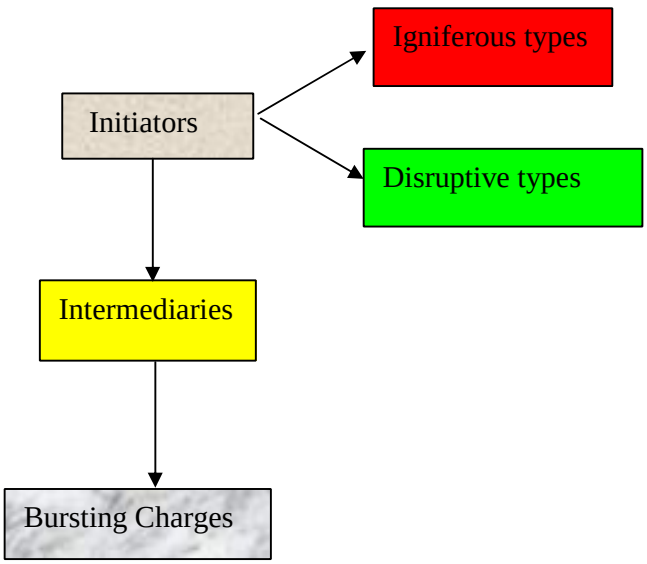
EXPLOSIVES CLASSIFICATION

In order that the subject of explosives may be dealt with in a logical and safe manner they are classified in accordance with their behaviour and purpose. The simple schematic shows the basic classification of high explosives. As you can well appreciate different explosives require different storage conditions to ensure that the inherent risks associated with explosives are minimised and that dangers to the public and users are reduced to the least acceptable level.

For example one would not store all your initiators in one storehouse as they are very sensitive and dangerous to handle, whereas your bursting charges are very insensitive thus they can be stored in greater quantities. You do not want to store items together that will interact with each other such as initiators stored with demolition explosives.



Because Gunpowder was the only known propellant and explosive for many years, and because it was initiated by flame or spark, the term "Firing" became accepted as the signal for the commencement of any explosive reaction. This holds good even today.

But it does not follow that all explosives are functioned by fire. Some explosives will burn quite happily without exploding and others will explode, quite readily, without any flame being required. Naturally, some explosives will always explode if a flame is applied to them

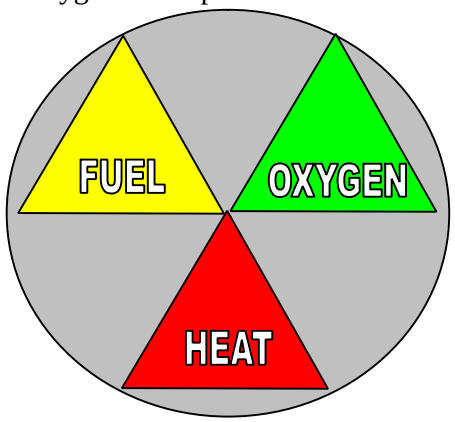
The differences are related to the speed of the reactions concerned. To our senses the reaction of an explosion is instantaneous, but measurements with electronic instruments show that the speed of the various types of reactions varies considerably over a large range of values.

The range of these reactions is divided into three broad classifications and these are:

BURNING **EXPLOSION** **DETONATION**

BURNING

Most people very well understand the phenomenon of burning today. Suffice it to say that what is not clearly understood by everyone is the fact that **burning is a fast form of oxidation**. This is to say that a fire is converting a fuel to other substances by combining the fuel with oxygen in the presence of heat and in the process gives off energy, some of which is heat energy. The rate at which this occurs is observable over many hours. In fact if the fuel is particularly hard the time frame is quite long. A form of oxidation that is particularly a nuisance is rusting. This is a very slow rate and one that is usually only noticed when the damage has been done, usually when the drill instructor looks down the barrel of the offending weapon. The essential requirement for burning to take place is to have the three ingredients of Fuel, Oxygen and Heat. Firemen fight fires by trying to remove one of the three ingredients.



The rate of this oxidation can be controlled in various ways:

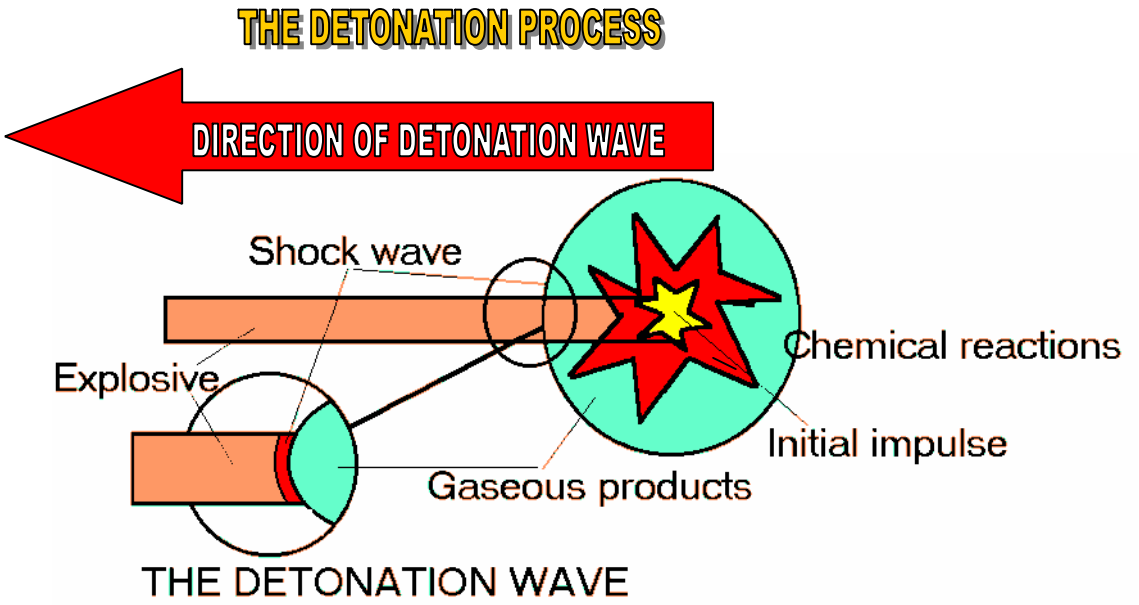
- Increasing the temperature at which the reaction takes place,
- Increasing the quantity of fuel,
- Changing the surface area of the fuel,
- Increasing the flow of oxygen to the reaction.

EXPLOSION

This phenomenon can best be described by referring to our old stand by gunpowder and examining the action of it as it explodes. As the action commences, the applied flame or spark raises the temperature of the first particles to ignition level and in doing so these particles cause the temperature of the adjacent particles to rise also. These in turn ignite and so pass the flame on throughout the mass of the explosive. Thus, the burning proceeds through the mass in a uniform manner, rarely exceeding 350 metres per second (even when closely confined) It is this slow speed of reaction that permits Gunpowder to be used as a propellant. The point to be noted here is that the explosion is in fact a **very rapid form of burning**. Proceeding through the explosive in a steady and reasonably predictable manner. The initial impulse to start the process is usually a flame applied to the substance.

DETONATION

The first thing to be understood clearly is that the phenomenon of detonation is **not** a rapid form of burning. What it is in fact is a wavelike action passing through the explosive in a linear manner at velocities that can be as high as 10000 metres per second. Explosives that act in this manner are commonly termed High Explosives, usually abbreviated to HE. This action may be commenced by applying a violent shock to the explosive, usually in the form of a blasting cap. Many HEs will quite readily burn to detonation if set on fire and yet others will burn away contentedly until the entire explosive is consumed. Let us now look more closely at the detonation process.



The initial impulse is applied to the explosive, usually by means of a detonator. The explosive then begins to break down into its constituent parts in what appears to be a linear fashion. If you will look closely at the drawing you will note that the gaseous products are in fact expanding in a spherical form. What you don't see is the damage done to the air. What you do see is the damage and explosion of the explosive itself. This makes it appear as though the detonation travels in a linear way. The shock wave produced by the initial impulse creates a zone of chemical reactions giving off high temperature and high pressure gasses. This wave passes into the unexploded material and causes it to explode. As mentioned earlier this wave can reach speeds around 10000 metres-per-second.