

IECEX CoPC : Unit Ex 001 Assessment Requirements



Ir. SYED FADZIL SYED MOHAMED, P.Eng
Consultant
Product Certification and Inspection Department
SIRIM QAS International Sdn. Bhd.

IECEX OPERATIONAL DOCUMENT

**IEC System for Certification to Standards relating to Equipment for use
in Explosive Atmospheres (IECEX System)**

**IECEX Scheme for Certification of Personnel Competence for Explosive
Atmospheres –**

Specification for Units of Competence assessment outcomes

FREE Download : <http://www.iecex.com>

Unit Ex 001 :
Apply basic principles of protection in explosive atmosphere



Table 4.1 – List of units of competency

Reference	Title	Scope limitation ^{a)}
Unit Ex 001	Apply basic principles of protection in explosive atmospheres	Not applicable
Unit Ex 002	Perform classification of hazardous areas	3
Unit Ex 003	Install explosion-protected equipment and wiring systems	1, 2, 3, 4
Unit Ex 004	Maintain equipment in explosive atmospheres	1, 2, 4
Unit Ex 005	Overhaul and repair of explosion-protected equipment	1, 2, 4
Unit Ex 006	Test electrical installations in or associated with explosive atmospheres	3, 4
Unit Ex 007	Perform visual & close inspection of electrical installations in or associated with explosive atmospheres	3, 4
Unit Ex 008	Perform detailed inspection of electrical installations in or associated with explosive atmospheres	3, 4
Unit Ex 009	Design electrical installations in or associated with explosive atmospheres	3, 4
Unit Ex 010	Perform audit inspection of electrical installations in or associated with explosive atmospheres	3, 4
^{a)} Limitation by: <ol style="list-style-type: none"> 1. Explosion-protection technique or 2. Product Type 3. Group 4. Voltage 		

SCOPE

- Covers the **explosion-protection aspects** of plant and machinery operation or maintenance.
- Requires the **ability to visually identify** any damage or deterioration of explosion-protected equipment, monitor equipment and plant in relation to **changes in the explosion hazard** and to follow procedures to limit the risk of an explosion.
- Based on various parts of **IEC 60079 series** and any other relevant standards that apply to this Unit of Competence.

PREREQUISITES

- No minimum** level of technical education applicable for this unit of Competence.
- Competence in this unit shall be **assessed in combination with**, or after gaining other competence required by a given industry or enterprise for plant or machinery operation or installations, maintenance or service functions. (see Annex A).

Unit Ex 001 :
Apply basic principles of protection in explosive atmosphere



ANNEX A

SUMMARY OF PREREQUISITE UNITS AND RECOMMENDED GENERAL COMPETENCE

Unit of Competence	Specific prerequisite Unit(s)	Previously attained competence
		Description
Unit Ex 001 – Apply basic principles of protection in explosive atmospheres	none	Competence in plant or machinery operation or installations, maintenance or service functions
Unit Ex 002 – Perform classification of hazardous areas	none	Competence in gathering and analysing technical data and using this data for risk assessment
Unit Ex 003 – Install explosion-protected equipment and wiring systems	Unit Ex 001	Competence in installation of electrical, electronic, instrumentation and/or data communication equipment and wiring systems
Unit Ex 004 – Maintain equipment in explosive atmospheres	Unit Ex 001	Competence in maintenance of general low-voltage or extra-low voltage electrical, electronic, instrumentation and/or data communication equipment and wiring systems
Unit Ex 005 – Overhaul and repair of explosion-protected equipment	Unit Ex 001	Competence in overhaul and repair of general low-voltage or extra-low voltage electrical/electronic equipment
Unit Ex 006 – Test electrical installations in or associated with explosive atmospheres	Unit Ex 001	Competence in conducting testing of general electrical, electronic, instrumentation and/or data communication installations
Unit Ex 007 – Perform visual and close inspection of electrical installations in or associated with explosive atmospheres	Unit Ex 003 or Unit Ex 004	Competence in general electrical installation inspection are an alternative to the specific units listed in Column 2
Unit Ex 008 – Perform detailed inspection of electrical installations in or associated with explosive atmospheres	Unit Ex 003 or Unit Ex 004	Competence in general electrical installation inspection are an alternative to the specific units listed in Column 2
Unit Ex 009 – Design electrical installations in or associated with explosive atmospheres	Unit Ex 001	Competence in designing electrical systems and installations
Unit Ex 010 – Perform audit inspection of electrical installations in or associated with explosive atmospheres	Unit Ex 003 or Unit Ex 004 or Unit Ex 009	Competence in general electrical installation inspection are an alternative to the specific units listed in Column 2

ELEMENTS AND PERFORMANCE CRITERIA

ELEMENTS		PERFORMANCE CRITERIA		CRITICAL ASPECTS OF EVIDENCE
1.	Prepare to work in hazardous area	1.1	Nature of explosion hazard in the area and risks are known and status of the explosion hazard is ascertained through established procedures .	Following work permits and clearance procedures .
		1.2	Operation and condition of plant and machinery, with regards to explosion protection , is ascertained through established procedures .	Following work permits and clearance procedure . Correctly operating plant and machinery.
		1.3	Established procedures for use of the plant and machinery, with regards to explosion-protection techniques used in the area, are followed .	Correctly operating plant and machinery.

continue

ELEMENTS AND PERFORMANCE CRITERIA

ELEMENTS		PERFORMANCE CRITERIA		CRITICAL ASPECTS OF EVIDENCE
2	Observe condition of explosion-protection system area	2.1	OH &S policies and procedures, with regards to explosion-protection, are followed.	Following work permits and clearance procedures.
		2.2	Performance of plant & machinery is monitored to identify faults that affect the integrity of the explosion-protected equipment / system.	Monitoring hazards and following evacuation procedures.
		2.3	Observations of explosion-protected equipment are made during operations and visual & audible Non-Conformance that affect the integrity of the explosion protection technique identified.	Identifying visual damage or deterioration of explosion protected equipment.
		2.4	Explosion hazard monitoring equipment is observed and dangerous state of hazard is identified (eg. By gas detectors)	Monitoring hazards and following evacuation procedures.

continue

Unit Ex 001 :
Apply basic principles of protection in explosive atmosphere



ELEMENTS AND PERFORMANCE CRITERIA

ELEMENTS		PERFORMANCE CRITERIA		CRITICAL ASPECTS OF EVIDENCE
3	Take actions to limit risk of an explosion	3.1	Variations outside normal operating conditions are reported and documented in accordance with established procedures .	
		3.2	Established procedures are followed in the event of a potential or immediate hazardous condition arising from any nonconformance identified in equipment/wiring or changes in the explosion hazard to a dangerous state.	Following plant and electrical isolation procedures .

Unit Ex 001 :
Apply basic principles of protection in explosive atmosphere



SCOPE LIMITATIONS

Scope limitations are **NOT APPLICABLE** to Unit Ex 001

Eg. Limitation by:

- Explosion-protection technique
- Product Type
- Group
- Voltage

EVIDENCE GUIDE – CRITICAL ASPECTS OF EVIDENCE

Evidence of competence in this unit shall show:

- proficient** performance associated with each element of competence by **employing the techniques**, procedures, information and resources available in the **workplace**
- understanding** of the knowledge and associated skills essential to performance as follows :
 - i. Explosive atmospheres and explosion-protection **principles**
 - ii. Explosion-protected equipment – Ex certification **schemes**
 - iii. Explosion-protected equipment – **Principles**
 - iv. Explosion-protection **visual** checks.

OD 504, Specification for Units of Competence assessment outcomes



Summary of essential knowledge and associated skills for each Unit of Competence

Essential knowledge and associated skills		Unit Ex 001 – Apply basic principles of protection in explosive atmospheres	Unit Ex 002 – Perform classification of hazardous areas	Unit Ex 003 – Install explosion-protected equipment and wiring systems	Unit Ex 004 – Maintain equipment in explosive atmospheres	Unit Ex 005 – Overhaul and repair of explosion-protected equipment	Unit Ex 006 – Test electrical installations in or associated with explosive atmospheres	Unit Ex 007 – Perform visual and close inspection of electrical installations in or associated with explosive atmospheres	Unit Ex 008 – Perform detailed inspection of electrical installations in or associated with explosive atmospheres	Unit Ex 009 – Design electrical installations in or associated with explosive atmospheres	Unit Ex 010 – Perform audit inspection of electrical installations in or associated with explosive atmospheres
5.1	Explosive atmospheres and explosion-protection principles	X	X	X		X	X	X	X	X	X
5.2	Explosion-protected equipment – Ex certification schemes	X		X	X	X	X	X	X	X	X
5.3	Explosion-protected equipment – Principles	X		X	X	X	X	X	X	X	X
5.4	Explosion-protection visual checks	X									
5.5	Explosive atmospheres classification techniques		X								
5.6	Hazardous area classification work performance		X								
5.7	Flameproof (Ex 'd') explosion-protection technique			X	X	X	X	X	X	X	X
5.8	Increased safety (Ex 'e') explosion-protection technique			X	X	X	X	X	X	X	X
5.9	Type of protection 'n' (Ex 'n')			X	X	X	X	X	X	X	X
5.10	Encapsulation (Ex 'm') explosion-protection technique			X	X	X	X	X	X	X	X
5.11	Oil immersion (Ex 'o') explosion-protection technique			X	X	X	X	X	X	X	X
5.12	Powder filled (Ex 'q') explosion-protection technique			X	X	X	X	X	X	X	X
5.13	Intrinsic safety (Ex 'i') explosion-protection technique			X	X	X	X	X	X	X	X
5.14	Pressurization (Ex 'p') explosion-protection technique			X	X	X	X	X	X	X	X

CRITICAL ASPECTS OF EVIDENCE

EXPLOSIVE ATMOSPHERES AND EXPLOSION-PROTECTION PRINCIPLES

Properties of **combustible substances** and potential to create an **explosive hazard**:

- Condition** in the workplace that will **lead to an explosion**
- Terms** ‘combustion’, ‘ignition’ and ‘propagation’
- Range of **substances** encountered in the workplace i.e. LEL/UEL
- Explosive** substances, i.e., properties of combustible materials – gases, vapours (such as flash point) and Dusts
- Difference** between gases and vapours
- Toxic nature** of gases and vapours and potential harmful **consequences**

CRITICAL ASPECTS OF EVIDENCE

EXPLOSIVE ATMOSPHERES AND EXPLOSION-PROTECTION PRINCIPLES

Nature of explosive atmospheres encompassing:

- ❑ Standards **definition** of a 'hazardous area'
- ❑ Recommended methods for **classifying** the type and degree of explosion hazard in an area
- ❑ Hazardous area **classifications** as defined by Standards
- ❑ **Factors** that are considered when a hazardous area is classified.

The basics of **how explosion-protection** is achieved by the methods of exclusion, containment, energy limitation, dilution, avoidance of ignition source.

CRITICAL ASPECTS OF EVIDENCE

EXPLOSIVE ATMOSPHERES AND EXPLOSION-PROTECTION PRINCIPLES

Occupational Health & Safety responsibilities encompassing:

- Features and purpose of a ‘clearance to work’ system (**PTW**)
- Procedures to be followed **before entering** hazardous area and **safety precautions** to be taken **while working**
- Purpose** of gas detectors and their **limitations**
- Effects of temperature** on gas and vapour detection, **monitoring** frequency, effects of temperature rise
- Factors affecting the **accuracy** of gas detectors, for example, contamination, condensation, temperature;
- Safety** in use of gas detectors, for example, ‘read and run concept’
- Housekeeping** requirements to minimise the effect of **dust layers**

Unit Ex 001 :

Apply basic principles of protection in explosive atmosphere



CRITICAL ASPECTS OF EVIDENCE

EXPLOSIVE ATMOSPHERES AND EXPLOSION-PROTECTION PRINCIPLES

Roles of the parties involved in the safety of explosive atmospheres encompassing:

- Regulations** related to the safety of explosive atmospheres and the **Authorities** responsible for their implementation
- Where **assistance and further information** can be obtained to assist persons with hazardous area responsibilities, for example, **Standard bodies**, experienced consultants

CRITICAL ASPECTS OF EVIDENCE

EXPLOSIVE ATMOSPHERES AND EXPLOSION-PROTECTION PRINCIPLES

Hazardous area **responsibilities** of:

- Owner and/or occupier** of premises in which a hazardous area exists;
- Installation and/or maintenance** of explosion-protection systems
- Classification** of explosive atmospheres and/or **design** of explosion-protection systems
- Overhaul, modification and/or assessment** of explosion-protected equipment;
- Inspection** of explosion-protection installations;
- Manufacturers** of explosion-protected equipment
- Designated authorities / Insurers**

EXAMPLE

Which of the following is the right sequence of an explosion to occur?

- A. Propagation -> Ignition -> Combustion**
- B. Ignition -> Propagation -> Combustion**
- C. Combustion -> Propagation -> Ignition**
- D. Ignition -> Combustion -> Propagation**

ANSWER : D

Unit Ex 001 :

Apply basic principles of protection in explosive atmosphere



EXAMPLE

Give 3 sources of ignition :

MARKING SCHEME

- Hot Surface
- Mechanically Generated Sparks
- Electrostatic Charges
- Lightning
- Flame
- Hot Gases
- Chemical Reactions
- Electromagnetic Fields
- Electromagnetic Radiation
- Ionizing Radiation
- Optical
- Adiabatic

CRITICAL ASPECTS OF EVIDENCE

EXPLOSION-PROTECTED EQUIPMENT : Ex CERTIFICATION SCHEME

Understanding of **Ex certification schemes** to accepted standards to an extent indicated by:

- Purpose and scope** of certification schemes.
- Other** certification schemes.
- Processes** for having equipment certified under the acceptable Ex schemes encompassing:
 - i.** scheme procedures
 - ii.** quality management requirements
 - iii.** conformance testing and assessment
 - iv.** requirements for ongoing certification.

Unit Ex 001 :

Apply basic principles of protection in explosive atmosphere



EXAMPLE

Which of the following certification scheme is NOT operated by IECEx:

- A. Certification of Hazardous Area Management System**
- B. Certification of Ex equipment**
- C. Certification of Personnel Competency**
- D. Certification of Service Facilities**

ANSWER : A

Unit Ex 001 :

Apply basic principles of protection in explosive atmosphere



EXAMPLE

List TWO requirements for manufacturers to have their equipment certified under the IECEx equipment certification scheme?

MARKING SCHEME

- Scheme procedure**
- Quality management requirements**
- Conformance testing and assessment**
- Requirements for ongoing certification**

CRITICAL ASPECTS OF EVIDENCE

EXPLOSION-PROTECTED EQUIPMENT : PRINCIPLES

Understanding of the principles of explosion-protection techniques:

Flameproof (**Ex 'd'**); Increased safety (**Ex 'e'**); Type of protection 'n' (**Ex 'n'**); Intrinsic safety (**Ex 'i'**); Encapsulation (**Ex 'm'**); Oil immersion (**Ex 'o'**); Pressurization (**Ex 'p'**); Powder filled (**Ex 'q'**) for gas atmospheres and Protection by enclosures-Dusts (**Ex 'tD'** or **Ex 't'**); Pressurization-Dusts (**Ex 'pD'**); Encapsulation-Dusts (**Ex 'mD'**); and Intrinsic safety-Dusts (**Ex 'iD'**).

Indication of understanding required:

- Principles** of each explosion-protection technique, the methods used and how each **technique works**.
- How explosion-protected equipment **marked** using 'Ex' symbol.
- Visible **conditions or actions** that would **void** the explosion-protection provided by a particular technique.

EXAMPLE

In which hazardous areas Ex'd' apparatus are permissive to be installed?

- A. Zone 0
- B. Zone 1
- C. Zone 2
- D. Non-hazardous area

ANSWER : B

Unit Ex 001 :

Apply basic principles of protection in explosive atmosphere



EXAMPLE

Define time t_E for Ex 'e'

MARKING SCHEME

time, in seconds, taken for an A/C. rotor or stator winding, when carrying the initial starting current, to be heated up to the limiting temperature from the temperature reached in rated service at the maximum ambient temperature

CRITICAL ASPECTS OF EVIDENCE

EXPLOSION-PROTECTION VISUAL CHECKS

Conditions of equipment that indicate the **protection is void** and **changes of the explosion hazard** that may render the explosion-protection **unsafe**.

- OH&S procedures to be followed **before** entering explosive atmospheres and **while conducting** close inspection.
- Visible defects** in explosion-protected equipment and wiring.
- Conditions that may indicate **change** in a given explosion hazard.
- Reporting** defects in explosion-protected equipment / wiring:
 - i. purpose of a verification dossier
 - ii. various ways for reporting defects in equipment / wiring.
- Procedures to be followed in the event of a **change in the explosion hazard**.

EXAMPLE

What is NOT the key contents of inspection report?

- A. Description of Non Compliances**
- B. Product specification**
- C. Recommendation of corrective action**
- D. Equipment detail**

ANSWER : B

Unit Ex 001 :
Apply basic principles of protection in explosive atmosphere



EXAMPLE

List **THREE** Grades of Inspection

MARKING SCHEME

- Visual
- Close
- Detail

Unit Ex 001 :
Apply basic principles of protection in explosive atmosphere



MINIMUM NUMBER AND TYPE OF ITEMS

Description	Selected Response A	Selected Response B	Contracted Response C	TOTAL
EXPLOSIVE ATMOSPHERES AND EXPLOSION-PROTECTION PRINCIPLES	8	12	4	24
EXPLOSION-PROTECTED EQUIPMENT : Ex CERTIFICATION SCHEME	6	9	3	18
EXPLOSION-PROTECTED EQUIPMENT : PRINCIPLES	4	8	2	14
EXPLOSION-PROTECTION VISUAL CHECKS	4	9	2	15
TOTAL	22	38	11	71

Unit Ex 001 :
Apply basic principles of protection in explosive atmosphere



KNOWLEDGE ASSESSMENT REQUIREMENT

DESCRIPTION	KNOWLEDGE ASSESSMENT
PAPER A	All (100 %) questions shall be designated absolute and shall be answered correctly
PAPER B	At least 80 % of these questions shall be answered correctly
PAPER C	At least 80 % of these questions shall be answered correctly
PRACTICAL	Not applicable for Ex 001

CHECKLIST DESCRIPTION

- All pages of the application **form completed** (including payment information and selected schedule)
- Valid **e-mail** address included
- Valid **telephone number** included
- Resume** with details of work experience associated with **Hazardous Areas** and **Non-Hazardous Areas**. Please provide details of **employer(s) or client(s)** for verification.
- Letter of **Current Employment**
- Copy of Degree / Diploma / Certificate
- Copy of **training** records related to **Hazardous Areas**
- Copy of Government issue **Identification Document** eg Mykad, International Passport etc. Please cross, with the word **-IECEX COPC-**
- Current **Passport size portrait photograph**, in colour and with a **white background** in electronic .jpg format 150 X 200 pixels. Please send it to : azlinad@sirim.my (**Subject : Applicant Name**)
- Evidence of **assessment fee payment** transaction eg. Cheque, payment slip etc
- Copy of completed application documents for **your records**

NOTE :

All documentation such as resume, certificates, identification document etc to be **reviewed / endorsed / certified** by current employer, notary public or commissioner of oaths (pesuruhjaya sumpah)



IECEX Certificate Personnel Competence



INTERNATIONAL ELECTROTECHNICAL COMMISSION IEC Certification System for Explosive Atmospheres

for rules and details of the IECEx Certification of Personnel Competence (CoPC) Scheme visit www.iecex.com

Certificate No.: issue No.:

Status: Date of Original Issue: 2014-01-21
Date of Expiry: 2017-01-21

Applicant: NUR HANANI BINTI ZAMANI

Scope of Competence: Ex 001 - Basic principles -
(Units according to IECEx OD 504) Based on various parts of IEC 60079 series



For Detailed information on Scope Application in accordance with IECEx OD 502 click on PCAR Number below:

PCAR Reference No.: [MY/SRMPCAR14.0015/00](#)

This certificate is issued as verification that the Applicant was assessed and found to comply with the IECEx CoPC Scheme requirements, relating to the scope of Competence and referenced Standards listed above. This certificate is granted subject to the conditions as set out in IECEx CoPC Scheme Rules, IECEx 05 as amended.

Approved for issue on behalf of the IECEx Certification Body: Harman bin Alang Kasim

Position: Certification Manager

Signature: _____

Date: _____

1. This certificate and schedule may only be reproduced in full.
2. This certificate is not transferable and remains the property of the issuing body.
3. The Status and authenticity of this certificate may be verified by visiting the [Official IECEx Website](#).

Certificate issued by:

SIRIM QAS International Sdn. Bhd.
Building 8, SIRIM Complex
No. 1, Persiaran Dato' Menteri
Section 2, P. O. Box 7035



Example of CoPC

IECEX Personnel Competence Assessment Report: registration details

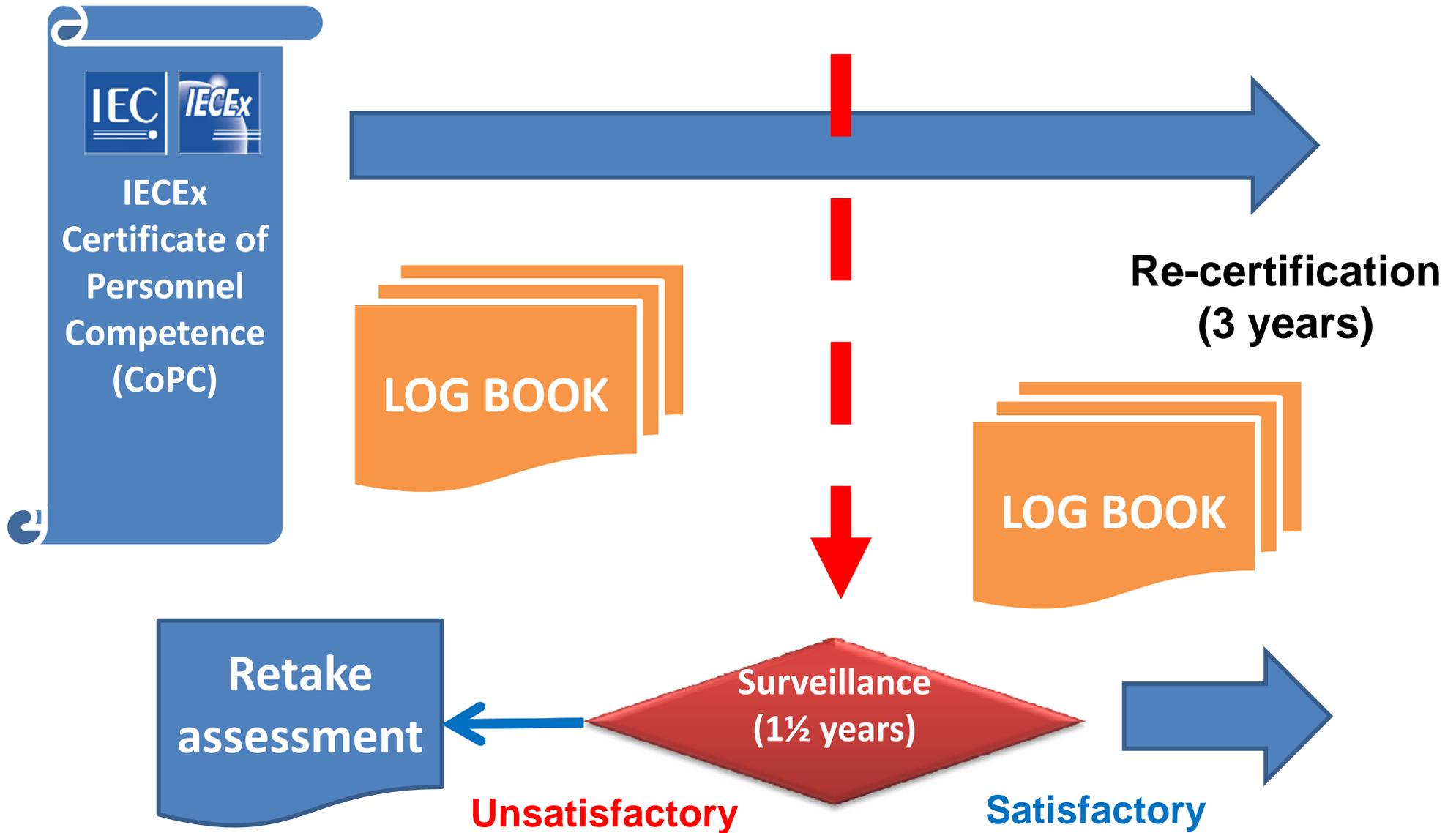
PCAR :	
PCAR Reference Number*: (automatic numbering)	MY/SRM/PCAR14.0015/00
Related PCARs:	
Status*:	Issued
PCAR Free Reference Number*:	Ex05-SIRIM-830914085630
Date of Original issue*:	2014-01-21
Date of Issue of this PCAR*:	2014-01-21
Due Date of Recertification*:	2017-01-21
Applicant Name*:	NUR HANANI BINTI ZAMANI
Applicant Country / Location*:	Malaysia
Applicant Employer:	PETRONAS CARIGALI SDN BHD
Issuing ExCB*:	SRM - SIRIM QAS International Sdn. Bhd.
Units of Competence*: (According to OD 504)	Ex 001 - Basic principles - Based on various parts of IEC 60079 series
List of Standards	
Limitations*: (According to OD 502)	
Related IECEX Certificates	IECEX CP SRM14.0015 issue: 0 [Current]
Comment:	
Attachment:	

Example of PCAR

Example : Wallet ID Card



SURVEILLANCE AND RE-CERTIFICATION



Q & A

Thank You

PRODUCT CERTIFICATION AND INSPECTION DEPARTMENT

SIRIM QAS International Sdn Bhd

Building 25, SIRIM Complex

No. 1, Persiaran Dato' Menteri

P.O. Box 7035, Section 2,

40700 Shah Alam, MALAYSIA

Tel: +60-3-5544 6400

Fax : +60-3-5544 6757

<http://www.sirim-qas.com.my>

E-Mail : syed@sirim.my / syedfadzil@gmail.com

Tel : +60-3-5544 5636 (Direct Line)

Mobile : +60-19-322 3375 (WhatsApp Enabled)