

Bulletproof Equipment



By Tom Lincir,
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Anyone who belongs to a health club is used to seeing constant renovation and upgrading going on throughout the facility — new wall and floor treatments, new furnishings, new exercise equipment. When you look at where clubs spend their money, it's obvious they understand the importance of the workout "experience" — the way surroundings and equipment look, the way equipment performs and feels. The emphasis is on Visual "Look", and Performance "Feel".

What I would like to talk about in this article are two additional considerations that are sometimes overlooked: Visual Durability and Performance Durability. That is, the philosophy behind making equipment "bulletproof".

It is not only important how something looks and performs when you buy it. It is just as important how it looks and performs long after you buy it. Sometimes the shiniest stuff on the trade show floor gets ugly real fast on the exercise floor. Uglified equipment is like a dirty fork in a 5 star restaurant. It can nullify the considerable investments that have been made everywhere else throughout the facility. It undermines the goal to be perceived as a world-class operation. So when you buy a piece of new equipment, it is important to ask yourself how

long it will look new and perform like new. How long will it continue to send the right signals to your members?

Over the years I've been in hundreds of clubs, maybe thousands, and if there is an area where the equipment looks like it's been in a war zone, it's the weight room. No one likes to spend money replacing equipment, and it's human nature to rationalize that you don't need to. With strength equipment, this rationalization takes the form of imagining that people who do strength training don't care if the equipment is a little dented, chipped, cracked, peeling, tarnished, bent, or beat up. So, some operators don't replace a strength piece until it becomes an embarrassment.

The flaw in this thinking is that club members don't leave their appreciation for aesthetics at the entrance to the weight room. They look for the same world-class look and feel in the weight room that they appreciate in all the other areas of the club. Enlightened operators recondition or replace their strength equipment on a frequent basis. Some manufacturers have sprung up who offer products priced low enough that you can afford to rebuy them twice a year or more often.

There is an alternative to this "buy cheap and replace often" approach. It is to start by visualizing the ideal product that you never have to replace. The ideal in any pursuit is seldom achievable, but if you keep it in mind, you'll get closer to it than if you throw in the towel and assume it can't be done. As Henry Ford said, "If you think you can, or you think you can't, you're right".

So let's go through an exercise of starting with an ideal and shooting for it. You could do this mental exercise with any piece of equipment. The ideal treadmill. The ideal elliptical. The ideal strength machine. For our purposes here, let's imagine the ideal Olympic bar. What would it be?

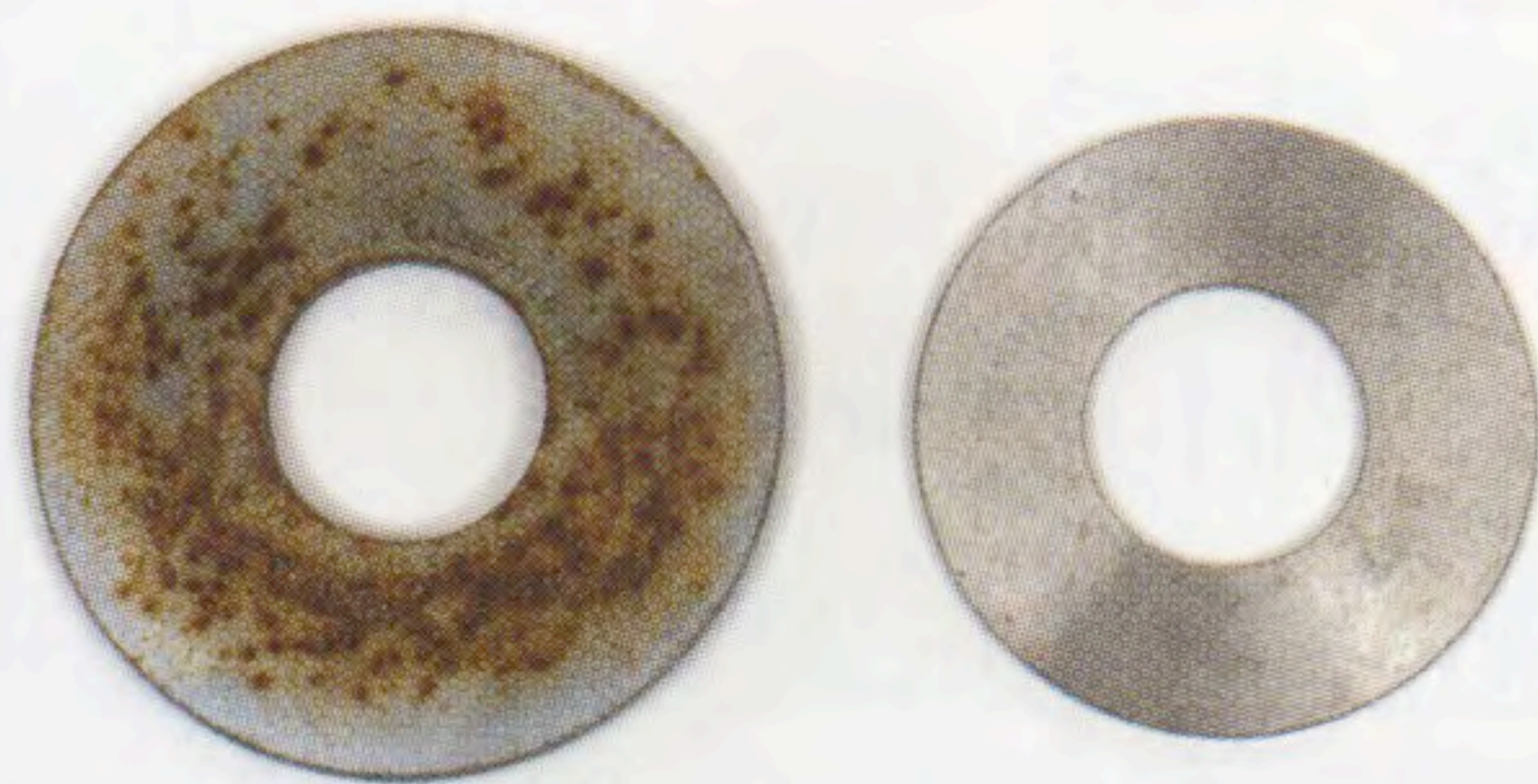
First and foremost, the ideal Olympic bar would be aesthetically pleasing when new, and it would stay looking that way through thousands of workouts. The surface coating would never crack, peel, chip, or tarnish. It would be perfectly straight, and never become bent. Its structural integrity would be verified so that it would never snap in two. The sleeves and collars would never come off. The ideal is a bar that you would only have to buy once. This is the ideal we kept in mind when we developed our line of stainless steel bars — our 7-foot Olympic size, a 5-1/2 foot "shorty", and our new E-Z Curl version. How did we attempt to pursue the ideal in engineering these products?

Surface Durability

We decided to start with stainless steel, because it needs no surface coating that can crack, chip, peel, or tarnish with exposure and use. In addition, stainless steel has a rich, high tech look that is quite different from chrome or paint, and in my opinion, sends as strong a quality signal as any other material you could choose.

Both chrome and stainless steel look good when they're new. The key is what happens with the passage of time? In our now famous Ivanko "Roof Test", we placed Ivanko stainless steel plates on the roof of our building

along with Ivanko chrome plates. The plates were exposed to the elements for two years, then cleaned and polished. The chrome plate showed residual pitting and discoloration while the stainless steel plate cleaned up "good as new". The chromed plate would have to be replaced in any club where members care about how things look. The stainless steel plates would not have to be re-bought.



Before Cleaning: After two years of "Roof Test" exposure, the chrome plate on the left exhibits considerable rust while the stainless steel plate on the right is only slightly blemished.

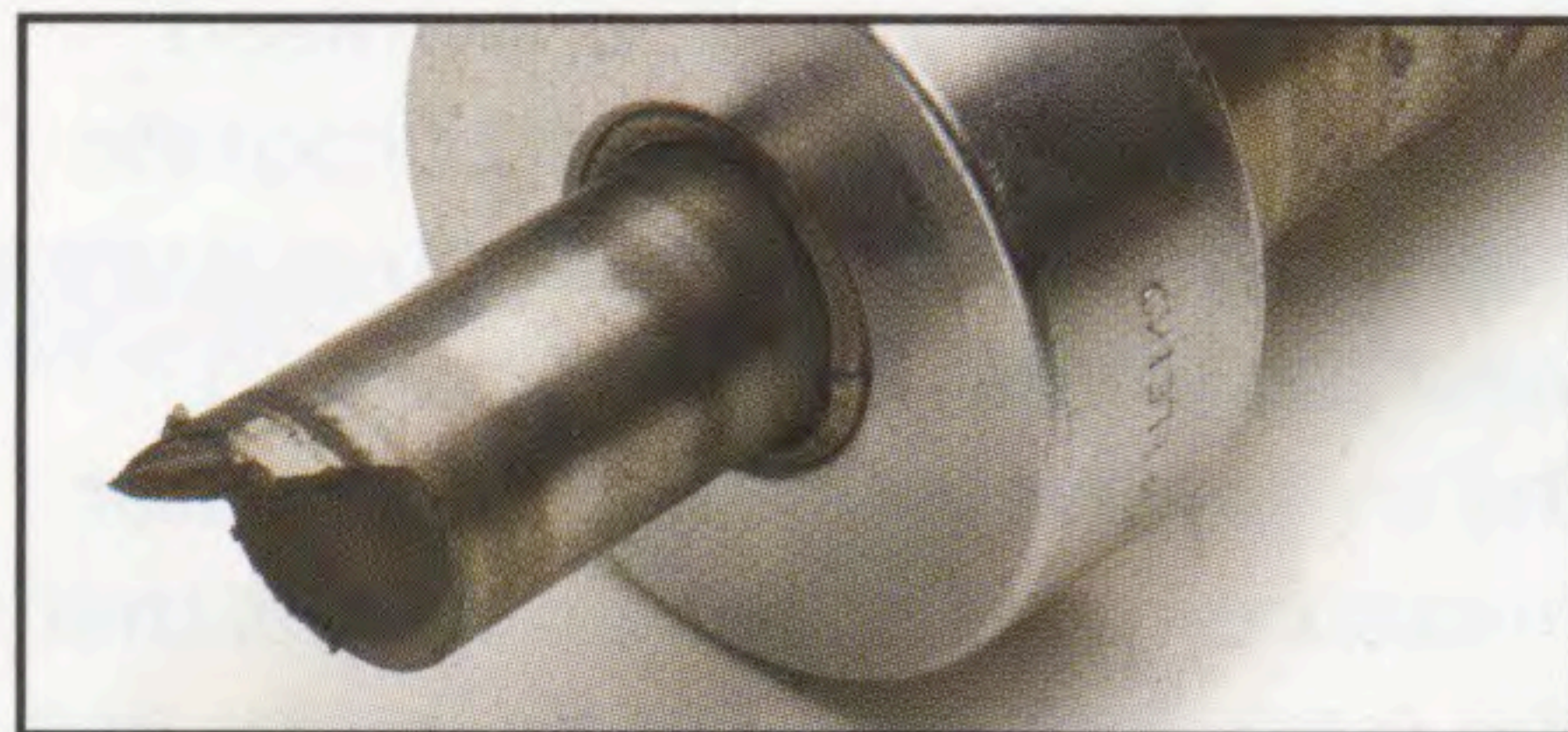


After Cleaning: The cleaned and polished chrome plate on the left exhibits residual pitting and discoloration, while the stainless steel plate on the right cleaned up "good as new".

Structural Integrity

Eliminating the need for a coating has another important advantage over chrome. The chrome plating process can cause what is called "hydrogen embrittlement", in which the electrolytic process degrades the steel's microstructure. This can cause the bar to snap at some unknown point in the future. In addition, any steel bar stock, coated or uncoated, can have an inclusion, flaw, or hairline crack that can cause the bar to snap at one of

these points of weakness. I have a collection of Olympic bars with the ends snapped off. Fortunately, you can detect these flaws with methodologies called magnetic particle testing and eddy current testing. On average, we throw away one out of sixteen bars (6%). It costs a few dollars more to run these tests and scrap the rejects, but the insurance policy it buys is well worth the investment. A structurally flawed Olympic bar can become a lethal weapon. If the bar snaps, the user can be injured, and the ensuing liability lawsuits could possibly bankrupt a commercial operation. The best guarantee against such risks is to self-insure by buying Olympic bars that are not chromed, and that are tested for microstructure flaws.



Microscopic flaws in the bar stock can cause sudden failure without warning.

Straightness

Bar stock from the mills falls within a tolerance of 89 thousandths of an inch curvature over the 7 foot length of an Olympic bar. Conventional bars and some "competition" bars that we have checked exhibit curves between 60 - 100 thousandths of an inch. Not only does it look shoddy, a bent bar will try to rotate to reach stability with respect to gravity. This defect can be immediately felt by the user, especially with exercises such as power cleans that involve rotating the bar.

Eleiko, a Swedish manufacturer with a world-class reputation claims a maximum deviation in the entire length of the bar not to exceed 19 thousandths of an inch. Ivanko's standard is 10 thousandths of an inch. Anything better than 20

thousandths is "really straight." Straightening is one of the most expensive operations we perform in manufacturing Olympic bars. It takes expensive machinery and a skilled operator to achieve this tolerance, but we feel the cost is well worth the quality difference that users will sense and appreciate.



A bent Olympic bar can be a visual turnoff and be felt by the user performing certain exercises.

Keeping the bar straight is another challenge. Resistance to bending is a function of "tensile strength" or PSI, the pounds per square inch of force required to pull the bar apart. Most Olympic bars are at 150,000 PSI or below. To eliminate bending we kept increasing the PSI with each production run. We noted as the tensile strength was increased the complaints of bent bars decreased. When we finally reached the 200,000 PSI, bending complaints became non-existent. I believe 200,000 PSI tensile strength is the ideal for a commercial gym or team use. For good measure, our current Stainless Steel Olympic bar has a tensile strength of 218,000 PSI.

As you would imagine, high tensile strength costs more money. First, higher quality steel is, naturally, more expensive. Second, 190,000+ PSI steel is more expensive to machine. The ultra hardened steel cuts tooling life to 10% of what it would be with softer steel. These difficulties are the major reason most manufacturers do not make bars over 150,000 PSI. In fact, to our knowledge only four companies make ultra hardened super strong Olympic bars: Schnell of Germany, Eleiko of Sweden, Uesaka of Japan, and Ivanko in the U.S.

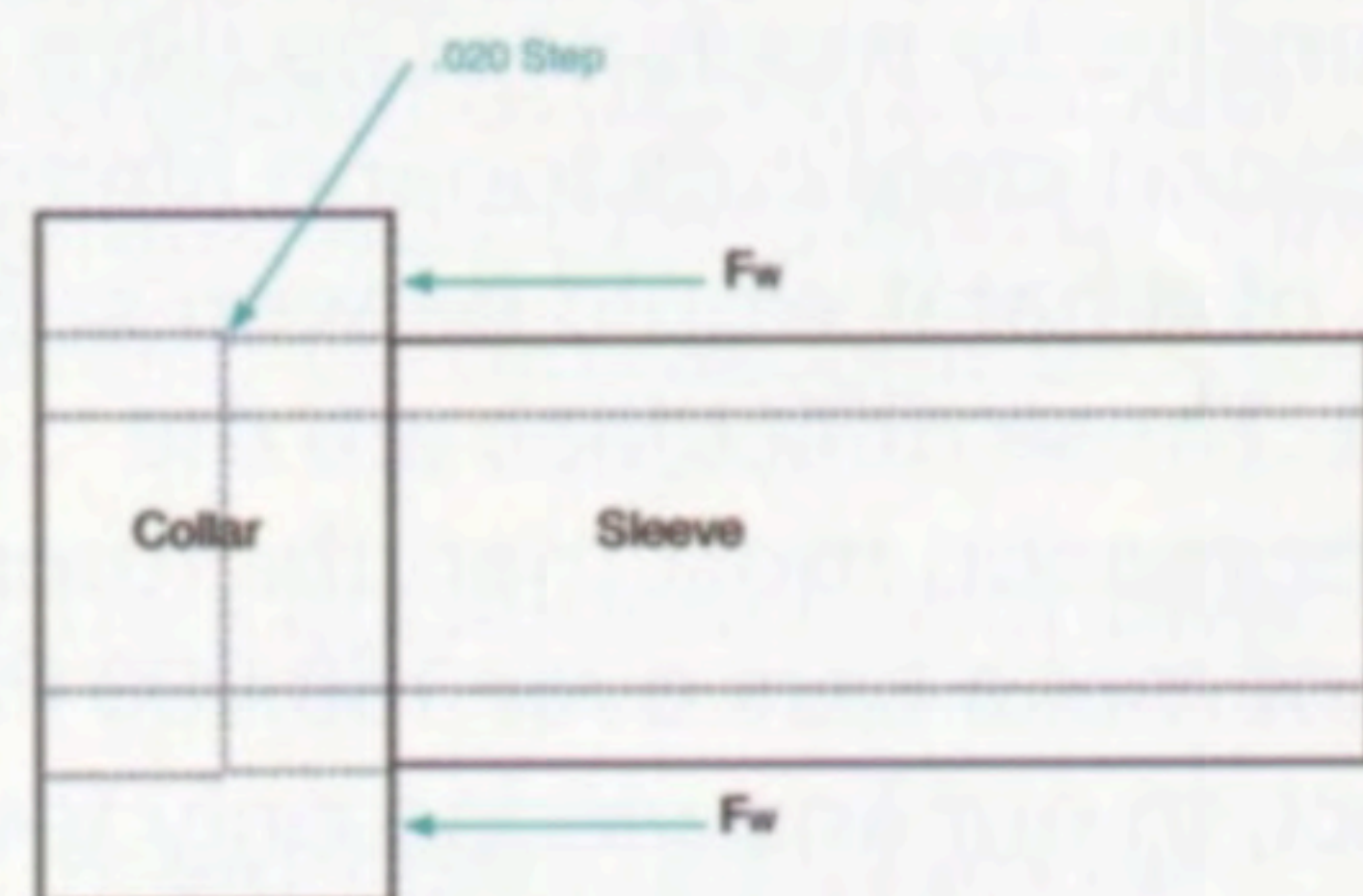
Sleeves and Collars

With the continuous banging of plates onto the bar, collars can eventually separate from the sleeve. Observing this over the years, we sought an alternative to welding that would more strongly fuse the collar to the sleeve. After much experimentation, trial, and error, we settled on "interference fit" technology.

To engineer an interference fit, the inner diameter of the collar is made intentionally too small for the outer diameter of the sleeve. By heating the collar to expand it, however, it just barely presses onto the sleeve. When the components cool, the collar contracts around the sleeve, fusing the surfaces together in a way that is 2-1/2 times stronger than conventional welding. Computer simulation and finite analysis determined that it would take 841,484 pounds of force to separate the two components.

In nuclear weaponry, computer simulation is used to assess consequences without having to actually explode a bomb and destroy buildings. In Olympic bar manufacturing, computer simulation is used to assess consequences without having to actually crack a weld and have the equipment cascade onto a person doing an overhead press.

Cross section of a collar inserted into the sleeve with a .020" step that must be overcome to separate the components.



The addition of a .020" step increases the interface pressure from 63,000 PSI to 139,000 PSI for the interference fit compared to 51,000 PSI for welding at both ends

A More Rewarding Business Model

You can make a good living selling products for the "buy cheap and replace often" market. You can make an equally good living striving for bulletproof products that never have to be replaced. As we near our 40th anniversary, we look back on the changes we've seen in the industry. Early on there were only a few commercial fitness equipment manufacturers. We were competitors, but we were friends. We took good-natured shots at each other over dinner, swapped war stories, and felt good about what we were doing. Today, we see a lot more people at the trade shows but too few of them look like they're having any fun. Maybe that's because there's more to life than pushing products that you know are compromised to meet price points and corporate profit guidelines. When you pursue your work with an ideal in mind, the rewards come in much greater measure. You do a lot of things that the customer can't see or verify, but you do them anyway, because it's right. So when you present your products, you have nothing to hide because you know you've done everything in your power to deliver against an ultimate standard. That's when smiles come easy. That's when you look back on 40 years of fun.

Ivanko Barbell Company was founded by Tom Lincir in 1967, and it is the leading provider of professional and commercial grade barbell and dumbbell products worldwide. Your comments or questions are welcome. Write Tom Lincir at Ivanko Barbell Company, P.O. Box 1470, San Pedro, CA U.S.A. 90733, or email him at tom@ivankobarbell.com.

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