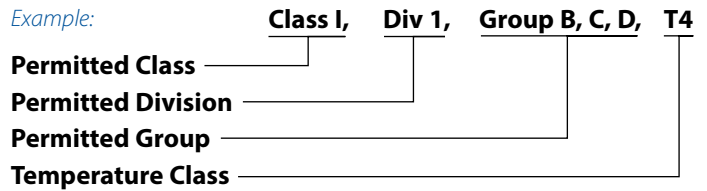


## Hazardous area descriptions

### National Electrical Code (NEC) 500

Traditional standards used in North America.

Example:



#### Permitted Class

- Class I: gas vapors
- Class II: dusts
- Class III: fibers

#### Permitted Division

- Division 1: gasses or vapors exist under normal conditions
- Division 2: gasses or vapors are present but are normally contained and can escape only through accident or abnormal operation

#### Permitted Group

- Group A: acetylene
- Group B: hydrogen or equivalents
- Group C: ethyl ether, ethylene or cyclopropane
- Group D: gasoline, hexane, naphtha, benzene, butane, propane, alcohol, acetone, benzol, lacquer, and natural gas
- Group E: metal dust
- Group F: carbon black
- Group G: flour, starch, grain dusts

#### Temperature Class\*

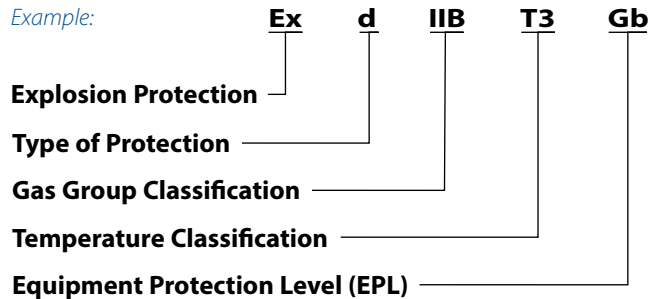
- T1: 450°C (842°F)
- T2: 300°C (572°F)
- T3: 200°C (392°F)
- T4: 135°C (275°F)
- T5: 100°C (212°F)
- T6: 85°C (185°F)

\* Device may be exposed to gases whose ignition temperature is higher than this value.

### IEC & EU (European) Standards

The IEC (International Electrotechnical Commission) markings are as follows:

Example:



#### Type of Protection

- d: flameproof enclosure - contain explosion and quench flame
- p: pressurized enclosure - fill with inert gas
- ia: intrinsically safe for Zone 0 - limit energy
- ib: Intrinsically safe for Zone 1 - limit energy
- o: oil immersion
- s: special protection
- e: increased safety - no arcing, sparking or hot surfaces
- m: encapsulation - sealed arcing devices or non-arcing
- q: sand-filled
- nL: nonincendive - limited energy
- nA: nonincendive - non sparking
- me: encapsulation/increased safety

#### Gas Group Classification

- IIC: acetylene and hydrogen
- IIB: diethyl ether, ethylene, cyclopropane and others
- IIA: gasoline, hexane, butane, naphtha propane, isoprene and many others

#### Temperature Classification\*

- T1: 450°C (842°F)
- T2: 300°C (572°F)
- T3: 200°C (392°F)
- T4: 135°C (275°F)
- T5: 100°C (212°F)
- T6: 85°C (185°F)

\* Device may be exposed to gases whose ignition temperature is higher than this value

#### Equipment Protection Level (EPL)

|      |     | Applicable Zone |
|------|-----|-----------------|
| Gas  | Ga: | 0               |
|      | Gb: | 1               |
|      | Gc: | 2               |
| Dust | Da: | 20              |
|      | Db: | 21              |
|      | Dc: | 22              |
|      |     |                 |

# Hazardous area descriptions

## ATEX Marking

European requirements centered around the safety of hazardous area equipment became mandatory on July, 1 2003 (94/9/EC). ATEX Directive 2014/34/EU superseded 94/9/EC effective April 20, 2016. All equipment exported into European member countries must meet the ATEX hazardous and essential health and safety requirements for acceptance.

### Equipment Group

- I: mines
- II: other than mines

### Category

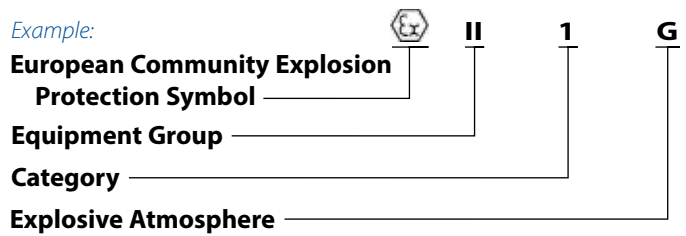
- 1: Zone 0
- 2: Zone 1
- 3: Zone 2

The ATEX markings are in addition to the standard Zone markings and indicate compliance to the new directives.

### Explosive Atmosphere

- G: gases/vapors
- D: dusts

Example:



## Other hazardous area information

### European Union

EU (directive 2014/34/EU) - ATEX

Ambient temperature ranges other than standard (-20° C < Ta < +40° C) must be marked.

### Area Classification

|                          | Flammable Material Present Continuously | Flammable Material Present Intermittently | Flammable Material Present Abnormally |
|--------------------------|---|---|---------------------------------------|
| <b>IEC/EU</b>            | Zone 0                                  | Zone 1                                    | Zone 2                                |
| <b>US</b> NEC® 505       | Zone 0                                  | Zone 1                                    | Zone 2                                |
|                          | Division 1                              |   | Division 2                            |
| <b>CA</b> CEC Section 18 | Zone 0                                  | Zone 1                                    | Zone 2                                |
|                          | Division 1                              |   | Division 2                            |

IEC classification per IEC 60079-10  
 EU classification per EN 60079-10  
 US classification per ANSI/NFPA 70 National Electric Code® (NEC®) Article 500 or Article 505  
 CA Classification per CSA C22.1 Canadian Electrical Code (CEC) Section 18 or Annex J

## Enclosure standards and protection concepts

### NEMA enclosure standards

NEMA (National Electrical Manufacturers' Association) has established standards for enclosures to provide protection from environmental contamination. A description of the more common standards is listed below. Type definitions are from NEMA 250-1997. For more detailed

and complete information, NEMA Standards Publication 250-1997, "Enclosures for electrical equipment (1000 Volts Maximum)" should be consulted. This Standards Publication, as well as all other NEMA publications, is available from IHS at 1-800-854-7179.

| Comparison of specific applications of enclosures for outdoor nonhazardous locations |                      |     |     |     |     |     |     |
|--|----------------------|-----|-----|-----|-----|-----|-----|
| Provides a degree of protection against the following environmental conditions       | NEMA enclosure guide |     |     |     |     |     |     |
|  | 3                    | 3R* | 3S  | 4   | 4X  | 6   | 6P  |
| Incidental contact with the enclosed equipment                                       | X                    | X   | X   | X   | X   | X   | X   |
| Rain, snow, and sleet**  | X                    | X   | X   | X   | X   | X   | X   |
| Sleet***   | ...                  | ... | X   | ... | ... | ... | ... |
| Windblown dust lint, fibers, and flyings   | X                    | ... | X   | X   | X   | X   | X   |
| Hosedown   | ...                  | ... | ... | X   | X   | X   | X   |
| Corrosive agents   | ...                  | ... | ... | ... | X   | ... | X   |
| Occasional temporary submersion  | ...                  | ... | ... | ... | ... | X   | X   |
| Occasional prolonged submersion  | ...                  | ... | ... | ... | ... | ... | X   |

\* These enclosures may be ventilated.

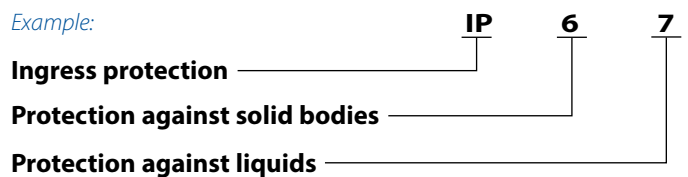
\*\* External operating mechanisms are not required to be operable when the enclosure is ice covered.

\*\*\* External operating mechanisms are operable when the enclosure is ice covered.

### IEC enclosure standards

The International Electrotechnical Commission has established enclosure standards for protection from environmental contamination as shown below. These standards are used widely in Europe, the Middle East, Africa and parts of Asia.

Example:



#### Protection against solid bodies

- 0: no special protection
- 1: protected against solid objects greater than 50 mm
- 2: protected against solid objects greater than 12 mm
- 3: protected against solid objects greater than 2.5 mm
- 4: protected against solid objects greater than 1 mm
- 5: dust protected
- 6: dust-tight

#### Protection against liquids

- 0: no special protection
- 1: protected against vertical falling water drops
- 2: protected against vertical falling water drops when enclosure is tilted at 15°
- 3: protected against sprayed water
- 4: protected against splashing water
- 5: protected against water jets
- 6: protected against heavy seas
- 7: protected from the effects of temporary immersion
- 8: protected from the effects of continuous immersion

## Chemical compatibility

The chemical compatibility reference guide has been developed to assist you in selecting the best StoneL products and material options for your applications. While this chart should assist you in selecting compatible materials, it is not a substitute for careful testing of a specific product in your operating environment. For additional assistance please contact StoneL technical support.

### Key

|     |   |
|-----|---|
| A   | No effect (recommended)                     |
| B   | Moderate effect                             |
| U   | Severe effect (not recommended)             |
| FC  | Fusion coating recommended on polycarbonate |
| --- | No test data or experience available        |

| Chemical                              | Aluminum | Polycarbonate  | Stainless Steel | Epoxy | Polysulfone |
|---------------------------------------|----------|----------------|-----------------|-------|-------------|
| Acetic acid                           | A        | B              | A               | B     | A           |
| Acetone                               | A        | FC             | A               | U     | B           |
| Acetylene                             | A        | --             | A               | A     | --          |
| Alcohol, amyl-                        | B        | FC             | A               | A     | A           |
| Alcohol, butyl-                       | B        | FC             | A               | A     | A           |
| Alcohol, ethyl-                       | B        | FC             | B               | A     | B           |
| Ammonia, liquid                       | A        | --             | A               | A     | A           |
| Ammonium hydroxide                    | B        | FC             | B               | A     | B           |
| Beer                                  | A        | A              | A               | A     | A           |
| Benzene                               | B        | FC             | A               | B     | U           |
| Boric acid                            | B        | A              | B               | A     | U           |
| Brine                                 | U        | B              | B               | --    | A           |
| Bromine                               | U        | FC             | U               | U     | U           |
| Calcium carbonate                     | U        | --             | B               | A     | --          |
| Calcium chloride                      | B        | A              | B               | A     | A           |
| Carbon tetrachloride                  | U        | FC             | B               | A     | A           |
| Chlorine                              | B        | FC             | B               | --    | U           |
| Chromic acid                          | U        | B              | U               | B     | U           |
| Citric acid                           | U        | B              | A               | A     | A           |
| Creosote                              | B        | FC             | B               | --    | --          |
| Ethyl chloride                        | --       | --             | A               | A     | U           |
| Ethylene                              | A        | --             | A               | --    | A           |
| Ethylene oxide                        | U        | --             | B               | A     | A           |
| Fluorine                              | B        | --             | A               | U     | U           |
| Freon (and other similar refrigerant) | B        | --             | A               | A     | B           |
| Gasoline                              | A        | FC             | A               | A     | B           |
| Heptane and hexane                    | A        | B              | A               | A     | A           |
| Hydrochloric acid, 10%                | U        | A <sup>1</sup> | U               | A     | A           |
| Hydrogen (gas)                        | A        | --             | A               | --    | --          |
| Hydrogen peroxide                     | A        | A              | B               | B     | A           |
| Hydrogen sulfide                      | B        | A              | A               | A     | --          |
| Isopropyl ether                       | A        | A              | A               | U     | A           |
| Jet fuel (JP 4,5,6)                   | A        | --             | A               | A     | B           |
| Kerosene                              | A        | --             | A               | A     | B           |
| Methane                               | A        | --             | B               | --    | --          |
| Methyl chloride                       | U        | FC             | A               | A     | U           |

| Chemical                              | Aluminum | Polycarbonate | Stainless Steel | Epoxy | Polysulfone |
|---------------------------------------|----------|---------------|-----------------|-------|-------------|
| Methyl ethyl ketone                   | B        | FC            | A               | B     | U           |
| Methylene chloride                    | B        | FC            | A               | A     | U           |
| Naptha                                | A        | FC            | B               | A     | A           |
| Natural gas                           | A        | --            | A               | --    | --          |
| Nickel chloride                       | U        | FC            | B               | A     | --          |
| Nitric acid (10%)                     | B        | A             | A               | A     | A           |
| Nitric acid (80%)                     | U        | B             | B               | U     | U           |
| Nitrous oxide                         | U        | --            | B               | --    | --          |
| Oils (animal)                         | A        | B             | A               | A     | --          |
| Oil (diesel)                          | A        | A             | A               | A     | A           |
| Oil (mineral)                         | A        | B             | A               | A     | A           |
| Phosphoric acid (85%)(air free)       | U        | B             | U               | B     | A           |
| Potassium chloride                    | U        | A             | B               | A     | A           |
| Potassium hydroxide (10%)             | U        | FC            | A               | A     | A           |
| Potassium hydroxide (70%)             | U        | FC            | A               | A     | A           |
| Potassium phosphate                   | U        | ---           | A               | --    | --          |
| Propane (LP gas)                      | A        | A             | B               | A     | B           |
| Soaps and detergents                  | B        | B             | A               | A     | A           |
| Sodium chloride                       | B        | A             | B               | A     | A           |
| Sodium hydroxide (10%) (caustic soda) | U        | B             | A               | A     | A           |
| Sodium hydroxide (50%) (caustic soda) | U        | FC            | B               | A     | A           |
| Sodium phosphate (monobasic)          | U        | --            | A               | A     | --          |
| Sulfur dioxide                        | B        | B             | A               | A     | B           |
| Sulfuric acid (7-40%)                 | U        | A             | U               | A     | A           |
| Tannic acid                           | B        | B             | B               | A     | A           |
| Toluol and toluene                    | A        | FC            | A               | B     | U           |
| Turpentine                            | B        | B             | B               | B     | B           |
| Urea                                  | B        | A             | B               | --    | B           |
| Vinyl Chloride                        | B        | --            | B               | --    | --          |
| Water, salt                           | U        | --            | B               | A     | A           |

<sup>1</sup> Temperatures less than 30° C

