

EXPLOSION SAFETY DOCUMENT FOR THE ATEX 137 DIRECTIVE – NEW NAME FOR A FIRE AND EXPLOSION HAZARD ASSESSMENT?

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This paper describes the requirements contained in the ATEX 137 Directive which includes an obligation of an employer to prepare an Explosion Safety Document. A risk assessment based approach is described whereby the potential hazards are identified on the basis of an area classification exercise to determine the extent and occurrence of potentially explosive atmospheres. This is followed by the selection of appropriate equipment and the identification of possible ignition sources arising from the plant operations. The requirements of ATEX 137 will be discussed and compared to the traditional fire and explosion hazard assessment currently carried out by many firms where potentially explosive atmospheres are likely to be present.

Explosion protection document; ATEX 137, DSEAR, Explosive atmospheres, Area classification; Ignition sources

INTRODUCTION

In December 1999 the European Parliament and Council agreed and passed the so called ATEX 137 Directive or Directive 99/92/EC which sets out minimum requirements for the safety and health protection of workers potentially at risk from explosive atmospheres. It is the 15th individual Directive within the meaning of Article 16(1) of Directive 89/391/EEC, the base Directive setting out measures to improve the health and safety of Workers, and must be enacted in the member states by the 30th June 2003.

For the purposes of this Directive, ‘explosive atmosphere’ means a mixture with air, under atmospheric conditions, of flammable substances in the form of gases, vapours, mists or dusts in which, after ignition has occurred, combustion spreads to the entire unburned mixture. The Directive does not apply to:

- areas used directly for and during the medical treatment of patients;
- the use of domestic gas burning appliances;
- manufacture, handling, use, storage of explosives or chemically unstable substances;
- mines or mineral-extracting industries;
- means of transport by land, water and air however, means of transport intended for use in a potentially explosive atmosphere are included.

The Directive sets out a set of obligations of the employer and includes two Annexes, the first provides the definitions for the classification of places where explosive atmospheres may occur – the so called ‘Zone Definitions’. The second Annex specifies the minimum requirements for improving the safety and health protection of worker potentially at risk from explosive atmospheres and includes the criteria to be used for the selection of equipment and protective systems in the different Zones.

The ATEX 137 Directive is the 'User' Directive which corresponds to the ATEX 95 Directive (Directive 94/9/EC) for manufacturers which sets out essential health and safety requirements for equipment for use in potentially explosive atmospheres.

EMPLOYER OBLIGATIONS OF DIRECTIVE 99/92/EC

The Directive sets out specific obligations that the employer has to fulfil as follows

- Prevent and protect against explosions.
- Carry out an assessment of the explosion risks.
- Ensure safe working conditions including the provision of instructions, training supervision and technical measures.
- Duty of Coordination subcontractors/visitors.
- Classify the areas where an explosive atmosphere may occur in to Zones including where appropriate the marking of entry points into such areas.
- Select appropriate equipment.
- Prepare an explosion protection document.

The requirements set out in the Directive apply to new work places used for the first time after 30.06.03. Existing workplaces must comply with the requirements set out in the Directive by 30.06.06.

The detailed employer obligations set out in the Directive are summarised in Appendix I.

MINIMUM REQUIREMENTS SPECIFIED IN DIRECTIVE 99/92/EC

Annex II of the Directive sets out the minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres. The requirements are divided into organisational and explosion protection measures and the degree to which they have to be implemented depends on the risk assessment:

ORGANISATIONAL MEASURES

The employer must provide those working in places where explosive atmospheres may occur with sufficient and appropriate training with regard to explosion protection. In addition work in hazardous places must be carried out in accordance with written instructions issued by the employer and a system of permits to work must be applied for carrying out both hazardous activities and activities which may interact with other work to cause hazards.

EXPLOSION PROTECTION MEASURES

Where appropriate i.e. following the risk assessment which has been carried out and documented in the explosion protection document, the following explosion protection measures have to be implemented:

- Any hazardous releases of explosive atmospheres (intentional or non-intentional) must be diverted to a safe place or safely contained or rendered safe.
- Prevention of ignition hazards must take account of electrostatic discharges and workers must be provided with suitable clothing.

- Only equipment and connecting devices which are safe should be used.
- Measures must be taken to minimise the risks of an explosion and, if an explosion occurs to minimise the explosion effects.
- Optical/acoustic warning and evacuation before explosion conditions reached.
- Provision and maintenance of emergency escape facilities.
- Emergency power supply/manual override of automatic processes.
- Overall explosion safety must be verified by a competent person before use.

ADDITIONAL REQUIREMENTS OF THE ATEX DIRECTIVE 99/92/EC COMPARED TO THE CHEMICAL AGENTS AT WORK DIRECTIVE 98/24/EC

Both the ATEX Directive and the Chemical Agents at Work (CAD) Directive come under the base European Directive for improving the safety and health of workers at work. As with all the subordinate Directives covering individual hazards, both these Directives use a risk based approach to evaluate the actual hazard and to specify the preventative or protective measures required. Thus many of the requirements in the main provisions of the ATEX 99/92/EC Directive are similar to the safety requirements contained in the in Chemical Agents at Work Directive 98/24/EC. Such as the requirements to prevent and protect against explosions and to assess explosion risks. Additionally, many of the minimum requirements in Annex II of ATEX are either implicit in CAD or represent good safety practices, some of which are already widely taken, and are equally applicable to other risks from dangerous substances.

However, some requirements in ATEX require substantially more than CAD or are not appropriate to risks other than those arising from explosive atmospheres. These requirements concern:

- the classification and zoning of places where explosive atmospheres may occur;
- the selection of equipment for use in those places;
- the marking of places where explosive atmospheres may occur;
- the verification of overall explosion safety before new workplaces are used for the first time;
- the provision of appropriate work clothing in explosive atmospheres, and
- coordination where employers share a workplace.

CORRELATION BETWEEN ATEX 137 DIRECTIVE FOR 'USERS' AND ATEX 95 FOR MANUFACTURERS

The Directive 94/9/EC or so called ATEX 95 Directive sets out specifications for both electrical and non-electrical equipment to be used in potentially explosive atmospheres. The aim of the Directive is to facilitate free trade within the member states and it provides a classification scheme and essential safety and health requirements for equipment of different categories which must be followed by manufacturers. This Directive also comes into force on 30.06.2003.

A comparison of the requirements of the different Directives for manufacturers and for employers is given in Table 1. It can be seen that there is a direct link between the two

Directives in that the 3 Categories of equipment specified in the ATEX 95 Directive correspond to the 3 Zones used in the ATEX 137 Directive for the classification of areas where explosive atmospheres are likely to occur.

Thus in Zone 2 or 22 an explosive atmosphere is unlikely to occur in normal operation and equipment of Category 3 may be used i.e. equipment that does not pose an ignition source in normal operation, whereas in Zone 0 or 20 where an explosive atmosphere can be present continuously equipment of Category 1 must be used i.e. equipment that does not present an ignition source even under conditions of rare malfunctions.

Table 1. Requirements of manufacturers and employers ATEX directives

Manufacturer requirements 'ATEX 95' - 94/9/EC	Employer requirements 'ATEX 137' - 99/92/EC
Definition of area of use of equipment, specification of equipment group/category	Determination of Zones in plant Select appropriate equipment
Category 1:	Zone 0/20
Category 2:	Zone 1/21
Category 3:	Zone 2/22
Comply with essential safety and health requirements or relevant standard	Comply with installation and maintenance requirements
Carry out a risk/ignition hazard assessment of equipment	Carry out a risk assessment of the work place, duty of Coordination
Prepare Conformity documentation	Prepare an Explosion protection document
Appropriate quality control	Regular updates

EXPLOSION PROTECTION DOCUMENT

The Explosion Protection Document required by Directive 99/92/EC is intended to demonstrate that the employer has complied with the requirements of the Directive. Thus it should demonstrate that explosion risks have been determined and assessed and show that adequate prevention and/or protection measures have been taken.

Where explosive atmospheres may occur in such quantities as to require special precautions the Explosion Protection Document must show how the areas have been classified in zones and that the minimum requirements of the Directive have been applied, in particular that the safe operation and maintenance of work place and equipment is ensured and that there are appropriate arrangements for the safe use of work equipment. In addition the Directive requires that the Explosion Protection Document is produced before work starts and is revised following changes.

It is clear that the Directive only requires the production of an Explosion Protection Document when the quantity of explosive atmosphere is hazardous. Thus the use of a small quantity of flammable solvent in an office does not require the production of such a document.

The Directive allows the Explosion Protection Document to be either a separate document or part of a combined safety report and as a whole must cover both technical and organisational or procedural aspects of explosion prevention and protection. Thus for the majority of process plant, it is recommended that these two aspects be separated and dealt with in different documents.

TECHNICAL CONTENT OF THE EXPLOSION PROTECTION DOCUMENT

- Description of process & plant
- Fire and explosion characteristics of materials
- Occurrence of flammable atmospheres - Zoning
- Identification of possible ignition sources - selection of equipment
- Risk assessment – i.e. discussion and justification of the measures taken
- Preventative and protective measures specific to this process/plant
- Technical/organisational measures

It can be seen that the technical aspects of the explosion protection document mirror the contents of a traditional fire and explosion hazard assessment which the majority of manufacturers using flammable/explosible materials already carry out.

PROCESS/PLANT DESCRIPTION

Depending on the nature of the operation i.e. batch/semi-batch or continuous and the consequential frequency of change in materials and or operations the technical aspects of the Explosion Protection Document will need to be written either specific to a plant or to a process. This section should therefore include a short description of the essential aspects of the process or plant sufficient to identify the objectives, key operations and major plant items.

FIRE AND EXPLOSION CHARACTERISTICS OF MATERIALS

A list of the substances used in the process and their fire and explosion properties should be given in the Explosion Protection Document. In order to carry out the assessment of the possible risk present in the process and in particular the likelihood of ignition, the required characteristics go beyond just whether a material is capable of forming an explosive atmosphere. Typical characteristic that will be required are shown in Table 2. It should however be recognised that this does not imply that the properties listed need to be measured for each substance.

In the many cases the data is either readily available in the literature or typical limit values may be used e.g. the Minimum Oxygen Concentration of typical hydrocarbons in Nitrogen lies between 9-10 vol.%.

OCCURRENCE OF FLAMMABLE ATMOSPHERES – ZONING

Directive 99/92/EC includes definitions for the classification of hazardous places in terms of zones on the basis of the frequency and duration of the occurrence of an explosive atmosphere. The 3 Zone concept used for many years for the specification and selection of electrical equipment for explosive gas and vapour atmospheres and more recently specified for explosive dust atmospheres is now embodied in European legislation.

Table 2. Flammability and explosion characteristics

Gases/liquids/vapours	Dusts
Flash point	Burning behaviour
Auto ignition temperature	Explosibility
Explosibility limits	Minimum ignition temperature (Cloud)
Minimum oxygen concentration	Layer ignition temperature
Density (relative to air)	Minimum ignition energy
Explosion characteristics	Explosion characteristics
- Flame speed	- Maximum pressure
- Maximum pressure	- Rate of pressure rise
- Rate of pressure rise	Thermal stability of bulk powder
Maximum experimental safe gap	

The Directive includes a definition of a hazardous place as a place in which an explosive atmosphere may occur in such quantities as to require special precautions to protect the health and safety of the workers. For the Zone definitions Zone 0, Zone 1, and Zone 2 are used to denote explosive atmospheres containing gases, vapours or mists while Zone 20, Zone 21 and Zone 22 are used to denote explosive atmospheres containing dusts. The same definitions are used for the different Zones of all explosive atmospheres as shown in Table 3. In addition the Directive includes a definition of normal operation and requires that hazards arising from deposits or layers of dusts must also be considered.

A methodology for area classification of places containing explosive atmospheres is already available in European standards, EN 60079-10 for both gases and vapours [3] and EN 50281-3 for dusts [4] though it should be recognised that the Directive does not specify that the methodology contained in these standards has to be used.

Table 3. Zone definitions of places containing explosive atmospheres

Zone	Duration and frequency of explosive atmosphere
0/20	Present continuously, or for long periods or frequently
1/21	Likely to occur in normal operation occasionally
2/22	Not likely in normal operation, but if so, only for a short period

Layers, deposits and heaps of dust must be considered as any other source which can form an explosive atmosphere.

“Normal operation” - situation when installations are used within their design parameters (i.e. including start up and shut down).

As mentioned the concept of area classification has been used for many years for the selection of electrical equipment. However the requirement of the Directive that areas or places containing explosive dust atmospheres together with the need to document the results the areas classification exercise in the Explosion Protection Document will often lead to a reappraisal of the Zone classification. This will be driven by the need specified in the Directive to only use equipment, both electrical and non-electrical of a specific category in a particular Zone.

The area classification methodology used in the European standards for both gases and vapours and for dusts is based on the concept of 3 'sources of release' namely continuous, primary and secondary which depending on the presence of openings and more importantly on the degree and efficiency of ventilation are used to determine the nature and extent of the Zone. An 'exact' evaluation is theoretically possible using numerical simulation but in practice the assumptions involved do not justify this approach and usually estimations of the extent of the Zones are made based on experience. Thus:

Zone 0/20 – continuous source of release occurs almost always only inside equipment or dust containment or transport systems or near the surface of flammable liquids.

Zone 1/21 – primary source of release usually occurs outside equipment for example around sampling points and filling/emptying points without extract, in the immediate vicinity of access doors frequently used when an explosive atmosphere is inside. It may also occur inside equipment for example inside extraction systems or in dust containment equipment such as some silos and filters where a dust cloud is only occasionally formed.

Zone 2/22 – secondary source of release for example around seals, fittings, valves, relief valves, outlets from vents, in the vicinity of access doors/openings infrequently used, storage areas (due to possible breakage) around filling/emptying points with extract/ventilation and areas with dust layers that can form explosive dust clouds.

The extent of the Zones is dependent on the degree of ventilation of extract but in many cases the extent of a zone around the source of release may be taken as 1 m for dusts and 1 m to 3 m for gases and vapours though in the case of gases and vapours heavier than air these may extend much further. It is clear that in the case of dusts good housekeeping is essential to remove deposits of dusts as soon as they are formed. Where this is effectively carried out the area may be classified as non-hazardous provided any layers are removed by cleaning before an explosive dust/air mixture is formed.

IDENTIFICATION OF POSSIBLE IGNITION SOURCES

A complete list of possible ignition sources is given in Table 4 [5].

Ignition sources can arise not only from the equipment used but also from the mode or type of operation carried out, thus a careful assessment of the likelihood of them occurring during the process is needed.

Static electricity, specifically mentioned in the Directive as a possible ignition source that must be considered, is generated whenever movement occurs. However provided all conducting parts of the plant and process materials are earthed and consideration has been given to the use of non-conducting materials, it is seldom an effective ignition source [6].

Table 4. List of possible ignition sources

Common	Special
Hot surfaces	Lightning
flames and hot gases (including hot particles)	Stray electric currents (e.g. from Cathodic protection systems)
Mechanical sparks	Radiation - High frequency, Optical, Ionising
Electrical equipment	Ultrasonics
Static electricity	Adiabatic compression and shock waves
Chemical reaction (thermal instability)	

SELECTION OF EQUIPMENT

As mentioned above, Directive 99/92/EC specifies criteria for the selection of equipment and protective systems. Thus unless the explosion protection document based on a risk assessment does not state otherwise, equipment and protective systems for all places in which explosive atmospheres may occur must be selected on the basis of the categories set out in Directive 94/9/EC. In particular, the following categories of equipment must be used in the zones indicated, provided they are suitable for gases, vapours or mists and/or dusts as appropriate:

- In zone 0 or zone 20, category 1 equipment.
- In zone 1 or zone 21, category 1 or 2 equipment.
- In zone 2 or zone 22, category 1, 2 or 3 equipment.

In the future the choice of equipment that is safe for use in a particular zone should present few problems as non-electrical as well as electrical equipment corresponding to the different categories becomes available. However for existing plants, it must be demonstrated that equipment currently in use is safe. The basic method and requirements developed and contained in the European Standard on non-electrical equipment for potentially explosive atmospheres EN 13463-1 [7] can be applied by users to decide whether a particular piece of equipment is safe to use. These concepts together with the ignition protection methods are further described in another paper in this symposium [8]. The basis of these concepts is the link between the frequency of occurrence of an explosive atmosphere and the conditions of operation when an ignition source is likely to occur as shown in Table 5. It is clear that this can be generally applied to decide whether any piece of equipment or operation is suitable for a particular zone.

As currently with electrical equipment, the choice of suitable equipment also depends on ensuring that the maximum surface temperature remains below the ignition temperature of the explosive atmosphere. For gases and vapours equipment is classified into classes T1 to T6 depending on the maximum surface temperature and this can be compared to the auto-ignition temperature of the gas or vapour. For explosive dust atmospheres the maximum

allowable surface temperature is the lower of either 2/3 rds of the ignition temperature of the dust cloud or the layer ignition temperature – 75 K.

RISK ASSESSMENT

The Directive specifies that the Explosion Protection Document should include an assessment of the risks associated with the work being carried out. In the majority of cases this needs to be no more than a discussion the occurrence and frequency of the presence of an explosive atmosphere and the likelihood of occurrence of an effective ignition source and justification of the measures taken. These will need to take into consideration the ignition energy and or ignition temperature required to ignite the particular atmosphere.

Table 5. Relationship between Zones and Categories of Equipment

Explosive atmosphere	Zone	Category	Ignition source
Continuous	0/20	1	None with rare malfunction
Occasional	1/21	2	None with malfunction
Not likely	2/22	3	None in normal operation

For more complex plants it is often useful to use a more structured approach to ensure that all the possible sources of hazards have been identified and appropriate measures taken to reduce the risk to an acceptable level. A methodology has been developed for equipment and unit operations for use in potentially explosive atmospheres as part of a European research project, the RASE Project [9]. This uses a risk matrix to evaluate the final risk and the final report of the project includes worked examples of the application of the methodology for spray drying operation, powder pneumatic transfer, paint spray booth, an exhaust system for gas turbine and an oil seed extraction unit.

PREVENTATIVE, PROTECTIVE MEASURES SPECIFIC TO THE PROCESS/PLANT

This section of the Explosion Protection Document should include a summary of the measures which have been applied to prevent the occurrence of an explosion or to protect against the effects of an explosion. A variety of measure are available and include the avoidance of ignition sources, the prevention of the formation of an explosive atmosphere, for example by inert gas blanketing, or where necessary protection measures such as:

- Explosion proof construction
- Explosion venting
- Explosion isolation
- Explosion suppression

The summary should include specific technical and or organisational measures, for example earthing of drums, which are necessary to ensure safe operation.

SAFETY MANAGEMENT ASPECTS OF THE EXPLOSION PROTECTION DOCUMENT

Many of the organisational requirements which need to be demonstrated under the ATEX 137 Directive will or should be already be documented as part of a safety management system. Written procedures should be in place for common activities which include:

- SHE Policy/Responsibilities
- Management of change
- Permit to work
- Procedures for visitors/subcontractors
- Instructions/training
- Frequency of review etc.

Safety management aspects will not be further covered here. Further details of setting up such a system can be found in HSE [1] and EPSC [2] publications.

IMPLEMENTATION IN THE EUROPEAN MEMBER STATES

European Directives have to be implemented in member states regulations within the time period specified in a particular Directive, in the case of the ATEX 137 Directive 99/92/EC this date is the 30th June 2003. According to the information available to the Authors in September 2002, the national regulations or their drafts for the implementation of the ATEX Directive are as yet only available in Holland, Germany and the United Kingdom, though all states contacted indicated that they intended implementing the requirements in the Directive by the Deadline date.

The way the Directives are implemented is left to the individual member state and there are often major differences. Thus, for example in the UK the ATEX 137 Directive is being implemented together with the Chemical Agents at Work Directive in one set of regulations known as the DSEAR Regulation or Dangerous Substances and Explosive Atmospheres Regulation. In contrast, in Germany two different laws are being used to implement the ATEX 137 Directive. Where an employer has a plant which uses or produces an explosive atmosphere then the plant has to comply with the so called "Betriebssicherheitsverordnung" (Plant Safety regulations) which includes all the requirements of the Directive including the necessity to produce an Explosion Protection Document. The safety of workers is in part covered by the "Gefahrstoffverordnung" (Dangerous Substances Regulations) and the requirements of the ATEX 137 Directive are in essence repeated in this regulation which also includes the requirements of the Chemical Agents at Work Directive.

As mentioned previously the ATEX 137 Directive specifies minimum requirements and the European Treaty allows member states to set more stringent requirements. From the perspective of international companies it is to be hoped that there will not be major differences though it is rumoured that one member state is considering requiring the installation of Category 2, instead of Category 3, non-electrical equipment in Zones 2 and 22! Small variations are to be expected particularly in view of the different ways that the Directive is implemented. Thus in Germany current plants have to comply with the complete requirements including the production of all the documentation by 2005 and not 2006 as specified in the Directive.

CONCLUSIONS

The new ATEX 137 Directive 99/92/EC places an onus on employers to ensure the provision of safe working conditions and equipment where potentially explosive atmospheres can occur. The minimum requirements specified in the Directive are no more stringent than current good practice already being used in the process industries. The documentary requirement of the Directive i.e. the production of an Explosion Protection Document, can be met in most cases by a combination of the fire and explosion hazard assessment together with reference to procedures and structures covering organisational aspects which are part of a safety management system.

The Directive provides flexibility for employers to continue using existing equipment and practices provided they are safe and allows the use of equipment not classified under Directive 94/9/EC in the future again provided that its safety has been demonstrated.

APPENDIX I: SUMMARY OF THE EMPLOYER OBLIGATIONS OF DIRECTIVE 99/92/EC [11]

PREVENT AND PROTECT AGAINST EXPLOSIONS

The employer has to take technical and/or organisational measures appropriate to the nature of the operation, in order of priority and in accordance with the following basic principles:

- the prevention of the formation of explosive atmospheres, or where the nature of the activity does not allow that,
- the avoidance of the ignition of explosive atmospheres, and
- the mitigation of the detrimental effects of an explosion so as to ensure the health and safety of workers.

Where necessary, these measures have to be combined and/or supplemented with measures against the propagation of explosions. They have to be reviewed regularly and, in any event, whenever significant changes occur.

ASSESSMENT OF EXPLOSION RISKS

The Directive requires employers to assess the specific risks arising from explosive atmospheres, taking account the following:

- the likelihood that explosive atmospheres will occur and their persistence,
- the likelihood that ignition sources, including electrostatic discharges, will be present and become active and effective,
- the installations, substances used, processes, and their possible interactions,
- the scale of the anticipated effects.

In addition the Directive requires that explosion risks shall be assessed overall and specifically mentions the problem of connections and/or openings to places where explosive atmospheres may occur.

GENERAL OBLIGATIONS

Once the risk assessment has been carried out the Directive requires employers to implement the findings to ensure safe working conditions with appropriate supervision and technical measures.

DUTY OF COORDINATION

The Directive requires that where workers from several undertakings are present at the same workplace, each employer shall be responsible for all matters coming under his control. However in addition it requires that the employer responsible for the work place coordinates the implementation of all the measures concerning workers' health and safety and shall state, in the explosion protection document, the aim of that coordination and the measures and procedures for implementing it.

PLACES WHERE EXPLOSIVE ATMOSPHERES MAY OCCUR

The Directive requires that the employer shall classify places where explosive atmospheres may occur into zones in accordance with the definitions given in Annex I. Following the area classification the employer has to ensure that the minimum requirements set out in Annex II of the Directive are implemented and, where necessary, that the entry points to the areas have to be marked.

EXPLOSION PROTECTION DOCUMENT

The employer has to ensure that a document, called the 'explosion protection document', is drawn up and kept up to date. The document has to demonstrate in particular:

- that the explosion risks have been determined and assessed,
- that adequate measures will be taken to attain the aims of the Directive,
- those places which have been classified into zones in accordance with Annex I,
- those places where the minimum requirements set out in Annex II will apply,
- that the workplace and work equipment, including warning devices, are designed, operated and maintained with due regard for safety,
- that arrangements have been made for the safe use of work equipment.

The explosion protection document shall be drawn up prior to the commencement of work and be revised when the workplace, work equipment or organisation of the work undergoes significant changes, extensions or conversions. The employer may combine existing explosion risk assessments, documents or other equivalent reports.

SPECIAL REQUIREMENTS FOR WORK EQUIPMENT AND WORKPLACES

This section of the Directive sets out the dates by which new and existing work places have to comply with the Directive and in particular when it is necessary to use equipment that has been design and manufactured according to the so called 'ATEX 95' Directive. In essence new work places that are used for the first time after 30.06.03 have to comply with the Directive whereas existing work places have to comply by 30.06.06.

It should be recognised however, that the Directive allows the unlimited continued use of existing equipment and also the installation of new equipment that is not manufactured

according to the ATEX 95 Directive provided the Explosion Protection Document shows that it is safe.

REFERENCES

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10. The RASE Project – Final report can be downloaded from www.safetynet.de.
11. The full text of European Directives can be downloaded from the European Union web site <http://www.europa.eu.int/eur-lex/>.