Legislation associated with Hazardous Locations

Pieter Coetzee

ZONE 2

ZONE 1

ZONE 0

Be safe be “Ex”
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Uncertified equipment is not allowed in hazardous locations
Hazardous Location Definition

An area in which an explosive gas atmosphere or combustible dust, in the form of a cloud is present, or may be expected to be present, in quantities such as to require special precautions for the construction, installation and use of equipment (SANS 60079-10-1)
The Fire Triangle

- **Oxygen**
- **Flammable Substance**
- **Ignition Source**
Possible results from explosions, incidents and fires

**Includes**

- **Loss** of life
- Loss of production (Financial Impact)
- Damage to plants
- Environmental impact

Explosion in Reynosa Mexico, Unofficially a leak of gas.

*Reynosa Mexico* reported the death of 30 contractors/PEMEX workers and 42 injured

- **Section 8** - Every employer shall provide and maintain, as far as is reasonably practicable, a working environment that is safe and without risk to the health of his employees.
Risk Analysis

- To see what everyone sees
- To think what nobody thinks
- To remember what everybody has forgotten
Appoint a competent person to ensure a safe and reliable work environment for all employees:

**GMR 2(1):** In order to ensure that the provisions of the Act and these Regulations in relation to machinery are complied with, an employer or user of machinery shall, subject to this regulation, in writing designate a person in a full-time capacity in respect of every premises on or in which machinery is being used.

**GMR 2(7)(a):** An employer or user of machinery may designate one or more competent persons to assist a person designated in terms of sub-regulation (1).
Occupational Health and Safety Act, 1993
Supervision of machinery (competent person)
General Machinery Regulation 2(1) - accountability

COMPANY NAME

OCCUPATIONAL HEALTH AND SAFETY ACT, 1993
SUPERVISION OF MACHINERY (COMPETENT PERSON)
GENERAL MACHINERY REGULATION 2(1)

(Appointee’s Name)

I, (Appointer’s Full Name) the (Legislative reference of appointment) appointee of (Appointer’s Area),
hereby appoint you (Appointee’s Name) as the General Machinery Regulation 2(1) appointee for
(Premises).

In terms of this appointment you must ensure that all machinery is in compliance with the
occupational health and safety legislation, implement a planned maintenance program and
ensure that the statutory machinery records are kept and maintained.

You are required to report any deviations of the legislation and above-mentioned
requirements to (CEO/Section 16(2) Appointee).

Your appointment is valid from (Date).

.............................................. ..............................................
(Appointer’s Full Name) (Date)

Kindly confirm your acceptance of this appointment by completing the following:

ACCEPTANCE
I, (Appointee’s Full Name) understand the implications of the appointment as detailed above and
confirm my acceptance.

.............................................. ..............................................
(Appointee’s Full Name) (Date)

Date
EIR 5(4) Design and construction

- A **registered person** shall exercise general control over all electrical installation work (**hazardous locations**) being carried out, and no person shall allow such work without such control.

- “**registered person**” means a person registered in terms of regulation 13 as an electrical tester for single phase, an installation electrician or a **master installation electrician**, as the case may be.

- “**master installation electrician**” means a person who has been registered as a master installation electrician in terms of regulation 13 and who has been approved by the chief inspector for the verification and certification of the construction, testing and inspection of any electrical installation;
Electrical contractor:

- employs a **registered person** in a full-time capacity, or is himself or herself a registered person
Identify Registered person - MIE
"installation work" means

- the installation, extension, modification or repair of an electrical installation;
- the connection of machinery at the supply terminals of such machinery; or
- the inspection, testing and verification of electrical installations for the purpose of issuing a certificate of compliance;

"specialised electrical installations" means electrical installations in

- explosive atmospheres as contemplated in SANS10086-1;
- the petroleum industry as contemplated in SANS 10089-2;
- hazardous locations as contemplated in SANS 10108; or
- medical locations as contemplated in SANS1 0142-1, published by Standards South Africa;
Hi Pieter: I suggest adding the definition of an electrical installation as well to add to the previous slide.
(1) Every employer or user shall identify all hazardous locations and classify them in accordance with the relevant health and safety standard incorporated into these Regulations under section 44 of the act.
Hazardous Area Classification /Map
SANS 60079-10-1
SANS 60079-10-2

South African Flameproof Association (SAFA)
Tel: 011 061 5000 | Fax: 086 686 7005 | Email: safaservices@vdw.co.za | Website: www.fip.co.za
(2) No person may use electrical machinery in locations where there is danger of fire or explosion owing to the presence, occurrence or development of explosive or flammable articles, or where explosive articles are manufactured, handled or stored, unless such electrical machinery, with regard to its construction relating to the classification of the hazardous locations in which it is to be used, meets the requirements of the safety standard

- **Equipment selection must follow the area classification**
- **Equipment must be appropriate to the area classification**
  - **Type of protection** – Ex d
  - **Gas/Dust group** - IIC
  - **Temperature class** – T3
  - ** Explosion Protection Level (EPL)** - Gb
## Equipment Protection Level (EPL)
### SANS 60079-0

<table>
<thead>
<tr>
<th>Group</th>
<th>Ex risk</th>
<th>Zone</th>
<th>EPL</th>
<th>Minimum type of protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>I (mines)</td>
<td>energized</td>
<td></td>
<td>Ma</td>
<td></td>
</tr>
<tr>
<td>I (mines)</td>
<td>de-energized in presence of Ex atmosphere</td>
<td></td>
<td>Mb</td>
<td></td>
</tr>
<tr>
<td>II (gas)</td>
<td>explosive atmosphere &gt; 1000 hrs/yr</td>
<td>0</td>
<td>Ga</td>
<td>ia, ma</td>
</tr>
<tr>
<td>II (gas)</td>
<td>explosive atmosphere between 10 and 1000 hrs/yr</td>
<td>1</td>
<td>Gb</td>
<td>ib, d, mb, px, py, e, o, q, s</td>
</tr>
<tr>
<td>II (gas)</td>
<td>explosive atmosphere between 1 and 10 hrs/yr</td>
<td>2</td>
<td>Gc</td>
<td>ic, nA, nC, nR</td>
</tr>
<tr>
<td>III (dust)</td>
<td>explosive surface &gt; 1000 hrs/yr</td>
<td>20</td>
<td>Da</td>
<td></td>
</tr>
<tr>
<td>III (dust)</td>
<td>explosive surface between 10 and 1000 hrs/yr</td>
<td>21</td>
<td>Db</td>
<td></td>
</tr>
<tr>
<td>III (dust)</td>
<td>explosive surface between 1 and 10 hrs/yr</td>
<td>22</td>
<td>Dc</td>
<td></td>
</tr>
</tbody>
</table>
(3) The employer or user who makes use of electrical machinery in hazardous locations must be in possession of a certificate, which is acceptable to the chief inspector, and which has been issued by an approved inspection authority. This certificate must certify that such electrical machinery has been manufactured and tested for the groups of dangerous articles in terms of the health and safety standards incorporated into these regulations.

- All Explosion Protected Equipment (EPE) must be certified by a local Accredited Approved Test Laboratory (ATL).
- All EPE must have an Inspection Authority (IA) certificate before any installation takes place as per ARP 0108.
- All Intrinsically Safe loops must have a loop calculation certificate approved by an ATL.
Annex c

Upgrading and maintenance of EPE certificates for mines and factories

C.1 In South Africa, all EPE used in underground mines (Group I) and on surface (Group II) shall be covered by an IA certificate. The requirements in C.2 to C.15 cover the validity of IA certificates.
Certified in possession of end user

### Annex to Certificate No S-XPL/07030

#### 1. GENERAL

The Vibration Switches are designed as a small flameproof enclosure in cast aluminum alloy with flanged joints and a volume below 500 cm³. The built-in electrical contacts (microswitch) can be operated by an operating rod passing through the cover of the enclosure. By means of a shaft the support can be adjusted from the outside of the enclosure. The vibration switches can be provided with or without a reset coil. The ambient temperature range is -40°C to 70°C

The relation between ambient temperature and the assigned temperature is as follows:

- Ambient temperature
- Temperature class
- T6

Based on the following documentation: DEMK002ATEK0212409.

#### 2. SAFETY PARAMETERS

- 480 VAC, max 15A, 250 VDC, max 1A
- 1/8 HP, 125 VAC / 1/4 HP, 250 VAC

#### 3. INSTALLATION INSTRUCTIONS

All power must be switched off before opening of the enclosure in an explosive atmosphere. The Vibration Switch must be electrically connected by means of a flameproof cable gland or stopping box certified to 60071-1 for ambient temperatures below -10°C and above +60°C use field wiring suitable for both minimum and maximum ambient temperature.

#### 4. SPECIAL CONDITIONS OF USE (X)

None.

#### 5. MARKING

The following marking must be added to the units in a legible and durable manner:

- Supplier: Pre Instrumentation
- A number: 8-XPL/07030
- Rating: Ex d IIB T6 or Ex d IIB-H2 T6

If the above marking does not appear on the unit, this certificate does not cover it.
**Certified IS Loop Calculation/Approval drawing.**

- IS loops can only be certified by a local Accredited Approved Test Laboratory (ATL)
- Legal requirements:
  - IA certificate for barrier or isolator
  - IA certificate for device in Hazardous Area
  - Approved calculation
  - Equipment installed as per calculation certificate
4) When diverse items of electrical machinery such as motors, cables and control apparatus are used together to form a system, the employer or user shall ensure that the selection, arrangement, installation, protection, maintenance and working of the system results in no less a degree of safety than when the individual items of such machinery are used separately.

- Certificate of Compliance (COC) must be issued after inspection, verification and testing – complete installation

- End user must be in possession of COC according to sub regulation 3
5) The employer or user shall use electrical machinery to which this regulation applies only under such conditions and in such surroundings as prescribed in the health and safety standard referred to in sub regulation (2).

- Only certified EPE can be use in Hazardous Locations
6) No employer or user shall effect repairs or adjustments to or otherwise work on electrical machinery under conditions envisaged by sub regulation (2) unless such machinery has been rendered dead and effective measures have been taken to ensure that such machinery remains dead.

- **Equipment must be positive isolated and locked out**
- **Entire installation is not compromised by repair or maintenance**
  - By not creating any risk of fire or explosion
  - Restore EPE integrity to its original design

- **Note:** Repairs can only be done under a mark scheme !!!
7) Wherever there is a possibility of the formation of static electricity under working conditions, the employer or user shall earth all metallic structures, machine parts, pneumatic conveyor ducts and pipelines conveying flammable articles and the like, or take such other measures as may be necessary to prevent the formation of electric sparks.

- Proper earthing and bonding
- Correct lightning protection schemes
(8) The employer or user shall cause all electrical machinery in a hazardous location to be visually inspected and tested at intervals not exceeding two years, or any other interval approved by the chief inspector after a risk assessment has been conducted by a person who is competent to express an opinion on the safety thereof: Provided that installed intrinsically safe equipment may in lieu of a test be verified in terms of the approved design.

- All EPE must be **Visually inspected** every two years
  - Record keeping is a key criterion
  - Inspections must be auditable

- A period shorter than 2 years (1 year) is recommended where machinery is exposed to adverse climate or physical conditions
  - Frequency can be determined/shortened by **Sample inspections**

- Only a competent person can execute Ex inspections
Certified approved IS loop calculations drawings must be used to inspect all IS loops.

- **Equipment must be verified per loop**
  - Loop must be linked to certified IS loop calculation certificate
  - Barrier or isolator as per IS loop certificate
  - Device in hazardous area as per IS loop certificate
  - Cable type/length as per IS loop calculation certificate

- **Note:** IS loop needs to be recertified if equipment replaced is not “in-kind”
9) The person carrying out the examination referred to in sub regulation (8) shall enter, sign and date the results of each examination in a record book which shall be kept by the employer or user for this purpose

- Record keeping is a key criterion
- Inspections must be auditable
## Legal responsibilities

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<th>Description</th>
<th>Regulation</th>
<th>Standard</th>
<th>Responsibility</th>
</tr>
</thead>
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<tr>
<td>Area Classification</td>
<td>EMR 9(1)</td>
<td>SANS 10108</td>
<td>Plant owner (Competent personnel; committees or consultant)</td>
</tr>
<tr>
<td></td>
<td>EIR 4(1)</td>
<td>SANS 60079-10</td>
<td>Production Manager</td>
</tr>
<tr>
<td>Selection of Ex equipment</td>
<td>EMR 9(2)</td>
<td>SANS 10108</td>
<td>Plant owner and projects (Engineering)</td>
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<tr>
<td></td>
<td>EIR 4(1)</td>
<td></td>
<td>Electrical Engineering Manager</td>
</tr>
<tr>
<td>Installation of Ex equipment</td>
<td>EMR 9(1)</td>
<td>SANS10086-1</td>
<td>Plant owner done by own personnel or contractors</td>
</tr>
<tr>
<td></td>
<td>EMR 9(2)</td>
<td>SANS 60079-14</td>
<td></td>
</tr>
<tr>
<td></td>
<td>EIR 4(1)</td>
<td>SANS10142-1</td>
<td></td>
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<tr>
<td>Certification of Ex equipment</td>
<td>EMR 9()</td>
<td>SANS 10108</td>
<td>Approved test Laboratory(ATL)</td>
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<td></td>
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<td>ARP 0108</td>
<td></td>
</tr>
<tr>
<td>Maintenance and inspection of Ex equipment</td>
<td>EMR 9(8)</td>
<td>SANS 10086-1</td>
<td>Plant owner( All Ex equipment must be inspected every two years) OSH ACT</td>
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<tr>
<td></td>
<td>EIR 2(1)</td>
<td>SANS 60079-17</td>
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<td>SANS 10142-1</td>
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<tr>
<td>Repair of Ex equipment</td>
<td>EIR 2(1)</td>
<td>SANS 10086-3</td>
<td>Manufacturer -OEM</td>
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<td>SANS 10142-1</td>
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</tr>
<tr>
<td>Certificate of compliance (COC)</td>
<td>-</td>
<td>SANS 10142-1</td>
<td>MIE test installation and make sure it complies and then issue a COC</td>
</tr>
</tbody>
</table>
Conclusion:
Risk assessments are always important

Can risk assessment avoid accidents?
What methods should be used?
Don´t be too sure

- You've carefully thought out all the angles.
- You've done it a thousand times.
- It comes naturally to you.
- You know what you're doing, it's what you've been trained to do your whole life.
- Nothing could possibly go wrong, right?
Think Again