style="list-style-type: none"> <li>The standard of the document appears not to be sufficient to be considered for adoption at this time.</li> <li>Each proposed regulation or code of practice that were adopted in the past <u>always</u> had a detailed 'Regulatory Impact Assessment'. This is absent from the current draft – therefore any impact on both mining and processing industry in Australia and on all regulatory systems in all Australian States and Territories cannot be properly assessed. This single argument prevents this code of practice from being considered for adoption.</li> <li>The Glossary for the document is obviously required – apart from many terms mentioned (but not described) in the text there is also a need to specify what mSv and Bq stand for, what the 'dose' is, etc</li> </ul>

- In addition, there are several sentences in the document that appear to me as what one would get as a result of a “free internet translation”. The meaning of these sentences is in many cases very unclear and some do not make any sense whatsoever – it appears that proofreading of the document has not been done prior to its release for comment. Several examples are presented below.
- Overall, the adoption of this code of practice in place of currently applicable WA Mines Safety and Inspection Regulations will clearly result in the significant degeneration of what currently is one of the best regulatory systems in the world into what is, at best, – mediocre and mostly inadequate regulations. The same comment is applicable to regulations in South Australia and Northern Territory and, possibly, to regulations in other States.

### **No.2 – General**

The document is written in a conversational style and appears to have been constructed from several existing guidelines. Some of them are clearly recognisable – particularly description of ‘management plans’ that was mostly copied from Western Australian NORM Guidelines. It is important to note that, whilst it is very nice to see pages of the text that we put together in Western Australia (or extracts from my ‘uranium exploration’ independent report) – it is important to note that these documents are *guidelines*, compliance with which is not legally enforceable and text cannot be simply copied (with only words “radiation” replaced with “major hazard”) without actually analysing the final result. Unless the text is revised to make it more ‘regulatory’ it cannot be called a ‘code of practice’, it may only be a ‘safety guide’. Numerous examples are presented below.

### **No.3 – General**

It appears that no consultation with ARPANSA (or, possibly, with any other State appropriate regulatory authorities that currently deal with radiation hazards) has taken place at all and no research of currently applicable regulations and guidelines has been undertaken – since:

- a) The basic structure of radiation protection in Australia is not mentioned or described;
- b) The harmonisation of radiation protection in Australia has already happened – the fact that all States and Territories adopted (or in the process of adopting) the ARPANSA Code of Practice for Mining and Mineral Processing (2005) is not taken into account;
- c) The fact that ARPANSA Safety Guide on Management of Naturally Occurring Radioactive Material (NORM) is already in existence for nearly three years (since August 2008) and its direct applicability to mining and mineral processing is not even mentioned;
- d) There is no reference anywhere in the document to the latest ARPANSA Safety Guide on Monitoring, Assessing and Recording Occupational Radiation Doses in Mining and Mineral Processing (RPS-9.1, June 2011).

### **No.4 – General**

As clearly stated in the ‘Scope and Application’ part of the draft:

*In the event of any conflict between this Code and that of the ARPANSA legislation, the latter will take precedence.*

Therefore, the need for this Code and its possible applicability appears to be very questionable, due to the following argument:

- a) The APRANSA Code of Practice and Safety Guide for Mining and Mineral Processing (2005) and the Safety Guide for the Management of NORM are much more comprehensive documents than the draft under review;
- b) The ARPANSA Codes have already been adopted (or being adopted) into the legislation of all Australian States and Territories,
- c) Therefore, ARPANSA Codes and Guides will take precedence over the draft under review under all feasible circumstances.

→ It is, therefore, suggested that the draft under the review is discarded (as, legally, there is no reason for its use at all by any mining

company and/or State regulatory body – due to ARPANSA Codes and Guides having precedence). Instead, the parts of ‘mining regulations’ that are intended to be replaced by the draft under review can be simply replaced by the ‘legislative’ reference to relevant ARPANSA documents.

#### **No.5 – General**

It appears that the part on exploration contains too much duplicated and unnecessary information and part on mining and mineral processing does not contain any information at all, except description of the management plan. This is definitely wrong – given completely different levels of exposure, less than public limit at exploration operations – and many designated employees at mining and processing operations.

#### **No.6 – Implications for Western Australia**

Comparing the draft Code of Practice with the currently applicable Mines Safety and Inspection Regulations clearly illustrates that the document cannot possibly replace Part 16 of WA Regulations due to the following:

1. Definitions (MSIReg.16.1) – as demonstrated by comments below many terms are introduced without any explanation of what they may mean. *Possible result – an overall confusion and disputes between industry and regulators in regards to what each term means.*
2. Applicability (MSIReg.16.2) – it is not clear to which industries this code of practice will apply, neither from the point of view of radionuclide concentrations, nor from the point of view of possible levels of exposure. *Possible result – each and every mining and mineral processing operation will require to be regulated to some degree (even it is a very small ‘notification’ one). The mechanism on where the additional radiation protection personnel (both for regulatory bodies and for the industry) will come from is not provided and with the current shortage of qualified personnel this will simply be impossible to achieve.*
3. Exemptions (MSIReg.16.3) – there is no provision for exemptions at all. *Possible result, as in the comment above, – everything may need to be regulated from the radiation protection point of view – even small granite quarries, open salt mines, all iron and gold mines, etc*
4. Mechanism for addressing non-compliances, reporting defects and providing notifications to the ‘regulator’ (MSIRegs.16.8, 16.10 and 16.11) – it is impossible to determine what needs to be reported, how, when and under which circumstances. *Possible result – it will be to the discretion of a mining company of what to report and what not to report, apparently without any enforcing mechanism* (it is understood that the enforcement maybe in other parts of the ‘general’ regulations, if this is the case – the direct link must be provided).
5. Conditions for young persons (MSIReg.16.13) – completely absent. *Possible result – there will be no longer need to have a limit for members of the public (1 mSv/year) to apply to persons under 16 years of age, there will be no requirement for persons under 18 years of age to work only for training purposes. Persons between 16 and 18 years of age will be able to be employed as full time designated employees – which is clearly unacceptable.*
6. Possibility of setting up different dose limits (MSIReg.16.21) is absent. *Possible result – there no longer will be a possibility for the State mining engineer to set up different limits of exposure, either lower or higher (for example, in cases of emergency situations).*
7. There will be no need for the mining company to ask the regulatory body for the approval to remove radioactive material from a site for use elsewhere in the State (MSIReg.16.27) – *possibly resulting in numerous contaminated sites across WA, due to the removal of this control measure.*

	<p>8. There will be no need for the mining company to ask the regulatory body for the approval to use imported radioactive materials in the State (MSIReg.16.28) – <i>possibly resulting in significant increases in occupational exposures, increase in volumes of radioactive waste, and possible increase in the number of contaminated sites in WA, due to the removal of this control measure.</i></p> <p>9. No specific conditions for storage of radioactive materials (MSIReg.16.30) and for the management of stockpiles (MSIReg.16.31) will be necessary, <i>possibly resulting in unregulated, uncontrolled and numerous stockpiles of radioactive material on sites, due to the removal of these control measures.</i></p> <p>10. Regulation of the disposal of radioactive waste (MSIReg.16.32) and of discharges from the site (MSIReg.16.34) will no longer be necessary – <i>possibly resulting in uncontrolled release of waste and residue from mining sites, due to the removal of these control measures.</i></p> <p>11. There will no longer be a need to consider long-term radioactive waste management (MSIReg.16.35), <i>possibly resulting in the creation of many ‘legacy’ sites across Western Australia in the future (similar to the ones from uranium mining and processing in Africa and Central Asia), remediation of which will need to be provided for from the State budget.</i></p> <p>It is hoped that the list above provides a sufficient explanation to the statement above that this code of practice cannot be (and should not be) possibly considered for adoption in Western Australia (and possibly in other States) – due to the obvious disintegration of the current system of radiation protection, which will be a clear outcome.</p>
Foreword, page 3	<p><b>No.6</b></p> <p><i>Compliance with the WHS Act and Regulations may be achieved by following another method, such as a technical or an industry standard, if it provides an equivalent or higher standard of work health and safety than the code.</i></p> <p><i>An inspector may refer to an approved code of practice when issuing an improvement or prohibition notice.</i></p> <ul style="list-style-type: none"> <li>• Therefore, using the above definition leads to the conclusion that the document under review cannot possibly be called a ‘code of practice’ – it is only a ‘safety guide’, compliance with which appears not to be compulsory.</li> <li>• The regulations cannot be replaced by ‘technical or industry standard’, particularly in areas concerning public and worker safety – such as in radiation protection. An inspector will not be able to issue any notices referring to the code that is not enforceable and parts of which are replaced by some technical standard at the discretion of a mining company.</li> </ul>
Scope and Application, page 3	<p><b>No.7</b></p> <p><i>This Code has been developed to assist the person conducting a business or undertaking to ensure that workplaces where naturally occurring radioactive materials (NORMs) associated with mining occur (whether in situ or when persons are exploring for minerals that contain NORMs, or handling, processing, storing or transporting minerals that contain NORMs) are without risks to health and safety and that facilities provided for the welfare of workers and health surveillance are adequate.</i></p> <ul style="list-style-type: none"> <li>• The definition of what ‘NORM’ is not available and only appears much later in the text. Everything contains “NORMs” including each and every mineral containing at least some parts per billion of <sup>232</sup>Th, <sup>238</sup>U or <sup>40</sup>K.</li> <li>• Transport <i>cannot possibly be in the scope</i> of this document (unless this transport is taking place within the boundaries of a registered mine site). Departments regulating mining and mineral processing activities have no power (and, possibly, no resources) to administer the regulation of transport of material on public roads. This is normally administered by different State departments and using completely different regulations (please refer to ARPANSA Code of Practice for Transport – RPS-2, 2008).</li> </ul>
Scope and Application, page	<p><b>No.8</b></p> <p><i>In the event of any conflict between this Code and that of the ARPANSA legislation, the latter will take precedence. ARPANSA has also published the</i></p>

4	<p><i>Code of Practice and Safety Guide: Radiation and Radioactive Waste Management in Mining and Mineral Processing (Radiation Protection Series Booklet 9) to support its legislation.</i></p> <ul style="list-style-type: none"> <li>• The fact that the draft under review will not be applicable at mining and processing operations under any feasible circumstances has already been addressed in the comment No.4 above.</li> <li>• It is unclear why ARPANSA Safety Guide for the Management of NORM is neither mentioned, nor quoted – as addressed in the comment No.3 above.</li> </ul>
Scope and Application, page 4	<p><b>No.9</b> <i>This Code applies to the control of occupational and public radiation exposures and the management of radioactive waste generated at all stages of mining and mineral processing from exploration to final site rehabilitation.</i></p> <ul style="list-style-type: none"> <li>• It is unclear why it is stated above on this page that “this Code aligns WHS Standards” with the system of radiation protection by ICRP, IAEA, ARPANSA and appears to ignore (does not have in its scope) radiation protection of the environment. Therefore, either the whole code needs to be revised or re-drafted taking this into account – or a completely separate document will need to be written.</li> </ul>
Scope and Application, page 4	<p><b>No.9</b> <i>This Code may apply to the mining and processing of other materials where products or wastes arising from these operations require management because the radionuclides they contain may cause harm to humans or to the environment.</i></p> <ul style="list-style-type: none"> <li>• As addressed in comment No.7 above, the definition is necessary. It is beyond the capability of any government department (State or Federal) to regulate everything. It can be argued that if a note of ionising radiation of a ‘major hazard’ will be required at each and every mining site – it should also be required in each and every bakery, bookshop, mechanical workshop, etc.</li> <li>• The clear descriptions are available of what exclusion, exemption and clearance are, and if the draft under review claims to align regulations with the current system of radiation protection – the definitions of applicability of these terms are required.</li> <li>• It is noted that the following paragraph states that, – <i>In line with ARPANSA’s Radiation Protection Series Booklet 9, the relevant regulatory authority may grant exemptions from the provisions of this Code either for the whole operation or for specified parts of the operation.</i> Then it is unclear why ionising radiation must be considered at every mining operation – despite the fact that ARPANSA Safety Guide on NORM provides a definitive list of industries where regulation may be considered.</li> <li>• It is also not clear why legally enforceable ARPANSA Code of Practice RPS-9 (2005) is (rather dismissively) called a “booklet”.</li> </ul>
Scope and Application, page 4	<p><b>No.10</b> <i>Throughout the WHS Act and its Regulations and this Code, there is reference to the term ‘so far as is reasonably practicable’, which relies on risk assessment to select suitable and sufficient control to proportionately prevent realisation of the risk. This term is broadly equivalent to the stricter term ‘as low as reasonably practicable (ALARP), which is generally used in the radiation industry, to select the best control.</i></p> <ul style="list-style-type: none"> <li>• In order for this code to be aligned with system of radiation protection of ICRP, IAEA and ARPANSA (as claimed) the term should be “As Low As Reasonably Achievable, social and economic factors being taken into account” (ALARA). A clear and detailed justification and explanation as to why different term is used instead of internationally accepted one is required. The ‘ALARP’ principle may be used by some organisations – but not by ICRP, IAEA, or ARPANSA.</li> <li>• The definition is necessary of what is meant by the term “radiation industry”.</li> </ul>
Introduction, part 1.1, page 5	<p><b>No.11</b></p> <ul style="list-style-type: none"> <li>• It is suggested to move the definition of NORM into a glossary (that is to be developed)</li> </ul>

Introduction, part 1.2, page 5	<p><b><u>No.12</u></b>  <i>Other specific legislation including the Australian Radiation Protection and Nuclear Safety Act 1998 (ARPANSA Act) and its Regulations also has requirements to protect the health of people and to protect the environment from the harmful effects of radiation.</i></p> <ul style="list-style-type: none"> <li>• This Act and Regulations are only applicable to entities regulated by the Commonwealth – thus referring to these documents makes no sense in the document to be adopted by the States and Territories.</li> </ul>
Introduction, part 1.2, page 5	<p><b><u>No.13</u></b>  <i>The level of detail to be included in a principal mining hazard management plan for NORMs largely depends on the degree of potential radiation exposure, which has been estimated or identified, and the expected difficulty of controlling it.</i></p> <ul style="list-style-type: none"> <li>• It is unclear to what “potential radiation exposure” refers to – exposure of workers, general public, environment?</li> <li>• If the potential radiation exposure is considered for workers and/or public – this provides a clear illustration that environmental radiation protection is necessary – an example will be a situation of a remote uranium exploration site that has not been appropriately remediated: exposure to workers will be non-existent (as the work is complete), exposure to members of the public – zero (as there will be none around), but exposure of the environment may be relatively significant and will require appropriate controls.</li> </ul>
Introduction, part 1.2, page 5	<p><b><u>No.14</u></b>  <i>Drilling, handling, extracting, storing, transporting and processing of ore samples that contain uranium or thorium mineralization has the potential to expose workers to a radiation hazard.</i></p> <ul style="list-style-type: none"> <li>• As described in comment No.7 above, the draft under review cannot possibly apply to the transport of materials on public roads.</li> <li>• From this sentence it appears that the draft under review is only intended to apply to exploration activities – as the only hazard identified is “ore samples”; with concentrates, products, by-products, wastes and residues completely ignored.</li> </ul>
Introduction, part 1.2, page 5	<p><b><u>No.15</u></b>  <i>Therefore, persons conducting a business or undertaking at an exploration, mining or processing site must ensure identify hazard, assess the risks and implement adequate control measures to protect all from exposure to radiation.</i></p> <ul style="list-style-type: none"> <li>• An example of sentence that is written very poorly, as described in comment No.1 above: what is “must ensure identify hazard”?</li> </ul>
Introduction, part 1.2, page 5	<p><b><u>No.16</u></b>  <i>For example, where no ionising radiation hazards are present whatsoever, a brief written principal mining hazard management plan for NORMs requires a simple statement indicating the reasons for holding this view must be done.</i></p> <ul style="list-style-type: none"> <li>• Whilst the intention to limit the regulatory impact on some industries is obvious – there still will be a need in many cases for a mining company to engage the services of a radiation protection specialist (if even for one or two hours), to confirm this statement.</li> </ul>
Introduction, part 1.2, pages 5-6	<p><b><u>No.17</u></b>  <i>The principal mining hazard management plan for NORMs for an initial greenfield exploration project would not be expected to contain as much detail as one for an advanced mining and processing project. As such, a principal mining hazard management plan for NORMs may need to be developed for new exploration activities and a separate one for established mining operations (including associated processing).</i></p> <ul style="list-style-type: none"> <li>• The requirement is not clear – does this refer to mining operations following an exploration stage, or separately – to exploration and existing operations? Separate plans must be (not may be) developed for both new exploration activities and for mining operations.</li> </ul>
Introduction, part	<p><b><u>No.18</u></b></p>

1.2, page 6	<p><i>When managing risks, the mine operator must consult with workers and other persons at the mine including other persons conducting a business or undertaking.</i></p> <ul style="list-style-type: none"> <li>• This is very inadequate – the consultations are required with all relevant government departments, members of the public and their representatives (such as different non-government organisations)</li> </ul>
Identifying Hazards, part 2.2, page 7	<p><b><u>No.19</u></b>  <i>When undertaking a risk assessment to determine control measures, the following factors as outlined in Schedule 9.2 of the WHS Regulations must be considered: the potential sources of ionising radiation from both natural and manufactured sources including from dust, air, water, ore and waste from mining and drilling operations, stack emissions, ventilation system emissions, surface contamination, core and sample storage, monitoring equipment</i></p> <ul style="list-style-type: none"> <li>• Why ‘manufactured’ sources are mentioned when it is clear that the code does not apply to them?</li> <li>• Why only ore and waste are mentioned, and concentrates, by-products, products, and residues are not?</li> <li>• The reason for inserting ‘monitoring equipment’ is not clear – does this mean that monitoring equipment may pose some kind of a radiation risk, or does this mean that monitoring equipment should be available and adequate for the task? I would suggest separating ‘monitoring equipment’ from the list.</li> </ul>
Identifying Hazards, part 2.2, page 7	<p><b><u>No.20</u></b>  <i>When assessing the risks, the mine operator should also consider the following factors: the type and scope of radiation work undertaken</i></p> <ul style="list-style-type: none"> <li>• The definition of what is considered to be “radiation work” is required.</li> </ul>
Identifying Hazards, part 2.2, page 8	<p><b><u>No.21</u></b>  <i>When assessing the risks, the mine operator should also consider the following factors: equipment, facilities, and systems of work for controlling radiation sources including optimisation of radiation protection by design, and optimisation of radiation protection by use of best practicable technology</i></p> <ul style="list-style-type: none"> <li>• The definition of what is considered to be “best practicable technology” is required.</li> </ul>
Identifying Hazards, part 2.2, page 8	<p><b><u>No.22</u></b>  <i>When assessing the risks, the mine operator should also consider the following factors: all relevant control measures including classification and demarcation of radiation work areas, working conditions and work systems</i></p> <ul style="list-style-type: none"> <li>• It is unclear what “work systems” are and how they can be classified or, in particular, demarcated.</li> </ul>
Identifying Hazards, part 2.2, page 8	<p><b><u>No.23</u></b>  <i>When assessing the risks, the mine operator should also consider the following factors: the transport, handling and storage of radiation sources</i></p> <ul style="list-style-type: none"> <li>• As detailed in comment No.7 above, the draft under review cannot be applicable to transport of materials on public roads.</li> <li>• Why (as in the comment No.19 above) “sources” are mentioned?</li> </ul>
Identifying Hazards, part 2.2, page 8	<p><b><u>No.24</u></b>  <i>When assessing the risks, the mine operator should also consider the following factors: training of all persons at risk of exposure to radiation</i></p> <ul style="list-style-type: none"> <li>• Another example of sentence that is written very poorly, as described in comment No.1 above: what is “training persons at risk”?</li> </ul>
Controlling the Risks, part 3, page 9	<p><b><u>No.25</u></b>  <i>The ICRP has defined two concepts to delineate the extent of radiological protection control for regulatory purposes: exemption from some or all radiological protection legislation for situations where such controls are felt to be unwarranted (for example, very low levels of radioactivity in building materials).</i></p> <ul style="list-style-type: none"> <li>• How the word “felt” can possibly be used for in a ‘code of practice’? Felt by whom? What if the operator and regulator (or two</li> </ul>

	<p>different regulators) have a “different feeling about it”? Words of this type should not even be used in a ‘safety guide’ type of documents, in my opinion.</p> <ul style="list-style-type: none"> <li>• The definition of what is considered to be “very low levels of radioactivity” is required.</li> </ul>
Controlling the Risks, parts 3 and 3.1, page 9	<p><b>No.26</b>  <i>There are three categories of radiation exposure: occupational, public, and medical.</i>  ...  <i>This is individual related and applies in planned exposure situations only.</i></p> <ul style="list-style-type: none"> <li>• The categories are listed correctly – though it is not clear why medical exposures are mentioned in this document,</li> <li>• The list of exposure situations from the ICRP (that is much more applicable than medical exposure) is however, not provided and only ‘planned exposures’ out of three is mentioned, without any definition of what this may mean.</li> <li>• All three types of exposure situations from ICRP-103 need to be listed and defined.</li> </ul>
Controlling the Risks, part 3.1, page 10	<p><b>No.27</b>  <i>This principle is commonly referred to as the ‘as low as reasonably practicable (ALARP) principle’. The ALARP principle takes economic and social factors into account and therefore broadly equates to ‘so far as is reasonably practicable’ used in the WHS Act which allows for the application of controls by the process of risk assessment.</i></p> <ul style="list-style-type: none"> <li>• As in comment No.10 above: a clear and detailed justification and explanation as to why different term is used instead of an internationally accepted one is required. The ‘ALARP’ principle may be used by some organisations – but not by ICRP, IAEA, or ARPANSA.</li> </ul>
Controlling the Risks, part 3.2, page 10	<p><b>No.28</b>  <i>Principles of best practicable technology</i></p> <ul style="list-style-type: none"> <li>• As in the comment No.21 above – the definition for “best practicable technology” is required</li> </ul>
Controlling the Risks, part 3.2, page 10	<p><b>No.29</b>  <i>The person controlling a business or undertaking at a mining operation should be able to demonstrate that the operation is employing the best practicable technology that it is reasonably practicable to use and that radiation doses to workers received as a result of that operation, so far as is reasonably practicable.</i></p> <ul style="list-style-type: none"> <li>• Another example of sentence that is written very poorly, as described in comment No.1 above: whilst the intent of the sentence is more or less clear – it fails to make sense to me, probably due to the use of word ‘practicable’ too many times.</li> </ul>
Controlling the Risks, part 3.2, page 10	<p><b>No.30</b>  <i>Principles of radiation design</i></p> <ul style="list-style-type: none"> <li>• What can possibly be considered “radiation design” and how one can “design” radiation?</li> <li>• Should it be “design for radiation protection”?</li> </ul>
Controlling the Risks, part 3.3, page 12	<p><b>No.31</b>  <i>These procedures should be reviewed periodically for their effectiveness as well as audited for their actual application in practice.</i>  ...  <i>All written procedures for controlled areas should also be part of the radiation management plan...</i></p> <ul style="list-style-type: none"> <li>• It will be useful to note that as procedures are a part of the plan – they will also need to be reviewed every two years, as detailed above.</li> </ul>



Controlling the Risks, part 3.3, page 13	<p><b><u>No.32</u></b>  <i>Classification of areas for radiation protection</i></p> <ul style="list-style-type: none"> <li>Whilst, in my personal opinion, the classification and signposting requirements are appropriate (and they do apply in Western Australia) – there is a conflict with ARPANSA Code of Practice RPS-9, which (a) does not have a definition of ‘restricted’ area and (b) does not require ‘supervised’ area to be signposted.</li> <li>Therefore, as detailed in the comment No.4 above – every operator of a mining and/or processing site will be able to quote ARPANSA RPS-9 and state that neither classification of restricted areas, nor the signposting of supervised areas are necessary (as ARPANSA document ‘takes precedence’). Therefore, some of these classifications (being used by some companies and ignored by others) cannot be legally enforced.</li> </ul>
Controlling the Risks, part 3.3, page 14	<p><b><u>No.33</u></b>  <i>Note: In the assessment of the internal exposure from airborne radioactivity outside of supervised or controlled areas, unless there is evidence to the contrary, the relevant dose conversion factor for the member of the public default aerial median aerodynamic diameter (AMAD) of 1 µm should be used.</i></p> <ul style="list-style-type: none"> <li>The definition is to be provided, clearly explaining what ‘AMAD’ is.</li> <li>Why the dose conversion factor for the public is given and the same value for workers is not even mentioned?</li> </ul>
Controlling the Risks, part 3.3, page 14	<p><b><u>No.34</u></b>  <i>Depending on the concentrations of radionuclides and processing conditions, some workers directly involved in the operation and maintenance of metallurgical plants processing radioactive materials may be classified as designated workers.</i></p> <ul style="list-style-type: none"> <li>Why only ‘metallurgical plants’ are mentioned as possible work areas? There is a clear potential for employees in underground mines, or operators of crushing plants, or for the pit technicians in some areas to be classified as designated workers as well.</li> </ul>
Controlling the Risks, part 3.3, page 15	<p><b><u>No.35</u></b>  <i>The approved radiation management plan for the mine should contain a radiation monitoring program that requires, amongst other matters, the monitoring of personal contamination levels and external gamma doses.</i></p> <p>...</p> <p><i>The site radiation safety officer (RSO) is expected to have a detailed knowledge of the mean contamination levels...</i></p> <ul style="list-style-type: none"> <li>It is not clear what “personal” and “mean” contamination levels are – levels of surface contamination on employee clothing/skin, levels of airborne contamination (dust/radon/thoron), or both. It will probably be better to change the word “contamination” to the word “exposure”.</li> </ul>
Controlling the Risks, part 3.3, pages 16 & 17	<p><b><u>No.36</u></b>  <i>If it is considered that it is highly unlikely that the circumstances will occur again, then the elevated exposure should not be included in the work category average, and should be declared as a separate ‘special exposure’ and assigned solely to those individual(s), who incurred the exposure.</i></p> <p>...</p> <p><i>The regulator must be notified in writing of any special exposures including the resultant dose or exposure and the conditions under which it was received</i></p> <ul style="list-style-type: none"> <li>It should be clearly explained that this may only happen after the approval from an appropriate regulatory authority, mining companies cannot declare ‘special exposures’ based simply on the results of some internal investigations. A simple ‘notification’ is not sufficient.</li> </ul>

Controlling the Risks, part 3.3, page 17	<p><b><u>No.37</u></b>  <i>Investigation levels need to be established for ...Airborne Radioactivity, Airborne Dust, Radon / Thoron in Air...</i></p> <ul style="list-style-type: none"> <li>There are only two pathways of exposure – either ‘dust’ or ‘radon/thoron’. It is not clear what is meant by ‘airborne radioactivity’. It appears that ‘airborne radioactivity’ is the duplication of two points below and needs to be deleted.</li> </ul>
Controlling the Risks, part 3.3, page 17	<p><b><u>No.38</u></b>  <i>Several units of competency are available from the Government Skills Australia web site at <a href="http://www.governmentskills.com.au">www.governmentskills.com.au</a> that can be used to create training programs for radiation workers.</i></p> <ul style="list-style-type: none"> <li>It should be made absolutely clear that these units of competency have been developed for the use exclusively by Registered Training Organisations (RTO’s) and any training developed and provided by different companies, service providers and State government departments – whilst useful – does not mean that appropriate competencies will have been achieved and/or will be recognisable by other companies or in other Australian States and Territories.</li> </ul>
Plan for exploration, part 4, page 18	<p><b><u>No.39</u></b>  <i>They must consider the protection of the health and safety of workers and the protection of the environment at all stages in the design, planning, construction and operation of the facility.</i></p> <ul style="list-style-type: none"> <li>It is necessary to explain why protection of the environment is not required in general (as described in comment No.9 above) – but is needed for exploration operations.</li> </ul>
Plan for exploration, part 4, page 18	<p><b><u>No.40</u></b>  <i>It is important that best practicable technology is incorporated into the design of facilities at a mining exploration site. For example, the location of radioactive mineral stockpiles, tailing's storage facilities and exhaust stacks in relation to regularly or temporarily-occupied workplaces and critical groups of the members of the public have a significant effect on the radiation exposure of the different groups of people and on the most effective manner in which operational procedures are carried out.</i></p> <ul style="list-style-type: none"> <li>As above – definition of “best practicable technology” is required.</li> <li>What kind of ‘exhaust stacks’ is expected to exist at exploration operation?</li> <li>The old term of ‘critical group of the members of the public’ may need to be replaced with the term ‘representative person’ (ICRP-103) and appropriate definition provided (throughout the text of the whole document)</li> </ul>
Plan for exploration, part 4.1, pages 18-19	<p><b><u>No.41</u></b>  <i>Natural and induced disequilibrium</i></p> <ul style="list-style-type: none"> <li>The whole part should be deleted as it details instructions for a geologist on how to assess the ore grade correctly and no relevance to health and safety and environmental protection whatsoever.</li> </ul>
Plan for exploration, part 4.1, page 19	<p><b><u>No.42</u></b>  <i>Persons conducting a business or undertaking at a mine should already have carried out a suitable and sufficient risk assessment, which will need to take account of any local hazards, including (but not limited to) exposure to airborne contaminants...</i></p> <ul style="list-style-type: none"> <li>Why airborne contaminants are specifically mentioned when the vast majority of worker’s exposures at exploration sites are actually from external gamma radiation?</li> </ul>
Plan for exploration, part 4.1, page 19	<p><b><u>No.43</u></b>  <i>Regular risk assessments of exposure to airborne contaminants are recommended during each phase of all mining operations, including exploration, construction, surface and underground mining, processing, shutdowns, care and maintenance and rehabilitation activities.</i></p>

	<ul style="list-style-type: none"> <li>It is unclear what construction, surface and underground mining, processing, etc are expected to be carried out at an exploration site in accordance with the draft under review.</li> </ul>
Plan for exploration, part 4.1, page 20	<p><b>No.44</b>  <i>Dust monitoring should be conducted as inhalation is a major exposure pathway. A personal dust pump should be worn by a worker on the rig to allow the collection of dust for analysis.</i></p> <ul style="list-style-type: none"> <li>Does this mean that from now on all workers around the drilling rig will have to wear dust monitoring pumps permanently?</li> </ul>
Plan for exploration, part 4.1, page 20	<p><b>No.45</b>  <i>Both the monitoring and the analysis of collected samples should be carried out in accordance with this Code.</i></p> <ul style="list-style-type: none"> <li>This is clearly incorrect – the monitoring must at all times be undertaken in accordance with the following Australian Standard: AS 3640: 2004. Workplace atmospheres – Method for sampling and gravimetric determination of inhalable dust, 2004.</li> <li>Any samples that will be taken in accordance with the code (and not in accordance with Australian Standard, as the draft suggests) are legally and technically invalid and any mining company conducting the sampling in accordance with the code will be deemed not have undertaken any dust monitoring at all in the case of any possible future legal proceedings.</li> </ul>
Plan for exploration, part 4.1, page 20	<p><b>No.46</b>  <i>Other than some short Greenfield campaigns, workers potentially exposed to radiation should wear a personal radiation monitoring badge or electronic dosimeter from an approved supplier of monitoring badges.</i></p> <ul style="list-style-type: none"> <li>A clear explanation is required of what ‘approved supplier’ is, who issues the approvals and under which circumstances.</li> </ul>
Plan for exploration, part 4.1, page 20	<p><b>No.47</b>  <i>For short duration Greenfield campaigns, the doses can be assessed by survey meter readings, if the initial risk assessment suggests exposures to radionuclides will be in line with the ALARP principle.</i></p> <ul style="list-style-type: none"> <li>A new term “exposures to radionuclides” without any reference as to what it may mean is introduced – internal or external exposure, to which radionuclides in particular (should only ‘head of the decay chain’ radionuclides be considered – or risk assessment needs to address all possible decay products as well)?</li> <li>As in comment No.10 above: a clear and detailed justification and explanation as to why different term is used instead of an internationally accepted one is required. The ‘ALARP’ principle may be used by some organisations – but not by ICRP, IAEA, or ARPANSA.</li> </ul>
Plan for exploration, part 4.1, page 20	<p><b>No.48</b>  <i>Dust is typically the greatest source of exposure and the ALARP principle demands dust suppression at source.</i></p> <ul style="list-style-type: none"> <li>The statement is incorrect – exposure to external gamma radiation is typically the ‘dominant’ pathway of exposure</li> <li>As in comment No.10 above: a clear and detailed justification and explanation as to why different term is used instead of internationally accepted one is required. The ‘ALARP’ principle may be used by some organisations – but not by ICRP, IAEA, or ARPANSA.</li> </ul>
Plan for exploration, part 4.1, page 20	<p><b>No.49</b>  <i>The difference between drilling with and without injected water acting as a dust suppressant (for instance, the water captures the dust that would become airborne) is appreciable, control of the dust at source is always preferable to relying on personal protective equipment, such as masks, which is prone to failure, over-loading, improper wear.</i></p> <ul style="list-style-type: none"> <li>Another example of sentence that is written very poorly, as described in comment No.1 above: whilst the intent of the sentence is</li> </ul>

	<p>more or less clear – a reasonable person would only understand the meaning after reading this several times.</p> <ul style="list-style-type: none"> <li>The descriptive, conversational and suggestive character of the sentence illustrates once again why the draft under review cannot be called a ‘code of practice’, it can only be a ‘safety guide’.</li> </ul>
Plan for exploration, part 4.1, page 20	<p><b>No.50</b></p> <p><i>Any clothing, plant or personal protective equipment should be cleaned and assessed for surface contamination prior to leaving site to ensure radioactive material is not being transported from the site.</i></p> <ul style="list-style-type: none"> <li>There is a need to describe what this assessment means and how results need to be interpreted. There should be some provisions for ‘unrestricted’ and ‘restricted’ release, which appear to be absent.</li> </ul>
Plan for exploration, part 4.1, page 20	<p><b>No.51</b></p> <p><i>Ingestion of radioactive material can be prevented by maintaining proper levels of workplace and personal hygiene and by requiring washing of hands before meal breaks or smoking.</i></p> <ul style="list-style-type: none"> <li>Why only hands (but not face) are required to be washed?</li> </ul>
Plan for exploration, part 4.1, page 20	<p><b>No.52</b></p> <p><i>Gamma radiation does not generally require any active control measures as it can be monitored with a survey meter although an appropriately calibrated portable gamma survey meter should be used to identify any active samples.</i></p> <ul style="list-style-type: none"> <li>It is not clear what the sentence means. It appears to be a very interesting innovation in health and safety: does this mean that if the hazard exists but can be monitored – there is no longer need for active control measures? Pretty much everything can be monitored – and if we are to follow this logic, no controls will be required for high levels of occupational noise or for excessive concentrations of toxic fumes in a workplace, for example.</li> <li>This sentence contradicts some points below about ‘active controls’ such as designating and signposting storage areas, locating them away from frequently occupied workplaces, etc</li> <li>The whole sentence does not make sense to me: “hazard does not require controls because it can be monitored but the monitor should be used to identify the hazard” – yet another example of poorly worded statement, as described in the comment No.1 above.</li> </ul>
Plan for exploration, part 4.1, page 20	<p><b>No.53</b></p> <p><i>Such TLD badges should be stored suitably between uses and not be exposed to any unrepresentative radioactive source when not in use; a hook is usually allocated to each worker and each control badge.</i></p> <ul style="list-style-type: none"> <li>What does “suitably” means? Suitably for whom – worker, company, service provider, regulator? Stored where – on the board, in worker’s desk, in the pocket, on the nearest piece of equipment in the plant?</li> <li>What “hook”, where it should be, what kind of a hook is it? Does this mean that companies will no longer be able to use wooden boards where TLD badges are put in slots?</li> </ul>
Plan for exploration, part 4.1, page 20	<p><b>No.54</b></p> <p><i>With a well designed principal mining hazard management plan and acceptable work practices doses, radiation exposures in mineral exploration are not expected to be significant, and should be well below the public limits.</i></p> <ul style="list-style-type: none"> <li>A general comment: since this is the case – paying as much attention to exploration as to mining and processing in the draft under review (equal number of pages) would probably not lead to any appreciable reduction of exposures of workers in exploration, but may result in creating an unnecessary anxiety of some workers – due to the possible ‘psychological’ overestimation of ‘radiation</li> </ul>

	hazard' (when the most important consequences of exploration are environmental ones...)
Plan for exploration, part 4.1, page 21	<p><b><u>No.55</u></b>  <i>Stores made of canvas (i.e. tents) generally have sufficient adventitious air to dilute any radon gas present, and therefore should not require ventilation per se.</i></p> <ul style="list-style-type: none"> <li>• The use of the word 'adventitious' could be questioned – it will be much more preferable to replace it with something more commonly used, or just delete it.</li> <li>• The statement is not correct in some cases – the dilution will depend on the material the tent is made of and if it is wet (from the rain or fog, for example) – when ventilation will be close to non-existent</li> </ul>
Plan for exploration, part 4.1, page 21	<p><b><u>No.56</u></b>  <i>The area should be secure</i></p> <ul style="list-style-type: none"> <li>• The definition of what "secure" may mean is required, as well as the levels of security that are required at an exploration site</li> </ul>
Plan for exploration, part 4.1, page 21	<p><b><u>No.57</u></b>  <i>The general external dose rate should be measured in the area and used to calculate doses in order to keep personal doses as low as practicable.</i></p> <ul style="list-style-type: none"> <li>• This appears to be unnecessary in order to calculate doses – as everyone will be wearing the TLD badge or an electronic dosimeter</li> </ul>
Plan for exploration, part 4.1, page 21	<p><b><u>No.58</u></b>  <i>It should be noted that a core storage areas containing a significant amount of radioactive material may need to be registered with other radiation regulators.</i></p> <ul style="list-style-type: none"> <li>• It is not specified what the word "significant" may mean and who are the "other radiation regulators", clarification required.</li> </ul>
Plan for exploration, part 4.1, page 21	<p><b><u>No.59</u></b>  <i>A boxed radioactive mineral keeps you from directly touching the specimen, which helps to minimise radiation exposure to your skin.</i></p> <ul style="list-style-type: none"> <li>• It is beyond my understanding what purpose a phrase from something like an employee handout can have in a code of practice.</li> </ul>
Plan for exploration, part 4.1, page 21	<p><b><u>No.60</u></b>  <i>...don't carry radioactive minerals open (for example, temporarily in a sealable bag),</i></p> <ul style="list-style-type: none"> <li>• Technically, the material in a sellable bag cannot be considered 'open'</li> </ul>
Plan for exploration, part 4.1, page 21	<p><b><u>No.61</u></b>  <i>...clean up small particles that may break away from using a type H vacuum cleaner</i></p> <ul style="list-style-type: none"> <li>• A definition is needed of what "type H vacuum cleaner" is and why any other types of vacuum cleaners cannot be used</li> </ul>
Plan for exploration, part 4.1, page 21	<p><b><u>No.62</u></b>  <i>...personal protective equipment (for example, P3 mask and disposable gloves)</i></p> <ul style="list-style-type: none"> <li>• There is no P3 mask – there are only P1 and P 2, to the best of my knowledge</li> </ul>
Plan for exploration, part 4.2, page 24	<p><b><u>No.63</u></b>  <i>Critical group information</i></p> <ul style="list-style-type: none"> <li>• As in comment No.40 above: the old term of 'critical group of the members of the public' may need to be replaced with the term 'representative person' (ICRP-103) and appropriate definition provided.</li> </ul>
Plan for exploration, part	<p><b><u>No.64</u></b>  <i>RSO will – as a minimum - ...had some experience in sampling of air contaminants...</i></p>

4.2, pages 24-25	<ul style="list-style-type: none"> <li>As detailed in the comment No.45 above (and in the similar statement for the RSO for mining, in the first paragraph on page 33) – the person <u>must</u> be properly qualified to take the samples, otherwise all of them are considered to be invalid.</li> </ul>
Plan for exploration, part 4.2, page 25	<p><b><u>No.65</u></b>  <i>Dust (and radon / thoron) should usually be controlled in such a way that protective equipment is not necessary for routine tasks.</i></p> <ul style="list-style-type: none"> <li>To the best of my knowledge, there is no personal protective equipment from radon/thoron, clarification needed.</li> </ul>
Plan for exploration, part 4.2, page 25	<p><b><u>No.66</u></b>  <i>All workers who may be exposed to radiation and all persons responsible for the implementation of the principal mining hazard management plan for exploration must receive appropriate training (vide supra).</i></p> <ul style="list-style-type: none"> <li>The Latin term referring the reader to something that has already been mentioned in the text will not be understood by 99% of the readers (myself included), in my opinion – suggest changing it to “as described/detailed above”</li> </ul>
Plan for exploration, part 4.2, page 25	<p><b><u>No.67</u></b>  <i>...an informative radiation safety guide for mining and minerals processing workers in the uranium, mineral sands and rare earths sectors is now available from Australian Uranium Association website if no site or company specific handbook is available.</i></p> <ul style="list-style-type: none"> <li>This statement has no place in the code of practice (maybe in a guideline);</li> <li>This may set a bad precedent – if a government <i>regulation</i> starts referring to a publication of <i>industry association</i> this could be easily interpreted that government has no resources or knowledge on this issue. Additionally – this may also confirm to some ‘interested’ NGO’s that their assumption about the direct dependency of regulators on the industry is justified. The publication is perfectly OK and acceptable, of course, – but it should be listed in the bibliography in the end of the document, or in some other way.</li> </ul>
Plan for exploration, part 4.2, page 27	<p><b><u>No.68</u></b>  <i>Transport of radioactive material</i></p> <ul style="list-style-type: none"> <li>As described in comment No.7 above, this document cannot possibly apply to transport of the material on the public roads and should be deleted</li> </ul>
Plan for exploration, part 4.2, page 28	<p><b><u>No.69</u></b>  <i>Wastes should be treated as though they contain deleterious levels of NORMs until there is evidence to the contrary.</i></p> <ul style="list-style-type: none"> <li>Does this mean that all ‘normal’ household waste from the camp’s kitchen will also need to be analysed for radionuclides? More clear statement is needed</li> </ul>
Plan for exploration, part 4.2, page 28	<p><b><u>No.70</u></b>  <i>The principal mining hazard management plan for exploration should be adequately resourced so as to give effect to the it intent and content.</i></p> <ul style="list-style-type: none"> <li>Another example of sentence that does not make much sense, as described in comment No.1 above: whilst the intent of the sentence is more or less clear – it is a little weird to see that the “plan should be resourced to give effect to the it...” I cannot stop wondering what this “IT” can be... Correction obviously needed</li> </ul>
Plan for mining, part 5, page 29	<p><b><u>No.71</u></b></p> <ul style="list-style-type: none"> <li>The general comment – the whole part is hopelessly inadequate as it is mostly a repeat of the Western Australian Guideline on the development of a radiation management plan. It is very much appreciated that our document has been used and it is quite nice to see the whole pages of my own writing (thus not too many comments from myself on this part...). However, there is still a need to describe all possible hazards (along the lines of how it was done for the part 4 on exploration). In my personal opinion,</li> </ul>

	there are about 20-30 pages missing between part 5 and part 5.1...
Plan for mining, part 5, page 29	<p><b><u>No.72</u></b>  <i>For example, the location of radioactive mineral stockpiles, tailing's storage facilities and exhaust stacks in relation to regularly occupied workplaces...</i></p> <ul style="list-style-type: none"> <li>• A simple typo here: -tailing's- should be –tailings’-</li> </ul>
Plan for mining, part 5, page 29	<p><b><u>No.73</u></b>  <i>...radon decay products (inhalation of radon / thoron decay progeny or daughters),</i></p> <ul style="list-style-type: none"> <li>• Meaning is clear but it may be misinterpreted by people without detailed knowledge – that radon and thoron may have <i>both</i> decay progeny <i>and</i> daughters (which is obviously the same thing)</li> </ul>
Plan for mining, part 5.1, page 30	<p><b><u>No.74</u></b>  <i>Critical group information</i></p> <ul style="list-style-type: none"> <li>• As in comment No.40 above: the old term of ‘critical group of the members of the public’ may need to be replaced with the term ‘representative person’ (ICRP-103) and appropriate definition provided.</li> </ul>
Plan for mining, part 5.1, page 33	<p><b><u>No.75</u></b>  <i>RSO is expected to have a degree in physical science or equivalent and several years of experience in radiation protection, preferably in the mining and mineral processing industry.</i></p> <ul style="list-style-type: none"> <li>• The word “preferably” needs to be deleted. One cannot possibly get a person out of a hospital or a university and expect him/her to be an RSO for the mining and/or processing site.</li> <li>• The “physical science” makes the requirement too narrow – suggest replacing it with “technical discipline” (as in our WA Guidelines)</li> </ul>
Plan for mining, part 5.1, page 37	<p><b><u>No.76</u></b>  <i>Transport of radioactive material</i></p> <ul style="list-style-type: none"> <li>• As described in comment No.7 above, this document cannot possibly apply to transport of the material on the public roads and should be deleted</li> </ul>
Appendix A, page 40	<p><b><u>No.77</u></b>  Numerous changes are required to this Appendix:</p> <ul style="list-style-type: none"> <li>• <i>Australian Radiation Protection and Nuclear Safety Agency Act 1998 (ARPANSA Act)</i> – as detailed in the comment No.12 below, this Act and associated Regulations have no relevance to the radiation protection regulations in States and Territories. Therefore, this reference should be deleted.</li> <li>• It is almost beyond belief that <i>Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) Code of Practice and Safety Guide entitled “Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing”</i> is dismissively called a “booklet” and instead of being listed in the part above with other Codes of Practice is just noted as a ‘key publication’. This is even more strange, as the draft under the review contains a clear statement (comment No.4 above) which effectively means that this particular ARPANSA Code of Practice takes precedence over the document that is being reviewed – at almost each and every occasion in all feasible situations.</li> </ul> <p>There is a huge number of publications that are directly relevant to the contents of the document and the following must be listed as key publications (if this is not considered – it will be very much appreciated if a clear justification and explanation is provided about why they</p>

	<p>were not included):</p> <ul style="list-style-type: none"> <li>a) Safety Guide – Management of Naturally Occurring Radioactive Material (NORM), Radiation Protection Series Publication No. 15, ARPANSA, August 2008</li> <li>b) Monitoring, Assessing and Recording Occupational Radiation Doses in Mining and Mineral Processing, Radiation Protection Series Publication No. 9.1, ARPANSA, June 2011</li> <li>c) AS 3640: 2004. Workplace atmospheres – Method for sampling and gravimetric determination of inhalable dust, 2004</li> <li>d) Radiation protection guidelines on mining in South Australia: Mineral exploration, Environment Protection Authority South Australia February 2010</li> <li>e) Management of Radioactive Waste from the Mining and Milling of Ores, IAEA Safety Guide WS-G-1.2, 2002</li> <li>f) Occupational Radiation Protection in the Mining and Processing of Raw Materials, IAEA Safety Guide RS-G-1.6, 2004</li> <li>g) Application of the Concepts of Exclusion, Exemption and Clearance, IAEA Safety Guide RS-G-1.17, 2004</li> <li>h) Monitoring and Surveillance of Residues from the Mining and Milling of Uranium and Thorium, IAEA Safety report 27, 2002</li> <li>i) Assessing the Need for Radiation Protection Measures in Work Involving Minerals and Raw Materials, IAEA Safety Report No.49, 2006</li> <li>j) Extent of Environmental Contamination by Naturally Occurring Radioactive Material (NORM) and Technological Options for Mitigation, IAEA Technical Report 419, 2006</li> </ul>
The Mine Records	
<b>Section/page number</b>	<b>Comment</b>
	none
WHS Management Systems in Mining	
<b>Section/page number</b>	<b>Comment</b>
	none
Inundation and Inrush Hazard Management	
<b>Section/page number</b>	<b>Comment</b>
	none
Emergency Response in Australian Mines	
<b>Section/page number</b>	<b>Comment</b>
	none
Strata Control in Underground Coal Mines	
<b>Section/page number</b>	<b>Comment</b>
	none
Ventilation of Underground Mines	



<b>Section/page number</b>	<b>Comment</b>
	none
Survey and Drafting Directions for Mine Surveyors	
<b>Section/page number</b>	<b>Comment</b>
	none
Health Monitoring	
<b>Section/page number</b>	<b>Comment</b>
	none
Mine Closure	
<b>Section/page number</b>	<b>Comment</b>
	none
Ground Control in Open Pit Mines	
<b>Section/page number</b>	<b>Comment</b>
	none
Ground Control for Underground Mines	
<b>Section/page number</b>	<b>Comment</b>
	none
Underground Winding Systems	
<b>Section/page number</b>	<b>Comment</b>
	none