

Understanding Hazardous Locations Concepts

EXTREME TELEMATICS CORP.

ETC
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Disclaimer

The content of this presentation is meant to be informative and cover the basic concepts behind hazardous locations. It is not intended to provide guidance for any particular installation and should not be relied on when making any decision regarding hazardous locations. Please consult your local electrical code for the applicable regulations as it will vary from region to region.

Overview

- ▶ What is the difference between **Intrinsically Safe** and **Explosion Proof**?
- ▶ What does the **Class** mean?
- ▶ What is the difference between **Div** and **Zone**?
- ▶ What are the other codes and ratings and how to read a certification label?
- ▶ Who develops standards and what are certification or testing organizations?

Reading a Certification Label

Manufacturer

Model Number

Serial Number

Ex Code

Class

Zone

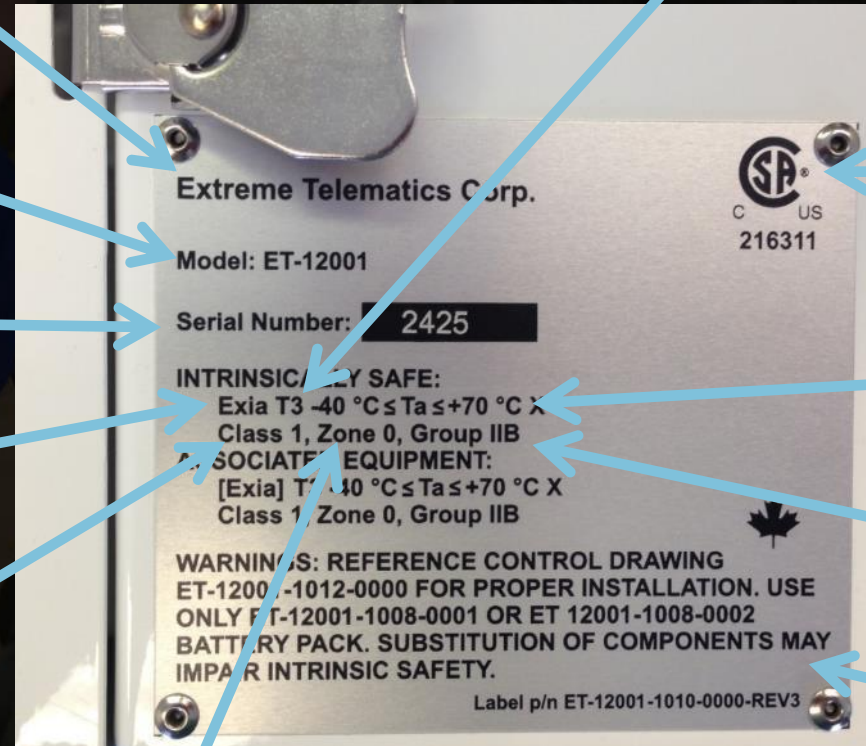
Surface
Temperature

Certifier Logo

Ambient
Temperature

Gas Group

Other
Instructions

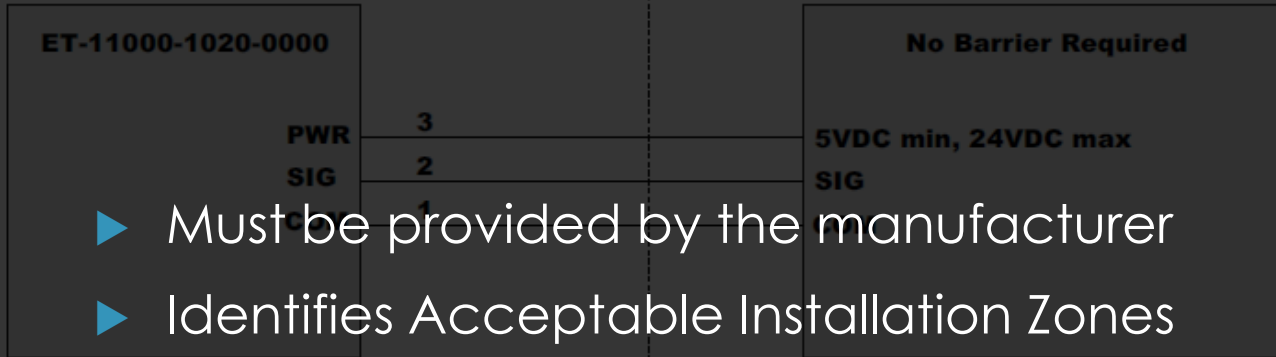


HAZARDOUS (Classified) LOCATION

Non HAZARDOUS

(Unclassified) LOCATION

Control Drawing



- ▶ Must be provided by the manufacturer
- ▶ Identifies Acceptable Installation Zones

▶ Details all connections with equipment outside the Zone

▶ Entity Parameters

- ▶ Ratings for each connection

- ▶ Includes Voltage, Current, Power, Capacitance, and Inductance

- ▶ Warnings and special notes

Entity Parameters:

Model ET-11000-1020-0000

Terminal 1,3	Terminal 1,2
V_{max} or $U_i = 28V$	V_t or $U_o = U_i$
I_{max} or $I_i = 175mA$	I_t or $I_o = 0.60 mA$
P_{max} or $P_i = 1W$	P_t or $P_o = 4.2mW$
$C_i = 2.0nF$	$C_a = 400nF$
$L_i = 1\mu H$	$L_a = 5mH$

NOTES:

1. WARNING: DO NOT OPEN WHILE ENERGIZED

2. WARNING: THIS DEVICE MUST NOT BE CONNECTED TO ANY ASSOCIATED APPARATUS THAT USES OR GENERATES MORE THAN 250V RMS OR 250V DC WITH RESPECT TO EARTH.

3. The installation must comply with national installation requirements. (for example to Canadian Electrical Code Section 18 or to United States National Electrical Code Article 501.

4. Figure 2 shows the wiring order for the connector plug, WECO p/n 120-D-111/03.

5. Housing: KILLARK Model GECCT-1

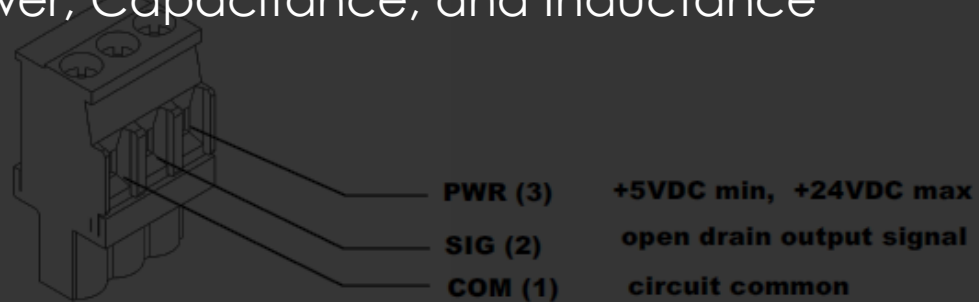


Figure 2.
Connector Plug.

Intrinsic Safety vs. Explosion Proof

- ▶ Intrinsic Safety

- ▶ Will not ignite the explosive atmosphere
- ▶ Voltage, current, and capacitance is designed to be low
- ▶ Component temperature does not exceed a threshold
- ▶ Internal spacing far enough apart to avoid arcing

- ▶ Explosion Proof

- ▶ Contains a potential explosion
- ▶ Less design constraints
- ▶ Can receive higher voltages and currents from other areas



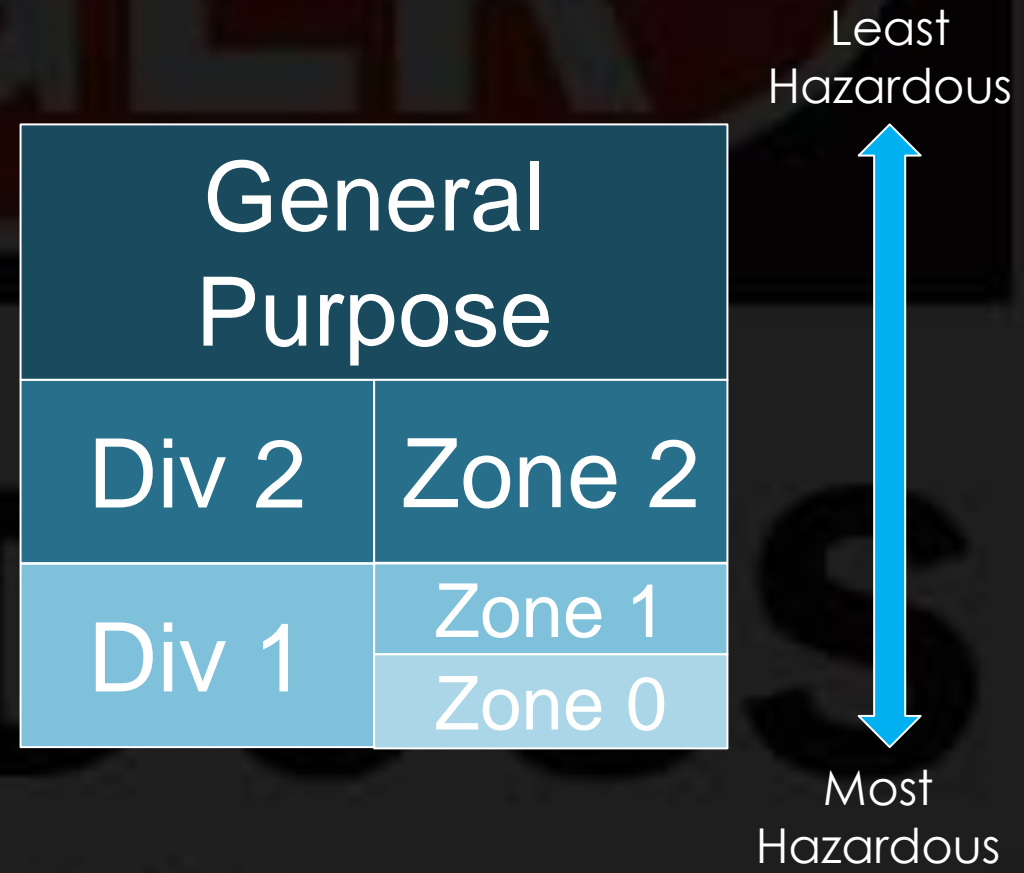
What Does the **Class** Mean?

- ▶ Each class identifies a different type of flammable material
- ▶ Class I
 - ▶ Flammable gases or vapors
 - ▶ Typically seen in Oil and Gas
- ▶ Class II
 - ▶ Combustible or electrically conductive dust
 - ▶ Typically seen in farming (i.e. Grain Dust)
- ▶ Class III
 - ▶ Ignitable fibers or flyings in the air



Divisions vs. Zones

- ▶ General Purpose – Not hazardous
- ▶ Divisions
 - ▶ Division 2 – Hazard exists in abnormal conditions
 - ▶ Division 1 – Hazard exists in normal conditions
- ▶ Zones
 - ▶ Zone 2 – Explosive atmosphere not normal
 - ▶ Zone 1 – Explosive atmosphere likely
 - ▶ Zone 0 – Explosive atmosphere continuous



Zone Examples

- ▶ Zone 0

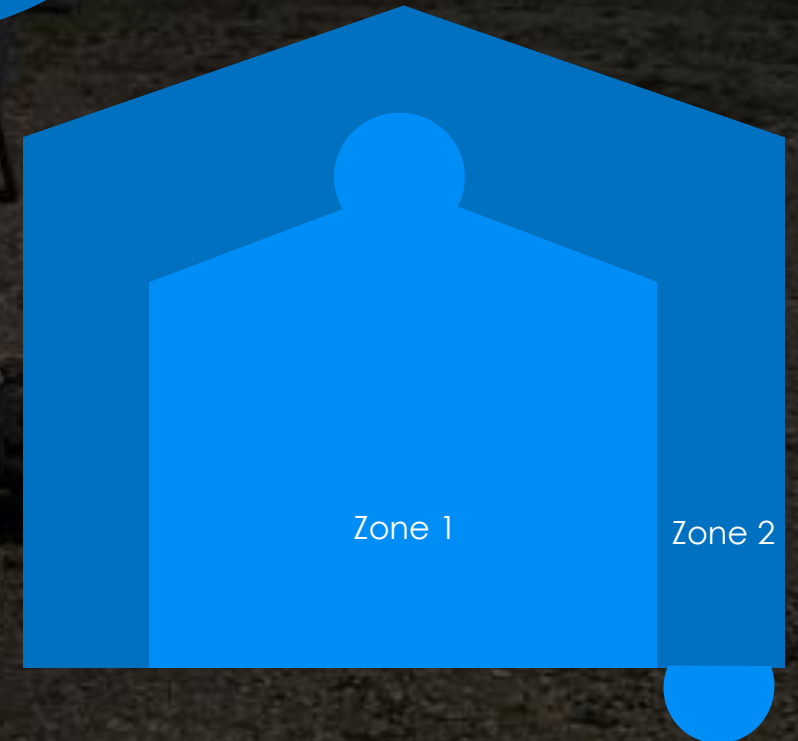
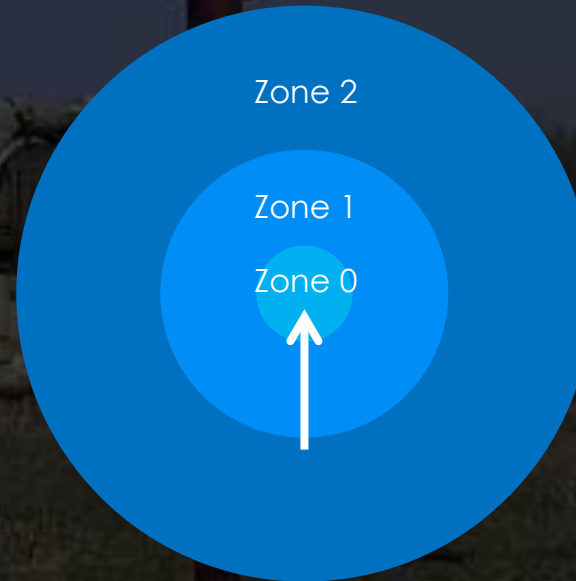
- ▶ Inside a Tank
- ▶ Surface Casing Vent
- ▶ Instrumentation Vent (0.15m)
- ▶ Process Equipment Vent (0.5m min)

- ▶ Zone 1

- ▶ Inside Well Shack
- ▶ Low Lying Areas
- ▶ Instrumentation Vent (0.5m)
- ▶ Process Equipment Vent (1.5m min)

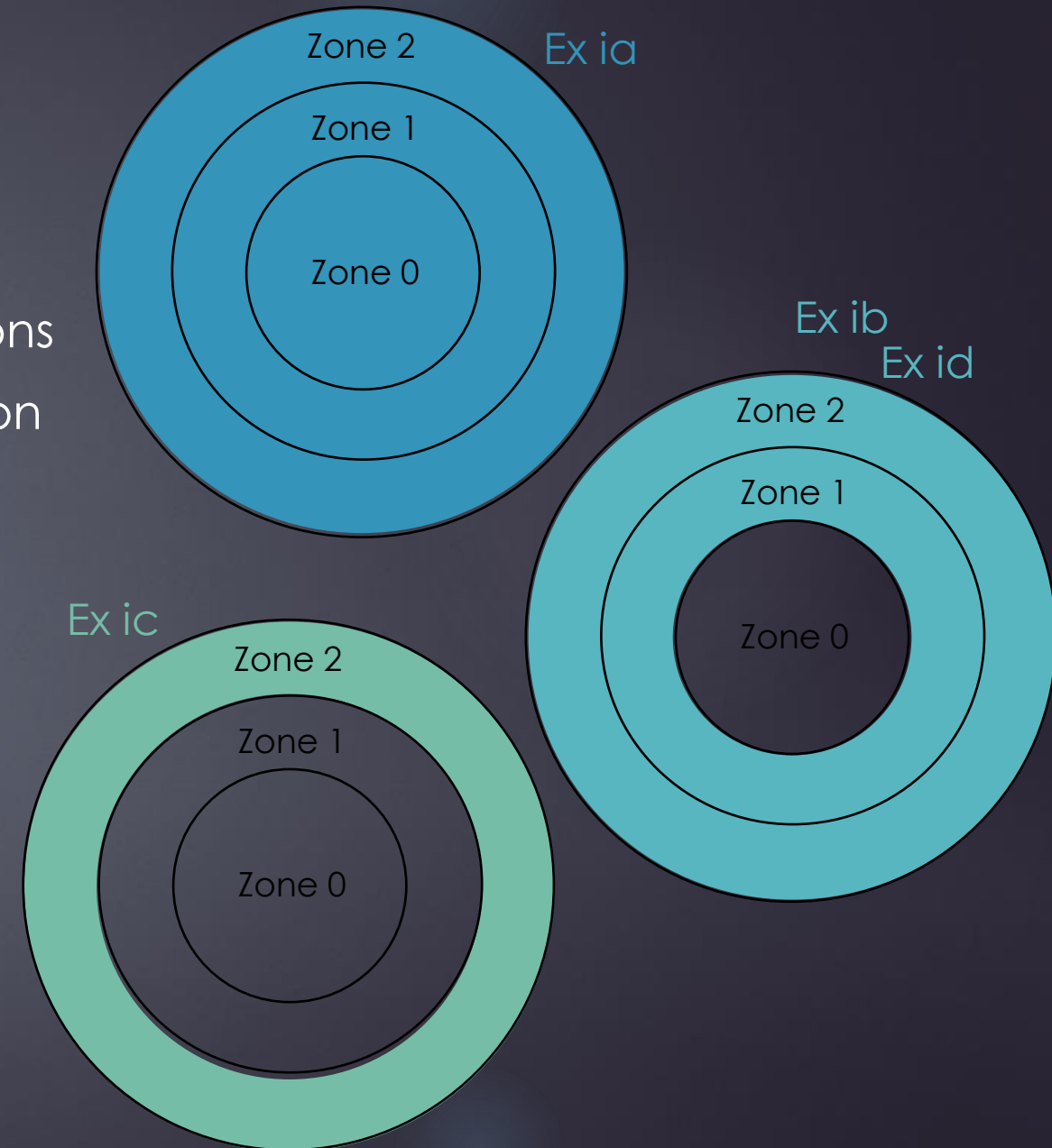
- ▶ Zone 2

- ▶ Outside Well Shack (3m)
- ▶ Instrumentation Vent (0.5m)
- ▶ Process Equipment Vent (1.5m min)



Ex Codes

- ▶ IEC 60079 broken into a number of subsections
- ▶ Ex Code used to distinguish type of protection
 - ▶ Ex ia – intrinsically safe for zones 0, 1, 2
 - ▶ Ex ib – intrinsically safe for zones 1, 2
 - ▶ Ex ic – intrinsically safe for zone 2
 - ▶ Ex d – Flameproof (explosion proof) zones 1, 2

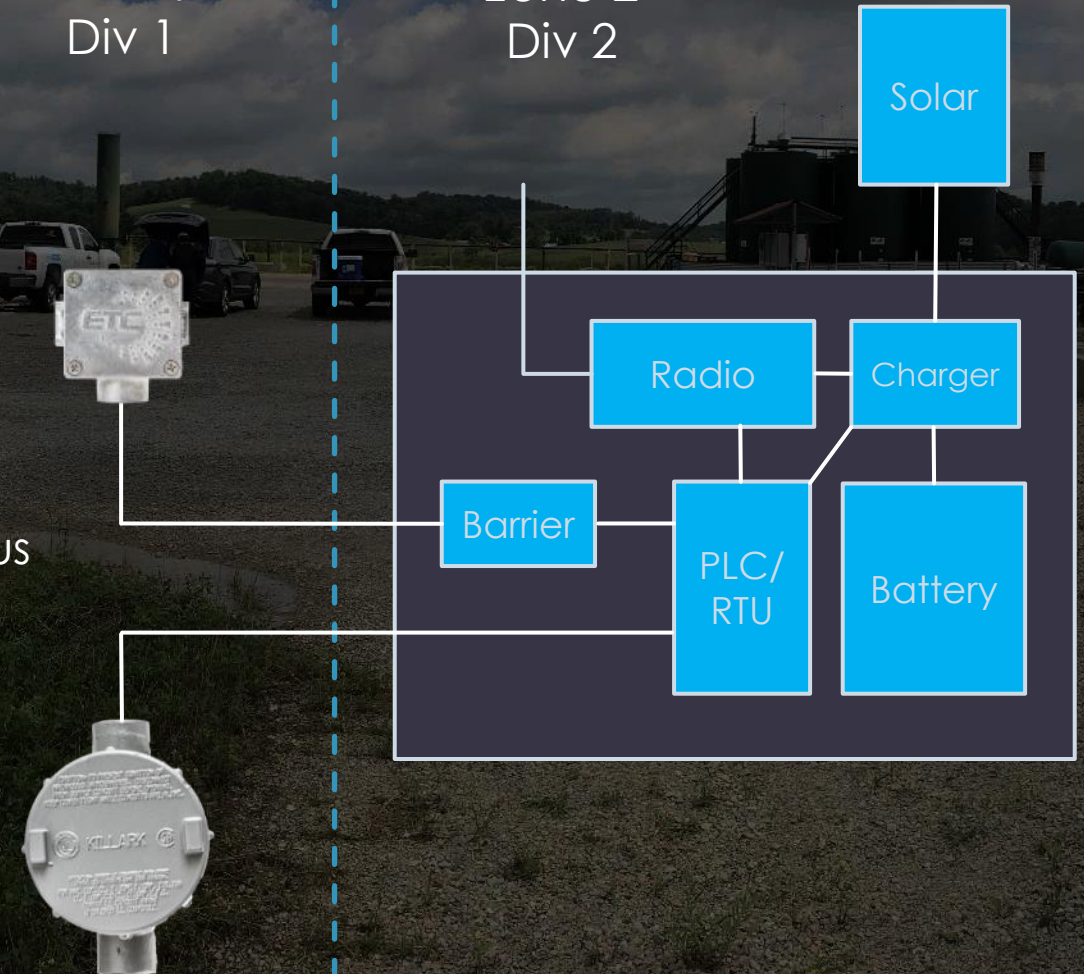


Crossing Zone Boundaries

- ▶ Simple if everything is in the same zone
 - ▶ Zone 0 Controls and Zone 0 Wellhead/Sensor
 - ▶ Zone 2 Controls and Zone 2 Wellhead/Sensor
- ▶ If crossing zones
 - ▶ Prevent gas flow to Zone 2
 - ▶ Sealed connections for short cables
 - ▶ Energy from Zone 2 is a hazard in Zone 1/0
- ▶ Intrinsic Safety Protection Method
 - ▶ Limit the transfer of energy into the more hazardous zone (entity parameters)
 - ▶ Intrinsic Safety (IS) Barrier acts as a limiter
- ▶ Explosion Proof Protection Method
 - ▶ Barrier not required
 - ▶ Explosion would be contained

Zone 1/0
Div 1

Zone 2
Div 2



Gas Groups

- ▶ Identifies the types of gases a product is approved for
 - ▶ IIA (D) – Propane, Methane
 - ▶ IIB (C) – Ethylene, Hydrogen Sulfide
 - ▶ IIC (A + B) – Hydrogen, Acetylene
- ▶ IIC is the most severe, while IIA is the least
- ▶ Product can be installed in an area with the designated gas group or a less severe group

Temperature Codes

- ▶ Specifies the maximum surface temperature of the product
- ▶ Helps set the ambient temperature rating of a product
- ▶ The lower the surface temp, the higher the allowable ambient temp
- ▶ Common Codes
 - ▶ T2 – 300 C/572 F
 - ▶ T3 – 200 C/392 F
 - ▶ T4 – 135 C/275 F
- ▶ Several steps in between identified with letter A - D

Standards Development

- ▶ Typically developed by international bodies
- ▶ Cover the requirements for safe installation and operation
- ▶ IEC (International Electrotechnical Commission)
 - ▶ Specializes in developing international standards
 - ▶ Electrical, electronic, and related technologies
- ▶ ATEX (Atmospheres Explosibles)
 - ▶ European Union (EU) Directives



Certification/Testing Organizations

- ▶ Many testing organizations worldwide. Many of which use the same or similar standards
- ▶ Commonly Recognized Names
 - ▶ CSA (Canadian Standards Association) - Canada
 - ▶ UL (Underwriter's Laboratories Inc.) - USA
 - ▶ ANCE (Association of Standardization and Certification) - Mexico
- ▶ Many Others
 - ▶ Intertek
 - ▶ MET (Maryland Electrical Testing)



Common North American Standards

- ▶ Historical
 - ▶ CSA, UL, and ANCE all had different standards
 - ▶ Could approve for each other's jurisdiction, but separate testing and certification required
 - ▶ Division based system. i.e. Class I Div 1
- ▶ Harmonization
 - ▶ Adopted IEC 60079
 - ▶ Easier to approve for multiple jurisdictions
 - ▶ Zone based system i.e. Class I Zone 0



Use in Canada and US



- ▶ Local authorities decide which standards and which certifications to observe.
- ▶ Canada
 - ▶ All new installations must adhere to the zone based standard
 - ▶ Existing installations are grand fathered
- ▶ United States
 - ▶ All installations can use division or zone system

Summary

- ▶ Make sure that you clearly understand the areas in which you are working.
 - ▶ Modems and RTU/PLCs are typically in Zone 2
 - ▶ Wellheads should be classified Zone 1 or 0
- ▶ Equipment certified for a more hazardous zone can typically be put in a less hazardous zone
- ▶ Multiple ways to safely cross a zone boundary
 - ▶ IS wellhead equipment + barrier
 - ▶ ExP wellhead equipment avoids barrier cost and hassle
- ▶ The world is evolving
 - ▶ Zone (IEC 60079) preferred over Div
 - ▶ Wellheads classified as Zone 0/1 and Div

