

How To Bend An Olympic Bar (Part One)



By Tom Lincir, President and Founder, Ivanko Barbell Company

This is the first of a three part series on how Olympic bars get bent, and how to prevent it.

A bent Olympic bar in a club weight room can be a turn-off that nullifies the considerable investment made in quality equipment and furnishings everywhere else. Not only does it look shoddy, but also 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.

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In research for this article I found in my old files from 1977 correspondence with Steel Mills and physicists asking for information on how to increase the strength of round bar material so it would stand up to the common abuse that was bending the Olympic bars of that era. In those years there were thousands of bent Olympic bars, all over the place. Every gym had one. This is why since the very beginning of my career in Manufacturing Olympic bars, the same questions from customers have been repeatedly asked: “Do you make a bar that won’t bend when you drop it?” and Do you have a guarantee against your bar bending?”

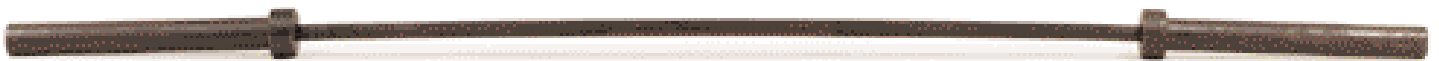
The problem with these questions is the true answer is not a simple answer.

First of all, most Olympic bar raw steel does not come straight. By this I mean “really straight.” This is because the allowable tolerance for straightness from the steel mill is not good enough for a first class Olympic bar. We believe first you must make a bar “really straight.” Then you have to make it strong enough to stay straight.

Secondly, years of testing and field experience have indicated to us that any Olympic bar with a tensile strength less than 195,000 PSI is not strong enough for commercial use. Usually experience is the best teacher. Early on, we kept increasing the PSI of the tensile strength and yield strength 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 level and above, bending complaints became non-existent. I believe 200,000 PSI tensile strength with a yield strength close to that is the ideal for a commercial gym or team use. Ivanko Olympic bars are made in the USA and are currently 195,000 to 220,000 PSI. We plan to increase to a higher level in the future.

So, to get a “really straight” Olympic bar that will not bend later on, we have to start with 200,000 PSI steel bars, then bend them straight. Along with grinding for roundness, straightening is the most expensive operation we do with bars. Some bars come with an even bend along the length. Others are bent only on one end. The worst and most difficult bars are twisted in a bent spiral. A bent bar is not straightened by just bending it back in the opposite direction. It must be bent back to a point determined by an experienced press operator to relieve stress. Then it must be bent back the other way to straightness.

Most manufacturers will not even attempt to straighten a twisted bar because it is very time consuming and few have skill and know-how to do it. This is especially true when the material is 200,000 PSI steel.



A bent Olympic bar can be a visual turnoff and cause “performance frustration.”

Readers comments from the National Fitness Trade Journal, Fall 2002 article, "How to Break an Olympic Bar" :

Tom,

Great job with the article. In 1968 I had an experience similar to the Russian lifter with an Eleiko bar that broke next to the sleeve. I dropped a 270 pound snatch from the overhead position. When the barbell hit the lifting platform, the bar broke and the jagged end of the bar swung up and just grazed the end of my nose. Lucky the bar didn't hit the side of my head or take my nose off. Peary Rader (Iron Man magazine) who sold bars at the time for Eleiko replaced the bar. When you get a chance, give me a call.

Osmo Kiiha, Editor, The Ironmaster

Tom,

Great article. Informative, direct and humble where appropriate.

Robert Reiff, Internationally Renowned Fitness Photographer

Nice article, Tom!

I think it is informative and correct. I am curious if it makes the desired impact on buyers. I found the description of the failures interesting. I have a degree in mechanical engineering and worked in the metallurgical field (mostly aluminum)

for 5 years. I remember learning that chrome plating of high-strength steel can cause severe hydrogen embrittlement. I think the problem arises when the steel is "pickled" in acid to remove oxides prior to plating. The hydrogen ions migrate into the steel and the higher the strength of the steel, the more severe this effect is. I was told there was no way to completely avoid this problem when plating. The photo of the jagged edge clearly identifies the break as a brittle type of failure and points towards either hydrogen embrittlement or steel that may not have been tempered after quenching. This is pretty fundamental stuff. As for the articles, keep them coming.

Bruce Morgan, Fitness Industry Veteran

Tom,

I haven't spoken with you in a while and hope all is going well. I love your articles in NFTJ mag. I just read the one in the Fall 2002 issue about Olympic bars breaking and found it fascinating. My associates also enjoy each article. I wish you continued success.

Dave Ringel, National Sales Manager, King Fitness

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Eleiko claims a maximum deviation in the entire length of the bar not to exceed .5mm (0.0197 in.). Ivanko's standard is .25mm (0.010 in.). Anything better than 0.020 inches is "really straight." "Really straight" bars are "fully functional." Regular readers of my articles know I am a strong proponent of "fully functional" products. This means straight bars and round plates. Anything less leads to "performance frustration."

The above explanation is important. If you realize that we have to bend a bar straight, it's easier to understand that you can also bend a bar crooked, or out of straightness.

Here's how bars get bent:

1. There is a misconception that an Olympic bar will bend if the plates are loaded on a bar that is left on a narrow bench press overnight. That's highly unlikely. But it's a rumor that I hear time and again.

2. All the imported bars from China have a very low tensile strength and lower yield strength. Their bars can be bent by doing an explosive deep knee bend with 300 pounds and reversing direction fast.

3. Bars made from American steel of 130,000 to 150,000 PSI will hold up on light floor exercises and bench pressing but are usually bent by dropping them on the floor or on the power rack. And this is often the fault of the power rack design as much as it is of the strength of the bar.

4. Another common way to bend a bar is to do bench squats, which are deep knee bends stopping when the buttocks touches the bench. The bending occurs when you can't finish the last repetition and get stuck in the bottom position with no alternative but to throw the bar off your shoulders. The loaded bar will drop three to four feet before hitting the nine inch wide bench in the center of the bar. This will "take out" all but the best bars, and it does not do the bench any good either.

5. Bars rarely bend from dropping when the plates hit first. It almost always happens when the bar hits first, such as on a power rack. This makes me wonder why, with all the great designers around, none of the gym equipment manufacturers can design and manufacture a shock absorbing power rack, or a power rack designed so that if a loaded bar drops, the plates hit first.

Back in 1987, a strength equipment designer by the name of Jim Sutherland conducted what he termed a "serious test" on 11 Olympic bars to determine the best bar to sell to serious power rack trainers. Jim was the head of research and development for Universal Gym Equipment, the major strength equipment manufacturers at that time. He tested Udeholm, Eleiko, York, Ivanko, Superior, Hastings, Texas Power Bar, Malone, and Billard. His test consisted of dropping weight-loaded Olympic bars from a three-foot height onto 1-1/4" diameter heat-treated power rack safety bars. He started with 350 pounds and increased the weight until the bar developed a permanent bend.

Seven bars developed bends ranging from 1/2" to 3" in the 350 – 700 pound range. Eleiko and Udeholm made it to 700 pounds before bending. Two bars made it to 1100 pounds

without developing bends: the Ivanko OBX-20 Kg and the Hastings Manganese Alloy bar. The Ivanko bar at that time was made of 185,000 PSI steel.

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All of this reminds me of an interesting story. Over 15 years ago, one of the biggest manufacturers of gym equipment sent us a purchase order for 2,000 power rack stop pins. They said they would pay us \$20 each. (A \$40,000 order was a lot in those days). There was a notation on the P.O. that read, “Must be made from Ivanko Olympic bar material.” I called the buyer and asked, “Why do you want us to use our Olympic bar material for the stop pins? Aren’t you afraid that the rigidity will cause the Olympic bar to bend on impact?” He replied, “That’s no problem. We don’t guarantee the Olympic bars!” We refused the order. It was the wrong thing to do on principle. Unfortunately, that’s the way much of the industry thinks today. Instead of doing what’s best for gym owners, they do what’s best for themselves.

A bent Olympic bar has no place in a facility that has invested in top quality equipment and furnishings everywhere else in order to be perceived as a first class operation. An Olympic bar made from high tensile strength steel that is

straightened to a high tolerance may cost more, but you only have to buy it once. And club members will be able to see and feel the difference.

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.

Extra! Ivanko Introduces A 5-1/2 Foot Stainless Steel Olympic Bar

For club owners who have come to appreciate “fully functional” strength training equipment, Ivanko introduces this new 5-1/2 foot (66”) stainless steel “shorty” Olympic bar. Like Ivanko’s 7 foot stainless steel Olympic bar, this shorter version is made super hard and super straight for the most punishing workouts without ever bending, chipping, peeling, rusting, or snapping in two. Item # OBS 66.



Ivanko’s 5-1/2 foot version of its Stainless Steel Olympic bar will never bend, chip, peel, rust, or snap in two. Available with tempered “blue steel” streaks intact, or cleaned off.