

Explosive Materials

Flash Powder

Flash powder is a chemical mixture that is extremely sensitive to heat and sparks. It burns very rapidly, causing a flash of light. **It should be handled with extreme caution.** Since it contains aluminum and magnesium, it is silver in color.

It is an explosive filler usually found in military simulators and M80 and M100 type devices. It is often found at sites where illegal explosive devices are found.

Blasting Agents and Oxidizers

A blasting agent is any booster-sensitive mixture or material that contains an oxidizer and fuel that is intended for blasting, is not otherwise defined as an explosive, and the finished product-- as mixed for use or shipment-- cannot be detonated by means of a No. 8 test detonator when confined. Since blasting agents do not contain nitroglycerin but consist largely of ammonium nitrate, they are relatively insensitive to heat, friction, and shock.

Blasting agents include ammonium nitrate-fuel oil (ANFO) mixtures; non-detonator sensitive water gels, emulsions, slurries; ANFO blends containing slurries, water gels or emulsions; and ammonium nitrate in prilled, grained, or liquor (water solution) form. This category includes both the bulk and packaged forms.



Figure 1-22. Assorted Blasting Agent Products.

Some brand names of blasting agents are Pellite™ WR, Austinite WR series, Fragmax™, Frapak™, Nilite® WR, Dynoflo® Extra, Plus, C Plus, and 600SLX®.

Ammonium Nitrate

Ammonium nitrate is one of the least sensitive and most readily available main charge high explosives. It is widely used as a blasting agent, an ingredient in certain dynamites, and as a fertilizer.

Depending on its purity, it will range in color from white to buff-brown and will have a saline or salty taste. To facilitate identification, colored dyes may be also added to the product. Ammonium nitrate is usually found in the form of small compressed pellets, commonly known as prills. When fuel oil is added to the prills, the mixture then becomes ANFO (ammonium nitrate and fuel oil).



Figure 1-23. Ammonium Nitrate Prills

In order to detonate ammonium nitrate, the use of a booster is required. Commercially, Pentolite and RDX are used as a booster, while the military will often use TNT as the booster.

Some degree of caution should be used when handling ammonium nitrate. It is a strong oxidizing agent and has the ability to increase the combustibility of other flammable materials with which it comes in contact. For example, brass or bronze non-sparking tools should **NOT** be used because of the reaction with ammonium nitrate, which will form an explosive that is as sensitive to impact as lead azide.

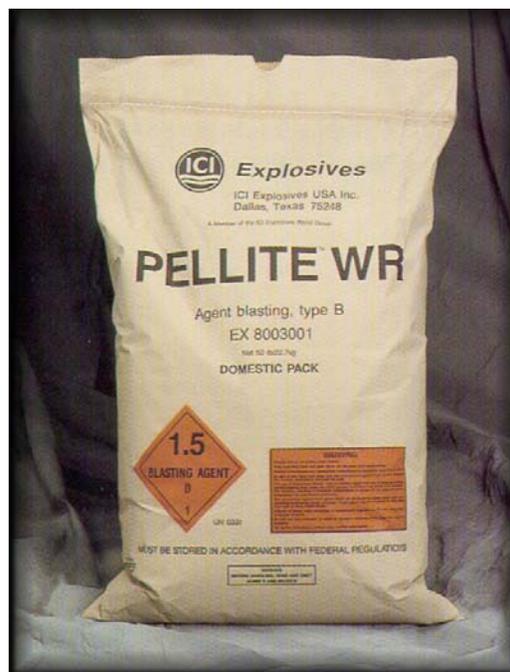


Figure 1-24. Ammonium Nitrate 50-Pound Bag

ANFO

ANFO is a commonly used explosive for commercial blasting in the United States. It has a slow rate of detonation that makes it ideal to use in quarry and other blasting applications.

ANFO is an explosive material consisting of 94% prilled ammonium nitrate and 6% fuel oil. It is insensitive, and a detonator alone will not cause ANFO to detonate. In order to initiate ANFO, it will require an initiating system and a booster. It comes in either bulk form (mixed on site and pumped directly into boreholes) or 50-pound bags (premixed). Some brand names are Ammonite, Bulk 100, Dyno® Mix, Iremix 100, and Burtmix #1.

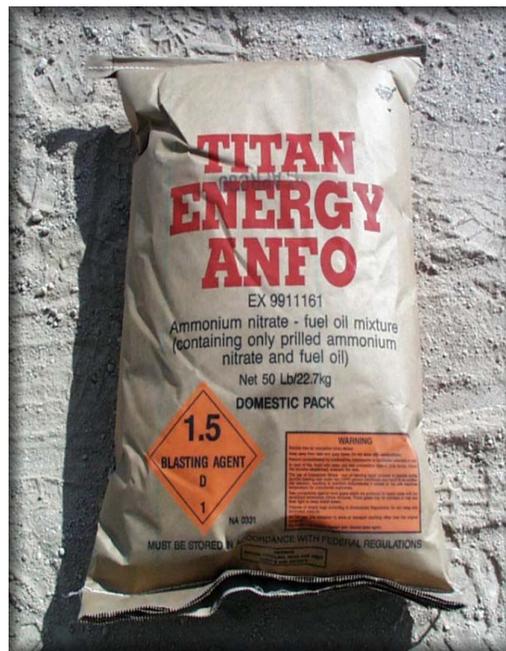


Figure 1-25. 50-Pound Bag of ANFO

Binary High Explosives (Two Part Explosives)

Binary explosives, sold as a solid and a liquid component, only become a detonator-sensitive high explosive when the two components are mixed together. The solid component is an oxidizer (ammonium nitrate) and the liquid is a flammable liquid (nitromethane). They are relatively insensitive to shock or friction and have an indefinite shelf life as long as there is a sufficient quantity of nitromethane in the unopened container to sensitize the ammonium nitrate. Binary explosives do not contain any nitroglycerin and can be shipped via parcel or freight services. Some binary explosives are frequently known as T-100® two Components, Xpak, and the Kinepak® family (Kinepouch® and Kinestik™).

Xpak solid is a white component with a hole in the middle that is available in red (1/3-pound), yellow (1/2-pound), and green (1-1/2 pound) rigid plastic cartridges, a red rigid plastic bottle (1-pound), and a red aluminum pouch (1/2-pound). Xpak liquid is a clear component that comes in a clear plastic bottle. Xpak can be used as a booster, column charge, or for secondary blasting. Xpak is widely used in agriculture, general demolition, industrial services, bomb disposal, and shearing oil well casing.



Figure 1-26. Xpak Products

Xpak can be disarmed and neutralized by removing the contents from the packaging and soaking it in water for 8 hours.

Kinepouch® system utilizes two separate chemical components (a white powder and a red liquid) and can be found as a plastic-coated aluminum foil package that comes in 1/2-pound, 1-pound, 2-pound, and 4-pound pouches. It is used to remove rock outcrops during road building and for breaking boulders in quarries.

Kinestik™ system utilizes two separate chemical components (a white powder and a red liquid) and can be found as 1/3-pound and 1-pound cartridges, and in 1/2-pound foil stick. It is a water-resistant explosive that is stronger than 60% dynamite and is used in ditching, stumping, and transmission line construction.



Figure 1-27. Kinestik™ Product

T-100® Two Components solid is a white component with a hole in the middle and is available in red (1/3-pound), yellow (1/2-pound), or green (1-1/2-pound) rigid plastic cartridges. The liquid component comes in a plastic bottle. Some uses for T-100® Two Component explosive products include construction, quarry, agriculture applications, and as a primer for ANFO.

Boosters

A booster is an explosive charge that provides the detonation link in the explosive train between the very sensitive primary explosive (detonator) and the comparatively insensitive main charge (high explosive).



Figure 1-28. Trojan™ Cap Booster

Boosters are manufactured in various sizes (most commonly ¼-pound, 1/3-pound, ½-pound, or 1-pound) and various shapes (cylindrical, cone, plastic well-type (stingers)).

Special application boosters, such as those used by the mining industry, will vary in size and explosives content. The U.S. military uses a variety of boosters primarily in military ordnance applications.



Figure 1-29. Display of Assorted Boosters



Figure 1-30. Display of Assorted Trojan™ Boosters

Cast boosters are usually cylindrical in shape with the explosive encased in cardboard, plastic, or light metal. There are generally at least one or two holes in the top of the cast booster to allow for the insertion of an electric detonator or detonating cord.



Figure 1-31. Cast Cylindrical Boosters

Trojan™ Super Prime® Cone Boosters, Super Prime® Mini-Seismic Boosters, Super Prime® Seismic Boosters, and Super Prime® Stinger Boosters are Pentolite explosives that do not contain any nitroglycerin. They are impervious to water, cannot freeze, do not leak dangerous explosive oils, and when stored properly, have an unlimited shelf life. The boosters are encased in rigid yellow, red, or orange plastic cartridges or cone shapes

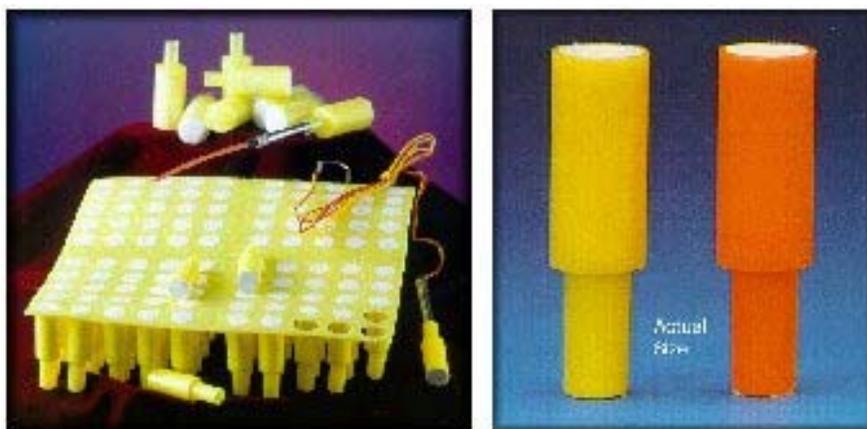


Figure 1-32. Trojan™ Super Prime® Stinger Boosters

and generally have at least one hole in the top of the booster to allow for the insertion of an electric detonator or detonating cord.

The Trojan™ Super Prime® Stinger Booster is used in small diameter boreholes. A detonator fits into an orange or yellow plastic well that is molded into the body of a booster. The yellow 8-gram stinger is used with an electric/nonelectric detonator. The orange 8-gram stinger is used with all fuse detonators.

Ensign Bickford Company manufactures the SOB® (slip-on-booster) that is used in commercial blasting applications. It is a waterproof flexible plastic cylindrical shaped explosive containing PETN or RDX that is slipped over a detonator to greatly enhance explosive output to initiate ANFO in small diameter blastholes. The SOB® is made in 6, 8, and 10-gram units and is not affected by water or moisture.

Common explosives used in boosters include:

Pentolite: It consists of a mixture of 50% Pentaerythritol Tetranitrate (PETN) and 50% Trinitrotoluene (TNT). The color varies from white to yellow to gray depending on the TNT content. Pentolite is widely used by the military in boosters and shape charges. Pentolite is more sensitive than TNT.

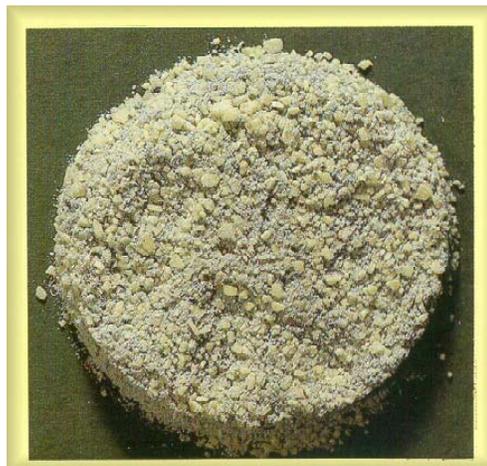


Figure 1-33. Pentolite 50/50

RDX: Cyclotrimethylenetrinitramine (RDX) is a stable white crystalline. RDX is also known as cyclonite. The abbreviation of RDX stands for “Research and Development Explosive.” RDX is one of the most widely used in composite and plastic explosives. RDX is extremely stable and has a shelf life comparable to TNT.

RDX is found in composite and plastic explosives such as C-4 and Semtex. RDX can also be found as a base charge in detonators, the explosive core of some types of detonating cord, as a component in main charge explosive mixtures, and as a booster explosive.

RDX used by the military is a white crystalline solid that has a shelf life comparable to TNT. It is extremely stable and non-toxic unless ingested.



Figure 1-34. RDX Explosives Granules

PETN: In addition to being filler for detonating cord, PETN is also used in boosters, Detasheet®, and Semtex.



Figure 1-35. PETN in various colors

TETRYL: It is the most commonly used military booster in the world. It is yellow in color, but may appear gray if graphite is added. When used as a booster, tetryl is usually found in pellet form. The US military discontinued the use of tetryl in 1979. Tetryl is more powerful than TNT.

TNT

TNT is most commonly used in boosters and demolition charges. TNT is a yellowish crystalline compound that comes in cast or flake form. TNT is mostly found in cast form. When TNT is exposed to sunlight for prolonged periods of time, it will turn brown. It is a moderately toxic explosive that is relatively insensitive, stable, and compatible with other explosives. When stored properly, TNT has a shelf life of at least 40 years.

TNT is the most common military explosive. It is used as a demolition charge, as part of a composition, and as main charge in filler for hand grenades, mines, bombs, projectiles, rockets, and depth charges.

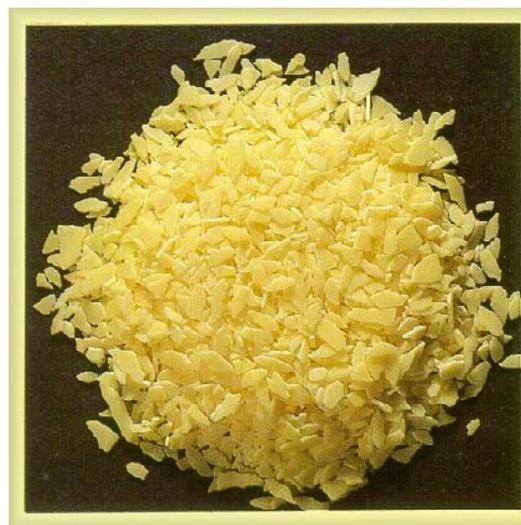


Figure 1-36. Flake TNT

Some brand names of boosters are Trojan™ Super Prime®, Pentex™, Black Cap booster, Green Cap booster, Rock Crushers, Renforcauvers, and ADP boosters.

Demex™

Demex™, a trademark of Royal Ordnance Factories, is an RDX-based plastic explosive that is British made but is available in the United States.

Demex™ 100 is a hand-moldable plastic explosive that is similar to the UK military explosive PE4. It is packaged in a white waterproof paper cartridge that is usually 1-¼ inches in diameter and 8 inches in length.

Demex™ 400 contains 500 grams of plastic explosive that is packaged in a white plastic mastic tube. The tube is used with an extrusion gun, which eliminates pre-handling and molding.



Figure 1-37. Demex™ Cartridge Tube

Dynamites

Dynamite is one of the most widely used high explosives in blasting operations. Dynamites differ widely in their explosive content, strength, and sensitivity.

Dynamite usually will be found in sticks or cylindrical form and wrapped in buff, white, or colored waxed paper. It comes in a variety of diameters and lengths.

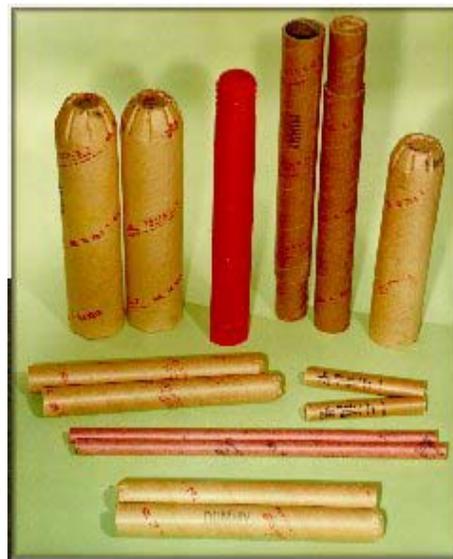


Figure 1-38. Assorted Dynamites

There are basically three types of dynamites: straight, ammonia, and semigelatin.

Straight dynamite has a pungent, sweet odor because of its nitroglycerin content. Inhalation of the nitroglycerin fumes will usually cause a severe and persistent headache. It will generally be light tan to reddish-brown in color and although the texture varies, it can be described as a loose, slightly moist, oily mixture. It is highly sensitive to shock and friction and produces toxic fumes when it is detonated.



Figure 1-39. Straight Dynamite

If crystals appear on the outside of a cartridge of dynamite, it means that nitrate salts have leached out and solidified, making the dynamite extremely unstable. Also, **if it appears to be leaking any oily substance, extreme caution should be taken. This may indicate the presence of nitroglycerin.**



Figure 1-40. Dupont Special Gelatin 40%

Ammonia dynamite has a pungent, sweet odor because it contains some nitroglycerin and, like straight dynamite, the fumes will cause a severe headache. It will generally be light tan to light brown in color and have a pulpy, granular, slightly moist, oily texture. It is less sensitive to shock and friction than straight dynamite because a part of the nitroglycerin content has been replaced with ammonium nitrate and nitroglycol.

One example of ammonia dynamite is Unimax®.



Figure 1-41. Atlas Ammonia Dynamite

Gelatin dynamite is insoluble in water and varies from a thick liquid to a tough rubbery gelatinous substance. It contains nitrocellulose. It is used in wet blasting operations and for blasting hard rock.



Figure 1-42. Dyno® Extra Gelatin

Some examples of gelatin dynamite are Gelaprime®, and Loggers Lite.

Semigelatin dynamites have the properties that fall between those of ammonia-gelatin and ammonia dynamite.

Some examples of semigelatin dynamites are Xactex® and Geldyne™.

Ammonia gelatin dynamites have most of the characteristics and qualities of gelatin dynamite but they contain ammonium nitrate.

Emulsions

Emulsions are explosive materials that contain substantial amounts of oxidizers dissolved in water droplets surrounded by a fuel that is incapable of blending or mixing. Some brand names of emulsions are Iremite®, Powermite®, and Irecoal®.



Figure 1-43. ICI Explosives and Atlas Emulsion Products

Water Gels

Water gel is an explosive material containing substantial portions of water, oxidizers (ammonium nitrate, sodium nitrate and/or calcium nitrate) and fuel (aluminum), plus a cross-linking agent which may be a high explosive or blasting agent. The addition of aluminum to the water gel gives it a silver appearance. It is most likely packaged in a plastic “sausage tube” and has metal ties on the ends. In recent years, water gels and emulsions have almost completely replaced dynamite.

Some water gels are known as Tovex®, Tovan®, Dynogel™, Boostrite™, Dyno®Split C, Slurrant® and Seismogel®.



Figure 1-44. Slurry Explosives Corporation Slurrant 430

Detasheet® (Flex-X)/Primasheet®

These are flexible, waterproof demolition charge sheets that are insensitive to shock, easy to cut, and attach to any item. They are found in a variety of forms (See Military Explosives Materials for additional information)