

The image shows an industrial facility with several large, cylindrical storage tanks and a complex network of pipes and walkways. The scene is dominated by a large blue diagonal overlay that covers the left and center portions of the image. The background is a clear blue sky.

Precision Digital Presents

The Fundamentals of Hazardous Area Classifications

Presenter



Joe Ryan
VP of Sales &
Marketing

Agenda

01

Why classify an area as hazardous

02

Definition of a Hazardous Location

03

Classification – Div, Area, Class

04

Methods of protection

05

Markings and Specifications



Objectives and Takeaways

01

Learn the basics of why and how hazardous areas are labeled and classified

02

Learn how to breakdown the alphabet soup of labels, markings, agencies and regulations

03

Put it all together with an analysis of a real-world product label

Why Classify an Area as Hazardous



**Eliminate the potential
for an explosion**

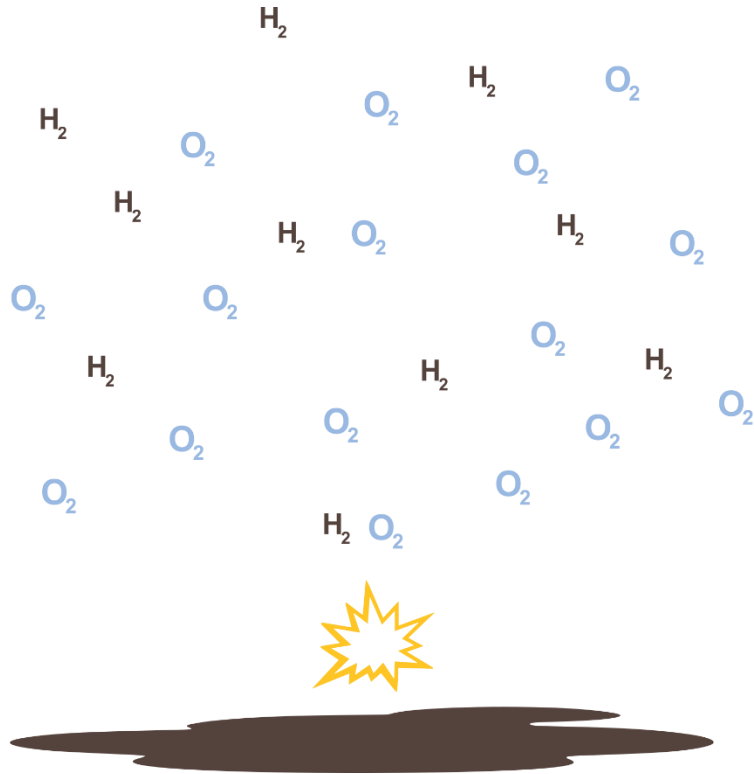


**Promote the safety of
personnel**



**Prevent property
damage**

Elements Necessary for an Explosion



Ignition source

(spark, high heat, open flame, etc.)



Oxidizer

(usually the Oxygen in air)



Flammable substance

- Flammable gas, i.e. Hydrogen
- Flammable liquid or vapor, i.e. gasoline, acetone, kerosene
- Flammable solids, i.e. dust, fibers, etc.

Typical Locations Where Explosions Occur



Paint shops



Corn or flour mills



Refineries



Chemical plants



Liquid transfer terminals



Tanks

3 Ways to Prevent an Explosion

1



Contain the explosion, such as with explosion proof devices and enclosures

2



Remove the possibility of a spark or other potential source of ignition with as with intrinsically safe or non-incendive designs

3



Isolate the explosive substance from ignition sources such as with purged panels

Regulations, Guidelines and Laws



- OSHA
- National Electrical Code NEC (US)
- Canadian Electrical Code CEC (CA)
- National Fire Protection Association NFPA
- Insurance requirements



North American Agencies



Factory Mutual (FM)

- Private insurance organization
- Popular US industry standard
- Tests products for approval



Underwriters Laboratories (UL)

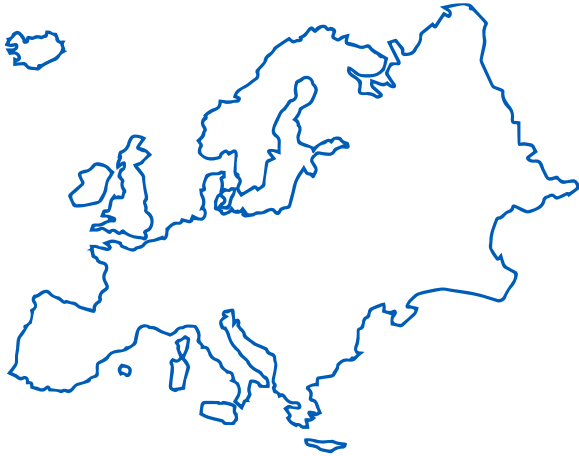
- Private standards testing organization
- Popular US & Canadian industry standard
- Tests products for approval
- NRTL & CSA inter-agency agreements



Canadian Standards Association (CSA)

- Government -driven organization
- Tests products for approval
- Purchased SIRA for global reach
- UL inter-agency agreements

Outside North America



ATEX (Appareils destinés à être utilisés en Atmosphères Explosives)

- European Union (EU) and other worldwide countries
- Set of harmonized standards
- Testing performed by Notified Bodies
- What ATEX means to US companies
 - Applicable to international business/companies



IEC (International Electrotechnical Commission)

- HQ Geneva
- European Union (EU) and other worldwide countries
- Competitor to ATEX
- Testing performed by Notified Bodies
- What IEC means to US companies
 - Applicable to international business/companies

Hazardous Area Ratings



Area classifications



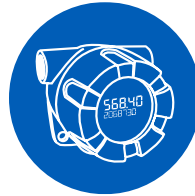
Division and/or zone



Equipment group



Temperature class



**Protection concepts
(application area and standard)**



NEMA/IP Codes

Class Definition



Class I

Areas where flammable vapors or gases may be present

Typical Environments

- Oil refinery
- Paint shops
- Offshore oil Rig



Class II

Areas where combustible dust may be present

Typical Environments

- Coal mine
- Grain silo
- Hay storage



Class III

Areas where ignitable fibers or flying debris may be present

Typical Environments

- Paper mill
- Textile mill
- Woodworking facility

Area Classification Guidelines

- Classifications describe the frequency of the presence of combustible gasses and dusts within the hazardous area
- Area Classifications Include
 - Divisions – Popular in the United States.
 - Zones – More detailed than Divisions, including different classifications for gasses and dusts. Popular in Europe.



Divisions (or Zones)



Division 1

Hazardous or ignitable substance present or expected to be present for long periods of time under normal operating conditions.



Division 2

Hazardous or ignitable substance only present under abnormal conditions (i.e. leaks)



Zones

Are newer (late 1990's) classifications to North America, based on more international standards.

Gas and Dust Area Classifications

Flammable Material	Present Continuously	Present Intermittently	Present Abnormally
IEC / EU	Zone 0	Zone 1	Zone 2
US NEC 505	Zone 0	Zone 1	Zone 2
US NEC500	Division 1		Division 2
CA CEC Section 18	Zone 0	Zone 1	Zone 2
CEC Annex J	Division 1		Division 2

IEC classification per IEC 60079-10

EU classification per EN 60079-10

US classification per ANSI/NFPA 70 National Electrical Code® (NEC®) Article 500 or Article 505

Reprinted from Guide to Hazardous Locations, CA classification per CSAC22.1 Candian Electrical Code (CEC) Section 18 or Annex J

Explosive Gas Atmospheres, FM Approvals, © 2008

Combustible Dust	Present Continuously	Present Intermittently	Present Abnormally
IEC / EU	Zone 20	Zone 21	Zone 22
US NEC 505	Zone 20	Zone 21	Zone 22
US NEC500	Division 1		Division 2
CA CEC Section 18	Division 1		Division 2

US classification per ANSI/NFPA 70 National Electrical Code® (NEC®) Article 500 or Article 506

CA classification per CSAC22.1 Candian Electrical Code (CEC) Section 18 or Annex J

EU classification per EN 61241-10

Reprinted from Guide to Hazardous Locations, IEC classification per IEC 61241-10

Explosive Dust Atmospheres, FM Approvals, © 2008

Questions?

- Please enter your questions in the Chat window



Groups

Traditional U.S. and Canada

US NEC® 500 or CA CEC Annex J Groups

- Group A – Acetylene
- Group B – Hydrogen, Butadiene, Ethylene Oxide, Propylene Oxide
- Group C – Ethylene, Cyclopropane, Ethyl Ether
- Group D – Propane, Acetone, Ammonia, Benzene, Butane, Ethanol, Gasoline, Methane, Methanol, Natural Gas

Note: These are different than Mine Safety and Health Administration (MSHA) Approvals and Certifications.

International

US NEC® 505 or CA CEC Section 18, EU, IEC

- Group IIC – Acetylene
- Group IIB + H2 – Hydrogen
- Group IIB – Ethylene
- Group IIA – Propane
- Group I - Methane

Temperature Class

- Maximum ambient surface (under dust) temperature the device can reach.
- Rated to prevent combustion
- Varies based on the internal heating elements of the device

Note: Traditional US and Canadian systems may include T2A, T2B, T3C, etc. for more precise temperature ratings.

An Enclosure Alone is Not Enough

- Look for fully approved products. Just putting equipment in an enclosure does not fully approve it.



T-Class	Hazards which will not ignite at temperatures below:
T1	450°C
T2	300°C
T3	200°C
T4	135°C
T5	100°C
T6	85°C

Protection Concepts

- Protection concepts and example protection concepts include:
 - No arcs, sparks, or hot surfaces
 - Increased Safety, Non-Incendive
 - Containing the explosion and extinguishing the flame
 - Explosion-proof, flame-proof, powder-filled
 - Limiting energy of spaces and surface temps
 - Intrinsically Safe
 - Keeping flammable materials out
 - Pressurized, encapsulation, oil emersion, fiber & flying protection, protection by enclosure
- Common European approvals include markings such as AEXd (Flameproof C1 Z1) and Ex ia (I.S. CI Z0).



Common NEMA/IP codes

Overview

- NEMA – Generally accepted in North America
- Ingress Protection (IP) Code – Generally accepted worldwide
- Both indicate physical protections against water and material ingress, but are slightly different. Not harmonized, and no exact cross-over is possible.
- Most often, NEMA is used for protection against water and corrosion
- Additional NEMA classifications can include hazardous area protections, NEMA 7, 8, 9, 10

NEMA 4

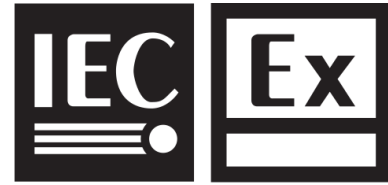
Indoor/outdoor protection to personnel against access to hazardous parts, protected against solid foreign objects (falling dirt, blown dust, etc.), ice, and hose-directed water.

NEMA 4X

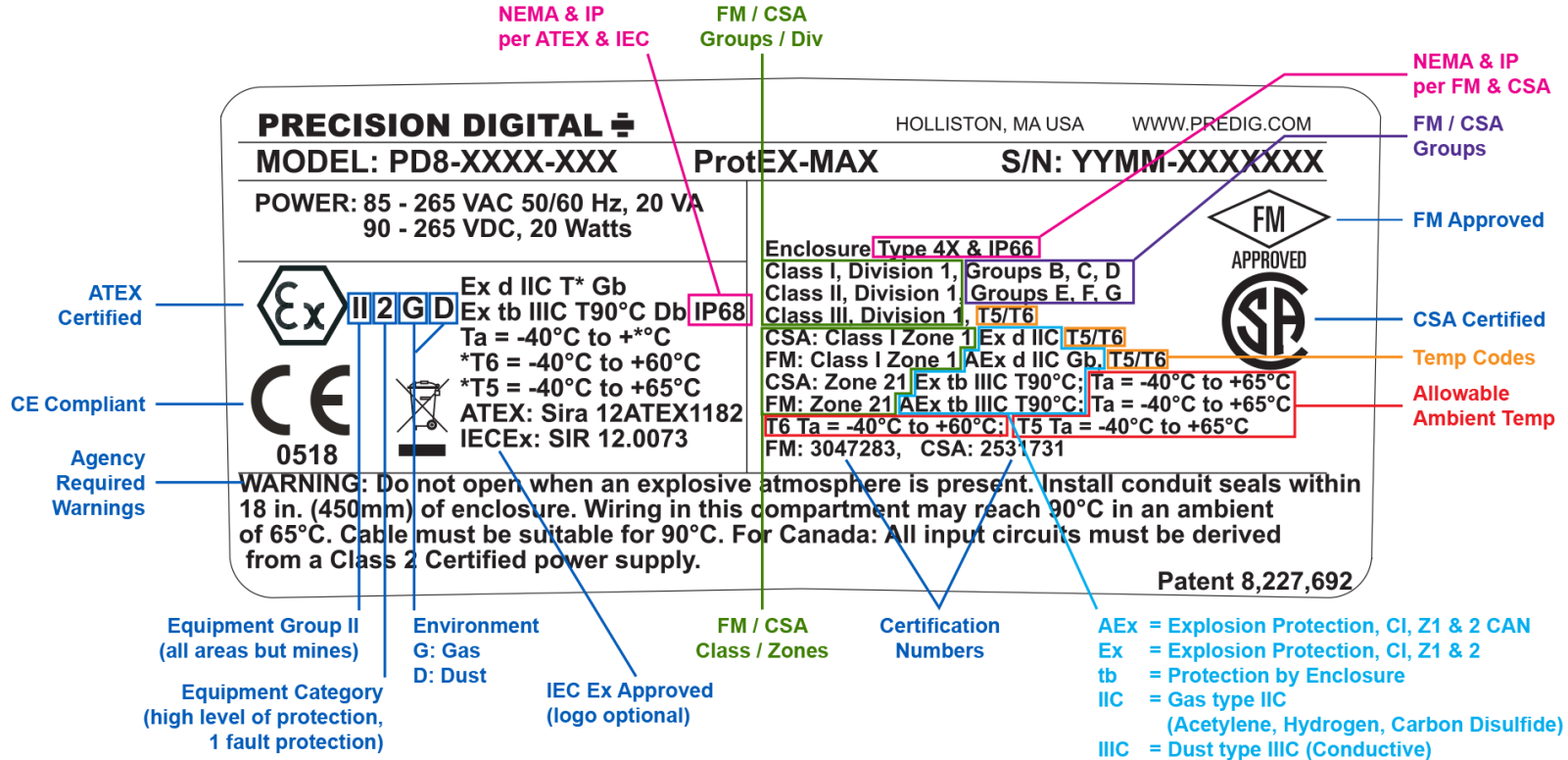
Similar to NEMA 4, with the addition of corrosion resistance.

- IP 55: Protection against dust and liquid such as water jets.
- IP 65: Dust-tight and protected against water jets.
- IP 66: Dust-tight and protected against powerful water jets and high seas.

Marking, Symbols & Specifications (Many Variants)



Explosion-Proof Label Sample



What Kind of Equipment or Protection Method Do I Need?

When it comes to instrumentation, two common choices.



1. Intrinsically Safe or Non-Incendive

- LCD display (Possibly Backlit)
- Low Power electronics
 - Transistor, passive 4-20 mA outputs
 - Precision Digital offers solid state relay outputs
- Loop-powered
- Lower cost instruments
- Non-incendive avoids barrier requirements in Div 2 areas



2. Explosion-Proof

- Bright LED and LCD Displays
- More features available
 - Mechanical relays, powered 4-20 mA outputs possible
 - Serial Communication
 - Precision Digital offers 24 VDC power supplies
- Line powered (high or low voltage)
- Popular for inherent ruggedness

Other Considerations

- Confirm you have the approvals you need for your Class, Division, Group, Temperature, etc.
- Often a facility has a preferred protection method.
- A facility also has preferred Marks, which may limit available equipment.
- Input & Output Requirements of the transmitters, pumps, valves, and other equipment.
- Mounting and Location preference.
- Expertise of the installers and operators.

Examples – Tank Level Displays



PD6600 4-20 mA Loop-Powered Meter

- Loop Powered (1.5 Volt Drop, 4.5 V w/Backlight)
- ATEX and IECEx Certified as I.S.
- UL & C-UL Listed as I.S. & Nonincendive
- NEMA 4X, IP65 Front
- Free PC-Based USB Programming Software
- Two Open Collector Outputs Standard
- Optional Loop-Powered Solid State Relays
- Optional Passive 4-20 mA Analog Output
- Relay Pump Alternation Based on Level and Runtime
- -40 to 167°F (-40 to 75°C)
- Starting at: \$329



PD6800 Loop-Powered Exp-Proof Meter

- Loop Powered (3.0 Volt Drop, 6.0 V w/Backlight)
- FM, CSA, ATEX, and IECEx Approvals
- Modern, Practical Enclosure for Hazardous Locations
- Explosion-Proof, IP68, NEMA 4X Enclosure
- Complete Product Approvals
- Available with Open Collector Outputs
- SafeTouch® Through-Glass Button Programming
- Flanges for Wall or Pipe Mounting
- -40 to 167°F (-40 to 75°C)
- Starting at: \$799



PD8-6000 Explosion-Proof Meter

- Line Powered (High or Low, AC or DC Voltage)
- SunBright LED Display Standard
- FM, CSA, ATEX, and IECEx Full Product Approvals
- Up to 4 Form C Mechanical Relays, Isolated Powered 4-20 mA Output, and 4 Digital Inputs
- Isolated 24 VDC @ 25 mA Transmitter Power Supply
- Relay Pump Alternation
- Modbus RS-485 Serial Communications
- Onboard USB MeterView® Pro Programming Software
- SafeTouch® Through-Glass Button Programming
- Flanges for Wall or Pipe Mounting
- -40 to 149°F (-40 to 65°C)
- Starting at: \$1,598

Questions?

- Please enter your questions in the Chat window





Thank you.

For additional questions

Please contact your local Gilson salesperson.
You can find them online at gilsoneng.com.

50th Anniversary



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