AS 4343—2005

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Australian Standard™

Pressure equipment—Hazard levels

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This Australian Standard was prepared by Committee ME-001, Pressure Equipment. It was approved on behalf of the Council of Standards Australia on 29 July 2005. This Standard was published on 15 September 2005.

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This Standard was issued in draft form for comment as DR 04147.

Australian Standard™

Pressure equipment—Hazard levels

Originated as AS 3920.1—1993.
Previous edition AS 4343—1999.
Second edition 2005.

Published by Standards Australia, GPO Box 476, Sydney, NSW 2001, Australia

ISBN 0 7337 6851 2

PREFACE

This Standard was prepared by the Australian members of Joint Standards Australia/Standards New Zealand Committee ME-001, Pressure Equipment to supersede AS 4343—1999.

After consultation with stakeholders in both countries, Standards Australia and Standards New Zealand decided to develop this Standard as an Australian Standard rather than an Australian/New Zealand Standard.

The objective of this revision is to include improvements suggested by users of this Standard.

The changes made to Table 2 are corrections only and do not indicate changes originating from changes in the source documents.

Significant changes are as follows:

(a) Section 2, Procedure added to guide use of Table 1.

(b) Table 1, Part 2, Vacuum vessels has been modified to enable selection of an appropriate hazard level similar to the criteria for pressure vessels.

(c) Table 1, Note 4 (a) (iv) has been modified to allow for inherent portability of vessels having volumes not greater than 200 L.

(d) Table 1, Note 4 (a) (v) has been added with regard to human-occupancy pressure vessels.

(e) Table 1, Note 5 has been modified to cater for high pressure and volume.

(f) Appendix B has been changed from a normative to an informative Appendix.

(g) A foreword has been added to give background to assist in the interpretation and use of the Standard and in risk assessment.

As in the previous edition, it is intended that this Standard replace the hazard level section of AS 3920.1, *Assurance of product quality*, Part 1: *Pressure equipment manufacture* which is under revision, to cover the conformity assessment provisions.

In determining and allocating the hazard level values, input has been received from regulatory authorities and users, and the practices adopted in industrialized countries and those in the European Union Pressure Equipment Directive have been taken into account.

The impact of this revision is expected to be negligible, except to resolve a number of issues raised in the use of the Standard, and to facilitate its use.

Adoption of this revision is intended to be by agreement of various parties concerned. It is not intended to be retroactive.

For regulatory purposes, its use must be in accordance with the requirements of the applicable Regulatory Authority, e.g. in some States and Territories the unrevised Standard may apply until regulations are amended.

The terms ‘normative’ and ‘informative’ have been used in this Standard to define the application of the Appendix to which they apply. A ‘normative’ appendix is an integral part of a Standard, whereas an ‘informative’ appendix is only for information and guidance.

Statements expressed in mandatory terms in Notes to Tables are deemed to be requirements of this Standard.

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FOREWORD

GENERAL

With the increasing importance of this Standard, which is referenced in most laws relating to pressure equipment in Australia and is used in New Zealand, Committee ME-001 requested inclusion of this background information to—

(a) assist in the understanding, interpretation and use of the Standard;

(b) record in more detail its important requirements and so supplement Clause 2;

(c) discuss its origin, development from AS 3920.1 and its relationship to other Standards;

(d) provide a comparison with EU-PED (Ref. 1) to avoid confusion in trade; and

(e) advise on the standard's use for purposes other than originally intended.

WHY WAS THIS STANDARD NEEDED?

In 1978, the late Alex Wilson AM, Chief Metallurgist, Electricity Commission of NSW, asked a new Chief Inspector of Boilers to clarify the law that required Government design approval, manufacturing inspection, registration and in-service inspection by government or licensed Inspectors, for a 30 L × 1 MPa air receiver, but did not require this for 660 MW, 16 MPa high-temperature steam turbine, which was potentially far more hazardous.

The 1962 'Boiler and Pressure Vessel Regulations' in NSW covered all equipment above or below atmospheric pressure, except vessels forming part of domestic cold water supply or those containing liquid below 100°C when pressure was due solely to height of liquid. By various exemptions, this was not applied to most small or very low-pressure equipment for practical reasons and because hazards were extremely low.

Obviously, a more logical and reasonable basis was needed.

By 1978, most regulations in Australia were still mainly based on boilers and air receivers associated with mines. Major developments after World War II had greatly increased pressure equipment types and numbers used in industry and by the public, e.g. mains pressure hot water heaters, gas cylinders, automotive LP Gas pressure vessels and many other types of consumer equipment. These serially produced vessels, which are now addressed by AS 2971—2002, *Serially produced pressure vessels*, (first issued in 1987), are used by millions in Australia and very few serious accidents have occurred, those that have occurred being mainly due to misuse or inadequate protection.

The existing regulations were similar across Australia but varied in important details and needed to be improved and unified to cover the burgeoning consumer market in pressure equipment.

Also in the 1970s, the world recognized the value of Quality Assurance (QA) systems to enhance quality management and hence safety. This was introduced into ASME Section VIII in 1973 but was not recognized in Australian pressure equipment regulations or Standards, although in effect was partly used by inspectors.

The main problem then was how to improve the total system of pressure equipment Standards and achieve the following:

(a) Relate hazards (pressure, volume, content fluid type, temperature) to regulatory controls in design verification, fabrication, inspection, and design and equipment registration. In-service inspection was not considered at the time.

(b) Accommodate the new move by advanced industries to quality assurance.

(c) Continue to meet governments' desire to ensure that risk levels of occupational (and public) safety and health are low.

(d) Make the system consistent across Australia.

After 1995, these functions were largely deregulated and made self-regulatory by industry itself as part of a major shift of philosophy on the role of government. This aimed to provide more flexibility, reduce cost to industry and the public, and use legal prosecution to maintain a very low risk record.

BACKGROUND TO THE STANDARD

General

As the pressure (p) and volume (V) of pressure equipment increase, the pressure energy also increases; and as this energy increases, probability and potential consequences of any serious failure also increase. This was clear from the major disasters, that had occurred with pressure equipment since the 1800s. One boiler explosion killed 1800 persons, while in the 1980s about 500 were killed in Mexico City in a gas vessel explosion and nearly 4000 in a toxic gas vessel explosion in Bhopal. These and other pressure equipment failures also resulted in billion dollar losses around the world.

Such accidents were far more complex than anticipated from just pressure and volume considerations; and so this made it difficult to simply quantify hazards and, particularly, to introduce into regulations a radically new concept of varying controls according to hazard or risk.

However, in 1980, a German engineer advised that German Pressure Equipment Law had just made significant step forward. A copy of the legislation in German legal terminology was made available but was not translated. It contained the term with '$p \times V$' and importantly, it also gave clear evidence that a regulatory authority had tackled the problem of hazard quantification.

This was a key to resolving Alex Wilson's request and the application of quality assurance (QA).

During the early 80s, the above ideas were developed for a solution relating the level of design verification, fabrication inspection and QA to different hazard levels. This involved:

(a) Review of many major failures and their consequences around the world, which showed that contents and the location or exposure of the equipment must be taken into account as well as pressure and volume.

(b) Review of world practices, which showed that ASME had based their exclusions on p and V.

(c) Finding more rational lower hazard limits when special regulatory requirements should apply;

(d) Use of QA on a trial basis to maintain safety and reduce costs to Government and industry by—

 (i) authorizing fabricators to transfer plate identification marks themselves using QA; and

 (ii) full QA with intermittent Government audit and inspection for a large fabricator in a remote area where economic inspection was difficult.

(e) Preliminary use of the above ideas to improve and unify requirements in AS 1210, *Pressure vessels*.

ME-001 support

The above ideas and work were supported by Committee ME-001 in 1984, provided that QA was not mandatory. Also it was agreed that new work include:

(a) A Standard on small, low hazard serially produced pressure vessels. This resulted in AS 2971–1987, probably the first ME-001 true performance standard. This partly involved the control and hazard concept with the introduction of '$p \times V$' criteria.

(b) A Standard to cover in-service inspection of pressure equipment—i.e AS 3788—1990, which also adopted in part the '$p \times V$' criteria for different types of vessels.

(c) Revision of AS 1210, which resulted in the 1989 edition but did not directly cater for QA or $p \times V$—because of the work in progress on AS 3920.1.

The first draft of AS 3920.1 in 1987 was aimed specifically at pressure vessels and was to be added to AS 1210. Its basis at the time, which did not refer to 'risk', was, briefly as follows:

(a) Probability of deaths with all pressure vessels should be at a very low level, e.g. 'less than one death per year from the 100 000 vessels' (e.g. as in Australia, probability of about 10^{-6} per vessel per annum).

(b) Regulatory controls for QA, inspection etc to be increased to reduce probability of failure (P_F) when the hazards (or consequence of failure) (C_F) increased, in order to achieve a very low probability of fatality or serious consequence with any vessel.

(c) AS 1210 technical requirements primarily aimed to achieve a consistent very low probability of failure for all vessels, i.e. like most PE Standards throughout the world.

Committee ME-001 accepted the concept and agreed it should also cater for other pressure equipment i.e. boilers and pressure piping. Gas cylinders were outside the scope of the committee but nevertheless successful gas cylinder practice would be taken into account as a guide. QA was not mandatory.

AS 3920.1—1993

Initial drafts of AS 3920.1, made in 1988 and 1989, were reviewed by ME-001 who formed Sub-Committee ME-001-21. This Committee first met in 1991 to develop AS 3920.1 to provide methods to assure the quality of pressure equipment for different hazard levels. This was submitted for public comment in November 1991.

The title of AS 3920.1, issued in 1993, was '*Assurance of product quality*—Part 1: *Pressure equipment manufacture*'. It was probably the first National Standard in the world to address this particular problem. It provided the flexibility needed by industry by having 12 different control methods that could be used with 5 different hazard levels.

EU Development

In the latter stage of development of AS 3920.1, ME-001-21 learnt of similar proposals being developed for a European Union-Pressure Equipment Directive for Conformity Assessment requirements, a new term that embraced inspection and QA controls. Later, in 1997, the EU finally adopted their approach with $p \times V$ and contents into two groups only (not four as in AS 3920.1, which included 'lethal' and 'non-harmful contents'). They also had not covered location, which ME-001 felt was important and this was subsequently proven by a billion dollar failure in 1998 in USA. There, one vessel ruptured in a large plant and destroyed four more vessels, seriously injuring about 30 people in the blast and from the contents, and damaging a town nearby.

The EU later identified their groups I, II, III, IV as Hazard Categories – similar to but not the same as AS 3920.1, Hazard Levels D, C, B, A, respectively.

The EU draft was partly used to fine-tune the draft for AS 3920.1 prior to ballot.

FUNDAMENTAL BASIS OF AS 3920.1

Hazards

Almost all pressure equipment is hazardous, i.e has the potential to harm, or cause injury or illness, or damage to plant, property, the environment and business.

Controls

Failure to control pressure equipment hazards is almost always due to human inadequacy and has resulted globally in many minor to catastrophic incidents. These clearly show the need for suitable controls. These controls primarily aim to mitigate the probability of failure, but sometimes also to minimize the consequences by various means of emergency response and safeguarding.

Concept

When issued, AS 3920.1 (the forerunner of AS 4343) embraced the above ideas and the concept that:

> '*as the hazard (or consequence of failure) with pressure equipment increases, controls (OHS, regulations, inspection, QA etc) should increase to provide a very low risk*'.

This Standard only applied to new construction.

Pressure equipment and risk

Standards for pressure equipment such as AS 1210 have technical requirements aimed to give a very low probability of failure (P_F) for all classes of vessels; and they are not related to different consequences of failure, except for equipment with lethal contents. Hence risk (R) is controlled to a very low value. This value of R is primarily determined and accepted by society, governments and industry, based on national and global safety performance.

Numbers of PE (*N*)

The number of vessels of a given design in service (N) influences the national risk. It has only a slight effect on the factors determining hazard levels; but it was significant in determining the hazard level limits, which influence the conformity assessment controls needed. This recognized that society wants low risk for individual items of pressure equipment, and also for the total numbers particularly those used by the public. Typical world failure rates are 10^{-5}/PE/year for complex industrial pressure equipment. However, with 10^{7} gas cylinders and more smaller equipment, this would mean 100 to 1000 serious failures per year in Australia which is unacceptable.

DEVELOPMENT OF AS 4343

Amendment 1 to AS 3920.1 (1995)

After 18 months initial use, industry identified that an excessive range of equipment with HL-C would require registration and significant national expense.

Thus the upper limit of HL-C was tripled, and HL-B and HL-C for lethal fluids, were increased by multiples of 30 and 10 to make the system consistent.

Hazard levels for boilers, previously based on rated MW, used the same $p \times V$ basis as pressure vessels to avoid anomalies with fired vessels. It includes the ×3 factor for fired equipment to simplify use.

Piping hazard levels were adjusted similarly to vessels, and other editorial improvements made.

Amendment 2 to AS 3920.1 (1999)

This major amendment resulted from changed philosophy of Australian governments to provide flexibility to industry and adopt a performance-based approach rather than prescriptive details such as technical details and when and how QA etc. should be applied. This generally followed the approach in the National Standard for Plant–1994, which adopted the increasingly recognized ‘risk management’ concept.

NOTE: Risk management was also taken up in ME-001 Standards with provisions in AS/NZS 3788 (1996), *Pressure equipment—In service inspection* and AS 1210 (1997).

Thus the Hazard Levels were transferred to the new AS 4343, and revision of AS 3920.1 was commenced to provide for ‘Conformity Assessment’, a new term introduced by ISO/IEC in 1994 and which was being adopted worldwide, for pressure equipment to include design verification, fabrication inspection, quality management (rather than quality assurance), and other checks.

AS 4343

AS 4343 was issued in 1999 and comprised of the Hazard Level section of AS 3920.1 with some improvements, such as the following:

(a) Modified hazard levels for vacuum vessels.

(b) Addition of an extensive Table 2, based on an earlier document trialled in industry for 2 years, which classified most fluids to simplify the use of the Standard.

(c) An equation to facilitate use by computer.

(d) General improvements to enable the Standard to be directly referenced by authorities Australia-wide without conflicting with new government philosophy.

AS 4343—2005

This new edition makes further improvements in the light of extensive use. These and their basis are identified in the Standard’s Preface and this Foreword.

SOME GENERAL FEATURES OF THE STANDARD

Separate standard

Issuing a separate standard on hazard levels facilitates its use for a variety of purposes, within PE Standards and regulations across Australia. This is consistent with ME-001’s philosophy and should also simplify the revision of AS 3920.1 and use of AS/NZS 3788 and other Standards.

AS 4343 does not make any drastic changes that would have altered practices or increased costs and continues to provide a practical generic method for determining the level of hazards.

AS 4343 has been developed with the full co-operation of industry and regulators and input from a wide range of industry to ensure compatibility. As a result, it is comparable with international practice and assists authorities and industry to unify practice.

Simplicity

Because the whole subject could be very complex with wide application, AS 4343 was intended to be simple, clear and practical. It therefore is not claimed to be exact.

Logarithmic base and $10^{0.5}$

As $p \times V$ values range from less than 0.01 to over 10^8 MPa L, all basic thinking was in orders of magnitude. Half orders ($10^{0.5}$) were rounded from 3.1623 to 3. This resulted in inconsistency between tabular and calculated values and has been modified in this edition, by specifying the use of Table 1.

BASIS OF TECHNICAL REQUIREMENTS OF AS 4343

Experience

This new edition is based on scientific principles applied practically and tempered by wide Australian, New Zealand and global experience.

Various elements of the Standard are amplified below in the order of Table 1 and Equation B1.

Pressure equipment types

AS 4343 applies only to pressure equipment, i.e. boilers, pressure vessels (including vacuum vessels, hot water heaters etc.), pressure piping and pressure safety devices.

Hazard levels (and value)

Hazard levels represent a range of 'effective or equivalent energy (in 100 J)' available in the first few seconds after rupture and immediate release of contents. It also assumes people are in average working conditions, e.g. some metres distant, protected by appropriate clothing and there is normal safe-guarding and emergency provision.

Number and limits of hazard levels

The number and limits of hazard levels were determined by review of current Australian and overseas laws and practice (Standards) requiring different levels of control i.e conformity assessment, registration etc. AS 3920.1 shows this relationship and Clause 2.1 of AS 4343 shows the large range of pressure equipment which required 5 levels.

The limits for HL reflect the level of controls needed as follows:

(A) High hazard—highest level of control for a few critical PE.

(B) Average hazard—normal or average level of control for most PE.

(C) Low hazard—a lower level of controls as apply to smaller equipment, gas cylinders etc.

(D) Extra low hazard—the lowest level of control for low hazard small low pressure PE requiring registration of design, but not of the equipment itself.

(E) Negligible hazard—no specific regulatory controls as applies to great majority of equipment (e.g name of maker required, and general safety and trade laws apply).

In the 1995 amendment to AS 3920.1, Hazard Level C limits were fine tuned as a result of initial experience, and to ensure C and D levels were compatible with Australian laws.

It should be noted that even with extra low or negligible hazard PE, serious injury or serious damage can result, like with any equipment, if reasonable care normally adopted by society is not taken at various stages.

Pressure (*p*)

Design pressure, not working pressure, has been selected as the only readily identifiable pressure value particularly at the construction stage.

Minimum pressure is based on wide Australian practice where pressures below 35 kPa are exempt from special requirements. This value was initially proposed but when the draft European Standards came to light, this was changed at the last minute to align as far as practicable with those 18 countries. Hence, the 50 kPa lower limit was adopted, except for very large vessels.

Vacuum vessels raised a problem as some thin-walled vessels had collapsed in a manner to seriously harm persons in the immediate vicinity, particularly those working at heights. The initial AS 3920.1 adopted height as a criteria but this raised other problems. This is now simplified to allow for contents and be consistent with the using a factor 1/3 to cover height and diameter appropriately.

Volume (V)

As explained in the text, this is the net volume of fluid contents, i.e. gas, liquid or both. It excludes solids e.g. fittings and refractory.

Compressibility and Mass (Factor F_C)

Gas under pressure contains far greater pressure energy than water with the same pressure and volume. This is why hydro-tests are preferred to pneumatic testing as a method of risk control during fabrication. See AS 1210 and AS/NZS 3788.

Hence, the two main forms of fluid were separated and a factor of 10 was generally used for gas. This also recognized that in a failure, liquids usually contained much more mass, thermal and chemical energy and toxicity than gas. This is a simplification adequate for this classification.

Fluid contents (F_f)

Materials were identified and included in Table 2, which follows a trial listing carried out by Tubemakers Australia in 1989, which was then distributed to industry where they were found to be very useful. This Standard is based on the fluid groups in the Australian Code for Transport of Dangerous Goods, which in turn adopted the United Nations classification.

The text's notes to Table 1, Section 3, Table 2 and Appendix B cover the basis, classification and use of various contents, i.e. fluids are in four types.

Lethal fluids were primarily identified because special controls are needed to ensure safety e.g. 100% RT or UT for vessel fabrication, and care in operation.

Non-harmful contents were intended to cover water, air and non-toxic non-flammable, non-combustible fluids where hazards are reduced. However, it should be noted these fluids can cause serious injury under special conditions e.g. when released at high pressure very close to persons (e.g. less than 1 m) or they exclude adequate oxygen for breathing, e.g. drowning or asphyxiation in high nitrogen confined space.

The other two types of contents are similar to EU-PED (Ref 1).

Fluid temperature raised difficulties, particularly with 'steam' and 'hot water', which have not been classified by UN, ADG or NOHSC but are known to kill in rare cases. It is assumed that persons are appropriately clothed and operate reasonably when near such fluids. Hence steam and water above 90°C is classified as 'harmful' while air and non-toxic non-flammable gases at any temperature are classified as non-harmful.

Service and site (Factor F_S)

The following factors apply:

(a) *Importance* Service and site conditions greatly influence the harm and consequence of any failure. This was recognized in the USA (Ref 2) where significant relaxations were permitted by law for remote sites, but not in EU-PED (Ref 1).

Hence the factor F_S was introduced – again as simple as practicable to cover these conditions.

(b) *Fired equipment* The factor of 3 is introduced to cover extra hazards associated with fire and similar high temperature heating sources. These can include highly focused solar energy but excludes heating by steam or hot water or air. Waste hot gases and electric heating are classified as fired.

The extra hazards are due mainly to furnace explosions, which have resulted in serious injuries and further damage to PE or plant. Such equipment also has greater probability of failure due to thermal fatigue, creep and overheating due to loss of control. Often equipment such as boilers are located close to operating personnel.

The values for boilers are now the same as for pressure vessels, but with the factor of 3 for fired equipment introduced to simplify use, i.e. incorporates the factor in Note 4 (a)(i) of Table 1.

(c) *Quick-actuating closures* The factor of 3 allows for the projection effect of the door and vessel in a sudden failure (release and separation) of the door. It is partly influenced by the relatively high frequency of these failures and injury to nearby persons.

(d) *Knock-on or domino effect* At sites where large amounts of pressure equipment are relatively closely located, the failure of a single piece of equipment may cause failure of adjacent equipment. A factor of 3 is used to allow for the increased hazard. Such sites usually involve more than five co-located pieces of equipment and also the Major Hazard Facilities as defined in the NOHSC and relevant state legislation.

(e) *Transportable vessels* The factor of 3 applicable here covers the extra hazards when such vessels get out of control or are impacted by other vehicles. These hazards result from the greater exposure to people, usually the public where involuntary risk must be kept at a very low level.

(f) *Very high pressure* Escaping fluid at such pressure poses extra hazards due to penetration effect on nearby persons and the projectile effect of dislodged plugs, fittings or parts.

(g) *Remote locations* The factor of 1/3 is introduced to allow for reduced hazard in remote sites similar to that done in Ref 2. and due to the greatly reduced exposure to people or sensitive property or environment. As a guide in determining 'remote', persons should not be near enough to be hurt in any way if the PE failed violently, for more than 1% of the time while the equipment is pressurized, e.g. approximately 7 hours per month for safety-trained maintainers to service equipment.

AS/NZS 3788 gives information on protection distance for air (as in pneumatic tests) but this should be increased for flammable and toxic fluids.

(h) *Buried and similar equipment* Bunkers, blast protection or properly installed underground or bunded vessels and piping could be considered as remote, and a factor of 1/3 applies.

(i) *Very low stress PE* Hazards with this equipment are usually reduced and warrant the factor of 1/3 because slight leakage usually occurs well before violent rupture. Low stress, compared with that normally allowed, also greatly reduces the likelihood of failure and thus risk. Such factor should not normally apply if there is a real feasibility of gross over-pressure due to lack of control on pressure.

(j) *Large low pressure vessels (tanks other than atmospheric)* These pose much greater hazards due to the loss of containment of contents than due to pressure. Often they are designed for less than 50 kPa. Hence to reduce the influence of pressure, the factor of 1/3 has been introduced.

(k) *Human occupancy* Hyperbaric chambers and other equipment containing people are increasing in numbers. Almost certainly if there is a sudden loss of pressure or over-pressure, hazards are higher. Hence the factor of 3 has been added.

This approach is recommended also for situations where more than 10 or 20 persons are severely exposed for lengthy periods.

Piping

Pressure piping is hazardous and, for simplicity, diameter is used in place of volume. The hazard level is made the same as for a pressure vessel with volume equal to that of a pipe length of 10 diameters.

Initial comment suggested the total volume of the piping should be used because this could influence the maximum damage that might occur. This can be the case but diameter was retained because:

(a) Most serious damage to people and consequence of a failure, usually occurred in the first two or three seconds of rupture and the resulting blast wave and immediate distribution of the contents.

(b) Piping in refineries, industrial plant and similar installations vary extensively in length and diameter between valves, and use of volume would complicate calculations.

(c) It would not be simple to allow for automatic shut-off devices to limit discharge or for various safe-guarding and emergency response provisions.

A recent gas explosion in Belgium, from a leaking major pipeline, indicates that blast and fire consequence some 30 minutes after a leak failure is a major factor depending on actions after the initial failure.

Components and fittings (subject to pressure)

These can be critical and to control hazards they are required to have at least the same hazard level as the pressure equipment to which they are attached.

APPLICATION

It is recommended that the hazard levels be used as follows:

(a) In accordance with the applicable regulations and Standards, e.g. AS 3920.1 AS/NZS 3788, AS 1210 etc.

(b) With care and for generic assessment of the consequences of failure for design, conformity assessment, and prioritising of in-service inspection and maintenance. For pressure equipment with highly hazardous contents in special circumstances, a more rigorous assessment of hazards and consequences of failure may be desirable.

(c) For general simplified risk management or risk-based asset management or inspection.

(d) Where the service conditions (pressure, temperature, contents and site etc.) are changed. Then the owner/user and in-service inspection body together should reclassify the Hazard Level appropriately and as required by the regulatory authority. If the hazard level is increased then the requirements for re-rating in AS/NZS 3788 should apply.

EXPECTED IMPACT OF NEW EDITION OF AS 4343

As suggested in the Preface, this edition should have a positive cost/benefit impact by improving safety and efficiency.

It is expected that there should be little or no change needed for existing equipment, but any changes desired should be in accordance with the edition referenced in the appropriate regulation.

CONCLUSION

AS 4343 provides a rational yet simple system for determining hazard levels, which are the basis for various controls used to ensure the probability of failure is sufficient to achieve a nationally acceptable very low level of risk for all pressure equipment.

The Standard effectively bridges the important and sensitive interface between law and Standards, and so is being adopted for regulatory controls in Australia.

It provides essential support to AS 3920.1. The two Standards have resulted in reduced costs, unified basis for controls whilst simultaneously improving safety.

The development over 25 years of this Standard illustrates:

(a) The great value, in making progress, of building on good ideas, continued improvement (particularly when shortcomings are identified), co-operation, trust, integrity and focus on optimum and practical solutions in the national interest.

(b) The importance of an environment or culture that encourages these ideas [AWRA as part of this technical infrastructure provided 3 key initiators of AS 3920.1].

(c) The success of a dedicated Standards Australia committee of industry users, makers, regulators and others working together to reach a transparent, equitable consensus, firstly in 1927 with title 'Unification of boiler regulations' and currently as ME-001, Pressure Equipment.

REFERENCES (SEE ALSO APPENDIX A)

[1] European Union. 'Pressure Equipment Directive' 97/23/EC – 29 May 1997.

[2] OSHA. Regulation 'Process Plant Safety Management' CFR 1901. February 1992. USA.

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