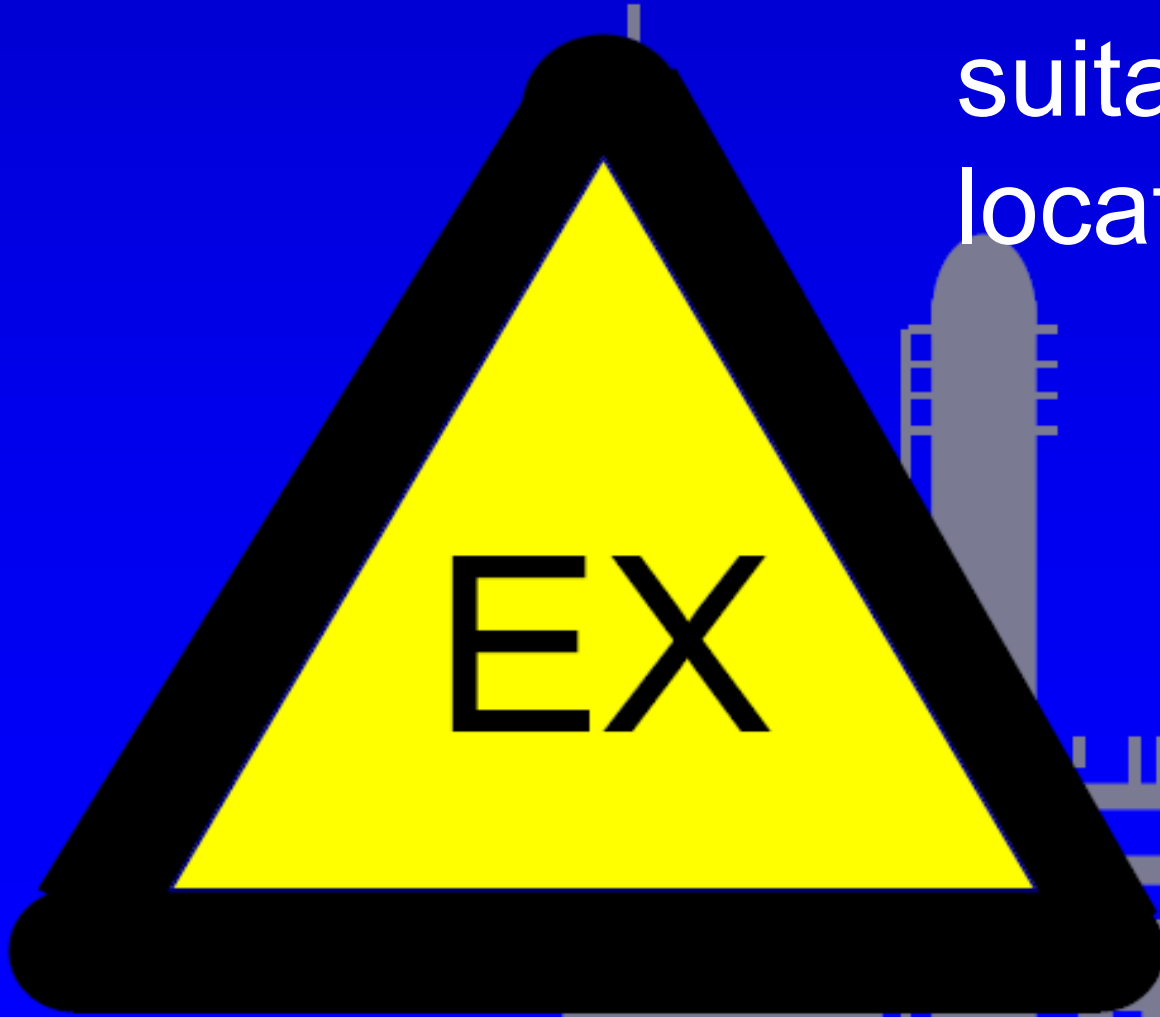


How to assess if a product is suitable for a hazardous location



IEEE SAS/NCS HazLoc Seminar, Sept. 2020

4 Simple Questions



Allan Bozek, P.Eng., MBA
EngWorks Inc.
Calgary, Canada

1. What is the hazardous location?
2. Is my equipment “Approved”?
3. What do the HazLoc product markings mean?
4. Is the product suitable for installation in the hazardous location?

Definition of a Hazardous Location



“Hazardous location means premises, buildings, or parts thereof in which there exists the hazard of fire or explosion due to...”

- *Flammable gases and liquids*
- *Combustible dust or flyings*
- *Ignitable fibres and materials*

CEC Section 0





CANADIAN ELECTRICAL CODE, PART I

SAFETY STANDARD FOR ELECTRICAL INSTALLATIONS



CSA
Group



Standards Council of Canada
Conseil canadien des normes

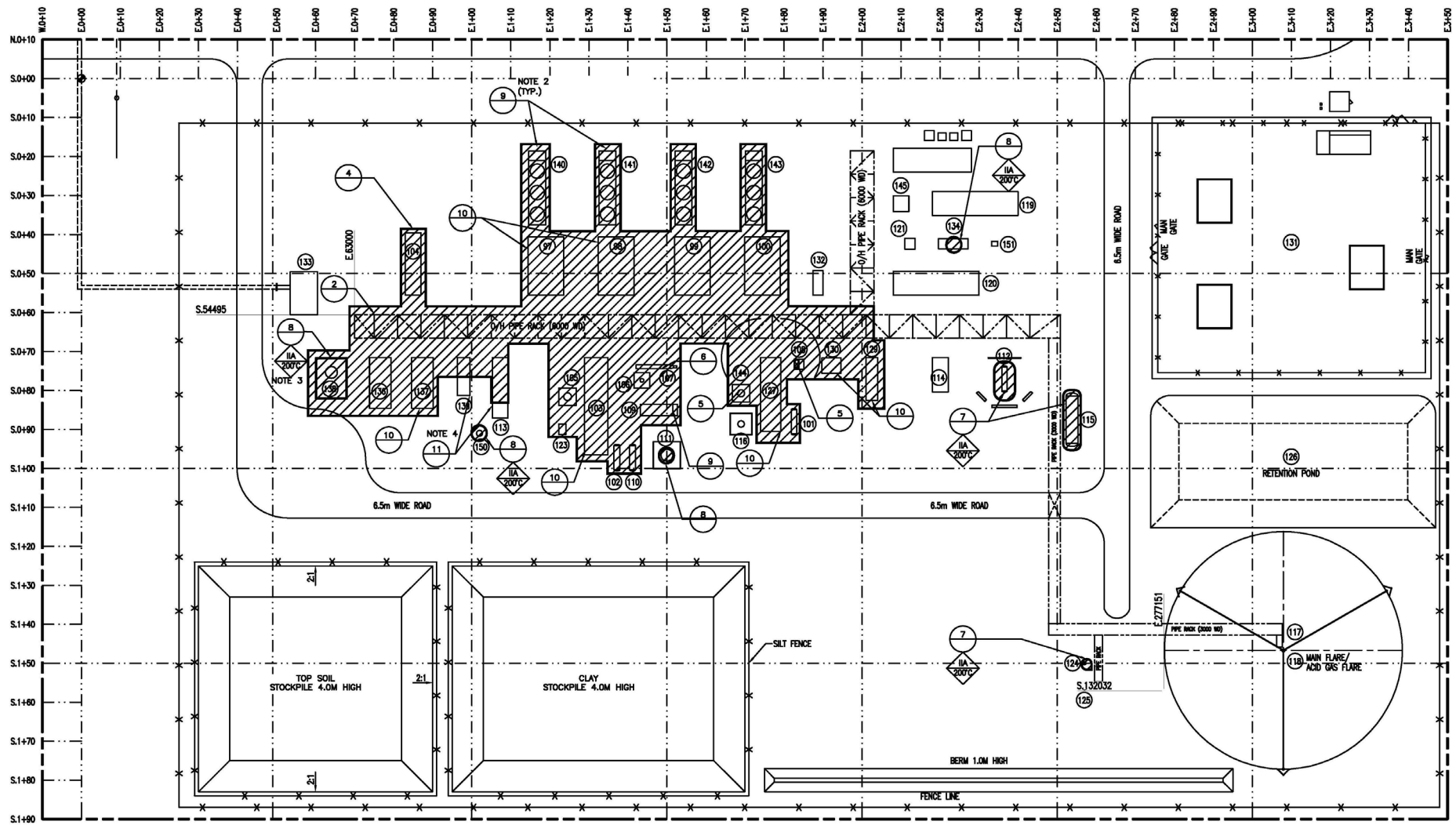
18-004 Classification of hazardous locations (see Appendices B, J, and L)

Hazardous locations shall be classified according to the nature of the hazard, as follows:

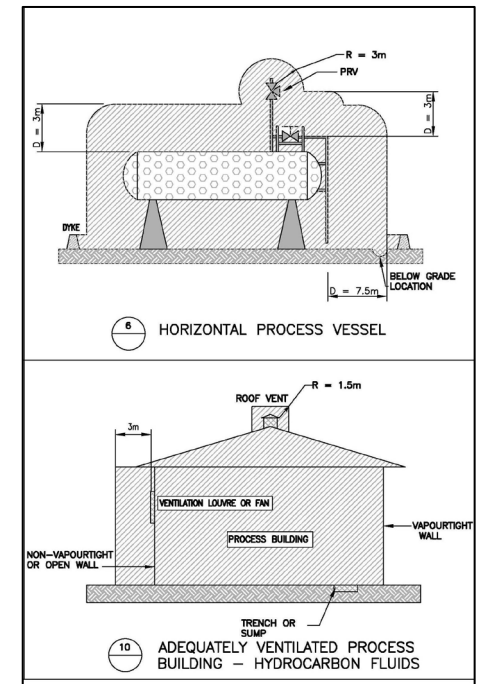
- (a) Explosive gas atmospheres; or
- (b) Explosive dust atmospheres.

- Rules that apply to Zone classified facilities are incorporated into Section 18 of the CEC.
- The CEC rules related to “Division” classified facilities are incorporated into Appendix J of the code.

1. What is the hazardous location?

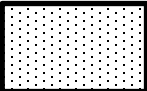
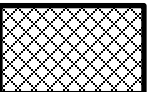




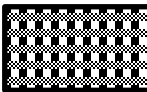
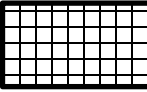
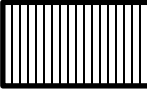

LEGEND	
	ZONE 0, GROUP IIA, AIT = 600°C
	ZONE 1, GROUP IIA, AIT = 600°C
	ZONE 2, GROUP IIA, AIT = 600°C
	NON HAZARDOUS



Zone Classification Legend



LEGEND	
	ZONE 0, GROUP IIA, AIT = 600°C
	ZONE 1, GROUP IIA, AIT = 600°C
	ZONE 2, GROUP IIA, AIT = 600°C
	NON HAZARDOUS

LEGEND	
	ZONE 20, GROUP IIIB, AIT = 230°C
	ZONE 21, GROUP IIIB, AIT = 230°C
	ZONE 22, GROUP IIIB, AIT = 230°C
	NON HAZARDOUS

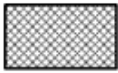
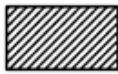

Zone	Criteria	
0	Explosive gas atmospheres are present continuously or for long periods of time	Explosive Gas Atmospheres
1	Explosive gas atmospheres are likely to occur in normal operation	
2	Explosive gas atmospheres are not likely to occur in normal operation and, if they do occur, they will exist for a short time only	
20	Explosive dust atmosphere is present continuously, frequently or for long periods of time	Explosive Dust Atmospheres
21	Explosive dust atmosphere is likely to occur in normal operation occasionally	
22	Explosive dust atmosphere is not likely to occur in normal operation, but, if it does occur, will persist for a short period only	



Division Classification Legend



Equivalent Zone
Classifications

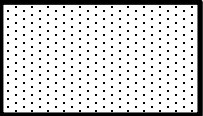
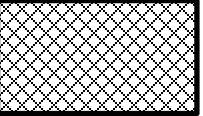
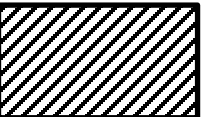

Zone	Criteria	Division
0 1	Locations in which explosive gas atmospheres are likely to be present continuously, intermittently or periodically during normal operation	Class I Division 1
2	Explosive gas atmospheres are not likely to occur in normal operation and, if they do occur, they will exist for a short time only	Class I Division 2
20 21	Combustible dust is or may be in suspension in air continuously, intermittently, or periodically under normal operating conditions in quantities sufficient to produce explosive or ignitable mixtures	Class II Division 1
22	Explosive dust atmosphere is not likely to occur in normal operation, but, if it does occur, will persist for a short period only	Class II Division 2

LEGEND	
	CLASS I, DIVISION 1, GROUP D, T1
	CLASS I, DIVISION 2, GROUP D, T1
	UNCLASSIFIED

LEGEND	
	CLASS II, DIVISION 1 GROUP G, T2C
	CLASS II, DIVISION 2 GROUP G, T2C
	UNCLASSIFIED

Zone Gas Group Classification



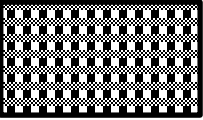
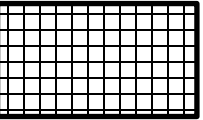
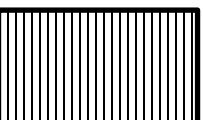

LEGEND	
	ZONE 0, GROUP IIA, AIT = 600°C
	ZONE 1, GROUP IIA, AIT = 600°C
	ZONE 2, GROUP IIA, AIT = 600°C
	NON HAZARDOUS

Group	Material
I	Mines
IIA	Methane
	Propane
	Butane
	Heptane
IIB	Pentane
	H ₂ S
IIB+H ₂	Ethylene
	Hydrogen
IIC	Acetylene

} Hydrocarbons

Zone Dust Group Classification



LEGEND	
	ZONE 20, GROUP IIIB, AIT = 230°C
	ZONE 21, GROUP IIIB, AIT = 230°C
	ZONE 22, GROUP IIIB, AIT = 230°C
	NON HAZARDOUS

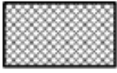


Group	Material Definition
IIIA	Solid particles, including fibres, greater than 500µm in nominal size, which may be suspended in air and could settle out of the atmosphere under their own weight
IIIB	Combustible dust other than combustible metal dust
IIIC	Combustible metal dusts

Division Group Classification



Flammable Fluids

Group	Material
A	Acetylene
B	Hydrogen
C	H ₂ S
	Ethylene
D	Hydrocarbons

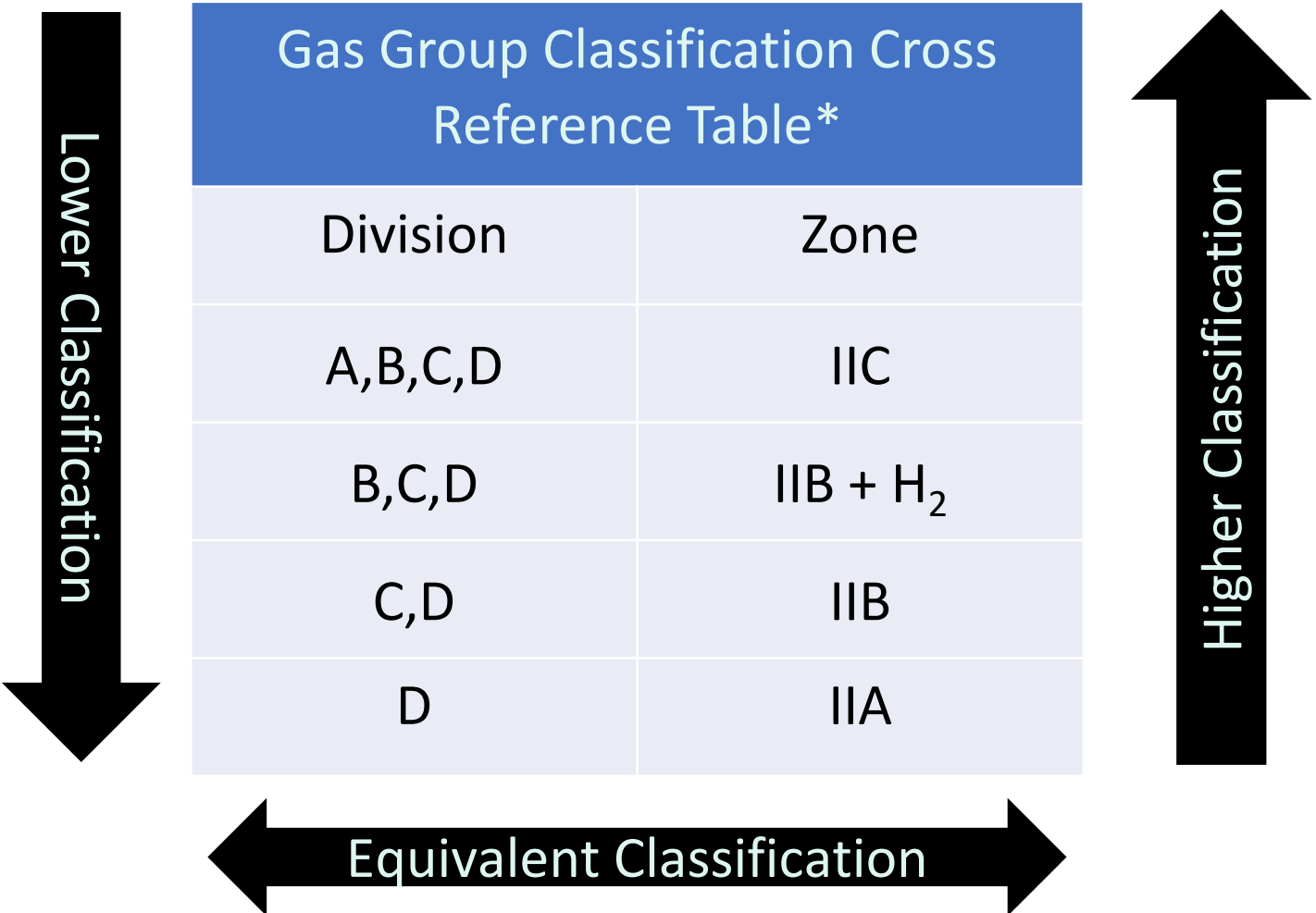
LEGEND	
	CLASS I, DIVISION 1, GROUP D, T1
	CLASS I, DIVISION 2, GROUP D, T1
	UNCLASSIFIED

LEGEND	
	CLASS II, DIVISION 1 GROUP G, T2C
	CLASS II, DIVISION 2 GROUP G, T2C
	UNCLASSIFIED

Combustible Dusts

Group	Material
E	Combustible metal dusts
F	Carbon black, coal or coke dust
G	Flour, starch or grain dust

Zone/Division Group Classification - Gas



Zone/Division Group Classification - Dust



Dust Group Classification Cross Reference Table*	
Division	Zone
Class II Group E	IIIC
Class II Group F, G	IIIB
Class III	IIIA

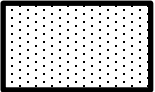
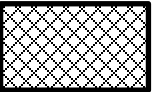


Lower Classification


Higher Classification

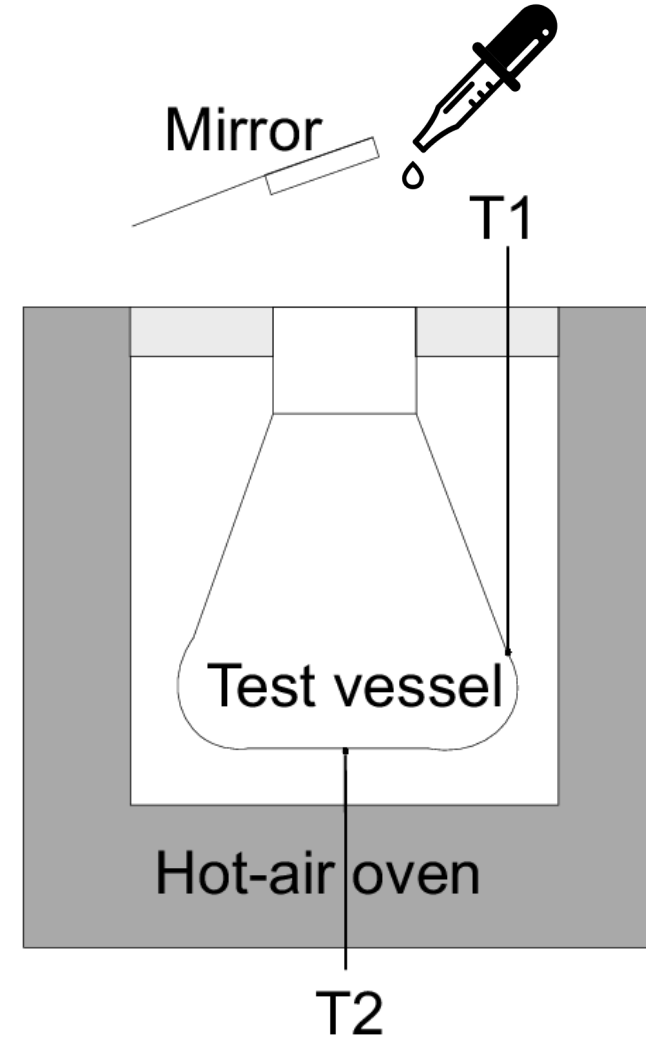
Equivalent Classification

Auto-ignition Temperature (AIT)



ZONE LEGEND	
	ZONE 0, GROUP IIA, AIT = 230°C
	ZONE 1, GROUP IIA, AIT = 230°C
	ZONE 2, GROUP IIA, AIT = 230°C
	NON HAZARDOUS

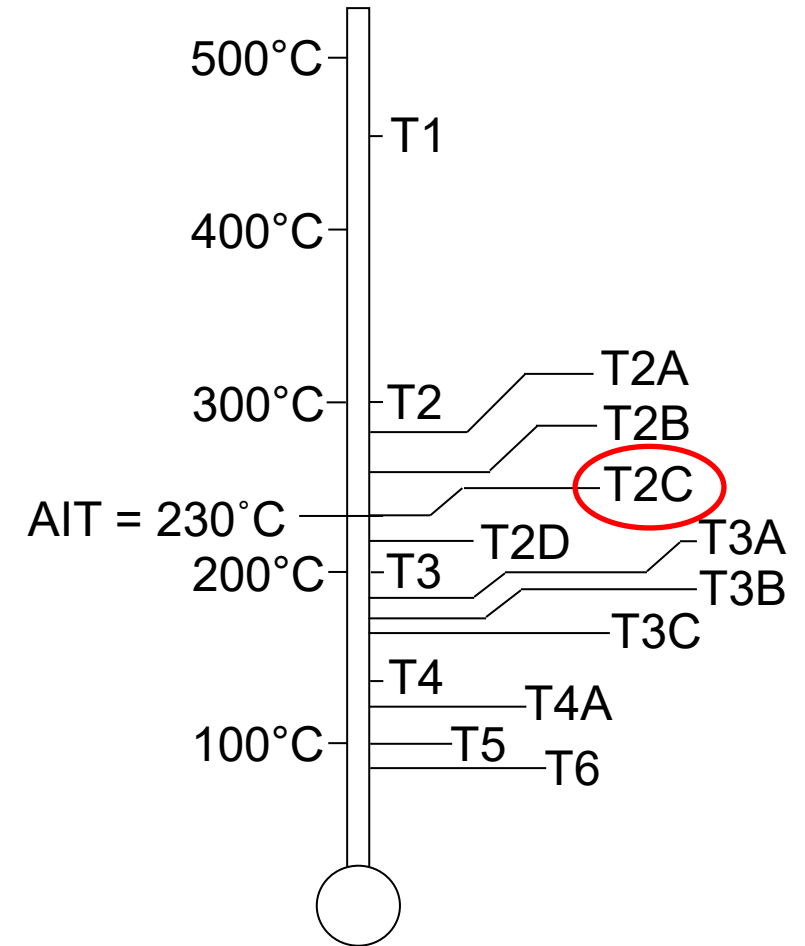
DIVISION LEGEND	
	CLASS I, DIVISION 1, GROUP D, T1
	CLASS I, DIVISION 2, GROUP D, T1
	UNCLASSIFIED



Auto-ignition Temperature (AIT)



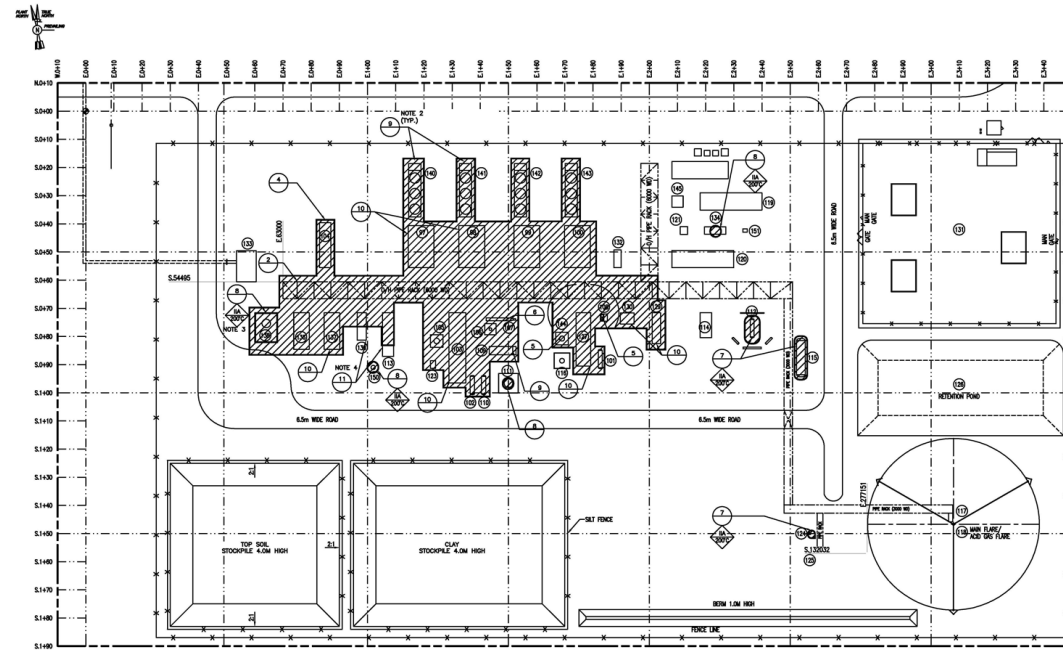
Temperature Code	
T1 - 450°C	T3A - 180°C
T2 - 300°C	T3B - 165°C
T2A - 280°C	T3C - 160°C
T2B - 260°C	T4 - 135°C
T2C - 230°C	T4A - 120°C
T2D - 215°C	T5 - 100°C
T3 - 200°C	T6 - 85°C



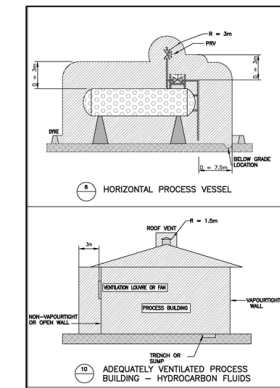
Assessing the End Classification



1. Determine what classification system is used to define the hazardous location
 - Zone or Division
2. Determine the classification of the location where your equipment will be installed
 - Class I Division 1, Zone 2 etc.
3. Note the group classification and the Auto-ignition temperature of the location
 - AIT may be defined by a temperature code



LEGEND	
	ZONE 0, GROUP IIA, AIT = 600° C
	ZONE 1, GROUP IIA, AIT = 600° C
	ZONE 2, GROUP IIA, AIT = 600° C
	NON HAZARDOUS



2. Is my Equipment Approved?



CANADIAN ELECTRICAL CODE, PART I

SAFETY STANDARD FOR ELECTRICAL INSTALLATIONS



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- CSA C22.1 Part I defines the installation requirements for a safe electrical installation
 - Requires all equipment be “approved”
- CSA C22.2 Part II standards define the product safety requirements for electrical equipment
 - listed in Appendix A of the CEC

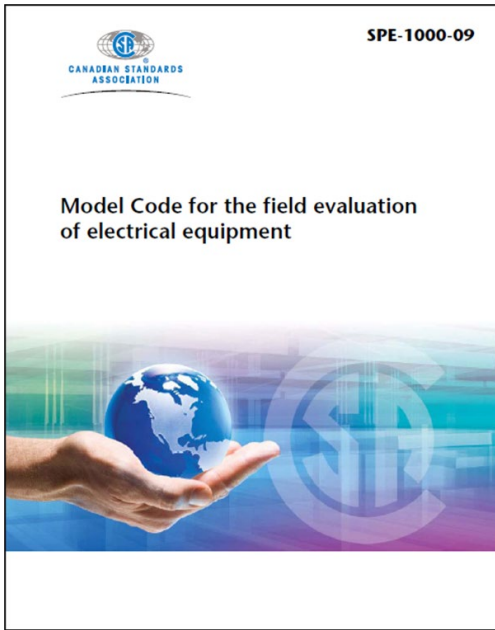
Product Certification Marks



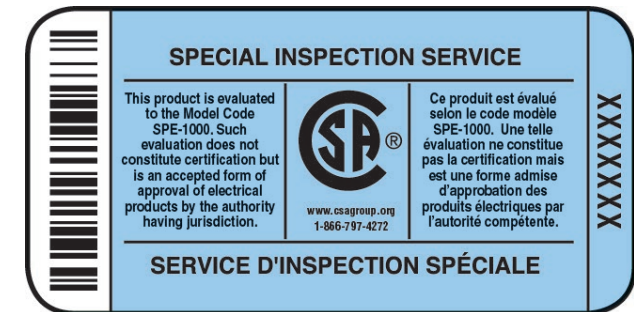
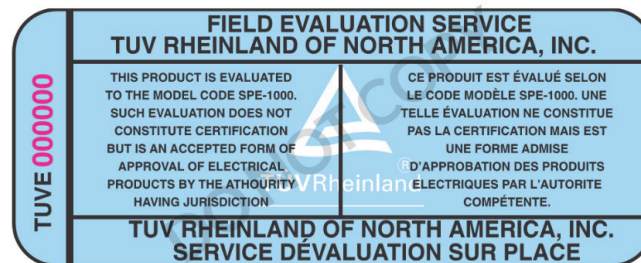
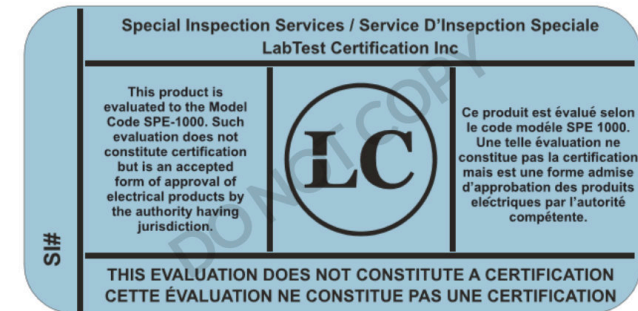
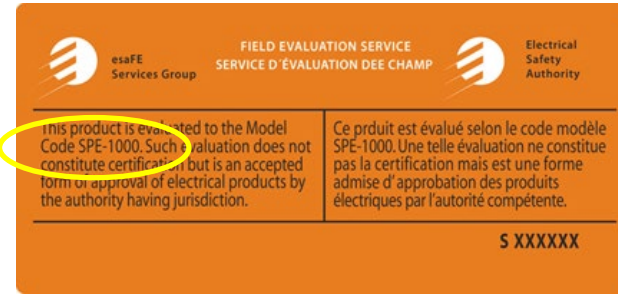
- Indicates that the product has met the certification requirements outlined in the listing



Field Evaluation Label



- Intended for limited production products or skid assemblies intended for Non-hazardous locations



Field Certification of Electrical Equipment



Certification program for products with limited production runs or one-time imports intended to be installed in a hazardous location



CSA C22.2 No. 60079-46:19
(IEC TS 60079-46:2017, MOD)
National Standard of Canada
Norme nationale du Canada

CSA C22.2 No. 60079-46:19
Explosive atmospheres — Part 46: Equipment assemblies
(IEC TS 60079-46:2017, MOD)

CSA C22.2 n° 60079-46:19
Atmosphères explosives — Partie 46 : Assemblages d'appareils
(IEC TS 60079-46:2017, MOD)



3. What do the HazLoc product markings mean?



- Hazardous location products may be marked with “Division” markings or “IEC Zone” markings
- Multiple certification marks and hazloc markings may be applied to product
 - Need to determine what markings apply in any given situation.




Applicable Markings



US Zone markings

Indicates the product is certified to Canadian and US Standards

CAN Zone markings for Gas

cULus Certified  **LISTED A 243**

Class I, Zone 1, AEx de IIC T4 Gb / Ex de IIC T4 Gb X

Class II, Zone 21, AEx tb IIIC T4 Db IP66

Ex tb IIIC T4 Db IP66 X ← CAN Zone markings for Dust

Class I, Division 2, Groups A, B, C, D
Class II, Division 2, Groups E, F, G
Class III

CAN/US Division markings

UL50, 50E, 508, UL60079-0, -1, -7, -31 ← Applicable US product standards

Type 3, 4, 4X, 12, 13 ← NEMA Enclosure Ratings

Ambient Range: -50°C < Ta < 60°C ← Ambient temperature range for Explosion Protection

Zone Marking

Division Marking

Marking not applicable

Division HazLoc Marking



Division	Criteria
1	Hazard exists continuously or for long periods of time
2	Hazard is not likely to exist and will exist for a short time only

Class I Division 1 GR. C,D T2C

Class	Criteria
I	Flammable gas explosive hazards
II	Combustible dust explosive hazards
III	Ignitable fibre fire hazards

Group
A
B
C
D
E
F
G

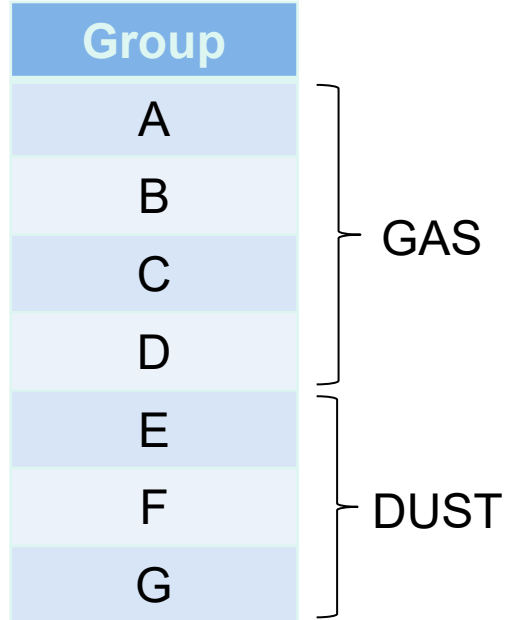
Temperature Codes	
T1 - 450°C	T3A - 180°C
T2 - 300°C	T3B - 165°C
T2A - 280°C	T3C - 160°C
T2B - 260°C	T4 - 135°C
T2C - 230°C	T4A - 120°C
T2D - 215°C	T5 - 100°C
T3 - 200°C	T6 - 85°C

Division HazLoc Marking



Class	Criteria
I	Flammable gas explosive hazards
II	Combustible dust explosive hazards
III	Ignitable fibre fire hazards

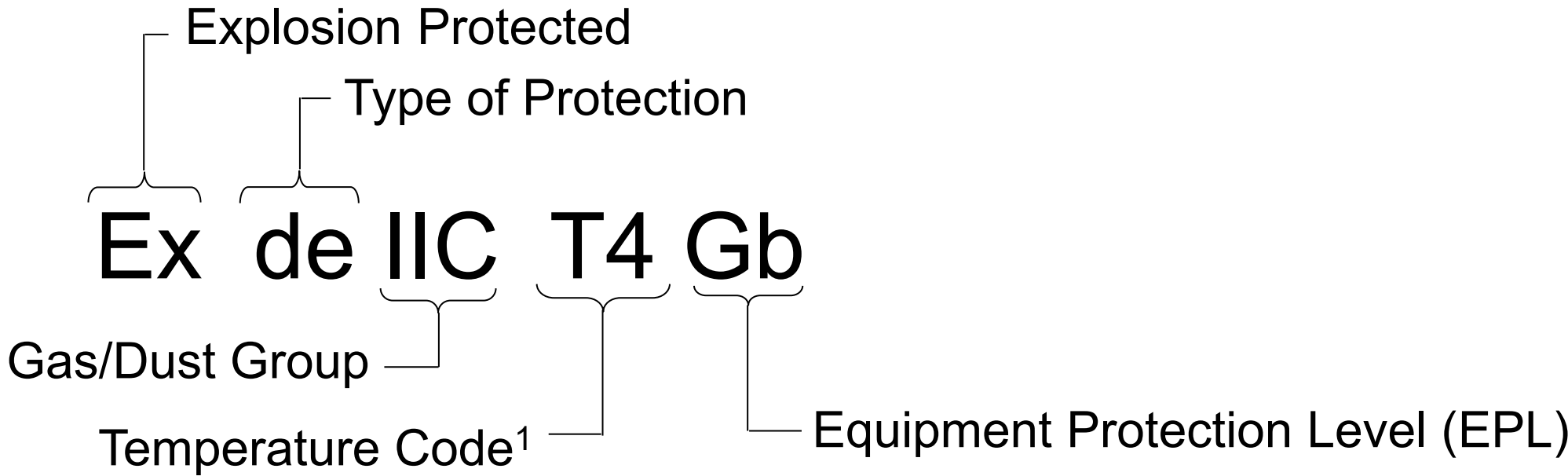
CL.I GR.C,D
CL.II GR.G



No Division marking indicates product is suitable for Division 1

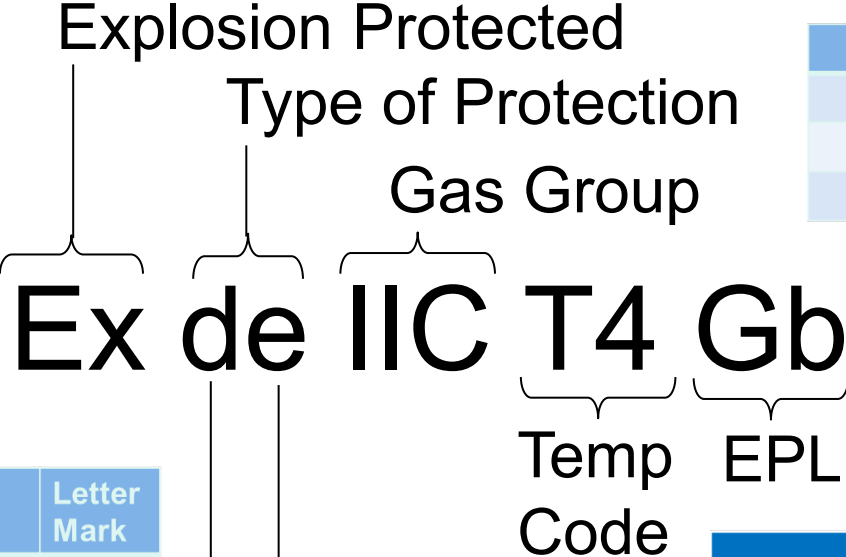
No Temperature Code indicates Surface operating temperature does not exceed 100°C (T5)

Zone Hazloc Marking



1. Max. Surface temperature may be indicated by TXXX°C

Zone Marking Example



Hazard	
M	Mines
G	Gas
D	Dust

Level of Protection	
a	Very High
b	High
c	Normal

Type of Protection	Letter Mark
Flameproof	d
Intrinsically Safe	i
Increased Safety	e
Pressurized	p
Encapsulation	m
Powder-filled	s
Protection by enclosure	t
Type of Protection n	nA, nC, nL

Gas Group
IIC
IIB+H2
IIB
IIA

Temperature Codes	
T1 - 450°C	T3A - 180°C
T2 - 300°C	T3B - 165°C
T2A - 280°C	T3C - 160°C
T2B - 260°C	T4 - 135°C
T2C - 230°C	T4A - 120°C
T2D - 215°C	T5 - 100°C
T3 - 200°C	T6 - 85°C



Ex de IIC T4 **Gb**

Hazard	
M	Mines
G	Gas
D	Dust

Level of Protection	
a	Very High
b	High
c	Normal

Zone Classification Suitability	
Ga	Zone 0
Gb	Zone 1
Gc	Zone 2
Da	Zone 20
Db	Zone 21
Dc	Zone 22

- **EPL** – **E**quipment **P**rotection **L**evel defines the level of protection incorporated into the device
- EPL mark takes precedence over all other Zone markings

4. Is the product suitable for installation in the hazardous location?



CANADIAN ELECTRICAL CODE, PART I

SAFETY STANDARD FOR ELECTRICAL INSTALLATIONS



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- Section 18 addresses facilities classified under the Zone system
- Annex J18 address facilities classified under the Division system
- Table 18 defines the equipment suitable for a given hazardous location

CEC Table 18



C22.1-18 Tables

Table 16A
Deleted

Table 16B
Deleted

Table 17
Deleted

Table 18

Equipment suitable for explosive atmospheres
(See Rules 18-090, 18-100, 18-150, 18-190, 18-200 and 18-250.)

Zone system		Division system	
Intrinsic safety	ia	Zone 0	
Intrinsically safe	Intrinsically safe, IS, I.S., Exi, Exia		
Encapsulation	ma		
Flameproof	da*		
Inherently safe optical radiation	op is, with Ga**		
Optical system with interlock	op sh, with Ga**	Zone 1	
EPL††	Ga		
Equipment suitable for use in Zone 0			
Equipment suitable for use in Class I, Division 1			
Flameproof	d, db		
Intrinsic safety	ib		
Increased safety	e, eb		
Pressurized enclosure	p, px, pxb, py, pyb		
Encapsulation	m, mb		
Powder filling	q, qb		
Oil immersion	o, ob	Zone 2	Class I, Division 2
Electrical resistance trace heating 60079-30-1	with Gb**		
Inherently safe optical radiation	op is, with Gb**		
Optical system with interlock	op sh, with Gb**		
Protected optical radiation	op pr, with Gb**		
EPL††	Gb		
Equipment suitable for use in Zone 1			
Equipment suitable for use in Class I, Division 2			
Type of protection	nA, nC, nL, nR		
Pressurized enclosure	pz, pzc		
Intrinsic safety	ic		
Flameproof	dc		

(Continued)

C22.1-18 Tables

Table 18 (Continued)

Zone system		Division system	
Increased safety	ec	Zone 20	Other electrical apparatus‡
Oil immersion	oc		
Encapsulation	mc		
Electrical resistance trace heating 60079-30-1	with Gc**		
Inherently safe optical radiation	op is, with Gc**		
Optical system with interlock	op sh, with Gc**		
Protected optical radiation	op pr, with Gc**		
EPL††	Gc		
Other electrical apparatus‡			
Equipment suitable for use in Class II, Division 1			
Intrinsic safety	ia	Zone 21	
Intrinsically safe	Intrinsically safe, IS, I.S., Exi, Exia		
Protection by enclosure	ta		
Encapsulation	ma		
Inherently safe optical radiation	op is, with Da**		
Optical system with interlock	op sh, with Da**		
EPL††	Da		
Equipment suitable for use in Zone 20			
Equipment suitable for use in Class II, Division 1			
Intrinsic safety	ib		
Protection by enclosure	tb		
Pressurized enclosure	p, px, pxb, py, pyb		
Encapsulation	mb		
Electrical resistance trace heating 60079-30-1	with Db**	Zone 22	Class II and Class III, Division 2
Inherently safe optical radiation	op is, with Db**		
Optical system with interlock	op sh, with Db**		
Protected optical radiation	op pr, with Db**		
EPL††	Db		
Equipment suitable for use in Zone 21			
Equipment suitable for use in Class II, Division 2			
Intrinsic safety	ic		
Protection by enclosure	tc		
Pressurized enclosure	pz, pzc		
Encapsulation	mc		
Electrical resistance trace heating 60079-30-1	with Dc**		

(Continued)

C22.1-18 Tables

Table 18 (Concluded)

Zone system		Division system	
Inherently safe optical radiation	op is, with Dc**	Zone 23	
Optical system with interlock	op sh, with Dc**		
Protected optical radiation	op pr, with Dc**		
EPL††	Dc		
Other electrical apparatus‡			

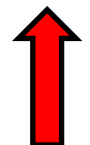
Note: This Table is structured to show the Zone equipment on the left side and Class/Division equipment on the right side. Zone equipment is suitable for use in Class/Division locations and vice versa. This is indicated by the phrase "Equipment suitable for use in". For example, in Class I, Division 1 locations, "Equipment suitable for use in Zone 0" means all equipment listed under Zone 0 can be used.

* "da" is limited to sensors of portable combustible gas detectors.
 † Because Class I, Division 1 encompasses the equivalent of Zone 0, types of protection designed for Zone 1 are not allowed in Class I, Division 1 (e.g., an intrinsic safety ib device is not allowed in a Class I, Division 1 location). Similarly, types of protection designed for Zone 21 are not allowed in a Class II/III, Division 1 location.
 ‡ "Other electrical apparatus" means electrical apparatus complying with the requirements of a recognized Standard for industrial electrical apparatus that does not in normal service
 a) have ignition-capable hot surfaces; or
 b) produce incendive arcs or sparks.
 See Rules 18-150 2), 18-250 2), 118-150 2) and 3), and 118-250. "Other electrical apparatus" also makes reference to equipment or systems currently acceptable as alternative means of protection (see Rules 18-064, 18-068, 118-062 and 118-066).
 § For use in Class II and Class III, such (Zone acceptable) equipment is subject to the limitation of Rules 118-054 2) or 118-054 3) respectively. Group IIIA equipment is not suitable for use in Class II locations.
 ** Equipment marked with these types of protection is available in multiple levels of protection that are not specifically identified within the Ex marking.
 †† The EPL takes precedence over the type of protection; for example, "Ex ia Gb" is suitable for Zone 1 (not Zone 0), "Ex op is Db" is suitable for Zone 21 (not Zone 20), and "Ex 60079-30-1 Gc" is suitable for Zone 2 (not Zone 1). Selection according to the marked EPL is critical to the safe application of this equipment.

Δ

Table 18
Equipment suitable for explosive atmospheres
 (See Rules 18-090, 18-100, 18-150, 18-190, 18-200 and 18-250.)

Zone system		Division system	
Intrinsic safety	ia	Zone 0	
Intrinsically safe	Intrinsically safe, IS, I.S., Exi, Exia		
Encapsulation	ma		
Flameproof	da*		
Inherently safe optical radiation	op is, with Ga**		
Optical system with interlock	op sh, with Ga**		
EPL++	Ga		
Equipment suitable for use in Zone 0			
Equipment suitable for use in Class I, Division 1		Zone 1	
Flameproof	d, db		
Intrinsic safety	ib		
Increased safety	e, eb		
Pressurized enclosure	p, px, pxb, py, pyb		
Encapsulation	m, mb		
Powder filling	q, qb		
Oil immersion	o, ob		
Electrical resistance trace heating 60079-30-1	with Gb**		
Inherently safe optical radiation	op is, with Gb**		
Optical system with interlock	op sh, with Gb**		
Protected optical radiation	op pr, with Gb**		
EPL++	Gb		
			Class I, Division 1 equipment+
			Intrinsically safe IS, I.S., Exi, Exia



Division Marked Control Assembly Division Classified Facility



Area Classification: Class I, Division 1, Group B,C,D, T3



Division Marked Control Assembly Division Classified Facility

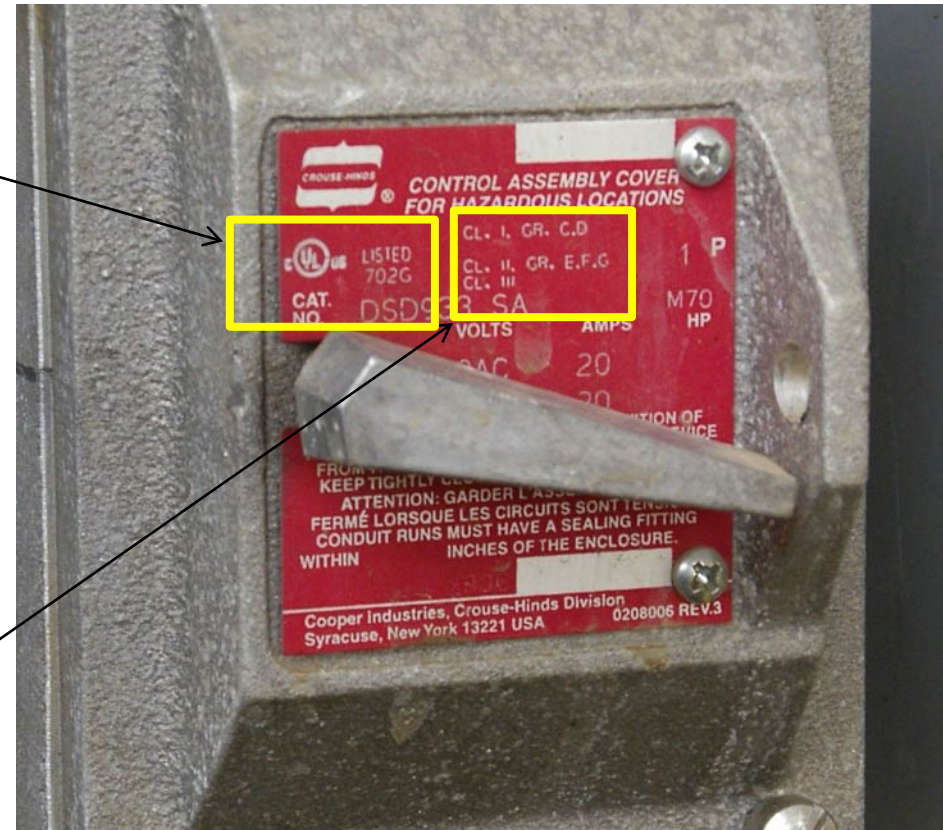


Area Classification: Class I, Division 1, Group B,C,D, T3

 Certification Mark

Class Group

Gas	CL. I GR. C,D
Dust	CL. II GR. E,F,G
Fibres	CL. III

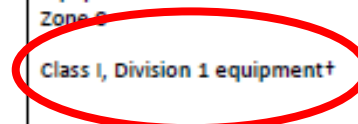


Lack of Division marking indicates product is suitable for Division 1 and 2 locations
Lack of Tcode indicates the Maximum Surface Operating Temperature $\leq 100^{\circ}\text{C}$

Δ

Table 18
Equipment suitable for explosive atmospheres
 (See Rules 18-090, 18-100, 18-150, 18-190, 18-200 and 18-250.)

Zone system			Division system	
Intrinsic safety	ia	Zone 0		
Intrinsically safe	Intrinsically safe, IS, I.S., Exi, Exia			
Encapsulation	ma			
Flameproof	da*			
Inherently safe optical radiation	op is, with Ga**			
Optical system with interlock	op sh, with Ga**			
EPL++	Ga			
Equipment suitable for use in Zone 0				
Equipment suitable for use in Class I, Division 1		Zone 1	Class I, Division 1+	Equipment suitable for use in Zone 0
Flameproof	d, db			Class I, Division 1 equipment+
Intrinsic safety	ib			
Increased safety	e, eb			
Pressurized enclosure	p, px, pxb, py, pyb			
Encapsulation	m, mb			
Powder filling	q, qb			
Oil immersion	o, ob			
Electrical resistance trace heating 60079-30-1	with Gb**			
Inherently safe optical radiation	op is, with Gb**			
Optical system with interlock	op sh, with Gb**			
Protected optical radiation	op pr, with Gb**			
EPL++	Gb			



Assess Group Classification and TCode



Defined Group Classification

Area Classification:
Class I, Division 1, Group B,C,D, T3

Gas Group Classification Cross Reference Table*	
Division	Zone
A,B,C,D	IIC
B,C,D	IIB + H ₂
C,D	IIB
D	IIA

Lower Classification

Higher Classification

Product marking

Equivalent Classification

Class I, Division 1, Group C,D, T5

Temperature Code	
T1 - 450°C	T3A - 180°C
T2 - 300°C	T3B - 165°C
T2A - 280°C	T3C - 160°C
T2B - 260°C	T4 - 135°C
T2C - 230°C	T4A - 120°C
T2D - 215°C	T5 - 100°C
T3 - 200°C	T6 - 85°C

AIT

Surface operating temperature

Conclusion



Area Classification: Class I, Division 1, Group B,C,D, T3



Does not meet Group Classification requirements of the Classified Location!

IEC Zone Marked Limit Switch Application Zone Classified Facility



Area Classification: Zone 1, Group IIA, AIT = 200°C



Certification Mark

Explosion Protected

Type of Protection – Intrinsic Safety

Ex ia IIC T4 Gb

Gas Group

Temperature Code

EPL



Ex ia IIC T4 Gb

EPL marking takes precedence over all other markings on a product

Δ

Table 18
Equipment suitable for explosive atmospheres
(See Rules 18-090, 18-100, 18-150, 18-190, 18-200 and 18-250.)

Zone system		Division system			
Intrinsic safety	ia	Zone 0	Equipment suitable for use in Zone 0		
Intrinsically safe	Intrinsically safe, IS, I.S., Exi, Exia				
Encapsulation	ma				
Flameproof	da*				
Inherently safe optical radiation	op is, with Ga**				
Optical system with interlock	op sh, with Ga**				
EPL++	Ga				
Equipment suitable for use in Zone 0				Class I, Division 1+ Zone 1	Equipment suitable for use in Class I, Division 1
Equipment suitable for use in Class I, Division 1					
Flameproof	d, db				
Intrinsic safety	ib				
Increased safety	e, eb				
Pressurized enclosure	p, px, pxb, py, pyb				
Encapsulation	m, mb				
Powder filling	q, qb				
Oil immersion	o, ob				
Electrical resistance trace heating 60079-30-1	with Gb**				
Inherently safe optical radiation	op is, with Gb**				
Optical system with interlock	op sh, with Gb**				
Protected optical radiation	op pr, with Gb**				
EPL++	Gb				
Equipment suitable for use in Class I, Division 1		Class I, Division 1+	Class I, Division 1 equipment+		
Equipment suitable for use in Zone 0					
Intrinsically safe IS, I.S., Exi, Exia					

Assess Group Classification and TCode



Defined Group Classification

Area Classification:
Zone 1, Group IIA, AIT = 200°C

Gas Group Classification Cross Reference Table*	
Division	Zone
A,B,C,D	IIC
B,C,D	IIB + H ₂
C,D	IIB
D	IIA

Temperature Code	
T1 - 450°C	T3A - 180°C
T2 - 300°C	T3B - 165°C
T2A - 280°C	T3C - 160°C
T2B - 260°C	T4 - 135°C
T2C - 230°C	T4A - 120°C
T2D - 215°C	T5 - 100°C
T3 - 200°C	T6 - 85°C

Surface operating temperature

Lower Classification

Higher Classification

Equivalent Classification

Product marking

Ex ia IIC T4 Gb

AIT

Conclusion



Area Classification: Zone 1, Group IIA, AIT = 200°C



Meets all requirements of the Classified Location! Must be installed as part of a intrinsically safe circuit.

Division Marked Solenoid Application Zone Classified Facility



Area Classification: Zone 2, Group IIA,
AIT = 245°C



Class Group Division

Gas	CL. I	GR. A,B,C,D	DIV 2
Dust	CL. II	GR. E,F,G	DIV 2
Fibres	CL. III		OP TEMP T4



CEC Table 18




CL. I GR. A,B,C,D DIV 2

OP TEMP T4



Table 18
Equipment suitable for explosive atmospheres
 (See Rules 18-090, 18-100, 18-150, 18-190, 18-200 and 18-250.)

Zone system		Division system	
Equipment suitable for use in Zone 1		 Zone 2	Class I, Division 2
Equipment suitable for use in Class I, Division 2			
Equipment acceptable in Zone 1			
Equipment acceptable in Class I, Division 2			
Type of protection	nA, nC, nL, nR		
Pressurized enclosure	pz, pzc		
Intrinsic safety	ic		
Flameproof	dc		
Increased safety	ec		
Oil immersion	oc		
Encapsulation	mc		
Electrical resistance trace heating 60079-30-1	with Gc**	Equipment suitable for use in Zone 2	
		Equipment suitable for use in Class I, Division 1	
		Class I, Division 2 equipment	
		Non-incendive	
		Other electrical apparatus‡	

Assess Group Classification and TCode



Product Marking
 CL. I GR. A,B,C,D DIV 2
 OP TEMP T4

Gas Group Classification Cross Reference Table*	
Division	Zone
A,B,C,D	IIC
B,C,D	IIB + H ₂
C,D	IIB
D	IIA

Lower Classification

Higher Classification

Equivalent Classification

implies

Temperature Code	
T1 - 450°C	T3A - 180°C
T2 - 300°C	T3B - 165°C
T2A - 280°C	T3C - 160°C
T2B - 260°C	T4 - 135°C
T2C - 230°C	T4A - 120°C
T2D - 215°C	T5 - 100°C
T3 - 200°C	T6 - 85°C

Product marking

Implied Surface operating temperature

Area Classification:
 Zone 2, Group IIA, AIT = 245°C

Conclusion



Area Classification: Zone 2, Group IIA,
AIT = 245°C



Meets all requirements of the Classified Location!

IEC Zone Marked Proximity Sensor Division Classified Facility



Area Classification: Class I, Division 1, Group C,D, T2C



ATEX
Markings

II 1G	Ex ia IIB T6 Ga
II 2G	Ex ia IIC T6 Gb
II 1D	Ex ia IIIC T90°C Da

CEC Table 18



Δ

Table 18
Equipment suitable for explosive atmospheres
 (See Rules 18-090, 18-100, 18-150, 18-190, 18-200 and 18-250.)

Zone system		Division system	
Intrinsic safety	ia	Zone 0	
Intrinsically safe	Intrinsically safe, IS, I.S., Exi, Exia		
Encapsulation	ma		
Flameproof	da*		
Inherently safe optical radiation	op is, with Ga**		
Optical system with interlock	op sh, with Ga**		
EPL††	Ga		
Equipment suitable for use in Zone 0		Class I, Division 1+	Equipment suitable for use in Zone 0 Class I, Division 1 equipment† Intrinsically safe IS, I.S., Exi, Exia
Equipment suitable for use in Class I, Division 1			
Flameproof	d, db		
Intrinsic safety	ib		
Increased safety	e, eb		
Pressurized enclosure	p, px, pxb, py, pyb		
Encapsulation	m, mb		
Powder filling	q, qb		
Oil immersion	o, ob		
Electrical resistance trace heating 60079-30-1	with Gb**		
Inherently safe optical radiation	op is, with Gb**		
Optical system with interlock	op sh, with Gb**		
Protected optical radiation	op pr, with Gb**		
EPL††	Gb		
		Zone 1	

Ex ia IIB T6 Ga ←

Ex ia IIC T6 Gb ↑



Equipment suitable for use in Zone 0

Assess Group Classification and TCode



Area Classification:
Class I, Division 1, GR C,D T2C

Gas Group Classification Cross Reference Table*	
Division	Zone
A,B,C,D	IIC
B,C,D	IIB + H ₂
C,D	IIB
D	IIA

Temperature Code	
T1 - 450°C	T3A - 180°C
T2 - 300°C	T3B - 165°C
T2A - 280°C	T3C - 160°C
T2B - 260°C	T4 - 135°C
T2C - 230°C	T4A - 120°C
T2D - 215°C	T5 - 100°C
T3 - 200°C	T6 - 85°C

AIT

Lower Classification

Higher Classification

implies

Defined Group Classification

Equivalent Classification

Product marking

Ex ia IIB T6 Ga

Surface operating temperature

Conclusion



Area Classification: Class I, Division 1, Group C,D, T2C



Meets all requirements of the Classified Location!



Where an ambient temperature range is not indicated on an equipment item, the following default temperatures will apply:

- Products marked “Ex” in conformance with the CSA C22.2 60079-XX series of standards:
 - $-20^{\circ}\text{C} \geq \text{amb} \leq 40^{\circ}\text{C}$

- Products marked Class I/II/III, Division 1 and Division 2:
 - $-50^{\circ}\text{C} \geq \text{amb} \leq 40^{\circ}\text{C}$

The four Questions Review:



1. What is the hazardous location?
 - Class (If Division), Zone/Division, Group, AIT or TCode
2. Is my equipment “Approved”?
 - Look for the little “c” adjacent the mark
3. What do the HazLoc product markings mean?
 - What Hazloc marks apply?
 - What do they mean?
4. Is the product suitable for installation in the hazardous location?
 - Refer to CE Code Table 18 requirements

For more practice Google “HazLoc Supermini” for a free course on evaluating products in accordance with the CE Code.