

Session 21 – Maintenance Inspection Requirements





Typical Maintenance Requirements under ATEX 137

The following organizational measures should be carried out:

produce written operating instructions, where required by the explosion protection document; instruct workers in explosion protection; ensure workers have adequate competence; apply a permit-to-work system for dangerous work, where required by the explosion protection document; carry out maintenance; carry out inspection and surveillance; mark hazardous places, where necessary.

The organizational measures taken must be recorded in the explosion protection document.

Operating instructions

Operating instructions are activity-related binding instructions and rules of conduct issued in writing by the employer to the employees. They describe the workplace-related dangers to human beings and the environment and indicate the protective measures taken or to be observed. Operating instructions are produced by the employer or a competent person whom he appoints to perform the task and must be observed by workers. They relate to a particular workplace or part of the establishment. Among the matters to be covered by operating instructions for workplaces where there are explosive atmosphere risks are what explosion hazards exist and where, what mobile work equipment may be used and whether special personal protective equipment must be worn.



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Worker competence

For every workplace, there should be available a sufficient number of workers with the requisite experience and training to perform the explosion protection tasks assigned to them.

Training of workers



Employers must provide workers with training which informs them of the explosion hazards at the workplace and the protective measures taken. This training must explain how the explosion hazard arises and in what parts of the workplace it is present. The measures taken should be listed and their operation explained. The correct way of working with the equipment available must be explained.

Workers must receive training on recruitment (before starting work); in the event of a transfer or a change of job; when work equipment is introduced for the first time or changed; when new technology is introduced. Training of workers must be repeated at suitable intervals, for example once per year. On completion of training, it can be useful to check on what has been learned. The duty to provide training also applies to the employees of outside contractors. Training must be given by a competent person. Records should be kept in writing of the date and content of training activities and the participants.



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Permit-to-work system

If work liable to cause an explosion is to be carried out in or near a hazardous place, it must be authorized by the person with responsibility for this function within the establishment. This also applies to activities which may interact with other work to cause hazards. A system of permits to work has proved useful in such cases. This may be implemented by means of a permit-to-work form which all concerned must receive and sign.

Once the work has been finished, a check must be made to establish whether the plant is still safe or has been made safe again. All concerned must be informed when the work is finished.

Maintenance

Maintenance comprises repair, servicing and inspection. Before maintenance work begins, all concerned must be informed and the work must be authorized, e.g. by means of a permit-to-work system. It may be carried out only by competent persons. Experience shows that a high accident risk attaches to servicing work. Before, during and after completion of the work, care must therefore be taken to ensure that all necessary protective measures are taken.



Typical Maintenance Requirementsunder ATEX 137

When maintenance involving a risk of ignition is carried out in a hazardous place, it should be reliably ensured that it will be free of hazardous explosive atmospheres for the duration of the work and if necessary for some time thereafter (e.g. to allow cooling). Except in exceptional circumstances, when other appropriate and adequate precautions have been taken, the items of plant on which work is to be carried out must as necessary be emptied, depressurized, cleaned, purged and must be free of flammable substances. While work is in progress, such substances must not reach the place where it is being carried out. Where work may give rise to flying sparks (e.g. welding, flame cutting, grinding), suitable screening should be provided and a fire sentry posted if necessary.





Typical Schedule of Inspection

SCHEDU	LE OF INSPECTIONS										
Methods	of protection against electric shock	Prevention of mutual detrimental influence									
(a) Prote	ction against both direct and indirect	(a)	Proximity of non-electrical services and other influences								
conta		(b)	Segregation of band I and band II circuits or band II insulation used								
(i)	SELV	(c)	Segregation of safety circuits								
(ii)	Limitation of discharge of energy	<u>Identification</u>									
(b) Prote	ction against direct contact:	(a)	Presence of diagrams, instructions, circuit charts and								
(i)	Insulation of live parts		similar information								
(ii)	Barriers or enclosures	(b)	Presence of danger notices and other warning notices								
(iii)	Obstacles	(c)	Labelling of protective devices, switches and terminals								
(iv)	Placing out of reach	(d)	Identification of conductors								
(v)	PELV	Cables a	nd conductors								
(vi)	Presence of RCD for supplementary protection	(a)	Routing of cables in prescribed zones or within mechanical protection								
(c) Prote	ction against indirect contact:	(b)	Connection of conductors								
(i)	EEBAD including:	(c)	Erection methods								
	Presence of earthing conductor	(d)	Selection of conductors for current-carrying capacity and								
	Presence of circuit protective conductors		voltage drop								
	Presence of main equipotential bonding conductors	(e)	Presence of fire barriers, suitable seals and protection against thermal effects								
	Presence of supplementary equipotential	<u>General</u>									
	bonding conductors	(a)	Presence and correct location of appropriate devices for isolation and switching								
	Presence of earthing arrangements for combined protective and functional	(b)	Adequacy of access to switchgear and other equipment								
	purposes	(c)	Particular protective measures for special installations								
	Presence of adequate arrangements for		and locations								
	alternative source(s), where applicable	(d)	Connection of single-pole devices for protection or								
\sqcup	Presence of residual current device(s)		switching in phase conductors only								
(ii)	Use of Class II equipment or equivalent insulation	(e)	Correct connection of accessories and equipment								
(iii)	Non-conducting location:	(f)	Presence of undervoltage protective devices								
	Absence of protective conductors	(g)	Choice and setting of protective and monitoring devices for protection against indirect contact and/or overcurrent								
(iv)	Earth-free equipotential bonding: Presence of earth-free equipotential	(h)	Selection of equipment and protective measures appropriate to external influences								
	bonding conductors	(i)	Selection of appropriate functional switching devices								
(v)	Electrical separation										
		Date									
		2414									
Inspect	ed by										
X to	indicate an inspection has been carried out a indicate an inspection has been carried out a indicate the inspection is not applicable										



What is Competency?

.... a standardized requirement for an individual to properly perform a specific job.

It encompasses a combination of **knowledge**, **skills** and **behavior**... (1)

(1) Definition from Wikipedia.com



Why is it important

IEC 60079-14

4.4 Qualifications of personnel

The design of the installation, the selection of equipment and the erection covered by this standard shall be carried out only by persons whose training has included instruction on the various types of protection and installation practices, relevant rules and regulations and on the general principles of area classification. The competency of the person shall be relevant to the type of work to be undertaken (see Annex F).

Appropriate continuing education or training shall be undertaken by personnel on a regular basis.

NORME INTERNATIONALE INTERNATIONAL STANDARD CEI IEC 60079-14

> roisième édition Third edition 2002-10

Matériel électrique pour atmosphères explosives gazeuses –

Partie 14:

Installations électriques dans les emplacements dangereux (autres que les mines)

Electrical apparatus for explosive gas atmospheres –

Part 1/1.

Electrical installations in hazardous areas (other than mines)



Numéro de référence Reference number SEL/JEC 60079-14-2002

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Key Point to remember 60079-17 Inspection Requirements....

- Inspections of Ex equipment maximum time frame is 3 years after put in service
- Three different types of inspection:
 Detailed, Close and Visual
- The various protection concepts have different inspection schedules and things to review....
- For example, all Ex d equipment must have joint surfaces inspected which entails opening up each enclosure after a perscribed period no greater than every 3 years....
- How can this effect your design of Ex skid packages even if your not responsible for maintenance of the equipment?

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Explosion protected equipment to type of protection "'nL" shall be inspected in accordance with Table 2 (see 5.3).

5.5.2 Restricted breathing enclosures

Restricted breathing enclosures with provision for routine_checking shall be subjected to periodic pressure test measurement (see IEC 60079-15) at intervals of six months or more, as experience dictates.

5.6 Type of protection "t" and "tD" – Protection by enclosure (see Table 1 and IEC 60079-31 and IEC 61241-1)

Explosion protected equipment type "t" and "tD" shall be inspected in accordance with Table 1.

5.7 Types of protection "m" and "mD" (encapsulation), "o", (oil-immersion) "op" (optical radiation) and "q" (powder-filling)

Tables have not been prepared to illustrate the inspection requirements for "m", "mD", "o", "op" and "q" types of protection. Table 1 should be utilised as appropriate for the enclosure and its contents.

NOTE Inspection details for type of protection "o" are under consideration in IEC 60079-6

6 Inspection tables

Table 1 - Inspection schedule for Ex "d", Ex "e", Ex "n" and Ex "t/tD"

Check that:				Ex "d"			Ex "e"			Ex "n" Ex"t/tD"		
X = required for all types, n = type "n" only, t = type "t" and "tD" only					Grade of inspec							
10 (10 (10 (10 (10 (10 (10 (10 (10 (10 (D	С	٧	D	С	٧	D	С	٧		
Α	GENERAL (ALL EQUIPMENT)	Г				Г	Г	Г	П	Г		
1	Equipment is appropriate to the EPL/Zone requirements of the location	Х	Х	Х	Х	X	Х	Х	Х	X		
2	Equipment group is correct	Х	Х		Х	Х		Х	Х			
3	Equipment temperature class is correct (only for gas)	Х	Х		Х	Х		n	n	Г		
4	Equipment maximum surface temperature is correct	Г				Г		t	t	Г		
5	Degree of protection (IP grade) of equipment is appropriate for the level of protection/group/conductivity	Х	Х	Х	X	X	Х	Х	Х	X		
6	Equipment circuit identification is correct	Х			Х		Г	Х				
7	Equipment circuit identification is available	Х	Х	Х	Х	Х	Х	Х	Х	X		
8	Enclosure, glass parts and glass-to-metal sealing gaskets and/or compounds are satisfactory	Х	Х	х	X	X	х	х	Х	X		
9	There is no damage or unauthorized modifications	Х	Г		Х			Х				
10	There is no evidence of unauthorized modifications	Г	Х	Х		Х	Х		X	X		
11	Bolts, cable entry devices (direct and indirect) and blanking elements are of the correct type and are complete and tight											
	- physical check	Х	Х		Х	Х	Г	Х	X			
	- visual check	Г	Г	X	Г	Г	Х	Г		X		
12	Threaded covers on enclosures are of the correct type, are tight and secured	Г										
	- physical check	Х	Х									
	- visual check	Г		Х								
13	Joint surfaces are clean and undamaged and gaskets, if any, are satisfactory and positioned correctly	х										