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IMPORTANT INFORMATION ABOUT OUR PRODUCTS

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SECTION 1:

AR500 STEEL AND HOW WE USE IT IN OUR PRODUCTS

AR500 steel is heat treated, through hardened steel alloy that has become the standard material for steel targets. There are two very important considerations when choosing products containing AR500 steel:

1.A: HOW IS THE AR500 STEEL CUT?

1.B: HOW IS THE AR500 STEEL ATTACHED?

These are explained below in detail.

1.A. CUTTING AR500 STEEL

AR500 is so hard, it is extremely difficult to cut with conventional methods. Drilling, sawing, milling and other conventional methods are extremely difficult even with carbide tools. This is why virtually all targets are cut using one of five methods:

<u>PLASMA CUTTING (Open Air Plasma Cutting):</u>

Open Air Plasma Cutting is a fast and inexpensive. It is not actual "cutting" in the conventional sense, it uses an electrical arc to *melt* the steel (similar to arc welding) and a blast of high pressure air to push away the molten steel leaving the cut. Heating AR500 to its melting point ruins the heat treatment, degrading the hardness and strength of the AR500 steel near the cut (Heat Affected Zone or HAZ) leaving it soft and weak. The properties of the substrate gradually improve away from the cut.

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Most steel targets are made using Open Air Plasma Cutting. It is an ideal economical alternative for most consumers and will usually provide many years of entertaining use. Bullet hits near the edge of a plasma cut plate will cause nicks, dents and gouges, especially with high velocity jacketed bullets. These nicks and gouges eventually lead to cracks after a high number of hits. Since it takes years for most consumers to accumulate this level of hits, customers are usually satisfied with the product.

We do not use Open Air Plasma Cutting in our products.

SUBMERSION PLASMA CUTTING

The next generation beyond Open Air Plasma Cutting is Submersion Plasma Cutting where the AR500 steel is cut while submerged under water. The water cools the material immediately after cutting, greatly reducing the HAZ. Targets using Submersion Plasma Cutting will chip and gouge less and last much longer than those cut with Open Air Plasma.

We do not use standard Submersion Plasma Cutting in our products.

OXYGEN ENHANCED SUBMERSION PLASMA CUTTING

This process uses oxygen instead of air to blast away the molten steel. Oxygen greatly increases the cutting speed so the time the AR500 is exposed to heat is much less, not only reducing the HAZ, but also providing a cleaner cut with less draft. (The surface finish of the cut edge is smoother and the taper is less). Though this process is more expensive than the other plasma options, it is the best value in providing a very strong and hard target at a reasonable cost.

Targets cut with Oxygen Enhanced Submersion Plasma Cutting have a long life and are suitable for clubs where they will see high use. In most cases, the edge properties of submersion plasma are so good that in practical applications it is difficult to distinguish it from waterjet cutting.

All our plasma cut AR500 parts use the Oxygen Enhanced Submersion Plasma process.

LASER

Laser cutting also melts the AR500 steel but the beam width is small so it provides a precise cut with less HAZ than Open Air Plasma Cutting. The HAZ is typically somewhere between Submerged Plasma Cutting and Oxygen Enhanced Submerged Plasma Cutting.

We use Laser Cutting in some of our products.

WATERJET CUTTING

Waterjet Cutting is clearly the best way to cut AR500 steel though it is very expensive. Water is pressurized to very high pressure and released through a diamond nozzle, then an abrasive is introduced just before it hits the steel. It is a cold process so the properties of the AR500 steel are retained and there is no HAZ. If you want the best, this is it. Targets and armor cut by this process cost about double those cut by Oxygen Enhanced Submersion Plasma.

We offer waterjet cutting as an option on all our products.

WHAT SHOULD YOU BUY?

From what we have seen in the field over the last 3 years, oxygen enhanced submersion plasma is the clear choice from an economical standpoint. Targets using this process appear little different than their waterjet counterparts but cost about 40% less. In the past, clubs have rejected targets cut with plasma, but that attitude has softened somewhat after witnessing real world results on targets using the oxygen enhanced submersion plasma cutting process.

1.B: ATTACHING AR500 STEEL

As explained above, heat degrades the properties of AR500 steel. Just as heat cutting can ruin the hardness and strength of AR500, so does welding. Though AR500 is a very weldable steel alloy, the heat softens and weakens the AR500.

Attaching AR500 targets and armor by welding is very cheap and easy. It results in a very cost effective (cheap) product because some supporting structure and fasteners can be eliminated. Unfortunately, the material is compromised and longevity is sacrificed.

Welded targets are sometimes used in handgun and Pistol Caliber Carbine competitions and the loss of material properties from welding often goes unnoticed. Pistol calibers generally do not induce stresses as much as high velocity rifle impacts so the AR500 substrate, though compromised, will sometimes be adequate. Unfortunately when targets are used in a club competition environment, the welds themselves often fatigue and crack from the high number of pistol caliber impacts. It is not unusual (but very comical) to see a target fall from its support during a Steel Challenge match because the weld has reached its fatigue limit. In almost all cases where the weld experiences the stress of the bullet impact, the weld will eventually fail.

As a general rule, we do not weld our AR500 targets and armor. We use AR500 because of its strength and hardness; we certainly do not want to ruin it to save a few bucks. Most of our targets and armor are bolted-on so not only are the material properties preserved, the parts are easily and inexpensively replaced (if it ever becomes necessary). We do weld some targets intended for .22LR only. Targets exposed to the (relatively) low stress of .22LR impacts can last a very long time as long as they are properly designed and welded. Another exception is welding the base to a handgun knock-over target as long as there is adequate weld area and low stress on the weld.

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SECTION 2

FALLING PLATES, PLATES THAT FALL WHEN THEY SHOULDN'T, PLATES THAT DON'T FALL WHEN THEY SHOULD, AND HOW WE DESIGN PLATE RACKS

Anyone who has shot falling steel plates more than a couple of times has seen plates that fall when the adjacent plate was hit, and has also seen plates not fall after receiving a solid hit by a .38 or 9mm. These problems are often related.

Most plate racks are simply fabricated and built to be rugged. Unfortunately subtle details are often overlooked such as center of mass, strength and stiffness of components. Just because a metal part is thick and heavy does not mean it is rigid and/or strong. Sometimes the impact energy of a high velocity bullet on a plate is efficiently transferred into the plate rack structure and subsequently into a nearby standing plate causing it to fall also. (This is essentially a billiard ball effect where impact energy is efficiently transferred from one body to the next down the line.) The common solution is to adjust all the plates to lean more forward making them more difficult to knock over. Plates adjusted to tolerate hits from hot .45's and .44 magnums will sometimes not fall from a solid hit on the lower portion of a plate with a .38 or 9mm target load. Shooters become very frustrated when they shoot a very fast and clean run only to find that one of the plates only rocked back a bit and did not fall.

Our plate racks are computer designed using 3D CAD. The components are optimized before metal is cut and the final product is right the first time. The plates and rack are designed to absorb bullet impact energy without transferring that energy to adjacent plates. The result is plates reliably fall when hit with light target loads without giving freebies to magnum shooters. Additionally, even though our efficient design results in racks that are lighter in weight than most of our competitors, they are actually *stiffer* due to the way they are designed. Likewise, our reset mechanisms are designed to be balanced so the plates reset with a low pull force, but still reliably return to the down position, which means no more reset bars getting stuck in the up position.

Efficient design yields not only a plate rack strong enough for years of club use, they are cost effective also. And if you have any problems, we are close by here in New Hampshire to resolve them.

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