

# Hazardux

## C.E.C. Code Changes

In 1998, the Canadian Electrical Code® (C.E.C.) adopted the International Electrotechnical Commission's (IEC) "Three Zone Area" Classification System for Class I hazardous locations. The Zone System is an alternate classification for Class I hazardous locations and was adopted to promote harmonization with international standards.

The Division System for Class I hazardous locations continues to be used for existing facilities and is expected to remain in use at least for the next few editions of the C.E.C. For this reason, this catalogue's certification information for Class I hazardous locations includes both the pre-1998 Division System and the new I.E.C. Zone System.

The following pages provide an overview of C.E.C. hazardous location classifications.

## Classes

The Canadian Electrical Code (C.E.C.), Part I, Section 18 - Hazardous Locations identifies three classes of hazardous locations:

- Class I - **Gas and Vapour Environments**
- Class II - **Dust Environments**
- Class III - **Fibers and Flyings Environments**

The 1998 revisions to the C.E.C. affect only Class I - Gas and Vapour Environments.

Hazardous location is defined by the C.E.C. as premises, buildings or parts thereof in which there exists the hazard of fire or explosion due to highly flammable gases and/or flammable, volatile liquid mixtures that are manufactured, used or stored in other than the original containers.

This definition can also be extended to include combustible dust and easily ignitable fibers that are likely to be present in sufficient quantities to produce an explosive mixture.

## Class I — Gas and Vapour Environments

Locations which are deemed hazardous due to the presence of **gases or vapours** that are present in the air in sufficient quantity to produce explosive or ignitable mixtures.

Locations identified as Class I require that enclosures and connectors be explosion proof. Class I hazardous locations are further subdivided into :

- **Divisions** (pre-1998 version of the C.E.C.), or
- **Zones** (I.E.C. Classification - 1998 C.E.C.)

The Division System may still be used for the maintenance and repair of existing facilities. All new construction must use the I.E.C. Zone Classification.

# Classifications

## Divisions

- **Division 1**

A Class I location where the hazardous atmosphere is expected to be present during normal operations on a continuous, intermittent or periodic basis.

- **Division 2**

A Class I location in which volatile flammable liquids or gases are handled, processed or used but in which they would normally be confined within closed containers or closed systems from which they can escape only in the event of an accidental rupture or breakdown of the containers or systems.

## Area Classification—Divisions vs. Zones

Continuous Hazard	Intermittent Hazard	Hazard under Abnormal Conditions
Zone 0	Zone 1	Zone 2
Division 1		Division 2

## Zones

- **Zone 0**

Class I locations in which explosive gas atmospheres are present continuously or are present for long periods.

- **Zone 1**

Class I locations in which:

- i. explosive gas atmospheres are likely to occur in normal operation; or
- ii. explosive gas atmospheres may exist frequently because of repair or maintenance operations or because of leakage; or
- iii. the location is adjacent to a Class I, Zone 0 location, from which explosive gas atmospheres could be communicated.

- **Zone 2**

Class I locations in which:

- iv. explosive gas atmospheres are not likely to occur in normal operation and if they do occur they will exist for a short time only; or
- v. flammable volatile liquids, flammable gases or vapours are handled, processed, or used, but in which liquids, gases or vapours are normally confined within closed containers or closed systems from which they can escape only as a result of accidental rupture or breakdown of the containers or systems or the abnormal operation of the equipment by which the liquids or gases are handled, processed or used; or
- vi. explosive gas atmospheres are normally prevented by adequate ventilation but which may occur as a result of failure or abnormal operation of the ventilation system; or
- vii. the location is adjacent to a Class I, Zone 1 location from which explosive gas atmospheres could be communicated, unless such communication is prevented by adequate positive-pressure ventilation from a source of clean air, and effective safeguards against ventilation failure are provided.

# Hazardux

## Gas Group Designations

Two systems of groupings for gases are included in the 1998 C.E.C: the pre-1998 Division Gas Groups consisting of Groups A, B, C and D; and the IEC System consisting of Groups IIA, IIB and IIC. Both systems are accepted by the C.E.C.

## Comparison of Hazardous Location Gas Group Designations From Most Restrictive to Least Restrictive

Typical Gas Hazard	Division Gas Groups	1998 CEC and IEC Gas Groups
Acetylene	A	IIC
Hydrogen	B	
Ethylene	C	IIB
Propane	D	IIA

## Division Gas Groups

- **Group A:** acetylene
- **Group B:** butadiene, ethylene oxide, hydrogen, manufactured gases containing more than 30% hydrogen (by volume), propylene oxide
- **Group C:** acetaldehyde, cyclopropane, diethyl ether, thylene, unsymmetrical dimethyl hydrazine (UDMH 1, 1-dimethyl hydrazine)
- **Group D:** acetone, acrylonitrile, alcohol, ammonia, benzene, benzine, benzol, butane, 1-butanol, 2-butanol, butyl acetate, isobutyl acetate, ethane, ethanol, ethyl acetate, ethylene dichloride, gasoline, heptanes, hexanes, isoprene, methane, methanol, 3-methyl-1-butanol, methyl ethyl ketone, 2-methyl-1-propanol, 2-methyl-2-propanol, naphtha, natural gas, petroleum naphtha, octanes, pentanes, 1-pentanol, propane, 1-propanol, 2-propanol, propylene, styrene, toluene, vinyl acetate, vinyl chloride, xylenes

## I.E.C. Zone Gas Groups

- **Group IIC:** acetylene, butadiene, propylene oxide, carbon disulphide, hydrogen or other gases or vapour of equivalent hazard
- **Group IIB:** cyclopropane, diethyl ether, ethylene, ethylene oxide, hydrogen sulfide, unsymmetrical dimethyl hydrazine (UDMH) or other gases or vapour of equivalent hazard
- **Group IIA:** acetaldehyde, acetone, acrylonitrile, alcohol, ammonia, benzine, benzol, butane, ethylene dichloride, gasoline, hexane, isoprene, lacquer solvent vapours, naphtha, natural gas, propane, propylene, styrene, vinyl acetate, vinyl chloride, xylenes or other gases or vapour of equivalent hazard

# Classifications

## Class II—Dust Environments

Locations which are deemed hazardous due to the presence of combustible or electrical conducting dusts. Class II locations normally require that enclosures and connectors be dust tight.

## Class III—Fibers and Flyings Environments

Locations which are deemed hazardous due to the presence of easily ignitable fibers or flyings, but in which such fibers or flyings are not likely to be in suspension in the air in sufficient quantities to produce ignitable mixtures. Class III locations normally require that enclosures and connectors be constructed to minimize the entry of fibers or flyings.

## Class II and III—Divisions

Class II and Class III locations are further subdivided as follows:

- **Division 1**

Where the hazardous atmosphere is expected to be present during normal operations on a continuous, intermittent or periodic basis.

- **Division 2**

Where volatile, flammable liquids or gases are handled, processed or used, but in which they would normally be confined within closed containers or closed systems from which they can escape only in the event of an accidental rupture or breakdown of the containers or systems.

## Class II and III—Gas Group Designations

The Canadian Electrical Code (C.E.C.), Part 1 Section 18 - Hazardous Locations defines various groups which have been established for the purpose of testing and approval.

- **Group E**

Comprising atmospheres containing metal dust including aluminum, magnesium, and their commercial alloys, and other metals of similarly hazardous characteristics.

- **Group F**

Comprising atmospheres containing carbon black, coal or coke dust.

- **Group G**

Comprising atmospheres containing flour, starch or grain dust, and other dusts of similarly hazardous characteristics.

## Hazlux Fixture Label Sample



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## Ignition Temperatures and Group Classifications for Flammable Gases and Vapors

MATERIAL	GROUP	AUTOIGNITION TEMPERATURE	
		DEGREES F	DEGREES C
ACETALDEHYDE	C	347	175
ACETIC ACID	D	867	464
ACETIC ANHYDRIDE	D	600	316
ACETONE	D	869	465
ACETONE CYANOHYDRIN	D	1270	688
ACETONITRILE	D	975	524
ACETYLENE	A	581	305
ACROLEIN (INHIBITED)	B(C)	455	285
ACRYLIC ACID	D	820	438
ACRYLONITRILE	D	898	481
ALLYL ALCOHOL	C	713	378
ALLYL CHLORIDE	D	905	485
ALPHA-LIMONENE	D	458	237
2-AMINOETHANOL	D	770	410
AMMONIA	D	928	498
n-AMYL ACETATE	D	680	360
ANILINE	D	1139	615
BENZENE	D	928	498
BENZYL CHLORIDE	D	1085	585
1.3-BUTADIENE	B(D)	788	420
BUTANE	D	550	288
BUTYL ALCOHOL	D	650	343
SEC-BUTYL ALCOHOL	D	761	405
n-BUTYL ACETATE	D	790	421
n-BUTYL ACRYLATE (INHIBITED)	D	559	293
BUTYLAMINE	D	594	312
BUTYLENE	D	725	385
n-BUTYRALDEHYDE	C	425	218
n-BUTYRIC ACID	D	830	443
CARBON DISULFIDE	*	194	90
CARBON MONOXIDE	C	1128	609
CHLOROBENZENE	D	1099	593
2-CHLOROETHANOL	D	797	425
2-(CHLOROMETHYL)oxirane	C	772	411
CRESOL	D	1038-1110	559-599
CROTONALDEHYDE	C	450	232
CUMENE	D	795	424
CYCLOHEXANE	D	473	245
CYCLOHEXANOL	D	572	300
CYCLOHEXANONE	D	473	245
CYCLOHEXENE	D	471	244
CYCLOPROPANE	D	938	503
p-CYMENE	D	817	436
n-DECANOL	D	550	288

\*Carbon Disulfide has characteristics which require safeguards beyond those required for any of the above groups.

# Classifications

MATERIAL	GROUP	AUTOIGNITION TEMPERATURE	
		DEGREES F	DEGREES C
DECENE	D	455	235
DI-ISOBUTYL KETONE	D	745	396
DI-ISOBUTYLENE	D	736	391
DI-N-PROPYLAMINE	C	570	299
DIACETONE ALCOHOL	D	1118	603
o-DICHLOROBENZENE	D	1198	647
1.1-DICHLOROETHANE	D	820	438
1.2-DICHLOROETHYLENE	D	860	460
DICYCLOPENTADIENE	C	937	503
DIETHYL BENZENE	D	743-842	395-450
DIETHYL ETHER	C	320	160
DIETHYLAMINE	C	594	312
DIETHYLENE GLYCOL MONOBUTYL ETHER	C	442	228
DIETHYLENE GLYCOL MONOMETHYL ETHER	C	465	241
n-n-DIMETHYL ANILINE	C	700	371
DIMETHYL FORMAMIDE	D	833	455
DIMETHYL SULFATE	D	370	188
DIMETHYLAMINE	C	752	400
1,1-DIMETHYLHYDRAZINE	C	480	249
1,4-DIOXANE	C	356	180
DODECENE	D	491	255
DU-ISOPROPYLAMINE	C	600	316
ETHANE	D	882	472
ETHANOL	D	685	363
ETHYL ACETATE	D	800	427
ETHYL ACETATE (INHIBITED)	D	702	372
ETHYL BENZENE	D	810	432
ETHYL CHLORIDE	D	966	519
ETHYL FORMATE	D	851	455
2-ETHYLHEXAN-1-OL	D	448	231
2-ETHYL HEXYL ACRYLATE	D	485	252
ETHYL MERCAPTAN	C	572	300
ETHYLAMINE	D	725	385
ETHYLENE	C	842	450
ETHYLENE DICHLORIDE	D	775	413
ETHYLENE GLYCOL MONOBUTYL ETHER	C	460	238
ETHYLENE GLYCOL MONOBUTYL ETHER ACETATE	C	645	340
ETHYLENE GLYCOL MONOETHYL ETHER	C	455	235
ETHYLENE GLYCOL MONOETHYL ETHER ACETATE	C	715	379
ETHYLENE GLYCOL MONOMETHYL ETHER	D	545	285
ETHYLENE OXIDE	B(C)	804	429
ETHYLENEDIAMINE	D	725	385
ETHYLENIMINES	C	608	320
2-ETHYLEHEXALDEHYDE	C	375	191

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## Ignition Temperatures and Group Classifications for Flammable Gases and Vapors (Cont'd)

MATERIAL	GROUP	AUTOIGNITION TEMPERATURE	
		DEGREES F	DEGREES C
FORMALDEHYDE (GAS)	B	795	429
FORMIC ACID (90%)	D	813	434
FUEL OILS	D	410-765	210-407
FURAN-2-YLMETHANOL	C	915	490
FURFURAL	C	600	316
GASOLINE	D	536-880	280-471
HEPTANE	D	399	204
HEPTENE	D	500	260
HEXAN-2-ONE	D	795	424
HEXANE	D	437	225
HEXENES	D	473	245
HYDRAZINE	C	74-518	23-270
HYDROGEN	B	968	520
HYDROGEN CYANIDE	C	1000	538
HYDROGEN SULFIDE	C	500	260
ISO-BUTYL ACETATE	D	790	421
ISO-OCTYL ALDEHYDE	C	387	197
ISOAMYL ACETATE	D	680	360
ISOAMYL ALCOHOL	D	662	350
ISOBUTYL ACRYLATE	D	800	427
ISOBUTYRALDEHYDE	C	385	196
ISOPHORONE	D	860	460
ISOPRENE	D	428	220
ISOPROPENYLBENZENE	D	1066	574
ISOPROPYL ACETATE	D	860	460
ISOPROPYL ETHER	D	830	443
ISOPROPYLAMINE	D	756	402
KEROSENE	D	410	210
LIQUIFIED PETROLEUM GAS	D	761-842	405-450
MESITYL OXIDE	D	652	344
METHANE	D	999	537
METHANOL	D	725	385
METHOXYMETHANE	C	662	350
METHYL ACETATE	D	850	454
METHYL ACRYLATE	D	875	468
METHYL ETHYL KETONE	D	759	404
METHYL FORMAL	C	460	238
METHYL FORMATE	D	840	449
METHYL ISOBUTYL KETONE	D	840	449
METHYL ISOCYANATE	D	994	534
METHYL METHACRYLATE	D	792	422
METHYL N-AMYL KETONE	D	740	393
2-METHYLPROPAN-1-OL	D	780	416
2-METHYL-2-PROPANOL	D	892	478

# Classifications

MATERIAL	GROUP	AUTOIGNITION TEMPERATURE	
		DEGREES F	DEGREES C
METHYLAMINE	D	806	430
METHYLCYCLOHEXANE	D	482	250
METHYLCYCLOHEXANOL	D	565	296
MONOISOPROPANOLAMINE	D	705	374
MONOMETHYL ANILINE	C	900	482
MONOMETHYL HYDRAZINE	C	382	194
MORPHOLINE	C	590	310
NAPHTHA (COAL TAR)	D	531	277
NAPHTHA (PETROLEUM)	D	550	288
NITROBENZENE	D	900	482
NITROETHANE	C	778	414
NITROMETHANE	C	785	418
2-NITROPROPANE	C	802	428
1-NITROPROPANE	C	789	421
NONANE	D	401	205
OCTANE	D	403	206
OCTENE	D	446	230
PENTANE	D	470	243
1-PENTANOL	D	572	300
2-PENTANONE	D	846	452
1-PENTENE	D	527	275
PROPANE	D	842	450
PROPAN-2-OL	D	750	399
1-PROPANOL	D	775	413
PROPIONALDEHYDE	C	405	207
PROPRIONIC ACID	D	870	466
PROPRIONIC ANHYDRIDE	D	545	285
n-PROPYL ACETATE	D	842	450
n-PROPYL ETHER	C	419	215
PROPYL NITRATE	B	347	175
PROPYLENE	D	851	455
PROPYLENE DICHLORIDE	D	1035	537
PROPYLENE OXIDE	B(C)	840	449
PYRIDINE	D	900	482
STYRENE	D	914	490
TETRAHYDROFURAN	C	610	321
TETRAHYDRONAPHTHALENE	D	725	385
TOLUENE	D	896	480
TURPENTINE	D	488	253
VALERALDEHYDE	C	432	222
VINYL ACETATE	D	756	402
VINYL CHLORIDE	D	882	472
VINYL TOLUENE	D	921	494
VINYLDENE CHLORIDE	D	1058	570
XYLENES	D	867-984	464-529