

Intrinsic Safety

How are Hazardous Locations Defined?

Answer: According to the National Electrical Code, Article 500, hazardous locations are defined by Class, Group and Division. Differentiation by Class and Group is in accordance with the laws of physics, while Division classification is based on environmental and physical plant conditions.

Relative to the application of Intrinsic Safety, it is important to define the actual Class, Group and Division into which any proposed Intrinsically Safe electrical circuits are to be installed. As shown by the ignition curves, all flammable mixtures do not require the same energy levels to ignite. Because Intrinsic Safety requires maintaining an energy level lower than that required to ignite a specific hazardous mixture, it is important to know what the energy allowances are for operational and safety considerations.

Typical Resistance Circuit Ignition Currents Identify Only Four Hazardous Substances: Hydrogen, Ethylene, Propane and Methane. Aren't There More Flammable or Combustible Materials Than That?

Answer: Yes, but those four hazardous mixtures represent the basis for all flammable or combustible mixtures subject to ignition from electrical sources. All are found, as shown in the Hazardous (Classified) Locations chart following, in Class I, with Hydrogen identified as Group B; Ethylene identified as Group C; Propane being Group D and, as a separate curve within Group D, Methane.

Acetylene: Group A and Hydrogen: Group B share the same required energy levels relative to ignition. They require less energy for ignition than does Group C, which requires less energy for ignition than Group D. Within Class II Group E, metal or electrically conductive dusts, Group F, Coal Dust and Group G, electrically nonconductive dusts, generally grain or agricultural dusts are identified. As Groups A and B share the same ignition curve, Group C, Ethylene, and Group E, metal or electrically conductive dusts, share the same ignition curve. Groups D, Propane, F, Coal Dust, and G, electrically nonconductive dusts, share the same ignition curve.

A complete listing of hazardous mixtures defined by Group can be found in National Fire Protection Association document NFPA 497 M.

The Definition of Intrinsic Safety Identifies Both Electrical and Thermal Energy as Potential Causes of Ignition. How Does Thermal Energy Relate to the Ignition of a Specific Flammable or Combustible Mixture?

Answer: There are temperatures at which a flammable or combustible mixture will ignite. The minimum temperature at which ignition takes place is called the "Auto-Ignition Temperature." Intrinsically Safe systems will not allow thermal energy to reach levels at which a specific flammable or combustible mixture will auto-ignite.

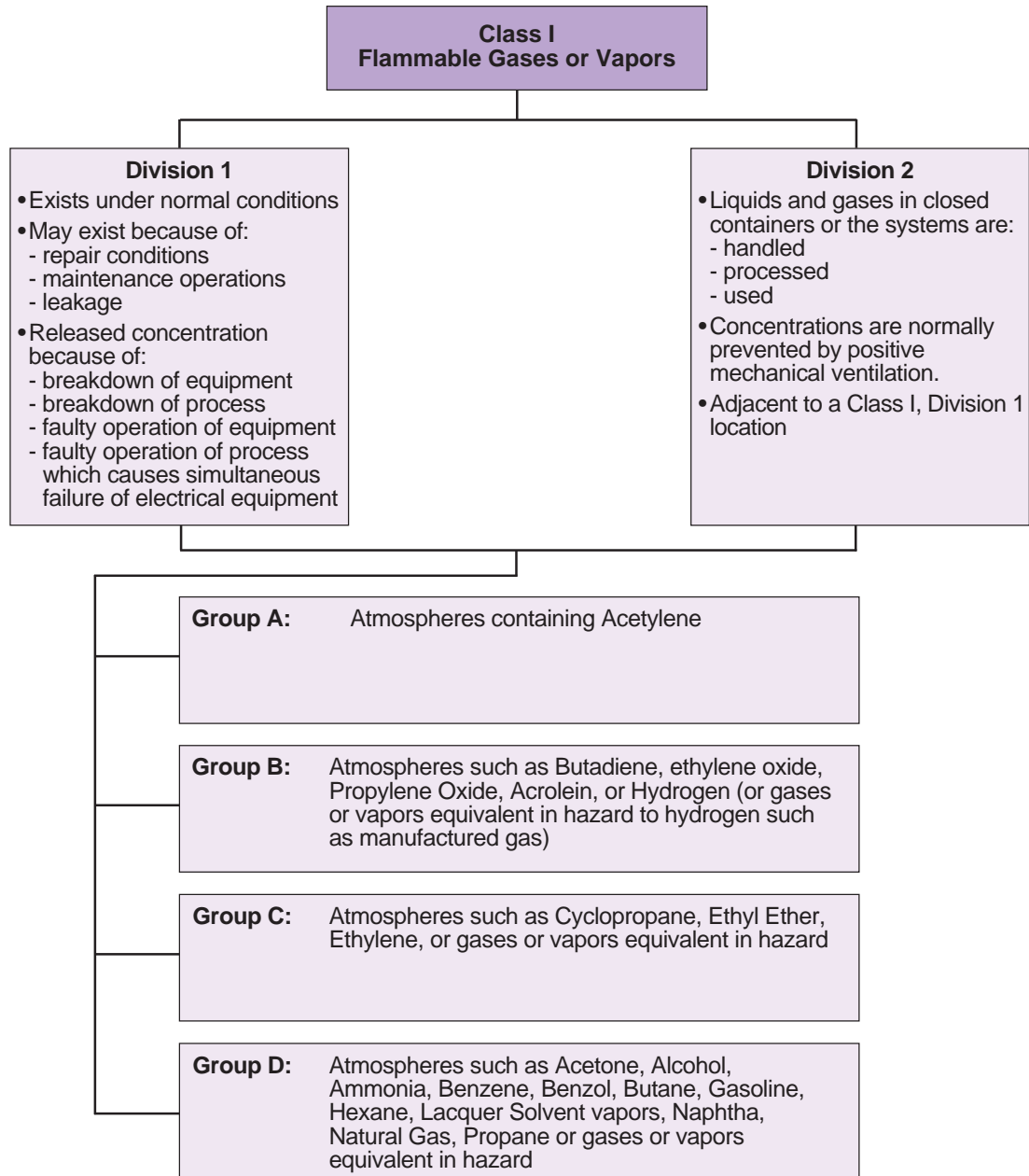
Figure 1 identifies common hazardous mixtures and their auto-ignition temperatures.

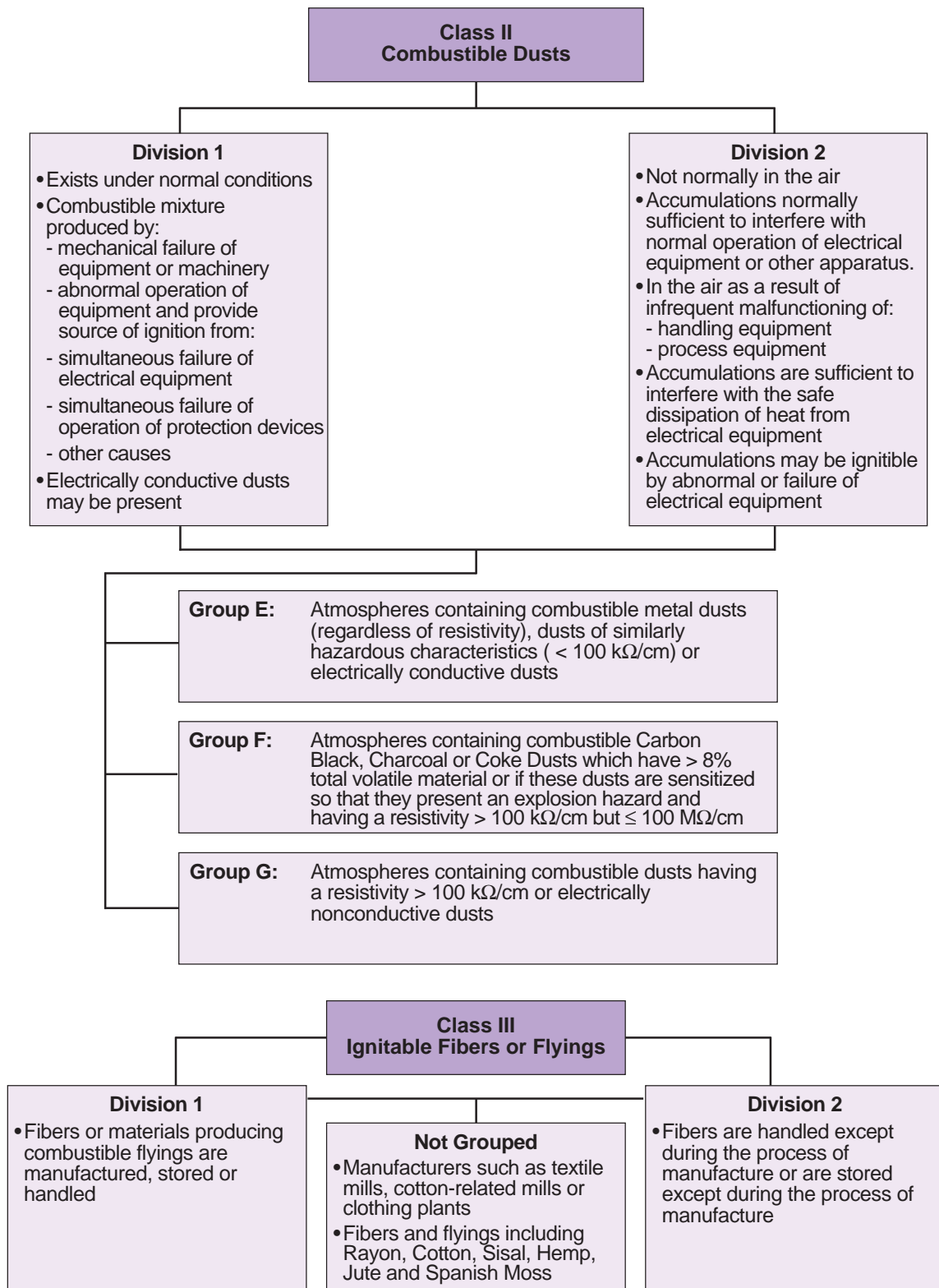
| Hazardous Mixture | Autoignition Temperature | |
|---------------------|--------------------------|------------|
| | °C | °F |
| Acetone | 540 | 1004 |
| Acetylene | 305 | 581 |
| Ammonia | 630 | 1166 |
| Benzene | 220 | 428 |
| Benzol | 555 | 1031 |
| Butane | 365 | 689 |
| Butylalcohol | 340 | 644 |
| Carbon Disulphide | 95 | 203 |
| Carbon Oxide | 605 | 1121 |
| Cyclohexane | 430 | 806 |
| Diesel Fuel | 220 to 300 | 428 to 572 |
| Ethane | 515 | 959 |
| Ethylacetate | 460 | 860 |
| Ethylalcohol | 425 | 797 |
| Ethylchloride | 510 | 950 |
| Ethylene | 425 | 797 |
| Ethylether | 180 | 356 |
| Ethyl Glycol | 235 | 455 |
| Fuel Oil | 220 to 300 | 428 to 572 |
| Hexane | 240 | 464 |
| Hydrogen aerioxide | 560 | 1040 |
| Hydrogen disulphide | 270 | 518 |
| Methane | 595 | 1103 |
| Methanol | 455 | 851 |
| Methyl chloride | 625 | 1157 |
| Naphthalene | 520 | 968 |
| Phenol | 595 | 1103 |
| Propane | 470 | 878 |
| Tetraline | 425 | 797 |
| Toluol | 535 | 995 |

Figure 1: Autoignition temperatures of some hazardous mixtures.

Intrinsic Safety Cont'd

Hazardous (Classified) Locations in Accordance with Article 500, National Electric Code-1990







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