



**Insurance Services Office (ISO)  
FSRS Equivalency List  
Credit Recognition**

## APPLICATION BULLETIN

### Reasons to Use F-500 Encapsulator Agent for Class D Fires

Class D fires occur fairly frequently in various industries. Class D, combustible metals are generally more volatile the finer the particle size. It is easier to ignite shavings, but solid Class D metals do ignite and present challenges.

#### Class D Metals (partial list)



Magnesium  
Titanium  
Aluminum

Lithium  
Uranium  
Plutonium

Pyrophoric Iron  
Thorium  
Tantalum

Zirconium  
Phosphorus  
Beryllium

The most common Class D fires occur in fabrication facilities, where metals are machined into finished products. Shavings, especially those with cutting oils, can easily ignite.

Aluminum is the third most abundant element on earth and is machined routinely around the world. Aluminum shavings do ignite and must never be extinguished with water or foam. Magnesium is the ninth most abundant element on earth and is widely used in airplanes, automobiles, electronics, paints, cans, sporting goods and more. Magnesium shavings can ignite easily and burn in excess of 5,500°F. These fires can easily spread due to their high temperatures. Titanium is also a Class D metal, but is expensive and harder to machine, so it is not as prevalent as magnesium. Titanium also burns at high temperatures.



In addition to fabrication facilities, fires can also occur where combustible metals are stored. Although shavings are easier to ignite, any adjacent fire can ignite solid combustible metals. Warehouse fires and automobile fires (with magnesium components) are prime examples.



#### Extinguishing Class D Metal Fires

Water and foam should never be used on Class D fires. The high temperatures cause the water molecules to separate into explosive hydrogen and oxygen gases. Carbon dioxide extinguishers should not be used because carbon dioxide can act as a catalyst, making the fire worse. Some recommend you should let Class D metal fires burn out, however, this is rarely feasible because the high temperatures can easily spread the fire throughout a facility.

Some dry powder extinguishers are rated for Class D fires, but these extinguishers specialize in the types of metals they extinguish. You must select the correct extinguisher for your hazard. Dry powders don't cool, so reignition

will occur. Sand is commonly used in an attempt to smother the fire, but sand also doesn't cool, so reignition is again, probable.

One fire suppression agent that breaks the mold is F-500 Encapsulator Agent. When mixed with water at 3%, the F-500 EA molecules change the structure of the water droplets. The F-500 EA molecules form a protective skin around the drops preventing evaporation. Water removes heat from a fire through Steam Conversion. An F-500 EA droplet absorbs the heat through Thermal Conveyance. Because of this, F-500 EA and water can be applied to Class D fires without violent explosions.

For designated fire personnel at industrial sites, or for firefighters, F-500 EA is the logical choice for fighting Class D fires. Not only is it safe to use on Class D fires, but it is extremely versatile and can be used on Class A fires, both polar and nonpolar Class B fires, three-dimensional fires and has been tested, recommended and used for lithium-ion battery fires and is recommended by ConEdison for transformer fires.

## Remember . . .

### F-500 EA is not a foam; it is an Encapsulator Agent

F-500 EA does not form a blanket of foam to smother a fire, instead F-500 EA;

- **Rapidly Cools the Fuel and Surrounding Structures**
- **Encapsulates Carbons and Hydrocarbons, Rendering Them Nonflammable**
- **Interrupts the Free Radical Chain Reaction, Greatly Reducing Smoke and Carcinogenic Toxins**

These extinguishing properties make F-500 EA far more versatile and capable than foams. NFPA does not recommend foams for three-dimensional fires.\* Since F-500 EA doesn't form a blanket, it's perfect for three-dimensional fires. F-500 EA can be used on Class D metal fires and combustible dust fires without flare-ups and potential explosions. F-500 EA has been tested and recommended by Bosch and others for lithium-ion battery car fires and by ConEdison for transformer fires.

\* NFPA 11 Annex A.1.1. - "Foam is not suitable for three-dimensional flowing liquid fuel fires or for gas fires."

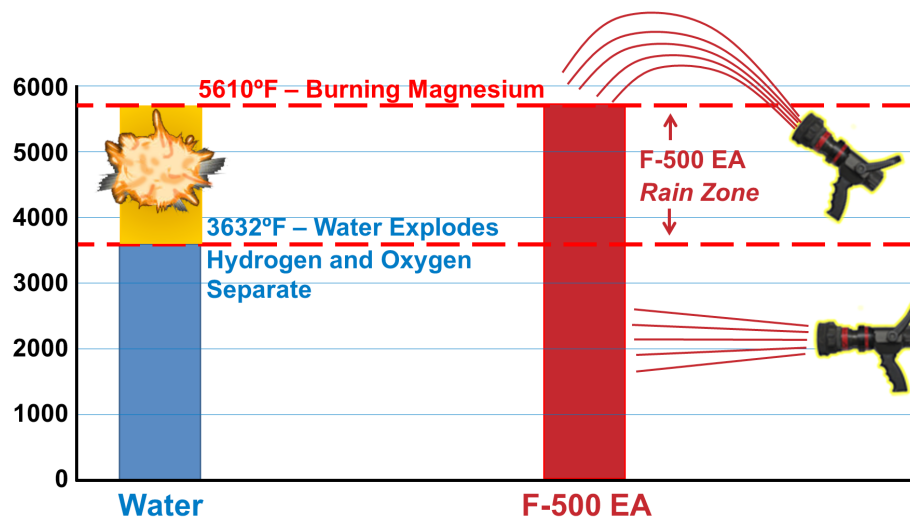
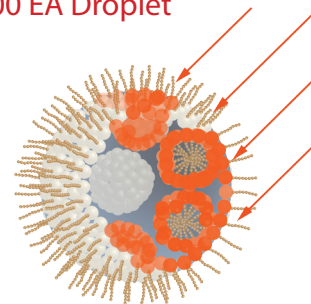
### Extinguishing a Class D Fire with F-500 EA

The unique molecules in F-500 Encapsulator Agent form a protective skin around the F-500 EA droplets. Water inefficiently removes heat through *Steam Conversion*. Most of the water evaporates without cooling, due to the high temperatures. F-500 EA absorbs the heat, without evaporating, by *Thermal Conveyance*, resulting in very rapid heat reduction.

With Class D metals, the high temperatures cause the water molecules to separate into explosive hydrogen and oxygen. On the chart, you can see this occurs above 3,632°F. As water is applied to the magnesium at 5,610°F, the water explodes.

This does not happen when a 3% solution of F-500 EA is applied to the burning magnesium. Above 3,632°F, we call this the "Rain Zone," because we recommend firefighters use a 40 degree pattern. First, F-500 EA is more effective at cooling with the smallest droplets. Second, a stream will scatter shavings and even solid metal, possibly spreading the fire. Cooling will occur in seconds. As the magnesium begins to cool, you can tighten the pattern on the nozzle.

F-500 EA Droplet



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