



CLASS D FIRE FIGHTING AGENTS

Class D fires involve combustible metals or metallic alloy elements with combustible metal components. Some of the better known combustible metals with a record of fire involvement include magnesium, titanium, zirconium, sodium, potassium, lithium and zinc. To be effective on any type of Class D fire, the extinguishing agent must suppress the fire without reacting physically or chemically with the combustible materials.

The more familiar dry powder extinguishing agents for controlling combustible metal fires are sodium chloride (salt), copper (US Navy developed for lithium fires) and graphite. It should be noted that the term Dry Powder should not be confused with Dry Chemical which is normally associated with extinguishing agents suitable for use on flammable liquid fires. In fact, some Dry Chemicals may create an explosive reaction when applied to combustible metal fires.

Amerex Super D Dry Powder is an off-white non-abrasive and non-combustible formulation of Sodium Chloride blended with additives to improve its flowing and non-caking characteristics which allows it to be applied with a smooth, even discharge from either the Amerex model B570

30 lb. stored Pressure hand portable or model 680 125 lb. argon cylinder operated wheeled class D extinguisher. The four foot discharge hose plus extension wand on the model B570 permits the operator an extra margin of safety when applying the powder with a minimum disturbance to the burning material via the specially designed baffled nozzle. The extension wand can be quickly disconnected so that the powder can be lobbed through a straight nozzle where greater range is desired. The model 680 may be discharged through the wand for large volume close-up fire fighting.

Normally, the Super D powder is applied by making a ring around the fire, gradually reducing the circle until the surface of the combustible metal has been completely covered to a depth sufficient to smother the fire. The application of Super D powder forms a sealing crust on the combustible metal fire. This crust excludes air and also assists in dissipating the heat from the burning metal.

Amerex Copper Dry Powder is a non-abrasive, non-combustible pure copper powder. This unique Class D agent was developed by and for the US Navy specifically for the very difficult extinguishment of lithium and lithium alloy fires. It is an excellent heat sink providing a quick cooling effect on the fire. It is two to three times more effective than graphite on lithium fires. It will cling to vertical surfaces and is heavier and more dense which makes it the preferred agent on three dimensional and flowing fires. The model B571 30 lb. hand portable and model 681 250 lb. argon cylinder operated wheeled Class D wheeled units use inert argon as the pressurizing gas since lithium reacts with nitrogen to form other combustible metal alloys. An extension wand with straight nozzle capability is optional with the model B571 and for the model 681.

Amerex G-Plus Dry Powder is a black, non-toxic material consisting of finely graded, granular graphite (carbon). It is normally applied to a metal fire using a spark proof scoop or shovel. The powder should be applied with a minimum disturbance, adequately covering the fire area to a depth of approximately two inches. If the burning material is on a combustible surface, the fire should be covered with dry powder as previously mentioned. A one or two inch layer of powder should then be spread on a nearby area (preferably a non-combustible surface) and the burning material shoveled onto this layer with more powder added as needed.

Graphite is an excellent conductor of heat (heat sink). When applied to a combustible metal fire, the temperature is reduced below the metal's ignition temperature. The finely ground particles of the powder also act as a smothering agent by packing and effectively sealing the hazard from air.

Practice drills should be conducted to train possible users of any of the three types of dry powder extinguishing agents. Fires in some combustible metals and combustible metal alloys generate by-products which constitute a health hazard. It is very important that you consult the MSDS provided by the material supplier for recommended breathing and clothing protection.

You and your customers should be aware of the following OSHA Requirements:

29CFR 1910.157 (6) "the employer shall distribute portable fire extinguishers or other containers of Class D extinguishing agent for use by employees so that the travel distance from the combustible metal working area to any extinguishing agent is 75 feet (22.9 m) or less. Portable fire extinguishers for Class D hazards are required in those combustible metal working areas where combustible metal powders, flakes, shavings, or similarly sized products are generated at least once every two weeks."

29CFR1910.158 (g) Training and education. (1) "Where the employer has provided portable fire extinguishers for employee use in the workplace, the employer shall also provide an educational program to familiarize employees with the general principles of fire extinguisher use and the hazards involved with incipient stage fire fighting. (2) The employer shall provide the education required in paragraph (g)(1) of this section upon initial employment and at least annually thereafter."

The following pages contain excerpts taken from NFPA 49 – Hazardous Chemicals Data – provide additional information on several hazardous metals. NFPA 49 and the Hazardous Material Handbook are valuable reference guides for the many rare and exotic combustible metals you will encounter during your daily service work. Amerex will research other potentially hazardous materials upon request but the first place you should look for an extinguishing agent is the MSDS your customer must have in order to work with the material in his plant. The MSDS contains fire fighting information from the prime manufacturer of the metal. No one has more experience with any given material than the one who has been producing it!

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ALUMINUM (Al) (dust or powder) Al

Description: Silvery colored powdered metal.

Fire & Explosion Hazards: Forms explosive mixture in air. Bulk dust when damp may heat spontaneously. Hazard greater as fineness increases. Reacts with some acids and caustic solutions to produce hydrogen.

Life Hazard: Respiratory and eye irritant only.

Fire Fighting Phases: Do not use water. Smother with suitable dry powder.

Usual Shipping Containers: Cans, barrels and boxes.

Storage: Protect containers against physical damage. Keep dry and isolate acids, caustics and chlorinated hydrocarbons. Separate from oxidizing materials. Avoid storage near combustible materials.

Remarks: Electrical installations in Class II hazardous locations, as defined in Article 500 of the National Electrical Code, should be in accordance with Article 502 of the code; Class II, Group E electrical equipment should be used in atmospheres containing aluminum dust. The hazardous powder may be produced by some metal spraying operations. See Code for the Processing and Finishing of Aluminum (NFPA 65), Code for the Prevention of Dust Explosions in the Manufacture of Aluminum Powder (NFPA 651) and National Electrical Code (NFPA 70).

BERYLLIUM (Be) (dust or powder)

Description: Silvery material, resembling aluminum powder.

Fire & Explosion Hazards: Forms explosive mixture in air. Hazard greater as fineness increases. Reacts readily with some strong acids producing hydrogen.

Life Hazard: Extremely toxic respiratory poison and eye irritant. If introduced under skin through cuts or punctures, may develop slow-healing ulcers.

Fire Fighting Phases: Do not use water. Smother with suitable dry powder. After exposure to beryllium fire, personnel should bathe carefully; all equipment and clothing should be washed down and clothing should be laundered separately from other non-contaminated material and clothing.

Usual Shipping Containers: Steel and fiber drums.

Storage: Protect containers against physical damage. Keep dry and isolate acids, caustics and chlorinated hydrocarbons. Separate from oxidizing materials.

Remarks: Electrical installations in Class II hazardous locations, as defined in Article 500 of the National Electrical Code, should be in accordance with Article 502 of the code; and electrical equipment should be suitable for use in atmospheres containing beryllium dust.

CALCIUM (C)

Description: Silvery soft metal. Tarnishes to grayish white on exposure to air.

Fire & Explosion Hazards: When heated to its ignition temperature, calcium burns quiescently in air without displaying any tendency to melt or flow. Finely divided calcium exposed to moist air may ignite spontaneously at room temperature. Calcium reacts with water to form hydroxide and hydrogen, but the reaction is much less violent than with Sodium. Mixed with air the liberated hydrogen may present an explosion hazard. As discussed below, explosion or violent reaction may take place if care is not exercised in selecting extinguishants applied to a calcium fire.

Life Hazard: Solid material will cause skin and eye burns since it reacts with moisture to form caustic. Similarly the fumes from burning calcium are highly irritating to skin, eyes and mucous membranes.

Personal Protection: Wear self-contained breathing apparatus; wear goggles if eye protection is not provided.

Fire Fighting Phases: Do not use water or halogenated hydrocarbons such as carbon tetrachloride. Carbon dioxide and dry chemical are ineffective. Use dry graphite, soda ash, powder sodium chloride or appropriate metal fire extinguishing powder.

Usual Shipping Containers: Hermetically sealed cans and drums.

Storage: Protect containers against physical damage. Keep away from water or locations where water may be needed for fire in other storage or in the building itself. Avoid high temperatures. Store under kerosene or other neutral oil. Never store under halogenated hydrocarbons. A detached fire resistant building is recommended for quality storage.

CALCIUM CARBIDE (CaC₂)

Description: Grayish-black irregular lumps.

Fire and Explosion Hazards: Not flammable in dry state but produces acetylene gas on contact with water or moisture. Will generate sufficient heat on contact with small amount of water to ignite acetylene gas formed.

Life Hazard: Dust is an eye and respiratory irritant and can cause skin burns.

Fire fighting Phases: Do not use water, vaporizing liquids or foam. Carbon dioxide is ineffective. Smother with suitable dry powder.

Usual Shipping containers: Steel drums and cans.

Storage: Protect against physical damage. Store in dry, non-combustible, well ventilated place without sprinkler protection and exclude possible sources of ignition of acetylene gas. Isolate from other materials.

Remarks: See Standard for the Installation and Operation of Gas Systems for Welding and Cutting (NFPA 51) and Chemical Safety Data sheet SD-23 (Manufacturing Chemists' Association, Inc.)

LITHIUM (Li)

Description: Silvery, soft (about as hard as lead) metal, tarnishes to grayish-white on exposure to air.

Fire and Explosion Hazards: While massive lithium will not normally ignite spontaneously in air unless heated above its melting point, ignition of the finely divided metal may take place at room temperatures. Unless physically confined, the burning metal has a pronounced tendency to melt and flow out. Combustion is accomplished by emission of dense, white and opaque fumes which tend to mask the seat of the fire. Lithium will burn in air, oxygen, nitrogen and carbon dioxide. The susceptibility of molten lithium surfaces to spontaneous ignition is increased by presence of lithium oxides or nitrides. Metallic lithium is sometimes handled at high temperatures (e.g. 1000°F) in closed systems with an inert gas (usually dry argon) in the void space. Leaks of molten lithium from such systems are normally accompanied by spontaneous ignition if the metal is permitted to contact air. At high temperatures lithium may react violently with concrete or other materials containing moisture. Lithium reacts with water to form hydrogen and lithium hydroxide. The reaction rate at room temperature is far less rapid than the corresponding reaction with sodium or potassium. Hydrogen resulting from the reaction may present an explosion hazard when mixed with air. Use of improper extinguishants for lithium fire control may introduce explosion or violent reaction hazards.

Life Hazard: Solid material may cause skin and eye burn since it reacts with moisture to form caustic. Similarly the fumes from burning lithium are highly irritating to skin, eyes and mucous membranes.

Personal Protection: Wear self-contained breathing apparatus, wear goggles if eye protection not provided.

Fire Fighting Phases: Do not use water or halogenated hydrocarbons, such as carbon tetrachloride. Carbon dioxide and dry chemicals are ineffective. Use dry graphite or appropriate metal fire extinguishing powder.

Usual shipping Containers: Hermetically sealed cartridges, cans and drums.

Storage: Protect containers against physical damage. Keep away from water or locations where water may be needed for fire in other storage or in the building itself. Avoid high temperatures. Store under kerosene or other neutral oil. Never store under halogenated hydrocarbons. A detached fire resistive building is recommended for quantity storage.

MAGNESIUM (including alloys) (Mg)

Description: Silvery metal; looks like aluminum but is one-third lighter.

Fire and Explosion Hazards: Combustible metal. Fine powder, thin sheets, chips and turnings are easily ignited and burn with intense heat and brilliant white flame. Powders form explosive mixtures with air which may be ignited by a spark. Pieces having thickness over 1/8 inch are difficult to ignite or to maintain flame as heat is conducted away so rapidly. However, thick pieces can be ignited when enough heat is applied. In finely divided form, will react with water and acids to release hydrogen; also hazardous in such form with chlorine, bromine, iodine, oxidizing agent and acids.

Life Hazard: Dust is a slight irritant.

Personal Protection: In fire conditions protect eyes and skin against flying particles. Avoid direct viewing of magnesium fires as eye injury may result.

Fire Fighting Phases: Smother with dry graphite or other suitable dry powders. Do not use foam, carbon tetrachloride or carbon dioxide. Manual application of water should be conducted with care to prevent contact with burning or molten magnesium. Protect eyes and skin against flying particles. Avoid direct viewing of magnesium fires as eye injury may result.

Usual Shipping Containers: Shavings or powder shipped in tightly closed metal or fiber containers. Shipped without containers as ingots, billets, castings, forgings, extruded shapes, rolled sheet and plates.

Storage: Protect against physical damage. Store finely divided chips or shavings in detached fire-resistive building, protected from moisture and away from chlorine, bromine, iodine, acids and all possible sources of ignition. Heavier sections may be stored in the open like steel or aluminum.