

AS/NZS 3800:2020
(Incorporating Amendment No. 1)



Australian/New Zealand Standard™

Electrical equipment for explosive atmospheres — Repair and overhaul (IEC 60079-19:2015 (ED. 3.1), MOD)



AS/NZS 3800:2020

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- Australian Cablemakers Association
- Australian Chamber of Commerce and Industry
- Australian Industry Group
- Aviation and Marine Engineers Association
- Construction Forestry Miners and Energy Union
- Department of Mines, Industry Regulation and Safety, WA
- Department of Natural Resources, Mines and Energy, Qld
- Engineers Australia
- Minerals Council of Australia
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Australian/New Zealand Standard™

Electrical equipment for explosive atmospheres — Repair and overhaul (IEC 60079-19:2015 (ED. 3.1), MOD)

Originated in Australia as AS 2290.2—1979.
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Preface

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee EL-023, Electrical Equipment in Mines and Quarries, to supersede AS/NZS 3800:2012.

This Standard incorporates Amendment No. 1 (July 2021). 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.

The objective of this Standard is to give instructions, principally of a technical nature, on the repair, overhaul, reclamation and modification of equipment designed for use in explosive atmospheres. It is not applicable to maintenance, other than when repair and overhaul cannot be disassociated from maintenance, neither does it give advice on cable entry systems, which may require a renewal when the equipment is re-installed. It prevents overhaul without manufacturer and certificate documentation to types of protection "i", "m" and "s". This Standard is based on the assumption that good engineering practices are adopted throughout.

This Standard is an adoption with national modifications, which has been reproduced from the Final version of IEC 60079-19:2010+AMD1:2015 CSV (ED.3.1), *Explosive atmospheres ?* Part 19: *Equipment repair, overhaul and reclamation*, and has been varied as indicated to take account of Australian/New Zealand conditions.

The inclusion of national variations in boxed text under the relevant clauses in this modified adoption, was approved by the Standards Australia Production Management Group (PMG) on 6 September 2018, as a one-off exemption to the directives of Clause A.3 in Standardisation Guide 007: Adoption of International Standards.

Additional national variations, requirements and guidance are set out in Appendix ZA to Appendix ZH.

Terms and definitions in this Standard that are additional to those of IEC 60079-19 are numbered beginning from 3.201.

The national variations address issues including the following:

- (a) Alignment between AS/NZS 3800 and IEC 60079-19.
- (b) Clarification around the general requirements for a repair facility.
- (c) Clarification around the requirement for spare parts.
- (d) Provide additional details regarding the certification nameplate and markings.
- (e) Provide additional details regarding reclamations and metal spraying.
- (f) Clarification around the welding techniques permitted.
- (g) Amendment of the requirements for threaded holes for fasteners to improve the practicability of the verification methods.
- (h) Clarification on actions to take when performing modifications.
- (i) Amendment of the requirements for temporary repairs.
- (j) Amendment of the requirements for overpressure testing to align with the requirements of the 60079 series of standards.

As this Standard is reproduced from an International Standard, the following applies:

- (i) In the source text "this part of the IEC 60079 series" should read "this Australian/New Zealand Standard".
- (ii) A full point substitutes for a comma when referring to a decimal marker.

Australian or Australian/New Zealand Standards that are identical adoptions of international normative references may be used interchangeably. Refer to the online catalogue for information on specific standards.

The terms "normative" and "informative" are used in Standards to define the application of the appendices or annexes to which they apply. A "normative" appendix or annex is an integral part of a Standard, whereas an "informative" appendix or annex is only for information and guidance.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

EXPLOSIVE ATMOSPHERES –

Part 19: Equipment repair, overhaul and reclamation

NATIONAL VARIATION:

Delete title and replace with the following:

Electrical equipment for explosive atmospheres — Repair and overhaul (IEC 60079-19:2015 (ED. 3.1), MOD)

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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This Consolidated version is not an official IEC Standard and has been prepared for user convenience. Only the current versions of the standard and its amendment(s) are to be considered the official documents.

This Consolidated version of IEC 60079-19 bears the edition number 3.1. It consists of the third edition (2010-11) [documents 31J/180/FDIS and 31J/192/RVD] and its amendment 1 (2015-03) [documents 31J/249/FDIS and 31J/250/RVD]. The technical content is identical to the base edition and its amendment.

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendment 1. Additions and deletions are displayed in red with deletions

being struck through. A separate Final version with all changes accepted is available in this publication.

International Standard IEC 60079-19 has been prepared by subcommittee 31J: Classification of hazardous areas and installation requirements, of IEC technical committee 31: Equipment for explosive atmospheres.

The significant technical changes with respect to the previous edition are as follows:

- inclusion of specific Group I requirements;
- inclusion of offshore requirements.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of the IEC 60079 series, under the general title *Explosive atmospheres*, can be found on the IEC website.

The committee has decided that the contents of the base publication and its amendment will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

INTRODUCTION

When electrical equipment is installed in areas where dangerous concentrations and quantities of flammable gases, vapours, mists or dusts may be present in the atmosphere, protective measures are to be applied to reduce the likelihood of explosion due to ignition by arcs, sparks or hot surfaces produced either in normal operation or under specified fault conditions.

This part of IEC 60079 is supplementary to other relevant IEC standards, for example IEC 60364 series, as regards installation requirements, and also refers to IEC 60079 series and its appropriate parts for the design requirements of suitable electrical equipment.

Clause 4 of this part of IEC 60079 contains general requirements for the repair and overhaul of equipment and should be read in conjunction with the other relevant clauses of this standard dealing with the detailed requirements for individual types of protection.

In cases where protected equipment incorporates more than one type of protection, reference should be made to all clauses involved.

This part not only gives guidance on the practical means of maintaining the electrical safety and performance requirements of repaired equipment, but also defines procedures for maintaining, after repair, overhaul or reclamation, compliance of the equipment with the provisions of the certificate of conformity or with the provisions of the appropriate explosion protection standard where a certificate is not available.

The nature of the explosion protection offered by each type of protection varies according to its unique features. Reference should be made to the appropriate standard(s) for details.

Users will utilize the most appropriate repair facilities for any particular item of equipment, whether they be the facilities of the manufacturer or a suitably competent and equipped repairer (see Note).

This part recognizes the necessity of a required level of competence for the repair, overhaul and reclamation of the equipment. Some manufacturers may recommend that the equipment be repaired only by them.

In the case of the repair, overhaul or reclamation of equipment which has been the subject of design certification, it may be necessary to clarify the position of the continued conformity of the equipment with the certificate.

NOTE Whilst some manufacturers recommend that certain equipment be returned to them for repair or reclamation, there are also competent independent repair organizations who have the facilities to carry out repair work on equipment employing some or all of the types of protection covered by IEC 60079 series. For repaired equipment to retain the integrity of the type(s) of protection employed in its design and construction, detailed knowledge of the original manufacturer's design (which may only be obtainable from design and manufacturing drawings) and any certificate documentation may be necessary. Where equipment is not being returned to the original manufacturer for repair or reclamation, the use of repair organizations that are recommended by the original manufacturer should be considered.

NATIONAL VARIATIONS:

Add the following after the second paragraph:

This standard details the repair, overhaul and reclamation performance requirements for electrical explosion-protected equipment and is supplementary to other relevant Australian, New Zealand and IEC standards, e.g. AS/NZS 3000, AS 2067, AS/NZS 4871 and AS 60034/IEC 60034 series, as regards installation requirements, and also refers to the appropriate parts of AS/NZS 60079 for the design requirements of suitable electrical equipment. Processes and methods associated with repair and overhaul previously

included in this standard have been transferred to SA/SNZ Handbook HB 239, *Guidance of the repair and overhaul of electrical equipment for explosive atmospheres*.

Add the following to the end of the fifth paragraph:

This standard also contains provisions to assist Group II operators to repair equipment in compliance with the requirements of the appropriate explosion-protection standard where a certificate is not available.

EXPLOSIVE ATMOSPHERES –

Part 19: Equipment repair, overhaul and reclamation

NATIONAL VARIATION:

Delete title and replace with the following:

Electrical equipment for explosive atmospheres — Repair and overhaul (IEC 60079-19:2015 (ED. 3.1), MOD)

1 Scope

This part of IEC 60079

- gives instructions, principally of a technical nature, on the repair, overhaul, reclamation and modification of equipment designed for use in explosive atmospheres;
- is not applicable to maintenance, other than when repair and overhaul cannot be disassociated from maintenance, neither does it give advice on cable entry systems which may require a renewal when the equipment is re-installed;
- is not applicable to type of protection “m”, “o” and “q”;
- assumes that good engineering practices are adopted throughout.

NOTE Much of the content of this standard is concerned with the repair and overhaul of electrical machines. This is not because they are the most important items of explosion-protected equipment, but rather because they are often major items of repairable capital equipment in which, whatever type of protection is involved, sufficient commonality of construction exists as to make possible more detailed instructions for their repair, overhaul, reclamation or modification.

NATIONAL VARIATION:

Delete “– is not applicable to type of protection “m”, “o” and “q””; and replace with the following:

- prevents overhaul without manufacturer and certificate documentation to types of protection “i”, “m” and “s”;

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60079 (all parts), *Explosive atmospheres*

IEC 60079-0, *Explosive atmospheres – Part 0: Equipment – General requirements*

IEC 60079-1, *Explosive atmospheres – Part 1: Equipment protection by flameproof enclosures “d”*

IEC 60079-2, *Explosive atmospheres – Part 2: Equipment protection by pressurized enclosure “p”*

IEC 60079-7, *Explosive atmospheres – Part 7: Equipment protection by increased safety “e”*

IEC 60079-7:1990, *Electrical apparatus for explosive gas atmospheres – Part 7: Increased safety "e"*

IEC 60079-7:2001, *Electrical apparatus for explosive gas atmospheres – Part 7: Increased safety "e"*

IEC 60079-14, *Explosive atmospheres – Part 14: Electrical installations design, selection and erection*

IEC 60079-15:2005, *Electrical apparatus for explosive gas atmospheres – Part 15: Construction, test and marking of type of protection "n" electrical apparatus*

IEC 60079-15:2010, *Explosive atmospheres – Part 15: Equipment protection by type of protection "n"*

IEC 60079-19, *Explosive atmospheres – Part 19: Equipment repair, overhaul and reclamation*

IEC 60079-26, *Explosive atmospheres – Part 26: Equipment with equipment protection level (EPL) Ga*

IEC 60085, *Electrical insulation – Thermal evaluation and designation*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC 61241 (all parts), *Electrical apparatus for use in the presence of combustible dust*

IEC 61241-0, *Electrical apparatus for use in the presence of combustible dust – Part 0: General requirements*

IEC 61241-4, *Electrical apparatus for use in the presence of combustible dust – Part 4: Type of protection "pD"*

ISO 4526, *Metallic coatings – Electroplated coatings of nickel for engineering purposes*

ISO 6158, *Metallic coatings – Electrodeposited coatings of chromium for engineering purposes*

NATIONAL VARIATION:

Add the following normative references:

AS 60034.1, *Rotating electrical machines, Part 1: Rating and performance*

AS 60529, *Degrees of protection provided by enclosures (IP Code)*

AS/NZS 1826, *Electrical equipment for explosive gas atmospheres—Special protection—Type of protection 's'*

AS/NZS 4761, *Competencies for working with electrical equipment for hazardous areas (EEHA) (all parts)*

AS/NZS 4871, *Electrical equipment for mines and quarries (all parts)*

AS/NZS 60079.0, *Explosive atmospheres, Part 0: Equipment—General requirements (IEC 60079-0:2017 (ED.7.0) MOD)*

AS/NZS 60079.6, *Explosive atmospheres, Part 6: Equipment protection by oil immersion 'o'*

AS/NZS 60079.7, *Explosive atmospheres, Part 7: Equipment protection by increased safety 'e'*

AS/NZS 60079.14, *Explosive atmospheres, Part 14: Electrical installations design, selection and erection (IEC 60079-14:2013 (ED.5.0) MOD)*

AS/NZS 60079.15, *Explosive atmospheres, Part 15: Equipment protection by type of protection 'n'*

AS/NZS 60079.17, *Explosive atmospheres, Part 17: Electrical installations inspection and maintenance*

AS/NZS 60079.33, *Explosive atmospheres, Part 33: Equipment protection by special protection 's'*

ISO 4063, *Welding and allied processes — Nomenclature of processes and reference numbers*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60079-0 and the following apply.

NOTE Additional definitions applicable to explosive atmospheres can be found in IEC 60050-426.

3.1

serviceable condition

condition which permits a replacement or reclaimed component part to be used without prejudice to the performance or explosion protection aspects of the equipment, with due regard to the requirements of the certificate documentation as applicable, in which such a component part is used

3.2

repair

action to restore faulty equipment to its fully serviceable condition complying with the relevant standard

NOTE The relevant standard means the standard to which the equipment was originally designed.

3.3

overhaul

action to restore to a fully serviceable condition equipment which has been in use or in storage for a period of time but which is not faulty

3.4

maintenance

routine actions taken to preserve the fully serviceable condition of the installed equipment (see Clause 1)

3.5

component part

an indivisible item

NOTE The assembly of such items may form equipment.

3.6

reclamation

means of repair involving, for example, the removal or addition of material to reclaim component parts which have sustained damage, in order to restore such parts to a serviceable condition in accordance with the relevant standard

NOTE The relevant standard means the standard to which the individual parts were originally manufactured.

**3.7
modification**

change to the design of the equipment which affects material, fit, form or function

NOTE As the certificate describes specific construction of the equipment, a modification of the equipment would no longer comply with the construction described in the certificate documentation.

**3.8
manufacturer**

maker of the equipment (who may also be the supplier, the importer or the agent) in whose name usually the certificate, where appropriate, of the equipment was registered

**3.9
alteration**

change to a product that results in an alternative construction that is described in the certificate documentation

**3.10
user**

user of the equipment

**3.11
repair facility**

facility providing a service that consists of repairs, overhauls, or reclamations of explosion-protected equipment who may be the manufacturer, the user or a third party (repair agency)

**3.12
certificate**

document that assures the conformity of a product, process, system, person, or organization with specified requirements

NOTE The certificate may be either the supplier's declaration of conformity or the purchaser's recognition of conformity or certification (as a result of action by a third party) as defined in ISO/IEC 17000.

**3.13
certificate references**

a certificate reference number may refer to a single design or a range of equipment of similar design

**3.14
symbol "X"**

symbol used to denote specific conditions of use

NOTE The symbol "X" is used to provide a means of identifying that essential information for the installation, use, and maintenance of the equipment is contained within the certificate. Therefore, the certificate documents should be studied before such equipment is installed, repaired, overhauled, reclaimed, altered or modified.

**3.15
copy winding**

process by which a winding is totally or partially replaced by another, the characteristics and properties of which are at least as good as those of the original

**3.16
flameproof enclosure "d"**

enclosure in which parts which can ignite an explosive atmosphere are placed and which can withstand the pressure developed during an internal explosion of an explosive mixture and which prevents the transmission of the explosion to the explosive atmosphere surrounding the enclosure

3.17**type of protection “i”**

type of protection based on the restriction of electrical energy within apparatus and of interconnecting wiring exposed to the potentially explosive gas atmosphere to a level below that which can cause ignition by either sparking or heating effects

3.18**type of protection “p”**

technique of guarding against the ingress of the external atmosphere into an enclosure by maintaining a protective gas therein at a pressure above that of the external atmosphere

3.19**type of protection “e”**

type of protection applied to electrical apparatus in which additional measures are applied so as to give increased security against the possibility of excessive temperatures and of the occurrence of arcs and sparks in normal service or under specified abnormal conditions

3.20**type of protection “n”**

type of protection applied to the electrical equipment such that, in normal operation and in certain specified regular expected occurrences, it is not capable of igniting the surrounding explosive gas atmosphere

3.21**type of protection “tD” or Group III “t”**

type of protection for explosive dust atmospheres where electrical equipment is provided with an enclosure providing dust ingress protection and a means to limit surface temperatures

3.22**type of protection “pD”**

technique of applying a protective gas to an enclosure in order to prevent the formation of an explosive dust atmosphere inside the enclosure by maintaining an overpressure against the surrounding atmosphere

NATIONAL VARIATION:

Add the following terms and definitions:

3.201**operative**

person who can demonstrate a combination of knowledge and skills to effectively carry out activities on, or associated with, hazardous area equipment

3.202**responsible person**

person who can demonstrate a combination of knowledge and skills to effectively carry out, and supervise, activities on hazardous area equipment

3.203**type of protection “m”**

type of protection whereby parts that are capable of igniting an explosive atmosphere by either sparking or heating, are enclosed in a compound in such a way that the explosive atmosphere cannot be ignited under operating or installation conditions

3.204

type of protection “o”

type of protection in which the electrical apparatus or parts of the electrical apparatus are immersed in a protective liquid in such a way that an explosive atmosphere which may be above the liquid or outside the enclosure cannot be ignited

3.205**type of protection “q”**

type of protection in which the parts capable of igniting an explosive atmosphere are fixed in position and completely surrounded by filling material to prevent the ignition of an external explosive atmosphere

3.206**type of protection “s”**

concept that has been adopted to permit the assessment and testing of those types of electrical apparatus or parts thereof, which for technical, operational or functional reasons, do not comply with the constructional or other requirements specified for apparatus with established types of protection, but which nevertheless can be shown, where necessary by assessment and test, to be suitable for use in prescribed zones or hazardous areas

3.207**verification dossier**

set of documents showing the compliance of electrical equipment and installations, including certificates, manufacturer's instructions and records of previous repair, overhaul and reclamation.

4 General

4.1 General principles

This clause covers those aspects of repair, overhaul, reclamation, alteration, and modification which are common to all explosion-protected equipment. Subsequent clauses provide instructions for the additional requirements relevant to specific types of protection. When equipment incorporates more than one type of protection, reference shall be made to the appropriate clauses.

NOTE 1 Additional requirements for types of protection “m”, “o” and “q” have not been defined.

Assuming that repairs and overhauls are carried out using good engineering practices, then repairs and overhauls impacting the type of protection shall be presumed as being in conformity with the certificate when manufacturer's parts or parts specified in 4.4.1 are used and repairs or alterations are carried out specifically as detailed in this standard, the certificate documentation under 4.4.1.5, and when performed by competent persons as provided in 4.4.1.3.

In circumstances where the relevant documentation in accordance with 4.4.1.5.1 is not available, then the repair or overhaul shall be carried out on the equipment in accordance with this standard and other relevant standard(s). The steps taken to obtain the relevant documentation shall be recorded in the repair facility records (see 4.4.1.5.3).

If the equipment has been modified, it shall comply with the requirements of 4.4.3 where a new certificate is required to be prepared or the equipment is no longer suitable for use in a hazardous area.

NOTE 2 In some countries, legal requirements do not permit repair without relevant documentation to Group I equipment unless subjected to complete retesting and a new certificate issued.

If other repair or alteration techniques are used which are not in accordance with this standard, then it will be necessary to ascertain, from the manufacturers, and/or the certification authority, the suitability of the equipment for continued use in an explosive atmosphere.

NOTE 3 Repair of equipment which has no marking plate should be avoided.

NATIONAL VARIATIONS:

Delete the following note:

NOTE 1: Additional requirements for types of protection “m”, “o” and “q” have not been defined.

Delete paragraph 3 and *replace* with the following:

In circumstances where adequate documentation, in accordance with 4.4.1.5.1, is not available, then with the agreement of the user, the repair or overhaul shall be carried out on the equipment in accordance with this standard and any other relevant standard(s). The steps taken to obtain the certificate documents shall be recorded in the repair facility records (see 4.4.1.5.3). Where insufficient documentation is available to completely define the explosion-protected characteristics of the equipment, repair or overhaul alternatives shall be prevented for the following equipment:

- (a) Equipment for Group I applications.
- (b) Type of protection “i”, “m” and “s”.

After NOTE 3 *add* the following:

NOTE 4: Where the certificate of conformity has been cancelled due to safety concerns, repair or overhaul should not proceed.

4.2 Statutory requirements for repair facility

The repair facility, which may be the manufacturer, user or a third party repair, shall be aware of any specific requirements in relevant national legislation which may govern the repair or overhaul operation.

NATIONAL VARIATION:

Delete paragraph and *replace* with the following:

4.2.1 Repair facility

The repair facility, which may be the manufacturer, user or a third party repairer, shall be aware of any specific requirements in relevant legislation which may govern the repair or overhaul operation, such as competency levels and the responsibility to disclose residual occupational health and safety risk identified in equipment during repair or overhaul.

In the case of the repair, overhaul, reclamation, alteration or modification of equipment which has been the subject of design certification, the position of the continued compliance of the equipment with the certificate shall be clarified and the end-user notified.

Repair facilities involved in the repair, overhaul, and/or modification of explosion-protected electrical equipment shall have their capabilities for compliance with this standard independently verified.

NOTE: Means of verification include the following:

- (a) An inspection service facility accreditation program.

- (b) A certified service facility scheme.
- (c) A product certification body suitably accredited for this standard.

4.2.2 User

The equipment user should be aware of any relevant legislation in respect to periodical inspection and verification that electrical equipment installed in explosive atmospheres is fit for purpose. The user should consider whether sufficient facilities and competencies are available to undertake the repair or overhaul of such equipment by the user or whether it should be contracted to specialist repair and overhaul service providers. In addition, the user should be aware that sufficient information is to be provided to third-party repair facilities and installers to meet occupational health and safety obligations.

4.3 Instructions for the user

4.3.1 Certificates and documents

The equipment design certificate and other related documents (see 4.4.1.5) should have been obtained as part of the original purchase contract.

NATIONAL VARIATION:

Add the following as a second paragraph:

Where the certified item no longer reflects the documentation from the original purchase contract, due to changes made during subsequent modifications/overhauls/alterations, the facility performing such modifications/overhauls/alterations should provide updated documentation to the end user at the time of the change.

4.3.2 Records and work instructions

The relevant documentation (4.3.1), along with the records of any repairs, overhauls, alterations or modifications, should be kept by the user and made available to the repairer.

NOTE 1 The documentation and records are normally retained in the users verification dossier for the lifetime of the equipment.

NOTE 2 It will be in the interests of the user that the repairer is notified, whenever possible, of the fault and/or nature of the work to be done and any special application information, e.g. a motor supplied by an inverter.

Special requirements stipulated in the user's specifications, and which are supplementary to the various standards, e.g. enhanced ingress protection, specific environmental conditions etc., should be brought to the attention of the repairer.

NATIONAL VARIATION:

Add the following as a third paragraph:

Notification of any statutory requirements for compliance with the certificate shall be included in the work instructions/user specifications.

4.3.3 Re-installation of repaired equipment

Re-installation of repaired equipment is in accordance with IEC 60079-14.

NOTE Before the repaired equipment is re-commissioned, cable/conduit entry systems should be checked to ensure that they are undamaged and are appropriate to the equipment type of protection.

NATIONAL VARIATION:

Add the following as a second paragraph:

Re-installation of Group I repaired equipment shall also consider the requirements of the AS/NZS 4871 series.

4.3.4 Repair facilities

It is the responsibility of the user to ascertain that the repair facility concerned can demonstrate compliance with the relevant stipulations of this standard.

NATIONAL VARIATION:

Add the following to the end of the first paragraph:
and any regulatory requirements

4.4 Instructions for the repair facility

4.4.1 Repair and overhaul

4.4.1.1 General

Repair facilities shall operate a Quality Management System.

NOTE Overhaul of explosion-protected equipment involves special techniques. The Quality Management System should include documented procedures to ensure work is performed within an agreed refurbishment quality programme. For additional information, see ISO 9001.

The repair facility shall appoint a person ('responsible person') with the required competency (see Annex B), within the management organization, to accept responsibility and authority for ensuring that the overhauled/repaired equipment complies with the certification status agreed with the user. The person so appointed shall have a working knowledge of the appropriate explosion protection standards and an understanding of this standard.

The repair facility must have adequate repair and overhaul facilities as well as the appropriate equipment necessary and trained Operatives with the required competency (see Annex B) and authority to carry out the activities, taking into account the specific type of protection.

The repair facility shall conduct an assessment of the status of the equipment to be repaired, agree with the user the expected certification status of the equipment after repair and the scope of work to be done. This should include the justification for omission of any tests mentioned within this document that the user could reasonably assume to be included. The assessment shall be documented and shall address the relevant clauses of the appropriate equipment standard and this standard and be included in the job report to the user. Such assessments shall be conducted by the responsible person (supported by appropriate Operatives). The responsible person shall only conduct assessments with the explosion protection techniques for which they have demonstrated his competence.

The repair facility shall include additional procedures and systems to carry out overhaul/repair work at sites external to the repair facility, where appropriate.

NATIONAL VARIATION:

Delete all paragraphs and *replace* with the following:

The repair facility, which may be the manufacturer, user or a third-party repair facility, shall:

- (a) Be notified of any statutory requirements for compliance with the certificate in the work instructions/user specifications.
- (b) Operate a quality management system incorporating the requirements of AS/NZS 80079.34, together with the requirements detailed below:

NOTE 1: Overhaul of explosion-protected equipment involves special techniques. The quality management system should include documented procedures to ensure work is performed within an agreed refurbishment quality program. For additional information, see AS/NZS 80079.34. Also refer to appendix ZF for further information.

(c) Establish a quality process plan incorporating appropriate inspection, diagnostic, test and check procedures to ensure that the repairs and overhauls meet the functional and compliance requirements of the user and the relevant standards and/or certification documentation to be able to affirm to the user the suitability for re-installation to a potential explosive atmosphere.

(d) Nominate a minimum of one “responsible person” per individual repair facility with the required competency (see Annex B), within the management organization, to accept responsibility and authority for ensuring that the overhauled/repared equipment complies with the certification status agreed with the user. The person so appointed shall have a working knowledge of the appropriate explosion-protection standards and an understanding of this standard.

At least one full-time responsible person shall be retained to fulfil the role of signatory for compliance reporting for the repair facility and for the supervision of operatives and close supervision of other employees in respect to activities that can impact on the integrity of the explosion-protection technique.

NOTE 2: The responsible person fulfils the role of signatory for compliance reporting for the repair facility and for the supervision of operatives and close supervision of other employees in respect to activities that can impact on the integrity of the explosion-protection technique.

(e) Establish procedures or work instructions for overhaul and repair of explosion protected equipment.

(f) Identify and record the range of test and measurement capabilities and limitations of the repair facility to be used within the repair and overhaul of explosion protected equipment.

(g) Maintain a system for calibration of measuring equipment to International or National standards.

(h) Maintain records which shall be legible, provide traceability of measured results to calibrated instruments with actual measurements recorded and be retrievable for the specified storage period.

(i) Measure and monitor specific processes, by a responsible person or obtain a statement of compliance from a third-party supplier, to demonstrate compliance with required parameters where the specific repair process can affect the integrity of a type of protection, and where the resulting integrity cannot be verified after repair.

(j) Perform any required tests as specified in this standard or relevant standards with no sampling techniques being permitted.

(k) Maintain records of the work undertaken and whom the work was undertaken for.

(l) Maintain records of the end user, for traceability purposes, should non-conforming explosion protected equipment be supplied.

(m) Take action, appropriate to the risk, when non-conforming explosion protected equipment has been supplied.

(n) Have the following:

(i) Adequate repair and overhaul facilities;

(ii) The appropriate equipment necessary and trained personnel with the required AS/NZS 4761 competency or equivalent evaluation of competence (see Annex B).

(iii) Competency and authority to carry out the activities, taking into account the specific type of protection.

(o) Conduct an assessment of the status of the equipment to be repaired or overhauled and agree with the user the expected certification status of the equipment after repair or overhaul and the scope of work to be done. Any overhaul or repair shall require the repair facility to confirm all Ex requirements relating to the type of protection. Such assessments shall be conducted by the responsible person (supported by appropriate Operatives). The responsible person shall only conduct assessments with the explosion-protection techniques for which they have demonstrated their competence.

(p) Include an engineering justification for the omission of any test or inspection prescribed in this standard. The justification shall:

(i) Be conducted by the responsible person.

(ii) Be documented in the job report to the user.

(iii) Identify or reference the relevant clauses of this standard.

(iv) Identify or reference the appropriate equipment standard and affected clauses.

(v) Document how the objectives of the omitted tests/inspections have been otherwise met; and

(vi) Include details of the acceptance by the end user of the justification.

NOTE 3: Justifications based on cost or expediency are not appropriate.

(q) Conduct overhauls/repairs external to the repair facility where the QMS allows for the work to be completed at alternative locations, i.e. by generation of additional procedures and records to document the overhaul/repair.

(r) Ensure that work undertaken by an external facility that is not a repair facility or assessed as a contractor to the repair facility is adequately supervised by a responsible person

4.4.1.2 Certificates and standards

The repairer's attention is directed to the need to be informed of, and to comply with, the relevant explosion-protection standards and certificates, including any specific conditions of use, applicable to the equipment to be repaired or overhauled.

4.4.1.3 Competency

All personnel directly concerned with the repair and/or overhaul of the equipment shall be competent or supervised by a competent person. The competencies may be specific to the type of work.

Training and competency assessments are specified in Annex B.

Appropriate training and assessment shall be undertaken from time to time at intervals depending on the frequency of utilization of the technique or skill and change of standards or regulations. The interval should normally not exceed three years.

NATIONAL VARIATION:

Delete the first paragraph and replace with the following:

All personnel directly concerned with the repair and/or overhaul of the equipment shall be competent or supervised by a competent person. The competencies shall be specific to the type of work.

4.4.1.4 Repair of components

When a component of complete equipment is taken off site for repair, such as a rotor of a rotating machine, and it is impracticable to carry out certain tests, the repairer shall document the details and communicate them to the user before starting the repair.

NOTE In some countries, legal consequences may depend upon the extent to which the carrying out or not of certain actions or tests is practicable.

NATIONAL VARIATION:

Add the following to the end of the first paragraph:

Any additional work necessary to ensure the explosion-protected properties of the equipment shall be documented by the service facility in the overhaul certificate.

4.4.1.5 Documentation

4.4.1.5.1 General

The repair facility shall seek to obtain all necessary information/data from the user or manufacturer for the repair and/or overhaul of the equipment. This may include information relating to previous repairs, overhauls or modifications. The repair facility shall also have available and refer to the relevant explosion-protection standard.

NOTE As from the fourth edition of IEC 60079-0, manufacturers are required to prepare instructions including repair.

The data necessary for the repair and/or overhaul includes, but is not limited to, details of the:

- technical specification;
- drawings;
- type(s) of explosion-protection;
- operating conditions (such as environment, supply (inverter), lubricants, duty, etc.)
- dismantling and assembly instructions;
- certificate documentation with certificate limitations (specific conditions of use), where specified;
- marking (including Ex marking);
- recommended methods of installation/operation/maintenance/repair/overhaul for the equipment;
- list of spare parts;
- summary of previous history of the repaired product including information as gathered under 4.3.2.

The information may be subject to amendments.

The repair facility shall maintain copies of any relevant explosion-protection standards with which repaired/overhauled equipment is claimed to comply.

NATIONAL VARIATIONS:

Delete the first paragraph and *replace* with the following:

The repair facility shall seek to obtain all necessary information/data from the user or holder of the certificate of conformity for the repair and/or overhaul of the equipment. This shall include reference to the relevant explosion-protection standard, certificate documentation and information relating to previous repairs, overhauls or modifications.

Delete the last paragraph and *replace* with the following:

NOTE: Sufficient documentation is to be obtained to permit a complete verification of the explosion-protection characteristics of the equipment. Where insufficient information is available, refer to 4.1.

The repair facility shall maintain and refer to copies of any relevant explosion-protection standards with which repaired/overhauled equipment is claimed to comply.

4.4.1.5.2 Job report to the user

At the completion of the work, job reports shall be submitted to the user (see 4.3.2), for inclusion in the user's verification dossier, containing, at least, the following:

- details of fault(s) detected;
- full details of repair and overhaul;
- list of replaced or reclaimed parts;
- results of all checks and tests (in sufficient detail to be useful if required by the next repairer, see 4.3.2);
- a comparison of the results against the criteria that have been used to determine compliance;
- copy of the user contract or order;
- a recapitulation of the marking applied in accordance with Annex A.

The job reports of repairs/overhauls shall be retained for a period of time as agreed with the user. Retained information shall be adequately controlled to ensure correct retrieval.

For repairs undertaken without documentation in accordance with 4.4.1.5.1, the following shall be included in the repair report:

- a statement that the repair is in accordance with the manufacturer's instructions or applicable requirements of the Ex standard for the particular type of protection against which the equipment was originally manufactured;
- a statement that the repairer has insufficient evidence of full compliance with the certificate documents;
- a statement that any specific conditions of use have not been identified or considered in the repair or overhaul.

NATIONAL VARIATION:

Delete the second, third and fourth items in the first list and *replace* with the following:

- full details of repair and overhaul including software/firmware.
- list of replaced or reclaimed parts, software/firmware changes or versions.
- results of all checks and tests (in sufficient detail to be useful if required by the next repairer, see 4.3.2). The report is to include the "*as found*" and "*as at the end of the work or as condition*".

4.4.1.5.3 Repair facility records

The following records shall be retained by the repair facility:

- current and past copies of relevant technical standards in addition to the explosion protection standards;
- certification of Facility Quality Standard including:
 - details of Repair provider's Quality Assessment Scheme;
 - test instrument calibration;
 - competency and training records of personnel;
 - purchasing control system;
 - customer complaints system;
 - internal and, where appropriate, external audit documentation;
 - management review;
 - process control procedures;
 - register of manufacturer's drawings.
- job records including:
 - the steps taken to obtain the certificate documentation;
 - mechanical inspection record for compliance with relevant standards;
 - defect identification;
 - electrical test records before and after repair including traceability of instruments used and pass/fail criteria;
 - attestation of conformity for replacement components;
 - recovery procedure for repaired components;
 - record of any assessments by the responsible person along with the justification for decisions taken;
 - record of mechanical inspection during assembly and upon completion;
 - record of work undertaken by the repair facility;
 - record of any replacement parts manufactured by the repairer.

The record of the reclamation of repaired components (4.4.2.2.2) shall, at least, identify the following:

- a) identification of the component part;
- b) name of the organization carrying out the reclamation;
- c) a detailed justification for the work carried out;
- d) various options considered (e.g., welding, metal spraying);
- e) technical parameters, e.g., bond strength;
- f) the reasons for selecting the chosen technique;
- g) consumables used and method of storage;
- h) base material;
- i) reclamation process manufacturers' instructions considered;
- j) procedure utilized;
- k) identity and competency of the operator;
- l) inspection procedure used, e.g., ultra-sonic, dye-penetration, X-ray;
- m) maintenance and calibration details of automatic systems;
- n) detail of any dimensions which differ from those in relevant certificate documents or the original dimensions of the component part;
- o) drawing showing reclamation details including material removed and replaced;

p) date of reclamation.

These records shall be retained for a period of at least ten years or as agreed with the user.

NATIONAL VARIATIONS:

In the third dot point of the job records list *delete* “defect identification” and *replace* with the following:

defect identification, including traceability of test and measurement instruments used and pass/fail criteria.

Add the following at the end of the job records list:

- compliance documents used for conformity verification.
- operator(s) undertaking work.
- details of subcontracted work.
- test and measurement equipment used.

4.4.1.6 Spare parts

4.4.1.6.1 General

It is preferable to obtain new parts from the manufacturer, and the repairer shall ensure that only appropriate spare parts are used in the repair or overhaul of certified equipment. Depending on the nature of the equipment, these spare parts may be identified by the manufacturer, the equipment standard or the relevant certificate documentation.

Where components cannot be supplied by the original manufacturer, where the full specification for the component is available, and where the repairer’s quality scheme permits, the repairer may manufacture replacement component parts. Records of such replacement shall be retained and provided to the user.

NATIONAL VARIATION:

After the second paragraph *add* the following:

NOTE: Where the certificate of conformity has been cancelled due to safety concerns, replacement components should not be manufactured.

4.4.1.6.2 Fasteners

Where replacement bolts are used, they shall be the same type, diameter, pitch and length and at least the same tensile strength as specified for the original equipment.

Washers, plain or lock, shall not be placed under bolt heads, screw heads or nuts unless they are specified in the original certificate documentation or in the type of protection standard to which the equipment was manufactured.

NATIONAL VARIATION:

Delete the first paragraph and *replace* with the following:

Where replacement fasteners are used, they shall be the same type, material, diameter, pitch and length and the same tensile strength as specified in the certification for the original equipment.

4.4.1.6.3 Sealed parts

Parts, which are required by the equipment specification and certificate documents to be sealed, shall be replaced only by the particular spare part(s) detailed in the parts list.

NOTE Devices incorporated in equipment to indicate interference by third parties (e.g., security seals) as distinct from those required in the certificate documentation, are not intended to fall within the scope of this subclause.

4.4.1.7 Identification of repaired equipment

The equipment shall be marked to identify the repair or overhaul and the repairer's identity. The marking for the repaired equipment is given in Annex A.

Marking may be provided on a separate label. It may be necessary to amend or remove or supplement the label in certain circumstances as follows.

- q) If after repair, overhaul, or alteration, the equipment still complies with the restrictions imposed by this standard and the type of protection standards to which it was manufactured, but does not necessarily comply with the certificate documentation, the label should not normally be removed and the repair symbol "R" shall be written within an inverted triangle (see Annex A).
- r) If after repair, overhaul, alteration, or modification, the equipment is changed such that it no longer conforms with the type of protection standards or certificate documentation, the "Ex" marking and the mark of the certificate issuer on the certification label shall be removed unless a supplementary certificate has been obtained.
- s) Where the standards to which the previously certified equipment was manufactured are not known, the requirements of this standard and the current edition of the relevant type of protection standards shall apply. An assessment, by a person competent in assessing explosion protected equipment, shall be conducted to verify compliance with the relevant level of safety prior to release of the equipment by the repairer.

NATIONAL VARIATIONS:

Add the following before the first paragraph:

Existing certification labels should be checked to ensure they are secure and legible. Where this label is required to be replaced, it shall be sourced from the original manufacturer. Where a replacement label cannot be obtained from the original manufacturer, then a new label may be created by the repair facility, but the repair report shall detail that it has been replaced by the repair facility without the consent of the original manufacturer. For Group II equipment, this may also be performed as part of the fitness for purposes assessment to AS/NZS 60079.17.

Delete list items q), r) and s) and replace with the following:

(a) If after repair, overhaul or alteration, the equipment still complies with the restrictions imposed by this standard, the type of protection standards to which it was designed and with the certification documents, the label should not be removed and the repair symbol "R" shall be written within a square (see Annex A).

(b) If after repair, overhaul, or alteration, the equipment still complies with the restrictions imposed by this standard and the type of protection standards to which it was manufactured, but does not necessarily comply with the certificate documentation, the label should not normally be removed. The repair symbol "R" shall be written within an inverted triangle (see Annex A).

(c) If after repair, overhaul, alteration, or modification, the equipment is changed such that it no longer conforms with the type of protection standards or certificate documentation, the "Ex" marking and the mark of the certificate issuer on the certification label shall be removed unless a supplementary certificate or a new certificate has been obtained.

Add item (d) to the end of the list as follows:

(d) Where the standards to which the previously certified equipment was manufactured are not known, the requirements of this standard and the current edition of the relevant

explosion-protection standards shall apply. An assessment by a responsible person who has the appropriate units of competency in accordance with AS/NZS 4761 or equivalent shall be conducted to verify compliance with the relevant level of safety prior to release of the equipment by the repairer. The person performing the assessment shall not be connected to the repair facility and shall be part of a recognized body competent in the certification of explosion protected equipment.

Add the following after the list:

Method (d) shall not be used for Group I.

4.4.2 Reclamations

4.4.2.1 General

Where the repair process involves reclamation work, then, in addition to the requirements of 0 for repairs and overhauls, the requirements of 4.4.1 also apply.

NATIONAL VARIATION:

Add the following before the first paragraph:

Reclamations not affecting the explosion-protection are not the subject of this Clause (4.4.2). Such parts should be reclaimed using good engineering practices and be fit for purpose.

4.4.2.2 Exclusions

Some component parts are considered not to be reclaimable and are therefore excluded from the scope of this standard, such as:

- component parts made from the following materials: glass, plastics, or any material that is not dimensionally stable;
- fasteners;
- component parts, e.g., some encapsulated assemblies, which have been stated by the manufacturer to be not subject to repair.

4.4.2.2.1 Requirements

4.4.2.2.2 General

Any reclamation shall be carried out by competent personnel, skilled in the process to be employed and using good engineering practices (see Annex B). If any proprietary process is used, the instructions of the originator of such a process should be followed.

All reclamation shall be documented in accordance with 4.4.1.5.3.

If the reclamation is carried out other than by the user, the user shall be provided with a copy of the record.

NATIONAL VARIATIONS:

Add the following after the first paragraph:

Operators of reclamation techniques, e.g. welding or metal spraying, shall be required to undertake an initial and periodic practical skill test as specified in B.5.

Add the following after the last paragraph:

A reclamation procedure that would result in dimensions or other integral aspects affecting explosion-protection integrity being different from those given in relevant certificate documentation is a modification.

In the event of any uncertainty regarding the permissibility, from an explosion-protection safety point of view, of an intended reclamation procedure, the advice of the manufacturer or certifying authority should be sought. It may also be necessary to carry out tests to verify that the reclamation procedure is acceptable.

4.4.2.2.3 Responsibilities

If reclamations are contracted out by the repair facility to a specialized industry, such reclamations shall be the responsibility of the repair facility.

NATIONAL VARIATION:

Add the following to the end of the sentence:

The repair facility shall assess the reclamation works for compliance with relevant standards and certification documents.

4.4.2.2.4 Reclamation procedures

4.4.2.2.5 General

The following outlines some of the reclamation procedures which may be applicable to explosion-protected equipment.

It should be recognized that not all procedures are applicable to all types of protection. Detailed instructions are given in the appropriate clauses of this standard.

Metal removal shall be minimized and be just sufficient to remove the defect requiring repair and provide the minimum coating thickness recommended for the technique used.

NOTE 1 Industry guidance would suggest that the removal of up to 2% of metal thickness, or 0,5 mm metal thickness, whichever is greater, for metal spraying and up to 20% for welding will not be significantly detrimental to the strength of the component.

NOTE 2 Removal of a greater thickness of material should only be carried out after due consultation with the manufacturer or by calculation where the manufacturer is no longer available.

On completion of the reclamation, the repairer shall satisfy himself that the equipment is in a fully serviceable condition and complies with the standard(s) for the type of protection. Such compliance shall be recorded by the repair facility and retained in the job files.

4.4.2.2.6 Metal spraying

This method shall be used only when the extent of the wear or damage, plus the machining necessary to prepare the component part for reclamation, does not weaken the part beyond safe limits. A sprayed metal inlay, whilst adding some stiffness, shall not be taken into account when strength is considered. Indeed, the machining process prior to the application of metal spray may introduce stress raisers which may further weaken the component.

NOTE Metal spraying is not recommended where peripheral speed exceeds 90 m/s.

4.4.2.2.7 Electroplating

Electroplating is an acceptable procedure provided that the part is not weakened beyond safe limits. Detailed procedures for chromium and nickel plating are given in ISO 6158 and ISO 4526, respectively.

4.4.2.2.8 Sleeving

This method shall be used only when the extent of the wear and damage, plus the machining necessary to prepare the part for reclamation, does not weaken the part beyond safe limits. A sleeve, whilst adding some stiffness, should not be taken into account when strength is considered.

4.4.2.2.9 Brazing and welding

Reclamation by brazing or welding shall be considered only if the technique employed ensures the correct penetration and fusion of braze or weld with parent metal, resulting in adequate reinforcement, the prevention of distortion, the relief of stresses and the absence of blow-holes. It should be recognized that brazing and welding raise the temperature of the component to a high level and may cause fatigue cracks to propagate.

The following welding techniques are recognized by this standard:

- MMA: Manual metal arc
- MIG: Metal inert gas
- TIG: Tungsten inert gas
- Sub-Arc: MIG under a layer of flux
- Hot wire

Other techniques shall only be utilized in reclamations after due consultation with the manufacturer or, if relevant, the certifying authority.

NATIONAL VARIATION:

Delete the recognized welding technique list and *replace* with the following:

Any welding technique described in ISO 4063 that shields weld metals by flux or inert gas is acceptable.

4.4.2.2.10 Metal stitching

The cold reclamation of a fractured casting by the technique of closing the fracture with nickel alloy stitches and sealing the crack by nickel alloy chain studding may be admissible subject to a suitable thickness of casting.

NATIONAL VARIATION:

Add the following paragraph to the end of this clause:

An overpressure test shall be conducted after this type of repair to ensure the integrity is maintained.

4.4.2.2.11 Threaded holes for fasteners

Threads which have been damaged beyond an acceptable extent may be reclaimed, depending upon the type of protection, by the following means:

- oversize drilling and re-tapping;
- oversize drilling, re-tapping and the fitting of a proprietary thread insert which passes the appropriate pull test as specified by the thread insert manufacturer;
- oversize drilling, plugging¹, re-drilling and re-tapping;
- plugging¹, re-drilling and tapping elsewhere;

¹ Plugs shall be securely retained.

- plug-welding, re-drilling and tapping.

NATIONAL VARIATIONS:

Delete the second and third list items and *replace* with the following:

- oversize drilling, re-tapping and the fitting of a proprietary thread insert.
- oversize drilling and tapping, insert solid threaded plug, secure via welding, re-machine surface (as required).

Add the following after the list:

Plugs shall be securely retained in a manner that prevents loosening due to vibration and thermal expansion/contraction or as a result of regular loosening and tightening of the bolts.

The effectiveness of the repair shall be verified by an appropriate test which confirms Ex protection features are maintained and continued compliance with certification is maintained.

NOTE: The pull test defined in Appendix ZG may be used, or, as an alternative, an overpressure test may be conducted.

As per Clause 4.4.1.1, justification for the test method should be recorded and provided to the end user in the job report.

4.4.2.2.12 Re-machining

Re-machining worn or damaged surfaces shall be considered only if

- the component part is not weakened beyond safe limits;
- provided that the integrity of the enclosure is maintained;
- the required surface finish is achieved.

NATIONAL VARIATION:

Add the following to the bottom of the list:

For group 1 applications only, the design thickness is not reduced below what is stated within the certificate.

4.4.3 Alterations and modifications

4.4.3.1 Alterations

Where the repair process involves alteration work, then, in addition to the requirements of 4.4.1 for repairs and overhauls, the requirements of 4.4.3 also apply.

No alteration shall be made to the equipment unless that alteration is permitted in the certificate documentation. If the certificate documentation is not available to the repairer, the proposed alteration is confirmed in writing by the manufacturer to be permitted by the certificate. Subsequent clauses of this standard give detailed instructions regarding alterations in the context of different types of protection.

NATIONAL VARIATION:

Add the following after the last paragraph:

NOTE: The principle role of a repair facility is to maintain, or return equipment to, its originally certified condition. A repair facility may not assume the role of a manufacturer and assemble new equipment. In this context, a repair facility may not, for example, populate an empty enclosure to produce a new piece of equipment.

without that equipment first being returned to the original equipment manufacturer for quality verification and conformity assessment. An original equipment manufacturer may not delegate quality verification and conformity assessment of new equipment to a repair facility. Furthermore, the original equipment manufacturer may only sub-contract assembly work to a repair facility when the original equipment manufacturer's quality documentation, and the equipment's certification documentation, allow.

4.4.3.2 Modifications

The user shall be informed in writing and his written instructions obtained if a modification is proposed, which results in the equipment not conforming to the certificate documentation. If the modification is performed, the equipment is no longer suitable for use in an explosive atmosphere without additional assessment. If the repair is performed, and additional assessment not performed, the label shall be removed or altered to give a clear indication that the equipment does not conform to the original certificate. In addition, the report to the user shall clearly state the engineering characteristics of the modification and that the equipment is not suitable for use in an explosive atmosphere without additional assessment.

NOTE 1 The "assessment" may include third party certification of the modified equipment, but this may not be practical in all situations. When not practical, assessments by competent persons may be accepted by the user.

NOTE 2 Where labels are removed, efforts should be made to maintain traceability of the product in consultation with the user.

NATIONAL VARIATIONS:

Add the following after the first sentence:

The user shall provide written instructions on how to proceed.

Add the following at the end of the paragraph:

The report shall not take the format of a compliance statement.

Delete Note 1 and *replace* with the following:

NOTE 1: The "additional assessment" above should include third party certification of the modified equipment.

4.4.4 Temporary repairs

A temporary repair intended to achieve continued short-term operation of the equipment shall only be carried out if retention of explosion-protection aspects is ensured or other appropriate measures are taken until the equipment is fully restored. Certain temporary repair procedures may therefore not be allowed. Any temporary repair shall be brought up to full repair standards as soon as reasonably practicable.

NATIONAL VARIATION:

Delete the paragraph and *replace* with the following:

A temporary repair, such as per AS/NZS 2290.1 for underground coal mining applications, intended to achieve continued short-term operation of the equipment shall only be carried out if retention of explosion-protection aspects is ensured or other appropriate measures are taken until the equipment is fully restored. Certain temporary repair procedures may therefore not be allowed. Any temporary repair shall be replaced with a permanent repair in accordance with techniques identified in Clause 4.4.2 as soon as reasonably practicable.

Temporary repairs shall follow good engineering practice and shall only be completed on the end users' site where the in-service equipment is located and in consultation with either the manufacturer or repair facility.

Temporary repairs are a possible source of significant failure and therefore are to be approved by the end user, fully documented and added to the verification dossier and in the equipment repair record.

4.4.5 Rotating machinery

NATIONAL VARIATION:

Add the following text:

The repair facility should take into account the requirements in IEC TS 60034-23, which covers the procedures necessary to ensure the satisfactory rewinding and repair of all types and sizes of rotating electrical machines covered by the AS 60034/IEC 60034 series standards, applicable for rotating electrical machines intended to be installed in non-hazardous areas. The requirements in this standard are in addition to the requirements of IEC TS 60034-23.

4.4.5.1 Removal of damaged windings

The procedure of softening the impregnating varnish of windings with solvents before stripping is acceptable.

The alternative procedure which uses the application of heat to facilitate the removal of windings is acceptable provided that the operation is carried out with caution so as not to damage the insulation between the laminations of magnetic parts.

Removal of windings by heat on equipment with type of protection "e" and equipment with any type of protection having temperature class T6, T5 or T4 requires particular caution.

NOTE The advice of the manufacturer should be sought, regarding the construction of the core and the inter-laminar insulation material, if necessary.

The application of open flames to the core is not acceptable because it may damage the insulation between laminations.

The need for particular caution in those circumstances arises from the fact that an increase in core loss, which could result from degradation of inter-laminar insulation, could significantly affect type "e" parameters (t_E -time, etc.) or result in the temperature classification being exceeded.

The repairer shall satisfy himself, as in all reclamation procedures, that on completion of the reclamation the equipment is in a fully serviceable condition and complies with the standard(s) for the relevant explosion concept (see also 4.4.2.2.4).

4.4.5.2 Additional requirements

Before a rewind or repaired rotating machine is returned to the user, the repair facility shall ensure that fan cover ventilation holes are not blocked or damaged as to impair the passage of cooling air over the machine, and that any fan clearances are in compliance with the requirements of the equipment standards, if appropriate. Should a fan or fan cover be damaged so as to require renewal, the replacement parts shall be obtained from the manufacturer. If not available, then they shall be of the same dimensions and at least the same quality as the original parts. They shall, where appropriate, take account of the requirements of the equipment standard to avoid frictional sparking and electrostatic charging, and of the chemical environment in which the machine is used.

NATIONAL VARIATION:

Delete the first sentence and *replace* with the following:

Before a rewind or repaired rotating machine is returned to the user, the repair facility shall ensure that fan cover ventilation holes are not blocked or damaged as to impair the passage of cooling air over the machine, and that any fan clearances are in compliance with the requirements of the equipment documents, if appropriate.

4.4.5.3 Lubricants and corrosion inhibitors

Third-party repairers should establish from the user that on any rotating machine, on which they are asked to work, if any special lubricants are required. Attention is drawn to the correct selection and application of lubricants and corrosion inhibitors for example:

- no migration onto un-insulated electrical parts occurs;
- the flash-point of the lubricant or corrosion inhibitor exceeds the temperature class of equipment for which it is to be applied;
- the environment in which the equipment is used;
- its application will not aid flame transmission or defect the type of protection technique.

NATIONAL VARIATION:

Delete the first sentence and *replace* with the following:

The repair facility should establish from the user that on any rotating machine, on which they are asked to work, if any special lubricants are required.

Delete the last list item and *replace* with the following:

—its application will not aid flame transmission or impact the type of protection technique.

4.4.6 Inverters

Particular attention is drawn to the need for care when adding an inverter to an Ex rotating machine in ensuring that this is only done when the intended combination of inverter and rotating machine is specified in the certificate or in the rotating machine manufacturer's documentation.

Third-party repairers should establish from the user that if any rotating machine, on which they are asked to work, are fed by an inverter.

NATIONAL VARIATION:

Delete the second paragraph and *replace* with the following:

The repair facility should establish from the user that if any rotating machine, on which they are asked to work, are fed by an inverter.

Add the following after the second paragraph:

Where an inverter installed in an explosion-protected housing, such as an Ex “d” enclosure, is to be replaced with an alternate, the repair facility shall establish that the functional performance of the replacement inverter does not cause a thermal increase beyond the existing design of explosion-protected housing. The repair facility shall record any calculations relating to the performance assessment.

NOTE: Refer to Annex E of AS/NZS 60079.0 for further guidance.

5 Additional requirements for the repair and overhaul of equipment with type of protection "d" (flameproof)

5.1 Application

This clause contains additional requirements for the repair, overhaul, reclamation and alteration of equipment with type of protection "d". It should be read in conjunction with Clause 4, which contains general requirements, and any other appropriate clauses if relevant. The relevant equipment standards which should be referred to when repairing or overhauling an Ex "d" equipment are those to which the equipment was originally manufactured (see IEC 60079-1).

NATIONAL VARIATION:

Add the following after the first paragraph:

Verifying the integrity of flameproof equipment shall be completed in accordance with the evaluation procedures and parameters described in Annex C. The results of the various dimensional checks, inspections and tests nominated shall form part of the report to the user.

NOTE: HB 239 provides practical assistance and methods for verifying the integrity of explosion-protected equipment.

5.2 Repair and overhaul

5.2.1 Enclosures

5.2.1.1 General

It is preferable to obtain new parts from the manufacturer. Particular attention shall be paid to the correct assembly of flameproof enclosures after repair or overhaul, in order to ensure that the flameproof joints comply with the requirements of the relevant standard and, where appropriate, with the certificate documentation. Where flameproof joints are not gasketed and the manufacturer's documentation does not address joint protection but for ingress protection, then only non-setting grease or anti-corrosive agents without evaporating solvents shall be used or other methods of protection in accordance with IEC 60079-14.

Corrosion or deformation of parts shall be evaluated to ensure any original openings or gaps in the enclosure have not exceeded the limits of surface finish and the flamepath gap.

Where gaskets which are not part of the flamepath are incorporated into the flameproof joints, replacements shall be of the same materials and dimensions as the original. Any proposed change of material shall be referred to the equipment manufacturer, user or certification authority.

The drilling of holes into an enclosure is a modification and shall not be carried out without reference to the manufacturer's certified drawings, or, in exceptional circumstances, e.g., manufacturer discontinued trading, to the certifying authority.

NOTE Care should be taken when changing surface finish, paint, etc., as this may affect the surface temperature of the enclosure and thus the temperature classification.

NATIONAL VARIATION:

Delete the first paragraph and *replace* with the following:

New parts should be obtained from the manufacturer. Particular attention shall be paid to the correct assembly of flameproof enclosures after repair or overhaul, in order to ensure that the flameproof joints comply with the requirements of the relevant standard and, where appropriate, with the certificate documentation. Where flameproof joints are not

gasketed and the manufacturer's documentation does not address joint protection then only the following shall be used:

- (a) Non-setting grease without evaporating solvents.
- (b) Anti-corrosive agents without evaporating solvents.
- (c) Other methods of protection in accordance with AS/NZS 60079.14.

5.2.1.2 Over-pressure testing

An over-pressure test shall be conducted where structural repairs of the enclosure have occurred or the integrity of the enclosure is in doubt.

Testing shall be completed at 1,5 times the reference pressure nominated in certificate documentation and held at least 10 s. Where reference pressure is not stated, Group I are to be tested at 1 000 kPa, IIA and IIB enclosures at 1 500 kPa and Group IIC enclosures at 2 000 kPa. Pass/fail criteria shall include assessment of structural damage, measured at the geographical centre of an enclosure panel. Following over-pressure test, flamepath joint surfaces are to be measured to verify there is no permanent deformation.

For enclosures with threaded flameproof joints, where the threadform cannot be verified, an overpressure test shall be conducted.

Where over-pressure tests are carried out on motors or enclosures that are water-cooled, the tests shall be done with the water jacket dry and open to the atmosphere.

NATIONAL VARIATION:

Delete all paragraphs and replace them with the following:

"Over-pressure testing" means static testing at an internal pressure higher than the equipment's certified reference pressure (determined during type testing).

NOTE 1: The higher pressure is used to ensure a margin of safety in the enclosure's structural integrity.

NOTE 2: Over-pressure testing can involve significant safety hazards. The choice of testing fluid and test arrangement should give due consideration to the identified hazards and risk mitigation.

An over-pressure test shall be conducted:

- (a) where repairs have been made to a flameproof enclosure that might affect its structural integrity; or
- (b) where the integrity of the flameproof enclosure is otherwise in doubt; or
- (c) on an enclosure with threaded flameproof joints where the threadform or thread repairs cannot otherwise be verified; or
- (d) on all cast iron enclosures having graphitic microstructure (grey cast iron) subject to overhaul regardless of any structural repairs or structural integrity; or

NOTE 3: Cast iron enclosures are prone to becoming brittle over time, warranting their increased test regime.

Where damage or repairs occur that can affect the explosion protected integrity such as porosity, flamepath integrity, integrity of welds, corrosion etc.

Where over-pressure testing is carried out on multi-compartment enclosures: