

Australian Standard[®]

**Bursting discs and bursting disc
devices—Application, selection and
installation**



This Australian Standard® was prepared by Committee ME-001, Pressure Equipment. It was approved on behalf of the Council of Standards Australia on 21 September 2004. This Standard was published on 8 November 2004.

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-

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RECONFIRMATION
OF
AS 1358—2004
Bursting discs and bursting disc devices—Application, selection and installation

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NOTES

Australian Standard[®]

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee ME-001, Pressure Equipment, to supersede AS 1358—1989.

This Standard incorporates Amendment No. 1 (February 2007). The changes required by the Amendment are indicated in the text by a marginal bar and amendment number against the clause, note, table, figure or part thereof affected.

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 Standard is to provide requirements and guidance on the application, selection and installation of bursting discs and bursting disc devices.

The objective of this revision is to align the Standard with current international practice and specifically with ISO Standards.

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.

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STANDARDS AUSTRALIA

Australian Standard

Bursting discs and bursting disc devices—Application, selection and installation

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard provides requirements and guidance on the application, selection and installation of bursting discs and bursting disc devices.

The information to be used for identification and the information to be marked on bursting discs and bursting disc devices is specified in Appendix A.

Testing and certification requirements for bursting discs are specified in Appendix D.

NOTES:

- 1 Information which the purchaser may provide to assist in the design or the selection of bursting discs and bursting disc devices is given in Appendix B.
- 2 Equations for the calculation of the discharge capacity for single phase flow are given in Appendix C.

1.2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard.

AS

- | | |
|------|--|
| 1210 | Pressure vessels |
| 1271 | Safety valves, other valves, liquid level gauges and other fittings for boilers and unfired pressure vessels |
| 4942 | Pressure equipment—Glossary of terms |

ASME

- | | |
|------------|---|
| BPV-VIII-1 | Boiler and pressure vessel code Section VIII—Rules for construction of pressure vessels: Division 1 |
|------------|---|

ISO

- | | |
|--------|---|
| 4126 | Safety devices for protection against excessive pressure |
| 4126-6 | Part 6: Application, selection and installation of bursting disc safety devices |

1.3 DEFINITIONS

For the purpose of this Standard, the definitions given in AS 4942 and those below apply.

1.3.1 Average bursting pressure

The arithmetic average value, at the coincident temperature, of the test bursts carried out on a batch of discs by the manufacturer.

1.3.2 Backpressure

The static pressure existing at the outlet of a bursting disc device at the time the device is required to operate. It is the result of pressure in the discharge system from other sources or as a result of vacuum on the upstream side.

1.3.3 Backpressure support

That component of a bursting disc assembly which prevents the failure of the disc due to backpressure differential.

NOTE: A backpressure support which is intended to prevent the failure of the disc when the system pressure falls below atmospheric pressure is sometimes referred to as a vacuum support.

1.3.4 Baffle plate

A plate attached to the vent side of a bursting disc device or system to redirect discharge or reduce recoil.

1.3.5 Batch

A group of bursting discs of the same type, size, average bursting pressure, and coincident temperature, manufactured from material of the same lot of material and made as a single group.

1.3.6 Bursting disc

The pressure-containing and pressure-sensitive element of a bursting disc device.

1.3.7 Bursting disc assembly

The complete assembly of components which are installed in the bursting disc holder to perform the desired function.

1.3.8 Bursting disc device

A non-reclosing pressure-relief device actuated by differential pressure and designed to function by the bursting or venting of the bursting disc.

1.3.9 Bursting disc device discharge capacity

The rate at which a bursting disc device can discharge fluid after bursting or venting of the bursting disc.

1.3.10 Bursting disc holder

That part of a bursting disc device which retains the bursting disc assembly in position.

1.3.11 Bursting disc safety device discharge area

The area which is the minimum cross-sectional flow area of the bursting disc safety device taking into consideration the possible reduction of the cross-section, for example by backpressure supports, catching devices, or parts of the bursting disc which remain after bursting.

1.3.12 Bursting pressure

The value of the pressure differential across the disc at which a bursting disc device functions. (See Note to Clause 1.3.36.)

1.3.13 Bursting tolerance

The maximum variation of test results in equal positive and negative quantities or percentages related to the average bursting pressure. Where a zero manufacturing design range is stated, the tolerance is applied directly to the specified bursting pressure.

1.3.14 Coating

A layer of metallic or non-metallic material applied by brush, spray, dipping, fluidized bed, or other similar method to components of a bursting disc device.

1.3.15 Coincident temperature (bursting pressure)

The temperature used in conjunction with bursting pressure.

1.3.16 Conventional domed bursting disc (also referred to as ‘forward-acting’)

A bursting disc which is domed in the direction of the bursting pressure, i.e. where the bursting pressure is applied to the concave side of the bursting disc, see Figure 1.

1.3.17 Excess flow valve

A device which permits limited flow. When this flow is exceeded the valve closes.

1.3.18 Flat bursting disc

A bursting disc having one or more layers which is flat when installed. It may be made of a ductile or brittle disc.

1.3.19 Foil

The sheet or strip used for the manufacture of metallic bursting discs.

1.3.20 Graphite types**1.3.20.1 Graphite**

A crystalline form of the element carbon.

1.3.20.2 Impregnated graphite

Graphite in which the open porosity is impregnated with a filler material.

1.3.20.3 Flexible graphite

A graphite structure formed by the compression of thermally exfoliated graphite intercalation compounds.

1.3.20.4 Graphite composite

Made up of two or more distinct materials and having different properties to those of the separate materials and in which the proportion of graphite is over 50 per cent by weight.

1.3.21 Graphite bursting disc

A bursting disc manufactured from graphite, impregnated graphite, flexible graphite or graphite composite and designed to burst due to bending or shearing forces.

1.3.22 Inspector

A person able to inspect pressure equipment for the purposes of conformity with the specified requirements.

1.3.23 Lining

An additional sheet or sheets of material forming part of the bursting disc assembly or holder. The lining can be metallic or non-metallic.

1.3.24 Manufacturing design range

A range of pressure within which the average bursting pressure of a batch of bursting discs falls in order to be acceptable for a particular application.

1.3.25 Muffled outlet

A component of a bursting disc device which disperses the discharge.

1.3.26 Operating pressure

The pressure to which the bursting disc is exposed during normal operation.

1.3.27 Operating ratio

Ratio between the operating pressure and the minimum limit of bursting pressure (see Figure 9).

NOTES:

- 1 In the case of a pressure system with an operating pressure expressed in MPa gauge, and atmospheric pressure on the downstream side of the bursting disc, the operating ratio may be calculated from the following equation:

$$\text{Operating ratio} = \frac{\text{Operating pressure (MPa)}}{\text{Minimum limit of bursting pressure (MPa)}}$$

- 2 In the case of a pressure system with a back pressure on the downstream side of the bursting disc, the operating ratio is the value of the differential pressure between the upstream side and the downstream side of the bursting disc divided by the minimum limit of bursting pressure expressed as a differential pressure.

1.3.28 Operating temperature

The temperature range of the disc and the surrounding parts during normal operation.

1.3.29 Performance tolerance

A range of pressure in positive and negative quantities or percentages which includes both manufacturing design range and bursting tolerance at a coincident temperature, which is applied directly to the specified bursting pressure.

1.3.30 Plating

A metal layer applied to a disc or holder by a plating process.

1.3.31 Reverse domed bursting disc (also referred to as reverse-acting)

A bursting disc which is domed against the direction of the bursting pressure, i.e. where the bursting pressure is applied to the convex side of the bursting disc, see Figure 2.

1.3.32 Service life

The time period beginning at the installation of a bursting disc assembly and ending at either replacement or burst.

1.3.33 Shall

Indicates that a statement is mandatory.

1.3.34 Should

Indicates a recommendation.

1.3.35 Slotted lined bursting disc

A conventional domed bursting disc made up of two or more layers, one of which is slit or slotted so as to reduce its strength and to control the bursting pressure of the bursting disc.

1.3.36 Specified bursting pressure

The pressure, quoted with a coincident temperature, specified by the user or his agent when defining the disc requirement.

NOTE: The words maximum and minimum may be used with the terms 'bursting pressure' and 'specified bursting pressure'.

1.3.37 Stiffening ring

An integral component of the bursting disc assembly used primarily for the stiffening of fragile discs.

1.3.38 Temperature shield

A device which protects a bursting disc from excessive temperature.

SECTION 2 GENERAL DESCRIPTIONS OF BURSTING DISCS AND BURSTING DISC DEVICES

2.1 MATERIALS

2.1.1 Selection of materials

The selection of materials used for the components of bursting disc safety devices shall take the following into account:

- (a) Suitability with regard to manufacture.
- (b) Compatibility with the process fluid, the adjoining components and the chemical and physical conditions, both upstream and downstream of the rupture disc, to which the bursting disc safety device will be subjected when in service.

NOTE: The use of corrosion-resistant materials for the downstream side of the bursting disc device is recommended because corrosion of these parts can cause damage which can impair the performance of the bursting disc safety device.

2.1.2 Material specifications

Materials for the components of bursting disc safety devices shall meet the requirements of the relevant application Standard.

They shall have uniform chemical and physical properties and shall be free from defects, which would cause the bursting disc safety device to malfunction.

2.1.3 Protection from corrosion

Bursting disc safety devices are frequently required to operate in corrosive environments and, therefore, components manufactured from materials affected by corrosion shall, where appropriate, be protected by coating, plating or lining.

Coatings and plating shall be applied to give an even and homogeneous coating to the surfaces to be protected.

Linings shall be seamless and supplied with the bursting disc safety device so as to preserve them as a set or integral unit.

The corrosion protection shall be supplied by the manufacturer.

The corrosion protection shall not impair the performance of the bursting disc safety device.

2.2 TYPES OF BURSTING DISCS

2.2.1 Conventional domed bursting discs (forward-acting)

Conventional domed bursting discs shall be designed so that they burst due to tensile stresses when the bursting pressure is applied to the concave side of the bursting disc (see Figure 1).

They shall be domed by a means sufficient to cause a permanent set such that no further plastic flow will occur initially when the bursting disc is subjected to its intended operating condition.

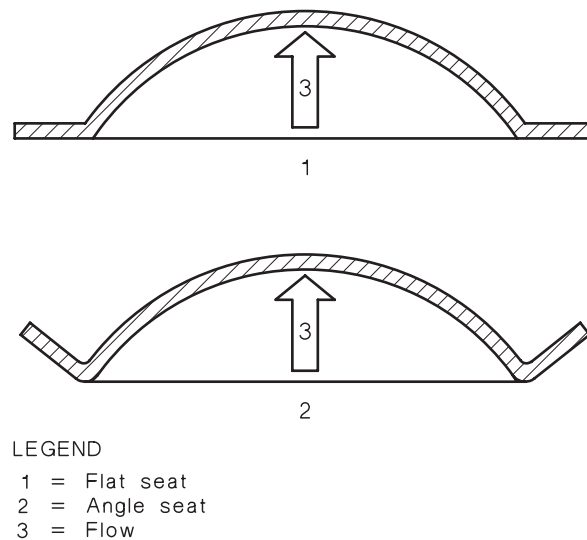


FIGURE 1 CONVENTIONAL DOMED BURSTING DISC (FORWARD ACTING)

Conventional domed bursting discs include the following types:

- (a) *Conventional simple domed* This type of bursting disc shall have one or more layers, the bursting pressure of which is controlled by the ultimate tensile strength of the material(s).
- (b) *Conventional slotted domed* This type of bursting disc shall have two or more layers, at least one of which shall have slits or slots so as to reduce its strength and to control the bursting pressure.
- (c) *Conventional scored simple domed* This type of bursting disc shall be scored such that when the bursting pressure is reached, the bursting disc opens along the score.
- (d) *Conventional simple domed with knife blades* This type of bursting disc shall open by being cut by the knife blades when the bursting pressure is reached.

2.2.2 Reverse domed bursting discs (reverse-acting)

Reverse domed bursting discs shall be designed to function due to buckling, bending or shearing stresses when the bursting pressure is applied to the convex side of the bursting disc (see Figure 2).

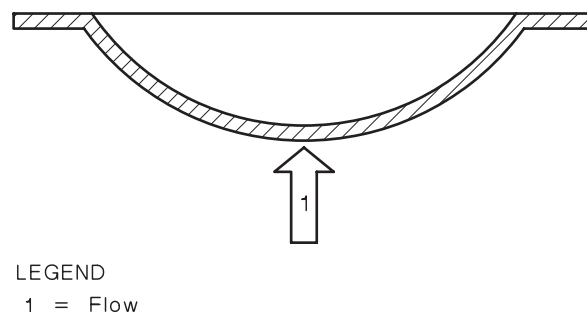


FIGURE 2 REVERSE DOMED BURSTING DISC (REVERSE ACTING)

Reverse domed bursting discs include the following types:

- (a) *Reverse domed scored* This type of bursting disc shall be scored such that, when the dome reverses at the bursting pressure, the bursting disc opens along the score. The bursting disc may also have areas of weakness which determine the pressure at which the bursting disc reverses.
- (b) *Reverse domed having slip or tear-away design* This type of bursting disc shall function by being expelled downstream from the bursting disc holder.
NOTE: A catching device may be provided for this type of bursting disc.
- (c) *Reverse domed with knife blades* This type of bursting disc shall open by being cut by knife blades during reversal of the dome.
- (d) *Reverse domed that function by shearing* This type of bursting disc shall have one or more layers which upon reversal opens due to shearing forces.
- (e) *Reverse domed composite or multi-layered* This type of bursting disc shall have two or more layers at least one of which shall contain areas of weakness of such a configuration as to determine the pressure at which the bursting disc reverses.

2.2.3 Flat bursting discs

Flat bursting discs shall have one or more layers. According to the type, they may require a bursting disc holder, or be fitted directly between installation flanges.

Flat bursting discs include the following types:

- (a) *Graphite replaceable element* This type of bursting disc shall be plane or recessed and used in conjunction with a bursting disc holder. They shall be designed to burst due to bending or shearing forces, (see Figure 3).

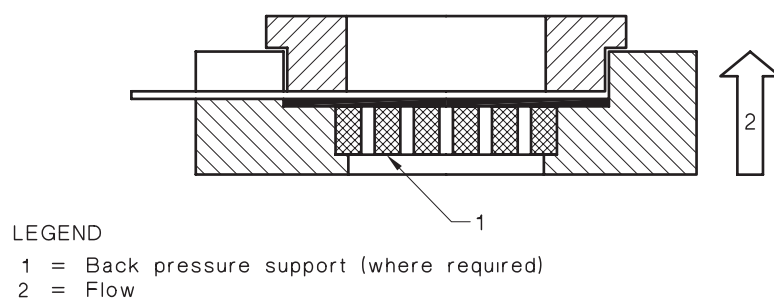


FIGURE 3 TYPICAL REPLACEABLE ELEMENT GRAPHITE BURSTING DISC AND HOLDER

- (b) *Graphite monobloc* This type of bursting disc shall be designed so as to fit directly between the installation flanges. They may be recessed on one or both sides according to the bursting pressure and direction in which it is to be applied (see Figure 4). Graphite monobloc bursting discs may be reinforced with an external armour ring. This design may be provided with a lining on the pressure side.

The pressure containing capability of graphite monobloc bursting discs, after bursting, shall be determined by one of the methods given in Clause 2.3.1.1.

NOTE: For this design of graphite monobloc bursting disc, the diameter of the downstream piping adjacent to the bursting disc should follow the manufacturer's instructions. Normally this diameter will be greater than the inside diameter of the recess.

- (c) *Flat slotted lined* This type of bursting disc shall have two or more layers. At least one of the layers shall have, for example, slits or slots so as to reduce its strength and to control the bursting pressure. According to the design it may be necessary for the bursting disc to be used in conjunction with a bursting disc holder.

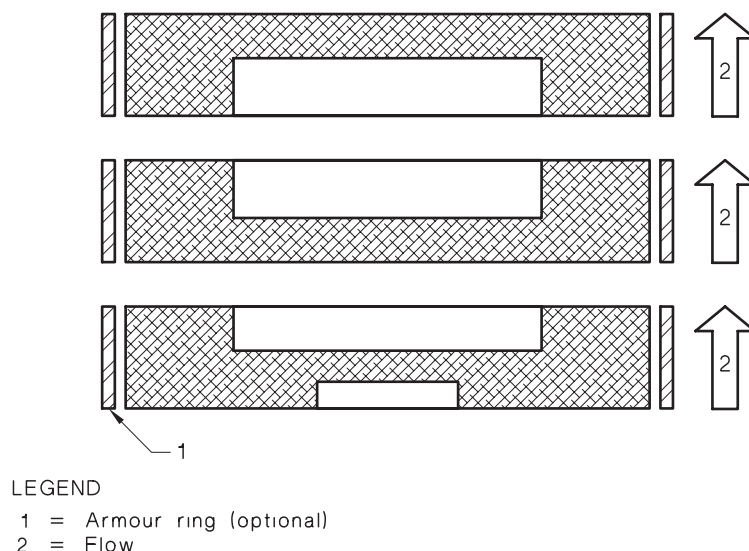


FIGURE 4 MONOBLOC GRAPHITE BURSTING DISCS—DIFFERENT CONFIGURATIONS

2.2.4 Other types and designs

Other types and designs of bursting discs are permitted providing that they meet the requirements of this Standard.

2.3 BURSTING DISC HOLDERS

2.3.1 Design

2.3.1.1 Pressure containing capability

The pressure containing capability of bursting disc holders shall be determined by one of the following:

- Calculation generally according to design rules for flanged connections such as AS 1210.
- Other established design methods of the manufacturer.
- Experimental design procedure(s) developed by the manufacturer, carried out on prototypes, or on representative production samples.

NOTE: For (b) and (c) above, the user may choose to reserve the right to review and then either agree with, reject or request modifications to the methods and/or procedures proposed by the manufacturer.

2.3.1.2 Other design requirements

The design of the bursting disc holder shall ensure the following:

- The accurate positioning of the bursting disc assembly.
- The bursting disc assembly, where applicable, can only be fitted the correct way round.