SCHEDULE 1

Regulation 2(1)

Essential Health and Safety Requirements

ESSENTIAL HEALTH AND SAFETY REQUIREMENTS RELATING TO THE DESIGN AND CONSTRUCTION OF EQUIPMENT AND PROTECTIVE SYSTEMS INTENDED FOR USE IN POTENTIALLY EXPLOSIVE ATMOSPHERES (Annex II of the ATEX Directive)

Preliminary observations

1.—(1) Technological knowledge which can change rapidly, must be taken into account as far as possible and be utilised immediately.

(2) For the devices referred to in regulation 3(2)(b), the essential health and safety requirements must apply only in so far as they are necessary for the safe and reliable functioning and operation of those devices with respect to the risks of explosion.

COMMON REQUIREMENTS FOR EQUIPMENT AND PROTECTIVE SYSTEMS

General requirements

Principles of integrated explosion safety

2.—(1) Equipment and protective systems intended for use in potentially explosive atmospheres must be designed from the point of view of integrated explosion safety.

(2) In this connection, the manufacturer must take measures—

(a) above all, if possible, to prevent the formation of explosive atmospheres which may be produced or released by equipment and by protective systems themselves;

(b) to prevent the ignition of explosive atmospheres, taking into account the nature of every electrical and non-electrical source of ignition;

(c) should an explosion nevertheless occur which could directly or indirectly endanger persons and, as the case may be, domestic animals or property, to halt the explosion immediately or to limit the range of explosion flames and explosion pressures to a sufficient level of safety, or both.

(3) Equipment and protective systems must be designed and manufactured after due analysis of possible operating faults in order as far as possible to preclude dangerous situations.

(4) Any misuse which can reasonably be anticipated must be taken into account.

Special checking and maintenance conditions

3. Equipment and protective systems subject to special checking and maintenance conditions must be designed and constructed with such conditions in mind.

Surrounding area conditions

4. Equipment and protective systems must be so designed and constructed as to be capable of coping with actual or foreseeable surrounding area conditions.

Marking

5.—(1) All equipment and protective systems must be marked legibly and indelibly with the following minimum particulars—

(a) name, registered trade name or registered trade mark, and address of the manufacturer;

(b) CE marking (see Annex II to RAMS);

(c) designation of series or type;

(d) batch or serial number, if any;

(e) year of construction;

(f) the specific marking of explosion protection  followed by the symbol of the equipment-group and category;

(g) for equipment-group II,

(i) the letter ‘G’ (concerning explosive atmospheres caused by gases, vapours or mists); or

(ii) the letter ‘D’ (concerning explosive atmospheres caused by dust); or

(iii) both the letter ‘G’ (concerning explosive atmospheres caused by gases, vapours or mists) and the letter ‘D’ (concerning explosive atmospheres caused by dust).

(2) Furthermore, where necessary, they must also be marked with all information essential to their safe use.

Instructions

6.—(1) All equipment and protective systems must be accompanied by instructions, including at least the following particulars—

(a) a recapitulation of the information with which the equipment or protective system is marked, except for the batch or serial number (see paragraphs 5(1) and (2)), together with any appropriate additional information to facilitate maintenance (e.g. address of the repairer, etc.);

(b) instructions for safe—

(i) putting into service;

(ii) use;

(iii) assembling and dismantling;

(iv) maintenance (servicing and emergency repair);

(v) installation;

(vi) adjustment;

(c) where necessary, an indication of the danger areas in front of pressure-relief devices;

(d) where necessary, training instructions;

(e) details which allow a decision to be taken beyond any doubt as to whether an item of equipment in a specific category or a protective system can be used safely in the intended area under the expected operating conditions;

(f) electrical and pressure parameters, maximum surface temperatures and other limit values;

(g) where necessary, special conditions of use, including particulars of possible misuse which experience has shown might occur;

(h) where necessary, the essential characteristics of tools which may be fitted to the equipment or protective system.

(2) The instructions must contain the drawings and diagrams necessary for the putting into service, maintenance, inspection, checking of correct operation and, where appropriate, repair of the equipment or protective system, together with all useful instructions, in particular with regard to safety.

(3) Literature describing the equipment or protective system must not contradict the instructions with regard to safety aspects.

Selection of materials

7.—(1) The materials used for the construction of equipment and protective systems must not trigger off an explosion, taking into account foreseeable operational stresses.

(2) Within the limits of the operating conditions laid down by the manufacturer, it must not be possible for a reaction to take place between the materials used and the constituents of the potentially explosive atmosphere which could impair explosion protection.

(3) Materials must be so selected that predictable changes in their characteristics and their compatibility in combination with other materials will not lead to a reduction in the protection afforded; in particular, due account must be taken of the material's corrosion and wear resistance, electrical conductivity, mechanical strength, ageing resistance and the effects of temperature variations.

Design and construction

8.—(1) Equipment and protective systems must be designed and constructed with due regard to technological knowledge of explosion protection so that they can be safely operated throughout their foreseeable lifetime.

(2) Components to be incorporated into or used as replacements in equipment and protective systems must be so designed and constructed that they function safely for their intended purpose of explosion protection when they are installed in accordance with the manufacturer's instructions.

Enclosed structures and prevention of leaks

9.—(1) Equipment which may release flammable gases or dusts must, wherever possible, employ enclosed structures only.

(2) If equipment contains openings or non-tight joints, these must, as far as possible, be designed in such a way that releases of gases or dusts cannot give rise to explosive atmospheres outside the equipment.

(3) Points where materials are introduced or drawn off must, as far as possible, be designed and equipped so as to limit releases of flammable materials during filling or draining.

Dust deposits

10.—(1) Equipment and protective systems which are intended to be used in areas exposed to dust must be so designed that deposit dust on their surfaces is not ignited.

(2) In general, dust deposits must be limited where possible. Equipment and protective systems must be easily cleanable.

(3) The surface temperatures of equipment parts must be kept well below the glow temperature of the deposit dust.

(4) The thickness of deposit dust must be taken into consideration and, if appropriate, means must be taken to limit the temperature in order to prevent a heat build up.

Additional means of protection

11.—(1) Equipment and protective systems which may be exposed to certain types of external stresses must be equipped, where necessary, with additional means of protection.

(2) Equipment must withstand relevant stresses, without adverse effect on explosion protection.

Safe opening

12. If equipment and protective systems are in a housing or a locked container forming part of the explosion protection itself, it must be possible to open such housing or container only with a special tool or by means of appropriate protection measures.

Protection against other hazards

13.—(1) Equipment and protective systems must be so designed and manufactured as to—

(a) avoid physical injury or other harm which might be caused by direct or indirect contact;

(b) assure that surface temperatures of accessible parts or radiation which would cause a danger, are not produced;

(c) eliminate non-electrical dangers which are revealed by experience;

(d) assure that foreseeable conditions of overload do not give rise to dangerous situations.

(2) Where, for equipment and protective systems, the risks referred to in paragraph (1) are wholly or partly covered by other European Union legislation, these Regulations do not apply or cease to apply in the case of such equipment and protective systems and of such risks upon application of that specific European Union legislation.

Overloading of equipment

14. Dangerous overloading of equipment must be prevented at the design stage by means of integrated measurement, regulation and control devices, such as over-current cut-off switches, temperature limiters, differential pressure switches, flowmeters, time-lag relays, overspeed monitors or similar types of monitoring devices, or both overspeed monitors and similar types of monitoring devices.

Flameproof enclosure systems

15. If parts which can ignite an explosive atmosphere are placed in an enclosure, measures must be taken to ensure that the enclosure withstands the pressure developed during an internal explosion of an explosive mixture and prevents the transmission of the explosion to the explosive atmosphere surrounding the enclosure.

POTENTIAL IGNITION SOURCES

Hazards arising from different ignition sources

16. Potential ignition sources such as sparks, flames, electric arcs, high surface temperatures, acoustic energy, optical radiation, electromagnetic waves and other ignition sources must not occur.

Hazards arising from static electricity

17. Electrostatic charges capable of resulting in dangerous discharges must be prevented by means of appropriate measures.

Hazards arising from stray electric and leakage currents

18. Stray electric and leakage currents in conductive equipment parts which could result in, for example, the occurrence of dangerous corrosion, overheating of surfaces or sparks capable of provoking an ignition must be prevented.

Hazards arising from overheating

19. Overheating caused by friction or impacts occurring, for example, between materials and parts in contact with each other while rotating or through the intrusion of foreign bodies must, as far as possible, be prevented at the design stage.

Hazards arising from pressure compensation operations

20. Equipment and protective systems must be so designed or fitted with integrated measuring, control and regulation devices that pressure compensations arising from them do not generate shock waves or compressions which may cause ignition.

Hazards arising from external effects

21.—(1) Equipment and protective systems must be so designed and constructed as to be capable of performing their intended function in full safety, even in changing environmental conditions and in the presence of extraneous voltages, humidity, vibrations, contamination and other external effects, taking into account the limits of the operating conditions established by the manufacturer.

(2) Equipment parts used must be appropriate to the intended mechanical and thermal stresses and capable of withstanding attack by existing or foreseeable aggressive substances.

Requirements in respect of safety-related devices

22.—(1) Safety devices must function independently of any measurement or control devices, or both measurement and control devices required for operation.

(2) As far as possible, failure of a safety device must be detected sufficiently rapidly by appropriate technical means to prevent dangerous situations from occurring.

(3) The fail-safe principle is to be applied in general.

(4) Safety-related switching must in general directly actuate the relevant control devices without intermediate software command.

(5) In the event of a safety device failure, equipment or protective systems or both must wherever possible, be secured.

(6) Emergency stop controls of safety devices must, as far as possible, be fitted with restart lockouts. A new start command may take effect on normal operation only after the restart lockouts have been intentionally reset.

Control and display units

23. Where control and display units are used, they must be designed in accordance with ergonomic principles in order to achieve the highest possible level of operating safety with regard to the risk of explosion.

Requirements in respect of devices with a measuring function for explosion protection

24.—(1) In so far as they relate to equipment used in explosive atmospheres, devices with a measuring function must be designed and constructed so that they can cope with foreseeable operating requirements and special conditions of use.

(2) Where necessary, it must be possible to check the reading accuracy and serviceability of devices with a measuring function.

(3) The design of devices with a measuring function must incorporate a safety factor which ensures that the alarm threshold lies far enough outside the explosion or ignition limits of the atmospheres to be registered, or both the explosion and ignition limits, taking into account, in particular, the operating conditions of the installation and possible aberrations in the measuring system.

Risks arising from software

25. In the design of software-controlled equipment, protective systems and safety devices, special account must be taken of the risks arising from faults in the programme.

Integration of safety requirements relating to the system

26.—(1) Manual override must be possible in order to shut down the equipment and protective systems incorporated within automatic processes which deviate from the intended operating conditions, provided that this does not compromise safety.

(2) When the emergency shutdown system is actuated, accumulated energy must be dispersed as quickly and as safely as possible or isolated so that it no longer constitutes a hazard.

(3) Sub-paragraph (2) does not apply to electrochemically-stored energy.

Hazards arising from power failure

27. Where equipment and protective systems can give rise to a spread of additional risks in the event of a power failure, it must be possible to maintain them in a safe state of operation independently of the rest of the installation.

Hazards arising from connections

28.—(1) Equipment and protective systems must be fitted with suitable cable and conduit entries.

(2) When equipment and protective systems are intended for use in combination with other equipment and protective systems, the interface must be safe.

Placing of warning devices as parts of equipment

29. Where equipment or protective systems are fitted with detection or alarm devices for monitoring the occurrence of explosive atmospheres, the necessary instructions must be provided to enable them to be provided at the appropriate places.

SUPPLEMENTARY REQUIREMENTS IN RESPECT OF EQUIPMENT

Requirements applicable to equipment in equipment - group I

Requirements applicable to equipment in category M 1 of equipment-group I

30.—(1) Equipment must be so designed and constructed that sources of ignition do not become active, even in the event of rare incidents relating to equipment.

(2) Equipment must be equipped with means of protection such that—

(a) either, in the event of failure of one means of protection, at least an independent second means provides the requisite level of protection; or

(b) the requisite level of protection is ensured in the event of two faults occurring independently of each other.

(3) Where necessary, equipment must be equipped with additional special means of protection.

(4) Equipment must remain functional with an explosive atmosphere present.

(5) Where necessary, equipment must be so constructed that no dust can penetrate it.

(6) The surface temperatures of equipment parts must be kept clearly below the ignition temperature of the foreseeable air/dust mixtures in order to prevent the ignition of suspended dust.

(7) Equipment must be so designed that the opening of equipment parts which may be sources of ignition is possible only under non-active or intrinsically safe conditions. Where it is not possible to render equipment non-active, the manufacturer must affix a warning label to the opening part of the equipment.

(8) If necessary, equipment must be fitted with appropriate additional interlocking systems.

Requirements applicable to equipment in category M 2 of equipment-group I

31.—(1) Equipment must be equipped with means of protection ensuring that sources of ignition do not become active during normal operation, even under more severe operating conditions, in particular those arising from rough handling and changing environmental conditions.

(2) The equipment must be de-energised in the event of an explosive atmosphere.

(3) Equipment must be so designed that the opening of equipment parts which may be sources of ignition is possible only under non-active conditions or via appropriate interlocking systems. Where it is not possible to render equipment non-active, the manufacturer must affix a warning label to the opening part of the equipment.

(4) The requirements regarding explosion hazards arising from dust applicable to equipment category M 1 must be applied.

Requirements applicable to equipment in category 1 of equipment - group II

Explosive atmospheres caused by gases, vapours or mists

32.—(1) Equipment must be so designed and constructed that sources of ignition do not become active, even in the event of rare incidents relating to equipment.

(2) It must be equipped with means of protection such that—

(a) either, in the event of failure of one means of protection, at least an independent second means provides the requisite level of protection; or

(b) the requisite level of protection is ensured in the event of two faults occurring independently of each other.

(3) For equipment with surfaces which may heat up, measures must be taken to ensure that the stated maximum surface temperatures are not exceeded even in the most unfavourable circumstances.

(4) Temperature rises caused by heat build-ups and chemical reactions must also be taken into account.

(5) Equipment must be so designed that the opening of equipment parts which might be sources of ignition is possible only under non-active or intrinsically safe conditions. Where it is not possible

to render equipment non-active, the manufacturer must affix a warning label to the opening part of the equipment.

(6) If necessary, equipment must be fitted with appropriate additional interlocking systems.

Explosive atmospheres caused by air and dust mixtures

33.—(1) Equipment must be so designed and constructed that ignition of air and dust mixtures does not occur even in the event of rare incidents relating to equipment.

(2) It must be equipped with means of protection such that—

(a) either, in the event of failure of one means of protection, at least an independent second means provides the requisite level of protection; or

(b) the requisite level of protection is ensured in the event of two faults occurring independently of each other.

(3) Where necessary, equipment must be so designed that dust can enter or escape from the equipment only at specifically designated points.

(4) The requirement in sub-paragraph (3) must also be met by cable entries and connecting pieces.

(5) The surface temperatures of equipment parts must be kept well below the ignition temperature of the foreseeable air and dust mixtures in order to prevent the ignition of suspended dust.

(6) With regard to the safe opening of equipment parts, sub-paragraph 32(5) applies.

Requirements applicable to equipment category 2 of equipment - group II

Explosive atmospheres caused by gases, vapours or mists

34.—(1) Equipment must be so designed and constructed as to prevent ignition sources arising, even in the event of frequently occurring disturbances or equipment operating faults, which normally have to be taken into account.

(2) Equipment parts must be so designed and constructed that their stated surface temperatures are not exceeded, even in the case of risks arising from abnormal situations anticipated by the manufacturer.

(3) Equipment must be so designed that the opening of equipment parts which might be sources of ignition is possible only under non-active conditions or via appropriate interlocking systems. Where it is not possible to render equipment non-active, the manufacturer must affix a warning label to the opening part of the equipment.

Explosive atmospheres caused by air and dust mixtures

35.—(1) Equipment must be designed and constructed so that ignition of air and dust mixtures is prevented, even in the event of frequently occurring disturbances or equipment operating faults which normally have to be taken into account.

(2) With regard to surface temperatures, sub-paragraph 33(5) applies.

(3) With regard to protection against dust, sub-paragraph 33(3) applies.

(4) With regard to the safe opening of equipment parts, sub-paragraph 34(3) applies.

Requirements applicable to equipment category 3 of equipment – group II

Explosive atmospheres caused by gases, vapours or mists

36.—(1) Equipment must be so designed and constructed as to prevent foreseeable ignition sources which can occur during normal operation.

(2) Surface temperatures must not exceed the stated maximum surface temperatures under intended operating conditions. Higher temperatures in exceptional circumstances may be allowed only if the manufacturer adopts special additional protective measures.

Explosive atmospheres caused by air and dust mixtures

37.—(1) Equipment must be so designed and constructed that air and dust mixtures cannot be ignited by foreseeable ignition sources likely to exist during normal operation.

(2) With regard to surface temperatures, sub-paragraph 33(5) applies.

(3) Equipment, including cable entries and connecting pieces, must be so constructed that, taking into account the size of its particles, dust can neither develop explosive mixtures with air nor form dangerous accumulations inside the equipment.

Supplementary requirements in respect of protective systems

General requirements

38.—(1) Protective systems must be dimensioned in such a way as to reduce the effects of an explosion to a sufficient level of safety.

(2) Protective systems must be designed and capable of being positioned in such a way that explosions are prevented from spreading through dangerous chain reactions or flashover and incipient explosions do not become detonations.

(3) In the event of a power failure, protective systems must retain their capacity to function for a period sufficient to avoid a dangerous situation.

(4) Protective systems must not fail due to outside interference.

Planning and design

Characteristics of materials

39.—(1) With regard to the characteristics of materials, the maximum pressure and temperature to be taken into consideration at the planning stage are the expected pressure during an explosion occurring under extreme operating conditions and the anticipated heating effect of the flame.

(2) Protective systems designed to resist or contain explosions must be capable of withstanding the shock wave produced without losing system integrity.

(3) Accessories connected to protective systems must be capable of withstanding the expected maximum explosion pressure without losing their capacity to function.

(4) The reactions caused by pressure in peripheral equipment and connected pipe-work must be taken into consideration in the planning and design of protective systems.

Pressure-relief systems

40. If it is likely that stresses on protective systems will exceed their structural strength, provision must be made in the design for suitable pressure-relief devices which do not endanger persons in the vicinity.

Explosion suppression systems

41. Explosion suppression systems must be so planned and designed that they react to an incipient explosion at the earliest possible stage in the event of an incident and counteract it to best effect, with due regard to the maximum rate of pressure increase and the maximum explosion pressure.

Explosion decoupling systems

42. Decoupling systems intended to disconnect specific equipment as swiftly as possible in the event of incipient explosions by means of appropriate devices must be planned and designed so as to remain proof against the transmission of internal ignition and to retain their mechanical strength under operating conditions.

43. Protective systems must be capable of being integrated into a circuit with a suitable alarm threshold so that, if necessary, there is cessation of product feed and output and shutdown of equipment parts which can no longer function safely.