Ex Equipment Repair Standard

IEC 60079-19

14th March 2024

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Explosions in hazardous areas are occurring regularly and have since the 19th century

Examples over the last 30 years have been,
Piper Alpha, Buncefield, Texas City, Gulf of Mexico

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Standards help reduce the occurrence of these incidents and ensure that the Ex Equipment manufactured is safe to use within a hazardous area.

Some standards include requirements to ensure that Ex Equipment is selected, installed, inspected, maintained and repaired to ensure the safety operation of Ex Equipment within a hazardous area

IEC 60079-15, IEC 60079-17 & IEC 60079-19

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Ex Equipment used in the presence of an explosive atmosphere has to be manufactured, tested and certified to International Standards to ensure that the equipment is safe for use.

When Ex Equipment within a hazardous area fails replacing the failed Ex Equipment with identical certified new equipment ensures the continued safety of the system.

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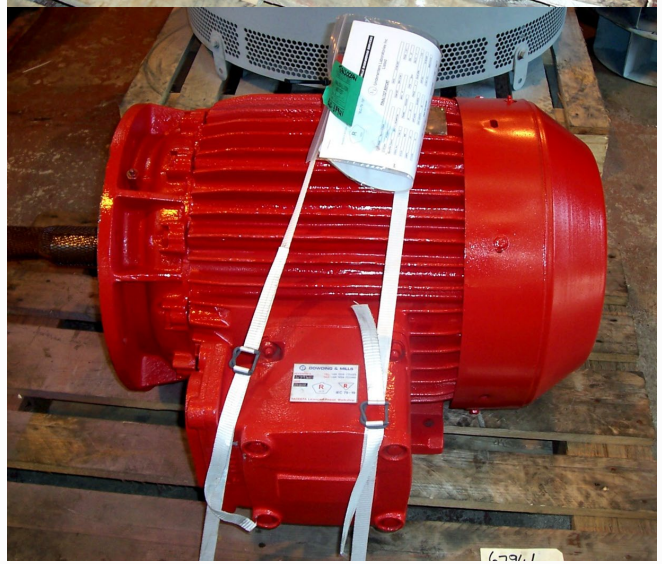
Ex Equipment for use in hazardous areas will be manufactured to meet the relevant gas group requirements in the IEC Type of Protection standards or ISO standards for Ex Equipment

When Ex Equipment has to be overhauled or repaired the essential safety features incorporated to make the Ex Equipment safe to use within a hazardous area must be maintained.



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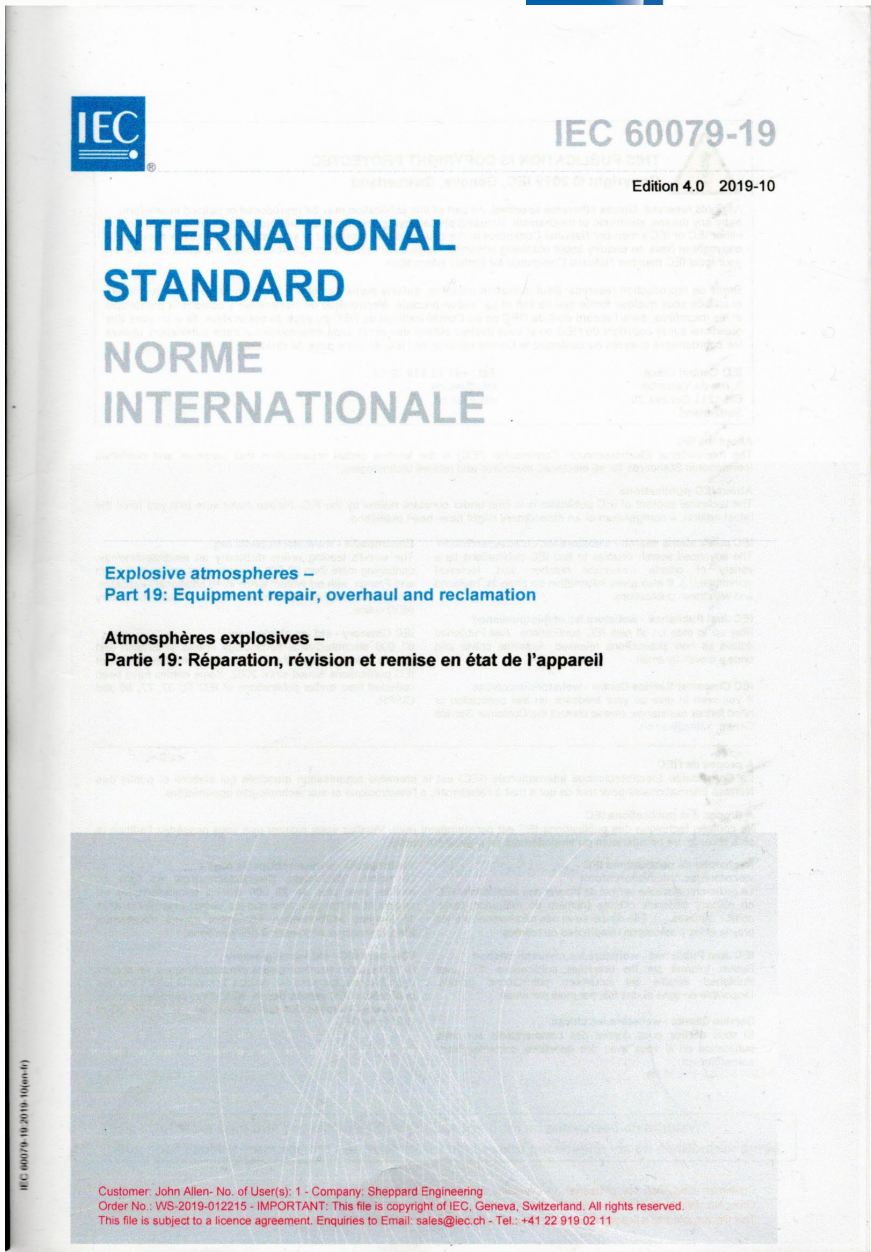
When replacement Ex Equipment is not available or not available within the timescale required to return the hazardous area plant back into service, Ex Equipment can be repaired to IEC 60079-19.

This standard's guidance and requirements has been proven to be effective over the last 40 years


IEC

IEC 60079-19

Edition 4.0 2019-10

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Explosive atmospheres –
Part 19: Equipment repair, overhaul and reclamation

Atmosphères explosives –
Partie 19: Réparation, révision et remise en état de l'appareil

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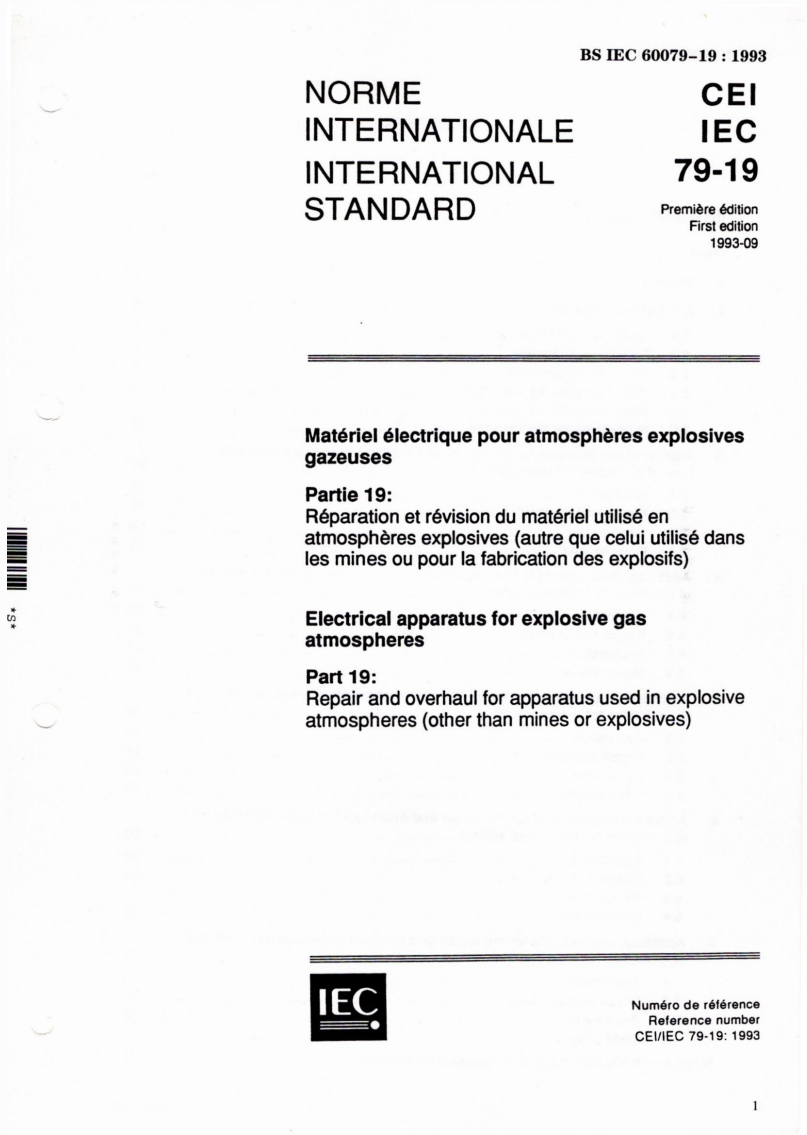
The first IEC 79-19 was published in 1993, this standard excluded electrical apparatus in mines

The current 4th edition of IEC 60079-19 was published in 2019.

The next 5th edition is currently being prepared for publication in 2025.



BS IEC 60079-19 : 1993

NORME INTERNATIONALE / INTERNATIONAL STANDARD

CEI IEC 79-19

Première édition
First edition
1993-09

Matériel électrique pour atmosphères explosives gazeuses

Partie 19:
Réparation et révision du matériel utilisé en atmosphères explosives (autre que celui utilisé dans les mines ou pour la fabrication des explosifs)

Electrical apparatus for explosive gas atmospheres

Part 19:
Repair and overhaul for apparatus used in explosive atmospheres (other than mines or explosives)

IEC

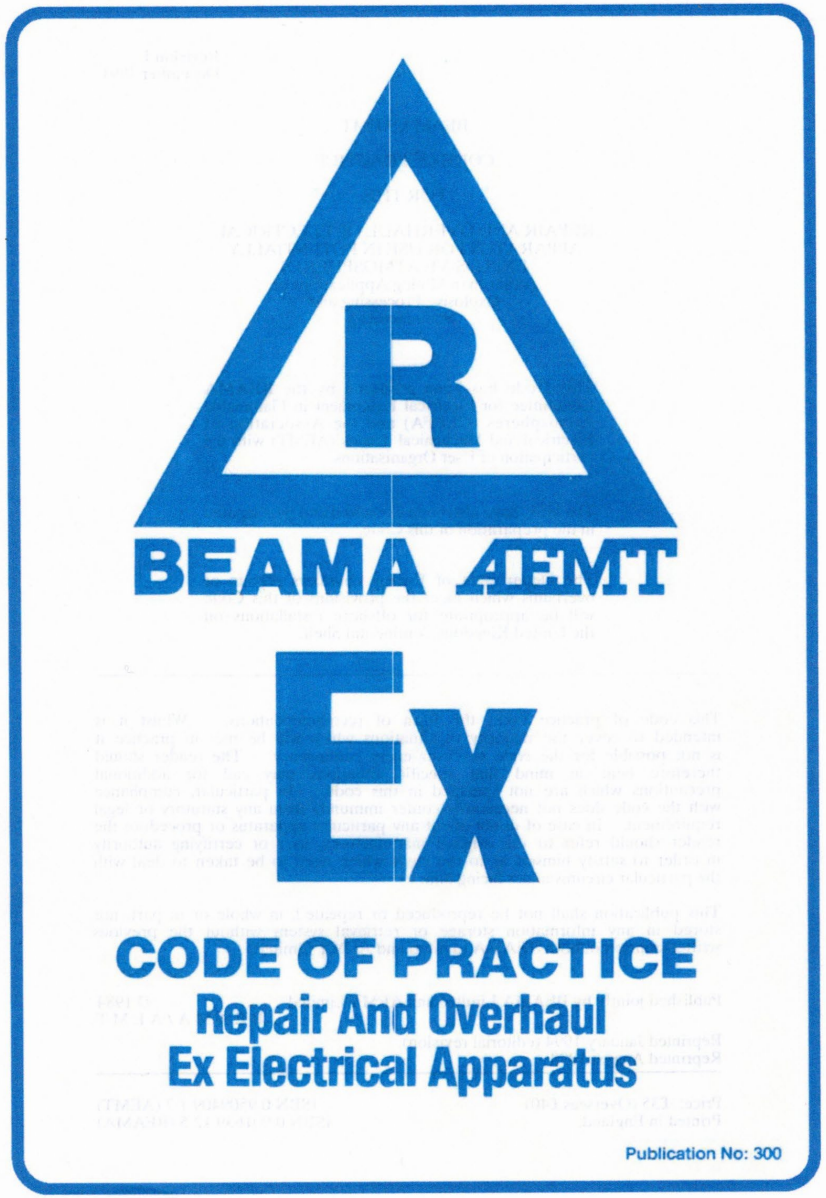
Numéro de référence
Reference number
CEI/IEC 79-19: 1993

1

Ex Equipment Repair Standard

The source document for original IEC 79-19 was a UK Code of Practice for Repair and Overhaul of Ex Electrical Apparatus published by BEAMA & AEMT in 1984.

This Code of Practice excluded repair of electrical apparatus in mines. At that time in the UK repair of Ex Electrical Apparatus for mines was controlled by the British Coal workshops



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Ex Equipment Repair Standard

The preferred method for overhaul and repair to IEC 60079-19 is working to the original equipment manufacturer (OEM) documentation.

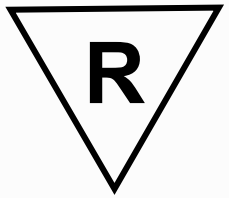
For this case the overhauled or repaired Ex Equipment is marked with an R within a square

Note: Ex Components are not repaired they are replaced

Ex Equipment Repair Standard

However when that OEM information is not available the Ex Equipment can be overhauled and repaired to IEC 60079-19 and the Type of Protection standards to which it was originally certified.

For this case the overhauled or repaired Ex Equipment is marked with an R with in an inverted triangle



Note: The only change from the BEAMA/AEMT Code of Practice was this inverted triangle

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Many Types of Protection concepts will be used on Ex Equipment in hazardous areas including Ex "d", Ex "i", Ex "p" and many others.

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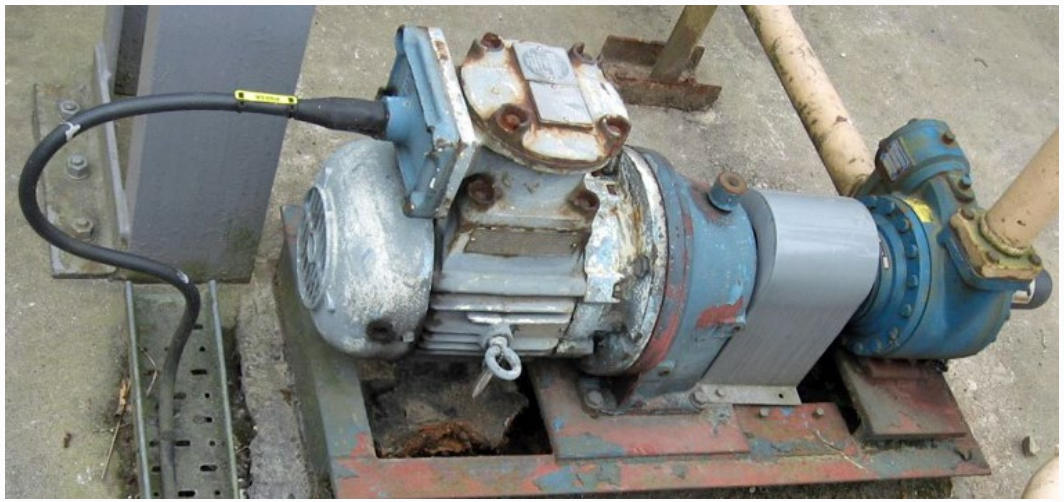
An example of Ex Equipment used within a hazardous area is an Ex "d" electric machine designed to IEC 60079-1 (Flameproof) & IEC 60079-0 and other relevant standards, such as IEC 60034-1, this machine may be driving a pump, gearbox or compressor



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During overhaul or repair of Ex “d” Equipment verifying the integrity of the enclosure and condition of flamepaths, required to construct or connect with the Ex Equipment, are critical in ensuring the Ex Equipment is safe for continued use.

Each of these critical area have different potential failure modes

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Typical enclosure failures can be: -

- Enclosure component defect or fracture
- Enclosure threaded hole defect
- Threaded fastener missing or not as specified
- Threaded fastener clearance hole damage

- Threaded fasteners are replaced when required

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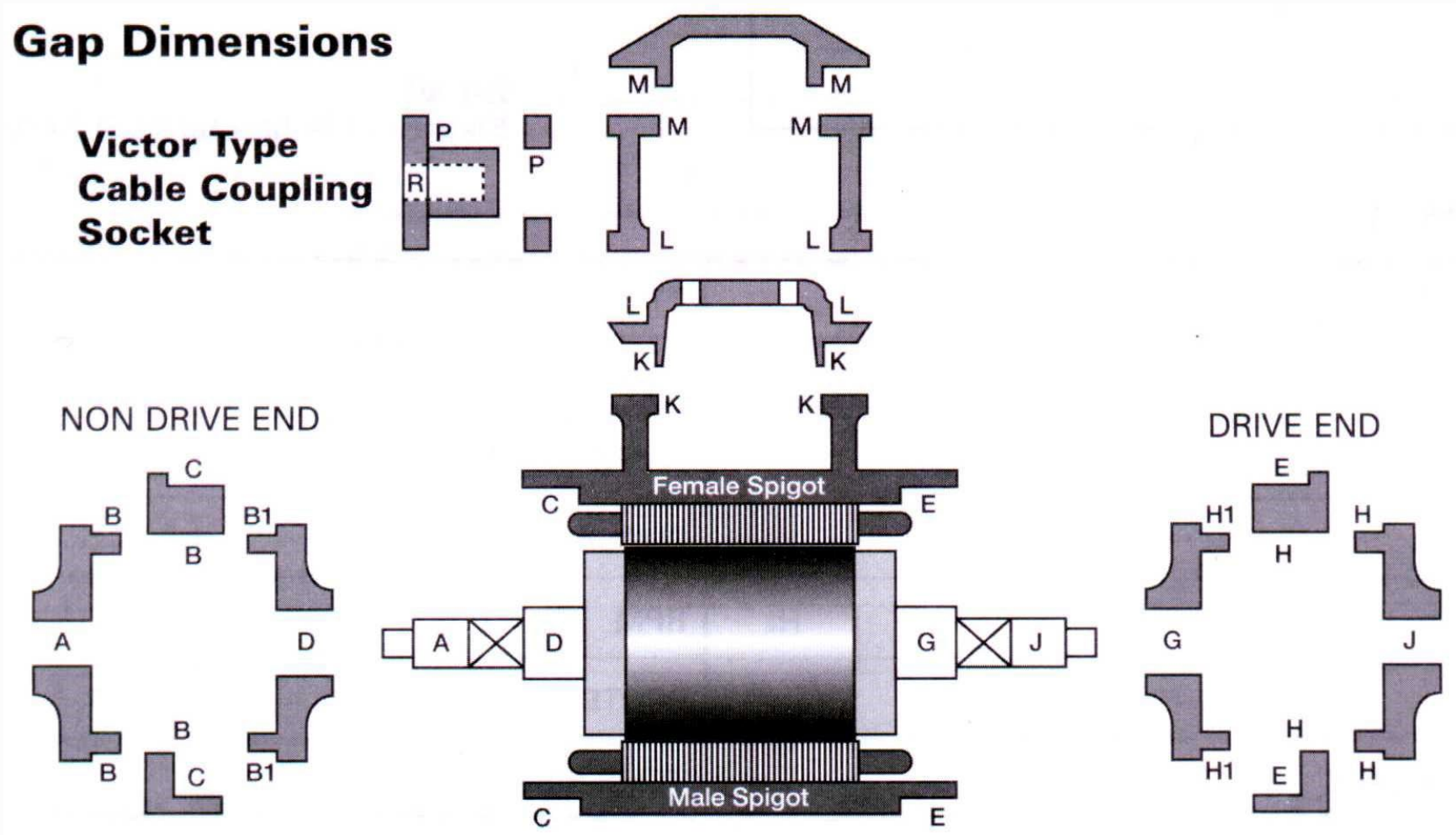
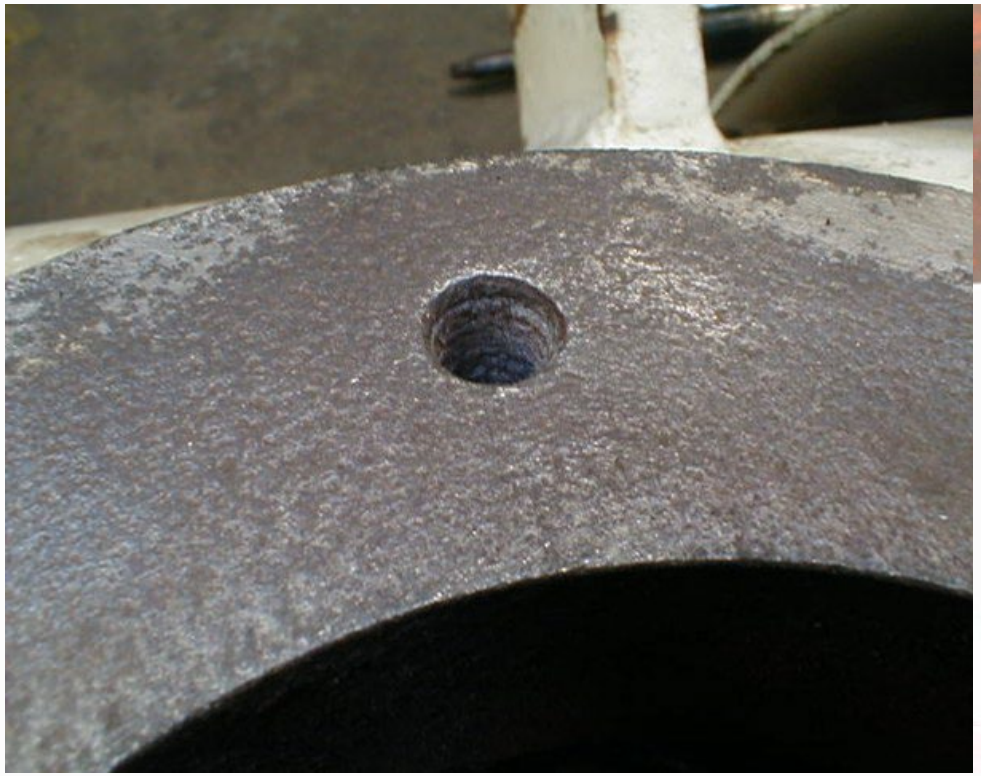
Ex “d” Motor Flamepaths to be inspected and measured



Ex Equipment Repair Standard

Corrosion can cause flamepath defects



Ex Equipment Repair Standard

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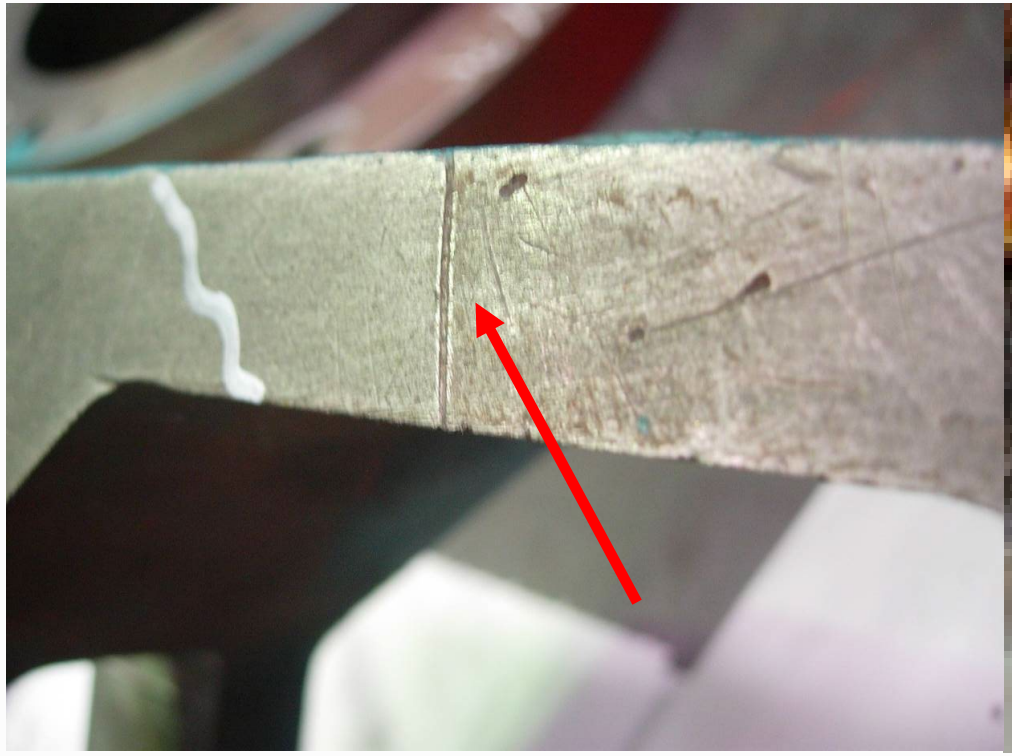
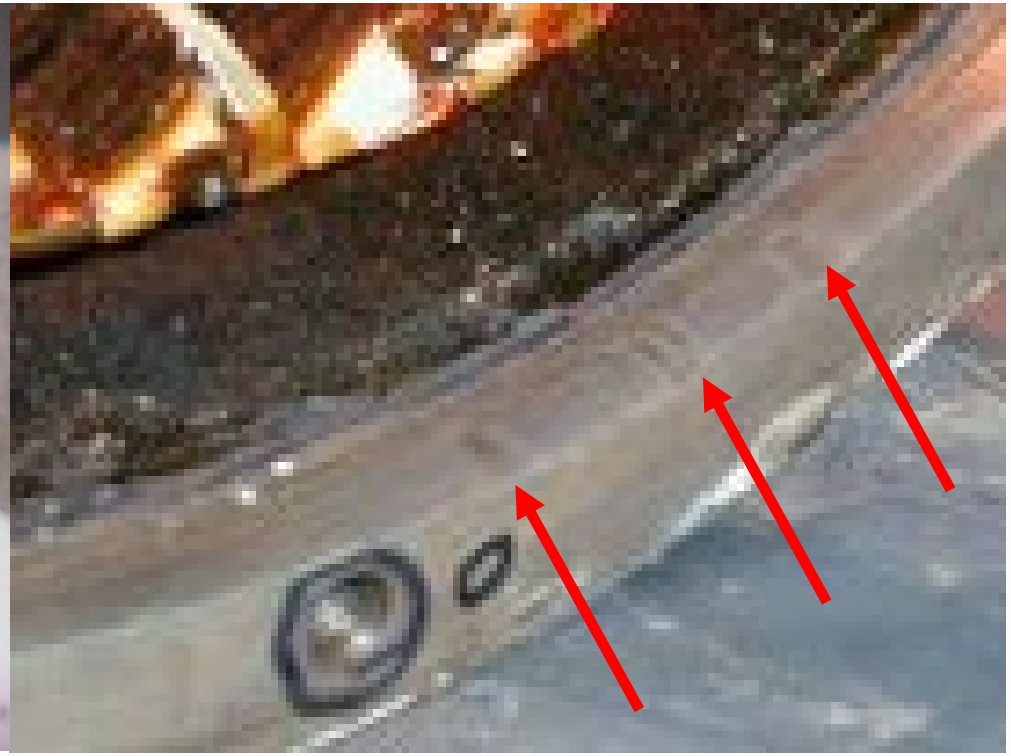
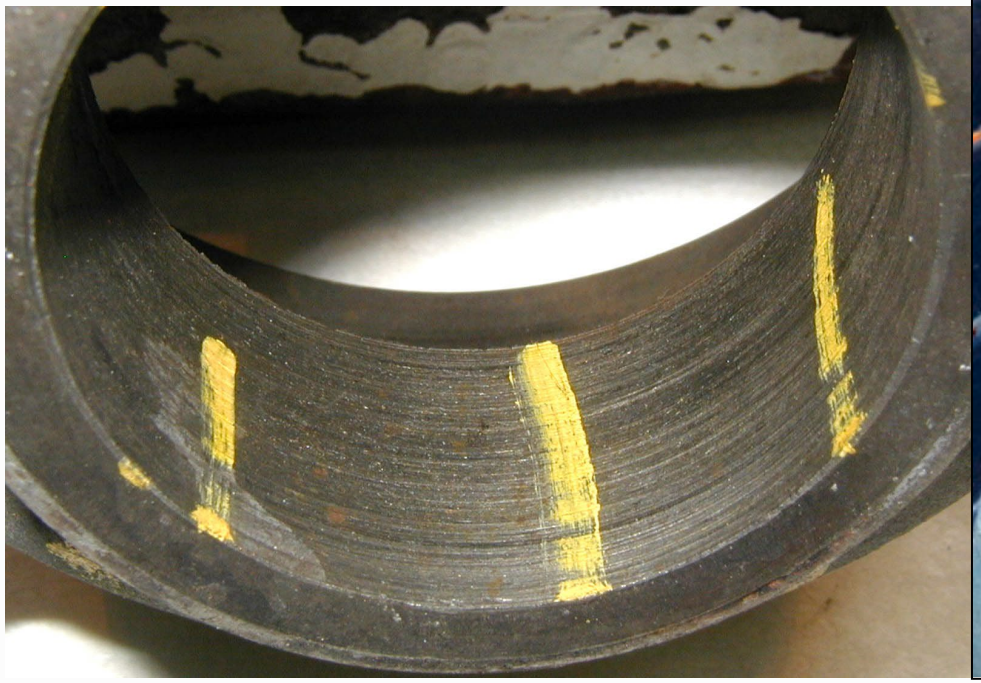
Operator Error can cause flamepath defects





Ex Equipment Repair Standard

Bearing failure wear can cause flamepath defects



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Typical cable entry failures can be: -

- Thread damage from corrosion or fitting error
- Insufficient wall thickness and threads to enable 5 full thread fit

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Typical accessory failures can be: -

- Temperature sensor failure
- Vibration sensor failure
- Cooling fan cowl or impellor damage

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Electric motor winding faults leaving stator core damage which could produce a hot spot which can take the Ex Motor out of it's temperature classification

Faults like this can be addressed following the requirements of IEC 60079-19 but for small machines the motor is more likely to be replaced unless it is of a non-standard design

Ex Equipment Repair Standard

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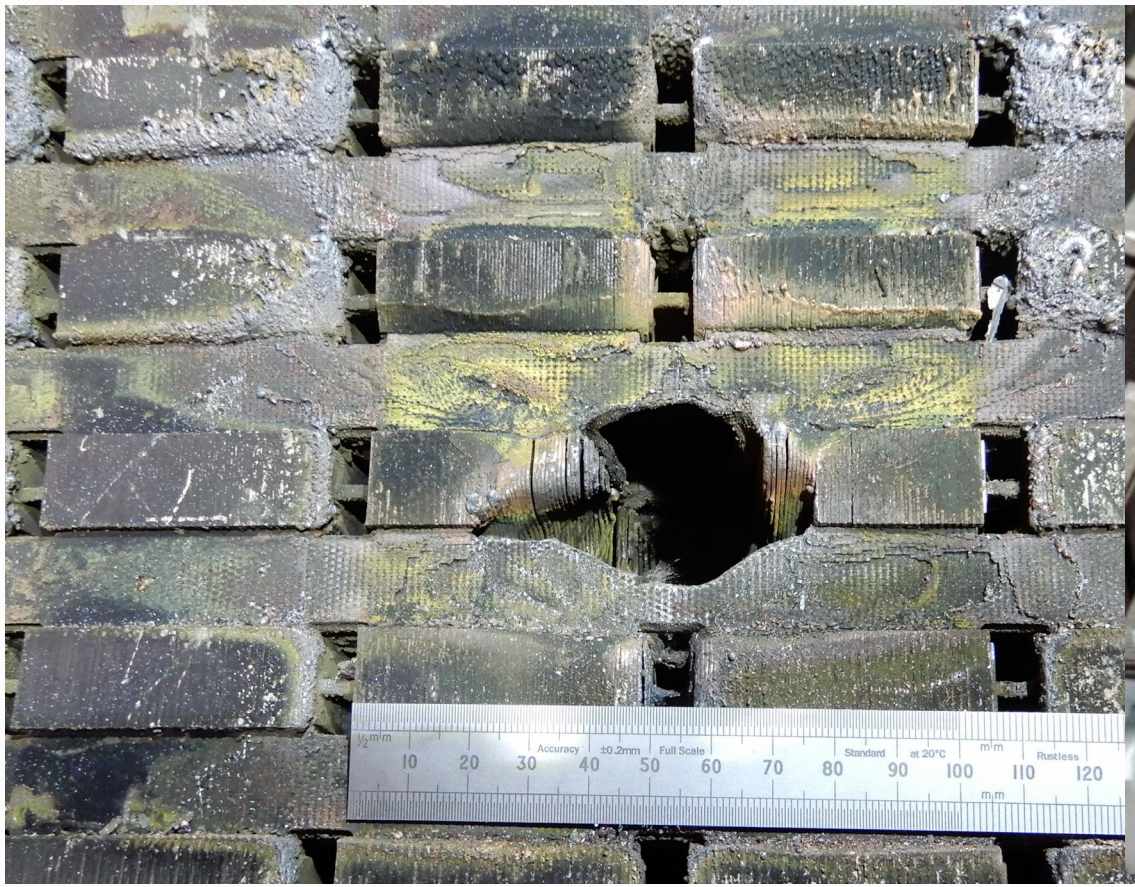
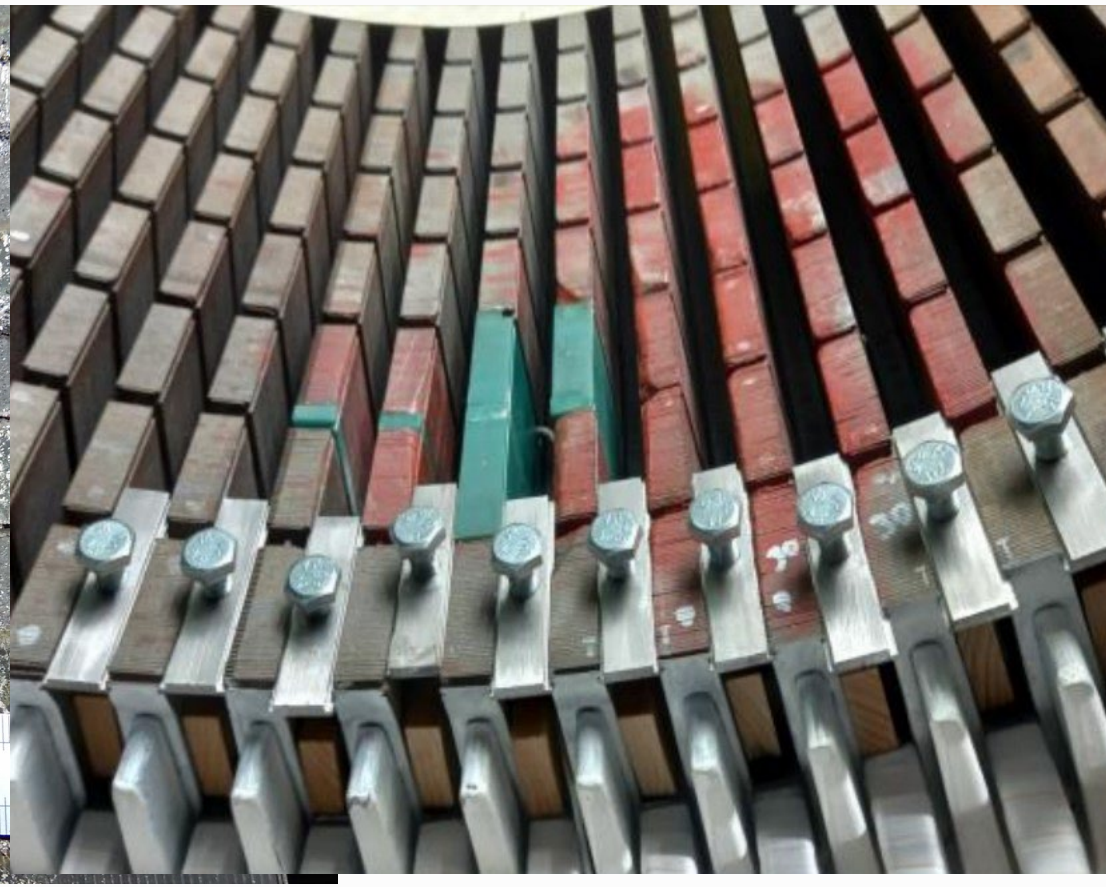
Faults like this can be addressed following the requirements of IEC 60079-19





Ex Equipment Repair Standard

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Good management controls and competent persons are key requirements within IEC 60079-19, service facilities have to have an effective QMS system to achieve these objectives

When the BEAMA/AEMT Code of Practice was introduced in 1984 an unspecified additional control factor was service facility assessment and monitoring by Ex Equipment User's inspectors, the most prestigious being the British Coal workshop inspectors

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Ex Equipment Repair Standard

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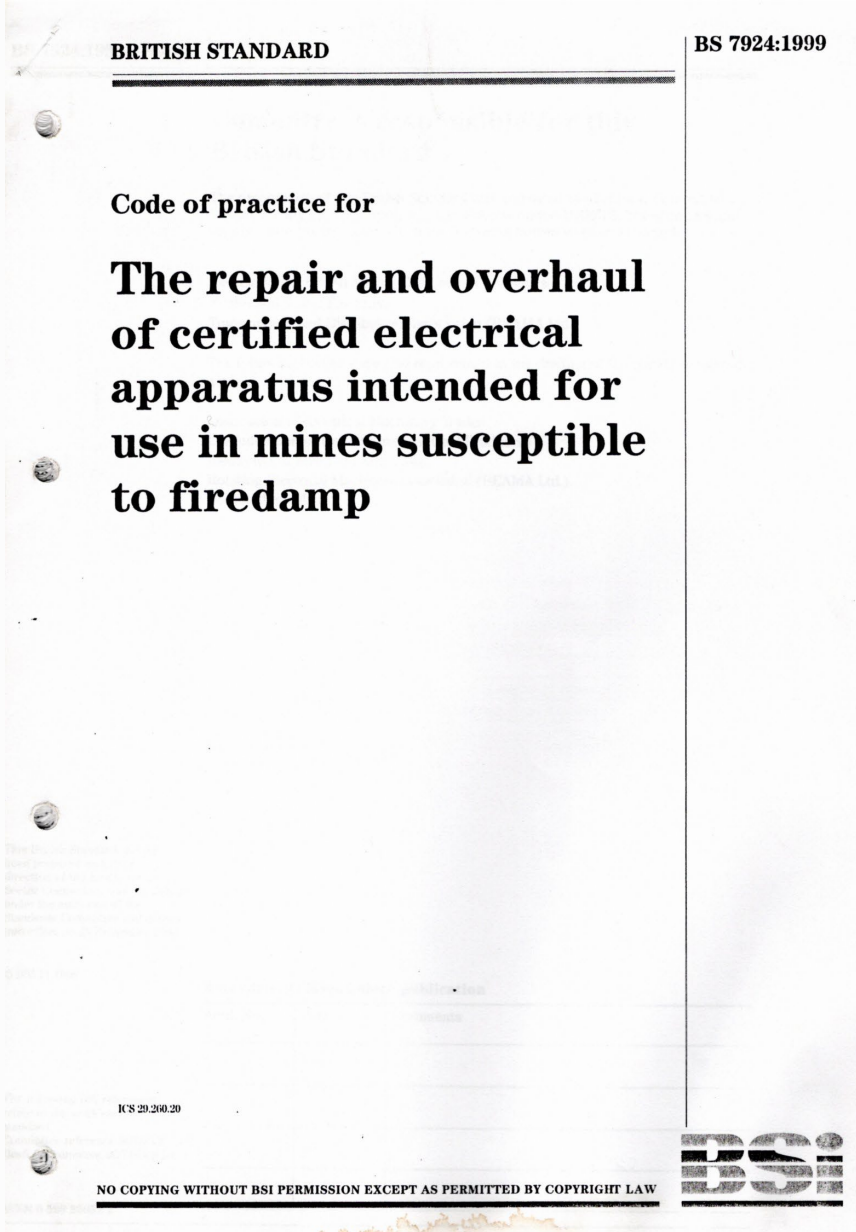
With changes in UK industry and closure of British Coal these user's service facility expert inspectors and assessors were not available.

This necessitated the publication of BS 7924 which changed the BEAMA/AEMT Code of Practice to a standard, which enabled 3rd party assessment of independent service facilities repairing UK mine electrical apparatus


BRITISH STANDARD

BS 7924:1999

Code of practice for

The repair and overhaul of certified electrical apparatus intended for use in mines susceptible to firedamp

ICS 29.260.20

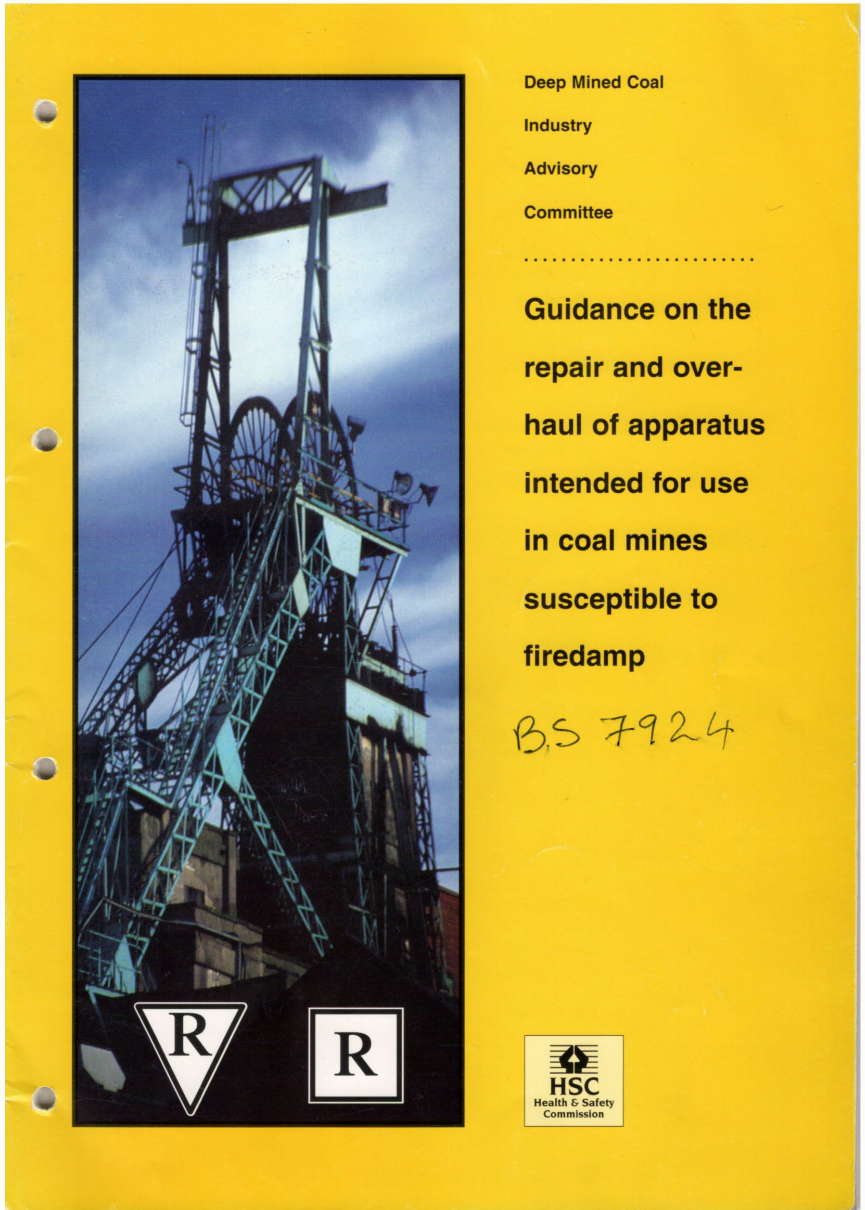
BSI

Ex Equipment Repair Standard

When BS 7924 was published HSE published a Guidance document to support the implementation of BS 7924

BS 7924 became the source material for the 1st revision of IEC 60079-19 which was published as the 2nd edition in 2006.

The restriction prohibiting use for mining equipment was removed



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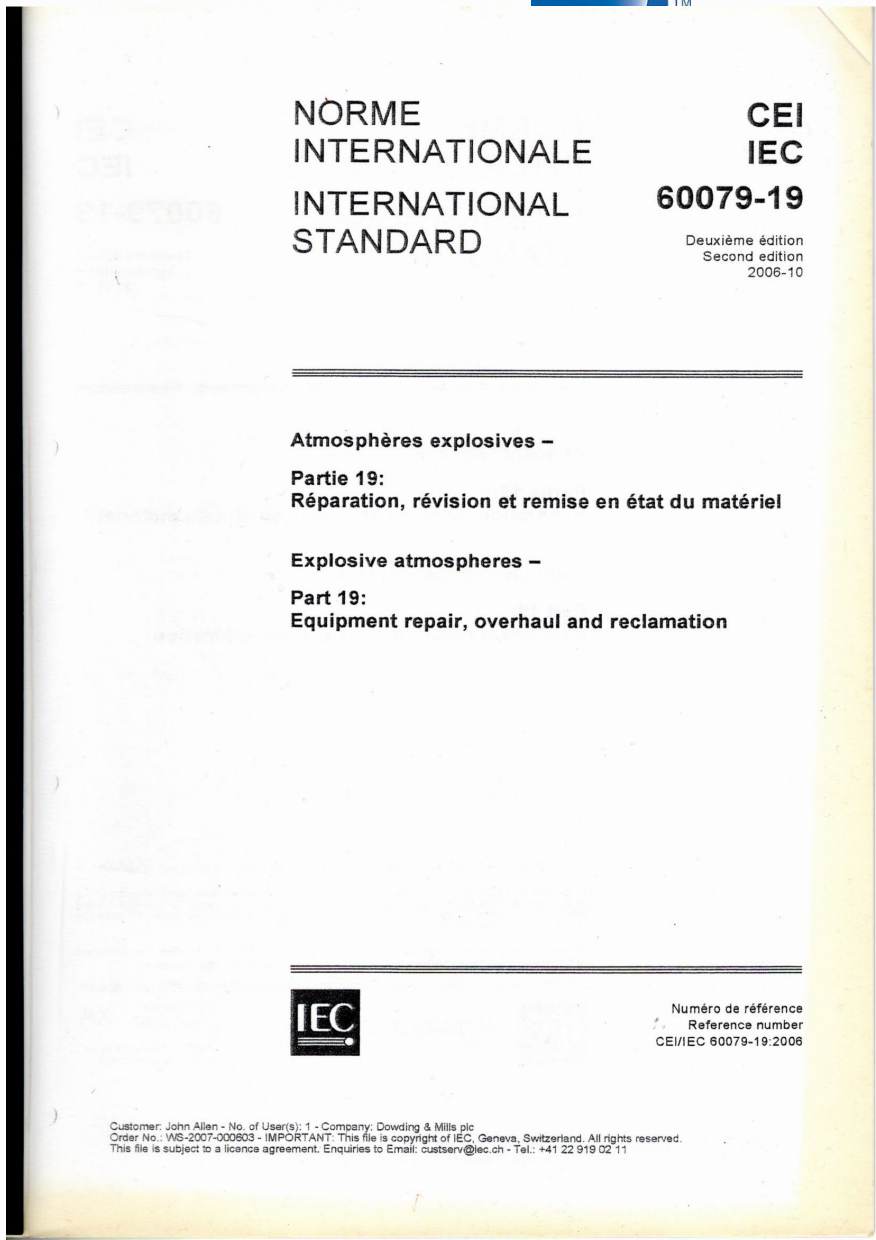
The 2nd edition of IEC 60079-19 introduced specific requirements for competence of persons working on Ex Equipment overhaul and repair.

A new requirement was that each service facility had to have a "responsible person" who had the responsibility to ensure that the repaired Ex Equipment fully met the status of the Ex Equipment after repair as agreed with the user



NORME INTERNATIONALE
INTERNATIONAL STANDARD

CEI IEC 60079-19

Deuxième édition
Second edition
2006-10

Atmosphères explosives –

Partie 19:
Réparation, révision et remise en état du matériel

Explosive atmospheres –

Part 19:
Equipment repair, overhaul and reclamation

IEC

Numéro de référence
Reference number
CEI/IEC 60079-19:2006

Ex Equipment Repair Standard

The first edition of IEC 60079-19 was limited to electrical apparatus, however following the introduction of the EU ATEX Directive in 1994, the 2nd and subsequent editions removed the electrical apparatus limitation changing to Ex Equipment.

Non-electrical Ex Equipment has been be overhauled and repaired to IEC 60079-19 since 2006 by following the requirements in Clause 4 General

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Service facilities had been overhauling and repairing non-electrical equipment used in hazardous area long before the ATEX directive required CE marking.

This included gearboxes, pumps, fans etc. many driven by electric machines

Ex Equipment Repair Standard

The first two editions of IEC 60079-19 required quality control and quality assurance procedures to be in accordance with the ISO 9000 series of standards.

Changes in ISO 9001:2015 necessitated the inclusion of specific QMS requirements into IEC 60079-19

Service facilities operate very differently to OEM's and current ISO 9001 QMS standards drafted for manufacturers does not give sufficient confidence for users that service facilities overhauling and repairing Ex Equipment are complying with the requirements of IEC 60079-19

Ex Equipment Repair Standard

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An OEM's ISO 9001:2015 QMS system may use sampling techniques for testing product and risk assessment for where additional controls are required.

This is appropriate where multiple products are manufactured to drawings with tolerances with tight documentation and inspection controls

Ex Equipment Repair Standard

However in a service facility every overhaul or repair will most likely be different, with different failure modes requiring individual quality plans and work plans for each job. Service facility quality is dependent on the competence of individual operators and the responsible person approving processes, collating and verifying evidence of compliance

Sampling and risk assessments are not appropriate, therefor some of the specific QMS requirement from earlier versions of ISO 9001 were included into editions 3 & 4 of IEC 60079-19

Ex Equipment Repair Standard

Revision of IEC 60079-19 have included technical changes to the Type of Protection clauses, to mirror changes in the Type of Protection standards, as well as the clarification of Clause 4 General requirements described above

Like all IEC standards the first 3 clauses are Scope, Normative References and Terms and Definitions.

The 4th clause contains general requirements which applies to all Types of Protections, Clauses 5 to 15 have specific requirement for each Type of Protection

Ex Equipment Repair Standard

IEC 60079-19 Clause 4. 'General', is similar to how IEC 60079-0 applies to all the other Types of Protection concepts within the IEC 60079 series of standards used for Ex Equipment design

When Ex Equipment is overhauled or repaired the following documents must be followed:

- IEC 60079-19 Clause 4 and specific Type of Protection clause
- IEC 60079-19 Normative Annexes (A – C)
- Type of Protection standards used when Ex Equipment was certified
- Other relevant standards relating to equipment such as IEC 60034-1
- OEM Instructions

Ex Equipment Repair Standard

IEC 60079-19 has 3 normative annexes:

- marking
- competence
- flamepath gap verification

and 2 informative annexes:

- ✓ rewinding best practice
- ✓ additional control equipment requirements

Ex Equipment Repair Standard

Requirements within standards can, and has been understood differently by different users.

This as true for IEC 60079-19 as for any of the other manufacturing standards in the IEC 60079 series of standards

The IECEx system which started in 1996 develop a common understanding of requirements and methodologies in Ex Equipment manufacture and certification the IECEx System issued it's 1st equipment certificates in 2003

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Ex Equipment Repair Standard

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The IECEx Equipment Scheme soon recognised that to maintain the design features, which made an IECEx Ex Equipment safe to operate within a hazardous area during its operating life, the IECEx System needed to engage with service facilities to ensure a unified understanding and application of the requirements in IEC 60079-19 and the IEC Type of Protection standards used to overhaul & repair the Ex Equipment

Ex Equipment Repair Standard

In 2003 IECEx started the process to set up a new IECEx Scheme for service facilities, similar to that which had been previously setup for Ex Equipment.

Initially this was a committee within the IECEx 02 Equipment Scheme for Overhaul and Repair of Ex Equipment to IEC 60079-19.

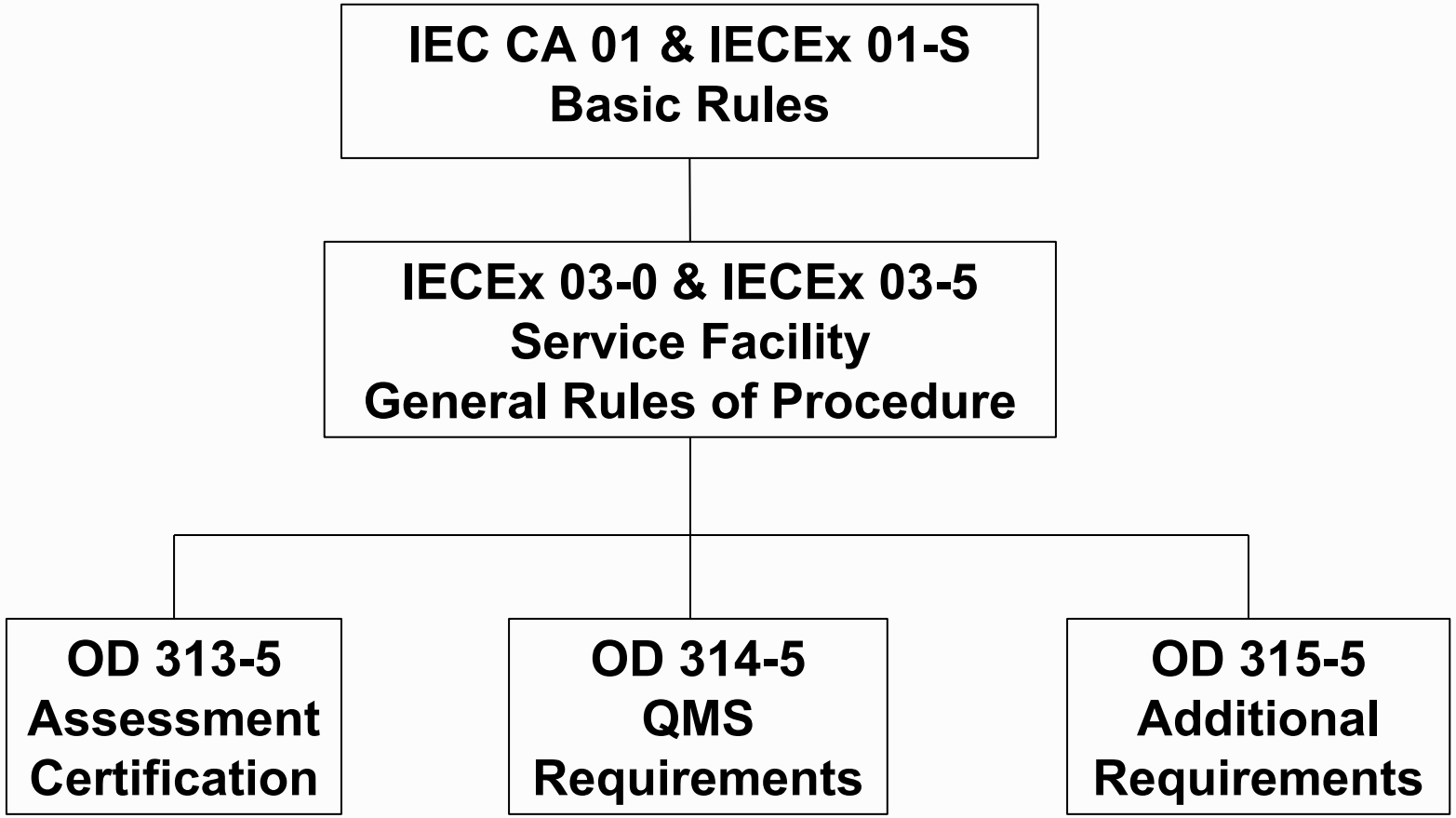
After additional services for IEC 60079-14 and IEC 60079-17 had been included this developed into the IECEx 03 Service Facility Scheme (ExSFC) in 2016

- 2003 was my first IECEx ExMC

Ex Equipment Repair Standard

IECEx Certified Service Facility Rules & Requirements

IECEx SFC 03-5 Scheme



Ex Equipment Repair Standard

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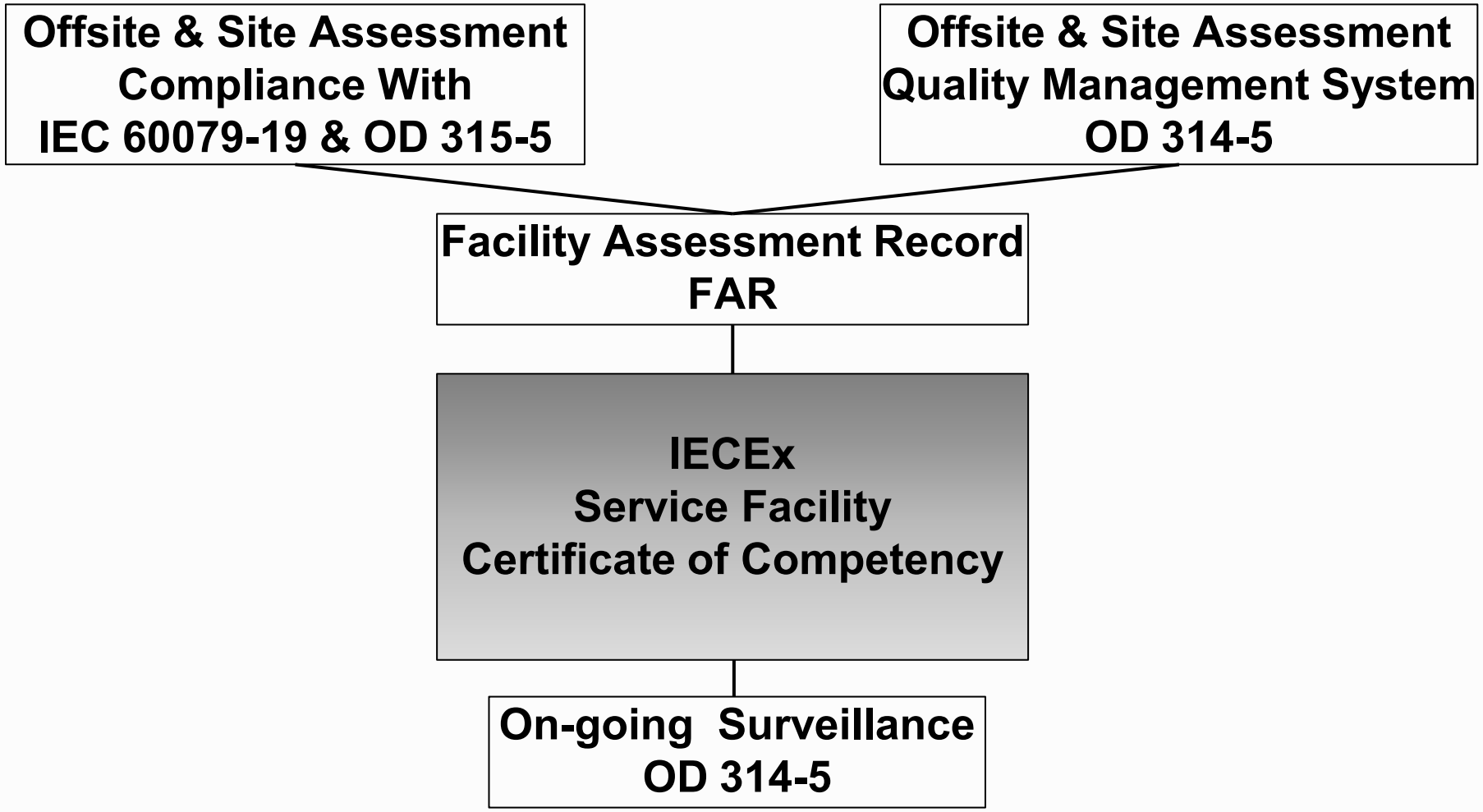
Service Facility Assessment Process



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The IECEx Service Facility **Certificate of Conformity** enables the Ex Equipment User to have confidence that robust systems are in place and monitored, within the Service Facility, to ensure that their Ex equipment will be overhauled and repaired in conformance with IEC 60079-19, to the certification status as agreed with the Service Facility and that the equipment will be safe to return to service

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The validity and status of any IECEx Service Facility Certificate of Conformity can be checked on-line at www.iecex.com

This is the only valid certificate any printed Certificate of Conformity is an uncontrolled copy

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When setting up the Service Facility Overhaul and Repair Scheme, it was quickly recognised that the competence of persons overhauling and repairing Ex Equipment was critical to service facility performance and to meet this need the IECEx System started the process which lead to the development of the IECEx Competence of Persons Scheme (Ex CoPC)

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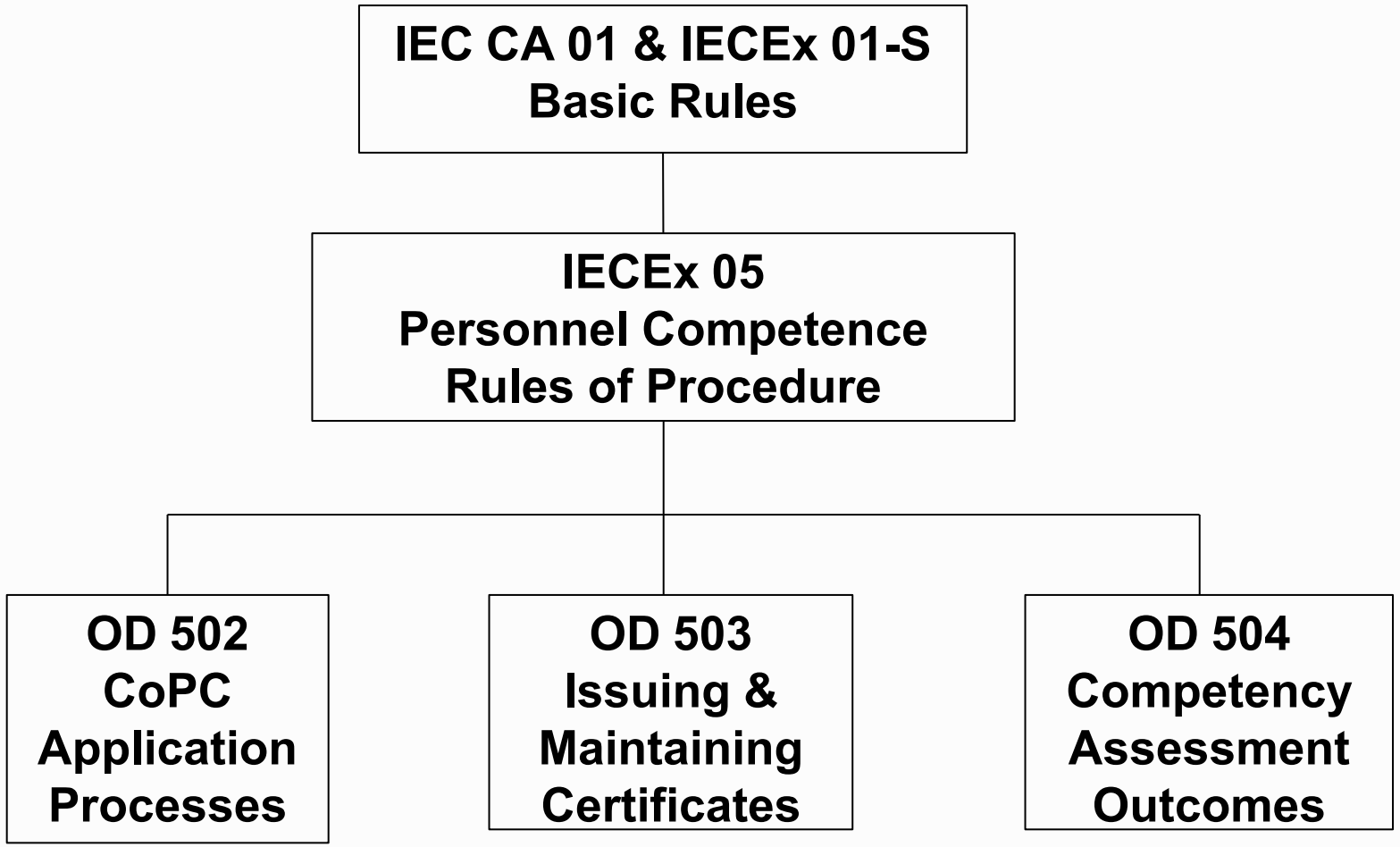
The IECEx CoPC Scheme Rules & Requirements



Ex Equipment Repair Standard

Competence of Persons Assessment Process

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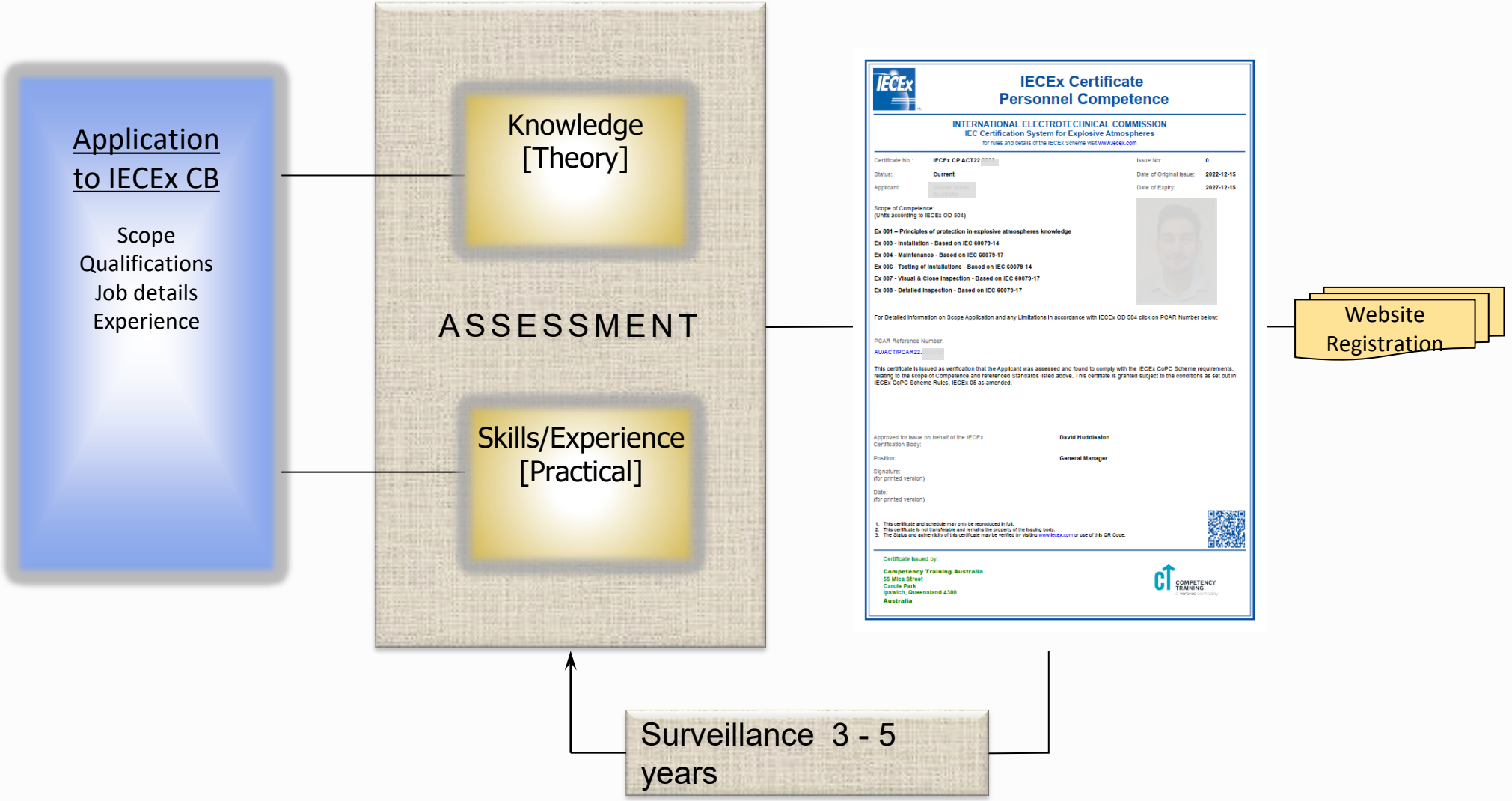

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Ex Equipment Repair Standard

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The IECEx **Competence of Person Certificate** enables the Hazardous Area User to have confidence that robust systems are in place and monitored to verify the competence of the person on the certificate, for the units of competence and limitations as detailed on that certificate,

The validity and status of any IECEx Competence of Person Certificate can be checked on-line at www.iecex.com

Ex Equipment Repair Standard

The Ex CoPC Scheme has 9 Units of Competence

2 Units of Basic Knowledge and 1 Unit of Knowledge which is a common requirement for other units of competence.

Unit Ex 0001	Principles of protection in explosive atmospheres **knowledge** (for other Units of Competence)
Unit Ex 0002	Perform classification of hazardous areas
Unit Ex 0003	Install explosion-protected equipment and wiring systems

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Unit Ex 0004	Maintain equipment in explosive atmospheres
Unit Ex 0005	Overhaul and repair of explosion- protected equipment
Unit Ex 0006	Test electrical installations in or associated with explosive atmospheres
Unit Ex 0007	Perform visual and close inspections of electrical installations in or associated with explosive atmospheres

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Unit Ex 0008	Perform detailed inspections of electrical installations in or associated with explosive atmospheres
Unit Ex 0009	Design electrical installations in or associated with explosive atmospheres
Unit Ex 0010	Perform audit inspections of electrical installations in or associated with explosive atmospheres

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The 2 Units of Basic Knowledge are.

Unit Ex 000	Basic knowledge and awareness to enter a site that includes a classified hazardous area
Unit Ex 011	Basic knowledge of the safety of hydrogen systems

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I hope that this brief introduction helps you understand the benefit of using a proven repair standard IEC 60079-19 for Ex Equipment used within a hazardous area

The 5th edition of IEC 60079-19 will include a new Type of Protection Clause 16 for non-electrical Ex Equipment which has been certified to ISO 80079-36 and ISO 80079-37.

Clause 4 is being totally restructured to minimise the risk of misinterpretation of the requirements in IEC 60079-19

It is planned that this 5th Edition will be published in 2025

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Overhaul and repair of Ex Equipment to the BEAMA/AEMT Code of Practice (1984) and IEC 60079-19 (1993) has demonstrated that they have been able to control overhauls and repairs of Ex Equipment to ensure it is safe for re-use over 40 years

3rd Party independent assessment of service facility's capability to work to IEC 60079-19 provides the user additional confidence that his overhauled and repaired Ex Equipment is safe to return to service.

The IECEx Service Facility Scheme Certificate of Conformity provides evidence for that additional User confidence

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Any Questions

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Thank you!

IECEx

John Allen

IEC TC31J MT60079-19 Convenor

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IECE ExSFC WG2 Convenor

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