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# Security Chains

## An Overview

These notes are primarily intended for businesses involved in developing and marketing security systems which include chain.

Security chains are an increasingly popular and effective deterrent. This is, however, all they are. No chain can be proof against an oxy-acetylene cutter or a determined attack with an angle grinder. Fortunately most thieves and vandals do not resort to such extremes.

The degree of security afforded by a chain varies enormously dependant upon a number of factors, and these notes are intended to help purchasers specify products suitable for their own particular applications or markets.

## Selecting a suitable product

Security chains currently being sold range from the simplest mild steels, not heat-treated, to ones made from high strength steels and subject to sophisticated heat treatments. They are as different as the proverbial chalk and cheese in both price and performance.

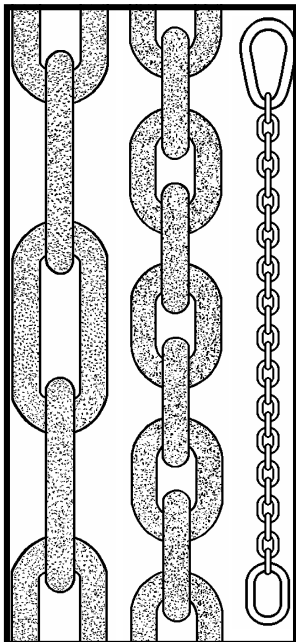
As the first step in the selection process it helps to define the actual properties one would desire in a security chain. In general chains are going to be attacked with hacksaws or bolt-cutters. More rarely thieves may resort to "snatch" loads to try to break the chain, perhaps with the addition of a freezing spray (in an attempt to induce brittleness). The optimum chain will therefore have a very hard skin to defeat the saw, a tough centre to resist crushing by bolt-cutters, and yet retain sufficient ductility to avoid brittleness when subject to very low temperatures. Such a chain is available, but it is by no means the cheapest option, and may well be overkill for many applications. Furthermore a couple of weightlifters with a scaffold tube on the end of large bolt-cutters will be a stern test for the best of chains. In these circumstances they may well break the cutter blades, but sheer force could still crush through the chain. Consequently for the greatest security we not only need the highest quality chain, we also need a large size – perhaps 13mm diameter steel or more - to counter this possibility. Such a chain rules itself out of many applications on size alone, although it is certainly the preferred product for valuable items of heavy plant – and the bigger the chain, the better the security!

If we now consider the security chains presently marketed they can in principle be divided into three fairly distinct types. These are described below, together with our comments.

- Mild steel, not heat treated. These are cheap and cheerful but can be cut by any of the methods described. They are a deterrent only, offering little security.
- Mild steel, case hardened. Resistant to saw and small bolt-cutters these are a good choice for general applications where small size is an important consideration.
- Alloy or boron steel, case hardened and through hardened. Providing steel chemistry, heat treatment and weld quality are carefully controlled these are highly resistant to all common forms of attack, particularly in larger diameters.

Please do not confuse case hardening with through hardening. Case hardening gives an extremely hard "skin" to the steel, far harder than can be achieved with through hardening. It resists sawing and bolt-cutters much better than an entirely through hardened product. A combination of both types of heat treatment gives the best results for security chains.

## Different chain designs



Chain is not all the same, and various designs are currently in use for security chains. The drawing on the left shows (from left to right): long link chain, short link chain, and a chain with larger endlinks, egg (or pear) shaped at the top, straight sided at the bottom.

The design adopted is somewhat dependent on the type of lock to be used. Open shackle locks will generally accept the two standard end links of a long link chain without difficulty. Short link chain is also useable with this lock style although more care needs to be taken with dimensional compatibility. Closed shackle locks have much more limited admittance and often only admit one link. They are more secure and can be used with long link chain or with chain having one or possibly two larger endlinks. In all cases one end link of a chain is reeved into the other end link and secured with the lock. Other more specialised locks are available opening up yet more design possibilities.

Which to choose? We can advise on chain design although we prefer not to comment on locks. In our opinion short link chain is the best type to use for security applications. It is more flexible and the closeness of adjacent links makes it more difficult to use cutting tools. Special endlinks should be large diameter and as small internally as is practical.

There are designs of chains featuring links made from square or “dee” shaped steel. These are claimed to offer greater resistance to bolt-cutters in that they present a flatter surface to the cutter blades. In our view such designs offer little advantage. They only address one method of attack. The extra expense is probably better justified by the purchase of a higher quality larger diameter chain rather than a special section.

## Finish and protection

For corrosion resistance and for appearance security chains are normally zinc coated. This is not as straightforward as it sounds, as when heat treated for high hardness many steels become susceptible to certain metallurgical phenomena which result in them becoming extremely brittle. They can literally fall apart after a relatively light blow – a situation one certainly wants to avoid! Some subsequent surface finishing processes are known causes of this brittleness. Even the most common finish – electroplating – can result in problems. We will only supply finishes which are generally accepted to be safe and we have to accept that this limits our options.

The question of protection also applies to the items one is trying to safeguard, as the chain itself can easily cause damage. This may not be relevant to a bulldozer, but it is to a bicycle. Plastic coating or sheathing chain with plastic tube (usually then shrunk onto the chain) is common practice.

## Anchorage points

Many security chain applications involve the use of ground anchors. These may be bolted or concreted in place and some are designed to be recessed. A well designed anchor will be of more substantial construction than either lock or chain, but this does not imply that the material, heat treatment, or surface finish specification can be less demanding. The best lock and chain are pretty pointless if the ground anchor can be parted with a hacksaw, or is brittle!

We have a range of forging and fabrication facilities which enable us to manufacture a wide variety of such anchors, and our experience in metal forming, welding, heat treatment and surface finishing enables us to produce high quality robust and reliable items at economical prices.

## The next step

If you would like more detailed technical information, or to discuss design or any problems you may be encountering, please talk to us. We would like to work with you to help you develop quality products unique to yourselves.

Alternatively, why not just ask us to quote for your current specification?

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