

**Competence Professional
Scheme
for
Personnel working in Hazardous Areas

Syllabus**

Prepared and copyright held by:

**Sira Certification Service
Crayford Road, Crayford,
Kent DA1 4AL**

Telephone No: +44 (0)1322 520500

Fax No: +44 (0)1322 520501



Record of amendments

Rev.	Date	Section	Amendment
1	March 2007	all	Initial published document
2	Jun 2007	Foreword	Syllabus Units updated for typographical errors
3	Dec 2007	all	Units 18 & 22 no longer mandatory Mandatory units are 3 & 7 and (either) 1 or 13 Updated information throughout units 1, 2, 3, 7, 18, 20 and 22 Note : Rev. 3 was not issued pending agreement by UKAS of reduction in number of mandatory units
4	July 2008	Unit 1	Unit includes “overview of ATEX 137 (and DSEAR) and relationship with ATEX 100a
4	July 2008	Unit 13	Unit includes “overview of ATEX 100a and relationship with ATEX 137 (and DSEAR)
4	July 2008	all	Syllabus sub-sections are numbered
4	July 2008	all	Editorial changes and reformatting to make text clearer
5	March 2009	-	Unit 25 (United Utilities Field Service Engineers) syllabus added

Please check the web site
www.competencepro.com
for a full description of all the units



Foreword

The need for Competent Personnel

The Dangerous Substances & Explosive Atmosphere Regulations (DSEAR) states:

*"Before a workplace containing places classified as hazardous is used for the first time, the employer shall ensure that its overall explosion safety is verified by a person who is **competent** in the field of explosion protection as a result of his experience, or any professional training, or both."*

In an industry where safety of personnel, equipment and the surrounding environment is of paramount importance, it is essential not only to ensure that equipment and plant conforms to the relevant standards and codes of practice, but also to make sure that the people working in these areas are competent to carry out their respective tasks. "Competence Professional" is an independent assessment scheme providing personnel with UKAS accredited Competence Certification to ensure that the employee and the employer can demonstrate the relevant competence needed for everyday duties.

How the scheme works

The Competence Professional Scheme is operated by SCS in association with a number of registered training providers. The scheme consists of syllabus units that are grouped into training courses to provide knowledge in fields of study relevant to the job specification e.g. area classification, plant design etc. Competence Professional enables assessments and experience evaluations to be conducted in the chosen field of study.

Getting started

Delegates must apply to SCS in the first instance and will be sent details of the scheme and an application form to complete. When delegates have completed their training they will be assessed on their knowledge of a given topic as well as experience in the field. The knowledge element will be assessed via a theory-based assessment; whereas reviewing a personnel log detailing the delegates experience within their field of work will assess the experience element. Both parts will need to be satisfactorily completed in order to issue a Competence certificate. Successful completion of the theoretical assessment but not of the experience element will result in a knowledge certificate only and not a competence certificate.

To ensure competence is maintained, periodic surveillance is a feature of the scheme.



Benefits of the Competence Scheme

- Ensure that competence is demonstrated when carrying out the job function
- Promote a high level of reliability and confidence in hazardous area personnel
- Ensure that continuous surveillance and assessment of hazardous area personnel is implemented
- Produced in collaboration between regulators, relevant trade associations and industry to ensure:
 - a common competence standard
 - a “portable” competence certificate which the delegate can take with them throughout their career. (It will also prove useful for subcontract staff when working on different sites.)

We have set out to offer a series of services to industry to assist them in the demonstration of Competence in all aspects of Hazardous Areas - not presently provided. The intention is to provide the necessary skills to enable all levels, management through to operatives, within an organisation to discharge their duties under ATEX 100a directive and the ATEX 137 directive implemented by DSEAR in the UK.

The intention is that this will be a flexible, cost-effective service - presented in a modular format called “units” to enable the competence criteria to accurately match the precise requirements for an individual person or industry sector. The scheme is UKAS accredited to IEC 17024.

The scheme is not centred around any individual discipline, but on the broader requirements for installations in Hazardous Areas. In certain cases an understanding of basic electrical engineering will be necessary which will require additional, basic, electrical engineering experience but will not form part of the proposed scheme.

This is an Ex Competence programme and does not necessarily require previous electrical engineering experience - unless otherwise specified.

Electrical personnel needing the core competence skills to undertake installations in Hazardous Areas are already catered for by the existing CompEx schemes.

Competence Assessments

Based on the training provided, SCS will offer different assessments to enable the candidate to gain a knowledge certificate in that given area of study. Together with a satisfactory experience log, this will enable the delegate to subsequently achieve a Competence Certificate.

The exams consist of 3 Mandatory Units and a wide range of Optional Units. If you wish to sit optional units, please select the appropriate units from the optional units list which are suitable and related to your role and responsibilities.



From the selected units and examination paper will be produced with suitable questions which will be marked and assessed to identify the individual competence level of each candidate.

Mandatory Units

The following units are Mandatory and must be achieved in order to gain a Competence Certificate. Modules 3 and 7 must be taken with a choice of either 1 or 13.

Unit Number	Unit Description
3	Properties of flammable materials and ignition sources
7	Overview of all protection methods, apparatus grouping and temperature classification

You must choose either one of these two

1	ATEX 100a Introduction Guidance and Application
13	A basic understanding of ATEX 137 & DSEAR (Dangerous Substances & Explosive Atmosphere Regulations)

Syllabus Units

Unit 1	ATEX 94/9/EC 100a Introduction Guidance and Application (mandatory)	7
Unit 2	ATEX 100 a Product Conformity Assessment - a comprehensive coverage (not yet available)	8
Unit 3	Properties of Flammable materials and ignition sources (mandatory)	10
Unit 4	International equipment certification (IECEx Scheme) (not yet available)	11
Unit 5	ATEX & Non-Electrical Equipment Development in Non-Electrical / Mechanical Standards (not yet available)	12
Unit 6	Self-Certification of Equipment (not yet available)	13
Unit 7	Overview of all protection methods, apparatus grouping and temperature classification (mandatory)	14
Unit 8	Increased safety Ex e protection concept, installation and inspection (optional)	16
Unit 9	Flameproof Ex d protection concept, installation and inspection (optional)	17
Unit 10	Intrinsic safety Ex ia/Ex ib protection concept, installation and inspection (optional)	18
Unit 11	Pressurised Ex p protection concept, installation and inspection (optional)	20
Unit 12	Non incendive Ex n Protection concept, installation and inspection (optional)	21
Unit 13A	basic understanding of ATEX 137 and DSEAR (Dangerous substances and explosive atmosphere regulations) (mandatory)	22
Unit 14	Hazard appreciation and risk assessment basics (not yet available)	23
Unit 15	Detailed risk assessment – liquids, gases and vapours (not yet available)	24
Unit 16	Detailed risk assessment – dusts (not yet available)	25
Unit 17	Handling combustible dusts and fibres (optional)	26
Unit 18	Area Classification Overview for flammable gases, vapours, mists and dusts (optional)	28
Unit 19	Area classification, a detailed understanding (not yet available)	29
Unit 20	Theory for Inspection & Maintenance against IEC 60079-17 (optional)	31
Unit 21	Installation Practices IEC 60079-14 (not yet available)	33
Unit 22	Overview of hazardous area electrical installations against IEC 60079-14 (optional)	34
Unit 23	Code of practice repair and overhaul of electrical apparatus IEC60079-19 Part 1 General requirements. (not yet available)	35
Unit 24	General Introduction to Functional Safety EN 61508, (not yet available)	36
Unit 25	United Utilities Field Service Engineers (optional)	38

(Blue – mandatory units; Red – optional units ; Black – Units not yet available)



Unit 1 ATEX 94/9/EC 100a Introduction Guidance and Application (mandatory)

Brief description of unit and objective

This module is primarily aimed at manufacturers of hazardous area equipment and provides an understanding of which equipment comes under the Directive, the conformity assessment process and marking requirements. Users of hazardous area equipment will also gain some benefit from this module, since a knowledge of ATEX categories and marking is necessary for correct installation of hazardous area equipment.

The unit includes

1.1 ATEX 94/9/EC Directive

- The basic requirements of the directive
- How the new-style directive is implemented
- Notified bodies, certification bodies
- What equipment is covered?
- overview of ATEX 137 (and DSEAR) and relationship with ATEX 100a

1.2 Marking

- Abbreviations and acronyms
 - (ATEX, EN, IEC, EEx/Ex)
- Pre-ATEX marking and its meaning
- Post ATEX markings

1.3 Essential health and safety requirements (EHSR's)

- How existing standards are used to support the EHSR's

1.4 ATEX Quality Assurance

- For which equipment is a Quality Assurance Notification (QAN) required?



Unit 2 ATEX 100 a Product Conformity Assessment - a comprehensive coverage (not yet available)

Brief description of unit and objective

This unit looks at all the 39 EHSR's of directive 94/9/EC. The unit sets out to explain what a notified body would be looking for to demonstrate the product compliance.

The unit includes

2.1 Common requirements for equipment and protective systems

- Principles of integrated explosion protection
- Analyses of operating faults
- Checking and maintenance conditions
- Surrounding area conditions
- Marking and instructions

2.2 Selection of materials

- Materials not to trigger off explosion
- Effect of explosive atmosphere on materials
- Changes in materials

2.3 Design and construction

- With regard to technical knowledge
- Replacement components, enclosed structures and prevention of leaks
- Dust deposits, safe opening and overload
- Flameproof enclosure systems

2.4 Potential ignition sources

- Ignition sources including Static electricity,
- Stray electric and leakage currents
- Overheating and pressure compensation

2.5 Hazards arising from external affects

- Changing external conditions and aggressive substances

2.6 Requirements in respect to safety related devices

- Safety devise failure and restart lockouts
- Control and display units
- Devices with a measuring function
- Checking accuracy and serviceability
- Safety factor and risks arising from software



- 2.7 Integration of safety requirements relating to the system**
- Manual override and emergency shutdown
 - Hazards arising from power failure and connections
 - Placing of warning devices
- 2.8 Supplementary requirements in respect of equipment**
- Group 1, Category M1 & M2
- 2.9 Requirements applicable to equipment in category 1 of equipment group 2**
- Category 1G & 1D
- 2.10 Requirements applicable to equipment in category 2 of equipment group 2**
- Category 2G & 2D
- 2.11 Requirements applicable to equipment in category 3 of equipment group 2**
- Category 3G & 3D
- 2.12 Supplementary requirements in respect of protective systems**
- Design and positioning of protective systems
 - Functioning in the event of a power failure
 - Outside interference
- 2.13 Planning and design**
- Characteristic of materials
 - Withstanding shock waves
 - Accessories
 - Pressure relief systems
 - Pressure resistance/pressure shock resistance
 - Inert systems
 - Explosion suppression and decoupling systems
 - Alarm integration
- 2.14 Application of Quality Systems**
- ATEX 94/9/EC Annex IV, VII, VI, V, IX
 - EN ISO 9001: 2000
 - EN 13980: 2002
 - The role of the authorised person
 - QMS requirements
 - Test & Inspection requirements for CAT 1 and CAT 2 equipment
 - Sub-contracting
 - Trade Agents



Unit 3 Properties of Flammable materials and ignition sources (mandatory)

Brief description of unit and objective

When working in hazardous areas, it is important to understand and appreciate the basic safety requirements when using equipment in hazardous areas. This unit therefore looks at the application of ignition properties for hazardous substances and the general requirements for apparatus, providing an overview of the basic principles of hazardous area equipment and the information needed to use this equipment in safety.

The unit includes

3.1 Considerations for potential sources of ignition

- Hot surfaces;
- Flames, included smoking and hot work activities;
- Mechanically generated (friction) sparks including thermite sparks;
- Electrical apparatus;
- Stray electric currents within installations;
- Static electricity;
- Lightning;
- Radio frequency electromagnetic radiation;
- Visible and similar high frequency electromagnetic radiation;
- Ionising radiation;
- Ultrasonic sound waves;
- Adiabatic compression and shock waves; and
- Exothermic reactions, spontaneous combustion

3.2 Properties of flammable materials

- Definition of flashpoint temperature
- Auto-ignition temperature
- Relationship between the temperature classes, surface temperature, ignition temperature
- Ignition by naked flame
- Principles of flammable explosive limits, UEL and LEL
- Spark ignition energy

3.3 Apparatus sub group

- Definition of relative density, locations for gas detectors

3.4 Ingress protection

- Awareness of the Ingress Protection (IP) and NEMA systems for enclosures



Unit 4 International equipment certification (IECEX Scheme) (not yet available)

Brief description of unit and objective

This unit will provide an overview of the IECEX Scheme, background, objectives and conformity assessment procedures. The unit will also cover technical and quality assurance requirements including comparison with the ATEX Directive.

The unit includes

4.1 Objective & Field of application

4.2 Comparison/Relationship with ATEX

4.3 IECEX organisation & membership of IECEX

- Management committee
- Participating organisations
- Testing and assessment group
- Board of appeal

4.4 IEC Product Standards (including IEC 60079 series)

- IECEX Operational Documents
- Normative references
- IECEX 01, ISO/IEC Guide 2 1996, ISO/IEC 17025, ISO/IEC Guide 65

4.5 IECEX Scheme approvals process

- Documentation
- Samples
- Examination
- Test reports
- Description of equipment

Restrictions

4.7 Certificate of conformity

- Issue requirements
- Layout and content
- Mark of Conformity

4.8 Quality Assurance Requirements

- Assessment of manufacturer quality system
- Surveillance



Unit 5 ATEX & Non-Electrical Equipment Development in Non-Electrical / Mechanical Standards (not yet available)

Brief description of unit and objective

The unit will provide competence in the awareness of non-electrical type hazards as given in the ATEX Directive, EN13463-1: 2001 and associated standards. The unit will also identify other standards currently being developed in preparation concerning non-electrical equipment for use in potentially explosive atmospheres.

The unit includes

- 5.1 Overview of non-electrical sources of ignition**
- 5.2 Ignition hazards, primary integration protection**
- 5.3 Control of ignition hazards**
- 5.4 Awareness of CEN non-electrical harmonised standards**
- 5.5 ATEX routes to compliance**
- 5.6 Requirements for explosive protection documentation & self-certification**
- 5.7 Employer's obligations, risk assessment, Directive 1999/92/EC workplace**
- 5.8 Standards currently under development and preparation**



Unit 6 Self-Certification of Equipment (not yet available)

Brief description of unit and objective

Category 2 non-electrical and all category 3 equipment can be “self-certified” by the manufacturer. This entails the use of the “Internal Control of Production” module, Annex VIII of the ATEX directive. This unit provides the necessary information to enable manufacturers to declare conformity with the ATEX Directive. It looks at the process of self certification from Internal Control of Production to the Declaration of Conformity.

The unit includes

6.1 Which directives?

- The standards used
- Determining compliance with ATEX Directive 94/9/EC
- Other Directives that may apply

6.2 Protective Systems (explosion suppression or flame arresting devices)

6.3 Hazardous Area zoning

- Ignition hazard assessment
- Pressure type tests and routine production tests

6.4 Compliance via ‘Essential Health & Safety Requirements’

- Essential Health & Safety Requirements – Instructions, languages (1.0.6)
- Condition for safe use
- ATEX 94/9/EC Annex X, Section B

6.5 Who can self certify?

- CE mark affixed to claim compliance
- Product Marking
- Declaration of Conformity – objective, responsibilities in & outside the EU
- IEC 17050 Declaration of Conformity content
- What do I need to do if I can not self certify?

6.6 Record retention

- EN 13463 Series for Non-Electrical Equipment
- EN 50021 For Electrical Equipment ATEX Cat. 3
- EN 60079-15 (as per EN 50021)
- EN 50281-1-1 For Electrical Equipment – Dust
- Internal Control of Production (Annex VIII)
- Category 2 non-electrical and Category 3 apparatus
- Technical Construction File requirements

6.6 Lodging a technical file with a Notified body (Cat 2 non-electrical)

6.8 Quality systems & plans



Unit 7 Overview of all protection methods, apparatus grouping and temperature classification (mandatory)

Brief description of unit and objective

This unit will provide candidates with an understanding of various protection methods used for both electrical & mechanical equipment within hazardous areas. Looking at zones, categories, apparatus groupings and temperature classes candidates will understand the relationship between these and the importance within hazardous areas thus creating a 'fitness for purpose' environment.

The unit includes

7.1 Recognised concepts of protection Electrical

- Increased safety
- Flameproof
- Quartz/sand filled
- Intrinsic safety
- Pressurised
- Encapsulation
- Oil immersion
- Type n (Non Sparking, enclosed break, sealed, restricted breathing, energy limitation, simple pressurised)

7.2 Recognised concepts of protection Mechanical

- Flow restricted enclosure
- Flameproof enclosure
- Inherent safety
- Constructional safety
- Control of ignition sources
- Pressurisation
- Liquid immersion

7.3 Recognised dust-protection methods

- Ex tD
- Ex iaD/ibD
- Ex pD
- Ex maD/mbD
- Marking of dust-protected equipment

7.4 Symbols for the various methods of protection

7.5 Apparatus groups

- Gases and vapours
- Selection of equipment according to apparatus sub group.
- Relationship between gas/vapour sub-division and apparatus sub-group.



7.6 Temperature Class

- Group I
- Group II
- Comparison of T-rating CENELEC/IEC NEC 500/505 group II Definition of gas grouping, NEC 500/505 groups

7.7 Key properties of flammable dusts



Unit 8 Increased safety Ex e protection concept, installation and inspection (optional)

Brief description of unit and objective

Additional measures are applied to an electrical apparatus to give increased security against the possibility of excessive temperatures and of the occurrence of arcs and sparks during the life of the apparatus. It applies only to an electrical apparatus, no parts of which produce sparks, arcs or exceeds the limiting temperature of the materials, upon which safety depends, that are used in its construction.

The unit will provide competence in the installation of Increased Safety apparatus and will cover the inspection requirements of standard EN 60079-17 and the reporting of faults in preparation for on-site maintenance.

The unit includes

8.1 Concepts and principles

- Benefits and drawbacks to this protection concept
- Applicable standards
- Principles of EEx e protection, applications and zones of use

8.2 Technical requirements

- Features of control of temperature and elimination of arcing, sparking
- Estimation of terminal content for enclosures to manufacturer's guidance
- Consideration of spare conductor length and looming of conductors
- Requirements for termination of used cable cores

8.3 Zones of use

- Gas and vapour
- Dust

8.4 Motors

- Principles EEx e motors and protection to tE time
- Summary of general requirements in design for EEx e motors

8.5 Equipment selection

- Selection of equipment , installation requirements and earth bonding of equipment

8.6 Inspection

- Principles of Inspection in preparation for maintenance
- Introduction to use of inspection schedules and sample checklists



Unit 9 Flameproof Ex d protection concept, installation and inspection (optional)

Brief description of unit and objective

The equipment is contained within an enclosure which will withstand an internal explosion of a flammable gas or vapour that may enter it, without suffering damage and without communicating the internal explosion to the external explosive atmosphere, through any joints or structural openings in the enclosure.

The unit will provide competence in the installation of flameproof apparatus and will cover the inspection requirements to standard EN 60079-10 and reporting of faults in preparation for on-site maintenance.

The unit includes

9.1 Concepts and principles

- Benefits and drawbacks to this protection concept
- Applicable standards
- Principles of EEX d protection, applications and zones of use

9.2 Technical requirements

- Types of flameproof joints, flange, spigot and screwed thread
- Requirements of flame path gap dimensions, (non intentional gap)
- EN standards for maximum gap dimensions, types of flame path
- Requirements for enclosure non-modification
- Requirements for thread engagement, closing unused entries
- Causes of pressure piling and modification
- Requirements for obstruction to flanged type flame paths
- Specifications for ingress protection, weatherproofing and sample greases

9.3 Zones of use

- Gas and vapour
- Dust

9.4 Equipment selection

- Selection of cable glands, direct and indirect cable entries
- Selection of equipment, installation requirements to EN 60079-10, 79-14

9.4 Inspection

- Principles of Inspection in preparation for maintenance
- Use of inspection schedules and sample checklists



Unit 10 Intrinsic safety Ex ia/Ex ib protection concept, installation and inspection (optional)

Brief description of unit and objective

A protection technique based upon the restriction of electrical energy within the apparatus and in the interconnecting wiring, exposed to an explosive atmosphere, to a level below that which can cause ignition by either sparking or heating effects. Because of the method by which intrinsic safety is achieved it is necessary that not only the electrical apparatus exposed to the explosive atmosphere, but also other (associated) electrical apparatus with which it is interconnected, is suitably constructed.

Intrinsic safety is the most difficult of the concepts of protection and the certification process can be equally as confusing. The fundamental ideas are, however, relatively straightforward and with guidance, those with a basic knowledge of electronics should be able to design intrinsically safe apparatus and systems.

This unit will provide competence in the principles of intrinsic safety, installation of intrinsically safe apparatus and will cover the inspection requirements to standard EN 60079-17 and the reporting of faults in preparation for on-site maintenance.

The unit includes

10.1 Concepts and principles

- Benefits and drawbacks to this protection concept
- Applicable standards
- Principles of EEx I protection, applications and zones of use
- Inherent advantages of EEx i protection
- Comparison between, EEx ia, EEx ib protection
- Reference to associated and simple apparatus
- Requirements for system documentation, as built drawings

10.2 Technical requirements

- Principles of zener barrier, main components and types
- Arrangements for IS integrity earthing, short circuit fault condition
- Preventing voltage invasion
- General requirements for integrity earthing, earth bonding, continuity testing
- Earthing requirements

10.3 Zones of use

- Gas and vapour
- Dust



10.4 Installation

- General requirements for intrinsic safety installation
- Requirements for cable installation, termination of spare conductor cores
- Overview of system design, safety descriptions for Interface, field devices and cable parameters
- Principle of ignition curves for gas groups, reference to safety description of interface
- Basic principle of galvanic interface protection

10.5 Inspection

- Principles of Inspection in preparation for maintenance
- Introduction to use of inspection schedules and sample checklists

Unit 11 Pressurised Ex p protection concept, installation and inspection (optional)

Brief description of unit and objectives

A method of protection using the pressure of a protective gas to prevent the ingress of an explosive atmosphere to a space that may contain a source of ignition. Where necessary, using continuous dilution of an atmosphere within the space that contains a source of emission gas, which may form an explosive atmosphere?

This unit will provide competence in the main principles of pressurisation protection and will cover the inspection requirements to standard EN 60079-17 and reporting of faults in preparation for on-site maintenance.

The unit includes

11.1 Concepts and principles

- Benefits and drawbacks to this protection concept
- Applicable standards
- Principles of Ex p protection, applications and zones of use
- Provision of safety devices and circuit control
- Provision of protective gas flow monitoring, over-pressure and pressure relief
- Principle of purging and requirements for purge cycle

11.2 Technical requirements

- Requirements for ingress protection
- Requirements for enclosure covers and doors, interlocking arrangements
- Requirements for spark particle barriers
- Principles of Ex p types: static, continuous flow, leakage compensation & continuous dilution
- Action in loss of pressure

11.3 Zones of use

- Gas and vapour
- Dust

11.4 Inspection

- Principles of Inspection in preparation for maintenance
- Introduction to use of inspection schedules and sample checklists



Unit 12 Non incendive Ex n Protection concept, installation and inspection (optional)

Brief description of unit and objectives

A type of protection applied to an electrical apparatus such that, in normal operation, it is not capable of igniting a surrounding explosive atmosphere and a fault capable of causing ignition is not likely to occur.

This unit will provide competence in the installation of the principal types of 'n' protection and will cover the inspection requirements of standard EN 60079-17 and the reporting of faults in preparation for on-site maintenance.

The unit includes

12.1 Concepts and principles

- Benefits and drawbacks to this protection concept
- Applicable standards
- Principles of EEx n protection methods, applications and zones of use
- Suitability in design to Zone 2 category 3 applications, self certification

12.2 Technical requirements

- Principle of non-sparking nA
- Principle of enclosed break nC
- Principle of non-incendive nC
- Principle of hermetically sealed nC
- Principle of encapsulated nC
- Principle of restricted breathing nR
- Principle of simplified pressurisation nP

12.3 Zones of use

- Gas and vapour
- Dust

12.4 Equipment selection

- Selection of equipment, installation requirements to EN 60079-10, 79-14
- Requirements of earth connections and earth bonding of equipment

12.5 Inspection

- Principles of Inspection in preparation for maintenance
- Introduction to use of inspection schedules and sample checklists



Unit 13 A basic understanding of ATEX 137 and DSEAR (Dangerous substances and explosive atmosphere regulations) (mandatory)

Brief description of unit and objective

The unit provides competence in the methods of analysis and classification of environments where explosive atmospheres may occur to facilitate the implementation of correct procedures, selection and installation of apparatus for use in such areas.

The unit includes

13.1 Purpose of DSEAR

- Protect workers and others from fire or explosion or other energy-releasing event caused by dangerous substances

13.2 Relationship between DSEAR & other legislation

- DSEAR made under HSWA along with other legislation
- DSEAR implements the ATEX 1999/92/EC and CAD 98/24/EC Directives
- DSEAR concentrates on fire and explosion from flammable materials
- Other causes of energy releasing events need to be considered under other legislation e.g. PUWER, PSR
- overview of ATEX 100a and relationship with ATEX 137 (and DSEAR)

13.3 ATEX 137 Directive and DSEAR overview

- Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR). Requirement to protect against risks from fire, explosion and similar events arising from dangerous substances
- Minimum requirements for the protection of workers from fire and explosion risks related potentially explosive atmospheres
- Timetable for Implementation

13.4 Summary of regulations

- Regulation 5: risk assessment
- Regulation 6: elimination/reduction of risk by substitution, control or mitigation
- Regulation 7: places (area classification, equipment, marking, verification, appropriate work clothing)
- Regulation 8: arrangements to deal emergencies
- Regulation 9: information and training
- Regulation 10: identification of hazardous contents
- Regulation 11: co-ordination with other site occupants



Unit 14 Hazard appreciation and risk assessment basics (not yet available)

The risk assessment is the identification and careful examination of the dangerous substances present, or liable to be present, in the workplace. It identifies how they might cause a fire or explosion that could harm employees and identifies the controls in place to prevent harm.

The unit includes

14.1 Dangerous substances

- Classified under CHIP as explosive, oxidising, extremely flammable, highly flammable, or flammable
- Physical & chemical properties of substances
- Physical conditions of use (normal and foreseeable)

14.2 Dangerous events

- Quantity used/released and circumstances of use (normal and foreseeable)
- Work activities (normal and foreseeable)
- Sources of ignition (normal and foreseeable)
- Storage
- Who might be harmed?

14.3 Risk assessment arrangements

- HSE Codes of Practice L21, INDG163, INDG218
- Competent person who understands risk assessment techniques and DSEAR requirement
- Risk assessment team with plant/process knowledge
- Review meetings
- Risk assessments undertaken for HSAWA, COSHH, etc.

14.4 Risk assessment

- Identification of hazardous events
- Existing controls and mitigation
- Scale of effects
- Outstanding level of risk (likelihood and severity)
- Tolerable residual risk
- As Low As Reasonably Practicable (ALARP)
- Identification of additional risk reduction measures required
- Fire safety

14.5 Results

- Recording
- Identify significant findings
- Provide information for employees and others on site
- Identify training needs, warning notices, etc.
- Review



Unit 15 Detailed risk assessment – liquids, gases and vapours (not yet available)

Brief description of unit and objective

The risk assessment is the identification and careful examination of the dangerous substances present, or liable to be present, in the workplace. It identifies how they might cause a fire or explosion that could harm employees, and identifies the controls in place to prevent harm. It is assumed that the basics of DSEAR risk assessment have already been covered at Unit 14.

The unit includes

15.1 Liquid, gas or vapour as a dangerous substance

- Classified under CHIP as explosive, extremely flammable, highly flammable, or flammable
- Physical & chemical properties of liquids, gases and vapours. Flash point, autoignition temperature, lower and upper explosive limits, minimum oxygen concentration
- Physical conditions of use (normal and foreseeable)
- Liquids, vapours, gases, mists

15.2 Handling, storage, and release of liquid, gas or vapour

- Quantity used/released and circumstances of use (normal and foreseeable)
- Continuous, primary and secondary releases
- Work activities (normal and foreseeable, including plant start-up and shutdown)
- Storage

15.3 Hazardous events

- Releases to atmosphere
- Failure of control measure
- Sources of ignition (13 types of ignition source)
- Foreseeable and rare events
- Who might be harmed?

15.4 Control measures

- Oxygen concentration or gas/vapour concentration
- Containment
- Ventilation
- Segregation
- Working arrangements

15.5 Mitigation

- Minimise the number of people exposed to danger
- Avoid propagation of fires and explosions – separation, barriers
- Pressure relief
- Explosion suppression
- Explosion resistant plant
- PPE, Site boundaries, escape routes, adjacent activities



Unit 16 Detailed risk assessment – dusts (not yet available)

Brief description of unit and objective

The risk assessment is the identification and careful examination of the dangerous substances present, or liable to be present, in the workplace. It identifies how they might cause a fire or explosion that could harm employees and identifies the controls in place to prevent harm. **It is assumed that the basics of risk assessment have already been covered at Unit 14.**

The unit includes

16.1 Dust as a dangerous substance

- Classified under CHIP as explosive, oxidizing, extremely flammable, highly flammable, or flammable
- Physical & chemical properties of substances. Cloud ignition temperature, layer ignition temperature, minimum oxygen concentration, maximum explosion pressure, St value
- Physical conditions of use (normal and foreseeable)

16.2 Handling, storage, and release of dust

- Quantity used/released and circumstances of use (normal and foreseeable)
- Continuous, primary and secondary releases
- Work activities (normal and foreseeable, including plant start-up and shutdown)
- Storage

16.3 Hazardous events

- Credible sources of ignition (13 types of ignition source)
- Failure of control measure
- Foreseeable and rare events
- Secondary explosions
- Pressure piling
- Who might be harmed?

16.4 Control measures

- Oxygen concentration
- Containment
- Ember detection / incipient reaction detection
- Control of layers
- Segregation
- Working arrangements

16.5 Mitigation

- Minimise the number of people exposed to danger
- Avoid propagation of fires and explosions – separation, decoupling
- Pressure relief
- Explosion suppression
- Pressure resistant / pressure shock resistant plant
- PPE, Site boundaries, escape routes, adjacent activities



Unit 17 Handling combustible dusts and fibres (optional)

Brief description of unit and objective

With the implementation of DSEAR, understanding the fundamentals of dust explosivity is therefore a sensible option for anyone in the powder handling industries. More than 70% of powders handled by industry are combustible and are capable of causing fires and explosions.

This unit will identify the properties and hazards associated with explosible dusts, equipment design considerations, and the requirements for the operation of equipment.

The unit includes

17.1 Dust explosive properties

- Classified under CHIP as explosive, oxidizing, extremely flammable, highly flammable, or flammable
- Physical & chemical properties of dusts. A/B ignition test, cloud ignition temperature, layer ignition temperature, minimum oxygen concentration, minimum ignition energy, variation of ignition energy with oxygen concentration, maximum explosion pressure, reaction/degradation rate, minimum explosible concentration, St value
- Effect of particle size. Effect of contaminants, e.g. oils, fine dust
- Physical conditions of use (normal and foreseeable)

17.2 Handling, storage, and release of dust

- Assess each section of plant individually
- Quantity used/released and circumstances of use (normal and foreseeable)
- Identify where dust exists continuously, often, occasionally
- Work activities (normal and foreseeable, including plant start-up and shutdown)

17.3 Hazardous events

- Credible sources of ignition
 - 13 types of ignition source
 - Static electricity – brush discharge, cone discharge, spark discharge
 - Which sources are incendiary?
- Failure of control measure

17.4 Control measures

- Inert / reduced oxygen atmosphere
- Ember detection / incipient reaction detection
- Containment
- Metal detection
- Operation at slight suction

17.5 Mitigation

- Pressure relief
- Explosion suppression
- Pressure resistant / pressure shock resistant plant



17.6 Plant design

- Evaluate effectiveness of control or mitigation measures in each part of process plant
- Establishing the “basis of safety” for each equipment item

17.7 Propagation

- Avoid propagation of fires and explosions
- Pressure piling
- Decoupling plant equipment items
- Dust layers
- Secondary explosions
- Avoiding build-up of dust, fibre or dust/fibre/liquid mixtures in lean-phase equipment and conveying lines

17.8 Classification of dust hazardous areas

- Area classification of flammable dust areas is required under DSEAR
- Consider basis of safety when establishing type of hazardous zone and carrying out the risk assessment

17.9 Personnel protection

- Site boundaries, escape routes, adjacent activities
- Minimise number of people exposed to danger
- PPE



Unit 18 Area Classification Overview for flammable gases, vapours, mists and dusts (optional)

Brief description of unit and objective

Every company that uses flammable materials is now obliged to carry out an area classification exercise. This is part of the overall risk assessment which is a legal requirement under the ATEX 1999/92/EC Directive (DSEAR in the UK). Area classification is the basis of equipment selection and control of work practices. This unit covers the basic principles of making a realistic and objective assessment of the hazardous areas and gives an outline of the appropriate equipment types.

The unit will provide an understanding of the principles of area classification and the link between the severity of the zones and the appropriate level of protection for equipment. This unit is not intended for those who intend to carry out area classification, but need to understand the underlying principles.

The unit includes

18.1 Principles of area classification

- ATEX/DSEAR requirements
- Area classification objectives
- The concepts of foreseeable malfunction and catastrophic failure
- Definition for gases, vapours, liquids and combustible dusts, fibres, flyings

18.2 Zones

- Comparison of classified locations to CENELEC/IEC and NEC 500/505 class/division
- The definitions of the zones for gases and dusts
- The concept of probability applied to zones
- Relationship between the equipment's ATEX category (if applicable) and zones of use
- Selection of suitable equipment
- Hazardous area zone symbols

18.3 Codes of practice

- Introduction to EN 60079-10 and EN 61241-10
- Introduction to Institute of Petroleum code, IP15
- Introduction to other industry codes of practice

18.4 Grade and extent of hazardous area (gas, vapour and dust)

- Grades of release: continuous, primary and secondary
- Examples of sources of release
- Problems of indoor zoning
- Introduction to area classification for flammable dusts



Unit 19 Area classification, a detailed understanding (not yet available)

Brief description of unit and objective

The unit covers the basic principles of area classification, identifies the relevant codes of practice and demonstrates the detailed application of the principles.

This unit covers the principles of area classification for gases, vapours and dusts. It provides sufficient detail to allow those completing it to carry out area classification as part of a team and to contribute to the team's decisions. The knowledge gained can be applied to a wide range of sectors, from oil and gas to the water industries.

The unit includes

19.1 Principles and techniques of area classification

- DSEAR requirements
- Safety Principles
- Area classification objectives.
- The concepts of foreseeable malfunction and catastrophic failure

19.2 Area classification arrangements

- Who is responsible for area classification?
- The procedure and documentation for area classification
- The area classification team
- Competent person
- Review meetings

19.3 Zones

- The definitions of the zones for gases and dusts
- The concept of probability applied to zones
- Relationship between the equipment's ATEX category (if applicable) and zones of use
- Selection of suitable equipment
- Hazardous area zone symbols

19.4 Codes of practice

- "General Purpose" eg BS EN 60079-10 for gases and vapours and BS EN 61241-10 for combustible dust
- "Industry Sector" eg Institute of Petroleum (IP) Model Code of Safe Practice, Part 15
- "Industry-specific" eg Institution of Gas Engineers (IGE) IGE/SR/25, British Compressed Gases Association (BCGA) GN2
- Introduction to other industry codes of practice

19.5 Information required to classify an area

- Gas/vapour properties. Flash point, autoignition temperature, vapour density
- Dust properties. Testing for explosibility, cloud and layer ignition temperature
- List of equipment for Area Classification (LEAC sheets)
- Operating conditions under normal and foreseeable conditions, including start up and shutdown



- Properties of materials
- Operating conditions (normal and foreseeable)
- Site layout
- Ventilation

19.6 Extent of hazardous area (gas, liquid and dust)

- Sources of release
- Grades of release: continuous, primary and secondary
- Dispersion of vapour
- Examples from codes of practice

19.7 Calculations to determine zone extent

- The use of calculations as an alternative to classification by example from a code of practice
- Calculations for release rate and zone extent. Hypothetical volume

19.8 Area classification indoors

- The effect of limited ventilation and calculations for indoor situations
- Interconnecting rooms
- Doors and openings
- “Local” ventilation rates in large rooms

19.9 Extent of hazardous area (dusts)

- Effect of extract ventilation on zone
- Layers and housekeeping
- Secondary explosions and the need for decoupling
- Mixtures of dust and gas

19.10 Area classification arrangements

- Competent person
- Area classification team
- Review meetings



Unit 20 Theory for Inspection & Maintenance against IEC 60079-17 (optional)

This unit can only be taken after the relevant protection method units have been taken.

Brief description of unit and objective

The objective of this is to be able to demonstrate knowledge and understanding of the principles of inspection of electrical equipment in explosive gas atmospheres.

The unit includes

20.1 Concept of zones and the selection of electrical equipment

- Classification of areas
- Concept of zones
- Gas Groups and Temperature Classes
- ATEX categories
- Equipment dataplate marking

20.2 Fundamentals of safety of installation (U.K.)

- TNS system
- Design of installation to meet BS 7671
- Earthing and bonding

20.3 Inspection requirements

- Types of inspection
- Grades of inspection
- Sample inspections
- Documentation required prior to inspection
 - Hazardous area classification drawings
 - Inventory of electrical equipment
 - Explosion Protection Certificate and Schedule (Annexe)
 - Certificate of Conformity and Installation, Operation and Maintenance Instructions
- Equipment 'tagging' system



20.4 Preparation for work

- Understanding scope of work
- Need for Permits to Work
- Need for electrical isolation (where appropriate)
- Access arrangements
- Application of tagging system

20.5 The inspection checklists

- Schedules for each type of explosion protection
- Key points to identify
- Conditions of use

20.6 Managing the results

- Equipment not suitable for zone
- Unauthorised modifications
- Prioritisation of defects
- Environmental effects
- Bad installation practice
- Recording data on Maintenance Management System
- Using data to provide feedback to installation and maintenance practices and procedures
- Establish the period for inspection

Unit 21 Installation Practices IEC 60079-14 (not yet available)

Under construction

Unit 22 Overview of hazardous area electrical installations against IEC 60079-14 (optional)

Brief description of unit and objective

This unit will provide competence in the applications of low-voltage wiring and earthing and the general requirements for conduit systems. The identification of cable types for low-voltage power, intrinsic safety, process circuits and segregation requirements for power and IS circuits. The requirement for earth continuity and the safe use of instruments for testing purposes will be included.

The unit includes

Hazardous area cable types

- 22.2 Power systems (non intrinsic safety) earthing and bonding**
- 22.3 Review of IS integrity earthing**
- 22.4 Outer sheath colour identification**
- 22.5 Cable transit sealing blocks**
- 22.6 Review of termination of unused cores for system cables**
- 22.7 Cable entries for EEx d, EEx e, EEx n enclosures**
- 22.8 Polycarbonate enclosures – earthing requirements and bonding**



**Unit 23 Code of practice repair and overhaul of electrical apparatus IEC60079-19
Part 1 General requirements. (not yet available)**

The unit includes

23.1 Part 1 General requirements

23.2 Part 2 Flameproof Ex d

23.3 Part 3 Intrinsic Safety Ex I

23.4 Part 4 Pressurisation Ex p

23.5 Part 5 Increased Safety Ex e

23.6 Part 6 Ex n Protection Types



Unit 24 General Introduction to Functional Safety EN 61508, (not yet available)

The standard covers the design of equipment and the engineering management processes. Functional Safety is concerned with equipment whose failure could have an impact on the safety of persons and/or the environment. These units offer an understanding of the techniques and advantages of implementing Functional Safety, and give general and in-depth overviews of the Requirements of the standard.

Brief description of unit and objective

This unit will provide competence of staff involved following best practice for managing and operating plant having an impact on the safety of persons and the environment. The unit will also examine current legislation, international standard IEC 61508 and the industry specific standards later developed.

A thorough introduction to the reasons why the requirements of the Functional Safety Standard IEC 61508 have become an essential part of the design-cycle for the majority of electronic and programmable products. An explanation of the resources necessary to demonstrate conformance and the penalties of taking no action. A brief summary of the technical requirements of the Standard and the ways in which they can be met. An understanding of the needs of the specification placed on a systems integrator. How to avoid using inappropriate concepts in invitations to tender

The unit includes

24.1 Objectives and Introduction

- The background to and development of the Standard and related industry guidelines
- Why demonstrate conformity
- Meaning of Functional Safety
- Growth of standard and guidance UKOOA, MOD etc
- Brief overview of second tier guidance
- Process, oil & gas, Rail, Defence, Transport

24.2 Structure of IEC 61508

- Overall scope and definitions
- Hazard and risk analyses
- Overall safety requirements
- Safety validation plan
- Validation of safety data provided by the manufacturer
- Assessing random hardware failures and safe failure fraction

24.3 Meeting the Standard

- Random hardware failures
- ALARP
- Diagnostics and Architectures
- Managing Life-cycle activities
- Capability and compliance



24.4 Demonstrating Conformance

- Current framework in the UK
 - Self assessment
 - Third party assessment
 - Accreditation

24.5 Establishing SIL targets

- Functional safety and setting integrity targets
- Need for quantitative and qualitative assessments
- Basic steps in assessment
- SIL Exercises 1-2 - Target low demand SIL
- SIL Exercise 3 - Target high demand SIL
- Risk graph approaches

24.6 Installation and commissioning plan

24.7 Operation and maintenance

24.8 Modifications and refits

Decommissioning

Unit 25 United Utilities Field Service Engineers (optional)

Brief description of unit and objective

This unit is designed for United Utilities' Field Service Engineers (FSEs) based on the United Utilities Code of Practice (Document ref. 60024, issue 6, March 2008), and is made up of three parts. Part A covers all applications, Part B covers clean water applications and Part C covers wastewater applications.

The unit includes

Part A – All applications - mandatory

- 25.1 Area classification – general principles
- 25.2 Equipment selection – general principles
- 25.3 Installation (Ex e equipment)
- 25.4 Installation (Ex d equipment)
- 25.5 Installation (Ex i equipment)
- 25.6 Installation (Ex n equipment)
- 25.7 Inspection and maintenance – general principles
 - 25.7.1 Inspection, maintenance and fault finding (Ex nA enclosure)
 - 25.7.2 Inspection, maintenance and fault finding (Ex e enclosure)
 - 25.7.3 Inspection, maintenance and fault finding (Ex nR luminaire)
 - 25.7.4 Inspection, maintenance and fault finding (intrinsically safe circuit protected by a zener barrier)
 - 25.7.5 Inspection, maintenance and fault finding (intrinsically safe circuit protected by a galvanic isolator)
- 25.8 Safe working

Part B - Clean Water applications - optional

- 25.9 Properties of flammable materials (specific to clean water applications)
- 25.10 Area classification (specific to clean water applications)
- 25.11 Equipment selection and inspection (specific to clean water applications)

Part C – Wastewater applications - optional

- 25.12 Properties of flammable materials (specific to wastewater applications)
- 25.13 Area classification (specific to wastewater applications)
- 25.14 Equipment selection and inspection (specific to wastewater applications)

