SC6.15 Industrial hazard and risk assessment planning scheme policy

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1 Introduction

1.1 Relationship to planning scheme

This planning scheme policy:

1. provides information the Council may request for a development application;
2. provides guidance or advice about satisfying an assessment benchmark which identifies this planning scheme as providing that guidance or advice.

1.2 Purpose

This planning scheme policy provides information required for a development application and guidance and advice for satisfying assessment criteria for the preparation of a preliminary hazard analysis report.

Minimising risk of impact from industrial hazards will require new industrial development to implement best available risk management measures. However, even when best available measures and technologies are applied, risks from some industrial activities cannot be completely eliminated. Therefore, minimising the impact of industrial hazards on people and the environment will require appropriate separation between sensitive and industrial uses.

1.3 Terminology

In this planning scheme policy, unless the context or subject matter otherwise indicates or requires, a term has the following meaning:

ALARP: as low as reasonably practicable principle

hazard: a situation or an intrinsic property with the potential to cause harm to people, property or the environment

individual fatality risk: the risk of death to a person at a particular point

risk: the likelihood of harm occurring from a hazard

potential hazard: typically depends on five main factors–

1. the properties of the substance/s being handled or stored;
2. the conditions of storage or use;
3. the quantity involved;
4. the location with respect to the site boundary;
5. the surrounding land uses.

2 Preliminary hazard analysis reports for industrial development

1. A preliminary hazard analysis report is based on the preliminary information available at the time the analysis is carried out. A final hazard analysis may be necessary to address changes that occur during design.
2. A preliminary hazard analysis report is to:
3. identify the potential hazards associated with the development;
4. identify sensitive uses that may be affected by hazards and risks relevant to the development;
5. analyse each hazard in terms of consequence to people and the biophysical environment and likelihood of occurrence;
6. quantify the analysis and estimate the resultant risks to surrounding land uses and the environment;
7. assess the risks in terms of the location, land use planning implications and hazard and risk criteria and ensure that the proposed safeguards are adequate and that the development will not impose an unacceptable level of risk;
8. document results of the hazard and risk assessment, including comparison to Hazard and risk criteria, and graphical representation of results at gridded receptors;
9. describe the best available hazard and risk control measures to be applied by the development to minimise hazard and risk impacts.

3 Hazard and risk assessment methods

1. The hazard and risk assessment methods used for a preliminary hazards analysis report is to:
2. comply with the methods listed in this section, unless a justification is made to and accepted by the Council, for any departure from the approved methods;
3. include sufficient detail to enable replication of the methodology and results of the hazard and risk assessment by Council or third parties.
4. The preliminary hazards analysis report is to include a description of the impact assessment methodology, including the:
5. model selected and justification for model selection;
6. model configuration and justification for model configuration;
7. hazards and risks assessed and criteria used in the assessment;
8. input data and sources of input data;
9. assumptions and uncertainties.
10. The preliminary hazards analysis report is to enable the assessment manager to make a judgement about the level of risk involved in a proposal and its acceptability. It should allow the assessment manager to decide if the level of risk exceeds the hazard and risk criteria and whether the level of risk can be managed.

3.1 Graded approach to risk assessment

1. The level and extent of analysis is to reflect the nature, scale and location of each development. The methodology involves a graded framework aimed at providing consistency by progressing the analysis and its assessment only as far as is needed to demonstrate that the development does not result in sensitive uses being exposed to unacceptable levels of risk due to industrial hazards.
2. The methodology uses a combination of qualitative and quantitative approaches. The level and the extent of qualitative or quantitative assessment will depend on the nature and scale of the development proposal, together with its proposed location in relation to surrounding land uses and natural environment.
3. The hazard analysis methodology includes three levels of analysis:
4. Level 1 is a qualitative approach based on comprehensive hazard identification to demonstrate that the activity does not pose a significant hazard.
5. Level 2 supplements the qualitative analysis by sufficiently quantifying the main risk contributors to show that risk/consequence criteria will not be exceeded.
6. Level 3 is a full quantitative analysis.
7. [Table 1](#Table1) summarises the information and assessment requirements for the different levels.

Table 1—Levels of analysis and assessment

| Level of analysis | Assessment basis |
| --- | --- |
| Level 1 Qualitative |
| 1. identify type and quantity of materials;
2. describe storage/process activity;
3. identify hazards using summary diagram, FMEA, fault and event trees, HAZOP;
4. identify key accident scenarios and qualitative estimate of risks;
5. consider surrounding land uses;
6. compare with qualitative criteria;
7. assess protective, technical and management measures, including codes and standards.
 | 1. appropriate methods used for identification;
2. all key scenarios thoroughly examined;
3. realistic estimates of risk;
4. relevant qualitative criteria met;
5. proposed measures appropriate and sufficient;
6. compliance with all relevant codes and standards.
 |
| Level 2 Partially quantitative |
| 1. qualitative elements as for Level 1;
2. quantification of consequences of all events with significant off-site consequences;
3. indicative estimate of risk versus criteria;
4. assess technical controls, risk reduction and management measures.
 | 1. qualitative elements as for Level 1;
2. sound consequence methodology used;
3. appropriate failure data used;
4. technical methods and results appropriately documented;
5. relevant criteria shown to be met;
6. appropriate controls and safeguards.
 |
| Level 3 Fully quantitative |
| 1. qualitative elements as for Level 1;
2. comprehensive quantification of significant consequences and their likelihood;
3. evaluation of risk against all relative criteria;
4. assess technical controls, risk reduction and management measures.
 | 1. qualitative elements as for Level 1;
2. sound consequence methodology used;
3. appropriate failure data used;
4. technical methods and results well documented;
5. all relevant criteria met;
6. ALARP principles followed;
7. appropriate controls and safeguards.
 |

3.2 Identify the potential for off-site impacts

1. The report is to identify hazardous incident scenarios and proposed operational and organisational safeguards, including all assumptions and uncertainties (in terms of final design and operation).
2. The report is to separately document the results of consequence computations for all hazardous scenarios and include all major and minor hazardous incidents that could potentially occur as the result of facility operations.
3. The likelihood estimation is to involve the analysis and estimation of the probability of each incident scenario being translated into particular outcomes having regard to all the proposed technical, organisational and operational safety controls.
4. Generally, the failure frequency information related to various plant items may be based on generic data applicable to similar equipment under similar operating environments. In some cases failure frequency data may be adopted that vary from such generic data. In such cases, a justification of the data used is to be provided as part of the study.
5. The results of the consequence and likelihood estimation are to be combined and the risk results presented in the form of contours, societal risk curves or other appropriate format. The results are to address, where appropriate, impacts on people, property and the environment.
6. Other land use safety related issues that are to be addressed in the report include:
7. a description of all proposed safeguards and hazard control systems, with particular emphasis on the relevancy and effectiveness of such safeguards;
8. an outline of organisational safety controls including:
9. the principles of emergency planning procedures and plans;
10. fire prevention and protection measures;
11. monitoring, auditing, operators’ training and safety management systems.
12. Where hazard identification and consequence analysis establish that off-site impacts will not occur, it may not be necessary to continue with the remaining components of the assessment. However, where these studies indicate that off-site impacts may occur, further components of the hazard analysis process will need to be conducted.

**3.3 Level 1 – qualitative analysis**

1. A qualitative analysis is sufficient if:
2. the materials are relatively non-hazardous, e.g. corrosive substances, combustible liquids;
3. the quantities of materials exceed the threshold quantities stated in the Storage of dangerous goods maximum volumes/quantities table in the relevant development code by only a relatively small margin;
4. there are no worst-case major off-site consequences;
5. the technical and management safeguards are self-evident and readily implemented;
6. the surrounding land uses are relatively non-sensitive.
7. A level 1 – qualitative analysis is to:
8. identify the types and quantities of all dangerous goods to be used;
9. describe the storage/processing activities that will involve these materials;
10. identify accident scenarios and hazardous incidents that could occur;
11. consider surrounding land uses identifying any nearby uses of particular sensitivity;
12. identify safeguards that can be adopted (including technical, operational and organisational) and assess their adequacy (having regard to the above matters).
13. Where off-site impacts are demonstrated to be unlikely, compliance with relevant Australian Standards, industry codes of practice and similar, would be considered adequate control measures.

Note—Most facilities will also fall within the definition of an environmentally relevant activity as outlined by the [Environmental Protection Act 1994](http://www.legislation.qld.gov.au/LEGISLTN/CURRENT/E/EnvProtA94.pdf) and will need to obtain an environmental authority which may require additional conditions.

**3.4 Level 2 – partial quantification analysis**

1. A partial quantification analysis is required for development if hazard identification, a simplified consequence analysis or risk classification and prioritisation has identified one or more risk contributors with consequences beyond the [site](Definitions.docx#Site) boundaries but with a low frequency of occurrence.
2. The level and extent of this analysis is to reflect the nature, scale and location of the development and is required:
3. when the materials used are relatively hazardous and/or are used in relatively large quantities;
4. when there are likely to be serious potential consequences from a hazardous event, even after obvious safeguards have been put in place.
5. In addition to including all the elements of the qualitative analysis, a partial quantification analysis is to:
6. model the consequences of all events for which hazard identification indicates there could be credible effects beyond the [site](Definitions.docx#Site) boundary;
7. estimate the likelihood of each event which detailed modelling confirms would have significant off-site consequences;
8. assess the results of the preceding estimation steps to confirm that the overall effect of all events considered would not cause criteria to be exceeded.
9. An analysis involving a quantified risk assessment is to be prepared in accordance with [NSW Hazardous Industry Planning Advisory Paper (HIPAP) No. 6 Guidelines for Hazard Analysis](https://www.planning.nsw.gov.au/policy-and-legislation/hazards). A partial quantification analysis is to demonstrate that the risk level performs to the criteria established in [Hazardous Industry Planning Advisory Paper (HIPAP) No. 4 Risk criteria for land use safety planning](https://www.planning.nsw.gov.au/policy-and-legislation/hazards). For this reason, both papers should be used together in the preparation and assessment of the analysis. If the methodology differs, justification, description and assumptions are to be stated.

**3.5 Level 3** – **full quantitative analysis**

1. A fully quantified analysis involves a quantitative risk assessment and is required:
2. when the materials used are relatively hazardous and/or are used in relatively large quantities;
3. when there are likely to be serious potential consequences from a hazardous event, even after obvious safeguards have been put in place;
4. where a partial quantification analysis is unable to demonstrate that the risk criteria will be met;
5. where the societal risk from the facility is plotted in the intolerable zone.
6. A quantitative analysis is to include all the matters addressed in a qualitative analysis and also include a full risk quantification through the analysis of the consequences and frequencies of hazardous incidents that could lead to injury/ fatality off site consistent with [NSW Hazardous Industry Planning Advisory Paper (HIPAP) No. 6 – Hazard Analysis,](https://www.planning.nsw.gov.au/policy-and-legislation/hazards) together with the calculation of risk contours.
7. The risk assessment process detailed in HIPAP No. 6 also includes reference to societal risk. Societal risk is generally only a relevant consideration for major development proposals in which potential consequences could affect large numbers of people. Where appropriate, consideration of societal risk should be included in the analysis.

3.6 Further studies

1. The following safety assessment studies are to be undertaken concurrently and interactively at the detailed design stage to input to the decision refinement process and ensure that adequate design and management measures are adopted so that the facility will achieve and maintain the safety standards specified in the preliminary hazard assessment:
2. a hazard and operability study;
3. a fire safety study;
4. an emergency plan and procedures;
5. an updated hazard analysis and risk assessment (final hazard analysis).
6. Prior to the commencement of any construction a construction safety program is also to be documented.

3.6.1 Hazard and operability study

1. This is a hazard identification exercise at a micro scale and is to be undertaken when detailed design information available and completed before the completion of design and prior to the commencement of substantial construction on site. Guidelines for HAZOP studies are provided in [NSW Hazardous Industry Planning Advisory Paper (HIPAP) No. 8 - Hazard and Operability Studies](https://www.planning.nsw.gov.au/policy-and-legislation/hazards).
2. The study is to relate to the preliminary hazard analysis, updated hazard analysis and information from the hazard analysis, particularly relating to the consequences of various hazardous incidents and to risk contributors, and is to be used as an integral part of the study process. Where appropriate, input is also to be drawn from the fire safety study and emergency plan preparation.
3. This study is to:
4. involve the comprehensive and systematic examination of the facility, section by section (usually on the basis of the flow/piping and instrumentation diagrams) and in most cases using 'guide words';
5. identify possible deviations from normal operating conditions which could lead to hazardous occurrences;
6. examine the consequences and likelihood of such deviations;
7. evaluate the adequacy and relevancy of available safeguards to detect such deviations and prevent or protect against their resultant effects;
8. evaluate hazard control systems and prepare recommendations for any necessary modifications.

3.6.2 Fire safety study

1. A fire safety study is to ensure that the proposed fire- prevention, detection, protection and fighting measures are appropriate for the specific fire hazard and adequate to meet the extent of potential fires for the development at the particular location.
2. The study is to be undertaken prior to substantial construction on site and before the commencement of operations.
3. The scope, content and procedures for a fire safety study are provided in [NSW Hazardous Industry Planning Advisory Paper (HIPAP) No. 2 - Fire Safety Study](https://www.planning.nsw.gov.au/policy-and-legislation/hazards).
4. The fire safety study is to involve a case-specific hazard analysis and design of fire safety arrangements to meet that hazard so that fire systems design does not rely on the application of general codes and standards in isolation. The case-specific approach offers the benefit that fire safety measures can be tailor-made and cost-effective.
5. The fire safety study should be concerned with all the effects of fire. It is to address the direct effects of flame, radiant heat and explosion and also the potential for the release of toxic materials and combustion products in the event of fire and the potential for the release of contaminated fire-fighting water.
6. The results of the preliminary hazard analysis and updated hazard analysis are to provide the basis for fire safety requirements with a clear relationship between fire safety systems and emergency plans and procedures.

3.6.3 Emergency plan and procedures

1. The ongoing safety of a potentially hazardous development requires plans and procedures to deal with emergencies to be prepared before the commencement of operations to reduce the likelihood and the magnitude of potentially hazardous incidents and reduce the consequences of any incidents which do occur.
2. The scope and content of emergency plans and guidance for their preparation are provided in [NSW Hazardous Industry Planning Advisory Paper (HIPAP) No. 1 - Industry Emergency Planning](https://www.planning.nsw.gov.au/policy-and-legislation/hazards).
3. Emergency procedures and plans are to be specifically developed and tailored to the needs and hazards at each facility, and at each locality. The preliminary hazard analysis and updated hazard analysis is to provide the basis of hazard identification and the nature and extent of consequences and input to the formulation of relevant emergency procedures and to resource requirements. The results of the fire safety study are also to be used as an input.
4. Emergency planning can reduce the likelihood of incidents by ensuring that when potentially dangerous situations develop the response is both quick and appropriate. The range of possible incidents involving potentially hazardous industries can be large. The smallest, if promptly detected and dealt with, will have virtually no adverse effects. If allowed to grow, however, incidents may have serious consequences both on and off the site. The magnitude can be reduced through early control which, for example, limits the size of a spill or fire. The consequences of any given incident can be reduced by such measures as control, evacuation and clean up.

**3.6.4 Updated hazard analysis and risk assessment (final hazard analysis**)

1. Throughout the detailed design phase, the effect of design and procedures decisions and modifications on hazard and risk as assessed in the preliminary hazard analysis is to be identified.
2. When detailed fire safety studies and emergency plans are completed, the design finalised, and the safety control systems determined to a final stage, the preliminary hazard analysis and risk assessment is to be updated before the commencement of operations.
3. The final updated hazard analysis and risk assessment is to follow the same principles as the preliminary studies, but assumptions and results reworked to fully account for the detailed design information and precise safeguards.
4. The principles of multi-level risk assessment apply to the final hazard analysis, as with the preliminary studies. The final hazard analysis is to be prepared in accordance with the [NSW Hazardous Industry Planning Advisory Paper (HIPAP) No. 6 - Guidelines for Hazard Analysis](https://www.planning.nsw.gov.au/policy-and-legislation/hazards).
5. The final hazard analysis is to determine risk levels to be used as the basis for future development operations, updates, extensions and the like. Refinement to earlier safety control commitments should result in improvements to the risk levels.

3.6.5 Construction safety study

1. A construction safety study is to result in formalised arrangements which ensure the safety of workers and of surrounding land uses during the construction phase.
2. The study is to focus on the potential for [hazardous materials](Definitions.docx#HazardousMaterial) incidents and cover commissioning operations, as outlined in [NSW Hazardous Industry Planning Advisory Paper (HIPAP) No. 7 - Construction Safety Study](https://www.planning.nsw.gov.au/policy-and-legislation/hazards).
3. Construction safety codes and regulations are available and are to be complied with. Procedures covering hot and cold work permits are also governed by regulations.
4. In terms of land use safety planning, specific procedures are to be developed, particularly for cases where construction involves the modification of existing facilities or the construction of new plants near existing operating hazardous facilities. In such cases in particular, formal procedures should be established and documented to account for potentially hazardous incidents and interaction. Provision is to be made, for example, to ensure atmospheric testing before certain construction activities involving welding or cutting take place.

3.6.6 Safety management system/hazard audit

This system is to be developed to ensure ongoing safety management. Regular audits of the facility are an essential component of the safety management system. The system is to be finalised before commencement of operations and its implementation is ongoing.

3.7 Additional considerations

Other issues such as social and economic factors may need to be taken into account when using these risk criteria. Consultation with the community to determine acceptable risk may also be required. It is important to note that when assessing hazardous facilities, the criteria apply to the risk levels at the receptor from all sources. Accordingly, it is not possible to assess the risk of a single facility in isolation from existing operations on the [site](Definitions.docx#Site) or in isolation from other nearby hazardous facilities.

4 Requirements for preliminary hazard analysis reports for development in the industrial hazards investigation overlay sub-category

1. Where development is proposed in the Industrial hazards investigation overlay sub-category of the Industrial amenity overlay code, the industrial hazard and risk must be within the acceptable criteria.

Editor’s note – Applicants should contact Council for advice

1. Options available to manage the risk are limited to:
2. providing adequate separation distances from the hazardous industry;
3. minimising the number of people exposed to the hazard;
4. adopting design and management measures to improve emergency management, such as evacuation plans, adequate access and escape routes.
5. It is not appropriate to rely on existing lawful industries to reduce their risks and hazards to facilitate adjacent development.

5 Best available hazard and risk management measures

1. Irrespective of the numerical value of any consequence or risk criteria level for risk assessment purposes, new industrial development is to demonstrate the ALARP (as low as reasonably practicable) principle that:
2. all avoidable risk is avoided to ensure that risk is not introduced in an area where feasible alternatives are possible and justified;
3. risk is reduced wherever practicable, irrespective of the numerical value of the cumulative risk level from the whole installation;
4. the consequence of an event is contained within the [site](Definitions.docx#Site) as far as practicable;
5. if there is an existing high risk, additional risk is avoided as far as practicable.
6. The preliminary hazard analysis report is to include a description of the hazard and risk management measures to be applied by the development.
7. Industrial type development is to undertake all reasonable and practical measures, including implementing best available hazard and risk management measures, to achieve the ongoing minimisation of hazards and risk even where modelling predicts that the industrial hazards and risk criteria of the planning scheme can be met.
8. The best-available hazards and risk management measures are considered to be the cost-effective available technology currently used nationally (or where relevant, internationally) for the activity or as otherwise prescribed by Council.
9. The preliminary hazard analysis report is to include:
10. a description of the effectiveness and the risk levels expected from the use of the best-available hazard and risk management measures;
11. a description of the ongoing maintenance requirements to ensure that the stated emission performance of the development does not deteriorate with time.

6 Hazard and risk criteria

6.1 Context

1. Development and overlay codes contain hazard and risk criteria for development. This section provides an explanation of those hazard and risk criteria.
2. The identification of hazards and the quantification of risks outside the boundaries of a potentially hazardous development and the assessment of that risk in terms of the nature of land uses in the vicinity provide the basis for compatible land use safety planning.
3. The identification of criteria against which the compatibility of various land uses is assessed ensures a consistent approach to risk assessment.
4. The tolerability or acceptability of risk is influenced by factors other than the physical magnitude of that risk. Risk criteria need to have a quantitative technical basis and also account for qualitative community concerns. Social and economic factors may need to be taken into account when using risk criteria. Consultation with the community to determine acceptable risk may also be required.
5. The two dimensions of risk to be considered separately are individual and societal risk. An individual’s concern about their own life or safety is mostly independent of whether the risk is from an isolated incident or a large-scale disaster. Society’s risk perception is mostly influenced by multiple fatality or injury disasters.
6. When an individual or a group of people are exposed to a risk, for example by locating a hazardous facility in an area, the acceptability of that risk is that it should be low relative to other known and tolerated risks.
7. Hazard and risk principles are:
8. the avoidance of all avoidable risks;
9. the risk from a major hazard is to be reduced wherever practicable, even where the likelihood of exposure is low;
10. the effects of significant events should, wherever possible be contained within the [site](Definitions.docx#Site) boundary;
11. where the risk from an existing installation is already high, further development is to not pose any incremental risk.
12. Where risk levels exceed the criteria, the acceptability of the risk at or from a facility is to be considered in the light of the economic or social benefits provided by the development.

6.2 Application of hazard and risk criteria

1. Uncertainties in the numerical outputs from a risk analysis, require that the implementation and interpretation of probabilistic risk criteria consider:
2. qualitative as well as quantitative outputs of the analysis;
3. the sensitivity of the results to changes in critical input assumptions;
4. the consequences and likelihood of hazardous events;
5. the vulnerability of people and property in the area (on and off site);
6. the sensitivity of the affected environment;
7. the potential benefits of the facility to the local and wider community;
8. variations in local conditions;
9. existing risk exposures;
10. current and likely future use of the surrounding areas.
11. The hazard and risk criteria contained in the [NSW Hazardous Industry Planning Advisory Paper (HIPAP) No. 4 - Risk Criteria for Land Use Safety Planning](https://www.planning.nsw.gov.au/policy-and-legislation/hazards) (the document explains the basis for risk criteria and provides some guidance for implementing the criteria) are used in this planning scheme.

Note—The adoption of these criteria in Queensland is recommended by the Australia and New Zealand Hazardous Industry Planning Taskforce. The Hazardous Industries and Chemicals Branch, [Queensland Department of Justice and Attorney General](http://www.justice.qld.gov.au/) (the lead agency in Queensland for the management of dangerous goods) recognises and supports the use of these criteria in the planning scheme.

6.3 Risk criteria for potentially hazardous development

6.3.1 Qualitative risk criteria

Irrespective of the numerical value of any risk criteria level for risk assessment purposes, the following qualitative criteria are to be applied in assessing the risk implications of a development of a potentially hazardous nature or the locational safety suitability of a development in the vicinity of a potentially hazardous installation:

1. All ‘avoidable’ risks should be avoided, including the investigation of alternative locations and alternative technologies to ensure that risks are not introduced in an area where feasible alternatives are possible and justified.
2. The risk from a major hazard is reduced wherever practicable, irrespective of the numerical value of the cumulative risk level from the whole installation. If the consequences (effects) of an identified hazardous incident are significant to people and the environment, then all feasible measures (including alternative locations) are adopted so that the likelihood of such an incident occurring is made very low.
3. The consequences of the more likely hazardous events (i.e. those of high probability of occurrence) are contained within the boundaries of the site.
4. Where there is an existing high risk from a hazardous facility, additional hazardous development does not occur if they add significantly to that existing risk.

6.3.2 Quantitative risk criteria

6.3.2.1 Individual risk criteria

1. Individual fatality risk is the risk of death to a person located at a particular point. Different levels of acceptable individual fatality risk are defined for different land uses, recognising the differing vulnerabilities of people and that for some land uses, the people occupying the area are continually changing.
2. Injury risk is the level of risk for injury to a person, but will not necessarily cause fatality. Injury risk criteria are defined for heat radiation from fires, blast overpressure from explosions and toxic exposure due to the release of toxic gases.
3. Property damage and accident propagation criteria are the risk criteria for physical parameters that may cause damage to buildings and structures and that may cause a failure at a neighbouring facility thus creating an escalation of events. Property damage and accident propagation risk criteria are defined for heat radiation from fires, blast overpressure from explosions and toxic exposure due to the release of toxic gases.

6.3.2.2 Societal risk criteria

1. Societal risk criteria are used for addressing the level of societal concern when there is a risk of multiple fatalities occurring in one event.
2. The criteria use FN-curves obtained by plotting the frequency at which such events might kill N or more people, against N. This compares the impact profiles of man-made accidents with the equivalent profiles for natural disasters with which society has to live.
3. The criteria take into account that society is particularly intolerant of accidents, which though infrequent, have a potential to create multiple fatalities.
4. The criteria incorporate an ALARP approach.

6.3.3 The ALARP principle

1. ALARP is a principle that may be applied in relation to the degree of risk reduction that may be sought from a particular activity. In weighing the costs of extra safety measures, the principle of reasonable practicability applies in such a way that the higher or more unacceptable a risk is, the more, proportionately, an employer is expected to spend to reduce it.
2. The societal risk criteria contain three societal risk bands: negligible, ALARP and intolerable. Below the negligible line, provided other individual criteria are met, societal risk is not considered significant. Above the intolerable level, an activity is considered undesirable, even if individual risk criteria are met. Within the ALARP region, the emphasis is on reducing risks as far as possible towards the negligible line. Provided other quantitative and qualitative criteria are met, the risks from the activity would be considered tolerable in the ALARP region.
3. Above a certain level, a risk is regarded as intolerable whatever the benefit might be. Below such levels, an activity may take place and in pursuing any further safety improvement account can be taken of the cost. This approach suggests the limit of tolerable risk to a worker is 10-3/year; the limit of tolerable risk to a member of the public is taken as 10-4/year. The risk to a member of the public that might be regarded as acceptable, as opposed to tolerable, is then taken as 10-6/year.

6.3.4 Environmental risk criteria

1. In addition to the risk to people and property, the siting and impact assessment process for potentially hazardous installations is to consider the risk from accidental releases to the biophysical environment.
2. In the case of the biophysical environment, fire and explosion hazards are of less relevance in comparison to the effect of these hazards on people. Acute and chronic toxicity impacts are those which shall be chiefly addressed. Generally, there is less concern over the effects on individual plants or animals. The main concern is instead with whole systems or populations.
3. Due to the complexities of assessing effects and case-to-case differences, defined biophysical environment risk criteria are not specified. Acceptability of the risk will ultimately depend on the value of the potentially affected area or system to the local community and wider society. Further guidance is provided in [NSW Hazardous Industry Planning Advisory Paper (HIPAP) No.4-Risk Criteria for Land Use Safety Planning](https://www.planning.nsw.gov.au/policy-and-legislation/hazards) on how to consider biophysical risk assessment and decision making.
4. The criteria apply to the risk levels at the receptor from all sources. The risk from the development is to be assessed in relation to existing operations on the [site](Definitions.docx#Site) and in relation to other nearby hazardous facilities.

6.4 Risk criteria for development in the vicinity of potentially hazardous facilities

6.4.1 Individual fatality risk criteria

6.4.1.1 Residential and sensitive land uses

The individual risk criteria relating to risks to residential and sensitive use development in the vicinity of existing industrial-type development are more stringent than those which apply to less sensitive uses, such as industrial- and commercial-type development.

6.4.1.2 Other land uses

If the hazard and risk criteria in the relevant code are initially exceeded, commercial- and industrial- type development may be appropriate where mitigating measures can be implemented to reduce risk exposure to less than the target individual fatality risk level.

6.4.1.3 Individual injury risk criteria

If development for residential and sensitive uses, possible injury and irritation impacts are to be considered.

6.4.2 Societal risk criteria

1. Societal risk criteria focus on multiple fatality situations. It is generally not meaningful to address societal risk when considering development for a dwelling house in the vicinity of a potentially hazardous facility. However, where a development involves a significant intensification of population in the vicinity of such a facility, the change in societal risk is to be taken into account, even if individual risk criteria are met.
2. Examples of such situations include medium-to-high density residential development (although this would not normally be considered to be appropriate in such a location), sporting facilities where large numbers of spectators are likely to be present and shopping complexes.
3. In such instances, the incremental societal risk is to be compared against the indicative hazard and risk criteria in the relevant code. Incremental societal risk that lies within the negligible region is acceptable. If incremental risks lie within the ALARP region, development layout should locate people away from the affected areas. If, after taking this step, there is still a significant portion of the societal risk plot within the ALARP region, the development is to demonstrate that benefits clearly outweigh the risks.