



Fundamentals of Area Classification

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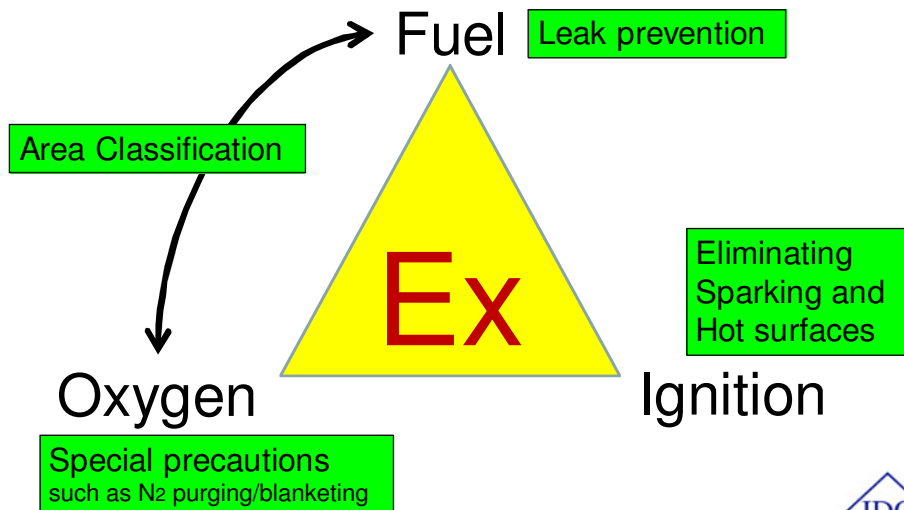


OVERVIEW

- Basics of Explosion prevention.
- Basics of Area Classification (AC).
- Essential Information on AC.
- Case study one and two: AC of Surface Plant handling and producing flammable gasses.
- Case study three: AC of plant handling flammable dusts.
- Conclusion and Pitfalls.



Basics of Explosion prevention



Basics of Area Classification

- Start with SANS10108 that will refer you to one of the several AC standards.
- Try to stick to one standard.
- Gather documentation to be able to:
 - Capture Process description (to allow future readers to trace changes to the plant).
 - Identify the flammable material and its properties (MSDS).
 - Identify level of ventilation.
 - List Sources of release.



Information to include in AC Documents

- AC Report and Drawing
 - In order to select equipment include the:
 - Zone
 - T- class (T1-T6)
 - Material Group (I/IIA-IIIC/IIIA-IIIC)
 - To be able to back trace the calculations include:
 - Material Class
 - Housekeeping
 - Process
 - Ventilation
 - Risk analyses
 - Who was involved
 - Information sources

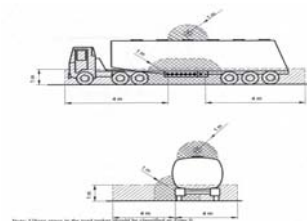
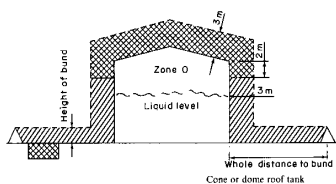
} Essential

} Traceability



Area Classification Gasses

- DIRECT EXAMPLE
- (standard installations, e.g. vehicle refuelling stations).
- NOTE - Same products and conditions must apply.



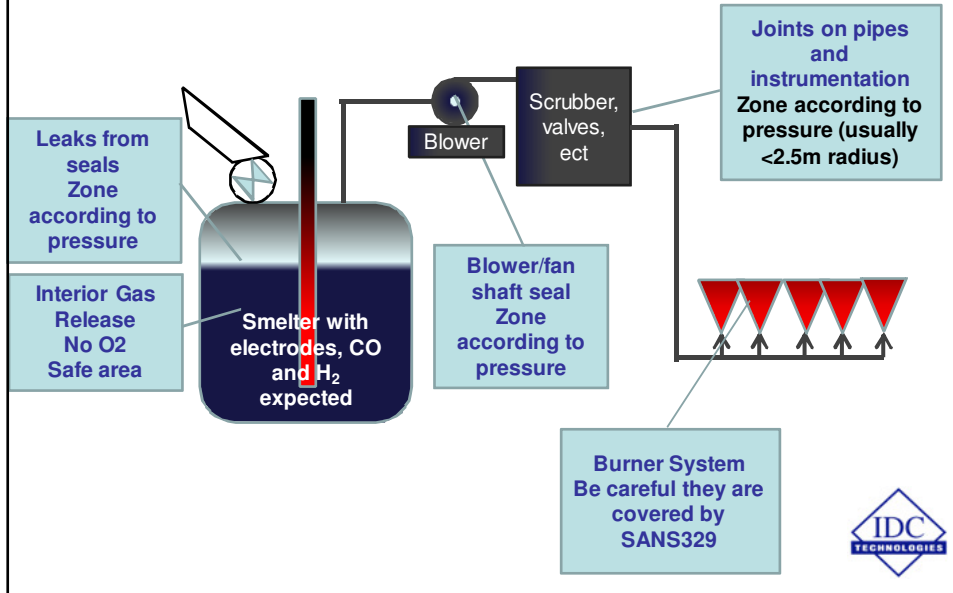
OR

- DISPERSION THEORY using SOURCES OF RELEASE.

• If the release rate for secondary sources of release cannot be determined by dispersion theory, a RISK-BASED CALCULATION can be done.

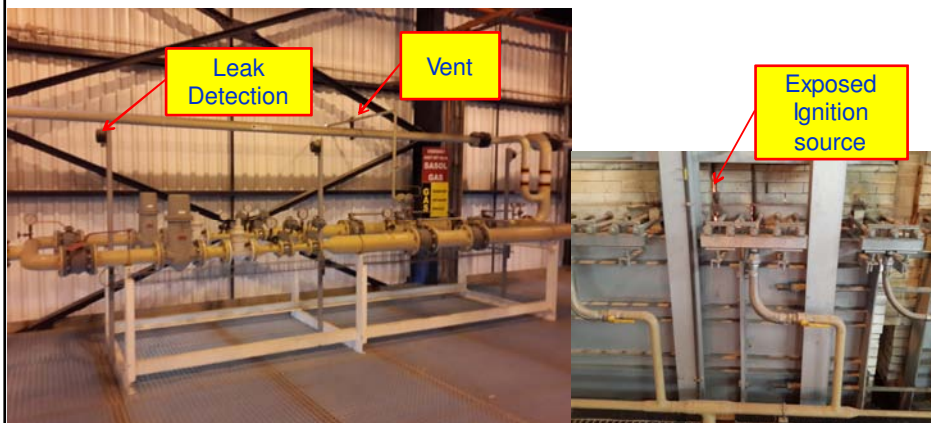


Case two: Metal Smelter



Burner Systems

Use burner Safety Standard

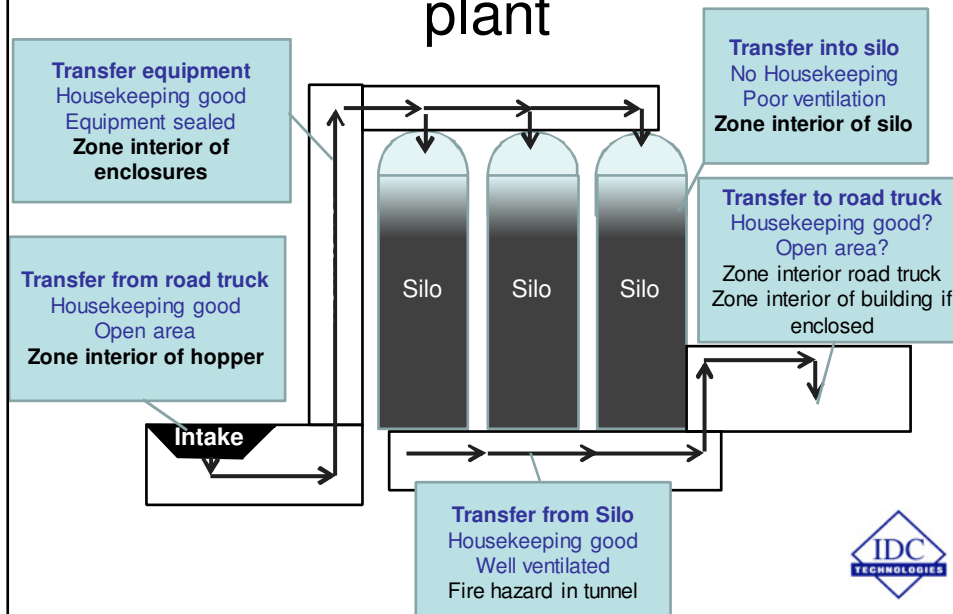


Area Classification for Dusts

1. Dust must be in suspension (must form dust clouds) and small (<0.5mm) to be explosive.
2. Layers not timeously removed may causes fires or even participate in explosions when disturbed. HOUSEKEEPING!!
3. "Cremora" rule: If the dust clouds are inside, it is a Zone 20. If they are outside, it is Zone 21. If there are dust layers on top of equipment, it is Zone 22.



Case Three: Grain handling plant



Other Examples Of Dust Plants



Mist or Spray Formation

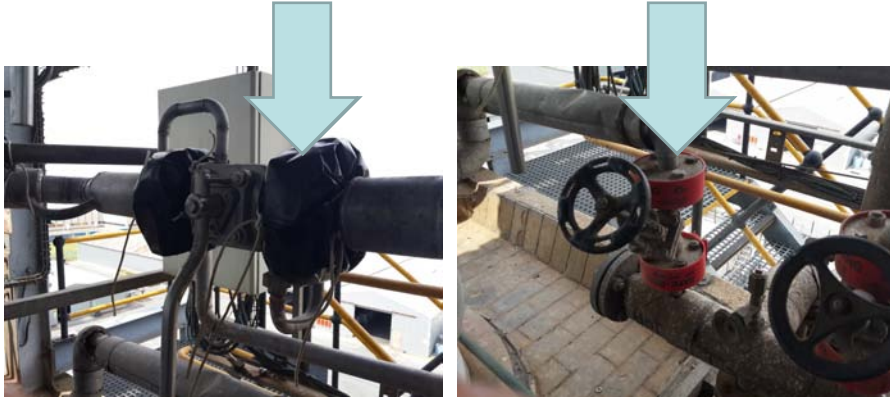
- Mist or sprays can be found in Annex D of SANS 60079-10-1:2010.
- It warns however that flammable materials handled at process temperatures below its flash point can form a flammable mist but it should not be over emphasised since some releases (such as flanges) will tend to drip rather than form a mist.
- According to IP Part 15 the interior of tanks handling flammable materials (including diesel) should be regarded as a Zone 0 due to the possibility of mist or spray formation.
- Other long discussions was included in IP Part 15 on mists and sprays.

Due to the possibility of mist, spray formation, the ullage space of Class II(1) and III(1) tanks should also be regarded as Zone 0. It is recommended that the area surrounding any vents or openings on the roof of such a tank be regarded as Zone 1 to a radius determined using section 5.4.4.2 at the vent tip.

	point
Class III(1)	Liquids that have flash points above 55°C up to and including 100°C, handled below flash point



Mist or Spray Prevention



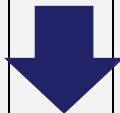
Laboratories

- Highly impractical to have zones
 - Limit the Volumes (IP 15, suggest <25ℓ)
 - Store closed containers in dedicated places
 - Decant in fume cupboards
 - Isolate gas cylinders outside LAB
 - Conduct leak checks on gas lines
 - Competent persons in LAB



Capturing the information

Equipment		SOR	Grade of release (C/P/S)	Flammable Material		Ventilation		Hazardous Area			Reference
ID	Item			P (kPag)	T (°C)	Type	Degree	Zone	Horiz (m)	Vert (m)	
Booth A and B											
1	Spray gun	Spray gun nozzle.	P	5 000 (assumed maximum for spray gun)	Amb	N	A	1	5	5	IP 15 Table C9 with nozzle release hole size equivalent of 2mm.



Extend to include the interior of the booth.



Example of the "Old" approach

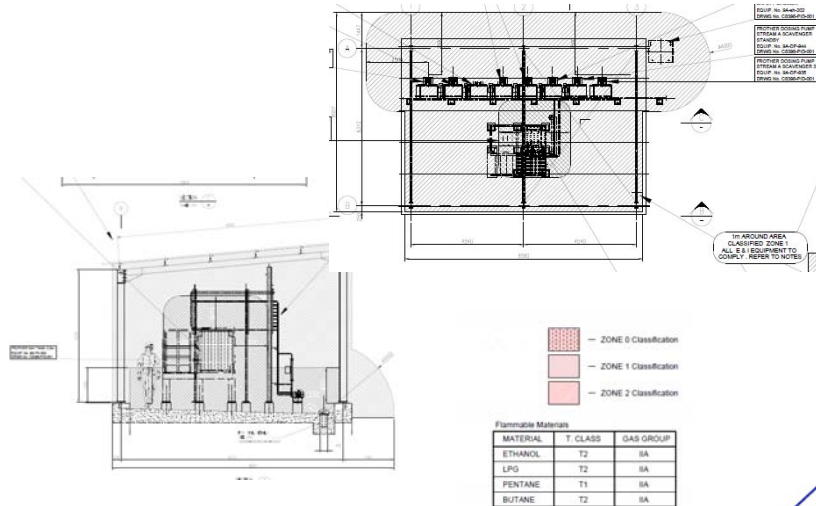
APPENDIX A
HAZARDOUS AREA CLASSIFICATIONS

1	Ammonia Bulk Storage	Safe Area (comply To OHSAct)
2	Ammonia/Caustic/Acid off Loading bay	Safe Area (comply To OHSAct)
3	Chemical make-up Tank Room	Safe Area (comply To OHSAct)
4	Battery rooms	Zone 2
5	Diesel/Fuel oil/Dirty oil bulk storage tankes	Zone 2
6	FRF/ Turbine Lube Oil room	Safe Area (comply To OHSAct)
7	Fuel Oil Pumps	Safe Area (comply To OHSAct)
8	Generator seal oil Plant	Zone 2
9	H2 Detraining Tanks	Zone 2
10	H2 Plant	Zone 2
11	Laboratory (Damp cupboards)	Zone 1
12	Lab Gas Store	Zone 2
13	LP Gas Storage Tank	Safe Area (comply To OHSAct)
14	Milling Plant/ Cable Racks/ Coal Plant	Zone 22
15	Oil Store	Safe Area (comply To OHSAct)
16	Paint store	Zone 2
17	Petrol Pump Station	Zone 1/ Zone 2
18	Spray Booth	No Spray booth (Zone 1)
19	Unit Diesel Generator Supply Tank	Zone 2
20	Unit H2 Distribution	Zone 2
21	Sewage Plant	Not classified
22	Diesel tanks (coal stock yard & Ash disposal)	Not classified

Zone 2, but where?



Area Classification Drawings



Signage in Zoned Areas

SANS 10108:2014, Annex E



Gevaargebied
Hazardous location

Zone 2, interior volume of gas cabinet.
Gas group: IIC
Temperature Class: T6
Special conditions:
Cylinder valves to be closed after use.
Cylinders cabinets to be closed.



Conclusion and pitfalls

- “Block Zoning” becomes impractical.
- Leave enough Zone 2 areas (in stead of just having Zone 1).
- Zones not enough detail in report.
- Gas groups and temperature class.
- No Ex zone at ignition sources, burners,
Zone + Ignition = Explosion
- Consider housekeeping for dust handling plants.



References

- SANS 10108 Edition 6: 2014 “The classification of hazardous locations and the selection of equipment for use in such locations”.
- Edition 3: 2005 of Part 15 of the IP Model Code of Safe Practice in the Petroleum Industry, “Area Classification Code for Installations Handling Flammable Fluids”, IP 15 for short.
- SANS 60079-10-1:2010 “Explosive atmospheres – Part 10-1: Classification of areas – Explosive gas atmospheres”.
- SANS 60070-10-2:2009, Explosive atmospheres part 10-2: Classification of areas – Combustible dust atmospheres.
- SANS 10089-3:2003 “The installation of underground storage tanks, pumps/dispensers and pipework at service stations and consumer installations”.
- Paper by Dr. Paul Roberts, “Hazardous Laboratory Design Compliance Requirements”.

