Wear Resistance Ltd
Hardmetal Carbide Specialists

Wear Plate Fastening Methods – a comparison

This document, in conjunction with the accompanying cross-sectional drawings, gives a brief description of commonly used methods of attachment for wear plates, and then compares them with our "Integral Bolts":-

There are three widely-used fixing methods for hard surfaced wear plates:

1) **Welded-on studs and threaded bosses:**
These can be accurately positioned, but there is a risk of detachment in service, as they rely on the integrity of attachment welds, which are in tension. These are not sufficiently reliable for dynamic or high stress assemblies.

2) **Welded-in countersunk inserts:**
As with studs and bosses [above], these are also prone to detachment, particularly if the insert attachment weld is contaminated with hard metal from the edge of the hole into which it is welded. This method also leaves the bolt head exposed, leading to preferential wear. The bolt head can then be hard surfaced, but this still results in preferential wear over the bolt head [because it has not been hard surfaced at the same time as the rest of the plate, and because it is manually welded by a different process]. The hard surfacing of the bolt head also subjects the bolt to very high, concentrated heat from the weld pool, thus affecting the properties of the bolt.

3) **Countersunk holes, plasma cut or laser cut:**
These can be cut into the hard surfaced plate by plasma cutting or by laser cutting. A countersunk bolt can then be fitted into the plate, and hard surfaced over [although this results in premature wear and affects the bolt in the same way as Welded-in Countersunk Inserts, above]. The surface of the countersink [the countersunk bolt head seating face] is also likely to be of poor quality, as it is not machined, but made by a thermal cutting process. This results in an insecure seating for the bolt head, thus stressing the bolt unevenly. The fastener is likely to lose tension in service.

The fastener types above are sometimes wrongly described as integral bolts, but they are inferior in quality, security and cost-effectiveness, for the reasons stated.

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The unique fastener system developed and used exclusively by Wear Resistance Limited features a true "integral" bolt, as it becomes an integral part of the structure of the wear plate:

Integral Bolts:

Special countersunk bolts of the appropriate alloy grade are fitted into any number of machined, countersunk holes before any hard surfacing takes place. The holes are positioned such that, after the plate has shrunk during hard surfacing, they will be correctly positioned relative to each other and to the finished wear plate.

Each bolt head is chamfered, thus forming a V-shaped weld prep when fitted. The bolt is welded into the hole, and the excess weld metal is ground flush with the plate surface, which is then hard surfaced in one operation.

Integral Machined Countersunk Holes:

Wear Resistance Limited is able to apply the same method to the production of any number of machined countersunk holes [or combination of integral bolts and countersunk holes in the same plate], for use at locations where access restrictions at the underside of the support structure prevent the use of fixed integral bolts.

Advantages:-

- The relatively small shrinkage rates associated with our unique HD overlays, and the predictability of the shrinkage which does occur, enable us to produce bolted wear plates which fit the attachment holes in the support plate or structure without difficulty.
- Sets of large plates containing, for example, eighty M16 integral bolts each are routinely produced.
- The fasteners are secure, robust, and simple to use with normal tools.
- The accurate positioning of bolts achieved on the first set of liners will be repeated on all subsequent sets of spares in later years.
- There has never been a breakdown caused by failure of our integral bolts since we introduced them over 40 years ago.
- No other welded overlay manufacturer can safely produce wear plates with integral bolts of this type.

We are committed to continuous development aimed at tailoring designs to suit differing or changing environments. One example of this is recessed integral bolts, a recent innovation which eliminates the need for nut protection cups on the underside of impeller fan blades. Initial cost, weight, turbulence in the gas flow, and maintenance requirements in service are all significantly reduced, thus providing substantial benefits and savings for the end-user, and thereby increasing the cost-effectiveness of our products.