Fire-O Fireproofing Chemicals 2007

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Introduction

It is a common belief, that we are aware of the risks involved in a household fire and it is an illusion that we are prepared to face a fire.

However, the fact is that, only in the USA, fire incidents result with the loss of 6000 citizens and roughly 28.000 injuries every year. The simple cause of those tragic losses is that we think we know what fire is and that we can fight with it in ease. Make no mistake about it, to be caught in fire is not something you can understand by imagination. All that you think you know, you loose them when surrounded with the flames and you feel the heat burning your skin. Than instantly, starts panic: The factor hat will cost you your life and your loved ones'. You now live the minutes that will make all the difference in your life. That is the couple of minutes your life depends on. Will you be able to survive it?

We are here to see to it that your chance of survival is not limited to what you do in those couple of minutes. We are here to give you the one thing that is the most precious in case of a fire... **TIME**

Let us have a glance at the results of a drill made by NFPA... But first, a pop quiz:

Question 1

Assume, while you are asleep, the curtains of your living room caught fire. How long do you think you have to evacuate the house?

a) One or two minutes

b) Five minutes

c) Ten minutes

d) Fifteen minutes

The correct answer is a). A minute or two.

A fire was simulated in the drill house of NFPA to see the results of a fire originating from the orderly bin in the living room.

- In about two minutes the fire detectors react and the alarm goes off.
- By the third minute the temperature of the living room reaches the fatal limits of 260^{o}C.
- By the fourth minute the corridors become impossible to use.
- Some seconds later a person caught in this incident shall start breathing smoke or burn to die.

In real life, unlike movies, in case of fire, there is no time to get dressed, collect your valuables, or even call the fire fighters. The furniture and home electronics do not burn slowly, they flare and explode.

Question 2

Assume you are asleep. The smoke detector starts giving alarm. What do you do first?

a) Get up and try to understand what is going on

b) Call the fire department

c) Crawl fast towards the bedroom door

The correct answer is c). Crawl.

In case of fire, the smoke can choke you in a couple of seconds

Another vital information about fire is the heat factor. Below is a table demonstrating the heat at certain levels of height:

Height		**Temperature**
60cm (2feet)	……………………	93°C (200°F)
150cm (5feet)	……………………	260°C (500°F)
350cm (11feet)	……………………	427°C (800°F)

So a simple decision of crawling or standing up again makes the difference between survival and death.

Facts On Fire

Fire in the United States

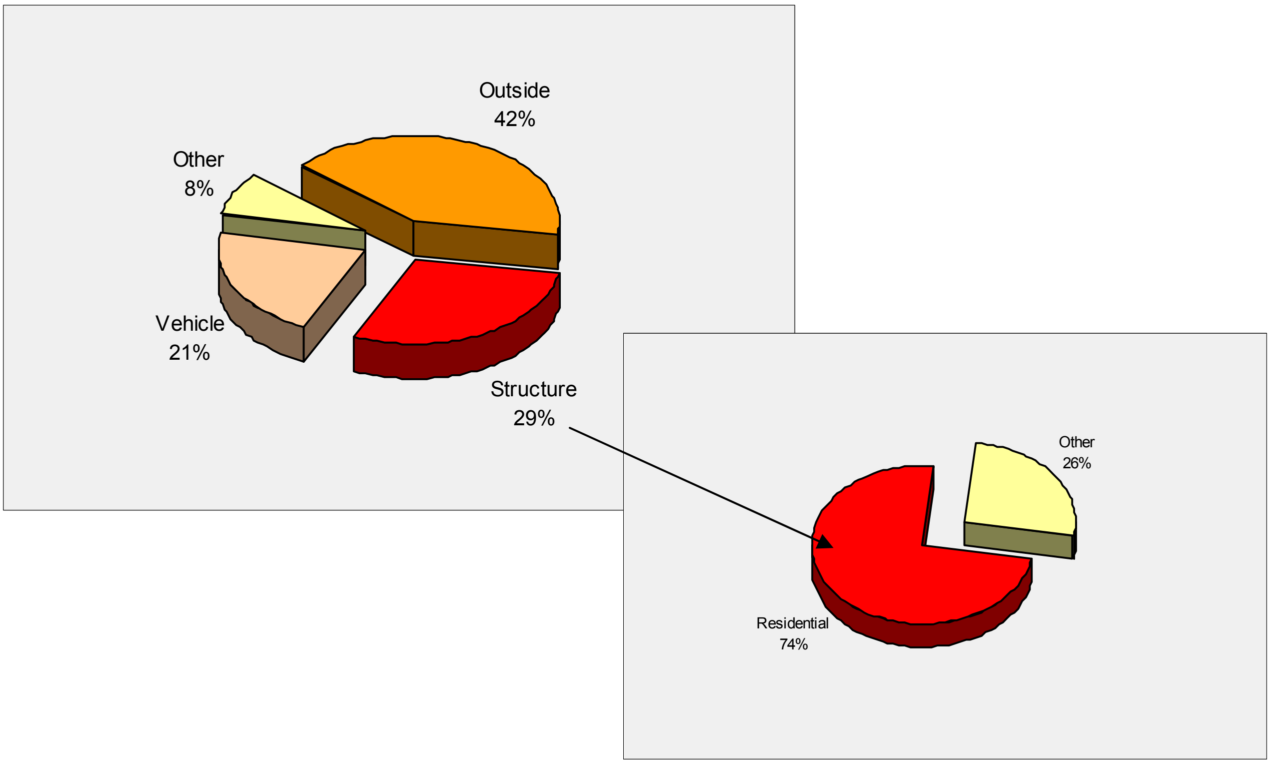
- The U.S. has one of the highest fire death rates in the industrialized world. For 1998, the U.S. fire death rate was 14.9 deaths per million population.
- Between 2001 and 2006, an average of 4,800 Americans lost their lives and another 27,100 were injured annually as the result of fire.
- About 100 firefighters are killed each year in duty-related incidents.
- Each year, fire kills more Americans than all natural disasters combined.
- Fire is the third leading cause of accidental death in the home; at least 80 percent of all fire deaths occur in residences.
- About 2 million fires are reported each year. Many others go unreported, causing additional injuries and property loss.
- Direct property loss due to fires is estimated at $8.6 billion annually.

Where Fires Occur

- There were 1,855,000 fires in the United States in 2004. Of these:

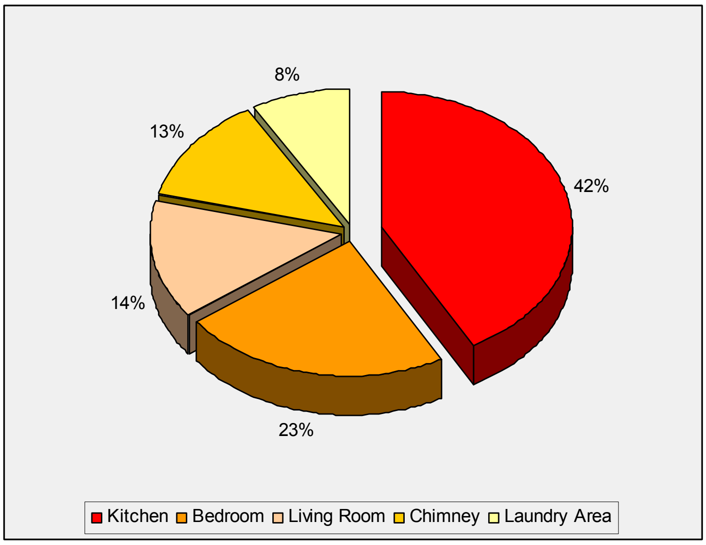
41%	were	Outside Fires
29%	were	Structure Fires
22%	were	Vehicle Fires
8 %	were	Fires of other types

- Residential fires represent 22 percent of all fires and 74 percent of structure fires.



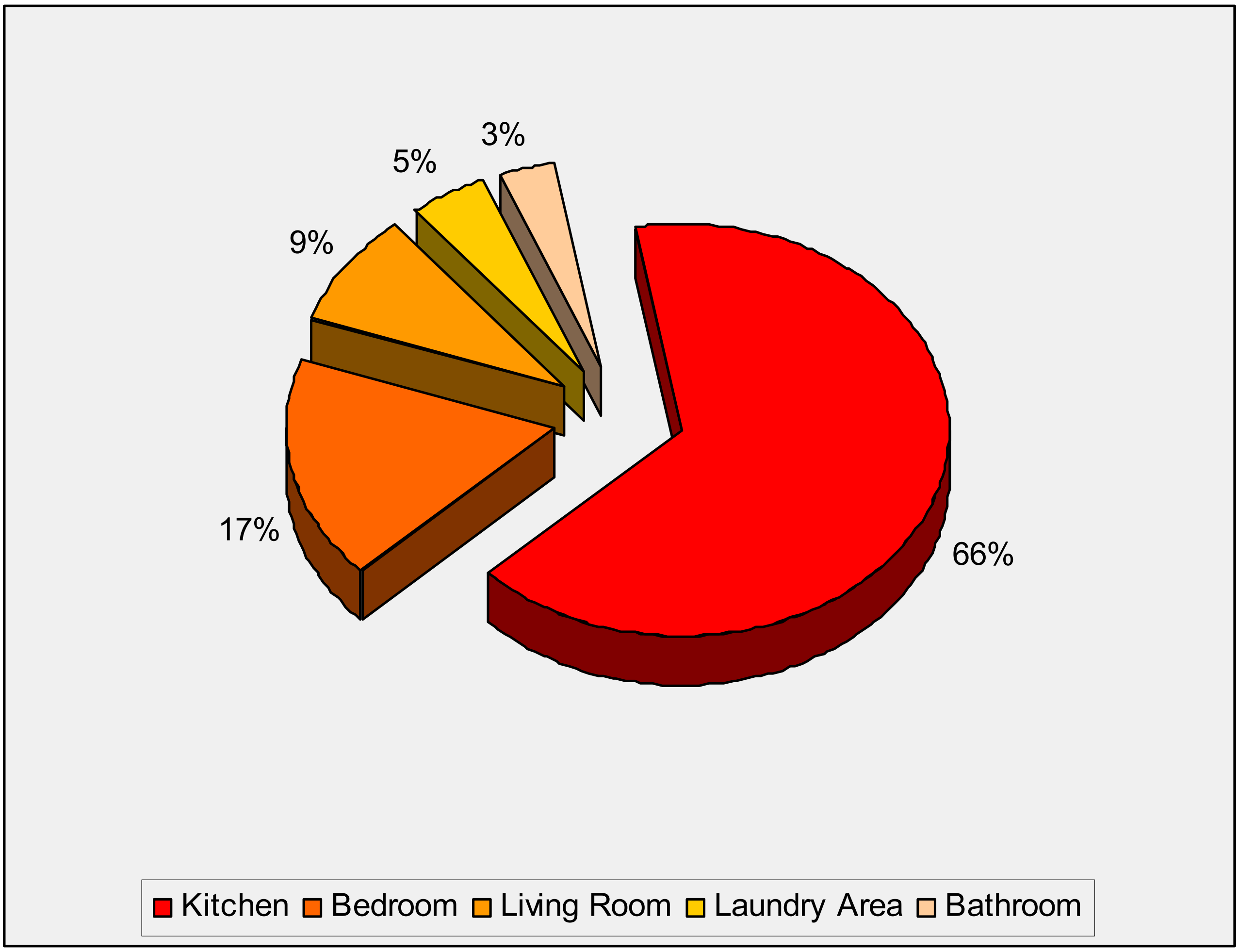
- Fires in 1-2 family dwellings most often start in the:

Kitchen	23.5%
Bedroom	12.7%
Living Room	7.9%
Chimney	7.1%
Laundry Area	4.7%



Apartment fires most often start in the:

Kitchen	46.1%
Bedroom	12.3%
Living Room	6.2%
Laundry Area	3.3%
Bathroom	2.4%



The South has the highest fire death rate per-capita with 18.4 civilian deaths per million population.

80 percent of all fatalities occur in the home. Of those, approximately 85 percent occur in single-family homes and duplexes.

Causes of Fires and Fire Deaths

- Cooking is the leading cause of home fires in the U.S. It is also the leading cause of home fire injuries. Cooking fires often result from unattended cooking and human error, rather than mechanical failure of stoves or ovens.
- Careless smoking is the leading cause of fire deaths. Smoke alarms and smolder-resistant bedding and upholstered furniture are significant fire deterrents.
- Heating is the second leading cause of residential fires and the second leading cause of fire deaths. However, heating fires are a larger problem in single family homes than in apartments. Unlike apartments, the heating systems in single family homes are often not professionally maintained.
- Arson is both the third leading cause of residential fires and residential fire deaths. In commercial properties, arson is the major cause of deaths, injuries and dollar loss.

Who is Most at Risk

- Senior citizens age 70 and over and children under the age of 5 have the greatest risk of fire death.
- The fire death risk among seniors is more than double the average population.
- The fire death risk for children under age 5 is nearly double the risk of the average population.
- Children under the age of 10 accounted for an estimated 17 percent of all fire deaths in 1996.
- Men die or are injured in fires almost twice as often as women.
- African Americans and American Indians have significantly higher death rates per capita than the national average.
- Although African Americans comprise 13 percent of the population, they account for 26 percent of fire deaths.

What Saves Lives

- A working smoke alarm dramatically increases a person's chance of surviving a fire.
- Approximately 88 percent of U.S. homes have at least one smoke alarm. However, these alarms are not always properly maintained and as a result might not work in an emergency. There has been a disturbing increase over the last ten years in the number of fires that occur in homes with non-functioning alarms.
- It is estimated that over 40 percent of residential fires and three-fifths of residential fatalities occur in homes with no smoke alarms.
- Residential sprinklers have become more cost effective for homes. Currently, few homes are protected by them

As you see and you will see in many examples, in case of fire you are surrounded with endless critical decisions that you have to take in seconds. In each of those decisions you face two paths:

- Wrong decision takes to one to the path to grave dangers
- Right decision takes one to the path to survival

We, Innotra Trading Inc present to you a chemical that will change your approach to fire and will save you those precious minutes to take the right decisions in saving your own life and your family's.

Fire-O Fire Proofing Chemicals

Now let us briefly identify the enemy:

What is Fire

Fire is not a state of matter: rather, it is an exothermic chemical reaction accompanied by intense heat released during a rapid oxidation of combustible material. Fire may be visible as the brilliant glow and flames and may produce smoke.

Fires start when a flammable or combustible material with adequate supply of oxygen or other oxidizer is subjected to enough heat. The common fire-causing sources of heat include a spark, another fire (such as an explosion, a fire in the oven or fireplace, or a lit match, lighter or cigarette) and sources of intense thermal radiation (such as sunlight, a flue, an incandescent light bulb or a radiant heater). Mechanical and electrical machinery may cause fire when combustible materials used on or located near the equipment are exposed to intense heat from Joule heating, friction or exhaust gas. Fires can sustain themselves by the further release of heat energy in the process of combustion and may propagate, provided there is continuous supply of oxygen and fuel. Fires may become uncontrolled and cause great damage to and destruction of human life, animals, plants and property.

Fire is extinguished when any of the elements of so-called fire triangle—heat, oxygen or fuel—is removed. The unburnable solid remains of fire are called ash.

Exothermic reaction

In chemistry, an exothermic reaction is one that releases heat. It is the opposite of an endothermic reaction. Expressed in a chemical equation:

$$\text{Reactants} \longrightarrow \text{product} + \text{energy}$$

When using a calorimeter, the change in heat of the calorimeter is equal to the opposite of the change in heat of the system. This means that when the solution in which the reaction is taking place gains heat, the reaction is exothermic.

In an exothermic reaction, the total energy absorbed in bond breaking is less than the total energy released in bond making.

The absolute amount of energy in a chemical system is extremely difficult to measure or calculate. The enthalpy change, ΔH, of a chemical reaction is much easier to measure and calculate. A bomb calorimeter is very suitable for measuring the energy change, ΔH, of a combustion reaction. Measured and calculated ΔH values are related to bond energies by:

ΔH=energy used in bond breaking reactions-energy released in bond making products

For an exothermic reaction, this gives a negative value for ΔH as a larger value is subtracted from a smaller value. For example, when hydrogen burns:

$$2H_2 + O_2 \rightarrow 2H_2O$$

$$\Delta H = -483{,}6 kJ/mol \text{ of } O_2$$

Examples of exothermic reactions

- Combustion
- Neutralization
- Adding water to concentrated acid
- Adding water to anhydrous copper(II) sulfate
- Termite

Combustion

Combustion or burning is a complex sequence of chemical reactions between a fuel and an oxidant accompanied by the production of heat or both heat and light in the form of either a glow or flames.

Since not every oxidation process results in the production of heat (for example, corrosion), the term combustion can only be applied to exothermic processes that occur at a rate fast enough to produce heat.

In a complete combustion reaction, a compound reacts with an oxidizing element, and the products are compounds of each element in the fuel with the oxidizing element. For example:

$$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O + HEAT$$

$$CH_2S + 6F_2 \rightarrow CF_4 + 2HF + SF_6 + HEAT$$

In most cases, combustion uses oxygen (O2) obtained from the ambient air, which can be taken as 21 mole percent oxygen and 79 mole percent nitrogen (N2). Thus, when methane (CH4) is combusted using air as the oxygen source, the first example equation above becomes:

$$CH_4 + 2O_2 + 7{,}52N_2 \rightarrow CO_2 + 2H_2O + 7{,}52N_2 + HEAT$$

As can be seen, when air is the source of the oxygen, nitrogen is by far the largest part of the products of combustion.

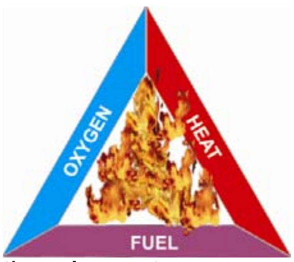
The simple word equation for the combustion of a hydrocarbon in air is:

$$Fuel + Oxygen + Nitrogen \rightarrow Heat + Water + Carbondioxide + Nitrogen$$

Typical temperatures of fires and flames

- Oxyacetylene Flame (3,000 C or above)
- Oxyhydrogen Flame (2,000 C or above)
- Bunsen Burner Flame (Max. Setting) (1,300 - 1,600 C)
- Candle Flame (1,400 C)
- Blowtorch (1,800 C - 1,300 C)
- Log fire (1,000 C ~)
- Heather Fire (500 - 1,000 C~)
- Paper — (approximately 235 C)

Fire triangle



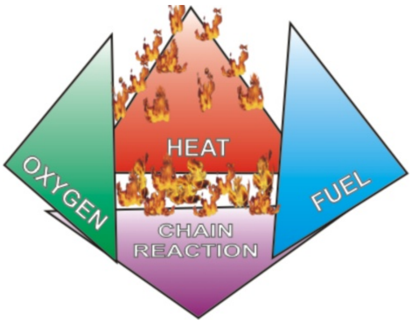
The fire triangle is a simple model, from the science of firefighting, for understanding the ingredients necessary for most fires. It has largely been replaced in the industry by the fire tetrahedron, which provides a more complete model, also described below.

The “triangle” illustrates the rule that in order to ignite and burn, a fire requires three elements — heat, fuel, and oxygen. The fire is prevented or extinguished by “removing” any one of them. A fire naturally occurs when the elements are combined in the right mixture (e.g., more heat needed for igniting some fuels, unless there is concentrated oxygen).

When a fire runs out of fuel it will stop. Fuel can be removed naturally, as where the fire has consumed all the burnable fuel, or manually, by mechanically or chemically removing the fuel from the fire. Fuel separation is an important factor in wild land fire suppression, and is the basis for most major tactics. Other fuels may also be chemically altered to prevent them from burning at ordinary temperatures, perhaps as part of a fire-prevention measure.

In short, it is possible to prevent fire by simply preventing one of those three elements to come together and form the triangle.

Fire tetrahedron



The fire triangle is a useful teaching tool, but fails to identify the fourth essential element of fire: the sustaining chemical reaction. This has led to development of the fire tetrahedron: a triangular pyramid having four sides (including the bottom). In most fires, it does not matter which element gets removed; the fire fails to ignite, or it goes out. However, there are certain chemical fires where knowing only the “fire triangle” is not good enough.

Combustion is the chemical reaction that feeds a fire more heat and allows it to continue. With most types of fires, the old fire triangle model works well enough, but when the fire involves burning metals (known as a class-D fire in the American system of fire classifications, involving metals like lithium, magnesium, etc.), it becomes useful to consider the chemistry of combustion. Putting water on such a fire could result in the fire getting hotter (or even exploding) because such metals can react with water in an exothermic reaction to produce flammable hydrogen gas. Therefore, other specialized chemicals must typically be used to break the chain reaction of metallic combustion and stop the fire.

The US and European Standards of Fire Classification

US Classifications

Class-A fires

A campfire would be an example of a class-A fire.

Class-A fires are the most common type of fire that occurs when a material such as wood becomes sufficiently hot enough, and has oxygen available to it causing combustion. (See fire triangle) At this point the material bursts into flame, and will continue burning as long as the fire triangle - heat, fuel, and oxygen - continues to be available to it.

Class-A fires are used all around buildings and everywhere in the world in controlled circumstances, such as a campfire, lighter, match, or candle. This makes an example easy to come by. For example, a campfire has a fire triangle - the heat is provided by another fire (such as a match or lighter), the fuel is the wood, and the oxygen is naturally available in the open-air environment of a forest. This fire is not dangerous, because the fire is contained to the wood alone and is usually isolated from the ground by rocks. However, when a class-A fire burns in an environment where fuel and oxygen are in accessible positions, the fire can quickly grow out of control.

Class-A fires are fairly simple to fight and contain - by simply removing the heat or oxygen (or in some cases fuel), the fire triangle collapses and the fire dies out. The most common way to do this is by removing the heat by spraying the fire with water. Other means of control or containment would be to "smother" the fire with carbon dioxide or nitrogen from a fire extinguisher, cutting off it's oxygen and causing the fire to die.

Class-B fires

A firefighting plane drops a chemical retardant.

Class-B fires are combustible fuels, hydrocarbons or solvents on fire. These fires follow the same basic fire triangle - heat, fuel, and oxygen - as class-A fires, except that the fuel in question is a hydrocarbon or solvent. This changes the strategy that must be used when fighting them considerably.

If the fuel is a lighter-than-water liquid such as oil or gasoline, as is the case with many, water that would ordinarily be used for fighting a class-A fire would end up spreading the fire, as the on-fire hydrocarbon would float on top of the water and continue burning. Specialized methods not usually available to regular fire departments are required to contain and put out this kind of fire.

A fire extinguisher rated for class A, B, and C fires.

One method would be dropping or spraying a chemical retardant, such as slurry, onto the fire. This is usually done by plane, and the pumps required to handle a chemical retardant would not often be available to ground fire crews - this makes it's use against class-B fires limited. A carbon dioxide fire extinguisher may be used on small class-B fires, though some fire extinguishers are not designed to fight against all classes of fire.

The most common method for fighting class-B fires would be to use a type of protein-based foam to cut off the fire's oxygen and cool the hydrocarbon/solvent. This can be fired from any pumper, even ones that were designed to hold only water, meaning that it does not require any specialized equipment. However, most fire departments do not have direct access to foam and require for it to be transported to them - this can delay firefighters severely and make fighting class-B fires a logistical problem.

Class-C fires

Class-C fires are electrical fires, where the heat side of the fire triangle is caused by, for example, short-circuiting machinery or overloaded electrical outlets. There are two main ways of fighting a class-C fire - cutting off it's oxygen, or simply turning off the electricity to the fire from a breaker. A class-C fire could be put out with a fire extinguisher rated for class-C fires, or with protein foam, but the primary approach would be to simply turn off the power as said above - this would cause the fire to become an ordinary class-A fire, or perhaps die out entirely.

Class-D fires

Class-D fires are metal fires. Certain metals, such as sodium, titanium, magnesium, potassium, uranium, lithium, plutonium, calcium and others are flammable. Magnesium fires and titanium are common. When one of these combustible metals ignites, it can easily and rapidly spread to surrounding class-A materials.

Generally, masses of combustible metals do not represent unusual fire risks because they have the ability to conduct heat away from hot spots so efficiently that the heat of combustion cannot be maintained - this means that it will require an extreme amount of heat to actually set the material on fire. Generally, metal fire risks exist when sawdust, machine shavings and other metal fines are present.

Water and other common firefighting materials can excite metal fires and make them worse. A special extinguishing agent is needed. This extinguishing agent is usually made up of dry powder firefighting materials, such as powdered copper. Dry powder extinguishing agents eliminate Class-D fires by removing heat (copper powder has a very high thermal coefficient, making powdered copper the most usual type of class-D extinguishing agents) and by smothering the inflamed metal.

Class-D fires represent a unique hazard because of their rareness and extremely high temperature (a high temperature is required to set the materials on fire). Even a small class-D fire can spread class-A fires to the surrounding combustible materials extremely easily.

Class-K fires

Class-K fires are fires that involve cooking oils. Though by definition Class-K is a subclass of Class-B, the special characteristics of these types of fires are considered important enough to recognize.

European classifications

In Europe and Australasia, a different classification system is used.

Class A

Fires that involve flammable solids such as wood, cloth, rubber, paper, and some types of plastics.

Class B

Fires that involve flammable liquids or liquefiable solids such as petrol/gasoline, oil, paint, some waxes & plastics, but not cooking fats or oils.

Class C

Fires that involve flammable gases, such as natural gas, hydrogen, propane, butane.

Class D

Fires that involve combustible metals, such as sodium, magnesium, and potassium.

Shock Risk (formerly known as Class E)

Fires that involve any of the materials found in Class A and B fires, but with the introduction of an electrical appliances, wiring, or other electrically energized objects in the vicinity of the fire, with a resultant electrical shock risk if a conductive agent is used to control the fire.

Class F

Fires involving cooking fats and oils. The high temperature of the oils when on fire far exceeds that of other flammable liquids making normal extinguishing agents ineffective.

The system is more or less the same as the U.S system, with letter designations shifted around - for instance, Class C fires in the U.S system are known as "shock risk" in Europe.

Science of fire

A flame is an exothermic, self-sustaining, oxidizing chemical reaction producing energy and glowing gas, of which a very small portion is plasma. It consists of reacting gases emitting visible and infrared light, the frequency spectrum of which is dependent on the chemical composition of the burning elements and intermediate reaction products.

In many cases such as burning organic matter like wood or incomplete combustion of gas, incandescent solid particles, soot produces the familiar red-orange 'fire' color light. This light has a continuous spectrum. Complete combustion of gas has a dim blue color due to the emission of single wavelength radiations from various electron transitions in the excited molecules formed in the flame. Usually oxygen is involved, but hydrogen burning in chlorine produces a flame as well, producing the toxic acid hydrogen chloride (HCl). Other possible combinations producing flames, amongst many more are fluorine and hydrogen, or hydrazine and nitrogen tetroxide.

The glow of a flame is somewhat complex. Black-body radiation is emitted from soot, gas, and fuel particles, though the soot particles are too small to behave like perfect blackbodies. There is also photon emission by de-excited atoms and molecules in the gases. Much of the radiation is emitted in the visible and infrared bands. The color depends on temperature for the black-body radiation, and chemical makeup for the emission spectra. The dominant color in a flame changes with temperature. The photo of the forest fire is an excellent example of this variation. Near the ground, where most burning is occurring, it is white, the hottest color possible for organic material in general, or yellow. Above the yellow region, the color changes to orange, which is somewhat cooler, then red, which is even cooler. Above the red region, combustion no longer occurs, and the uncombusted carbon particles are visible as black smoke.

Fire Variables

In the last section, we saw that fire is the result of a chemical reaction between two gases, typically oxygen and a fuel gas. The fuel gas is created by heat. In other words, with heat providing the necessary energy, atoms in one gaseous compound break their bonds with each other and recombine with available oxygen atoms in the air to form new compounds plus lots more heat.

Only some compounds will readily break apart and recombine in this way -- the various atoms have to be attracted to each other in the right manner. For example, when you boil water, it takes the gaseous form of steam, but this gas doesn't react with oxygen in the air. There isn't a strong enough attraction between the two hydrogen atoms and one oxygen atom in a water molecule and the two oxygen atoms in an oxygen molecule, so the water compound doesn't break apart and recombine.

The most flammable compounds contain carbon and hydrogen, which recombine with oxygen relatively easily to form carbon dioxide, water and other gases.

Different flammable fuels catch fire at different temperatures. It takes a certain amount of heat energy to change any particular material into a gas, and even more heat energy to trigger the reaction with oxygen. The necessary heat level varies depending on the nature of the molecules that make up the fuel. A fuel's piloted ignition temperature is the heat level required to form a gas that will ignite when exposed to a spark. At the unpiloted ignition temperature, which is much higher, the fuel ignites without a spark.

The fuel's size also affects how easily it will catch fire. A larger fuel, such as a thick tree, can absorb a lot of heat, so it takes a lot more energy to raise any particular piece to the ignition temperature. A toothpick catches fire more easily because it heats up very quickly.

A fuel's heat production depends on how much energy the gases release in the combustion reaction and how quickly the fuel burns. Both factors largely depend on the fuel's composition. Some compounds react with oxygen in such a way that there is a lot of "extra heat energy" left over. Others emit a smaller amount of energy. Similarly, the fuel's reaction with oxygen may happen very quickly, or it may happen more slowly.

The fuel's shape also affects burning speed. Thin pieces of fuel burn more quickly than larger pieces because a larger proportion of their mass is exposed to oxygen at any moment. For example, you could burn up a pile of wood splinters or paper much more quickly than you could a block of wood with the same mass, because splinters and paper have a much greater surface area.

In this way, fires from different fuels are like different species of animal -- they all behave a little differently. Experts can often figure out how a fire started by observing how it affected the surrounding areas. A fire from a fast-burning fuel that produces a lot of heat will inflict a different sort of damage than a slow-burning, low-heat fire.

Principle behind Fire-O Fire Proofing Chemicals

As you see, the enemy is fierce, frightening and merciless. So how the battle should be fought?

The answer comes from a 6th Century BC Chinese Master General:

The victorious military is first victorious and after that, does battle.

The defeated military first does battle and after that, seeks victory.

(The art of War, Chapter 4, Form)

The essence of success in protecting lives and property against fire is not in the fight with it but it is in taking preventive measures against it.

As you might remember from above, in class A fires, the fire triangle has to be collapsed by taking one of the factors out of the equation to fight with it. But than again as you might remember from the correct answers of our quiz, you have a very limited chance once fire has started.

Fire-O Fire Proofing Chemicals is the ultimate way to minimize the risk of defeat in this battle as it eliminates the contact between the fuel source and oxygen before the incident. It encapsulates the fuel source in molecular level hence it becomes impossible for air to get in contact with the fuel to start the combustion reaction.

Another positive consequence of this molecular encapsulation effect is the fact that the treated material becomes almost non convective. It was witnessed in our tests that a piece of 20mm plywood subjected to 1300-1500oC blowtorch flame for 42 minutes not only resisted flames but a temperature of approximately 120oC was measured at the back side.

Fire-O Fire Proofing Chemicals comes in a variety of forms so it may be used in the treatment of many materials during production:

Areas of Use

Fire-O Fire Proofing Chemicals in liquid form an be used in the treatment of following materials:

Wood

Natural Wood / MDF / OSB / PLYWOOD

Vacuum treated wood with Fire-O Fire Proofing Chemicals such as pine, Anigre, Oak, Ash tree, Beech, Spruce or OSB, MDF, Plywood may be used in the production following fire proof projects:

- Joists and subflooring.
- Beams and purlins.
- Stud-framed walls and partitions.
- Roof decks and sheathing.
- Roof and floor trusses.
- Wood blocking and furring.

- Paneling and architectural millwork.
- Rough Carpentry
- Finish Carpentry
- Manufactured Wood Trusses
- Architectural Woodwork
- Kitchen cabinets
- Furniture
- Window frames
- Fire doors

MDF or wood treated with **Fire-O**, used in kitchen furniture would bring a high level of safety to the major source of household fires, the kitchen

Fireproof doors would bring the safety of steel fire doors used in the hotels to your homes by isolating each room in case of fire.

OSB which is widely used in the construction as isolation in the roofs, if treated with **Fire-O**, becomes virtually impossible to burn.

While processing, if the logs are treated with **Fire-O**, a high standard of fire safety is brought to the wooden houses.

During MDF production, we suggest the use of **Fire-O** powder, in order to render the MDF fireproof.

Paper

Wood pulp treated with **Fire-O** Fire Proofing Chemicals is used in the production of following projects:

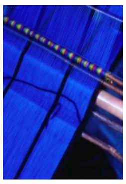
Packaging (Envelops and boxes for the transfer of valuable documents)

Wallpaper

Table Cover

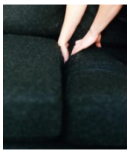
Place Mat

Textile



Textile processed with **Fire-O** shall bring a high standard of safety to police, fireman and army uniforms. **Fire-O** is a basic solution, and thus can be used as a detergent to clean carpets and curtains (for average cleaning purposes, not against heavy and/or greasy stains). The cleaning will make the curtains and carpets fireproof. This may help hotels to attain fire safety standards easily.

Felt



Felt material widely used in the household or automotive industry as fillings in chairs, seats and car doors as isolation, if processed with **Fire-O** during production, would make the interior of a car virtually impossible to catch flame.

Other

If **Fire-O** sprayed from an airplane, onto a tree-covered area, it can be used as a fireproof barrier in order to prevent forest fire expansion. Fire-O is environmentally friendly and safe to use directly on plants and trees.

Fire-O, in powder form can be used in the production of fire proof electric cable.

Fire-O may also be used with water based paints in the production of flame retardant paint

What makes Fire-O Fire Proofing Chemicals So Unique?

There are many studies and achievements in producing chemicals to be used as flame retardants. However, those achievements came with side effects:

We may classify those compounds under 4 groups:

- Compositions made of phosphoric acid and hydrochloric acid. Those are compounds that release poisonous gases when burned. Thus their use is restricted.
- Nitrogenous compositions made of phenol and formaldeid when burned, release gases that consume the oxygen in the ambient. They are used in fire fighting, however consuming the oxygen and the poisonous gases result in endangering the life of the personnel or the living organisms in the area.
- Compositions made of trioxide and antimony aim to consume the oxygen by the release of ammonium oxide, however it is known that antimony trioxide contains %0, 15 arsenic and % 0, 05 lead thus are dangerous for human health.
- Compositions made by putting strong bases and acids into a reaction in order to consume the oxygen in the burning area however this reaction also results in poisonous gases.

The Shortcomings of Surface-Applied Fire Retardant Wood Coating

- Some fire retardant wood coatings have been promoted in ways that encourage their misuse in structural applications. Model building codes do not permit fire retardant coatings to be used for structural applications.

- Coatings are only permitted for interior trim, paneling, cabinets and other non-structural uses. For all structural uses pressure impregnated FRTW[1] is required. When evaluating coatings, consider the following:
- Coatings may have been mistakenly accepted as FRTW by building officials, fire marshals, architects and contractors when they were are not aware of the differences between pressure impregnated fire retardant treatments and surface-applied fire retardant coatings. Pressure impregnated fire retardants, such as Fire-O, are permanent treatments and do not require additional reapplications.
- Third party quality control of the application process is required by model codes. FRTW is treated and redried in commercial pressure treating plants. An agency certification mark is applied to each piece indicating
- in-plant third party quality control, as required by the model codes.
- On the other hand, coatings are applied anywhere by on-site applicators. Unlike FRTW, which has in-plant third party quality control of the treating process, there is little or no third party quality control of the coating application at the jobsite.
- The UL Building Materials Directory states that for coatings the local building official is responsible for assuring proper application in the field. This is unnecessary with FRTW.
- Flame spread testing for FRTW is far more severe than for coatings. The basic test procedure in both cases is the familiar ASTM E-84 "Tunnel Test," which is a 10-minute test. However, unlike coatings, FRTW must endure the test for additional 20 minute duration. Codes require FRTW to have a flame spread rating of 25 or less (Class A) per ASTM E-84, plus there can be no significant progressive combustion when the test is extended to 30 minutes. The superficial protection provided by coatings cannot pass the 30-minute Tunnel Test. Unfortunately, since the test designation in both cases is "ASTM E-84," it's easy to mistake Class A 10-minute test results as meeting code requirements for structural use, which it does not.
- Codes require strength testing after high temperature/high humidity exposure. Coatings often claim little or no strength loss (there is little or no penetration into the wood) and their test data rarely includes high temperature exposure.
- For structural purposes, building codes require FRTW to be pressure applied and tested for flame spread under ASTM E-84, the extended version. Using a surface applied fire retardant coating is not allowed as an option.

FR-S Rating – What Does It Mean?

Sometimes fire-retardant-treated wood (FRTW) specifications refer to a "FR-S" rating. This can create confusion because building codes do not use the FR-S designation. Building codes do, however, require a flame spread rating of 25 or less for FRTW.

The FR-S rating indicates that a specific species of wood exhibits a flame spread and smoke developed rating of 25 or less when tested in accordance with the ASTM E84 "Standard Test of Surface Burning Characteristics of Building Materials" extended for additional 20-minutes.

[1] Fire Retardant Treated Wood

There are two issues of concern with smoke:

1. Obscuration
2. Toxicity

Building codes do not specify a smoke-developed requirement for FRTW. With FRTW the amount of smoke developed is not an issue. Using the worst smoke developed number for FRTW and the best for untreated wood, FRTW produces only about %20 as much smoke.

The testing indicates that the smoke is no more toxic than the smoke from untreated wood.

Fire-O meets or exceeds all building code requirements. For the best competitive quote, a specification of flame spread less than 25 gives the contractor the option of using the

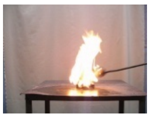
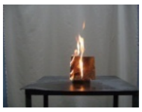
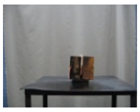
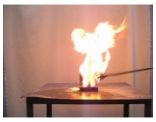
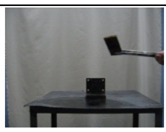
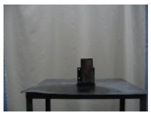
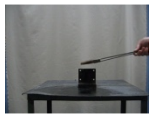
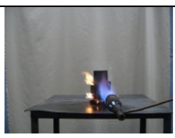
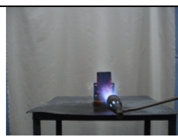
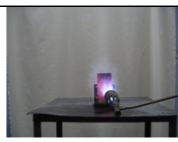
species and treatment that is best suited for the application.

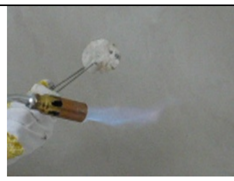
As you see, Fire-O not only protects human life against fire but eliminates all the side effects brought by its predecessors.

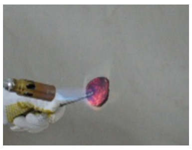
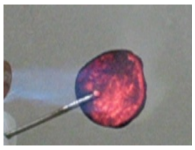
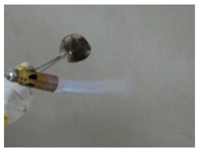
In the following chapter, you are kindly presented some test results with photos:

Tests

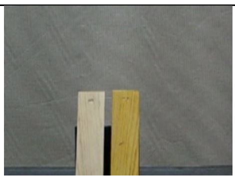
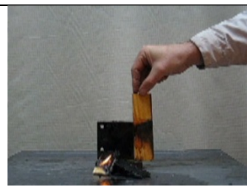
TEST REF: OSB-01		Treated OSB (8mm thickness –60 * 120mm dimensions)				
0 sec	60 sec	120 sec	180 sec	240 sec	300 sec	
						
In test OSB-01, 2 OSB pieces, subject to blowtorch flame (1300°C) untreated piece starts showing deformations by the 2nd minute. By the 5th minute, it burrns to ashes. The treated piece, by the end of the 5th minute shows minor deformation, never catches fire and there is minor carbonization at the back side proving that the treated piece does not conduct heat either.						

TEST REF: OSB-02		Treated OSB (8mm thickness – 60 * 120mm dimensions)				
OSB Pieces dipped into gasoline Round #1				OSB Pieces dipped into gasoline Round #2		
0 sec		60 sec	120 sec	0 sec	150 sec	
						
OSB Pieces dipped into gasoline Round #3			OSB Pieces dipped into gasoline Round #4			
0 sec	160 sec		0 sec	180 sec		
						
OSB Pieces subject to blowtorch flame						
90 sec		240 sec		270 sec		
						
In test OSB-02 A piece of OSB was dipped in gasoline 4 times and the same piece was subjected to blowtorch flame (1300°C). The first round of the gasoline test was made with a piece of same specs as a comparison. In the following rounds, it was seen that after gasoline burns and evaporates, the fire ceases (in 2,5 -3 sec). OSB piece does not catch fire. It does not get deformed. After the 4th round with gasoline, we have applied blowtorch flame for 4,5 minutes. The piece has been carbonized, never caught flame and resisted heat applied, with minor deformation						

TEST REF: COT-01	Treated Cotton piece of 50 mm diameter			
0 sec	30 sec		45 sec	
	Front	Back	Front	Back
				

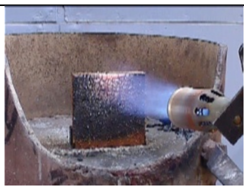
60 sec		75 sec		120 sec	
Front	Back	Front	Back	Front	Back
					

A piece of cotton, treated with Fire-O Fire Proofing Chemicals, has been subjected to blowtorch flame (1300oC) for 2 minutes. It has been vithnessed that during the test cotton did not take flame and due to the fact that Fire-O gives a non conductivity of heat, the back side of the cotton had moderate carbonization and minor deformation

TEST REF: PINE-01	Untreated/Treated Pine (5mm thickness – 40 * 140mm dimensions)			
0 sec	30 sec	60 sec	120 sec	150 sec Back
				

A piece of pine wood, treated with Fire-O, after being subjected to blowtorch flame (1300^{o}C) is compared to a natural one. The untreated piece burns to ashes in 150 seconds however the treated piece shows minor deformation and the back side preserves its natural color and form.

TEST REF: PLW–01	Untreated Plywood (20mm thickness –120 * 120mm dimensions)			
0 min	3 min	5 min	8 min	11 min
				
Result at 11th min				

TEST REF: PLW–01	Treated Plywood (20mm thickness –120 * 120mm dimensions)			
0 min	3 min	5 min	8 min	11 min
				
20 min	30 min	35 min	42 min	42 min back