

## Z-BAR THRU-TIE SYSTEMS

**Thru-tie bar, deformed bar** or **Z-bar** are all the same item and refer to a special steel rod available in 3 sizes, and most typically used for double sided wall formwork, to resist the forces generated by the concrete pressure. Z-bar's unique element is its high tensile strength (1000MPa), which is 3 times stronger than most mild steel used in general fabrication. Z-bar is a deformed bar and has an oval shape with 2 round sides and 2 flat sides, 15mm z-bar is actually 15mm in the short direction and 17mm in the long direction, where 20mm z-bar is 20mm and 23mm respectively.

Z-bar's tension capacities (pulling force) is as detailed below:

- 15mm z-bar = 90.0kN
- 20mm z-bar = 160.0kN
- 26mm z-bar = 300.0kN

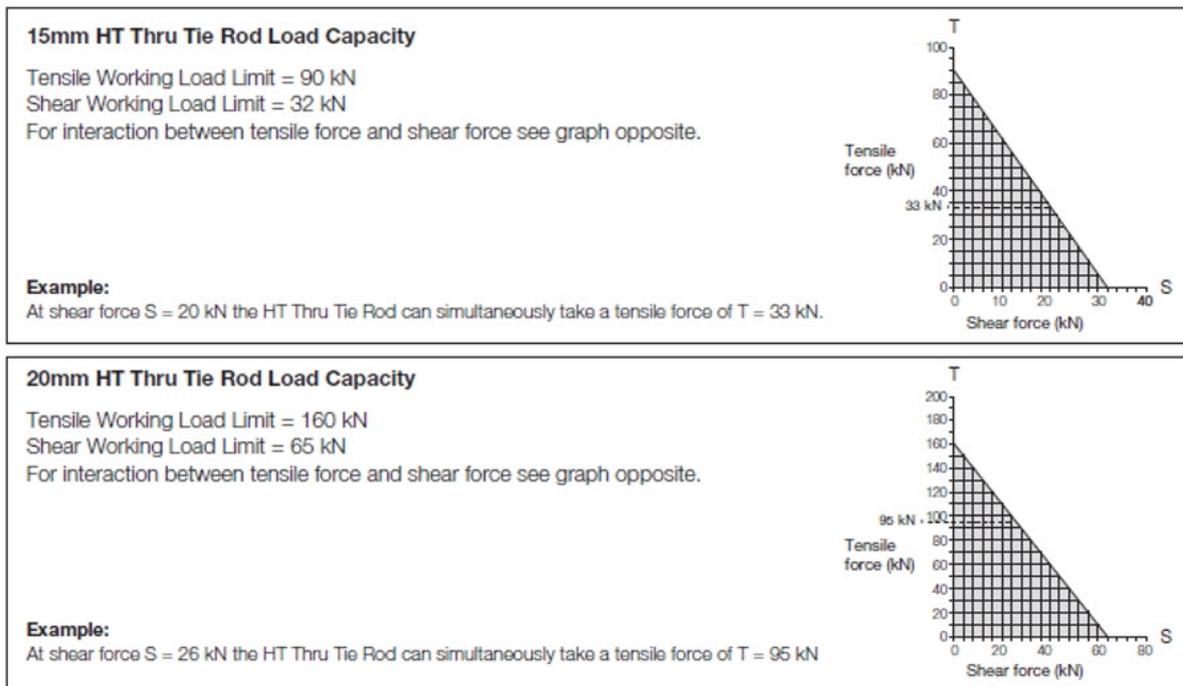
It is important to note that in formwork applications, clause 4.5.6.3 (c) of AS3610-1995 (Formwork Standard) specifies that, for tension members resisting lateral concrete pressure, the forces applied to the z-bar shall be increased by 20%. This reduces the SWL loads of z-bar sizes to those noted below:

- 15mm z-bar = 75.0kN
- 20mm z-bar = 133.0kN
- 26mm Z-bar = 250.0kN

This is because it is an additional safety factor required by the standard due to ties being a critical support member of the system.

## TENSILE & SHEAR INTERACTION

Z-bar may also be used in a shear loading scenario or a combined tension/shear loading scenario as per the following charts found in the Acrow Formwork Hardware Brochure. Acrow are the only supplier to publish this information and allows us to use z-bars for systems like jump forms etc.



### NOTE:

1. HT Thru Tie Bars must not be used as a load lowering/raising device.
2. For welding or galvanising HT Thru Tie Bars, please refer to the Acrow Engineering Department.
3. When the Thru Tie is supporting the form weight in a climbing form application, the load must be applied directly at the concrete face.
4. The Thru Tie is not suitable to resist forces which impose bending moments.

## THINGS TO AVOID WITH Z-BAR

1. NEVER weld z-bar.
2. NEVER use z-bar as a raising or lowering device.
3. NEVER use z-bar in an application where it could bend.
4. NEVER apply heat to a z-bar.

## COMMON MISCONCEPTIONS

1. Z-bar and reo are the same thing - **INCORRECT**. General reinforcement is ½ the strength of z-bar at only 500MPa.
2. Z-bar accessories and reo accessories are the same - **INCORRECT**. These are not interchangeable.
3. Z-bar can be bent - **INCORRECT**. It will snap if trying to deform it like reo unless heat treated.
4. I can weld to z-bar - **INCORRECT**. You cannot weld to z-bar unless there is a specific weld procedure, and it is welded by a competent person. It is highly discouraged even with a weld procedure. There is however a weldable z-bar by Dwidag, but it is not of the same strength. We recommend welding a 90mm joiner then inserting the z-bar into the joiner.
5. You can weld a wingnut - **INCORRECT**. Wingnuts are cast/forged and cannot be welded. We do however have machined 90mm z-bar joiners that can be welded.
6. A safety wing nut behind a wingnut will act as a lock nut - **INCORRECT**. While we do this regularly, because of the coarse speed thread on the bar, the second nut can become loose. It is however still used because it does provide a small factor of safety and it is rare the safety nut doesn't work.

## TYPICAL FAILURE OF Z-BAR

Generally, z-bar is the strongest element of the thru-tie system. The limiting element is typically the z-bar nuts. These will generally slip and destroy the thread before the z-bar snaps, and this is because the z-bar nuts are a softer cast steel. Because of the high strength of steel used in the thru tie bar, if a bar does snap there will be no warning sign. Z-bar however does stretch slightly before failure and the failure does exhibit some necking as shown in the below photo. A 20mm z-bar does neck to about 13mm prior to failure. The time it takes for it to yield (reach a point at which it will no longer support load and begin to neck) and failure can be in the matter of seconds.



## HOW DO WE TEST Z-BAR?

For all new batches of z-bar accessories that we import, we test a small sample size to ensure they meet the minimum WLL. This test is simple, and we basically just insert the bar through

a hollow hydraulic cylinder with a digital pressure gauge and apply load until it fails. You can see the test below was to check the capacity of the z-bar itself, so we had to use 3 x 70mm nuts so the z-bar would fail prior to the nuts.



## FREQUENTLY ASKED QUESTIONS

### Can I safely re-use z-bar?

Yes. We have successfully completed cycle testing on z-bar and z-bar accessories where we apply the working load limit, hold this load for 5 mins and continue this procedure for more than 20 times, then we finally take the z-bar to failure and there is no effect on performance if used in the correct manner. It is recommended to visually inspect the bar and nut threads for wear or deformation prior to use. It does not mean they have an unlimited life span and when they are looking worn, they should be scrapped.

### I can use a wing nut as a hook?

Yes. We have tested 15mm z-bar wing nuts as a hook (often referred to as a reverse wing nut) and have given them a working load limit of 10kN when hooked onto a 16mm reo bar or similar.

### Why does a 15mm wing nut only have one wing?

This is so when used in a wall formwork application any excessive vibration does not cause the wingnut to unwind itself as gravity prevents the wing completing a full rotation.

**Please note, this advice is general in nature. If in doubt, just ask.**

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