Area Classification with update on End User International Standards

Marino Kelava – IEC SC 31J Secretary

2024 IECEx INTERNATIONAL CONFERENCE - Safety of Equipment, Services and Personnel in Explosive Atmospheres

Split, Croatia – Thursday, 14th March 2024

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Introduction

Marino Kelava, M.E.Eng.

- Professional in Ex business since 2002 (testing, certification, inspection, standardization, Ex training, assessment of ExTLs and ExCBs)
- Managing Partner at Fiditas Ltd. (ATEX + IECEx ExCB & ExTL, IECEx Member Body for Croatia)
- Secretary IEC SC 31J since 2005
- IECEx Lead Assessor for schemes 02, 03, 04 and 05
- IECEx Management Committee Member
- Member of several IEC TC 31 MTs, PTs and WGs
- Croatian Mirror committee to IEC SC 31J Chair

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Presentation

- Explosive Atmospheres in the Industry
- Importance of Hazardous Area Classification (HAC)
- IEC SC 31J Standard Tools Available
- IEC SC 31J Recent Developments
- IEC SC 31J Info Resources

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Explosive atmosphere

- Mixture with air, under atmospheric conditions, of flammable substance in the form of **gas**, **vapour, mist or dust**, which, after ignition, permits self-sustaining flame propagation.

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Hazardous areas

- Areas in which presence of **explosive atmosphere** can be expected in the quantities that requires **special measures** regarding **construction, installation** and **equipment** usage.

Hazardous areas in the industry

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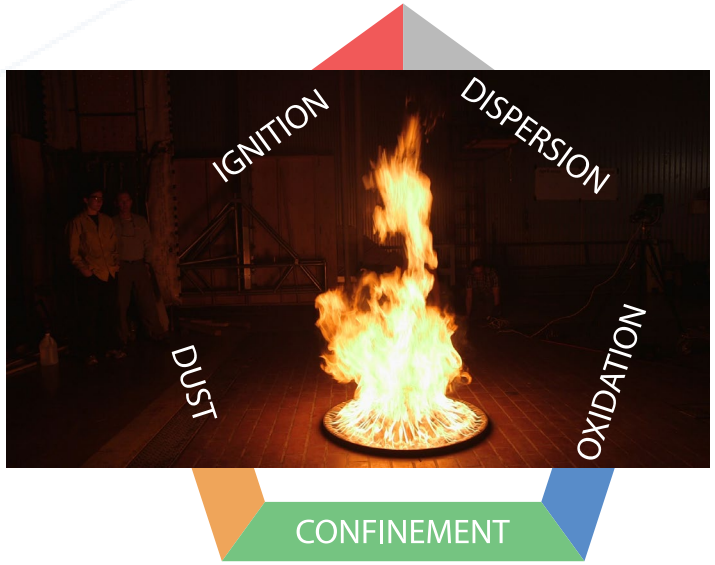
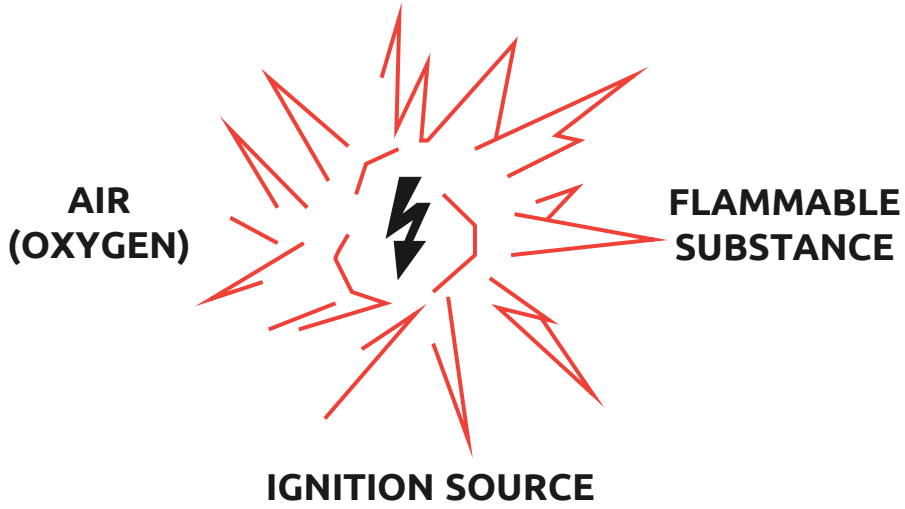
Explosion of explosive atmosphere

Dust



Gas and vapour



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Hazardous areas in the industry

2008 Georgia sugar refinery explosion

Pre-design phase

- Identify the purpose of the facility, the scope and complexity of the project
- Select the required **skills** and **competences** for designers
- Identify roles, **responsibilities** and communication path
- Identify **hazards** related to **materials** and **processes**
- Identify relevant **legislation**, good practice guidance and applicable **standards**

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National regulations

- EU Directive 1999/92/EC (ATEX 153)
- The Dangerous Substances and Explosive Atmospheres Regulations 2002

Explosion protection measures

PRIMARY MEASURES	To prevent the formation of explosive atmosphere.
SECONDARY MEASURES	To prevent the ignition of existing explosive atmosphere.
TERTIARY MEASURES	To limit or mitigate harmful effects of explosion.

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Hazardous area classification

- Hazardous area classification is based on the frequency and duration of occurrence of explosive atmosphere.

- Area classification presents the basis for the correct selection, installation and maintenance of equipment intended for use in hazardous areas.

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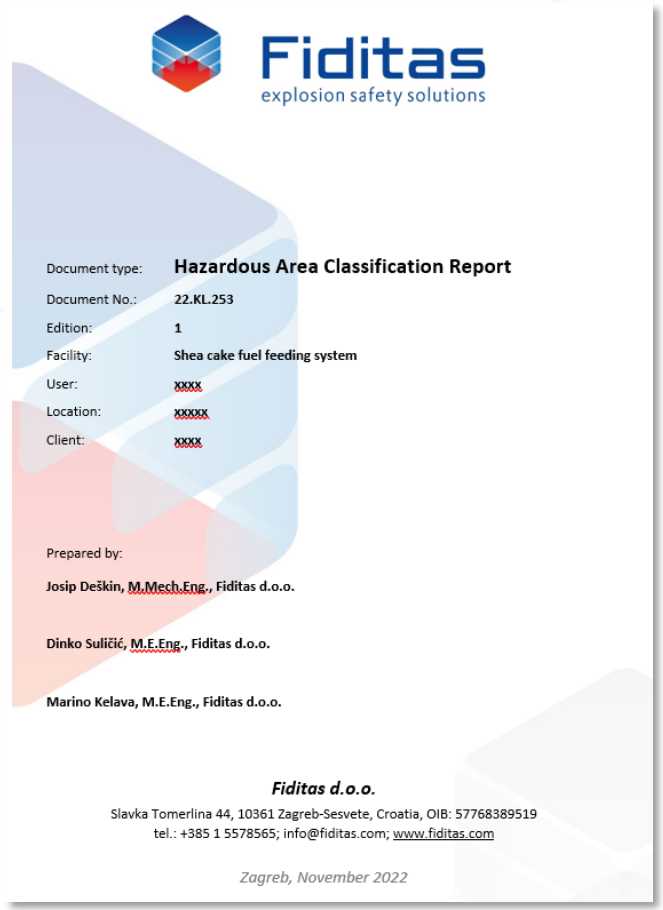
Importance of HAC Report



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Document type: **Hazardous Area Classification Report**
Document No.: **22.KL.253**
Edition: **1**
Facility: **Shea cake fuel feeding system**
User: **xxxx**
Location: **xxxxx**
Client: **xxxx**

Prepared by:

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Zagreb, November 2022

- Hazardous Area Classification (HAC) Report is the basis for the design and selection of Ex equipment and installations
- HAC Report provides results of comprehensive analyses that follows the essential criteria against which the ignition hazards can be assessed and gives guidance on the design and control parameters which can be used in order to reduce such hazards.

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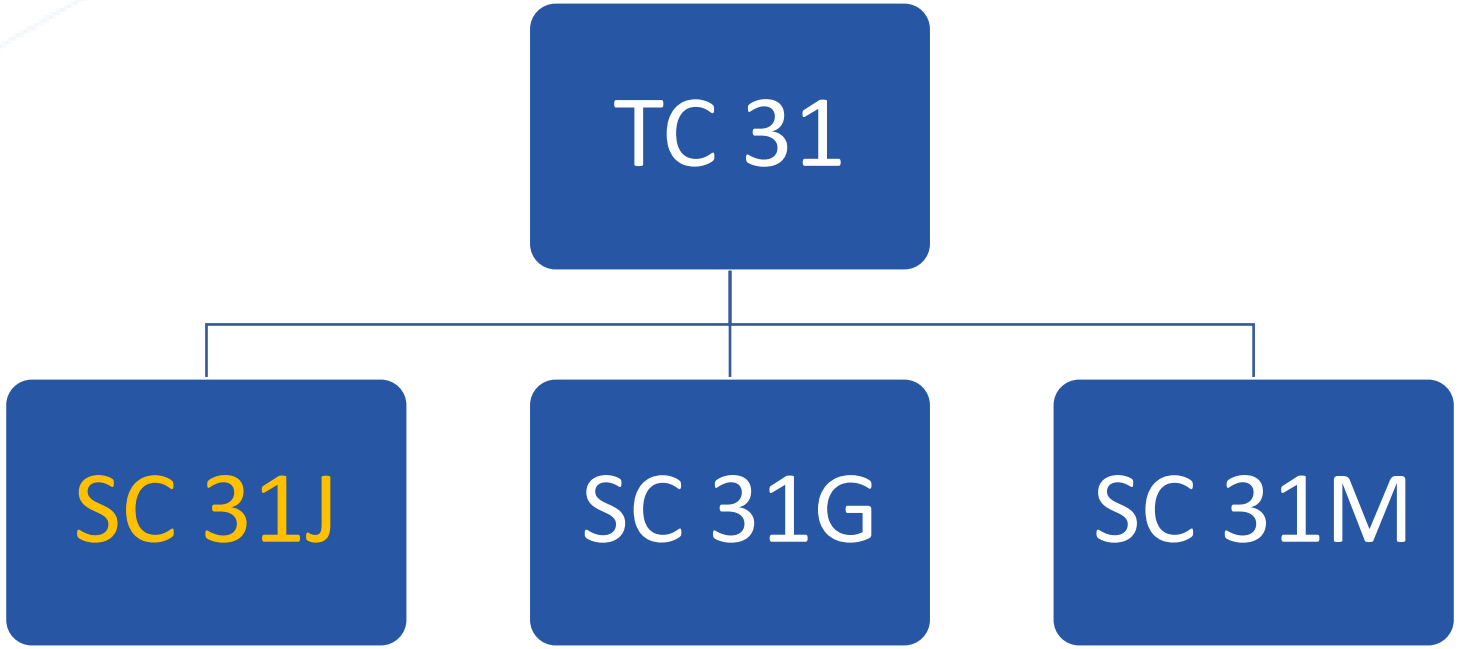
IEC TC 31 – Explosive Atmospheres



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IEC TC 31 / SC 31J

- Established in 1981, Secretariat held by Croatia
- To prepare and maintain international standards relating to the **use** of equipment including **area classification**, the **selection** and **installation**, **inspection** and **maintenance**, **repair**, **overhaul** and **reclamation** of equipment where there is a hazard due to the possible presence of explosive atmospheres of gases, vapours, mists or combustible dusts.

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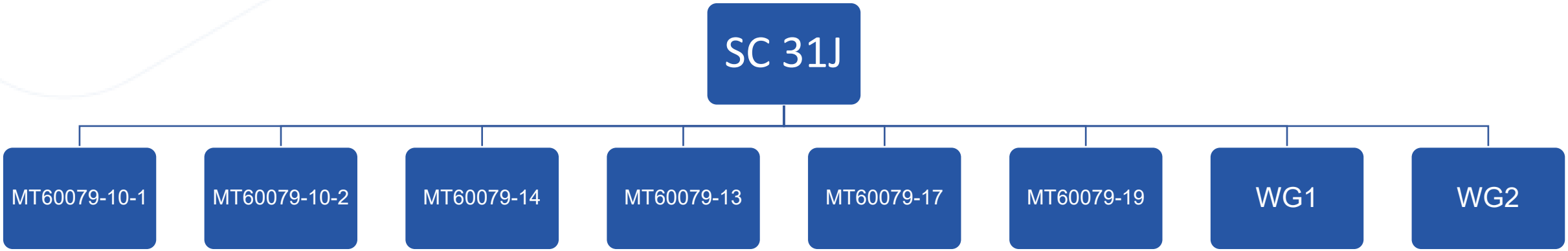
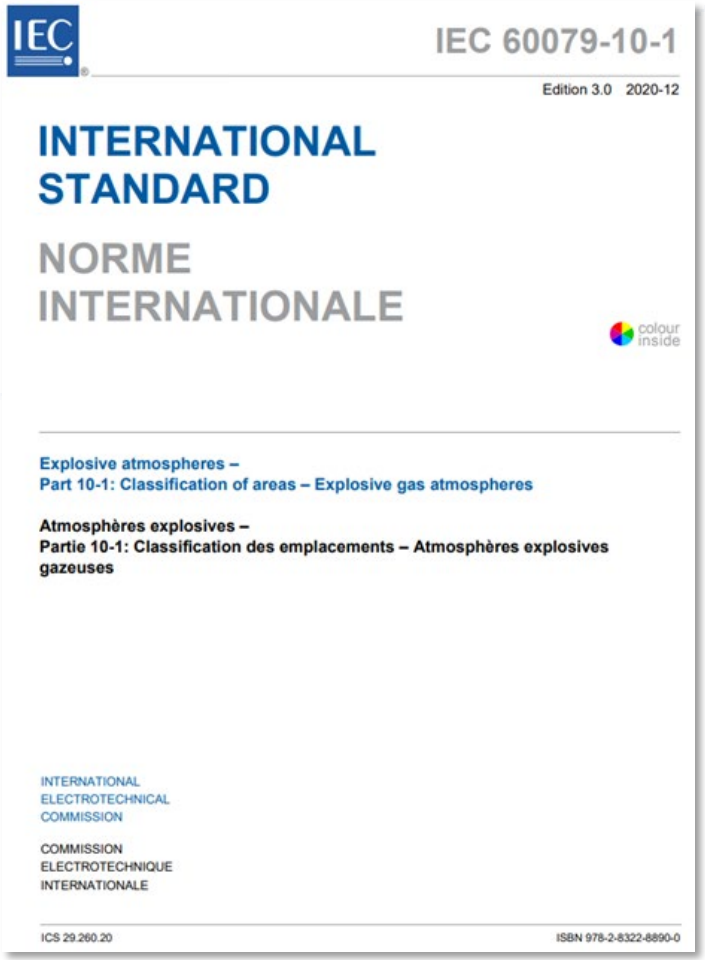
SC 31J Structure



MT60079-10-1


IEC 60079-10-1

Edition 3.0 2020-12

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Explosive atmospheres –
Part 10-1: Classification of areas – Explosive gas atmospheres

Atmosphères explosives –
Partie 10-1: Classification des emplacements – Atmosphères explosives gazeuses

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

ICS 29.260.20

ISBN 978-2-8322-8890-0

- This part of IEC 60079 is concerned with the classification of areas where flammable gas or vapour hazards may arise and may then be used as a basis to support the proper design, construction, operation and maintenance of equipment for use in hazardous areas.

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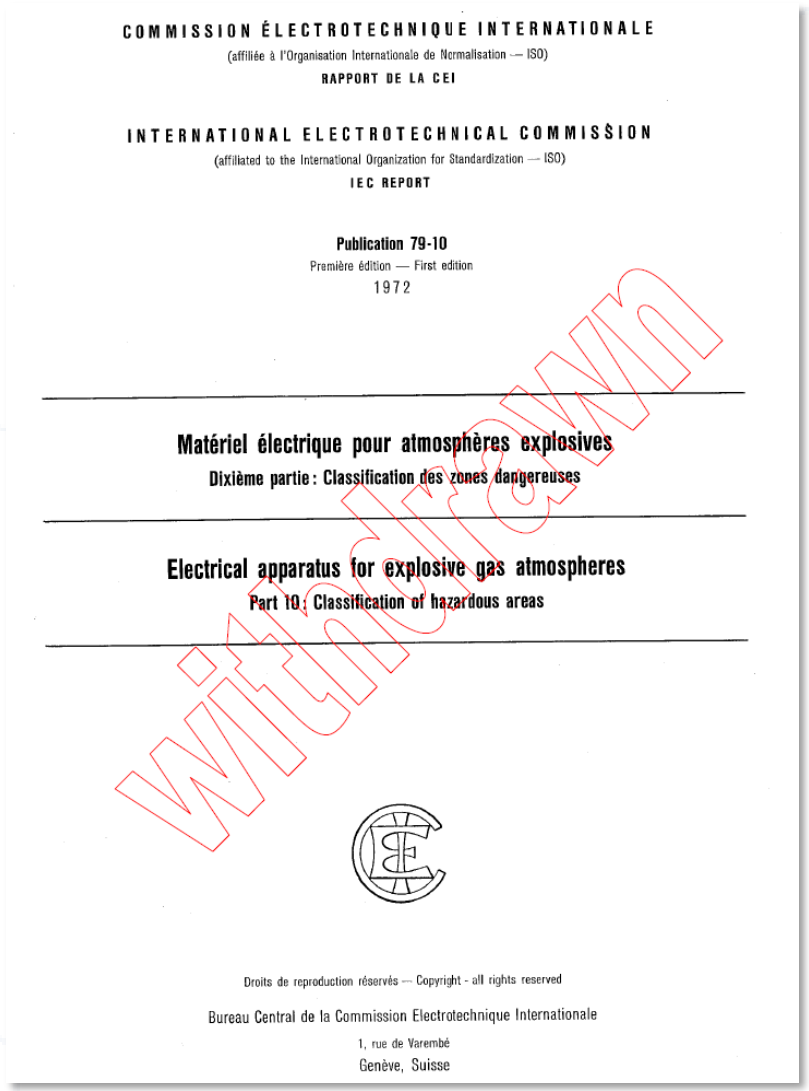
IEC 60079-10



COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE
(affiliée à l'Organisation Internationale de Normalisation — ISO)
RAPPORT DE LA CEI

INTERNATIONAL ELECTROTECHNICAL COMMISSION
(affiliated to the International Organization for Standardization — ISO)
IEC REPORT

Publication 79-10
Première édition — First edition
1972

Matériel électrique pour atmosphères explosives
Dixième partie: Classification des zones dangereuses

Electrical apparatus for explosive gas atmospheres
Part 10: Classification of hazardous areas

Bureau Central de la Commission Electrotechnique Internationale
1, rue de Varembé
Genève, Suisse

- Approach to classification is based on :
  - Characteristics of flammable substances
  - Characteristics of potential sources of release
  - Ventilation characteristics
  - Dilution conditions
- First edition published in 1972

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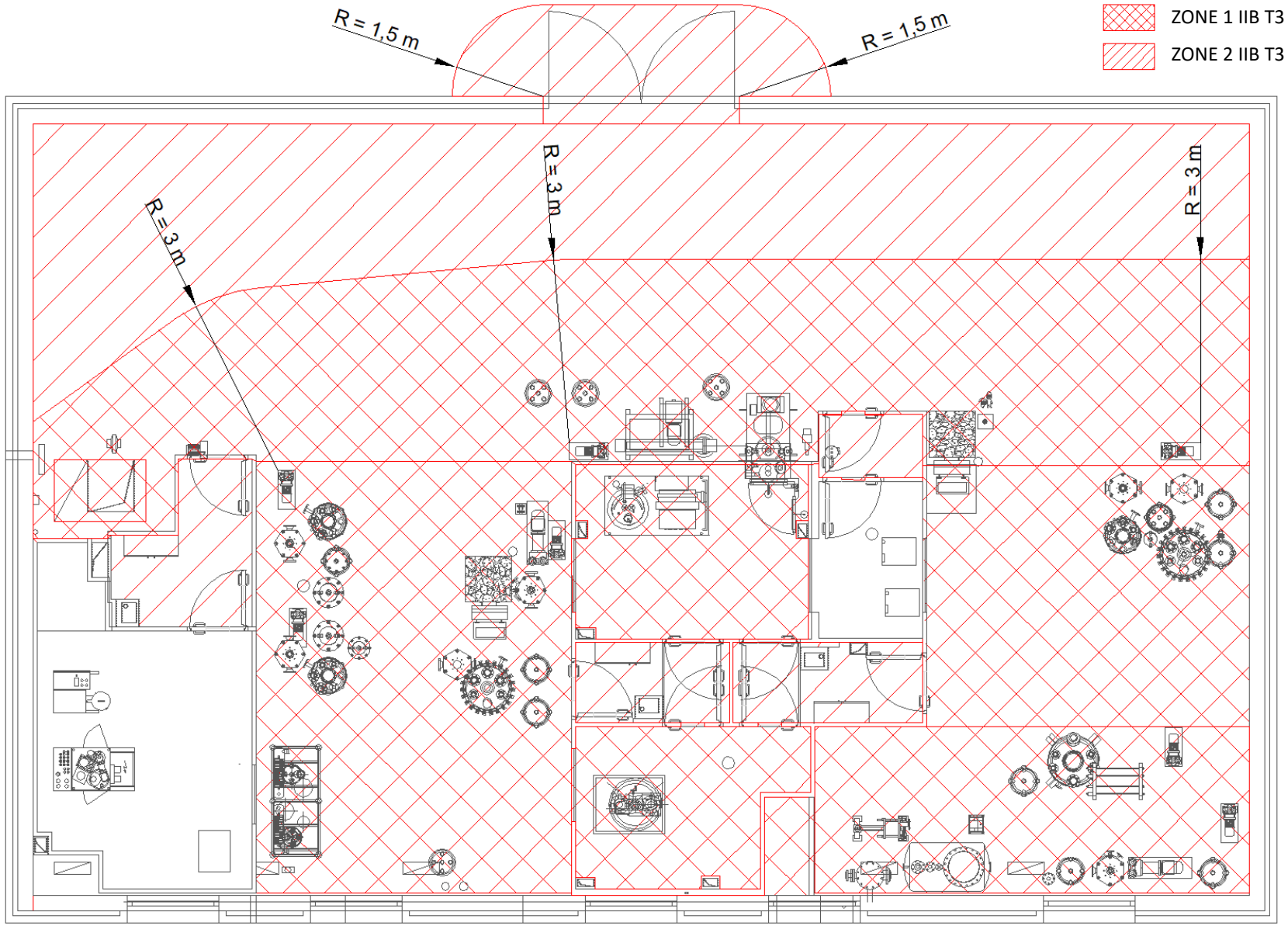
IEC 60079-10



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IEC Commented version (CMV) of IEC 60079-10-1

"The comprehension of what a standard requires or allows is one thing but understanding why is an equally important dimension. If you understand why, then following a standard becomes more intuitive."

Neil Dennis, Immediate Past IEC SC 31J Chair

- Consensus-based content
- Highlighted changes between versions
- Experts' technical commentary

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MT60079-10-2

- IEC 60079-10-2 is concerned with the identification and classification of areas where explosive dust atmospheres and combustible dust layers are present, in order to permit the proper assessment of ignition sources in such areas.

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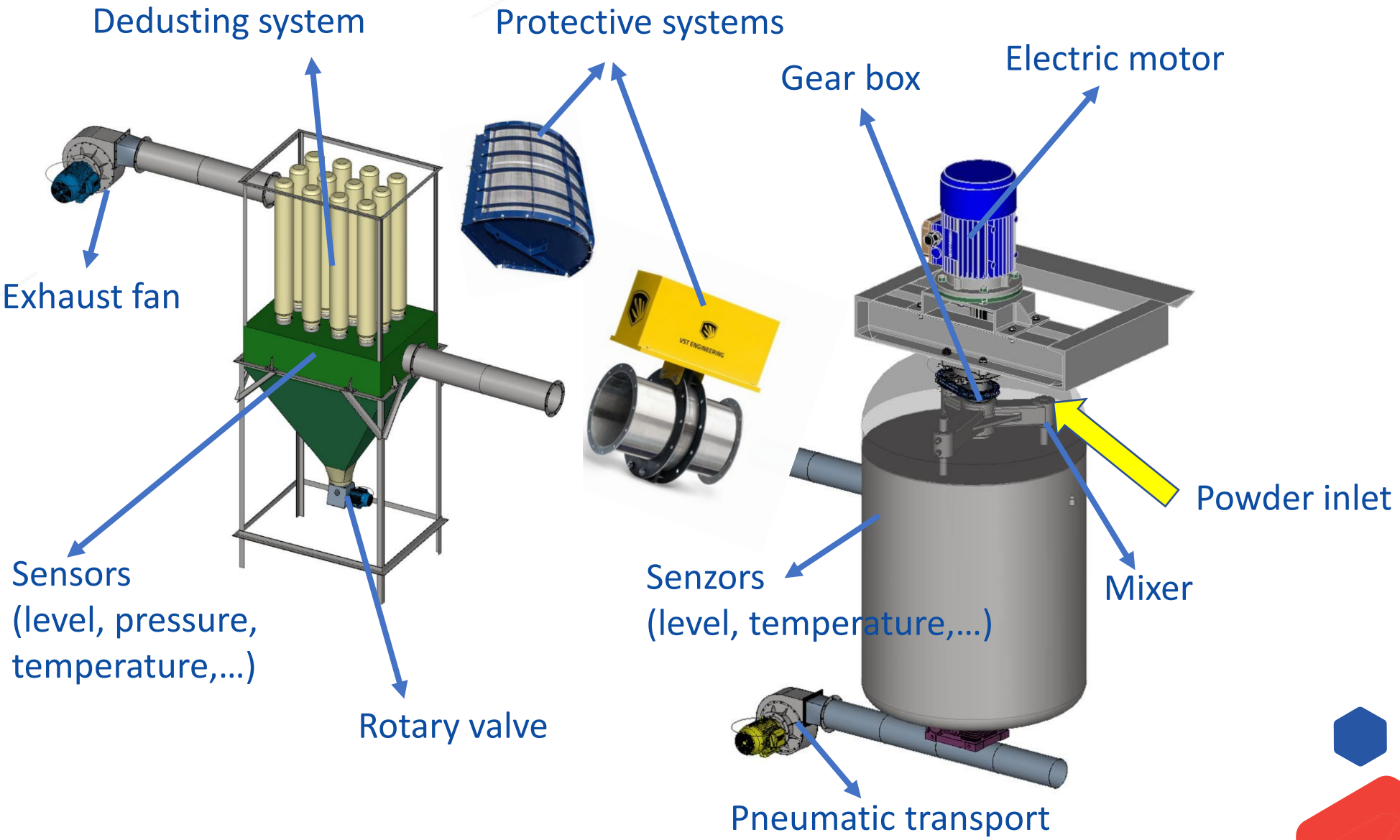
IEC 60079-10-2 typical application



MT60079-10-2: Development highlights

- The need to document material characteristics (laboratory tests)
  - particle size
  - moisture content
  - cloud and layer minimum ignition temperature
  - minimum ignition energy of dust/air mixtures
  - maximum explosion pressure P_{max} of dust clouds
  - maximum rate of explosion pressure rise $(dp/dt)_{max}$ of dust clouds
  - lower explosion limit (LEL) of dust clouds
  - limiting oxygen concentration LOC of dust clouds
  - electrical resistivity of dusts

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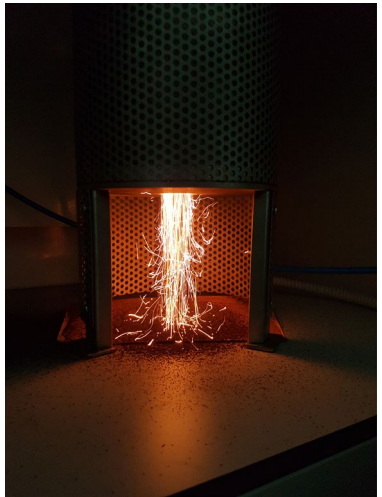
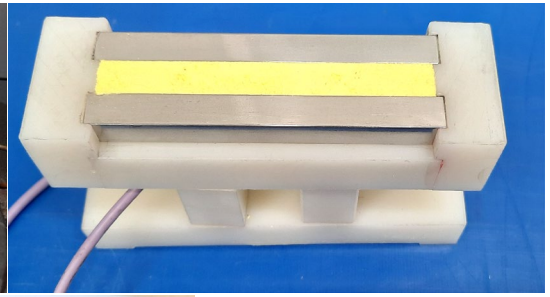
MT60079-10-2: Development highlights

Parameter	Standard
Minimum ignition energy (MIE)	**EN IEC/ISO 80079-20-2** Explosive atmospheres Part 20-2: Material characteristics - Combustible dusts test methods
Minimum Ignition Temperature of a Dust Cloud (MIT)	
Hot Surface Ignition Temperature of Dust Layers (LIT)	
Electrical resistivity of Dust	
Burning behaviour of dust layers	**EN 17077** Determination of burning behaviour of dust layers





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MT60079-10-2: Development highlights

Paremeter	Standard
Explosion Severity Test (K_{St} ,P_{max} and dp/dt_{max})	**EN 14034-1** Determination of explosion characteristics of dust clouds -- Part 1: Determination of the maximum explosion pressure **P_{max}** of dust clouds **EN 14034-2** Determination of explosion characteristics of dust clouds -- Part 2: Determination of the maximum rate of explosion pressure rise **dp/dt_{max}** of dust clouds
Lower explosion limit (LEL)	**EN 14034-3** Determination of explosion characteristics of dust clouds -- Part 3: Determination of the lower explosion limit LEL of dust clouds
Limiting oxygen concentration (LOC)	**EN 14034-3** Determination of explosion characteristics of dust clouds -- Part 4: Determination of the limiting oxygen concentration LOC of dust clouds

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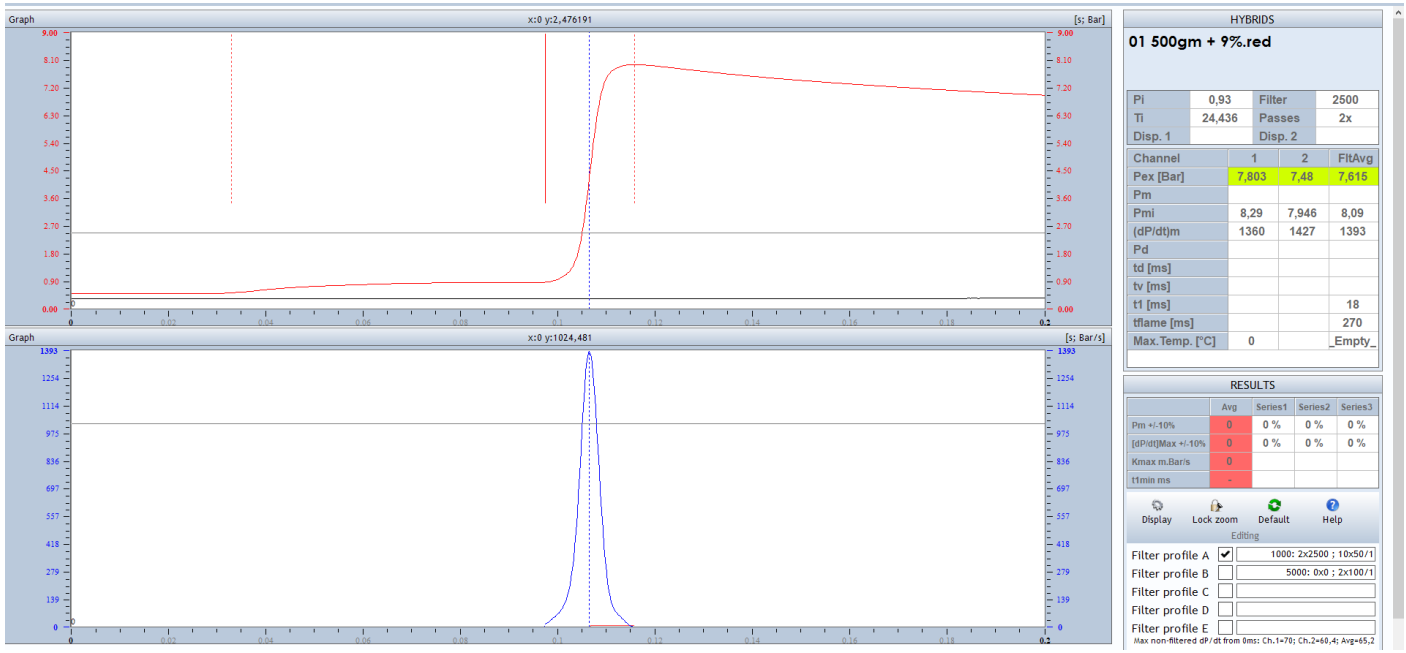
Hybrid mixtures explosivity determination

P_{max} and $(dp/dt)_{max}$ hybride mixture (St3)



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MT60079-14

- This part of the IEC 60079 series contains the specific requirements for the design of electrical systems, selection, installation and the required initial inspection of electrical installations of Ex Equipment including requirements for documentation and personnel competency in, or associated with, explosive atmospheres.

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MT60079-14: Development of Edition 6

- FDIS to be circulated soon
- new title „Electrical installation design, selection and installation of equipment, including initial inspection”
- Document structure fully revised
- Mayor techical revision since the first edition
- 34 editorial changes
- 34 extensions to current edition
- 5 major technical changes

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MT60079-17: Electrical installations inspection and maintenance

- IEC 60079-17 applies to users and covers factors directly related to the inspection and maintenance of electrical installations within hazardous areas, where the hazard may be caused by flammable gases, vapours, mists, dusts, fibres or flyings. Document is slightly revised.
  - 6 editorial changes
  - 4 extensions to current edition
  - 3 major technical changes

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MT60079-19: Equipment repair, overhaul and reclamation

- This document gives guidance on the practical means of maintaining the explosion protection of repaired equipment. Procedures for repair, overhaul or reclamation and verification of continued compliance of the equipment with the provisions of the Ex Equipment Certificate or with the provisions of the appropriate explosion protection standard where Ex Equipment Certificate is not available.

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MT60079-19: Development of Ed.5

- CDV is currently beeing translated to French and bilingual version will be circulated for voting soon
- MT60079-19 will meet next week (22nd March) here in Podstrana

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WG1: Specific requirements for underground mining

- Electrical installations design, selection, erection and inspection in **underground mines** susceptible to firedamp
- To investigate and prepare for the implementation of specific requirements for **underground mining electrical equipment and installations** into SC 31J standards.
- WG1 will meet next week (21st March) here in Podstrana.

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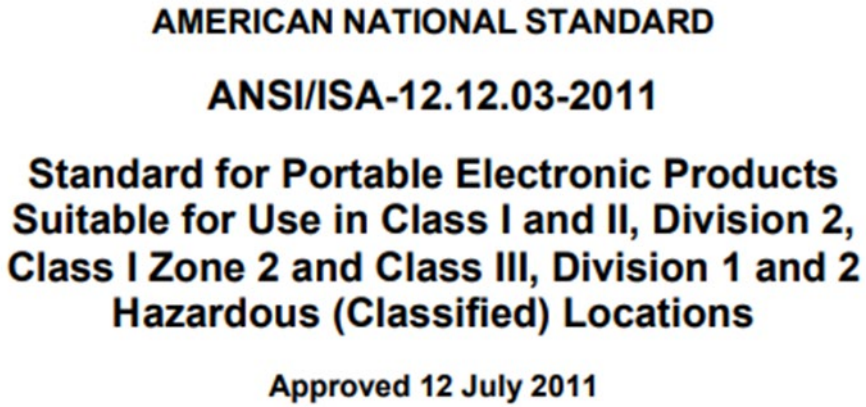
WG2: Portable and personal equipment

- WG2 was established in 2019 with the task to investigate and prepare guidance for the implementation of specific requirements for portable and personal equipment into SC 31J standards.

WG2: Portable and personal equipment

- IEC TS 60079-48 provides guidance for the use of **portable** or **personal electrical equipment** to be used in Equipment Protection Level (EPL) Gb, Gc, Db, or Dc hazardous areas that are not otherwise available with a certificate for use in these EPLs.
- Based on:



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WG2: Portable and personal equipment

- **PEP**: portable or personal electrical product (self-contained, low power equipment that can be hand-held or that is further defined by PEP 1 and PEP 2)
- **PEP1**: equipment intended to be worn by and to be in contact with a person's body that is considered incapable of causing an ignition under normal conditions
- **PEP2**: equipment intended to be carried by a person during its operation that is considered incapable of causing an ignition under normal conditions

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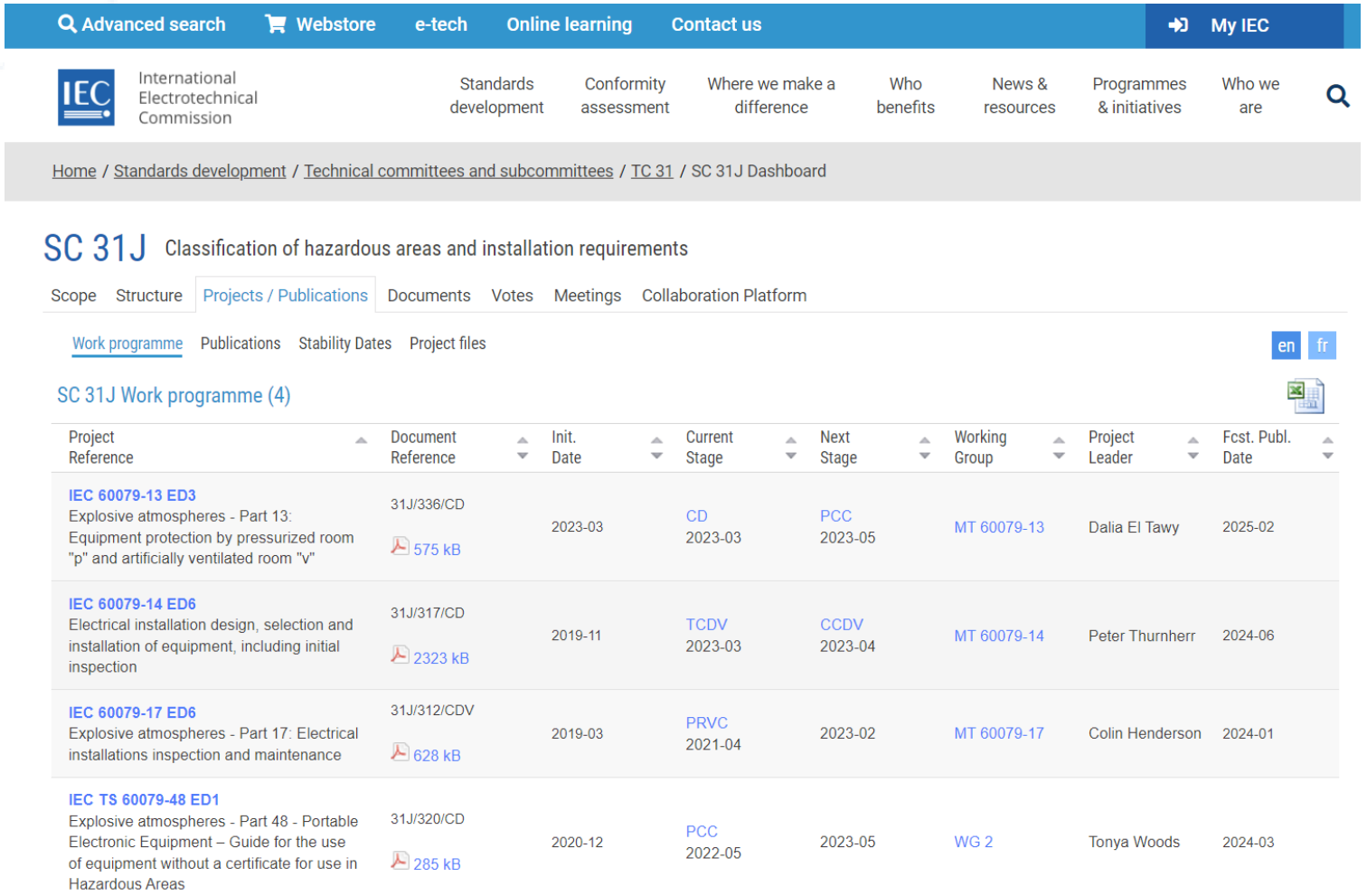
Info Resources – SC 31 Dashboard

www.iec.ch/sc31j



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SC 31J Classification of hazardous areas and installation requirements

Scope | Structure | Projects / Publications | Documents | Votes | Meetings | Collaboration Platform

Work programme | Publications | Stability Dates | Project files

en | fr

SC 31J Work programme (4)

Project Reference	Document Reference	Init. Date	Current Stage	Next Stage	Working Group	Project Leader	Fcst. Publ. Date
IEC 60079-13 ED3 Explosive atmospheres - Part 13: Equipment protection by pressurized room "p" and artificially ventilated room "v"	31J/336/CD 575 kB	2023-03	CD 2023-03	PCC 2023-05	MT 60079-13	Dalia El Tawy	2025-02
IEC 60079-14 ED6 Electrical installation design, selection and installation of equipment, including initial inspection	31J/317/CD 2323 kB	2019-11	TCDV 2023-03	CCDV 2023-04	MT 60079-14	Peter Thurnherr	2024-06
IEC 60079-17 ED6 Explosive atmospheres - Part 17: Electrical installations inspection and maintenance	31J/312/CDV 628 kB	2019-03	PRVC 2021-04	2023-02	MT 60079-17	Colin Henderson	2024-01
IEC TS 60079-48 ED1 Explosive atmospheres - Part 48 - Portable Electronic Equipment – Guide for the use of equipment without a certificate for use in Hazardous Areas	31J/320/CD 285 kB	2020-12	PCC 2022-05	2023-05	WG 2	Tonya Woods	2024-03

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