

The international scheme for competency validation and certification of personnel who work in explosive atmospheres.

Technical Guidance

Non-Electrical Inspection Schedule

CCL 7003 Rev4 05/24



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Foreword

This first edition of CCL 7003 is a Technical Guidance document that provides Inspectors of Non-electrical (Mechanical) Ex equipment with an introduction to inspection and includes two check list tables. They are formatted in a similar manner to the Electrical check list tables which can be found within IEC 60079-17.

Table M.1 covers Non-electrical Ex equipment which is certified as Ex 'h', Ex 'd', Ex 'p' and Ex 't'. The Ex 'h' checks can be used for legacy equipment which is not certified but covered by an Ignition Hazard Risk Assessment.

Table M.2 covers Piping and Manually operated valves.

It has been produced by a CompEx Non-Electrical Working Group comprising representatives of CompEx Technical Team, Industry Mechanical experts, EEMUA and CompEx Approved Training Providers (see Acknowledgements).

The tables (like those in IEC 60079-17) are not intended to be applied exactly as presented. Checks within the tables may be deleted, if not relevant to the type of equipment being inspected or be added to according to the nature of the site. In the preparation of this document, it has been assumed that those involved in carrying out inspections of non-electrical Ex equipment are competent to do so and are able to apply sound engineering judgement.

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Acknowledgements:

CompEx Certification Limited is grateful for the contributions made in the preparation of this document by representatives of the following organisations.

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EEMUA

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Jon Hall – SETA

Industry Working Group

Simon Smith – SOS Consultancy
Mark James – C&P Engineering
Tony Clark – FES Ex
James Ward – FES Ex
Tim Cooper – Bridges
Tim Street – National Gas
Simon Phillips – National Gas
Daniel Jackman – National Gas
Lumu Kigozi – National Gas
Oliver Breen – Engineer
Ian Spriggs – Anglian Water
Aaron O'Shea – HADI
Richard Lewthwaite – HADI
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Introduction:

Inspection plays a major part in ensuring the on-going safety of personnel, equipment, and the environment.

There are **three** different **grades*** of inspection (which inform you **how** to inspect) these are: detailed (D), close (C) or visual (V)

Visual inspection: inspection that identifies, without the use of access equipment or tools, those defects, such as missing bolts, which will be apparent to the eye.

Close inspection: inspection that encompasses those aspects covered by a visual inspection and, in addition, identifies those defects, such as loose bolts, which will be apparent only by the use of access equipment, for example steps (where necessary) and tools.

Note: Close inspections do not normally require the enclosure to be opened, or the equipment to be de-energised.

Detailed inspection: inspection that encompasses those aspects covered by a close inspection and, in addition, identifies those defects which will only be apparent by opening the enclosure, and/or using, where necessary, tools and test equipment.

Note: Detailed inspections will normally require the equipment to be de-energised under a 'Safe System of Work'

For non-electrical equipment, the level of mechanical and/or process isolation will depend upon factors such as the type of equipment, its intended function (duty) and grade of inspection.

All work on non-electrical equipment and systems must be subject to a safe system of work and risk assessment. This will identify the appropriate methods for isolation and, the steps and precautions required for its completion. For example, a visual inspection may not require any isolation whereas a close inspection may require the process to be isolated. A detailed inspection would normally require full mechanical and potentially process isolation.

There are **four** recognised **types*** of inspection (which inform you **when** to inspect) these are: initial, periodic, sample, and continuous supervision. Further information on this and other relevant points can be found in IEC 60079-17.

Note: Consideration may need to be given to assessing any ignition capability of legacy non-electrical equipment installed before the introduction of the Workplace Directive (ATEX 1999/92/EC)¹ in 2003, using the application of sound engineering judgement and implementation of reasonable precautions, proportionate to the zone classification, in such a way to minimise the risk of explosion.²

The inspection approach adopted in the following tables align with IEC 60079-17 but is limited to the requirements for the main protection types currently in use against the risk of ignition of flammable gas or dust atmospheres.

- Table M1. Protection Ex 'h' ('b', 'c' & 'k'), Ex 'd', Ex 'p/pD' and Ex 't/tD'
- Table M2. Piping and Manually operated valves.

¹ Directive 99/92/EC - Workplace Directive on minimum requirements for improving the health and safety protection of workers potentially at risk from explosive atmospheres.

² More information on ignition hazard risk assessment can be found in ISO 80079-36.

Table M.1: Inspection Schedule for Non-Electrical installations
Based on ISO/IEC 80079-36 and 80079-37 and IEC 60079-1, -2, -31 and -17
Covering Ex 'h' ('b', 'c' & 'k'), Ex 'd', Ex 'p/pD' and Ex 't/tD'

Check that: X = required for all types, B, C and K = required for Ex 'b', Ex 'c' or Ex 'k' types		Ex 'h'			Ex 'd'			Ex 'p/pD'			Ex 't/tD'			
		Grade of Inspection												
		D	C	V	D	C	V	D	C	V	D	C	V	
A	PREPARATION for inspection													
a	Ex certificate, manufacturer instructions / manuals, and project drawings/documentation are available during inspection	X			X			X				X		
b	Risk Assessment and Technical File are available. (Refer to ISO/IEC 80079-36 Clause 9 Documentation and ISO/IEC 80079-37 Clause 9 Documentation)	X												
c	Risk Assessment - summary of the relevant ignition hazards are identified and the protective means to be implemented is available. (Refer to ISO/IEC 80079-36 Clause 9 Documentation and ISO/IEC 80079-37 Clause 9 Documentation)	X												
d	Safety devices that are part of an Ex 'b' ignition protection system have been incorporated into the inspection schedule (see Risk Assessment summary document)	X												
e	Manufacturer's schedules for Inspection, if applicable, are available	X			X			X				X		
GENERAL (ALL EQUIPMENT)														
A01	Equipment is clearly marked with Ex fixed data plate. (Ex data plate format and marking as per ISO/IEC 80079-36, ISO/IEC 80079-37. and IEC 60079-0)	X	X		X	X		X	X		X	X		
A02	Equipment installed is that specified in the documentation (<i>see also B01</i>). Note: This may be applicable where replacement equipment needs to meet specific non-Ex requirements to ensure the equipment is not a source of ignition (e.g. Maximum speed for a high-speed pump).	X	X		X	X		X	X		X	X		
A03	Equipment is appropriate to the EPL/Zone requirements of the location	X	X	X	X	X	X	X	X	X	X	X	X	X
A04	Equipment Group is correct	X	X		X	X		X	X		X	X		
A05	Equipment temperature class is correct (only for gas)	X	X		X	X		X	X					
A06	Equipment maximum surface temperature is correct (only for dust)	X	X					X	X		X	X		
A07	Degree of protection (IP rating) of equipment is appropriate for the location / level of protection (Gb, Dc etc) / group (IIA, IIIC etc)	X	X	X	X	X	X	X	X	X	X	X	X	X
A08	Equipment identification (e.g. pump/valve number) is correct	X			X			X			X			
A09	Equipment identification (e.g. pump/valve number) is available	X	X	X	X	X	X	X	X	X	X	X	X	X
A10	Equipment services (e.g. pneumatic, hydraulic line) identification is correct	X			X			X			X			
A11	Equipment services (e.g. pneumatic, hydraulic line) identification is available		X	X		X	X		X	X		X	X	
A12	There is no damage or unauthorised modifications	X			X			X			X			
A13	There is no evidence of unauthorized modifications		X	X		X	X		X	X		X	X	

Check that: X = required for all types, B, C and K = required for Ex 'b', Ex 'c' or Ex 'k' types		Ex 'h'			Ex 'd'			Ex 'p/pD'			Ex 't/tD'				
		Grade of Inspection													
		D	C	V	D	C	V	D	C	V	D	C	V		
A14	Bolts, plugs, breathers, elements, nipples, threaded covers, etc. are the correct type and specification, are complete and tight (correct torque) Physical check Visual check	X			X			X			X		X		
A15	Flameproof joint surfaces are clean and undamaged and gaskets, if any, are satisfactory and positioned correctly				X										
A16	Condition of enclosure gaskets/seals are satisfactory	X			X			X			X				
A17	Seals are of the correct type and are complete and tight with no evidence of leaks. Physical check, Visual check	X													
A18	There is no evidence of ingress of water or solids into the enclosure in accordance with the IP rating of the equipment	X			X			X			X				
A19	Dimensions of Flameproof flanged joint gaps are: -within the limits in accordance with manufacturers documentation or - within maximum values permitted by relevant construction standard at time of installation or - within maximum values permitted by site documentation				X										
A20	Breathing and draining devices are satisfactory	X			X			X			X				
EQUIPMENT SPECIFIC (ROTATING and LINEAR EQUIPMENT)															
A31	Motor fans have sufficient clearance to the enclosure and/or covers.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
A32	Bearings are of the correct type	X			X			X			X				
A33	Couplings are of the correct type and are complete	X			X			X			X				
A34	Guards are fabricated from the correct material (see manufacturer's specification) and are fitted correctly.	X													
B	INSTALLATION - GENERAL														
B01	Specific Conditions of Use (if applicable) are complied with (suffix 'X' Certificate)	X			X			X			X				
B02	Solid obstructions adjacent to flameproof flanged joints are in accordance with IEC 60079-14				X	X	X								
INSTALLATION - Ex 'b' protection by control of ignition source															
B11	Safety devices that are part of an Ex 'b' ignition protection system which are not intended to be placed in a hazardous area are marked [Ex h]. They must be located in a non-hazardous area and fitted with a warning label such as: "WARNING – this enclosure contains equipment forming part of an ignition protection system in accordance with ISO/IEC 80079-37".	B	B	B											

Check that: X = required for all types, B, C and K = required for Ex 'b', Ex 'c' or Ex 'k' types		Ex 'h'			Ex 'd'			Ex 'p/pD'			Ex 't/tD'			
		Grade of Inspection												
		D	C	V	D	C	V	D	C	V	D	C	V	
B12	The following checks/documents have been carried out/followed by another inspection (e.g. Functional safety, process) 1. Supplementary controls (instrumentation, sensors, safety devices) are functioning according to manufacturer's documents, and operated within permitted limits. 2. Ex 'b' manufacturer's instructions: a) relating to the action / reaction level settings of ignition protection systems have been followed. b) specifying the method and the frequency of routinely checking that the system is functioning and is calibrated correctly have been followed. 3. Ex 'b': manufacturer's specifications: Indicator(s), or gauge(s) or other similar types of monitoring device of any coolant, lubricant, or protective liquid necessary to maintain the ignition protection commensurate with the assigned Equipment Protection Level (EPL) when in service have been complied with respect to the correct level, pressure, and flow rate. 4. Where necessary, indicators or gauges intended for operator-controlled equipment are so arranged that they can be easily seen by the operator responsible for applying the control	B												
	INSTALLATION - Ex 'c' protection by constructional safety													
B21	Ex 'c' equipment is installed / operated within the design limits and show no signs of unauthorised modifications or wear and tear.	C												
	INSTALLATION - Ex 'k' protection by liquid immersion													
B31	Ex 'k': protective liquid is the correct type as per Manufacturer's Instructions. Details of the type of liquid to be used, any limitations of the liquids, correct level, or its minimum viscosity.	K												
B32	Ex 'k': specific mounting instructions have been followed	K												
B33	Ex 'k': breathing and draining devices are satisfactory.	K												
B34	Ex 'k': sealed enclosure pressure-relief devices are satisfactory	K												
B35	Ex 'k': level of the protective liquid is at or below the maximum and above the minimum permitted level	K	K	K										
B36	Ex 'k': enclosures which are not intended to be opened have no visible evidence that the enclosure has been opened	K	K	K										
B37	Ex 'k': the maximum working angle to the horizontal of the equipment is satisfactory	K	K	K										
B38	Ex 'k': enclosures which are intended to be opened are re-filled to within the required level range with the protective liquid required and re-sealed in accordance with the manufacturer's instructions	K												
B39	Ex 'k': the pressure and flow rate of the protective liquid is at or below the maximum and above the minimum permitted level;	K												
B40	Ex 'k': the dipstick (if provided) is secured in its measurement position and its seal is satisfactory	K	K	K										
B41	Ex 'k': the operation of any remote protective liquid level indicating device is satisfactory	K	K	K										

Check that: X = required for all types, B, C and K = required for Ex 'b', Ex 'c' or Ex 'k' types		Ex 'h'			Ex 'd'			Ex 'p/pD'			Ex 't/tD'		
		Grade of Inspection											
		D	C	V	D	C	V	D	C	V	D	C	V
	INSTALLATION - Ex 'p' - Pressurisation												
B51	Protective gas inlet temperature is below maximum specified												
B52	Ducts, pipes, and enclosures are in good condition												
B53	Protective gas is substantially free from contaminants												
B54	Protective gas differential pressure and/or flow is adequate												
B55	Pressure and/or flow indicators, alarms and interlocks function correctly												
B56	Conditions of spark and particle barriers of breathers or ducts for Exhausting the gas/ vapours in hazardous area are satisfactory												
	INSTALLATION - ROTATING and LINEAR EQUIPMENT												
B61	Assembly is correctly aligned, coupled, bolted e.g. PM (Pump + Motor), MGB (Motor + Gearbox)												
B62	Machine guards are in place, with adequate clearance												
B63	Equipment is securely mounted, with all fixings secure												
B64	Machine foundations have no indentations or cracks.												
B65	Cooling systems are undamaged												
B66	Equipment is free of apparent leaks												
B67	Lubrication systems are in good condition												
B68	Oil sight glass is showing the correct fill level												
B69	Equipment is free of abnormal noise when running												
B70	Equipment is free of abnormal vibration												
B72	Equipment housing is not running at excessive temperature (taken with thermography camera)												
B73	Equipment bearings are not running at excessive temperature (taken with thermography camera)												
B74	The following checks have been carried out by routine maintenance: Bearing temperature monitoring equipment Vibration monitoring equipment Flow monitoring equipment. Flow temperature devices are set correctly and operate within permitted limits.												
B75	Condition of connecting pipework and local support brackets is satisfactory												
B76	Type of connecting flange is appropriate, aligned with all bolts fitted and tight. Detailed & Close - Physical check. Visual - Visual check												
B77	Mechanical power transmission system Detailed: correct type, complete and tight. Close: condition is satisfactory.												

<p style="text-align: center;">Check that: X = required for all types, B, C and K = required for Ex'b', Ex'c' or Ex'k' types</p>		Ex 'h'			Ex 'd'			Ex 'p/pD'			Ex 't/tD'		
		Grade of Inspection											
		D	C	V	D	C	V	D	C	V	D	C	V
B78	Belt/chain tension is correct	X			X			X			X		
B79	Equipment (e.g. product valves adjacent to pumps) is correctly orientated (i.e. in accordance with Manufacturer's documentation).	X	X	X									
C	ENVIRONMENT												
C01	Equipment is adequately protected against corrosion, weather, vibration & other adverse factors	X	X	X	X	X	X	X	X	X	X	X	X
C02	No undue accumulation of dust & dirt	X	X	X	X	X	X	X	X	X	X	X	X
C03	No ingress of foreign materials within moving parts	X			X			X			X		
(D = detailed, C = close, V = visual)													

**Table M.2: Inspection Schedule for non-Electrical installations
Based on ISO/IEC 80079-36 and 80079-37
Covering Piping and Manually operated valves.**

Check that: X = required for all types		Grade of Inspection		
		D	C	V
D	PIPELINES AND PIPEWORK - Above Ground			
D01	There is no leakage from pipe joints. - physical check - visual check	X	X	X
D02	Pipework has no visible sign of mechanical damage or movement (Loose bolts)	X	X	X
D03	Pipe supports and anchors are secure. - physical check - visual check	X	X	X
D04	pipework has no sign of deterioration/corrosion. - physical check - visual check	X	X	X
D05	Bonding and earthing of pipes is satisfactory. - physical check - visual check	X	X	X
	VALVES INSPECTION - Manually Operated Valves			
D11	There is no leakage from the valve. - physical check - visual check	X	X	X
D12	Valve has no sign of deterioration and corrosion. - physical check - visual check	X	X	X
D13	Valves are locked off or capped	X	X	X
(D = detailed, C = close, V = visual)				

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