PUBLIC DISCUSSION PAPER SAFETY REQUIREMENTS FOR THE DESIGN, MANUFACTURE AND CONFORMITY ASSESSMENT OF PLANT

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Australian Government
Australian Safety and Compensation Council

Public Discussion Paper

Safety Requirements for the Design, Manufacture and Conformity Assessment of Plant

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SECTION 1 – INTRODUCTION

1. The *National Standard for Plant* (NSP) was declared in 1994 by the National Occupational Health and Safety Commission. The Standard attempted to bring together the range of different requirements for plant safety set out in the OHS legislation of the states and territories at the time into a set of requirements to be used as the basis of consistent regulation of plant across Australia. The Standard covers safety standards for plant design and use, and administrative processes related to plant design and registration of items of high hazard plant.

2. All but two jurisdictions have adopted provisions of the NSP into regulations as the basis for their regulation of plant safety. Queensland initially adopted the NSP as an advisory standard (the *Plant Advisory Standard 2000*) which has now been replaced by the *Plant Code of Practice 2005,* as well as some components being placed in regulation. The ACT adopted the NSP as an Approved Code of Practice in 1995.

3. A review of the NSP is currently underway, and public comment is being sought to inform decision making on the future direction of plant regulation in Australia. The current environment in which the review is being undertaken is one in which the Australian, state and territory governments have agreed, through an intergovernmental agreement, to develop model OHS legislation as the basis for consistent OHS legislation across jurisdictions. It is therefore anticipated that the outcomes of the review, including the public comment arising from this discussion paper, will be used to inform the development of plant related elements of the model OHS legislation framework.

SECTION 2 – SCOPE AND PURPOSE OF THIS PAPER

4. The purpose of this discussion paper is to seek public comment on aspects of the NSP that relate to plant design, plant manufacture and design registration. The main intent of these provisions in the NSP is to establish processes to provide a level of confidence that high hazard plant is safe for use and consistent with its design before it enters the Australian marketplace. As such, this paper only deals with issues associated with the requirements for the design and manufacture of plant, including where the design and/or manufacture takes place in Australia, or where it takes place in another country.

5. This paper identifies a range of issues with the effectiveness of the current requirements as set out in the NSP and outlines proposed ways of dealing with these issues. Comment is sought on the validity of the proposed approaches to improve the regulation of plant design and plant conformity, as well as to identify other alternatives that should be considered to address the issues raised. Comment is also sought on how the proposed approaches could be refined. If the result of comment is that the overall approach is not supported, this additional information will still be used to inform any revised approach.

6. Part of the proposed framework involves identifying types of plant as high hazard and only applying the verification and registration of design to these types of plant. The types of plant currently identified as high hazard plant are listed in Item 1 of Schedule 1 of the NSP (see paragraph 10). Comment is sought on whether high hazard plant should still be separately identified for these requirements, and if so, whether the existing list requires modification to account for changing technology. Suggestions for appropriate criteria for determining whether a type of plant should be considered as high hazard or not are also sought.

7. Throughout the paper you will find questions in italicised text (*like this*). These are designed to stimulate discussion on particular issues. The questions should be viewed as prompts and should not be seen as restrictive. Please feel free to provide comment on any issues of interest. A compilation of all the questions is available at www.ascc.gov.au in the public comment response form.

SECTION 3 – BACKGROUND

National Standard for Plant

8. The original objective in developing the NSP was to protect the health and safety of persons from hazards arising from plant and systems of work associated with plant. The NSP was a significant change from the prescriptive regulation in place in most jurisdictions at the time in that it set out a performance-based approach by establishing hazard identification, risk assessment and risk control requirements for all types of plant.

9. However, design requirements for plant still relied heavily on compliance with relevant Australian Standards (as set out in Schedule 2 of the NSP), an essentially prescriptive approach. The NSP did provide for the use of other technical standards to design plant through provision 6 (3):

> *"Where this national standard incorporates a standard, other comparable standards which are deemed acceptable by an Authority may be used in lieu of the referenced standard."*

In practice, a lack of agreement between the authorities as to what constituted an acceptable comparable standard meant this clause was generally not utilised.

10. The NSP also established a system of registering the designs of plant considered to be high hazard. Registration was only possible once the design had been verified by a design verifier, an independent and appropriately competent person. A model of the current plant design and verification requirements is at Figure 1.

Terms of reference for the review

11. In 2003, the National Occupational Health and Safety Commission agreed to review the NSP, with the following terms of reference relevant to this paper:

a. review the use of Standards Australia material in the NSP to ensure that the decisions of the Workplace Relations Ministers' Council about the referencing of such material are observed

b. develop Essential Safety Outcomes/Criteria, or adapt existing international models, for high hazard plant to provide benchmarks for standards in plant design

c. identify administrative issues related to inconsistencies in adoption by jurisdictions

d. examine the development of practical processes for the:

    i. independent verification of plant design and design registration (including issues related to accreditation, certification and restricted license)

   ii. uniform marking system to indicate compliance with a conformity assessment process

e. consider approaches that may be necessary to address issues associated with the importation, movement, procurement or exchange of new and second-hand plant, machinery and equipment across national and international borders, and consider any impact on international agreements (e.g. those with the World Trade Organisation, Asia-Pacific Economic Cooperation, the EC-Mutual Recognition Agreement, Australia-United States Free Trade Agreement, Trans Tasman Mutual Recognition Agreement, etc.) on the regulation of plant, and

f. consider recommendations of the Productivity Commission Review on Mutual Recognition Arrangements within Australia.

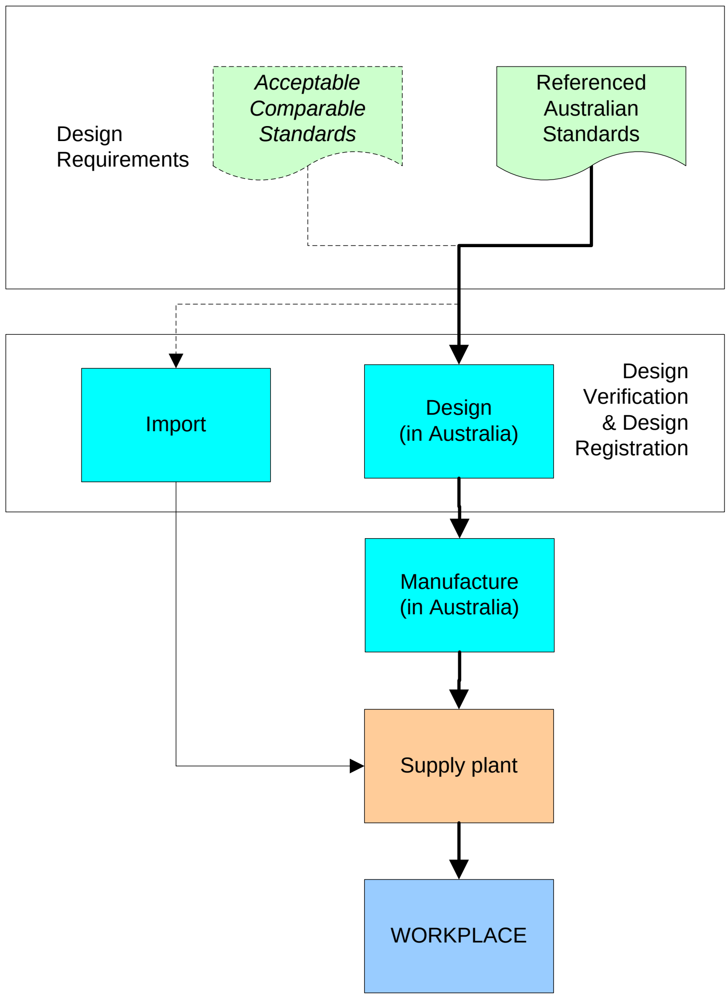

Fig. 1: Current Plant Design and Verification Requirements (as set out in the NSP)

Issues with the National Standard for Plant

12. A number of issues, relevant to the scope of this paper, have been identified with the current NSP. These include:

a. the extent of referencing of Australian Standards as the basis for compliance for plant design requirements

b. lack of an 'acceptable comparable standards' list or criteria for determining such a list

c. limitations of the current design registration and verification processes

d. no mutual recognition of comparable overseas safety systems relating to assessment of conformity

e. import of plant that does not meet acceptable Australian safety requirements

f. ‘dumping’ of second-hand plant in Australia after it has passed its design life or useful life elsewhere, and

g. whether the current list of high hazard plant is still adequate, considering the speed at which plant design and technology is progressing.

More information on each of these issues is provided at Appendix 1.

Jurisdictional variations from the National Standard for Plant

13. Compounding the issues identified with the NSP is that jurisdictions have not all adopted the requirement for plant design and design verification and registration in the same way. Some examples of the differences include:

a. some jurisdictions define a ‘design verifier’, some specify additional requirements for this role, such as a requirement that the competent person be registered with the OHS authority

b. some jurisdictions require more information than others in the application for design registration

c. not all jurisdictions use AS4343 to determine the hazard level of pressure equipment

d. although most jurisdictions will recognise a design registration by another OHS authority there are some situations where this is not the case, and

e. Most jurisdictions require a design registration to be on display near the item of plant, one jurisdiction requires the design registration number to be on the plant in a permanent manner.

SECTION 4 – OPTIONS TO ADDRESS ISSUES RELATED TO DESIGN REQUIREMENTS FOR PLANT

14. Several options exist for addressing the risks associated with plant within the regulatory framework. Those considered to date are:

a. Essential Safety Outcomes

b. Essential Safety Outcomes directly adopted from overseas model, and

c. Current NSP approach with modifications to address issues where possible.

These options are discussed below.

ESSENTIAL SAFETY OUTCOMES

15. The Essential Safety Outcomes approach progresses the work begun with the NSP to move away from prescriptive design requirements for plant. The framework would do this by specifying the level of safety to be achieved by plant in the form of a series of outcome statements called Essential Safety Outcomes (ESOs).

16. Each statement would specify the level of safety necessary for a particular aspect of plant. Plant would need to be designed and manufactured to meet all of the ESOs relevant to that particular piece of plant. A complete appreciation of the safety level to be achieved would only occur once all of the relevant statements were taken in combination.

17. For certain types of plant there would be additional ESOs to address specific risks such as those involved in lifts and escalators, plant that performs lifting operations, amusement devices and in pressure equipment. This would require that lifts, for example, would need to satisfy all of the General Requirements as well as those ESOs specific to lifts.

18. The difference between this proposal and the current approach is that the ESOs would specify *what* level of safety needed to be achieved whereas, by referencing technical standards, the current system specifies *how* to achieve the required level of safety and thereby implies that by satisfying the technical parameter, an acceptable level of safety will be met.

19. As an example of the difference, consider an item of plant which requires a moving blade to achieve its purpose. One of the key risks to the operator would be making contact with the moving blade. One essential safety outcome for this risk is that the operator must not be able to access the blade until it has stopped moving. Current provisions in technical design standards (such as Australian Standards directly referenced in regulations) would instead address this risk by specifying a particular type of guarding. For example, AS1893, referenced in the NSP, has seven pages of detailed provisions relating to guarding of guillotines.

20. The draft ESOs accompanying this discussion paper have been adapted from the European Machinery Directives[1] that inform the design, manufacture and conformity assessment of plant in the European Community (EC).

21. The EC Directives establish the safety requirements that must be achieved without detailing the corresponding technical solution. The Directives are able to deal more effectively with large 'families' of products by describing the essential requirements that must be present regardless of the size of the item and, in so doing, provide for greater flexibility in the manner in which a designer may satisfy the requirement. The flexibility in the ways that the directives are satisfied is brought together by the application of a consistent conformity assessment process that is applied at an appropriate point or points in the design and manufacture of plant.

Benefits of the ESO approach

22. Moving to the ESO model of safety outcomes will address the various issues identified with the current NSP. In particular, the proposal has several benefits:

a. addresses the requirement to no longer reference Australian Standards in regulation

b. allows use of overseas technical standards

c. improved importation of plant

d. mutual recognition of processes allowing free movement of plant within Australia, and

e. allows for design innovations.

Removing references to Australian standard

23. The ESO model will remove the need to directly reference Australian Standards from OHS regulations. Directly referencing Australian Standards within regulations usually means that the level of safety is specified as a series of prescriptive design requirements. It also means the requirements are set by (albeit well-meaning and highly competent) committees outside of the usual legislative process and its associated controls. Since the technical standards are not freely available, it also imposes a cost on business to purchase these documents.

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[1] EC Machinery Directives can be found at http://ec.europa.eu/enterprise/newapproach/standardization/harmstds/reflist.html

Use of overseas technical standards

24. The ESO model will allow plant to be designed and manufactured to technical standards from other countries provided it can be demonstrated that the chosen standard meets all relevant ESOs and are therefore conforming technical standards. As a result, plant imported to Australia according to a conforming technical standard will no longer require modification to meet the Australian Standard requirements. This will effectively establish the provision 6(3) of the current standard to recognise equivalent overseas standards (see paragraph 9 above).

25. This change will mean that modifications will only be required in the future if the unmodified plant does not meet all relevant ESOs. There will no longer be a need to modify plant just to meet the Australian Standard technical specifications, irrespective of the safety outcome. As a result, the change should involve significant savings for companies importing plant while maintaining the level of safety currently achieved.

26. Potentially this will also limit the practice of removing otherwise functional safety features often incorporated on foreign plant in order to lower the cost item to in turn, cover the additional cost of meeting the (Australian) technical specifications.

Imported plant

27. The ability to design and manufacture plant to overseas technical standards should remove some of the existing barriers to importing overseas plant. These include the costs associated with modifying plant to meet the relevant Australian Standards and developing plant specifically for the relatively small Australian market.

28. Facilitating this process even further, the proposed model for plant design and conformity requirements has been strongly based on the EC New Approach Directives relating to plant safety, with changes made to adapt the framework to suit the broader Australian OHS environment. As a result, the requirements in Australia should be closely aligned to those of the EC environment, facilitating free trade between Australia and the EC, and other countries that accept the EC approach.

Movement of plant within Australia

29. As outlined in paragraph 13 above, a large degree of complexity exists in the current system because of differing arrangements around the country. Establishing the safety outcomes to be achieved will remove the cause of many of these differences. As a result, the ESO model should ensure all OHS authorities apply the same requirements to the design and manufacture of plant. This should in turn ensure greater mutual recognition of existing processes when plant moves within Australia, including when the plant is moved due to re-sale.

Design innovations

30. The current NSP specifications limit the ability of designers to develop and implement alternative approaches to addressing OHS risks. Effectively this stifles design innovation, limiting the possibility for improvements in safety beyond the currently specified levels. The ESO model allows for a design specification to be developed directly to the ESOs, which removes the current limitations on design innovation. The ESOs should ensure that the level of safety is maintained or, preferably, improved by taking this approach although greater monitoring may be warranted.

Comment sought:

Q1. *Do you support the new proposed framework for regulating plant design and manufacture, incorporating ESOs and conformity assessment as the preferred option? Please provide general comments on your views.*

Q2. *Do you support other options, including new options not listed above? If so, please provide details.*

Potential issues with the ESO model

31. Several potential issues exist with the ESO model:

a. not specifying a particular solution to a risk could be seen to undermine safety

b. identifying and appropriately expressing all safety outcomes for plant is complex and may lead to gaps, and

c. some designers may prefer the certainty that comes from using a specified solution, in particular for the design of high risk plant.

Level of specification in the ESOs

32. By not specifying a particular solution to a risk, the system relies heavily on the ability of designers to correctly interpret and apply the relevant ESOs. In recognition of this potential, there has been a view expressed that ESOs will need a comprehensive level of specification, such as stipulating coefficients of safety where appropriate, to ensure that an adequate level of safety is specified.

33. Such an approach would make it easier to identify the levels of safety required when design specifications are developed directly from the ESOs. However, the greater the degree of specification of the requirements, the lesser the flexibility to use alternative technical standards or design innovations. Balancing the level of detail set out in the outcomes in ESOs will be important to ensure that flexibility is maintained without allowing a level of ambiguity that could be used to drive the level of safety down.

34. An important part of the ESO proposal is the inclusion of a robust conformity assessment process. It is proposed that this process would always apply to high hazard plant to confirm that the design of that plant meets all relevant ESOs in much the same way as the current design verification and subsequent registration process operates. The current processes for addressing high hazard plant are discussed later in this document.

35. The conformity assessment process would also be used to confirm that high hazard plant has in fact been manufactured in accordance with this design. Conformity assessments would be undertaken by independent, competent persons or organisations. This system would provide confirmation that the designer had appropriately interpreted and applied the ESOs and therefore should minimise some of the risks introduced by ESOs. More detailed information on conformity assessment is provided at Section 6 of this paper.

Possible gaps in ESOs

36. The category of plant covers a broad array of machinery and items and therefore incorporates a large variety of risks. Adequately expressing the level of safety to address all of these risks is complex leading to the potential for gaps in coverage.

37. The proposed model for plant design and conformity requirements has been strongly based on the EC New Approach Directives relating to plant safety. These directives have been in place in the EC for more than two decades and were developed after a comprehensive risk assessment process. A benefit of using these directives as a base for the ESO model is that it builds on this work, minimising the possibility of gaps in the system.

‘Complying’ standards

38. In some cases, designers may prefer the certainty that comes from designing directly to prescriptive standards. Specifying the level of safety through ESOs does not prevent the use of prescriptive standards. Instead, prescriptive standards that meet the ESOs provide one means of complying.

39. Prescriptive standards (such as Australian Standards) could also potentially be used in a ‘deemed to comply’ context with the ESOs. Under this arrangement, a list would be developed of the more commonly used technical standards which had been assessed as meeting the requirements of the ESOs. This would allow designers the option to follow one of these standards to meet the requirements of the ESOs. A plant design based on a complying standard would only meet the ESOs if it fully complied with all aspects of the standard.

40. This system would not preclude the use of other technical standards or of design specifications developed directly from the ESO requirements.

Implementing ESOs within the legislative framework

41. If ESOs are adopted, consideration will need to be given as to how this is achieved within the broader legislative framework. Options are to include them as regulations, as a code of practice or as a reference document for regulations. Further comment on the regulatory approach will be sought through a later public comment process once the policy direction has been agreed.

Comment sought:

Q3. *If ESOs are adopted, do you have a preference for the regulatory instrument used to implement them? Please provide details.*

Draft ESOs

42. If ESOs are adopted, consideration will need to be given as to how this is achieved within the broader legislative framework. Options are to include them as regulations, as a code of practice or as a reference document for regulations. Further comment on the regulatory approach will be sought once the policy direction has been agreed.

43. It is proposed that all plant must comply with Chapter 1 of the ESO document where the general requirements for plant are outlined. The other chapters provide additional ESOs for specific types of plant (i.e. mobile plant, amusement structures, etc).

Comment sought:

Q4. *Are the draft ESOs sufficient to provide an assurance as to the safety of plant designs?*

Q5. *Are the General Requirements of the draft ESOs too broad leaving potential gaps? If so, please identify specific areas that need tightening and suggest an approach that would address the issue.*

Q6. *Do the draft ESOs provide enough flexibility for new types of plant or new technologies that may enter the workplace in the future?*

Q7. *Are there any specific types of plant that need to have additional ESOs to those identified in the draft document?*

ESOS ADOPTED DIRECTLY FROM OVERSEAS MODEL

44. One option being canvassed in this discussion paper is that the European Machinery Directives be adopted directly without modification.

Benefits

45. There are several benefits in this approach. A significant volume of plant entering Australia already satisfies the European model of ESOs and conformity assessment or a process in place in another country that is comparable. In addition, formal trade agreements oblige Australia to recognise those processes in providing the movement of goods and the removal of technical barriers to trade.

46. Currently, the mere presence of a CE marking on equipment used in Australia does not necessarily mean that the product complies with relevant European or Australian standards. Instead, it is common for manufacturers to exclude essential safety systems or devices when exporting the equipment to Australia, even though the CE marking is left in place (usually as a part of castings forming the equipment). By adopting the European Directives, particularly if a similar conformity assessment process is also employed, the ongoing relevance of the CE mark once the plant enters Australia will be ensured. This will remove some of the potential for a CE mark to provide a misleading perception of safety.

47. The European model has been in place for almost two decades and has evolved to a point where it is widely accepted as providing a level of confidence for designers, manufacturers and suppliers of plant that satisfying the requirements will provide market access. Direct adoption would mean the historical development work would be accepted without Australia needing to duplicate this effort.

48. Australian manufacturers competing in the global marketplace already need to meet these requirements when exporting to most overseas markets. This is the reverse of the situation where importers of some plant are required to alter a design, or retrofit items to satisfy a uniquely Australian requirement without necessarily providing a safer item.

Potential issues

49. The European model is the result of a mature and cohesive process that oversees the management of the Directives and the direct translation of the European model may not address the differences in the way safety levels are defined in Australia. While language differences can be readily accommodated, there are some additional 'workplace culture' considerations necessary in any direct translation.

50. The European Directives include specific safety requirements for various categories of plant described earlier as 'families' of plant. Some of these categories, such as food processing machinery, are not considered necessary in Australia as the specific (food safety) requirements are satisfied by other regulations. Similarly, other categories of plant widely used within Australia, such as scaffolding or pre-fabricated formwork, have no equivalent in the European Directives.

51. The relative 'simplicity' of the European Directives is made possible by the maturity of the process in the European context. Being new to the process, Australia would need to be mindful that what works in Europe may not be directly translatable.

52. A secondary, but no less important consideration, is how to address the inevitable changes to the European Directives that will take place over time. Directly adopting the Directives would mean that these would apply without input to the process. If not adopted, gradual adjustments in the EC could result in decreasing benefits in Australia.

Comment sought:

Q8. *If the ESO concept was adopted, would you prefer some more detailed specifications to be included in the ESOs (such as coefficients of safety)?*

Q9. *Should the structure of the EC Directives be more directly adopted, particularly the 'families' of plant captured by the 'General Requirements'?*

Q10. *Is it considered necessary to introduce additional sections for types of plant not currently addressed separately in the Directives?*

MODIFYING THE CURRENT SYSTEM

53. One option for consideration is to continue the current process but with a concerted effort to identify standards, including international standards with comparable level/s of safety to current standards, which would be acceptable to all OHS authorities. The current process could then be further enhanced by the adoption of a consistent approach to design verification such as that discussed in relation to conformity assessment.

Benefits

54. The benefits that might arise from an adjustment of the current processes stem from the fact that it should require only minimal change to many of the arrangements already in place. It also has the potential to provide less scope for individual jurisdictions or designers to interpret requirements differently.

Potential issues

55. Adjusting the current process, even if it addressed the comparable standards issue, will retain the problems that exist with the direct referencing of Australian Standards, as well as the other issues outlined at Appendix 1.

56. Gaining universal acceptance of comparable standards amongst the OHS jurisdictions has been elusive to date. In spite of a stated commitment to achieving this it has been impossible to resolve in the light of subtle differences in the manner in which the NSP has been incorporated into regulations across the jurisdictions. The problem is made more complex given the somewhat ‘fluid’ nature of standards development and the need for a mechanism that can accommodate amendments from time to time.

57. Although it would be possible to include a range of comparable International Standards, such a move is still likely to continue the issues that exist around the importing of new or second hand plant, and the conflict that may still be present when measured against Australia’s international trade obligations.

Comment sought:

Q11. *Will the list of complying standards as well as the ability to use other technical standards with additional requirements to validate compliance with the draft ESOs provide reasonable options for a designer of plant?*

HIGH HAZARD PLANT

58. The NSP identifies several types of plant as high hazard (see Table 1), with the additional requirement of verification and registration of design only applying to these types of plant. An additional consideration of both the options of maintaining the status quo or moving to the proposed model incorporating ESOs and a conformity assessment process is the need to continue to specify additional requirements for high hazard plant.

59. The continuing basis of the existing list is predominantly historical. It is timely to consider whether there is a need to continue differentiating between high hazard plant and other plant in relation to design conformity requirements.

Comment sought:

Q12. *Should a category of plant that has specific conformity assessment requirements to other plant continue to be treated separately?*

Table 1: High hazard plant currently requiring design verification under the NSP

- *pressure equipment*, other than *pressure piping*, and categorised as *hazard l*evel A, B, C or D according to the criteria identified in *AS* 3920 Part 1, *Pressure Equipment Manufacture -Assurance of Product Quality*
- *gas cylinders* covered by *AS* 2030
- *tower cranes* *
- *lifts* #
- *building maintenance units*
- *hoists*, with a platform movement in excess of 2.4 metres, designed to lift people *
- *work boxes* suspended from *cranes*
- *amusement structures* covered by *AS* 3533, with the exception of class 1 structures
- *prefabricated scaffolding*
- *boom-type elevating work platforms*
- *gantry cranes* with a safe working load greater than 5 tonnes or *bridge cranes* with a safe working load of 10 tonnes, and any *gantry crane* or *bridge crane* which is designed to handle molten metal or dangerous goods *
- *vehicle hoists* *
- *mast climbing work platforms* *
- *mobile cranes with a safe working load greater than 10 tonnes* *

* for the purposes of registration, cranes and hoists in Schedule 1 of the NSP exclude those that are manually powered, elevating work platforms and tow trucks
# registration of lifts includes escalators and moving walkways

Adequacy of current list of high hazard plant

60. If there is a rationale for continuing to differentiate between high hazard plant and other plant then a consistent set of criteria to identify high hazard plant will need to be developed. Many of the types of plant identified as high hazard plant were those that had been set in legislation prior to the declaration of the NSP in 1994. There have been significant engineering advances since that time, as well as a greater range of new plant entering the market.

Considering the rapid evolution of plant technology, there may be other types of plant that should be identified as high hazard plant and subjected to additional controls, and/or types of plant currently on the list that should be removed.

Comment sought:

Q13. *What criteria should be used to determine if a type of plant is classified as high hazard?*

Q14. *Is the current list of high hazard plant (Table 1, above) appropriate?*

Imported high hazard plant

61. Should there be sufficient support for the separate treatment of high hazard plant, it would be likely that all imported high hazard plant (new or second hand) will need to meet the requirements of the ESOs at the time the high hazard plant enters the Australian marketplace or workplace.

62. Generally, imported high hazard plant would be required to follow the same requirements applying where the high hazard plant was designed and manufactured in Australia, with the importer taking on the responsibility of the designer and manufacturer in the provision of the relevant information. This aligns with what currently occurs.

SECTION 5 - CONFORMITY ASSESSMENT

63. Should the proposal for ESOs be adopted, additional processes would need to be implemented to support the concept, particularly a comprehensive conformity assessment (CA) process.

64. The proposed CA process is intended to ensure that all plant, particularly high hazard plant, going into the workplace has been both designed to meet the relevant ESOs and manufactured according to its design specifications. The CA process would operate at different levels of 'complexity' to reflect the level of risk inherent in the item.

65. The CA process being proposed is a verification process undertaken by an independent competent person or organisation, to confirm both these aspects. Consistent with current requirements for design verification, the CA process is expected to be mandatory for high hazard plant.

66. A form of CA already exists in the current system. The requirements of the NSP state that, before an item of high hazard plant can be used in a workplace in Australia, its design must have been registered with one of the OHS authorities. The NSP sets out that a person applying to register a design must ensure that the design has been verified by a design verifier and must provide to the OHS Authority a compliance statement that has been signed by the designer, a verification statement and representational drawings of the plant design. Section 3 and Appendix 1 discusses the variability in the application of these requirements across the OHS jurisdictions in Australia.

67. The current design verification process must be undertaken by an appropriately competent person[2] who is independent of the design process, or is otherwise operating under a certified quality system.

68. For pressure equipment, the NSP sets out that the design verification process must be carried out in accordance with Australian Standard 3920.1. The level of verification required under this process is dependent on the hazard level of the pressure equipment which takes account of the design pressure, volume and type of contents of the equipment.

69. Figure 1 illustrates the design process as set out in the NSP for items of plant listed in Schedule 1 of the NSP.

70. One of the main differences between the current process and that proposed is that there will need to be an additional component whereby an independent verification confirms that the item is manufactured in accordance with the design. This would probably only be required for high hazard plant but would nonetheless, take the form of the highest level of CA.

[2] '**Competent person**' (as defined in the NSP) means a person who has acquired through training, qualification, or experience, or a combination of these, the knowledge and skills enabling that person to perform the task required by this national standard.

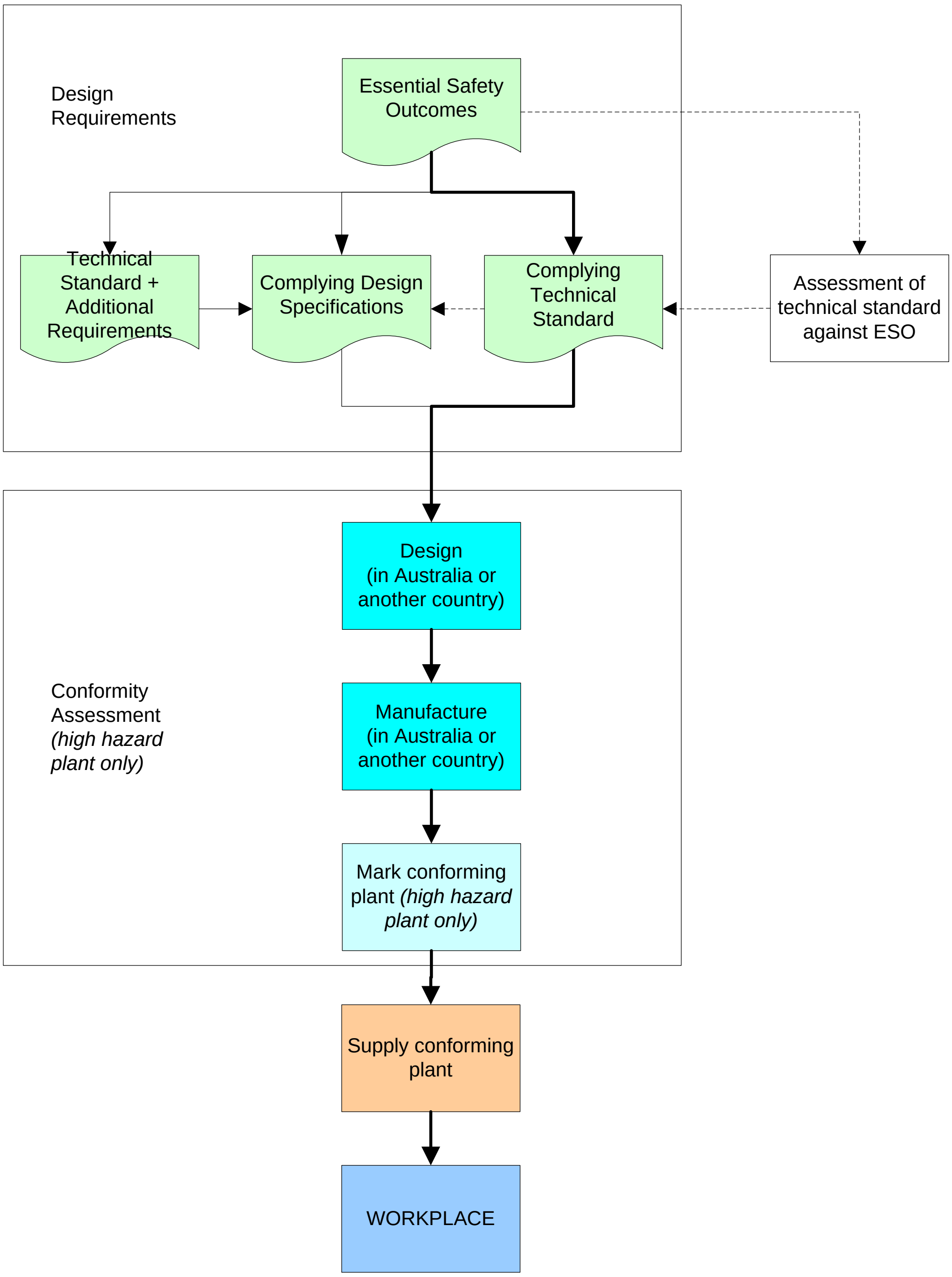

Fig. 2: Proposed plant design and conformity assessment requirements

71. It is proposed that the CA process be based on several principles:

- The use of Australian Standards (AS)/International Standardization Organization (ISO) standards on conformity assessment as the basis for the process
- The CA process will cover both the design and manufacture stages
- The use of conformity assessors accredited by a third party, such as the Joint Accreditation System of Australia and New Zealand (JAS-ANZ) or National Association of Testing Authorities (NATA)

- Where appropriate, options be available for different CA modules to be applied, to enable designers and manufacturers to choose a model most suited to their operations
- The level and independence of scrutiny increases as the hazard level of the plant increases, and
- Where possible, the CA process should allow for mutual recognition of other CA processes used in countries from which high hazard plant is imported.

72. Additional steps may be necessary to confirm that the design met the ESOs where other technical standards have been used by the designer. Equally, where design specifications were developed directly to the ESO requirements, it would be necessary to confirm that the design specifications met all relevant ESOs.

Conformity assessors

73. Given the importance of the CA process to confirm compliance with the ESOs, an option to ensure the independence and competence of the persons or organisations undertaking the assessment is to have them be accredited.

74. One option is to have conformity assessors accredited under the JAS-ANZ. Accreditation under JAS-ANZ could also provide a basis for mutual recognition of similar accreditation processes overseas.

75. Initial discussions with JAS-ANZ indicate that under their current requirements, Conformity Assessment Bodies can only be organisations, not individuals. However, options may exist to allow different forms of accreditation for individuals although this may limit mutual recognition overseas for any assessment undertaken by these individuals.

76. A further consideration is to have conformity assessors accredited by jurisdictions, similar to the way design verifiers are recognised in some jurisdictions presently.

Comment sought:

Q15. *What is your preferred option for accreditation of conformity assessors?*

77. At present the continuing viability of the design verification process in Australia relies on the availability of individual consultants to provide the verification function. Due to the limited size of the Australian market, there may not be a sufficient volume of work to attract large conformity assessment organisations across the entire range of plant. One of the dangers of mandating that the CA process only be undertaken by accredited organisations is that it may result in a lack of availability of suitable conformity assessors across the full range of high hazard plant.

Comment sought:

Q16. *Should the conformity assessor role allow individual consultants to undertake the CA process? Why or why not?*

Mutual recognition of CA processes

78. It is proposed that the CA process should allow, where possible, for mutual recognition of plant conformity from other systems, such as overseas, that provide a similar level of surety. This might mean that an item of plant designed and manufactured overseas that has gone through a comparable CA process (e.g. the European CE process), would be recognised within Australia without any further paperwork/processes here in Australia. The system of recognising overseas systems is something that could be facilitated through JAS-ANZ if a CA model was constructed within their framework.

Comment sought:

Q17. *Are there particular conformity assessment schemes that Australia should aim to mutually recognise? If so, why?*

Application to other plant

79. If it were agreed that the CA process should be mandated for high hazard plant then a potential extension of the CA process could be to make it available on a voluntary basis for designers and manufacturers of plant other than high hazard plant. This may provide marketing opportunities locally as well as assisting with formal recognition of these products into other markets. To ensure the integrity of the CA process, if a manufacturer decided to utilise the voluntary CA process, the full requirements of the CA would apply and the manufacturer would have the same responsibilities under the CA as a manufacturer of high hazard plant.

Comment sought:

Q18. *Should the option exist for the CA process to be utilised for plant other than high hazard plant on a voluntary basis? Why or why not?*

Proposed conformity assessment modules

80. Based on the processes outlined in the AS/ISO standards on conformity assessment, there are eight modules that could be used within a CA process. The modules differ in the level of external scrutiny applied within the process and the level of responsibility assigned to the designer or manufacturer. Schedule 1 provides a summary of the respective levels of assessment for each of the eight modules.

81. The modules can be organised in such a way to provide assurance of the quality of both the design and of the manufacture of the plant. The natural combinations of the modules could allow for different processes to exist for up to five different categories of plant, based on the level of hazard posed. The higher the level of hazard, the more stringent the requirements of the conformity assessment process. In the model presented below, Hazard Category 1 is for plant that presents the highest level of hazard. Figure 3 outlines the eight modules arranged into the five hazard categories.

82. It is proposed that high hazard plant could be assigned to the first four categories based on their level of hazard. This model is similar to that currently in place for pressure equipment. For other types of high hazard plant, criteria to determine the hazard category will need to be developed to ensure that the appropriate CA process is undertaken.

Comment sought:

Q19. *What criteria should be used to determine the hazard category of types of high hazard plant other than pressure vessels?*

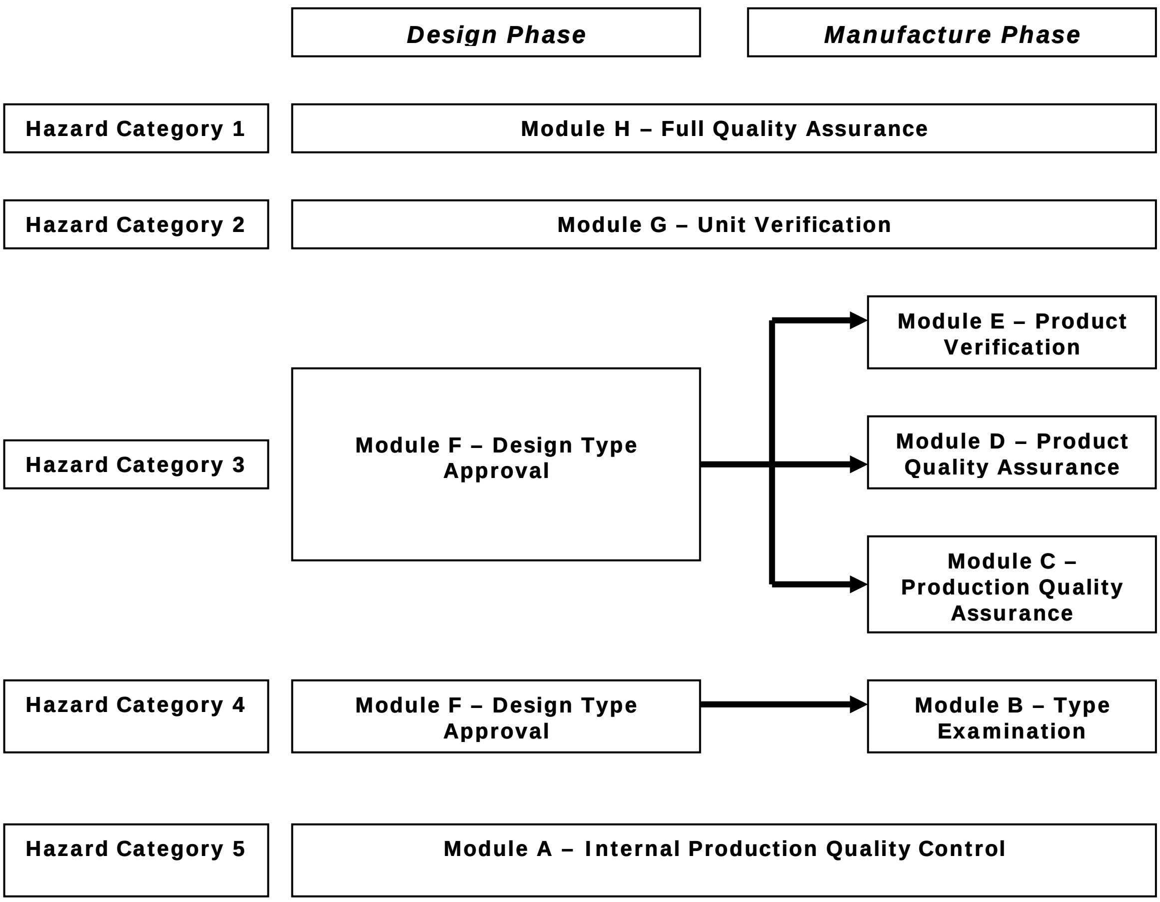

Fig.3: Diagram of the proposed application of CA modules

Imported second hand high hazard plant

83. The importer of items of second hand high hazard plant imported into Australia would need to demonstrate that plant:

(a) had undergone an appropriate design conformity assessment at the time of manufacture, and

(b) was still capable of operating at a level of safety specified in the original conforming design.

For a (yet to be determined) period of time after the plant had been first used, it may be acceptable to rely on the CA undertaken at the time of manufacture to meet the second part of the requirement. After that time period, a further, new, assessment would need to be made of the plant's capability to operate safely. It is most likely that such a time period will relate directly to the hazard category of the item with different time periods applying depending on the hazard category of the plant.

Comment sought:

Q20. *For imported second hand high hazard plant, for how long after the date of manufacture should the conformity assessment undertaken on the new item of plant be accepted? Please provide reasons.*

SECTION 6 - MARKING OF PLANT

84. The EC approach to conformity assessment, on which the above proposal is based, includes a conformity mark that is applied to all conforming plant, the CE mark.

85. If a marking element were adopted in Australia, the conformity mark could be used to record a range of information useful in managing plant. Items which could be included are: the designer, the manufacturer, the person or organisation that undertook the CA process, the design reference and the expiry date of plant relative to its design life. The ability to affix a mark indicating conformity would reside with the conformity assessor.

86. An option being considered is the concept of a compliance plate, rather than simply a mark, that would include as much information about the item of plant and where it was designed, manufactured, etc as possible. The compliance plate could include the registration of the completed CA process so an audit trail would be available if necessary.

87. Issues around the marking of conforming plant, and issues around the acceptance of marking on imported plant which have undergone a similar conformity assessment process overseas, are still being considered.

88. It is anticipated that the marking of plant would be compulsory for high hazard plant that was required to go through a CA process. If a voluntary CA process was undertaken, the requirement of a mark would need to be determined.

Comment sought:

Q21. *Do you agree with the concept of marking plant that has been through a CA process? Why or why not?*

Q22. *Do you agree with the 'compliance' plate concept for marking? Why or why not?*

Q23. *Do you agree that if a voluntary CA process is progressed, that a mark should be a requirement? Why or why not?*

SECTION 7 - OTHER INFORMATION

REGULATORY IMPACT STATEMENT (RIS)

89. Attachment B to this discussion paper provides some initial data and related information for the development of a full consultation RIS. The information provided at Attachment B is only within the scope of this discussion paper – that is in relation to the ESO and CA proposals.

90. A RIS is a formal document prepared by a government agency responsible for a regulatory proposal following consultation with relevant parties. It formalises the steps that must be taken to ensure sound policy formulation and requires a costs and benefits analysis of alternative approaches. A RIS is a well-established procedure for assessing the impact of policy and regulatory proposals on affected stakeholders and industries.

Additional comment is sought on the Draft Regulation Impact Statement found at Attachment B.

ATTACHMENT A – ESSENTIAL SAFETY OUTCOMES

Essential Safety Outcomes for Plant

Contents

NOTE

The technical details, numerical values and safety co-efficients contained in these draft ESOs are indicative only and are included solely for the purpose of stimulating public comment.

The consultation process by which more descriptive technical criteria for the ESOs will be developed has yet to be determined and to facilitate that part of the process, comment is sought on an approach that should be taken to describing parameters that will enable the ESOs to be defined, and to ensure that an appropriate conformity assessment process is identified.

ESSENTIAL SAFETY OUTCOMES FOR THE DESIGN OF PLANT

Application

This document sets out the Essential Safety Outcomes (ESOs) for the design of plant. It establishes the minimum health and safety requirements which must be incorporated into plant design and in this way will assist manufacturers, suppliers and users of plant in understanding the safety outcome that a particular item of plant must achieve. The objective of this process is to improve the level of safety associated with the use of plant in Australia by addressing safety issues at the design stage.

The ESOs do not seek to define the process or choice of measures which may be applied by a designer in designing an item of plant. Rather, they highlight the safety outcome while allowing for flexibility and innovation in the application of design principles and manufacturing processes. The ESOs do not contain the technical details that are often found in documents such as Australian Standards (AS) – a designer may determine that the contents of an AS meet the requirements of the ESO and design according to that.

The ESOs identified in this document must be achieved in so far as they apply to a particular piece of plant.

These ESOs specify detailed requirements for all types of plant. It is recognised that some items of plant have particular safety requirements and additional ESOs may need to be developed to address specific issues in addition to the following types of plant:

- mobile plant
- plant intended to lift
- portable hand-held and/or hand-guided plant
- portable fixing and other impact equipment
- plant for working wood and materials with similar physical characteristics
- plant intended to lift and/or move people
- amusement structures
- scaffolding
- lifts, and
- pressure equipment.

Designers of such equipment must address the specific requirements outlined in the relevant chapters in addition to the general requirements contained in Section 1 which relates to the general requirements for all types of plant.

Scope

This document relates to the design of items of plant, equipment, tools, and any associated accessories or attachments. The following items are excluded from the scope of the ESOs:

- plant for medical use used in direct contact with patients
- plant specially designed for nuclear purposes which, in the event of failure, may result in the release of radioactivity
- firearms
- means of transport, i.e. vehicles intended solely for transporting passengers or goods by air or on road, rail or water
- seagoing vessels and mobile offshore units together with equipment on board such vessels or units
- machines specially designed for military or police purposes, and
- any plant to the extent it is covered by separate legislation.

NOTE: *Essential Safety Outcomes acknowledge that the Department of Defence and the Australian Defence Force employ certain classes of plant specifically designed and constructed to apply force against an enemy combatant. The ESOs further recognise that such activities take place in an operating environment fundamentally different from that which pertains in the wider community. As such, there may well be occasions when full adherence to an 'outcome' is either inappropriate or on engineering compromise is justified in the interests of military operational effectiveness. Nonetheless, the Department of Defence and the Australian Defence Force is obligated to follow safe design principles wherever reasonably practicable and ensure that all such plant does not pose an unreasonable risk to its operator.*

This caveat applies equally, within appropriate limits, to plant similarly utilised for either law enforcement or officially sanctioned protective services purposes.

NOTE: *As well as meeting the requirements of the ESOs the designer must adhere to safety obligations such as electrical safety and radiation exposure which are covered under other legislation.*

GENERAL PRINCIPLES

1. The manufacturer of plant or their authorised representative must ensure that a risk assessment is carried out in order to determine the essential safety outcomes which apply to the plant. The plant must then be designed and constructed taking into account the results of the risk assessment.

By the iterative process of risk assessment and risk reduction referred to above, the manufacturer or their authorised representative must:

- determine the limits of the plant, which include the intended use and any reasonably foreseeable misuse thereof

- identify the hazards that can be generated by the plant and the associated hazardous situations

- estimate the risks, taking into account the severity of the possible injury or damage to health and the probability of its occurrence

- evaluate the risks, with a view to determining whether risk reduction is required, in accordance with the objective of these Essential Safety Outcomes, and

- eliminate the hazards or reduce the risks associated with these hazards by application of protective measures, in the order of priority established in Section 1.1.1(b).

2. The obligations laid down by the Essential Safety Outcomes only apply when the corresponding hazard exists for the plant in question when it is used under the conditions foreseen by the manufacturer or their authorised representative or in the case of reasonably foreseeable misuse. In any event, the principles of safety integration referred to in Section 1.1.1 and the obligations concerning marking of plant and instructions referred to in Sections 1.11.5 and 1.12.1 apply.

3. Taking into account the state of knowledge, it may not be possible to meet the objectives set by them. In that event, the plant must, as far as possible, be designed and constructed with the purpose of approaching these objectives.

4. This document is organised in several Sections. The first one has general requirements and is applicable to all kinds of plant. The other Sections refer to certain kinds of more specific hazards. Nevertheless, it is essential to examine the whole of this document in order to be sure of meeting all the relevant essential outcomes. When plant is being designed, the requirements of the general Section (1) and the requirements of one or more of the other chapters shall be taken into account, depending on the results of the risk assessment carried out in accordance with point 1.1 of these General Requirements.

Definitions

For the purposes of the ESOs, the following definitions apply:

Amusement Structure: Equipment operated for hire or reward which provides entertainment or amusement. An amusement structure may be either an amusement ride, where the patrons are not necessarily required to move themselves to obtain the desired effect; or, an amusement device through or on which a patron moves, where the desired effect is primarily achieved by virtue of the patron's self-powered motion.

Carrier: A part of the lifting plant on or in which people and/or goods are supported in order to be lifted supported or contained. In the case of an amusement structure the carrier may be a car, gondola, chair, capsule, compartment or similar.

Chains, ropes and webbing: Those designed and constructed for lifting purposes as part of lifting plant or lifting accessories.

Control system: A set of electrical, electronic, pneumatic, hydraulic and mechanical components which are designed to order the operation of the plant.

Control device: An external component of the control system used by the operator to direct the functioning of the plant.

Critical safety component: A component, the failure or malfunctioning of which endangers the safety or health of exposed persons.

Danger zone: Any zone within and/or around plant in which an exposed person is subject to a risk to their health and safety.

Design specification: The information, including drawings, provided by the designer to ensure the plant can be manufactured as intended and which specifies all the necessary safety features to eliminate the hazards or control the risks associated with its installation, operation, dismantling and disposal.

Driver: An operator responsible for the movement of a machine. The driver may be carried on the plant or may be on foot, accompanying the plant, or may guide the plant by remote control.

Dynamic test: The test during which lifting plant is operated in all its possible configurations at the maximum working load multiplied by the appropriate dynamic test coefficient with account being taken of the dynamic behaviour of the lifting plant in order to check that it functions properly.

Earthmoving plant: An operator controlled item of plant intended to be used to excavate, load, transport, compact or spread earth, overburden, rubble, spoil, aggregate or similar material but does not include a tractor or industrial lift truck.

Ergonomic principles: Principles relating to the physical capabilities and limitations of a person that are developed from anthropomorphic data.

Exposed person: Any person, wholly or partially, in a danger zone.

Fall arrest system: A system consisting of a fall arrest harness and other components connecting the harness to an anchor point to minimise the distance and severity of a fall.

Fail-safe: A state or condition whereby, if any component of an item of plant fails, a system exists to prevent any increase of the assessed risk associated with the device.

Fixed plant: Plant which is physically secured to a supporting surface by mechanical or other means, excluding plant that is temporarily immobilised for the purpose of operation.

Foreseeable: An outcome that can be anticipated by the designer as a result of an assessment of the plant for a particular application. The assessment must include anticipated human behaviour based on the current state of knowledge.

Guard: A part of the plant used specifically to provide protection by means of a physical barrier.

Guided load: A load where the total movement is made along rigid or flexible guides whose position is determined by fixed points.

Hazard: Any thing (including an intrinsic property of a thing), or situation with the potential to cause harm to people.

Hazardous situations: A circumstance such as an event or action or the failure to take appropriate action which may create a situation with a potential for harm in terms of human injury or ill health or damage to property or a combination of these.

Hold-to-run control device: A component that must be manually retained in a certain position to enable a particular operation be carried out.

Intended use: The use of plant in accordance with the design specification.

Lift: Any permanent plant (or plant intended to be permanent) that is in or attached to a building or structure and by means of which persons, goods or materials may be raised or lowered within or on a car, cage or platform and the movement of which is restricted by a guide or guides and includes an apparatus in the nature of a stairway chair lift, escalator or moving walk, and any supporting structure, plant, equipment, gear, lift well, enclosures and entrances. It includes lifts moving along a fixed course even where they do not move along guides which are rigid also fall within the scope of the ESO for lifts (for example, scissor lifts).

Note: For the purposes of these ESO's, 'lift' means a carrier serving different levels, having a car moving along guides which are rigid and inclined at an angle of more than 15 degrees to the horizontal and intended for the transport of:

(a) persons,

(b) persons and goods,

(c) goods alone if the car is accessible, for example, a person may enter it without difficulty, and fitted with controls situated inside the car or within reach of a person inside.

Lifting accessory: A component or equipment not permanently attached to the lifting plant, allowing the load to be held, which is placed between the lifting plant and the load or on the load itself, or which is intended to constitute an integral part of the load. Slings and their components are also regarded as lifting accessories.

Lifting operation: A movement of unit loads consisting of goods and/or people necessitating, at a given moment, a change of level and/or direction.

Lifting plant: The plant that provides the force necessary to lift a load, and which supports the load, either directly on a carrier or indirectly via lifting accessories, during the lifting operation.

Maximum load: The absolute maximum un-factored load that can be applied to an item of lifting plant or a lifting accessory in its most favourable configuration without adversely affecting its stability or structural integrity.

Maximum working load: The maximum load specified in the design specification that can be applied to an item of lifting plant or a lifting accessory in its most favourable configuration.

Operator: The person or persons who may be responsible for some or all of the tasks of installing, operating, adjusting, maintaining, cleaning, or transporting the plant.

Patron: A person participating in an amusement ride or device who does not require any formal training or previous experience to be able to participate in a safe manner.

Pressure equipment: A vessel, associated piping, safety accessories and pressure accessories intended to contain (positive or negative) pressure relative to atmospheric pressure.

Protective device: A device (other than a guard) which reduces the risk, either alone or in conjunction with a guard.

Reasonably foreseeable misuse: The abnormal use of an item that can be predicted from recorded human behaviour.

Ride-on: A feature of plant whereby the driver drives/operates it from a dedicated position on the plant itself.

Risk: a combination of the probability and the degree of an injury or damage to health that can arise in a hazardous situation

Safety component: A component which fulfils a safety function when in use and the failure or malfunctioning of which endangers the safety of persons operating or using the plant.

Static test: The test during which lifting plant or a lifting accessory is inspected, and subjected to a force corresponding to the maximum working load multiplied by the appropriate static test coefficient, and re-inspected once the said load has been released to ensure that no damage has occurred.

Self propelled plant: Plant including a motor vehicle, whether wheeled or track mounted, that is designed and constructed to provide power and movement, including self-propelled plant used to provide power and movement for any machine or implement attached by a transmission shaft, belt or linkage system, not including earthmoving plant.

Test coefficient: means the arithmetic ratio between the load used to carry out the static or dynamic tests on lifting plant or a lifting accessory and the maximum working load marked on the lifting plant or lifting accessory.

Unintended use: A description of the use of plant in a way not intended by the designer, but which may result from readily predictable human behaviour.

Vicinity: The area in or around the plant within which persons may be exposed to a risk to health or safety arising from that plant.

Working load: The maximum load specified in the design specification that can be applied to a unit of lifting plant for a particular configuration. For lifting plant with a fixed configuration, the working load is the same as the maximum working load.

Note: The term ‘working load’ is known as ‘rated capacity’ when applied to cranes.

Working coefficient: The arithmetic ratio between the maximum load and the maximum working load marked on the component.

1 General plant

1.1 General requirements

1.1.1 Safety integration

Plant must be designed following these principles:

(a) Plant must be designed and constructed so that it is fit for its function, and can be operated, adjusted and maintained without putting persons at risk when these operations are carried out under the conditions foreseen but also taking into account any reasonably foreseeable misuse of the plant.

The aim of measures taken must be to eliminate any risk throughout the foreseeable lifetime of the plant including the phases of transport, assembly, operation, dismantling, and disposal.

(b) In selecting the most appropriate methods, the manufacturer or an authorised representative must apply the following principles, in the order given:

- eliminate or reduce risks as far as possible (inherently safe plant design and construction)
- take the necessary protective measures in relation to risks that cannot be eliminated, and
- inform users of the residual risks due to any shortcomings of the protective measures adopted, indicate whether any particular training is required and specify any need to provide personal protective equipment.

(c) When designing and constructing plant and when drafting the instructions, the manufacturer or an authorised representative must envisage not only the intended use of the plant but also any reasonably foreseeable misuse of the plant.

The plant must be designed and constructed in such a way as to prevent abnormal use if such use would engender a risk. Where appropriate, the instructions must draw the user's attention to ways, which experience has shown might occur, in which the plant should not be used.

(d) Plant must be supplied with all the special equipment and accessories essential to enable it to be adjusted, maintained and used safely.

1.1.2 Materials and products

The materials used to construct plant or products used or created during its use must not endanger persons' safety or health. In particular, where fluids are used, machinery must be designed and constructed to prevent risks due to filling, use, recovery or draining.

1.1.3 Lighting

Plant must be supplied with integral lighting suitable for the operations concerned where the absence thereof is likely to cause a risk despite ambient lighting of normal intensity.

There must be no area of shadow, glare or reflection likely to adversely affect visibility. The lighting recommended in the design must not cause dangerous stroboscopic effects on moving parts.

Internal parts requiring frequent inspection and adjustment, and maintenance areas must be provided with appropriate lighting.

1.1.4 Design of plant to facilitate its handling

Plant or each component part must be:

- capable of being handled and transported safely, and
- designed and manufactured so that it can be packaged, transported and/or stored safely and without damage.

During the transportation of the plant and/or its component parts, there must be no possibility of sudden movements or of hazards due to instability as long as the plant and/or its component parts are handled in accordance with the instructions.

Where the weight, size or shape of plant or its various component parts prevents them from being moved by hand, the plant or each component part must be:

- fitted with attachments for lifting gear or coupling device, or
- capable of being fitted with such attachments (e.g. threaded holes), or
- shaped in such a way that standard lifting gear can easily be attached.

Where plant or one of its component parts is to be moved by hand, it must be:

- capable of being moved safely, and
- equipped with attachments such as hand-grips

Lifting or coupling devices which are fitted to plant must be designed to ensure easy and safe connection and disconnection and to prevent accidental disconnection while being lifted.

Special arrangements must be made to mitigate the risk for the handling of tools and/or plant parts which, even if lightweight, could be hazardous.

1.1.5 Ergonomics

Under the intended conditions of use, the discomfort, fatigue and physical and psychological stress faced by the operator must be reduced to the minimum possible, taking into account ergonomic principles such as:

- allowing for the variability of the operator's physical dimensions, strength and stamina
- providing enough space for movements of the parts of the operator's body
- avoiding a machine-determined work rate
- avoiding monitoring that requires lengthy concentration, and
- adapting the worker/plant interface to the foreseeable characteristics of the operators.

If the plant is intended to be used in a hazardous environment presenting risks to the health and safety of the operator or if the plant itself gives rise to a hazardous environment, adequate means must be provided to ensure that the operator has good working conditions and is protected against any foreseeable hazards.

1.1.6 Operating positions

The design of the item of plant must ensure safe access to and egress from the operating position.

The operating position must eliminate hazards from exhaust gases and/or lack of oxygen.

If plant gives rise to a hazardous environment, the operator must be protected against any foreseeable hazards.

Where appropriate, the operating position must be fitted with a cabin designed to fulfill the above requirements. The exit from any cabin must allow rapid evacuation. When applicable, an emergency exit must be provided in a direction which is different from the usual exit.

The design specification must provide details of particular locating requirements to ensure these conditions are achieved.

1.1.7 Seating

Where sufficient space is available and where the working conditions so permit, work stations constituting an integral part of the plant must be designed with seats.

The seat and its interface with the machine must be adjustable and take into account ergonomic principles.

If the plant is subject to vibrations, the seat must be designed and constructed in such a way as to reduce the vibrations transmitted to the operator to the lowest level that is reasonably possible. The seat mountings must withstand all stresses to which they can be subjected. Where there is no floor beneath the feet of the operator, the design must include footrests covered with a slip-resistant material.

1.2 Controls

1.2.1 Safety and reliability of control systems

Control systems must be designed and constructed in such a way that:

- they are safe and reliable, in a way that will prevent a hazardous situation arising
- they can withstand the intended operating stresses and external influences including, but not limited to, interference such as from communication devices
- a fault (or faults) in the hardware or software of the control system does not lead to a dangerous situation
- the required fault tolerance or acceptable probability of dangerous failure of the control system hardware necessary to achieve the required system reliability has been determined based on the results of the system risk assessment
- where software is involved in the safety control system, such software must be appropriately developed and documented to demonstrate its acceptability for use in such safety systems, and
- reasonably foreseeable human logic or error does not lead to hazardous situations.

Particular attention must be given to the following points:

- the plant must not start unexpectedly
- the parameters of the plant must not change in an uncontrolled way
- where a change in operating parameters may lead to hazardous situations, the plant must not be prevented from stopping if the stop command has already been given
- no moving part of the plant or piece held by the plant must fall or be ejected where such events are not controlled by the operator
- automatic or manual stopping of the moving parts, whatever they may be, must be unimpeded
- the protective devices must remain fully effective or give a stop command, and
- the safety-related parts of the control system must apply in a coherent way to the whole of an assembly of plant and/or partly completed plant.

For cable-less control, an automatic stop must be activated when correct control signals are not received, including loss of communication.

1.2.2 Control devices

Control devices must be:

- clearly visible and identifiable and appropriately marked where necessary
- positioned in such a way as to be safely operated without hesitation or loss of time and without ambiguity
- designed in such a way that the movement of the control is consistent with its effect
- located outside the danger zones, except for certain controls where necessary, such as emergency stops, or a 'teach' pendant
- positioned in such a way that their operation cannot cause additional risk
- designed or protected in such a way that the desired effect, where a hazard is involved, can only be achieved by a deliberate action, and
- made in such a way as to withstand foreseeable forces and environmental conditions; particular attention must be paid to emergency stop devices liable to be subjected to considerable strain.

Where a control is designed and constructed to perform several different actions, namely, where there is no one-to-one correspondence, the action to be performed must be clearly displayed and subject to confirmation where necessary.

Controls must be so arranged that their layout, travel and resistance to operation are compatible with the action to be performed, taking account of ergonomic principles.

Constraints due to the necessary or foreseeable use of personal protective equipment (such as footwear, gloves, etc) when operating controls, must be taken into account.

Plant must be fitted with indicators as required for safe operation. The designer must provide for indicators of a suitable size and positioned in such a way for the operator to be able to read them from the control position.

From each control position, the operator must be able to confirm that no-one is in the danger zone/s, or the control system must be designed and constructed in such a way that starting is prevented while the dangerous situation exists.

Where this is not possible, the control system must be designed and constructed so that an acoustic and/or visual warning signal is given whenever the plant is about to start. The exposed person must have the time and the means to evacuate the danger zone or have the means to prevent the plant starting up.

If necessary, means must be provided to ensure that the plant can be controlled only from control positions located in one or more predetermined zones or locations.

Where there is more than one control position, the control system must be designed in such a way that the use of one of them precludes the use of the others, except for stop controls and emergency stops.

When plant has two or more operating positions, each position must be provided with all the required control devices without the operators hindering or putting each other into a hazardous situation.

1.3 Starting

1.3.1 Deliberate starting

Plant must be designed and constructed so that it is only possible to start the plant by intentional actuation of a control device provided for the purpose.

The same requirement applies when:

- restarting the plant after a stoppage, whatever the cause, and
- effecting a significant change in the operating conditions (e.g. speed, pressure, etc)

The restarting of the plant or change in operating conditions may be effected by voluntary activation of a device other than the control device provided for that purpose, provided that this does not lead to a hazardous situation.

For plant functioning in automatic mode, the starting of the plant, restarting after a stoppage, or a change in operating conditions may be possible without operator intervention provided that this does not lead to a hazardous situation.

Where plant has several starting controls and the operators can therefore put each other in danger, additional devices must be fitted to eliminate such risks. If safety requires that starting and/or stopping must be performed in a specific sequence, there must be devices that ensure that these operations are performed in the correct order.

1.4 Stopping device

1.4.1 Normal stopping

Plant must be fitted with a control whereby the plant can be brought safely to a complete stop.

Each workstation must be fitted with a control device to stop some or all of the moving parts of the plant, depending on the severity of the hazard presented, so that the plant is rendered safe.

The plant's stop control must have priority over the start controls.

Once the plant or its hazardous functions have stopped, the energy supply to the actuators concerned must be cut off until the hazardous situation has been corrected.

1.4.2 Operational stop

Where, for operational reasons, a stop control that does not cut off the energy supply to the actuators is required (e.g. to hold a work piece firmly in place), the stop condition must be monitored and maintained.

1.4.3 Emergency stopping

Plant must be fitted with one or more emergency stop devices to enable actual or impending danger to be averted unless the following exceptions apply:

- plant in which an emergency stop device would not lessen the risk, either because it would not reduce the stopping time or because it would not enable the special measures required to deal with the risk to be taken, or
- hand-held portable machines and hand-guided machines.

The emergency stop device must:

- have clearly identifiable, clearly visible and quickly accessible controls
- stop the hazardous process as quickly as possible, without creating additional risks, and
- where necessary, trigger or permit the triggering of certain safeguard movements.

Once active operation of the emergency stop device has ceased following a stop command, that command must be sustained by engagement of the emergency stop device until that engagement is specifically overridden.

In particular it:

- must not be possible to engage the emergency stop device without also triggering a stop command
- must be possible to disengage the device only by a specific operation, and
- must ensure that disengaging the emergency stop device does not restart the plant but only permit restarting.

The emergency stop function must be available and operational at all times, regardless of the operating mode.

Emergency stop devices must support other safeguarding measures and not be a substitute for them.

1.4.4 Assembly of plant

In the case of plant or parts of plant designed to work together, the plant must be designed and constructed so that the stop controls, including the emergency stop, can stop not only the plant itself but also all related equipment if its continued operation may be dangerous.

1.5 Mode selection

The control or operating mode selected must override all other control or operating modes with the exception of the emergency stop.

If plant has been designed and constructed to allow for its use in several control or operating modes requiring different protective measures and/or work procedures, it must be fitted with a mode selector which can be locked in each position. Each position of the selector must be clearly identifiable and must correspond to a single operating or control mode.

The selector may be replaced by another selection method which restricts the use of certain functions of the plant to certain categories of operator.

If, for certain operations, the item of plant must be able to operate with a guard displaced or removed and/or protective device disabled, the control or operating mode selector must simultaneously:

- disable all other control or operating modes
- permit operation of hazardous functions only by control devices requiring a sustained action
- permit the operation of hazardous functions only in reduced risk conditions while preventing hazards from linked sequences, and
- prevent the operation of hazardous functions by voluntary or involuntary action of the plant's sensors.

If these four conditions cannot be fulfilled simultaneously, the control or operating mode selector must activate other protective measures designed and constructed to ensure a safe intervention zone.

In addition, the operator must be able to control operation of the parts he/she is working on from the adjustment point.

1.6 Failure of the power supply

The interruption, re-establishment after an interruption or fluctuation in whatever manner of the power supply to the plant, must not lead to a dangerous situation.
Particular attention must be given to the following:

- the plant must not start unexpectedly
- the parameters of the plant must not change in an uncontrolled way when such change can lead to hazardous situations
- the plant must not be prevented from stopping if the command has already been given
- no moving part of the item of plant or piece held by the plant must fall or be ejected
- automatic or manual stopping of moving parts whatever they may be must be unimpeded, and
- the protection devices must remain fully effective or give a stop command.

1.7 Protection against mechanical hazards

1.7.1 Risk of loss of stability

Plant, and its components and fittings must be stable enough to avoid overturning, falling, or uncontrolled movements during transportation, assembly, dismantling and any other action involving the plant.

If the shape of the plant or its intended installation does not offer sufficient stability in itself, appropriate means of anchorage must be incorporated in the design specification and indicated in the instructions.

1.7.2 Risk of break-up during operation

The various parts of plant and their linkages must be able to withstand the stresses to which they are subjected during intended use and reasonably foreseeable misuse.

The durability of the materials used must be adequate for the nature of the specified working environment. In particular, when nominating the type of materials to be used, the design must have regard for the possible effects of fatigue, ageing, corrosion and abrasion.

The design specifications must indicate the type and frequency of inspection and maintenance required for safety reasons. The design specifications must, where appropriate, indicate the parts subject to wear and the criteria for replacement.

Where a risk of rupture or disintegration of component parts remains despite the measures taken, the parts concerned must be mounted, positioned and/or guarded in such a way that any fragments will be contained, preventing hazardous situations.

Both rigid pipes and flexible hoses carrying fluids or substances such as gases or solids or a mixture thereof, particularly those under high pressure, must be able to withstand the foreseen internal and external stresses and must be firmly attached and/or protected to ensure that no risk is posed by a rupture.

Where the material to be processed is automatically fed to moving parts of the plant, the design must include the following considerations:

- when the material comes into contact with the moving parts, those parts must have attained their normal working conditions, and
- when the plant starts and/or stops (intentionally or accidentally) the feed movement of the material and the movement of the parts of the plant processing that material must be coordinated.

1.7.3 Risks due to falling or ejected objects

Precautions must be taken to prevent risks from falling or ejected objects.

1.7.4 Risks due to surfaces, edges or angles

In so far as their purpose allows, accessible parts of the item of plant must have no sharp edges, no sharp angles, and no rough or abrasive surfaces likely to cause injury.

1.7.5 Risks related to combined plant

Where the plant is intended to carry out several different operations which involve the manual removal of material between each operation, the combined plant must be designed and constructed in such a way as to allow each element to be used separately without the other elements constituting a risk to persons exposed.

For this purpose, it must be possible to separately start and stop any elements that are not protected.

1.7.6 Risks relating to variations in operating conditions

Where plant performs operations under different conditions of use, it must be designed and constructed in such a way that selection and adjustment of these conditions can be carried out safely and reliably.

1.7.7 Risks related to moving parts

The moving parts of plant must be designed and constructed in such a way as to prevent risks of contact which could lead to accidents, or must where risks remain, be fitted with guards or protective devices.

All necessary steps must be taken to prevent accidental blockage of moving parts involved in the work. In cases where, despite the precautions taken, a blockage is likely to occur, the necessary protective devices and tools must, when appropriate, be provided.

The instructions and, where possible, signage on the plant shall identify these protective devices and how they are to be used.

1.7.8 Choice of protection against risks arising from moving transmission parts

Guards or protective devices designed to protect against hazards generated by moving parts must be selected on the basis of the type of risk. The following guidelines must be used to determine the most appropriate control to incorporate in the design.

1.7.8.1 Moving transmission parts

Guards designed to protect persons against the hazards generated by moving transmission parts must be either:

- fixed guards as referred to in Section 1.8.2.1, or
- interlocking movable guards as referred to in Section 1.8.2.2.

Interlocking movable guards should be used where frequent access is envisaged.

1.7.8.2 Moving parts involved in the operation

Guards or protective devices designed to protect persons against the hazards generated by moving parts involved in the operation must be:

- fixed guards as referred to in Section 1.8.2.1, or
- interlocking movable guards as referred to in Section 1.8.2.2, or
- protective devices as referred to in Section 1.8.3, or
- a combination of the above.

However, when certain moving parts directly involved in the operation cannot be made completely inaccessible during the operation owing to operations requiring operator intervention, such parts must be fitted with:

- fixed guards or interlocking movable guards preventing access to those sections of the parts that are not used in the work, and
- adjustable guards as referred to in Section 1.8.2.3 restricting access to those sections of the moving parts where access is necessary.

1.7.9 Risks of uncontrolled movements

When a part of the plant has been stopped, any movement away from the stopping position, for whatever reason other than action of the control devices, must be prevented or must be such that it does not present a hazard.

1.8 Required characteristics of guards and protective devices

1.8.1 General requirements

Guards and protective devices must:

- be of robust solid construction
- be securely held in place

- not give rise to any additional hazard
- not be easy to by-pass or render non-operational
- be located at an adequate distance from the danger zone
- cause minimum obstruction to the view of the production process, and
- enable essential work to be carried out on installation and/or replacement of parts and for maintenance purposes by restricting access exclusively to the area where the work has to be done, if possible without the guard having to be removed or the protective device having to be disabled.

In addition, guards must where possible, protect against the ejection or falling of materials or objects and against emissions, generated by the plant.

1.8.2 Specific requirements for guards

1.8.2.1 Fixed guards

Fixed guards must be secured by systems that can be opened or removed only with tools. Their fixing systems must remain attached to the guards or the plant when the guards are removed. Where possible, guards must be incapable of remaining in place without their fixings.

1.8.2.2 Interlocking movable guards

Interlocking movable guards must:

- as far as possible remain fixed to the plant when opened
- be designed and constructed in such a way that they can be adjusted only by means of an intentional action
- be associated with an interlocking device that prevents the start of the hazardous functions until the guard is closed and locked, and
- gives a stop command whenever they are no longer closed.

Where it is possible for an operator to reach the danger zone before the risk due to the hazardous plant functions has ceased, movable guards must be associated with a guard locking device in addition to an interlocking device that:

- keeps the guard closed and locked until the risk of injury from the hazardous plant functions has ceased, and
- prevents the start of hazardous plant functions until the guard is closed and locked.

Interlocking movable guards must be designed in such a way that the absence or failure of one of their components prevents starting or stops the hazardous plant functions.

1.8.2.3 Adjustable guards restricting access

Adjustable guards restricting access to those areas of the moving parts strictly necessary for the work must be:

- adjustable manually or automatically depend on the type of work involved, and
- readily adjustable without the use of tools.

1.8.3 Specific requirements for protective devices

Protective devices must be designed and incorporated into the control system so that:

- moving parts cannot start up while they are within the operator's reach
- persons cannot reach moving parts while the parts are moving, and
- the absence or failure of one of their components prevents starting or stops the moving part.

Protective devices must be adjustable only by means of an intentional action.

1.9 Risks due to other hazards

1.9.1 Electricity supply

Where plant requires an electricity supply the plant must be designed, constructed and equipped to ensure that all hazards of an electrical nature are or can be prevented.

Specific regulations relating to electrical equipment designed for use within certain voltage limits must apply to plant which is subject to those limits.

Obligations concerning conformity assessment and the placing on the market and/or putting into service of plant with regard to electrical hazards are governed by relevant Australian standards or regulations.

1.9.2 Static electricity

Plant must be designed and constructed to prevent or limit the build-up of potentially dangerous electrostatic charges and/or be fitted with a discharging system.

1.9.3 Energy supply other than electricity

Where plant is powered by a source of energy other than electricity, it must be designed, constructed and equipped so as to prevent all potential risks associated with such sources of energy.

1.9.4 Errors of fitting

Errors likely to be made when fitting or refitting certain parts, which could be a source of risk, must be made impossible by the design and construction of such parts, or failing this, by information provided on the parts and or their housings. The same information must be given on moving parts and/or their housings where the direction of movement needs to be known in order to avoid a risk.

Where necessary, the instructions must provide further information on these risks.

Where a faulty connection can be a source of risk, incorrect connections must be made impossible by design or, failing this, by information given on the elements to be connected and, where appropriate, on the means of connection.

1.9.5 Extreme temperatures

Steps must be taken to eliminate any risk of injury arising from contact with or proximity to plant parts, materials or emissions at high or very low temperatures.

The design must incorporate measures to avoid or protect against the risk of hot or very cold material being ejected.

1.9.6 Fire

Plant must be designed and constructed so as to avoid any risk of fire or overheating posed by the plant itself or by gases, liquids, dust, vapours or other substances produced or used by the plant or by ambient operating and climatic conditions.

1.9.7 Explosion

Plant must be designed and constructed so as to avoid any risk of explosion posed by the plant itself or by gases, liquids, dust, vapours or other substances produced or used by the plant.

Plant must comply, as far as the risk of explosion due to its use in a potentially explosive atmosphere is concerned, with the specific requirements of explosives regulations.

1.9.8 Noise

Plant must be designed and constructed so as to ensure that risks resulting from the emission of airborne noise are reduced to the lowest level, taking account of technical progress and the availability of means of reducing noise, in particular at source.

The level of noise emission may be assessed with reference to comparative emission data from similar plant.

1.9.9 Vibration

Plant must be designed and constructed so as to ensure that risks resulting from vibrations produced by the plant are reduced to the lowest level, taking account of technical progress and the availability of means of reducing vibration, in particular at source.

The level of vibration may be assessed with reference to comparative emission data for similar plant.

1.9.10 Radiation

Undesirable radiation emissions from plant must be eliminated or be reduced to levels that do not have adverse effects on persons.

Any functional ionising radiation emissions must be limited to the lowest level which is sufficient for the proper functioning of the plant during setting, operation and cleaning. Where a risk exists, the necessary protective measures must be taken.

Any functional non-ionising radiation emissions during setting, operation and cleaning must be limited to levels that do not have adverse effects on persons.

1.9.11 External radiation

Plant must be designed and constructed in such a way that external radiation does not interfere with its safe operation.

1.9.12 Laser radiation

Where laser equipment is used, the following should be taken into account:

- laser equipment on plant must be designed and constructed in such a way as to prevent any accidental radiation

- laser equipment on plant must be protected so that effective radiation, radiation produced by reflection or diffusion and secondary radiation is minimised and does not cause a risk to health and safety, and

- optical equipment for the observation or adjustment of laser equipment on plant must be such so that no risk to health and safety is created by laser radiation.

1.9.13 Emissions of hazardous materials and substances

Plant must be designed and constructed to minimise potential risks to health and safety due to inhalation, ingestion, contact with the skin, eyes and mucus membranes and penetration through the skin of hazardous materials and substances which it produces.

Where a hazard cannot be eliminated, the plant must be so equipped that hazardous materials and substances can be contained, evacuated, precipitated by water spraying, filtered or treated by another equally effective method.

Where the process is not totally enclosed during normal operation of the plant, the devices for containment and/or evacuation must be situated in such a way as to have the maximum effect.

1.9.14 Risk of being trapped in/by the plant

Plant must be designed, constructed or fitted with a means of preventing a person being enclosed within it, or if that is not possible, with a means to summon help.

Where the provision of such protection compromises the proper functioning of the plant (i.e. between the carrier and the slewing part of a crane), protection may take the form of physical barriers that prevent persons from entering the danger zone.

1.9.15 Risk of slipping, tripping or falling

Parts of the plant where persons are likely to move about or stand must be designed and constructed to prevent persons slipping, tripping or falling on or off these parts.

Where appropriate, these parts must be fitted with handholds that are fixed relative to the user and that enable the user to maintain their stability.

1.9.16 Lightning

Plant in need of protection against the effects of lightning while being used, must incorporate a system for conducting the resultant electrical charges to earth.

1.10 Maintenance

1.10.1 Plant maintenance

Plant adjustment and maintenance points must be located outside danger zones. It must be possible to carry out adjustment, maintenance, repair, cleaning and servicing operations when the plant is at a standstill.

If one or more of the above conditions cannot be satisfied for technical reasons, measures must be taken to ensure that these activities can be carried out safely, Section 1.5 refers.

In the case of automated plant and, where necessary, other plant dependant on it, a connecting device for mounting diagnostic fault-finding equipment must be provided.

Automated plant components which have to be changed frequently must be capable of being removed and replaced with minimum risk. Access to the components must enable these tasks to be carried out with the necessary technical means in accordance with a specified operating method.

1.10.2 Access to inspection and maintenance points

Plant must be designed and constructed so as to allow safe means of access to all areas where intervention is necessary during operation, adjustment and maintenance of the plant.

1.10.3 Isolation of energy sources

Means must be included to isolate plant from all energy sources. Such isolators must be clearly identified. They must be capable of being locked if reconnection could endanger persons. They must also be capable of being locked where an operator is unable, from any of the points to which he/she has access to check that the energy is still isolated.

In the case of plant capable of being plugged into an electricity supply, removal of the plug is sufficient, provided that the operator can check from any of the points to which they have access that the plug remains removed.

After the energy is disconnected, it must be possible to dissipate normally any energy remaining or stored in the circuits of the plant without risk to exposed persons. Excepted from this requirement is where certain circuits need to remain connected to their energy sources in order, for example, to hold parts, protect information or light interiors. In this case, specific steps must be taken to ensure operator safety.

1.10.4 Operator intervention

Plant must be designed, constructed and equipped in such a way that any need for operator intervention beyond normal operation is limited. If operator intervention cannot be avoided, it must be possible to carry out the tasks easily and safely.

1.10.5 Cleaning of internal parts

Plant must be designed and constructed in such a way that it is possible to clean internal parts which have contained hazardous substances or preparations, without entering them; any necessary unblocking should also be possible from the outside. If it is impossible to avoid entering the plant, it must be designed and constructed in such a way as to allow for cleaning, unblocking and other services to take place safely.

1.11 Information

1.11.1 Information and warnings on plant

Information and warnings on plant should preferably be provided in the form of readily understandable symbols or pictograms. Any written or verbal information or warnings will be in English and use Australian legal units of measurement[1].

[1] As specified in the *National Measurement Act 1960*

1.11.2 Information and information devices

The information needed to control plant must be provided in a form that is unambiguous and easily understood. It must not be excessive to the extent of confusing the operator.

Visual display units or any other interactive means of communication between the operator and the plant must be easily understood and easy to use.

1.11.3 Warning devices

Where the health and safety of exposed persons may be endangered by a fault in the operation of unsupervised plant, the plant must be equipped to give an appropriate acoustic or light signal as a warning.

Where plant is equipped with warning devices, these must be unambiguous and easily perceived.

The operator must have facilities to check the operation of such warning devices at all times.

1.11.4 Warning of residual risks

Where risks remain despite inherent safe design, safeguarding or complementary protective measures adopted, plant must incorporate the necessary warnings, including warning devices to alert the operator to the presence of those risks.

1.11.5 Marking of plant

All plant must be marked visibly, legibly and indelibly with the following minimum particulars:

- full business name and street address of the manufacturer
- designation of series or type
- serial number, if any
- the date of construction, and
- country of origin.
- In addition, plant designed and constructed to operate in a potentially explosive atmosphere must be marked accordingly.

All such markings must be legible, indelible and unambiguous, and be in plain English and Australian legal units of measurement units.

Plant must also bear the information relevant to its type and essential for safe use as described in Section 1.11.1.

Points for lifting plant or parts (refer to Section 1.1.4) must be clearly identified as lifting points and identify the weight/mass of the plant.

1.12 Information to be provided to the manufacturer

The design specification must include information that can be incorporated into instructions supplied with the plant to ensure that it does not represent a risk to the health and safety of persons installing, commissioning, using, maintaining or disposing of the plant, or in its vicinity, when used for its intended purpose and all foreseeable alternative uses.

The design specifications for all plant must include information relating to its safe:

- transportation
- commissioning
- use
- handling, giving the mass of the plant and its various parts where they are regularly to be transported separately
- assembly, including location where necessary
- dismantling
- storage
- adjustment, and
- maintenance (servicing and repair),

The information must include details of at least the following:

- forces that will be imposed by the plant on its supporting structure or surface during use
- where necessary, anchorage or other stability requirements
- features for dealing with foreseeable emergency situations (for example, the means to lower the work platform of a mobile elevating work platform in the event of the loss of the normal power source)
- operator competencies and physical attributes that may be necessary to safely operate the plant
- where necessary, locating the plant to minimise the risk of excessive noise
- specific instructions for the safe use of the plant where it may be used in a potentially explosive atmosphere, and
- where necessary, the intended purpose of tools which may be fitted to the plant.

The information must specify the maintenance requirements over the intended life of the plant. It must identify the critical components and provide specific information relating to their inspection and maintenance to ensure their integrity and the ongoing safe use of the plant.

The information must detail all limitations of the plant for its foreseeable usage and clearly identify the foreseeable ways in which the plant should not be used.

1.12.1 Contents of the instruction manual

Each instruction manual must contain, where applicable, at least the following information:

(a) the business name and full address of the manufacturer and of an authorised representative

(b) the designation of the plant as marked on the plant itself, except for the serial number (Section 1.11.5 refers)

(c) a declaration of conformity against a conformity assessment process appropriate to the plant, or a document setting out the contents of the declaration of conformity, showing the particulars of the plant, not necessarily including the serial number and the signature of the individual making the declaration

(d) a general description of the plant

(e) the drawings, diagrams, descriptions and explanations necessary for the use, maintenance and repair of the plant and for checking its correct functioning

(f) a description of the workstation(s) likely to be occupied by operators

(g) a description of the intended use of the plant

(h) warnings concerning ways in which the plant must not be used that experience has shown might occur

(i) assembly, installation and connection instructions, including drawings, diagrams and the means of attachment and the designation of the chassis or installation on which the plant is to be mounted

(j) instructions relating to installation and assembly for reducing noise or vibration

(k) instructions for the putting into service and use of the plant and, if necessary, instructions for the training of operators

(l) information about the residual risks that remain despite the inherent safe design measures, safeguarding and complementary protective measures adopted

(m) instructions on the protective measures to be taken by the user, including, where appropriate, the personal protective equipment to be provided

(n) the intended purpose of tools which may be fitted to the plant

(o) the conditions in which the plant meets the requirement of stability during use, transportation, assembly, dismantling when out of service, testing or foreseeable breakdowns

(p) instructions with a view to ensuring that transport, handling and storage operations can be made safely, giving the mass of the plant and of its various parts where these are regularly to be transported separately

(q) the operating method to be followed in the event of accident or breakdown; if a blockage is likely to occur, the operating method to be followed so as to enable the equipment to be safely unblocked

(r) the description of the adjustment and maintenance operations that should be carried out by the user and the preventive maintenance measures that should be observed

(s) instructions designed to enable adjustment and maintenance to be carried out safely, including the protective measures that should be taken during these operations

(t) the specifications of the spare parts to be used, when these affect the health and safety of operators, and

(u) the following information on airborne noise emissions:

- the A-weighted emission sound pressure level at workstations, where this exceeds 85 dB(A); where this level does not exceed 85 dB(A), this fact must be indicated
- the peak C-weighted instantaneous sound pressure value at workstations, where this exceeds 85db(A), and
- the A-weighted sound power level emitted by the plant, where the A-weighted emission sound pressure level at workstations exceeds 85 dB(A).

These values must be either those actually measured for the plant in question or those established on the basis of measurements taken for technically comparable plant which is representative of the plant to be produced.

In the case of very large plant, instead of the A-weighted sound power level, the A-weighted emission sound pressure levels at specified positions around the plant may be indicated. Where the recognised standards are not applied, sound levels must be measured using the most appropriate method for the plant. Whenever sound emission values are indicated the uncertainties surrounding these values must be specified.

The operating conditions of the plant during measurement and the measuring methods used must be described. Where the workstation(s) are undefined or cannot be defined, A-weighted sound pressure levels must be measured at a distance of one metre from the surface of the plant and at a height equivalent to an operator’s ear position, without taking into account any protection which may be afforded by personal hearing protectors. The position and value of the maximum sound pressure must be indicated.

(v) where plant is likely to emit non-ionising radiation which may cause harm to persons, in particular persons with active or non-active implantable medical devices, information concerning the radiation emitted for the operator and exposed persons.

1.12.2 Sales literature

Sales literature describing the plant must not contradict the instructions as regards health and safety aspects. Sales literature describing the performance characteristics of plant must contain the same information on emissions as is contained in the instructions.

2 Portable hand-held and/or hand-guided plant

2.1 General

In addition to the General Requirements contained in Section 1, portable hand-held or hand-guided plant must:

- depending on the type of plant, have a supporting surface of sufficient size and have a sufficient number of handles and supports of an appropriate size, arranged in such a way as to ensure the stability of the plant under the intended operating conditions
- except where technically impossible, or where there is an independent control device, in the case of handles which cannot be released in complete safety, be fitted with manual start and stop control devices arranged in such a way that the operator can operate them without releasing the handles
- present no risks of accidental starting and/or continued operation after the operator has released the handles. Equivalent steps must be taken if this requirement is not technically feasible, and
- permit, where necessary, visual observation of the danger zone and of the action of the tool with the material being processed.

The handles of portable plant must be designed and constructed in such a way as to make starting and stopping easily understood and readily achieved.

2.2 Instructions

Instructions must give the following information concerning vibrations transmitted by portable hand-held or hand-guided plant:

– the vibration total value to which the hand/arm is subjected, if it exceeds 2,5 m/ś. Where this value does not exceed 2,5 m/ś, this must be mentioned, and
– the uncertainty of measurement.

These values must be either those actually measured for the plant in question or those established on the basis of measurements taken for technically comparable plant which is representative of the plant to be produced.

Where a recognised measurement standard is not applied the vibration data must be measured using the most appropriate measurement code for the plant.

The operating conditions during measurement and the methods used for measurement, or the measurement standard used, must be specified.

3 Portable fixing and other impact equipment

3.1 General

In addition to the General Requirements contained in Section 1, portable fixing and other impact equipment must be designed and constructed in such a way that:

- energy is transmitted to the impacted element by the intermediary component that does not leave the device
- an enabling device prevents impact unless the equipment is positioned correctly with adequate pressure on the base material
- involuntary triggering is prevented; where necessary, an appropriate sequence of actions on the enabling device and the control device must be required to trigger an impact, and
- accidental triggering is prevented during handling or in case of shock, and
- loading and unloading actions can be carried out easily and safely.

Where necessary, it must be possible to fit the device with splinter guard(s) and the appropriate guard(s) must be provided by the manufacturer of the plant.

3.2 Instructions

The instructions must give the necessary information regarding:

- the accessories and interchangeable equipment that can be used with the plant
- the suitable fixing or other impacted elements to be used with the plant, and
- where appropriate, the suitable cartridges to be used.

4 Plant for working wood and material with similar physical characteristics

In addition to the General Requirements contained in Section 1, plant for working wood and materials with similar physical characteristics must comply with the following requirements:

(a) the plant must be designed, constructed or equipped in such a way that the piece being machined can be placed and guided in safety; where the piece is hand-held on a work-bench, the latter must be sufficiently stable during the work and must not impede the movement of the piece

(b) where the plant is likely to be used in conditions involving the risk of ejection of work pieces or parts of them, it must be designed, constructed, or equipped in such a way as to prevent such ejection, or, if this is not possible, so that the ejection does not engender risks for the operator and/or exposed persons

(c) the plant must be equipped with an automatic brake that stops the tool in a sufficiently short time if there is a risk of contact with the tool whilst it runs down, and

(d) where the tool is incorporated into a non-fully automated machine, the latter must be designed and constructed in such a way as to eliminate or reduce the risk of accidental injury.

5 Mobile plant

In addition to the General Requirements contained in Section 1, designers of mobile plant must address the requirements outlined in this Section.

5.1 Scope

This section applies to all plant that is capable of travelling by an integral power source over a supporting surface whether independently or guided, such as on rails, and relying only on gravity for stability. It includes:

- Plant whose operation requires either mobility while working or movement between a succession of working locations, or

- Plant which is operated without being moved, but which may be equipped in such a way as to enable it to be moved more easily from one place to another, such as being mounted on a trailer or fitted with wheels.

It does not include plant fitted with attachment points for relocating by crane or another lifting device where this is the only means of movement between working locations.

The ESOs contained in this section do not apply to plant that is fixed in position, including fixed plant whose components move as part of its operation.

5.1.1 Driving position

Visibility from the driving position must be such that the driver can, in complete safety to the driver and other exposed persons, operate the plant and its tools in their foreseeable conditions of use. Where necessary, appropriate devices must be provided to remedy hazards due to inadequate direct vision.

Plant on which the driver is transported must be designed and constructed in such a way that a driver's cab may be fitted provided that this does not increase the risk and that there is room for it.

When fitted, the cab must incorporate a place for the instructions needed for the driver.

5.1.2 Seating

Where there is a risk that operators or other persons transported by the plant may be ejected from the plant and/or crushed between parts of the plant and the ground should the plant roll or tip over, in particular, for plant equipped with a protective structure referred to in Section 5.4.1 or 5.4.2, their seats must include a restraint system so as to keep the persons in their seats. Such restraint systems must not restrict movements necessary for operations or movements relative to the structure caused by the suspension of the seats.

Such restraint systems should not be fitted if they increase the risk.

5.1.3 Positions for other persons

If the conditions of use provide that persons other than the driver may occasionally or regularly be carried by the plant or work on it, appropriate positions must be provided which enable them to be transported or to work on it without risk.

The second and third paragraphs of Section 5.1.1 also apply to the places provided for persons other than the driver.

5.2 Controls

5.2.1 General

The plant must include mechanisms to prevent unauthorised use of controls as far as is reasonably practicable.

In the case of remote controls, each control unit must clearly identify the plant to be controlled from that unit.

The remote control system must affect only:

- the plant in question, and
- the functions in question.

Remote controlled plant must be designed and constructed in such a way that it will respond only to signals from the intended control units.

5.2.2 Control devices

The driver must be able to actuate all control devices required to operate the plant from the driving position, except for functions which can be safely actuated only by using control devices located elsewhere.

These functions include, in particular, those for which operators other than the driver are responsible or for which the driver has to leave the driving position in order to control them safely.

Where there are pedals, they must be designed, constructed and fitted as to allow safe operation by the driver with the minimum risk of incorrect operation. They must have a slip-resistant surface and be easy to clean.

Where their operation can lead to hazards, notably dangerous movements, the control devices, except for those with preset positions, must return to the neutral position as soon as they are released by the operator.

In the case of wheeled plant, the steering system must be designed and constructed in such a way as to reduce the force of sudden movements of the steering wheel or the steering lever caused by shocks to the guide wheels.

Any control that locks the differential must allow the differential to be unlocked when the plant is moving.

The requirements for acoustic and/or visual warning signals specified in Section 1 – General Plant, apply only for mobile plant that is reversing.

5.2.3 Starting

All travel movements of self-propelled plant with a ride-on driver must be possible only if the driver is at the controls.

Where the safe operation of the plant is dependent on certain devices, such as counterweights or stabilisers, the plant must not be capable of operating until such time as they have been correctly positioned or installed.

Where, for operating purposes, plant is fitted with devices which exceed its normal clearance zone (e.g. stabilisers, jib, counterweights), the driver must be provided with the means of checking their position before moving the plant.

Where certain parts of the plant must be in a certain position to allow its safe movement, movement must only be possible once these have been placed in the requisite position. Such parts must be secured and locked where necessary. The driver must be able to confirm the correct positioning of the parts prior to moving the plant.

The design of the plant must ensure that it is not possible for unintentional movement of the plant to occur while the engine is being started.

5.2.4 Travelling function

Without prejudice to road traffic regulations, self-propelled plant and its trailers must meet the requirements for slowing down, stopping, braking and immobilisation so as to ensure safety under all the operating, load, speed, ground and gradient conditions allowed for.

The driver must be able to slow down and stop self-propelled plant by means of a main device. In the event of a failure of the main device, or in the absence of the energy supply needed to actuate the main device, an emergency device with a fully independent and easily accessible control device must be provided for slowing down and stopping.

Where safety so requires, a parking device must be provided to render stationary plant immobile. This device may be combined with one of the devices referred to above, provided that it is purely mechanical.

Remote-controlled machinery must be equipped with devices for stopping operation automatically and immediately and for preventing potentially dangerous operation in the following situations:

- if the driver loses control
- if it receives a stop signal
- if a fault is detected in a safety-related part of the system, and
- if no validation signal is detected within a specified time.

The requirement outlined in Section 1.4 does not apply to the travelling function.

5.2.5 Movement of pedestrian-controlled plant

Movement of pedestrian-controlled self-propelled plant must be possible only through sustained action on the relevant control device by the driver. In particular, it must not be possible for movement to occur while the engine is being started.

The control systems for pedestrian-controlled plant must be designed in such a way as to minimise the risks arising from inadvertent movement of the machine towards the driver, in particular:

- crushing, and
- injury from rotating tools.

The speed of travel of the plant must be compatible with the pace of driver (operator) on foot.

In the case of plant on which a rotary tool can be fitted, it must not be possible to actuate the tool when the reverse control is engaged, except where the movement of the plant results from movement of the tool. In the latter case, the reversing speed must be such that it does not endanger the driver.

5.2.6 Control circuit failure

Where power-assisted steering is fitted, a failure in its power supply must not prevent the plant from being steered during the time required to stop it.

5.3 Protection against mechanical hazards

5.3.1 Risks due to uncontrolled movements

Plant must be placed on its mobile support in such a way as to ensure that, when moved, uncontrolled oscillations of its centre of gravity do not affect its stability or exert excessive strain on its structure.

5.3.2 Risks due to moving transmission parts

By way of exception to the requirements for moving transmission parts in Chapter 1 – General Plant, in the case of engines, moveable guards preventing access to the moving parts in the engine compartment need not have interlocking devices if they have to be opened either by the use of a tool or key or by a control located in the driving position, providing the latter is in a fully enclosed cab with a lock to prevent unauthorised access.

5.4 Risks to plant occupants

5.4.1 Roll-over and tip-over

Where, in the case of self-propelled plant with a ride-on driver, operator(s) or other person(s), there is a risk of rolling or tipping over, the plant must be fitted with an appropriate protective structure, unless this increases the risk.

This structure must be such that in the event of rolling or tipping over it affords the ride-on person(s) an adequate deflection-limiting volume. The efficacy of the design must be verified by testing.

5.4.2 Falling objects

Where, in the case of self-propelled plant with a ride-on driver, operator(s) or other person(s), there is a risk due to falling objects or material, the plant must take account of this risk and be fitted with an appropriate protective structure.

The protective structure must be such that, in the event of falling objects or material, it will guarantee the ride-on person(s) an adequate deflection-limiting volume. The efficacy of the design must be verified by testing.

5.4.3 Means of access

Handholds and steps must be designed, constructed and arranged in such a way that the operators use them instinctively and do not use the control devices to assist access.

5.5 Towing devices

All plant used to tow or to be towed must be fitted with properly designed and constructed towing or coupling devices that ensure easy and secure connection and disconnection and prevent accidental disconnection during use.

Such devices should be clearly marked with the towing/towed capacity and any speed restriction that will apply when used in that mode.

Insofar as the tow-bar load so requires, such plant must be equipped with a support with a bearing surface suited to the load and the ground.

5.6 Transmission of power between self-propelled plant and recipient plant

Removable mechanical transmission devices linking self-propelled plant (or a tractor) to the first fixed bearing of recipient plant must ensure that any part that moves during operation is protected over its whole length.

On the side of the self-propelled plant (or tractor), the power take-off to which the removable mechanical transmission device is attached must be protected either by a guard fixed and linked to the self-propelled plant (or tractor) or by any other device offering equivalent protection.

It must be possible to open this guard for access to the removable transmission device. Once it is in place, there must be enough room to prevent the drive shaft damaging the guard when the plant is moving.

On the recipient plant side, the input shaft must be enclosed in a protective casing fixed to the plant.

Torque limiters or freewheels must only be fitted to universal joint transmissions on the side adjoining the driven plant. The removable mechanical transmission device must be marked accordingly.

Recipient plant, whose operation requires a removable mechanical transmission device to connect it to self-propelled plant, must have a system for attaching the removable mechanical transmission device so that, when the plant is uncoupled, the removable mechanical transmission device and its guard are protected against damage by contact with the ground or part of the plant.

The outside parts of the guard must be so designed, constructed and arranged that they cannot turn with the removable mechanical transmission device. The guard must cover the transmission to the ends of the inner jaws in the case of simple universal joints and at least to the centre of the outer joint or joints in the case of wide-angle universal joints.

If means of access to working positions are provided near to the removable mechanical transmission device, the use of the shaft guards as steps must be avoided unless the shaft guards are designed and constructed for that purpose.

5.7 Risks due to other hazards

5.7.1 Batteries

The battery housing must be designed and constructed so as to prevent the electrolyte being ejected on to the driver and operators in the event of rollover or tip-over and to avoid the accumulation of vapours in places occupied by the driver and operators.

Plant must be designed and constructed so as to ensure that the battery can be disconnected with the aid of an easily accessible device provided for that purpose.

5.7.2 Fire

Where space permits, mobile plant must either:

- allow easily accessible fire extinguishers to be fitted, or
- be provided with built-in extinguisher systems.

5.7.3 Emissions of hazardous substances

The General Requirements in Section 1 pertaining to the emissions of hazardous materials and substances do not apply where the main function of the plant is the spraying of products. However, the driver must be protected against the risk of exposure to such hazardous emissions.

5.8 Information and indicators

5.8.1 Signs, signals and warnings

All mobile plant must have signs and/or instruction plates concerning use, adjustment and maintenance, wherever necessary, so as to ensure the health and safety of persons. They must be chosen, designed, constructed and positioned in such a way as to be clearly visible and indelible.

Without prejudice to the provisions of road traffic regulations, plant with a ride-on driver must have the following equipment:

- an acoustic warning device to alert persons
- an acoustic warning device when the plant is reversing
- except for plant intended solely for underground working and having no electrical power, a system of light signals relevant to the intended conditions of use, and
- an appropriate connection between a trailer and the plant for the extension of the operation of signals to the trailer.

Remote-controlled plant which, under normal conditions of use, exposes persons to the risk of impact or crushing must be fitted with appropriate means to signal its movements or with means to protect persons against such risks. This also applies to plant which involves, when in use, the constant repetition of a forward and backward movement on a single axis where the area to the rear of the machine is not directly visible to the driver.

Plant must be constructed in such a way that the warning and signalling devices cannot be disabled unintentionally. Where it is essential for safety, such devices must be provided with the means to check that they are in good working order and their failure must be made apparent to the operator.

Where the movement of plant or its tools is particularly hazardous, signs must be provided on the plant to warn against approaching the plant while it is working; the signs must be legible at a sufficient distance to ensure the safety of persons who have to be in the vicinity.

5.8.2 Marking

The following must be shown legibly and indelibly on all mobile plant:

- nominal power expressed in kilowatts (kW)

- mass of the most usual configuration, in kilograms (kg)
- or, for plant designed to travel on public roads, the motive power of the carrier and, where appropriate
- maximum drawbar pull provided for at the coupling hook, in Newtons (N), and
- maximum vertical load provided for on the coupling hook, in Newtons (N).

5.8.3 Instructions

5.8.3.1 Vibrations

The instructions must give the following information concerning vibrations transmitted by the plant to the hand-arm system or to the whole body:

- the vibration total value to which the hand-arm system is subjected, if it exceeds 2,5 m/s2. Where this value does not exceed 2,5 m/s2, this must be mentioned
- the highest root mean square value of weighted acceleration to which the whole body is subjected, if it exceeds 0,5 m/s^2. Where this value does not exceed 0,5 m/s2, this must be mentioned, and
- the uncertainty of measurement.

These values must be either those actually measured for the plant in question or those established on the basis of measurements taken for technically comparable plant which is representative of the plant to be produced.

The operating conditions during measurement and the measurement codes used must be described.

5.8.3.2 Multiple uses

The instructions for plant allowing several uses depending on the equipment used and the instructions for the interchangeable equipment must contain the information necessary for safe assembly and use of the basic plant and the interchangeable equipment that can be fitted.

5.9 Risks relating to attachments

Attachments intended to be fitted to an item of plant must:

- be designed to fit onto that item of plant
- be operated from the normal operating position or another dedicated position that incorporates the protective features and structures required in these ESOs, and

- not expose the driver and operator to additional risks, such as placing them in the arc of a slewing component.

In addition, the item of plant must have been designed and manufactured to accommodate the function being undertaken by the attachment.

6 Plant that undertakes lifting operations

Designers of plant that undertake lifting operations must address the requirements outlined in Section 1 – General Requirements, Section 2 – Mobile Plant (where relevant) as well as the specific safety outcomes in this section.

6.1 Protection against mechanical and structural hazards

6.1.1 Risks due to lack of stability

Lifting plant must maintain its stability both in service and out of service, including all stages of transportation, assembly and dismantling, during foreseeable component failures and also during the tests carried out in accordance with the instruction handbook.

The stability must be verified by appropriate tests specified in the design specification. The tests must be carried out in the least stable configuration of the lifting plant with the maximum load, and including, where appropriate, the use of lifting attachments that may have an adverse affect on the stability.

6.1.2 Plant running on guide-rails and/or rail tracks

Lifting plant that runs on guide rails or rail tracks must be provided with devices which act on the guide rails or tracks to prevent derailment. If, despite such devices, there remains a risk of derailment or of failure of a rail or of a running component, devices must be provided which prevent the equipment, component or load from falling or the lifting plant from overturning.

6.1.3 Mechanical strength

Plant, lifting accessories and their components must be capable of withstanding the stresses to which they are subjected, both in and, where applicable, out of use, under the installation and operating conditions provided for and in all likely configurations, with due regard, to the effects of atmospheric factors and forces exerted by persons. This requirement must also be satisfied during transport, assembly and dismantling.

Plant and lifting accessories must be designed and constructed in such a way as to prevent failure from fatigue and wear, taking due account of their intended use.
The materials used must be chosen on the basis of the intended working environments, with particular regard to corrosion, abrasion, impacts, extreme temperatures, fatigue, brittleness and ageing.

Plant and lifting accessories must be designed and constructed in such a way as to withstand the overload in the static tests without permanent deformation or patent defect. Strength calculations must take account of the value of the static test coefficient chosen to guarantee an adequate level of safety. That coefficient has, as a general rule, the following values:

(a) manually-operated plant and lifting accessories: ***1,5***, and
(b) other plant: ***1,25***

Plant must be designed and constructed in such a way as to undergo, without failure, the dynamic tests carried out using the maximum working load multiplied by the dynamic test coefficient. This dynamic test coefficient is chosen so as to guarantee an adequate level of safety: the coefficient is, as a general rule, equal to ***1.1***.

As a general rule, the tests will be performed at the nominal speeds provided for. Should the control circuit of the plant allow for a number of simultaneous movements, the tests must be carried out under the least favourable conditions, as a general rule by combining the movements concerned.

6.1.4 Sheaves, pulleys, drums, wheels, ropes and chains

Sheaves, pulleys, drums and wheels must have a diameter commensurate with the size of the ropes or chains with which they can be fitted.

Drums and wheels must ensure that the ropes or chains with which they are equipped can be wound without coming off.

Except where allowed below, ropes used directly for lifting or supporting the load must not include any splicing other than at their ends.

Splicings may be used in installations which are intended by design to be modified regularly according to needs of use.

To ensure an adequate level of safety, complete ropes and their endings must have a working coefficient of at least ***5***.

To ensure an adequate level of safety, lifting chains must have a working coefficient of at least ***4***.

Appropriate tests must be performed on each type of chain and rope used directly for lifting the load and for the rope ends to verify that an adequate working coefficient has been attained.

6.1.5 Lifting accessories and their components

Lifting accessories and their components must be sized with due regard to fatigue and ageing processes for a number of operating cycles consistent with their expected life-span as specified in the operating conditions for a given application.

The working coefficient of wire-rope/rope-end configurations must be chosen in such a way as to guarantee an adequate level of safety. This coefficient is, as a general rule, equal to ***5***. Ropes must not comprise any loops or splices other than at their ends.

Where chains with welded links are used, they must be of the short-link type. The working coefficient must be chosen in such a way as to guarantee an adequate level of safety. This coefficient is, as a general rule, equal to ***4***.

The working coefficient for textile ropes and slings is dependant on the material, method of manufacture, dimensions and use. The working coefficient must be chosen in such a way as to guarantee an adequate level of safety. This coefficient is, as a general rule, equal to ***7***, provided the materials used are shown to be of very good quality and the method of manufacture is appropriate to the intended use. Should this not be the case, the coefficient is, as a general rule, set at a higher level to secure an adequate level of safety. Textile ropes or slings must not include any knots, connections or splicings other than at the ends of the sling, except in the case of an endless sling and provided for in **6.1.4**.

All metallic components making up, or used with, a sling must have a working coefficient chosen in such a way as to guarantee an adequate level of safety. This coefficient is, as a general rule, equal to ***4***.

The maximum working load for a multi-legged sling is determined on the basis of the working coefficient of the weakest leg, the number of legs and a reduction factor which depends on the slinging configuration.

In order to verify that an adequate working coefficient has been attained, the manufacturer or an authorised representative thereof, must for each component referred to in (a) and (b), perform the appropriate tests or have the tests performed.

6.1.6 Control of movements

Devices for controlling movements must act in such a way that the lifting plant on which they are installed is kept safe.

Lifting plant must be designed and constructed or fitted with devices in such a way that the amplitude of movement of its components is kept within the specified limits. The operation of such devices must, where appropriate, be preceded by a warning.

Where several fixed or rail-mounted lifting plant can be manoeuvred simultaneously in the same place, with risks of collision, such lifting plant must be designed and constructed in such a way as to make it possible to fit systems enabling these risks to be avoided.

Lifting plant must be designed and constructed in such a way that the loads cannot creep dangerously or fall freely and unexpectedly, even in the event of partial or total failure of the power supply or when the operator stops operating the machine.

It must not be possible, under normal operating conditions, to lower the load solely by friction brake, except in the case of lifting plant whose function requires it to operate that way.

Holding devices must be designed and constructed in such a way that inadvertent dropping of the loads is avoided.

6.1.7 Movements of loads during handling

The operating position of lifting plant must be located in such a way as to ensure the widest possible view of trajectories of the moving parts, in order to avoid possible collisions with persons, equipment or other plant that might be manoeuvring at the same time and liable to constitute a hazard.

Lifting plant with guided loads must be designed and constructed in such a way as to prevent persons from being injured by movement of the load, the carrier or the counterweights, if any.

6.1.8 Machinery serving fixed landings

The movement of the carrier of lifting plant serving fixed landings must be rigidly guided to and at the landings.

Scissor-lifting systems are regarded as being rigidly guided.

6.1.8.1 Access to carrier

Where persons have access to the carrier, the lifting plant must ensure that the carrier remains stationary during access, in particular while it is being loaded or unloaded.

The lifting plant must ensure that the difference in level between the carrier and the landing being served does not create a risk of tripping.

6.1.8.2 Risks due to contact with the moving carrier

The travel zone for lifting plant serving fixed landings must be rendered inaccessible during normal operation to prevent persons being exposed to the risk of being crushed or otherwise injured by the moving carriage.

When, during inspection or maintenance, there is a risk that persons situated under or above the carrier may be crushed between the carrier and any fixed parts, sufficient free space must be provided for the persons undertaking the inspection or maintenance either by means of physical refuges or by means of mechanical devices blocking the movement of the carrier.

6.1.8.3 Risk due to the load falling off the carrier

Lifting plant must prevent the load falling off the carrier.

Where there is a risk due to the load falling off the carrier, the lifting plant must be designed and constructed in such a way as to prevent this risk.

6.1.8.4 Landings

Risks due to contact of persons at landings with the moving carrier or other moving parts must be prevented.

Where there is a risk of persons falling into the travel zone when the carrier is not present at the landing/s, guards must be fitted to prevent this risk. Such guards must not open in the direction of the travel zone. They must be fitted with an interlocking device controlled by the position of the carrier that prevents:

- hazardous movements of the carrier until the guards are closed and locked, and
- hazardous opening of the guards until the carrier has stopped at the corresponding landing.

6.1.9 Fitness for purpose

When lifting plant or lifting accessories are placed on the market or are first put into service, the manufacturer or their authorised representative must ensure, by taking appropriate measures or having them taken, that the plant or the lifting accessories which are ready for use, whether manually or power-operated, can fulfil their specified functions safely.

The static and dynamic tests referred to in Section 6.1.3 must be performed on all lifting plant ready to be put into service.

Where the plant cannot be assembled in the manufacturer's premises or in the premises of their authorised representative, the appropriate measures must be taken at the place of use.

6.2 Requirements for machinery whose power source is other than manual effort

6.2.1 Control of movements

Hold-to-run control devices must be used to control the movements of the plant or its equipment. However, for partial or complete movements in which there is no risk of the load or the plant colliding, the said devices may be replaced by control devices authorising automatic stops at pre-selected positions without the operator holding a hold-to-run control device.

6.2.2 Loading control

Lifting plant with a maximum working load of not less than 1 000 kilograms or an overturning moment of not less than 40 000 Nm must be fitted with devices to warn the operator and prevent dangerous movements in the event:

- of overloading, either as a result of the maximum working load or the maximum working moment due to the load being exceeded, or
- of the overturning moment being exceeded.

Where the working load varies as a result of changes to the configuration of the lifting plant such as might occur during telescoping, luffing, slewing or moving the load along a fixed cantilever support, or by using different attachments that change the capacity of the lifting plant, the devices must function throughout the range of the working load.

6.2.3 Installations guided by ropes

Rope carriers, tractors or tractor carriers must be held by counterweights or by a device allowing permanent control of the tension.

6.3 Information and markings

6.3.1 Chains, ropes and webbing

Each length of lifting chain, rope or webbing not forming part of an assembly must bear a mark or, where this is not possible, a plate or irremovable ring bearing the name and address of the manufacturer and the identifying reference of the relevant certificate.

The certificate mentioned above must display at least the following information:

(a) the name and address of the manufacturer and, if appropriate, their authorised representative;

(b) a description of the chain, rope or webbing which includes:

- its nominal size
- its construction
- the material from which it is made
- any special metallurgical treatment applied to the material, and
- the test method used.

(c) the maximum load to which the chain or rope should be subjected in service. A range of values may be given on the basis of the intended applications.

6.3.2 Lifting accessories

Lifting accessories must display the following particulars:

- identification of the material where this information is needed for safe use, and
- the maximum working load.

In the case of lifting accessories on which marking is physically impossible, the particulars referred to above must be displayed on a plate or other equivalent means and securely affixed to the accessory.

The particulars must be legible and located in a place where they are not liable to degrade as a result of wear or jeopardise the strength of the accessory.

6.3.3 Lifting plant

The maximum working load must be prominently marked on the lifting plant. This marking must be legible, indelible and in an unambiguous form.

Where the working load depends on the configuration of the lifting plant, each operating position must be provided with a load chart indicating, preferably in diagrammatic form, by means of tables or in an electronic form, the working load permitted for each configuration and which include side wind loadings for each configuration.

Information must be provided to cover all configurations and attachments possible for the plant.

Lifting plant intended for lifting goods only, equipped with a carrier which allows access to persons, must bear a clear and indelible warning prohibiting the lifting of persons. This warning must be visible at each place where access is possible.

6.4 Instructions

6.4.1 Lifting accessories

Each lifting accessory or each commercially indivisible batch of lifting accessories must be accompanied by instructions setting out at least the following particulars:

(a) the intended use;

(b) the limits of use (particularly for lifting accessories such as magnetic or vacuum pads which do not fully comply with Section 6.1.6);

(c) instructions for assembly, use and maintenance;

(d) the static test coefficient used.

6.4.2 Lifting plant

Lifting plant must be accompanied by instructions containing information on:

a) the technical characteristics of the lifting plant, and in particular:

b) the maximum working load and, where appropriate, a copy of the load plate or load table described in the second paragraph of Section 6.3.3 above,

c) the reactions at the supports or anchors and, where appropriate, characteristics of the tracks,

d) where appropriate, the definition and the means of installation of the ballast;

e) the contents of the logbook, if the latter is not supplied with the lifting plant;

f) advice for use, particularly to offset the lack of direct vision of the load by the operator;

g) where appropriate, a test report detailing the static and dynamic tests carried out by or for the manufacturer or their authorised representative;

h) for lifting plant which is not assembled on the premises of the manufacturer in the form in which it is to be used, the necessary instructions for performing the measures referred to in Section 6.1.9 before it is first put into service.

7 Plant that lifts people

Designers of plant that lifts people must address the requirements outlined in Section 1 – General Requirements, Section 3 – Mobile Plant (if relevant), Section 4 – Plant that undertakes lifting operations (if relevant) as well as the specific safety outcomes in this section.

7.1 Scope

This chapter applies to all plant that lifts people, including plant that is powered by manual effort. Plant that lifts people is classified as plant that provides the force necessary to lift a load, including persons, and which supports the load, either directly on a carrier or indirectly via lifting accessories, during the lifting operation.

This chapter does not apply to passenger lifts. The ESOs for such plant are given in Section 10 – Lifts. Plant not specifically designed to lift people but used for that task must meet these ESOs as far as is reasonably practicable.

7.2 General

7.2.1 Mechanical strength

The carrier, including any trapdoors, must be designed and constructed in such a way as to offer the space and strength corresponding to the maximum number of persons permitted on the carrier and the maximum working load.

The working coefficients for components set out in Sections 6.1.4 and 6.1.5 are inadequate for plant intended for the lifting of persons and must, as a general rule, be doubled. Machinery intended for lifting persons or persons and goods must be fitted with a suspension or supporting system for the carrier designed and constructed in such a way as to ensure an adequate overall level of safety and to prevent the risk of the carrier falling.

Plant intended for lifting people or people and goods must be fitted with a suspension or supporting system for the carrier designed and constructed in such a way as to ensure an adequate overall level of safety and to prevent the risk of the carrier falling.

If ropes or chains are used to suspend the carrier, as a general rule, at least two independent ropes or chains are required, each with its own anchorage.

7.2.2 Loading control for plant moved by power other than human strength

The requirements of Section 4.2.2 apply regardless of the maximum working load and overturning moment, unless the manufacturer can demonstrate that there is no risk of overloading or overturning.

7.3 Control devices

Where safety requirements do not impose other solutions, the carrier must, as a general rule, be designed and constructed in such a way that persons in the carrier have means of controlling upward and downward movements and, if appropriate, other movements of the carrier.

In operation, those control devices must override any other devices controlling the same movement with the exception of emergency stop devices.

The control devices for these movements must be of the hold-to-run type except where the carrier itself is completely enclosed.

7.4 Risks to persons in or on the carrier

7.4.1 Risks due to movements of the carrier

Plant that lifts people must be designed, constructed or equipped in such a way that the acceleration or deceleration of the carrier does not engender risks for persons.

7.4.2 Risks of persons falling from the carrier

The carrier must not tilt to an extent which creates a risk of the occupants falling, including when the plant and carrier are moving.

Where the carrier is designed as a work station, provision must be made to ensure stability and to prevent hazardous movements.

If the measures referred to in Section 1.9.15 are not adequate, carriers must be fitted with a sufficient number of suitable anchorage points for the number of persons permitted on the carrier. The anchorage points must be strong enough for the use of personal protective equipment against falls from a height. Any trapdoor in floors or ceilings or side doors must be designed and constructed in such a way as to prevent inadvertent opening and must open in a direction that obviates any risk of falling, should they open unexpectedly.

7.4.3 Risks due to objects falling on the carrier

Where there is a risk of objects falling on the carrier and endangering persons, the carrier must be equipped with a protective roof.

7.5 Machinery serving fixed landings

7.5.1 Risks to persons in or on the carrier

The carrier must be designed and constructed in such a way to prevent risks due to contact between persons and/or objects in or on the carrier with any fixed or moving elements. Where necessary in order to fulfil this requirement, the carrier itself must be completely enclosed with doors fitted with an interlocking device that prevents hazardous movements of the carrier unless the doors are closed. The doors must remain closed if the carrier stops between landings where there is a risk of falling from the carrier.

Plant that lifts people must be designed, constructed and, where necessary, equipped with devices in such a way as to prevent uncontrolled upward or downward movement of the carrier. These devices must be able to stop the carrier at 110 per cent of its working load and at the foreseeable maximum speed.

The stopping action must not cause deceleration harmful to the occupants, whatever the load conditions.

7.5.2 Control at landings

Controls, other than those for emergency use, at landings must not initiate movements of the carrier when:

- the control devices in the carrier are being operated, and
- the carrier is not at a landing.

7.5.3 Access to the carrier

The guards at the landings and on the carrier must be designed and constructed in such a way as to ensure safe transfer to and from the carrier, taking into consideration the foreseeable range of goods and persons to be lifted.

7.6 Information and markings

The carrier must bear the information, in plain English, necessary to ensure safety including:

- the number of persons permitted on the carrier, and
- the maximum working load in kilograms.

8 Amusement structures

Designers of Amusement Structures must address the requirements outlined in Section 1 – General Requirements as well as the specific safety outcomes in this section.

8.1 Scope

This section applies to the design of fixed and portable amusement structures, including land-borne inflatable devices, slides and high rope courses.

The following items are excluded from the scope of this chapter:

- rides or devices when operated under the control of public transport legislation
- aircraft
- seagoing vessels and mobile offshore units together with equipment on board such vessels or units
- miniature trains and railway systems owned and operated by model railway societies, clubs or associations, and
- plant specifically designed and used for sporting, professional stunt, theatrical or acrobatic activities.

8.2 Design loads

8.2.1 General

The loads to be employed in design computations must include the following:

- dead loads are gravitational force as a result of all fixed or moving components on the amusement structure, and
- live loads are to include all maximum possible forces (including operator or patron induced) arising from movement of patrons (traffic areas) and the motion/s of the amusement device. The minimum load for calculations purposes must be the maximum foreseeable weight of the patron/s that can fit on or in the vehicle.

8.2.2 Working loads

Amusement devices must be designed and constructed in such a way that they remain stable under the working load in its least stable configuration.

Working loads must include the loads applied to or within the structure or its components due to the motional behaviour of the ride or device or due to the motion of patrons upon the surface or within the system. Typically, they are occasioned by release of potential or kinetic energy, acceleration, braking, rotational, translational, centrifugal, gyroscopic and Coriolis force effects.

A comprehensive analysis of the motional behaviour of a ride or device, including its foundation system, must be made so that all forces and moments and their ranges of magnitude and direction are estimated for all the components and connections that make up the system.

The analysis must consider the effects of partial loading and unbalanced loading, unless such probabilities are made impossible by the design of the system. In particular, the conditions of emergency braking and any extraordinary motion thereby created must be checked.

The analysis must consider the frequencies of all working loads and moments determined, and must link such frequencies to the magnitudes and ranges so that a later check for fatigue may be made.

8.2.3 Effect of impact

Where impact is a feature of the motion of an amusement ride or device, the effects of such impacts must be catered for by the inclusion in the system of appropriate buffering elements of known characteristics from which the impact forces must be estimated.

8.2.4 Wind loads

For all structures that support, house or protect, or are otherwise associated with an amusement ride or device, wind loads must be considered in the analysis of the loading of the system.

Basic wind velocities must be taken as follows:

(a) *Mobile rides:*

(i) nominal out of service 46 m/s.
(ii) minimum in service (operating) 20 m/s.

The design out of service wind loading for mobile rides may be modified with specific agreement between purchaser and manufacturer. The designer must provide information on the design out of service wind loading so that the operator can dismantle and secure the ride in out of service wind conditions. The safe operation manual must include information on the design out of service wind loading with advice to the operator to dismantle and secure the ride in out of service wind conditions.

(b) *Fixed rides:*

(i) out of service 50 years return period maximum at site, and
(ii) minimum in service (operating) 20 m/s.

For both mobile and fixed rides, the designer must provide information on maximum in service wind velocity, which by design may be higher than the minimum specified above. The information will enable the operator to operate the ride within the design limits.

For calculation of the wind load generated by the motion of the amusement structure, where such loading has any effect on the structural or connective elements of the system, the wind velocity taken must be that due to the maximum velocity of the moving element under consideration, and forces must be estimated on the basis of the projected area(s) of the element and drag coefficients (shape).

8.2.5 Seismic (earthquake) loadings

Loadings generated by earthquakes or seismic activity must be considered in the design of all structures which support, house or are otherwise associated with any amusement ride or device fixed on a permanent foundation.

In the case of mobile or temporary unfounded amusement structure, the designer must consider seismic activity and consequent loadings, and the capacity of the device to withstand such activity must be specified in the operation and maintenance manual.

8.2.6 Other special loadings

Special loadings must be considered in the design of an amusement structure, unless their occurrence is precluded by special provisions or by virtue of the basic arrangement of the system:

(a) loads due to expansion, or contraction due to temperature changes
(b) pre-tensioning effects on membrane structures and supports
(c) pounding of rain or hail
(d) snow
(e) differential settlement of foundations or improper founding at set-up
(f) forces due to handling or erection
(g) forces due to unusual conditions, e.g. cyclic vibration
(h) hydrostatic loads or wave forces, and
(i) test loads.

8.2.7 Load combinations

The device, its structure, and its components must be designed to withstand the vector combination of the loadings which produces the most adverse conditions in the component or structure under consideration.

Analysis of stress and deflection for all structural elements comprising the amusement ride or device must be made on the basis of the vector sum of loadings.

8.3 Containment and restraints

8.3.1 Application

Containment and restraint of patrons must be installed where, because of the nature and arrangement of the device, patrons can:

- place themselves or others in jeopardy through not remaining within the confines of the designated riding position for the duration of the ride cycle;
- be at risk of injury because of relativity of motion between the riding position and an adjacent structure;
- be displaced suddenly or unexpectedly within the vehicle; or
- be ejected from the designated riding position by the inherent motion of the device.

8.3.2 Provision of restraints due to acceleration and seat inclination

Restraint devices must be provided in cases where it is reasonably foreseeable that patrons could be lifted or ejected from their seats or riding positions by the acceleration of the amusement ride or device, or by seat inclination, during the ride or device cycle and other reasonably foreseeable situations, e.g. the application of emergency brakes or vehicles stopped in inverted positions motion of the amusement structure, including acceleration, braking (including emergency braking), seat inclination and ride movements.

The coordinate system shown in Figure 1 must be used as the standard reference for acceleration directions, including the application of the different means of restraint in accordance with the criteria of the restraint diagram shown in Figure 2.

The restraint diagram in Figure 2 must be used as part of the risk assessment for determining if a restraint is required and, if required, what type. Figure 2 identifies and graphically illustrates five distinct areas of theoretical acceleration. Each of the five distinct areas may require a different type of restraint. Figure 2 applies for sustained acceleration levels only. It is not applicable to impact accelerations.

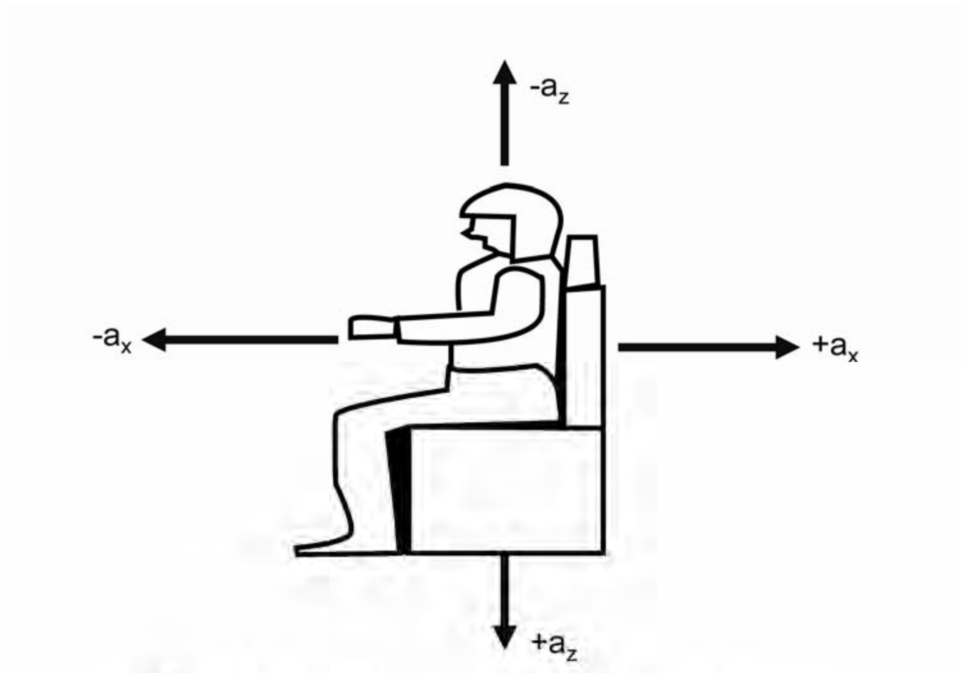

Figure 1– Coordinate axes reference for Acceleration Diagram

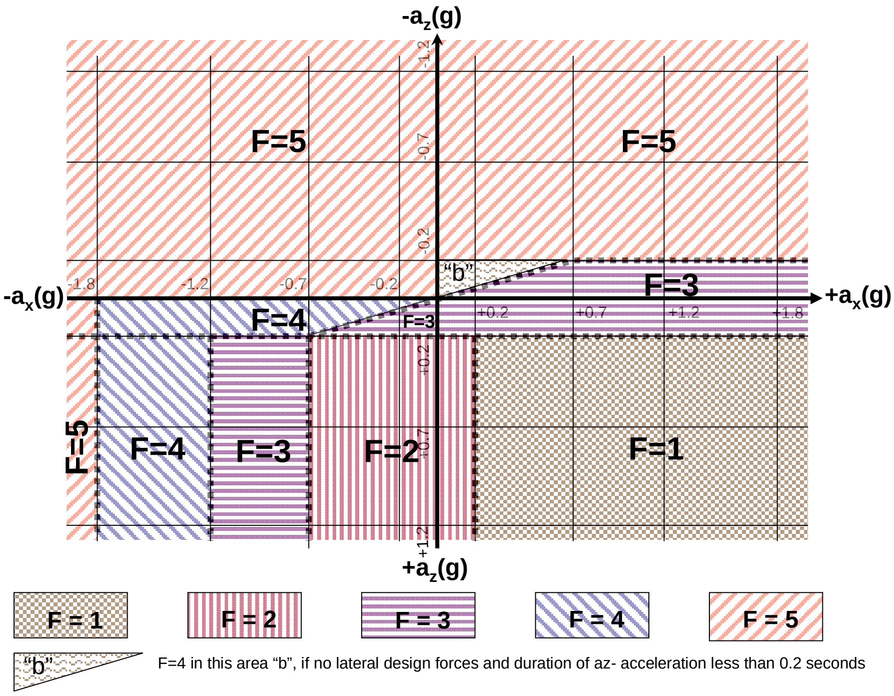

Figure 2 - Acceleration Diagram showing Value of Ejection Force Factor, F

8.3.3 Restraint criteria

With respect to Areas 1 to 5 in Figure 2, restraint Types 1 to 5 set out in the following sections must be used as a minimum unless modified in accordance with the section on other containment and restraint considerations.

8.3.4 Area 1

A Type 1 restraint is defined as unrestrained or no restraint at all.

Based solely on Area 1 dynamic forces, no restraint is required however, other criteria in the risk assessment may require a higher level of restraint.

8.3.5 Area 2

A Type 2 restraint is required unless patrons are provided sufficient support and the means to react to the forces, e.g. handrails, footrests or other devices. A Type 2 restraint is generally defined as a latching restraint device for each individual patron or a latching collective restraint device for more than one patron.

Type 2 restraints are devices or systems of components that inhibit patrons from leaving the correct ride position under normal ride forces and ride conditions, however, patrons are not restricted from leaving this position if they choose.

Examples of Type 2 restraints include lap bars, seat belts and lap or waist chains.

A Type 2 restraint must have at least the following characteristics:

- *number of patrons per restraint device* The restraint device may be for an individual patron or it may be a collective device for more than one patron
- *final latching position relative to the patron* The final latching position may be fixed or variable in relation to the patron
- *latching* The patron or operator may latch the restraint
- *unlatching* The patron or operator may unlatch the restraint
- *confirmation of status* The design must allow the operator to perform a visual or manual check of the restraint each ride cycle
- *means of activation* The restraint may be manually or automatically (e.g. motorised) opened or closed, and
- *Redundancy of latching device* Redundancy is not required.

8.3.6 Area 3

A Type 3 restraint is required. A Type 3 restraint is generally defined as a locking restraint device for an individual patron or a locking collective restraint device for more than one patron.

A Type 3 restraint must have at least the following characteristics:

- *number of patrons per restraint device* The restraint device may be for an individual patron or it may be a collective device for more than one patron

- *final locking position relative to the patron* The final locking position must be variable in relation to the patron, e.g. a bar or rail with multiple latching positions

- *locking* The patron or operator may manually lock the restraint or it may be automatic. The manufacturer must provide instructions that the operator must verify the restraint device is locked

- *unlocking* The operator manually or automatically unlocks the restraint

- *confirmation of status* The design must allow the operator to perform a visual or manual check of the restraint each ride cycle

- *means of activation* The restraint may be manually or automatically (e.g. motorised) opened or closed, and

- *redundancy of locking device* Redundancy is not required.

8.3.7 Area 4

A Type 4 restraint is required. A Type 4 restraint is generally defined as a locking restraint device for an individual patron.

A Type 4 restraint is a device or system of components designed to ensure the patron cannot leave the correct ride position either by (normal or unusual) forces exerted by the ride or self-movement. The patron cannot unlock the restraint while on the ride.

Examples of Type 4 restraint systems include individually adjustable lap bars, seat belts, lap, waist and crotch straps and chains and over shoulder restraints.

A Type 4 restraint must have at least the following characteristics:

- *number of patrons per restraint device* A restraint device must be for each individual patron

- *final locking position relative to the patron* The final locking position must be variable in relation to the patron, e.g. a bar with multiple locking positions

- *locking* The restraint device must be automatically locked

- *unlocking only* The operator must manually or automatically unlock the restraint

- *confirmation of status* The design must allow the operator to perform a visual or manual check of the restraint each ride cycle

- *means of activation* The restraint may be manually or automatically (e.g. motorised) opened or closed, and

- *redundancy of locking device* Redundancy must be provided for the locking device function.

8.3.8 Area 5

A Type 5 restraint is required.

A Type 5 restraint is a device or system of components specifically designed and provided to confine a patron to, and support the patron in, a unique position and in an appropriate posture which, while retained, ensures that forces produced by the action of the ride in both normal and unusual (e.g. emergency) circumstances and acting on the patron, do not cause the ejection of the patron from the ride. Patrons cannot unlock the restraint.

Examples of Type 5 restraint systems include lap and lap 'T' bars and over shoulder devices with crushable bolsters, body harnesses and other systems and combinations associated, typically, with body contour moulded seats or beds where the restraint precludes the patron from moving from the designed position and posture.

A Type 5 restraint must have at least the following characteristics:

a) *number of patrons per restraint device* A restraint device must be for each individual patron

b) *final locking position relative to the patron* The final locking position must be variable in relation to the patron, e.g. a bar with multiple locking positions

c) *locking* The restraint device must be automatically locked

d) *unlocking* Only the operator must manually or automatically unlock the restraint

e) *confirmation of status* An interlock and external indicator is required. If the interlock system detects a fault in the monitored restraint device, the ride must be brought to a cycle stop or cycle start must be inhibited. The interlock system must comply with the requirements for safety control systems

f) *means of activation* The restraint may be manually or automatically (e.g. motorised) opened or closed

g) *redundancy of locking device* Redundancy must be provided for the locking device function, and

h) *restraint configuration* Two restraints, e.g. shoulder and lap bar, or one fail-safe restraint device must be provided.

8.3.9 Secondary restraints for Type 5

A Type 5 restraint configuration may be achieved by the use of two independent restraints or one fail-safe restraint. When two independent restraints are used, the secondary restraint device may be an individual locking restraint device or a collective locking restraint device. The secondary restraint device must have at least the following characteristics:

a) *number of patrons per restraint device* The restraint device may be for an individual patron or it may be a collective device for more than one patron

b) *final locking position relative to the patron* The final locking position may be fixed or variable in relation to the patron

c) *locking only* The operator must be able to manually or automatically lock the restraint

d) *unlocking only* The operator must be able to manually or automatically unlock the restraint

e) *confirmation of status* The design must allow the operator to perform a visual or manual check of the restraint each ride cycle

f) *means of activation* The restraint may be manually or automatically (e.g. motorised) opened or closed, and

g) *redundancy of locking device* Redundancy is not required. The locking and unlocking of the secondary restraint must be independent of the primary restraint.

Table 1 summarises the various restraint types and their characteristics.

Secondary safety devices such as latching belts, straps or other devices that limit the travel of a primary restraint device are acceptable.

The design of the patron restraint and patron containment system are inter-related and should be coordinated with each other while addressing the intent of the amusement ride or device. Generally a highly contoured seat and lateral support in combination with the restraints may be the most desirable design.

The secondary device must be able to restrain the patron in case of failure of the primary restraint.

TABLE 1

SUMMARY OF RESTRAINT SYSTEM TYPES AND CHARACTERISTICS

	Type of restraint					
	1	2	3	4	5	Secondary 5
(a) Number of patrons per restraint						
No restraint required	●					
Individual or collective device		●	●			●
Individual restraint device for each patron				●	●	
(b) Final latching/locking position in relation to the patron						
Fixed or variable		●				●
Variable in relation to patron			●	●	●	
(c) Latching/locking						
Patron or operator manually latch/lock restraint or it is automatic. Operator required to verify it is latched/locked.		●	●			
Restraint device is automatically locked				●	●	
Only the operator may manually or automatically lock the restraint						●
(d) Unlatching/unlocking						
Patron or operator may unlatch restraint		●				
Only operator manually or automatically unlatches/unlocks the restraint			●	●	●	●
(e) Confirmation of status						
Design allows operator to visually or manually check each cycle		●	●	●		●
Interlock and external indicator required. Failure stops or inhibits cycle start					●	
(f) Means of activation						
Manually or automatically opened/closed		●	●	●	●	●
(g) Redundancy of latching/locking device						
Redundancy is not required		●	●			●
Redundancy required for locking device function				●	●	
Redundancy not required. Locking and unlocking of secondary restraint to be independent of primary restraint.						●
(h) Restraint configuration						
Two restraints, e.g. shoulder and lap bar, or one fail-safe restraint					●	

LEGEND:
- ● required characteristic

8.3.10 Other containment and restraint considerations

The application of Figure 2 is intended as a design guide. The patron containment and restraint risk assessment may indicate the need to consider another level of restraint (either higher or lower) or a form of containment.

Any special situation must be taken into consideration in designing the containment and restraint system. The plant restraint must be designed to accommodate special situations where they exist unless this increases the risk in which case another solution for ensuring safety must be applied.

8.4 Crowd control barriers

8.4.1 General

An amusement device must be provided with fences, handrails, guards and temporary barriers or other apparatus and controls as may be necessary to:

- confine operating staff and patrons within the boundaries of the device to safe areas;
- ensure the safety of persons in the vicinity of the device (e.g. spectators, passers-by and those queuing to use the device) other than patrons using the device when it is in operation; and
- ensure the safety of maintenance staff.

Sectional fences and railings not permanently fixed to an amusement device must be arranged to interlock and must remain stable against a horizontal force of 400 N, applied at a level of 1 m above their base in the direction of access.

8.4.2 Crowd control barriers

Crowd control barriers, where provided, must:

- delineate the zone of concern;
- be not less than 1 m in height above adjacent surfaces; and
- be constructed to effectively prevent any person from moving through it or under it, thus impeding unaided access to the zone of concern.

8.5 Maintenance of critical safety components

The designer of amusement structures must identify, and provide information on, all critical safety components contained on the structure. For each and every critical safety component identified, the designer must provide information on the following:

- design life
- maintenance requirements, including maintenance procedures and frequencies.
- inspection requirements, including the Non Destructive Testing (NDT) regime. NDT regime must include information on test types, test frequencies and acceptance criteria.

In determining the design life and NDT regime, consideration must also be given to the vibration effects as well as the wear and tear of rides that are transported.

8.6 Testing

8.6.1 General

Before being initially put into service, an amusement ride or device must undergo the following tests, as appropriate to the device:

- load test
- out-of-balance test
- testing to prove the effectiveness of evacuation procedures, control devices, speed-limiting devices, interlock control systems, brakes and other equipment provided for safe operation
- hydraulic system test
- pneumatic system test, and
- electrical test

8.6.2 Load test

The load test must be carried out by operating the device at the nominal full speed and service condition, with each patron-carrying vehicle loaded as recommended by the designer, but not exceeding 100% of the design load.

The device must operate satisfactorily at the specified design load rating without any adverse effects on any of its parts.

8.6.3 Out-of-balance test

Where the design of an amusement ride or device caters for a degree of out-of-balance loading, the designer must specify the appropriate test to confirm the strength and stability of the device according to the design. The specified out-of-balance test must be carried out and its results documented by the designer or other competent person. Where such permissible out-of-balance is a feature of the design, it must be confirmed, as part of the test, that the limits for out-of-balance operation are as specified in the operation and maintenance manual for the device.

Where specific data is not provided by the designer, or is not specified in the operation and maintenance manual, a competent person must assess the amusement structure and establish appropriate limits for out-of-balance loading. The device must be tested under the conditions established and must be considered to have passed the test, provided no adverse vibration, harmonic oscillation or movement relative to footings and foundations are witnessed. Upon completion of such a test, the limits determined must be noted in the operation and maintenance manual as limits for operation.

8.6.4 Hydraulic or pneumatic system test

The following tests must be conducted to establish the integrity of a hydraulic or pneumatic system and its components, in accordance with the specifications supplied by the manufacturer or designer:

- operational tests to prove the correct operation of the system and all safety devices.

- pressure tests to test each part of the system at the maximum working pressure sustained under all conditions of intended use.

8.6.5 Electrical test

Electrical testing must be performed during initial and subsequent testing to establish the amusement structure is electrically safe and that the safety control systems function in accordance with the design.

8.6.6 Certification

Testing at the completion of initial installation and commissioning (as appropriate) must be conducted in the presence of either the designer or the competent person nominated by the designer. Such tests must be conducted in accordance with the schedule prescribed by the designer. Upon completion of the schedule of tests and their associated reports, the designer or nominated competent person must certify in writing to the manufacturer, owner or proprietor of the device, that the device has been tested in accordance with this Section.

8.6.7 Device registration and logging of tests

The designer (or competent person nominated by the designer) must provide all test data required for the registration of an amusement device and the log for the device.

9 Scaffolding components and pre-fabricated scaffolding

Designers of scaffolding components and pre-fabricated scaffolding must address the requirements outlined in section – 1 General Requirements, as well as the specific requirements in this chapter, for component parts of scaffolding used to provide temporary support and/or access during the process of construction, renovation or demolition of a building or structure and, in undertaking other work where there is a need to provide a temporary working platform or support.

9.1 Scope

This chapter applies to component parts or pre-fabricated elements intended for use in the erection of temporary supporting structures and that typically require them to be re-used on multiple occasions and in multiple configurations. The structures may constitute scaffolds commonly known as modular, frame or tower frame scaffolds.

For the purposes of this chapter, components and/or pre-fabricated elements are defined as those including, but not limited to, tube and coupler components, working decks, façade bracing components, screens, catch platforms, landings, stair units, ladders, gin wheels, boatswains chairs, cradles, suspended platforms, components used for fixing to structures, cantilevered scaffolds, scaffold or formwork supports, and items of a type that will be used to provide temporary support for persons or materials in an elevated position.

In order to satisfy the safety requirements for scaffolding, designers and manufacturers must ensure that components and/or pre-fabricated scaffolding elements provide strength, stability and rigidity in structures formed from them, when such structures have been erected by suitably competent workers.

The items must be able to withstand the handling associated with scaffolding. The components or pre-fabricated elements must also have the strength and structural integrity to ensure the safety of persons engaged in the erection, alteration and dismantling of structures formed from the items and, that the safety of persons in the vicinity of the structures, is not undermined in the event of a failure of a component.

9.1.1 Materials

Scaffolding components must be manufactured from materials appropriate to the most adverse load conditions they will be subjected to in use and with a safety margin appropriate to the loads that will be applied to the components in use.

Such loads include the dead load, environmental loads and live loads which include the weight of persons likely to be using the scaffold, the weight of materials and debris, the weight of tools and equipment and, impact forces and the compounding effect of those loads.

Designers will provide information to manufacturers as to how the loads have been calculated and manufacturers will indicate the process they have undertaken to ensure that the components or pre-fabricated elements meet those requirements. The information will be provided in a form that will enable the information to be included in a technical file and/or handover certificate and will support the determination of:

- duty loadings
- maximum height to which the scaffolding can be erected,
- maximum number of working platforms that can be installed on the scaffold, and
- foundation loadings.

Designers and manufacturers of scaffolding and pre-fabricated scaffolding elements will ensure that the materials and fabrication methods specified for components that will form working platforms provide for slip-resistant surfaces and do not present trip hazards when in use.

Materials, such as timber decks used to form working platforms or fabrics used for protective screens, will be treated so as not to support the spread of fire.

9.1.2 Dimensional stability

Scaffolding and pre-fabricated scaffolding elements must be designed and manufactured to dimensional tolerances appropriate to the materials used in their manufacture, and, to their intended use. Where extensive structures created from the components or pre-fabricated elements are envisaged, the dimensional stability and potential interchangeability of the components must not limit this.

9.1.3 Manufacture

Scaffolding and pre-fabricated elements must be designed and manufactured so as to resist the forces likely to be applied to them in use. Manufacturers of components will ensure that the materials used in the manufacture of the components, and the manufacturing and/or fabrication techniques used in the manufacture of pre-fabricated scaffold elements will provide the level of structural integrity required of the finished item.

9.1.4 Testing

Designers of scaffolding components or pre-fabricated scaffolding elements will provide the manufacturer with advice regarding the test requirements that must be applied to the items in the manufacturing phase, and, details of the test requirements that must be applied to the items during their service life.

9.1.5 Maintenance requirements

Designers and manufacturers will provide clear guidance to users of the items regarding the requirements for maintaining the items over their service life. The purpose of this requirement being to enable action can be taken to ensure the quarantining of items that are in a condition unsuitable for continuing use.

9.1.6 Marking

Where the size of the component permits, a permanent means of providing information to users regarding:

- the manufacturer
- designation of series or type
- serial number/s
- date of construction
- country of origin
- standards used for manufacture, and
- any other information indicated in Chapter 1, *Marking*.

Where the size of components makes the marking of individual components impossible, the manufacturer will provide the information in an abbreviated form on the component part and provide the complete set of information in a form that can be used to develop the technical file and handover certificate for the completed structure. The minimum marking possible on any item will be the manufacturers name and/or trademark.

In addition to the General Requirements in Section 1, manufacturers of components and pre-fabricated scaffolding elements will provide additional advice to users of the items regarding the care, maintenance, transport, and storage of the items and the method of determining when an item has exceeded its service life.

9.1.7 Minimum sizes

Designers and manufacturers of components intended for use in the construction of tube and coupler type scaffolding must ensure that components are based on tubing having a minimum outside diameter of 47.5 mm and have a wall thickness relative to that required for the grade of metal used to form the tube.

The size of individual components should not be less than the size permissible for the intended application. Component sizes should not allow for the use of the component in structures for which it was not designed. For example, pre-fabricated platform decks must be of a size and strength relating their use in light duty, medium duty or heavy duty scaffolds and it should not be possible to use components rated for light duty in heavy duty scaffolds.

Pre-fabricated scaffolding elements will be of a size that will enable the user to manipulate the elements safely while working at heights.

9.1.8 Corrosion protection

Manufacturers of scaffolding or pre-fabricated scaffold elements will ensure that items manufactured by them are protected from corrosion and provide information to the user of the items regarding the corrosion resistance of the items manufactured by them.

Manufacturers must provide users of the items with any specific requirements for protecting the items from corrosion during the expected service life of the item.

9.1.9 Adjustability

Designers and manufacturers of scaffolding and/or pre-fabricated scaffolding elements should provide sufficient adjustability to cater for reasonable adjustment for on-site conditions without limiting the structural integrity of either the item/s or structures formed from the item/s.

The range of adjustability for critical components should prevent the possibility of such components being used in situations where they will always be set at the extreme limits of their structural integrity.

9.1.10 Rigidity of completed structures

Scaffolding and pre-fabricated scaffolding elements will be designed and manufactured so that structures formed from them provide a level of rigidity that will allow for the safety of persons working on or around the structures and, enable the structures to resist the loads that will be applied to them in use.

Scaffolding and pre-fabricated scaffolding elements that are intended for use in large-scale configurations will be designed in such a way as to incorporate the use of secondary supports at appropriate intervals to ensure rigidity. Advice to end-users on the correct means incorporating those supports will be provided.

9.1.11 Lifting points

Where it is intended that pre-fabricated scaffolding elements are to be lifted into position, the designer will provide the manufacturer with information on where to incorporate properly engineered lifting points within the item along with information regarding the mass of the item, and the necessity for any special lifting equipment such as load spreaders, slings and the like. The information relating to mass and lifting will be fixed to each component intended to be lifted or hoisted into place.

9.1.12 Components that permit lifting of goods, materials or persons

Where scaffolding components will be used to lift goods or materials or, where the components will be used to support workers in a suspended position, the components must be designed and manufactured in accordance with the requirements for Plant that Undertakes Lifting Operations Section 6, and those for Plant that Lifts People, contained in section 7.

The designer of components that lift goods, materials or people must provide the manufacturer of those components with information regarding the minimum specification of materials that can be used in their manufacture, and the test regime that must be undertaken by users to assure the continuing serviceability of the components.

All components that are intended for the lifting of goods, materials or persons, will be supplied with information to the user as to the intended life, or use cycles at maximum loads, of the item, the care and maintenance requirements and the specific requirements for the routine testing of the components.

Advice to users on the minimum configuration of components, in addition to the maximum loads to be placed on the components in that configuration, will be provided at the point of manufacture and will accompany each component in a form that is described in Section 1, 11.5, Marking of Plant.

9.1.13 Components intended to provide temporary protection

Components intended to provide protection to either workers or passers-by, such as toe-boards, catch nets or platforms, screens to prevent persons of materials falling from heights, components intended to support fall-arrest systems, scaffolding braces or props, and the like, must be designed to ensure that the components are capable of manufacture and subsequent use in a way that will provide the user with the level of protection required.

Such components must be designed and manufactured so as to be able to resist the forces defined in the General Requirements, Edge Protection, Section 1.1.6 1.

The manufacturer of those components must ensure that information regarding the correct installation of the components is provided so as to afford the protection for which the component was initially designed.

Only those components that have been designed and manufactured to provide specific protective solutions will be marked as such, with the intent that inadequate components are not used in situations where the safety of workers or passers-by is paramount.

10 Lifts

Designers of Lifts must address the requirements outlined in Section1 – General Requirements as well as the specific safety requirements contained in this section.

10.1 Scope

This chapter applies to lifts permanently serving buildings and structures. It also applies to the safety components for use in such lifts.

This chapter does not apply to:

- cableways, including funicular railways, for the public or private transportation of persons
- lifts specially designed and constructed for military or police purposes
- mine winding gear
- theatre elevators
- lifts fitted in means of transport
- lifts connected to plant and intended exclusively for access to the workplace
- rack and pinion trains, and
- construction-site hoists with a travelling speed of less than 0,15m/s that intended for lifting persons or persons and goods.

For the purposes of this chapter:

- the ‘installer of a lift’ means the person who takes responsibility for the design, manufacture, installation and placing on the market of the lift and who provides the declaration of conformity
- ‘placing on the market of the lift’ occurs when the installer first makes the lift available to the user
- ‘safety component’ means a component as listed in Section 10.1.1 and is a component which fulfills a safety function when in use and the failure or malfunctioning of which endangers the safety of persons travelling in or working on the lift
- the ‘manufacturer of the safety components’ means the natural or legal person who takes responsibility for the design and manufacture of the safety components and who provides the declaration of conformity, and
- a ‘model lift’ shall mean a representative lift whose technical file shows the way in which the essential safety requirements will be met for lifts which conform to the model lift defined by objective parameters and which uses identical safety components.

All permitted variations between the production model and the lifts forming part of the lifts derived from the production model must be clearly specified (with maximum and minimum values) in the technical file.

By calculation and/or on the basis of design plans it is permitted to demonstrate the similarity of a range of equipment to satisfy the essential safety outcomes.

Where, for lifts, the risks referred to in this chapter are wholly or partly covered by specific chapters, this chapter does not apply or shall cease to apply in the case of such lifts and such risks as from application of those specific ESOs.

10.2 General

10.2.1 Safety component/s

The designer must consider all safety components that are to be used for the purposes of the design and provide a statement that the safety components are suited for the design of the lift. In particular, documentation or instructions on safety components used in the lift must contain the following information:

- name and address of the manufacturer of the safety component
- where appropriate, name and address of the manufacturer's authorised representative
- description of the safety component, details of the type or series and/or serial number
- safety function of the component where it is not obvious from the description
- year of manufacture of the safety component
- all relevant provisions with which the safety component complies
- where appropriate, reference to technical standards used, and
- where appropriate, the name and address of the competent person who carried out the production checks on the safety component/s.

Any safety components fitted to the lift must be accompanied by an instruction manual so that assembly, connection, adjustment, maintenance and in-service inspection and testing can be carried out effectively and without danger.

10.2.2 Car

The lift car must be designed and constructed to offer the space and strength corresponding to the maximum number of persons and the rated load of the lift set by the installer.

In the case of lifts intended for the transport of persons, and where its dimensions permit, the car must be designed and constructed in such a way that its structural features do not obstruct or impede access and use by disabled persons and so as to allow any appropriate adjustments intended to facilitate its use by them.

10.2.3 Means of suspension and means of support

The means of suspension and/or support of the car, its attachments and any terminal parts thereof must be selected, designed, manufactured and installed so as to ensure an adequate level of overall safety and to minimise the risk of the car falling, taking into account the conditions of use, the materials used and the conditions of manufacture.

Where ropes or chains are used to suspend the car, there must be at least two independent cables or chains, each with its own anchorage system. Such ropes and chains must have no joins or splices except where necessary for fixing or forming a loop.

10.2.4 Control of loading (including overspeed)

Lifts must be so designed, constructed and installed as to prevent normal starting if the rated load is exceeded.

Lifts must be equipped with an overspeed governor. These requirements do not apply to lifts in which the design of the drive system prevents overspeed.

Fast lifts, those lifts travelling at more than 1.0m/s, must be equipped with a speed-monitoring and speed-limiting device.

Lifts driven by friction pulleys must be designed so as to ensure stability of the traction cables on the pulley.

10.2.5 Lift machinery

All passenger lifts must have their own individual lift machinery unless the counterweights are replaced by a second car.

The installer of the lift must ensure that the lift machinery and the associated devices of a lift are only accessible for maintenance and emergency uses.

10.2.6 Controls

The function of the controls must be clearly indicated.

The call circuits of a group of lifts may be shared or interconnected.

Electrical equipment must be so installed and connected that:

- there can be no possible confusion with circuits which do not have any direct connection with the lift
- the power supply can be switched while under load
- movements of the lift are dependent on electrical safety devices in a separate electrical safety circuit, and

– a fault in the electrical installation does not give rise to a dangerous situation.

The lift controls must be designed and located within the car in such a way as to be easily operated by all intended users.

10.3 Hazards to persons outside the car

The lift must be designed and constructed to ensure that the space in which the car travels is inaccessible except for maintenance or in emergencies. Before a person enters that space, normal use of the lift must be made impossible.

The lift must be designed and constructed to prevent the risk of crushing when the car is in one of its extreme positions.

The objective will be achieved by means of free space or refuge beyond the extreme positions. In specific cases, where this solution is impossible to fulfil such as within existing buildings, other appropriate means may be provided to avoid this risk.

The landings at the entrance and exit of the car must be equipped with landing doors of adequate mechanical resistance for the conditions of use envisaged.

An interlocking device must prevent during normal operation:

– starting movement of the car, whether or not deliberately activated, unless all landing doors are shut and locked, and
– the opening of a landing door when the car is still moving and outside a prescribed landing zone.

However, all landing movements with the doors open shall be allowed in specified zones on condition that the levelling speed is controlled.

10.4 Hazards to persons in the car

Lift cars must be completely enclosed by full-length walls, fitted floors and ceilings included, with the exception of ventilation apertures, and with full-length doors. These doors must be so designed and installed that the car cannot move, except for the landing movements referred to above unless the doors are closed, and comes to a halt if the doors are opened.

The doors of the car must remain closed and interlocked if the lift stops between two levels where there is a risk of a fall between the car and the shaft or if there is no shaft.

In the event of a power cut or failure of components the lift must have devices to prevent free fall or uncontrolled upward movements of the car.

The device preventing the free fall of the car must be independent of the means of suspension of the car.

This device must be able to stop the car at its rated load and at the maximum speed anticipated by the installer of the lift. Any stop occasioned by this device must not cause deceleration harmful to the occupants whatever the load conditions.

Buffers must be installed between the bottom of the shaft and the floor of the car.

The free space referred to in Section 10.2 must be measured with the buffers totally compressed except where the car cannot enter the free space by reason of the design of the drive system.

Lifts must be so designed and constructed as to make it impossible for them to be set in motion if the device provided for above is not in an operational position.

10.5 Other hazards

The landing doors and car doors or the two doors together, where motorised, must be fitted with a device to prevent the risk of crushing when they are moving.

Landing doors, where they have to contribute to the protection of the building against fire, including those with glass parts, must be suitably resistant to fire in terms of their integrity and their properties with regard to insulation (containment of flames) and the transmission of heat (thermal radiation).

Counterweights must be so installed as to avoid any risk of colliding with or falling on to the car.

Lifts must be equipped with means enabling people trapped in the car to be released and evacuated.

Cars must be fitted with two-way means of communication allowing permanent contact with a rescue service.

Lifts must be so designed and constructed that, in the event of the temperature in the lift machine exceeding the maximum set by the installer of the lift, they can complete movements in progress but refuse new commands.

Cars must be designed and constructed to ensure sufficient ventilation for passengers, even in the event of a prolonged stoppage.

The car should be adequately lit whenever in use or whenever a door is opened there must also be emergency lighting.

The means of communication and the emergency lighting referred to above must be designed, constructed and installed so as to function even without the normal power supply. Their period of operation should be long enough to allow normal operation of the rescue procedure.

The control circuits of lifts which may be used in the event of fire must be designed, manufactured and installed so that lifts may be prevented from stopping at certain levels and allow for priority control of the lift by rescue teams.

10.6 Marking

In addition to the minimum particulars required for any item of plant, including those identified in Section 10.6, each car must bear an easily visible plate clearly showing the rated load in kilograms and the maximum number of passengers which may be carried.

If the lift is designed to allow people trapped in the car to escape without outside help, the relevant instructions must be clear and visible in the car.

10.7 Instructions for use

The safety components referred to in Section 10.1.1 must be accompanied by an instruction manual, in the English language, so that:

- assembly
- connection
- adjustment, and
- maintenance and in-service inspection and testing can be carried out effectively and without danger.

Each lift must be accompanied by documentation in the English language. The documentation shall contain at least:

- an instruction manual containing the plans and diagrams necessary for normal use and relating to maintenance, inspection, repair, periodic checks and the rescue operations referred to in Section 10.4 above, and
- a logbook in which repairs and, where appropriate, periodic checks can be noted.

11 Pressure equipment

Designers of pressure equipment must address the requirements outlined in Section 1 – General Requirements, as well as the specific requirements in this section that apply to the design, manufacture and conformity assessment of pressure equipment and assemblies containing pressures relative to atmospheric pressure (101.325 kPa).

Manufacturers of pressure equipment must ensure that the requirements described in the design specification are satisfied and that the requirements for design verification and conformity assessment are applied.

11.1 Scope

The ESOs laid down in this section apply only if the corresponding hazard exists for the pressure equipment in question when it is used under conditions which are reasonably foreseeable by the manufacturer.

For the purposes of this section, pressure equipment includes vessels, piping, safety accessories, pressure accessories and, where applicable, pressure equipment includes elements attached to pressurised parts such as flanges, nozzles, couplings, supports, lifting lugs and the like.

The manufacturer should analyse the hazards in order to identify those which apply to the equipment on account of pressure, and then design and construct it taking account of that analysis.

The ESOs are to be interpreted and applied in ways that take account of the state of knowledge and current practice at the time of design and manufacture as well as of technical and economic considerations which are consistent with a high degree of health and safety protection.

The obligations arising from the ESOs for pressure equipment also apply to assemblies where the corresponding hazard exists.

11.2 General

Pressure equipment must be designed, manufactured, checked, and if applicable, equipped and installed in such a way as to ensure its safety when put into service in accordance with the manufacturer's instructions, or in reasonably foreseeable conditions.

In choosing the most appropriate solutions, the manufacturer must apply the principles set out below in the following order:

- eliminate or reduce hazards as far as is reasonably practicable
- apply appropriate protection measures against hazards which cannot be eliminated, and
- where appropriate, inform users of residual hazards and indicate whether it is necessary to take appropriate special measures to reduce the risks at the time of installation and/or use.

Where the potential for misuse is known or is reasonably forseeable, the pressure equipment must be designed to prevent danger from such misuse or, if that is not possible, adequate warning given that the pressure equipment must not be used in that way.

11.3 Design

11.3.1 General

The pressure equipment must be properly designed taking all relevant factors into account in order to ensure that the equipment will be safe throughout its intended life.

The design must incorporate appropriate safety coefficients using comprehensive methods which are known to incorporate adequate safety margins against all relevant failure modes in a consistent manner.

11.3.2 Design for adequate strength

The pressure equipment must be designed for loadings appropriate to its intended use and other reasonably foreseeable operating conditions. In particular, the following factors must be taken into account:

- internal/external pressure
- ambient and operational temperatures
- static pressure and mass of contents in operating and test conditions
- traffic, wind, seismic activity
- reaction forces and moments which result from the supports, attachments, piping, etc.
- corrosion and erosion, fatigue, etc., and
- decomposition of unstable fluids.

Various loadings which can occur at the same time must be considered, taking into account the probability of their simultaneous occurrence.

Design for adequate strength must, as a general rule, be based on a calculation method, supplemented if necessary by an experimental design method.

11.3.2.1 Calculation method

(a) Pressure containment and other loading aspects

The allowable stresses for pressure equipment must be limited having regard to reasonably foreseeable failure modes under operating conditions. To this end, safety factors must be applied to eliminate fully any uncertainty arising out of manufacture, actual operational conditions, stresses, calculation models and the properties and behaviour of the material.

These calculation methods must provide sufficient safety margins.

The requirements may be met by applying one of the following methods, as appropriate, if necessary as a supplement to or in combination with another method:

- design by formula
- design by analysis, and
- design by fracture mechanics.

(b) Resistance

Appropriate design calculations must be used to establish the resistance of the pressure equipment concerned.

(c) Stability aspects

Where the calculated thickness does not allow for adequate structural stability, the necessary measures must be taken to remedy the situation taking into account the risks from transport and handling.

11.3.2.2 Experimental design method

The design of the equipment may be validated, in all or in part, by an appropriate test programme carried out on a sample representative of the equipment or the category of equipment.

The test programme must be clearly defined prior to testing and accepted by the body responsible for the design conformity assessment module, where it exists. This programme must define test conditions and criteria for acceptance or refusal.

The actual values of the essential dimensions and characteristics of the materials which constitute the equipment tested shall be measured before the test.

Where appropriate, during tests it must be possible to observe the critical zones of the pressure equipment with adequate instrumentation capable of registering strains and stresses with sufficient precision.

11.3.3 Provisions to ensure safe handling and operation

The method of operation specified for pressure equipment must be such as to preclude any reasonably foreseeable risk in operation of the equipment. Particular attention must be paid, where appropriate, to:

- closures and openings
- dangerous discharge of pressure relief blow-off
- devices to prevent physical access whilst pressure or a vacuum exists
- surface temperature taking into consideration the intended use, and
- decomposition of unstable fluids.

In particular, pressure equipment fitted with an access door must be equipped with an automatic or manual device enabling the user easily to ascertain that the opening will not present any hazard. Furthermore, where the opening can be operated quickly, the pressure equipment must be fitted with a device to prevent it being opened whenever the pressure or temperature of the fluid presents a hazard.

11.3.4 Means of examination

(a) Pressure equipment must be designed and constructed so that all necessary examinations to ensure safety can be carried out;

(b) Means of determining the internal condition of the equipment must be available, where it is necessary to ensure the continued safety of the equipment, such as access openings allowing physical access to the inside of the pressure equipment so that appropriate examinations can be carried out safely and ergonomically;

(c) Other means of ensuring the safe condition of the pressure equipment may be applied:

- where it is too small for physical internal access, or
- where opening the pressure equipment would adversely affect the inside, or
- where the substance contained has been shown not to be harmful to the material from which the pressure equipment is made and no other internal degradation mechanisms are reasonably foreseeable.

11.3.5 Means of draining and venting

Adequate means must be provided for the draining and venting of pressure equipment where necessary:

- to avoid harmful effects such as water hammer, vacuum collapse, corrosion and uncontrolled chemical reactions. All stages of operation and testing, particularly pressure testing must be considered, and
- to permit cleaning, inspection and maintenance in a safe manner.

11.3.6 Corrosion or other chemical attack

Where necessary, adequate allowance or protection against corrosion or other chemical attack must be provided, taking due account of the intended and reasonably foreseeable use.

11.3.7 Wear

Where severe conditions of erosion or abrasion may arise, adequate measures must be taken to:

- minimise that effect by appropriate design, e.g. additional material thickness, or by the use of liners or cladding materials
- permit replacement of parts which are most affected, and
- draw attention, in the instructions referred to in Section 11.5, to measures necessary for continued safe use.

11.3.8 Assemblies

Assemblies must be designed so that:

- the components to be assembled together are suitable and reliable for their duty, and
- all the components are properly integrated and assembled in an appropriate manner.

11.3.9 Provisions for filling and discharge

Where appropriate, the pressure equipment must be so designed and provided with accessories, or provision made for their fitting, as to ensure safe filling and discharge with respect to hazards such as:

(a) on filling:

- overfilling or over-pressurisation having regard in particular to the filling ratio and to vapour pressure at the reference temperature, and
- instability of the pressure equipment;

(b) on discharge: the uncontrolled release of the pressurised fluid, and

(c) on filling or discharge: unsafe connection and disconnection.

11.3.10 Protection against exceeding the allowable limits of pressure equipment

Where, under reasonably foreseeable conditions, the allowable limits could be exceeded, the pressure equipment must be fitted with, or provision made for the fitting of, suitable protective devices, unless the equipment is intended to be protected by other protective devices within an assembly.

The suitable device or combination of such devices must be determined on the basis of the particular characteristics of the equipment or assembly.
Suitable protective devices and combinations thereof comprise:

(a) safety accessories, and

(b) where appropriate, adequate monitoring devices such as indicators and/or alarms which enable action to be taken either automatically or manually to keep the pressure equipment within the allowable limits.

11.3.11 Safety accessories

Safety accessories must:

- be designed and constructed so as to be reliable and suitable for their intended duty and take into account the maintenance and testing requirements of the devices, where applicable
- be independent of other functions, unless their safety function cannot be affected by such other functions, and

- comply with appropriate design principles in order to obtain suitable and reliable protection. These principles include, in particular, fail-safe modes, redundancy, diversity and self-diagnosis.

Pressure limiting devices must be so designed that the pressure will not permanently exceed the maximum allowable pressure; however a short duration pressure surge is allowable, where safety is not compromised.

Temperature monitoring devices must have an adequate response time on safety grounds, consistent with the measurement function.

11.3.12 External fire

Where necessary, pressure equipment must be designed and, where appropriate, fitted with suitable accessories, or provision made for their fitting, to meet damage-limitation requirements in the event of external fire having particular regard to its intended use.

11.4 Manufacturing

11.4.1 Manufacturing procedures

The manufacturer must ensure the competent execution of the provisions set out at the design stage by applying the appropriate techniques and relevant procedures, especially with a view to the aspects set out below:

(a) Preparation of the component parts

Preparation of the component parts (e.g. forming and chamfering) must not give rise to defects or cracks or changes in the mechanical characteristics likely to be detrimental to the safety of the pressure equipment.

(b) Permanent joining

Permanent joints and adjacent zones must be free of any surface or internal defects detrimental to the safety of the equipment.

The properties of permanent joints must meet the minimum properties specified for the materials to be joined unless other relevant property values are specifically taken into account in the design calculations.

For pressure equipment, permanent joining of components which contribute to the pressure resistance of equipment and components which are directly attached to them must be carried out by suitably qualified personnel according to suitable operating procedures.

For pressure equipment within the categories for high hazard plant (HHP), in HHP Categories 1, 2, 3 and 4, (Section 11.7) operating procedures and the competencies required of personnel must be approved by a competent third party which, at the manufacturer's discretion may be:

- a conformity assessment body, and
- a third-party organisation recognised by a regulatory authority**.**

To carry out these approvals the third party must perform examinations and tests as set out in the appropriate, recognised local or international standards or equivalent examinations and tests or must have them performed.

(c) Non-destructive tests

For pressure equipment, non-destructive tests of permanent joints must be carried out by suitable qualified personnel. For pressure equipment in HHP Categories 1, 2, 3 and 4 (Section 11.7), the testing personnel must be approved by a third-party organisation recognised as being competent for those purposes.

(d) Heat treatment

Where there is a risk that the manufacturing process will change the material properties to an extent which would impair the safety of the pressure equipment, suitable heat treatment must be applied at the appropriate stage of manufacture.

(e) Traceability

Suitable procedures must be established and maintained for identifying the material making up the components of the equipment which contribute to pressure resistance by suitable means from receipt, through production, up to the final test of the manufactured pressure equipment.

11.4.2 Final assessment

Pressure equipment must be subjected to final assessment as described below:

(a) Final inspection

Pressure equipment must undergo a final inspection to visually assess and by examination of the accompanying documents that the requirements of these ESOs are satisfied.

Tests carried out during manufacture may be taken into account. As far as is necessary on safety grounds, the final inspection must be carried out internally and externally on every part of the equipment, where appropriate in the course of manufacture (e.g. where examination during the final inspection is no longer possible).

(b) Proof test

Final assessment of pressure equipment must include a test for the pressure containment aspect which will normally take the form of a hydrostatic pressure test.

For HHP Category 5 (Section 11.7) serially-produced pressure equipment, this test may be performed on a statistical basis.

Where the hydrostatic pressure test is harmful or impractical, other tests of a recognised value may be carried out. For tests other than the hydrostatic pressure test, additional measures such as non-destructive tests or other methods of equivalent validity, must be applied before those tests are carried out.

(c) Inspection of safety devices

For assemblies, the final assessment must also include a check of the safety devices intended to check full compliance with the requirements referred to in Section 11.3.11.

11.4.3 Marking and labelling

In addition to the marking referred to in Section 1.11.5, the following information must be provided depending on the type of pressure equipment.

Further information necessary for safe installation, operation or use and, where applicable, maintenance and periodic inspection such as:

- the volume of the pressure equipment in litres
- the nominal size for piping
- the test pressure applied in kPa and date
- safety device set pressure in kPa
- output of the pressure equipment in kW
- supply voltage in volts
- intended use
- filling ratio kg/litre
- maximum filling mass in kg
- tare mass in kg
- the product group, and

where necessary, warnings fixed to the pressure equipment drawing attention to misuse which experience has shown might occur.

The marking and the required information must be provided on the pressure equipment or on a data-plate firmly attached to it, with the following exceptions:

- where applicable, appropriate documentation may be used to avoid repetitive marking of individual parts such as piping components, intended for the same assembly. This applies to other marking and labelling referred to in this section:
    - where the pressure equipment is too small, e.g. accessories, the information referred to above may be given on a label attached to that pressure equipment, and
    - labelling or other adequate means may be used for the mass to be filled and the warnings referred to above, provided it remains legible for the life of the item.

11.5 Operating instructions

(a) When pressure equipment is placed on the market, it must be accompanied, as far as relevant, with instructions for the user, containing all the necessary safety information relating to:

- mounting including assembling of different pieces of pressure equipment
- putting into service
- use
- dismantling
- taking out of service, and
- maintenance including checks by the user:

(b) Instructions must cover information affixed to the pressure equipment, with the exception of serial identification, and must be accompanied, where appropriate, by the technical documents, drawings and diagrams necessary for a full understanding of these instructions;

(c) If appropriate, these instructions must also refer to hazards arising from misuse and to particular features of the design.

11.6 Materials

Materials used for the manufacture of pressure equipment must be suitable for such application during the scheduled lifetime unless replacement is foreseen.

Welding consumables and other joining materials need to fulfil the requirements in an appropriate way, both individually and in a joined structure.

Materials for pressurised parts must:

(a) have appropriate properties for all operating conditions which are reasonably foreseeable and for all test conditions, and in particular they should be sufficiently ductile and tough. Where appropriate, the characteristics of the materials must comply with the relevant requirements. Moreover, due care should be exercised in particular in selecting materials in order to prevent brittle-type fracture where necessary; where for specific reasons brittle material has to be used appropriate measures must be taken

(b) be sufficiently chemically resistant to the fluid contained in the pressure equipment; the chemical and physical properties necessary for operational safety must not be significantly affected within the scheduled lifetime of the equipment:

(c) not be significantly affected by ageing

(d) be suitable for the intended processing procedures, and

(e) be selected in order to avoid significant undesirable effects when the various materials are put together.

11.6.1 Design calculations

(a) the pressure equipment manufacturer must define in an appropriate manner the values necessary for the design calculations referred to in Section 11.3.2.1 and the essential characteristics of the materials and their treatment referred to above

(b) the manufacturer must provide in the technical documentation elements relating to compliance with the materials specifications, and

(c) for pressure equipment in HHP Categories 1,2 and 3, (Section 11.7) the particular appraisal as referred to above must be performed by a body authorised to undertake conformity assessment procedures for the pressure equipment.

11.6.2 Confirming the integrity of materials

The equipment manufacturer must take appropriate measures to ensure that the material used conforms to the required specification.

11.7 Hazard categories for pressure equipment

The identification of the relevant hazard category for the pressure equipment will determine the appropriate[*] conformity assessment module/s to be applied. The relationship between the hazard category and the conformity assessment module is as follows:

- *Hazard Category 1* = Full Quality Assurance (Module H)
- *Hazard Category 2* = Unit Verification (Module G)
- *Hazard Category 3* = Design Type Approval (Module F) + Product Verification (Module E) + Product Quality Assurance (Module D) + Production Quality Assurance (Module C)
- *Hazard Category 4* = Design Type Approval (module F) + Type Examination (Module B), and
- *Hazard Category 5* = Internal Production Quality Control (Module A)

Safety accessories are to be classified in Category 4. However, safety accessories manufactured for specific equipment may be classified in the same category as the equipment they protect.

Pressure accessories are classified on the basis of:

- their maximum allowable pressure
- their volume or their nominal size, as appropriate, and

[*] Conformity Assessment Modules are described in Schedule 1 of the discussion paper

– the group of fluids for which they are intended.

11.7.1 Classification of pressure equipment

> ***NOTE***
> *Precise hazard categories for pressure equipment are yet to be determined.*
>
> *This public discussion process seeks expert advice as to the most appropriate method for describing such levels.*

Pressure equipment will be classified by category according to an ascending level of hazard with Hazard Category 1 representing the highest level.

For the purposes of aiding such classification, fluids contained by the pressure equipment are divided into two groups.

Group 1 comprises dangerous fluids. A dangerous fluid is a substance or preparation that comprises fluids defined as:

- explosive,
- extremely flammable,
- highly flammable,
- flammable (where the maximum allowable temperature is above flashpoint),
- very toxic,
- toxic, or
- oxidizing.

Group 2 comprises all other fluids.

Where a vessel is composed of a number of chambers, it will be classified in the highest category applicable to the individual chambers. Where a chamber contains several fluids, classification will be on the basis of the fluid which requires the highest category.

ATTACHMENT B – DRAFT REGULATION IMPACT STATEMENT

INTRODUCTION

As an integral component of the development of proposals to alter or adjust regulatory requirements, the Australian Government requires all agencies to produce a Regulation Impact Statement (RIS). A RIS provides information for the decision makers and evidence of the steps taken in good policy development.

The purpose of this document is to provide stakeholders with an overview of the projected impacts of the proposed ESO and CA system for high hazard plant [3] and to request additional information to quantify the likely economic costs and benefits associated with these impacts to the extent they are known. The information gathered will be used to inform the RIS that is developed for the final proposal.

COSTS ASSOCIATED WITH HIGH HAZARD PLANT INCIDENTS

Financial costs associated with workplace incidents are determined using a methodology developed by Access Economics (2004). This methodology captures the full financial costs of workplace incidents including production disturbance costs, human capital costs, medical costs, administration costs, transfer costs, and other costs. However, this methodology does not include costs related to property damage, loss of goodwill and value of life lost.

High hazard plant claims

The National Data Set for Compensation-based Statistics (NDS) database[4] contains information on high hazard plant claims. Table 1 displays this information. In 2003-04, there were 1630 high hazard plant claims. From 1997-98 to 2003-04, the incident rate of high hazard plant claims per 100,000 workers declined at a rate of 1.19 per cent annually. Based on these results, we estimate 1720 high hazard plant claims in 2007-08[5].

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[4] NDS is comprised of serious claims for workers' compensation made under the Commonwealth, state and territory workers' compensation Acts which resulted in a fatality, permanent disability or a temporary disability resulting in an absence from work of one week or more (based on an employee's normal working week). Commuting claims are excluded.

[5] Result obtained by projecting the 2003-04 figures forward using a continuation of the seven year trend.

TABLE 1: HHP CLAIMS FROM 1997-98 TO 2003-04[6]

Year ending June	1997–98	1998–99	1999–00	2000–01	2001–02	2002–03	2003–04
High hazard plant	1,565	1,590	1,380	1,510	1,290	1,575	1,630
Average annual growth rate	0.68%						
High hazard plant incidents per 100,000 workers[7]	42.26	42.33	35.62	38.72	32.50	38.83	39.32
Average annual growth rate	-1.19%						

High hazard plant fatalities

From 1997-98 to 2003-04, high hazard plant fatalities, as a proportion of total incidents remained relatively constant at 0.31 per cent, as shown in table 2.

TABLE 2: HHP FATALITIES

Year ending June	1997–98	1998–99	1999–00	2000–01	2001–02	2002–03	2003–04
Fatalities	4	3	5	4	7	2	7
Percentage of total incidences	0.26%	0.19%	0.36%	0.27%	0.54%	0.13%	0.43%
Average percentage	0.31%						

Number of high hazard plant incidents[8]

Access Economics (2004) previously determined the distribution of the total number of incidents in 2000-01 according to severity and compensation status, based on a comparison between NDS claims data and self-reported ABS data. This report concluded that NDS claims data represented only 42.9 per cent of the total incidents in 2000-01[9]. Total incidents[10] in 2007-08 were determined by scaling up the previously estimated number of high hazard plant claims by a factor of 2.33[11]. As a result, we estimate 4,013 incidents in 2007-08 (i.e. 1720 compensated serious cases with at least 5 day lost working time and 2289 other cases).

Total financial costs of incidents

The NDS provides cost data on compensated workplace claims. This NDS data shows costs of high hazard plant claims are 31 per cent higher than the average costs of all claims.

Total financial costs, which comprises of compensated and uncompensated costs can be determined using a methodology developed for this purpose by Access Economics. Access Economics (2004) reports a ratio of 1:4.5 for compensated to total costs. Therefore, total financial costs are obtained by factoring up the average cost of high hazard plant claims by 4.5 and

[6] Data extracted on 1 November 2007. Data correct at time of extraction. Requesting updated data. It is highly unlikely that updated data will change the result significantly.
[7] Determined by dividing the number of high hazard plant incidents by the number of people employed, which is from ABS data.
[8] See footnote 4.
[9] See footnote 2.
[10] Total high hazard plant incidents include those cases within the scope of NDS data plus unreported, uncompensated and mild injuries.
[11] 2.33 = 1/42.9%

applying the four year trend growth rate in costs of 1.56 per cent. In 2007-08 the estimated average total financial costs of a high hazard plant incident is $136,800. Total costs of all high hazard plant incidents for 2007-08 are therefore estimated to be $549 million.

ESTIMATED IMPACTS OF ESOS AND CA FOR HIGH HAZARD PLANT

The details of the proposed ESO's and CA process are not finalised. Despite this, it is possible to estimate the number of incidents likely to be averted under this system. Previous research (NOHSC 2004 ; Driscoll T 2005 ; Driscoll T 2008) commissioned by NOHSC concluded:

- From 1 July 2000 to 30 June 2002, 37 per cent of deaths resulting from workplace injuries had definite or probable design issues involved. Another 14 per cent of deaths had circumstances suggestive that design issues were involved.
- Design issues appeared to contribute to at least 30 per cent of injuries.
- From 1997 to 2002, 90 per cent of incidents involving machinery or fixed plant appeared to be due in part to design issues. In contrast, 54 per cent of machinery or fixed plant incidents involved design related issues in the 1989 to 1992 study.

Based on this research, it is assumed that 30 per cent of incidents could be avoided from the adoption of ESOs and CA.

Financial costs of incidents averted

Based on the estimate of 4013 high hazard plant possible incidents during 2007-08, if a system based on ESOs and CA was in place, 1204 incidents could be averted. The total financial costs of these averted incidents, and thus potential savings, in the order of $165 million for 2007-08.

Business compliance costs

Businesses who design/manufacture high hazard plant in Australia may face a small increase in some hazard identification compliance costs. Under the current system the national standard for plant requires plant to be manufactured in accordance with the relevant Australian Standard (AS), however these requirements do vary.

For many businesses, the actual costs involved in purchasing Australian Standards including their regular amendments and cross-referenced standards, is a considerable burden.

Under the proposed system, a CA will be required to be undertaken to ensure the high hazard plant has been manufactured in accordance with the original design specification design. Only costs imposed by the CA process that are not already undertaken as part of good business practice would represent a compliance cost. As the final ESO and CA process is yet to be determined, these costs are currently unquantifiable.

Comment sought:

Q1. *How many working hours do you currently spend per item of high hazard plant to ensure it is manufactured in accordance with the design?*

Q2. *Is the requirement to ensure manufacturing quality set out in an Australian Standard or is it another conformity process requirement? What is the relevant requirement? (i.e where is the requirement set out?)*

Designers/manufacturers of high hazard plant will also benefit from savings in some compliance costs. Firstly, costs associated with inter-jurisdictional inconsistencies are eliminated under the proposed system. Secondly, if mutual recognition with the European Communities (EC) system is agreed, compliance costs associated with exporting high hazard plant to the EC, or countries citing EC requirements, will be reduced. Thirdly, giving designers some flexibility as to how they ensure all ESOs are achieved is likely reduced compliance costs. These benefits are unquantifiable at this stage.

Comment sought:

Q3. *For high hazard plant that is <u>exported</u> to another country, how many working hours do you currently spend to ensure compliance with that other country's design and manufacturing standards? (Set out requirements for each type of high hazard plant and for each country, and separate costs between designer and manufacturers)*

The costs associated with importing high hazard plant that already complies with EC standards will be reduced significantly if mutual recognition is agreed. For imported high hazard plant that does not comply with the EC standard costs are likely to remain unchanged.

Comment sought:

Q4. *For high hazard plant that is <u>imported</u> into Australia, how many working hours do you currently spend to ensure compliance with Australian design and manufacturing standards?*

Q5. *Is this work in addition to work undertaken in the country of origin to demonstrate compliance with that country's design and manufacturing standards?*

Q6. *What countries is high hazard plant sourced from and what numbers (percentage) from each country?*

For users of high hazard plant, there are likely to be reductions in the costs associated with identifying and controlling risks, as the ESO and compliance marking system is likely to be more effective in shifting this burden towards those with the best information to lower remedy costs, i.e. designers and manufacturers rather than users. There will also be likely reductions in compliance costs for users of high hazard plant that operate across numerous jurisdictions.

In principle, record-keeping costs should be similar under the proposed CA system. More rigorous inspection by accredited inspectors may lead to more thorough record keeping, conversely, the CA process may actually reduce these costs. Thus at present, this cost is considered unquantifiable.

Comment sought:

Q7. *Do you believe the current record-keeping costs will be similar under the proposed system? If not, how do you believe they will change?*

OHS regulatory costs

The costs associated with enforcement of high hazard plant regulation will ultimately depend on:

- whether to total regulatory effort decreases, increases or remains constant, and
- how the jurisdictions set their fee structures for registration of high hazard plant.

It is expected regulatory costs will not change significantly under the proposed system.

Comment sought:

Q8. *Do you believe regulatory costs will change significantly under the proposed system? If so, please indicate how it will change and why.*

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SCHEDULE 1 - SUMMARY OF PROPOSED CONFORMITY ASSESSMENT MODULES

Module **A**	Internal production control	Covers internal design and production control.
Module **B**	Design type approval	Covers the design phase, followed by assessment in production phase. A type-examination certificate is issued by a conformity assessor.
Module **C**	Conformity to type	Covers the production phase and follows Module B. Provides for conformity with the type described in the examination certificate issued by the conformity assessor in accordance with Module B.
Module **D**	Production quality assurance	Covers the production phase and follows Module B. Derives from quality assurance standards (AS/NZS ISO 9000 series) with the conformity assessor approving the quality system for production, final product inspection and testing established by the manufacturer.
Module **E**	Product quality assurance	Covers the production phase and follows Module B. Derives from quality assurance standards (AS/NZS ISO 9000 series) with the conformity assessor approving the quality system for production, final product inspection and testing established by the manufacturer.
Module **F**	Product verification	Covers the production phase and follows Module B. The conformity assessor controls conformity to type described in the examination certificate issued in accordance with Module B and issues a certificate of conformity.
Module **G**	Unit verification	Covers the design and production phases. Each individual product is examined by the conformity assessor who issues a certificate of conformity.
Module **H**	Full quality assurance	Covers the design and production phases. Derives from quality assurance standards (AS/NZS ISO 9000 series) with the intervention of the conformity assessor responsible for approving and controlling the quality system for design, manufacture, final product inspection and testing established by the manufacturer.

APPENDIX 1 – ISSUES WITH THE CURRENT NSP

1. A number of issues relevant to the scope of this paper, have been identified with the current NSP. These include:

a. the extent of referencing of Australian Standards as the basis for compliance for plant design requirements

b. lack of an 'acceptable comparable standards' list or criteria for determining such a list

c. limitations of the current design registration and verification processes

d. no mutual recognition of comparable overseas safety systems relating to assessment of conformity

e. import of plant that does not meet acceptable Australian safety requirements

f. 'dumping' of second-hand plant in Australia after it has passed its design life or useful life elsewhere, and

g. whether the current list of high hazard plant is still adequate, considering the speed at which plant design and technology is progressing.

2. Each of these issues is expanded further below.

Extent of referencing Australian Standards

3. The direct referencing of Australian Standards in regulation as the basis for compliance is essentially a continuation of the prescriptive approach to design requirements that existed across the states and territories prior to development of the NSP.

4. Australian Standards referenced by regulations are themselves regulations (and therefore mandatory requirements). In turn, any documents that the standards then reference (such as other Australian Standards) are also regulations. Referencing a number of these documents can greatly expand the amount of regulation that applies to a subject area. For example, if the Australian Standards set out in schedule 2 of the NSP were all called up by reference in regulations, the directly referenced documents alone would add approximately 5000 pages of regulation, not counting the documents these standards in turn reference.

5. A shortcoming of this approach is that as technology evolves, the detailed technical requirements set out in standards need to be reviewed to remain current. As such, requirements in standards usually lag behind developments in technology, the degree of lag dependent on the level of activity of the relevant standard committee. Where standards are used as regulation, this can have the effect of stifling innovation.

6. Australian Standards are also developed outside of the normal legislative development process and are therefore not subject to the same level of scrutiny as other regulations drafted by government.

7. To try to overcome these issues associated with referencing Australia Standards, the Labour Minister's Council (now the Workplace Relations Minister's Council) made a decision (LMC 60) on 27 November 1998 to progressively remove referencing of Australian Standards from legislation.

8. The Council of Australian Governments (COAG) in their best practice regulation guidelines for ministerial councils and standards setting bodies (COAG 2007) set out further guidance on referencing standards.

9. The COAG guidelines also provide guidance in relation to the use of international standards and practices, in that wherever possible, regulatory measures or standards should be compatible with relevant international or internationally accepted standards or practices in order to minimise the impediments to trade. Compatibility in this context does not however, necessarily imply uniformity.

10. The review of the NSP is guided by the principles set by these ministerial councils.

11. Despite these issues, the availability of documents such as Australian Standards referenced in legislation does provide a level of certainty and comfort to designers and manufacturers that what they produce will comply if the standards are followed, particularly in instances where technical innovation is not a factor in the design.

Lack of acceptable comparable standards

12. An issue associated with the direct referencing of Australian Standards (or other technical documents) in regulation is that, in relation to plant, it can create unintended consequences where plant is designed and/or manufactured in another country to standards applying in those countries. Plant may be required to be modified especially for the Australian market or retro-fitted after import to meet the Australian Standard requirements without any real assessment as to whether the level of safety is being improved. These modifications may be at considerable cost.

13. While the NSP recognises this issue by providing a provision that allows jurisdictions to determine if another technical standard is comparable to those referenced in the NSP, it does not provide any guidance on how this could be achieved.

14. Attempts by the jurisdictions to develop a definitive list of technical standards from other countries that are comparable to the Australian Standards referenced in the NSP and acceptable to all jurisdictions have been largely unsuccessful. A large part of this is because comparing technical standards is about comparing different technical solutions to an issue and then trying to determine if they provide the

same level of safety. This requires a value judgement by the person undertaking the comparison in the absence of a definitive reference point clearly defining the level of safety that is expected.

15. Therefore, where a technical standard addresses a safety issue in a different way compared with the standard referenced in the NSP, because of the value judgement required, it will often mean that agreement can not be reached among regulators as to whether standards are comparable or not. This does not, however, necessarily mean that the two standards are not capable of delivering a plant design to an acceptable level of safety.

No mutual recognition of comparable overseas safety systems

16. The issue of overseas standards not generally being able to be used within the NSP is further compounded by the fact the NSP does not provide any recognition of overseas systems for determining the safety of the design of an item of plant, unless these are specifically identified in the referenced standards.

17. This means that where an item of plant designed and manufactured overseas has gone through a safety compliance process, it is still likely under the NSP that modifications will need to be made to that item of plant to enter the Australian market to ensure that it complies with the relevant Australian Standard. In conjunction the design would need to be verified in accordance with Australian requirements before the design can be registered.

Limitations of current design verification and registration processes

18. The processes for applying for design registration with the OHS authorities are slightly different for each authority. Similarly, the level of audit or scrutiny applied to those design applications differ across authorities. These issues, in addition to those relating to acceptable comparable standards may also mean one jurisdiction may accept designs for registration that another jurisdiction would not, due to different assessments of what is and is not acceptable.

19. Where these differences occur, jurisdictions may choose not to mutually recognise design registrations. This may mean items of plant registered in one jurisdiction may not be able to be used within another jurisdiction until the design has also been verified within the other jurisdiction.

Imported new plant

20. As indicated above, there are often different safety requirements to plant that is designed and manufactured for overseas markets. Some of that plant needs to be modified before entering the Australian market because the plant is from a location that has much lower safety standards than Australia and significant modifications would be required to ensure the safety is raised to the Australian Standard.

21. In other cases, modifications are required to be made to imported plant to meet Australian standards seemingly only for the purpose of meeting the standard rather than necessarily improving safety.

22. There are also examples where plant being imported has been designed and manufactured to a higher standard than is required for the Australian market and safety measures have been removed, to reduce cost, prior to entry into Australia.

23. There may also be circumstances where a design for an item of high hazard plant has been determined as safe in Australia, but the manufacturing occurs overseas where the quality of manufacture is not to the quality anticipated at the time of design and produces an unsafe product. There is currently no process to ensure that the manufacture actually meets the specifications of the design. This can lead to sub-standard plant being imported, sold and used in Australia. The issue may not be identified until the plant fails, by which time there may be a large number of items of the plant in use.

Imported second hand plant

24. The requirements for imported plant in the NSP are the same regardless of new or second hand.

25. An issue for second hand plant is that there are many examples of plant being imported to Australia built to technical standards that have ‘end of life’ or ‘design life’ timeframes after these timeframes have been reached in the country of origin. This means, for example, a crane that has been consistently lifting significant loads for a number of years could be imported into Australia at the end of its specified design life and put into use without appropriate inspection, testing and maintenance to ensure it is still capable of operating at an acceptable level of safety.

26. A number of overseas systems already exist that incorporate outcome based safety requirements and a conformity assessment process as identified within the NOHSC terms of reference. The most notable example is the EC Directives and related standards framework relating to plant safety. Adopting an existing system would greatly assist the ease of import of plant from the areas covered by the system adopted. However, other systems may not produce plant that meets the safety expectations of the Australian community. Also, the relatively small size of the plant market in Australia compared to some of the overseas markets may mean that some of the mechanisms used in other systems may not be feasible in a smaller market.

27. All of the systems examined would require some modification to enable them to work within the Australian environment given the differing OHS contexts in which they operate. Once any modifications were made, the potential financial benefits associated with adopting this option would decrease. This option would also not address the issues associated with mutually recognising systems from other areas.