

## **SHACKLE GUIDE PAGE**

Shackles are the standard, most cost effective method of attaching the anchor with chain. They can be the weakest link in the entire system and, as such, maximizing shackle quality is imperative. Shackles are identified by Shape, Material, Pin Style and Working Load Limit. All reputed shackles have key information such as Make, Size, Working Load Limit shown as permanent marking on body

### **Material and Construction**

Shackles can be made of Stainless Steel, Alloy Steel or regular Carbon Steel. Shackles can be forged or Cast. Stainless Steel is much more expensive but does not necessarily offer greater strength, it offers supremely high corrosion resistance and is suitable for underwater and marine type uses. Forged Alloy Steel is always better than Cast Carbon steel because forging, Heat treatment and tempering works off many of the metal stresses and offers greater strength and abrasion resistance. Also, the addition of alloys to carbon steel enhances specific qualities of the metal e.g. Manganese spikes up the Hardness. Cast Carbon steel is typically galvanized. While the thin layer of zinc offers some corrosion resistance, Cast Carbon steel is an economical choice for shackles. Forged Steel is a good balance of all worlds. Forging brings about the aforementioned advantages of heat treatment and tempering. However, the absence of alloys keeps costing economical.

### **Shackle Shape**

The standard configurations are the D shackles (also called U shackles or Chain Shackles), the Anchor Shackles (also sometimes known as Bow Shackles) and the Web Shackles.

**Anchor Shackles** have larger shackle body per given size and pin diameter is the same as the body diameter. The circular body permits multi directional load handling but only so long as the direction of the load is in the plane of the bow AND appropriate adjustments to WLL is made based on the angle of the load. Generally, a 45 degree angle of load implies 30% loss of WLL and 90 degree load (i.e. parallel to pin) implies 50% loss of WLL. This is general guide only. The tradeoff for flexibility is reduced strength. Side loading of a round pin shackle never permitted because cotter pin can shear. When shackle is used as a collector ring for a balanced load, even though individual slings may be at a side angle, balanced loads do not require adjustment of WLL.

**D-Shackles** are meant strictly for an in-line load. They are narrower than a bow or anchor shackle and generally have a threaded pin or pin close. The smaller loop is designed to take high loads primarily in line. Side and racking loads may twist or bend a D or chain shackle. The pin diameter is larger than the body diameter.

**Web Shackles** Designed to connect web and round-slings to eyebolts and lifting lugs. The wide and flat ear with rounded inside corners are designed to provide a wider sling bearing surface, increased area for load distribution, eliminate folding and tangling of the webbing and make for a more efficient web sling. Consequently, the full capacity of the sling can be achieved.

### **Pins**

Pins are of three types: Round Pin and Cotter (Class 1 ), Screw Pin (Class 2 ), Bolt, Nut and Cotter Pin (Class 3)

**Round Pin and Cotter** - Slowly, Industry is moving away from this type of pin and Mytee Products does not carry it in our catalog at present.

**Screw Pin** can be tightened and loosened by hand initially but with ongoing use, pliers may need to be used. Due to easy removal and tightening, good for applications where shackle is frequently removed. Not good for applications where pin is subject to torque. To be safe, Screw Pins Require seizing with double turns and twist of soft stainless steel or Monel wire. Alternately, electrical cable can also be used so the screw pin does not undo itself.

**Bolt and Nut Cotter Pin** - Highly secure and resistant to hazards of axial and torsion loading. No Seizing Required. Requires Wrench or Spanner to tighten and undo. Do not use if Rode and the anchor are to be separated frequently but otherwise, the Bolt style pin is recommended.

### **Safety**

Only use shackles where Working Load Limit is clearly imprinted on the metal. Size your load properly and use shackles that meet or exceed required working load limit. The Working Load limit is not a suggested limit, it is a hard limit and must be treated as such. Be sure to adjust your true Working Load Limit for conditions such as side loading on Anchor Shackles. Do not use Chain Shackles for Side Loading. Shackles are sized according to the diameter of the bow section rather than the pin size. Never use a shackle if the distance between the eyes is greater than listed in the manufacturer's tables. Consult with the manufacturer if using shackles in extreme conditions (e.g., temperature higher than 204°C or lower than -40°C, or exposure to corrosive fumes). When connecting two shackles, always do so Bow to Bow or Bow to pin and always inline.

### **Do Not:**

- replace the shackle pin with a bolt or unidentified pins. A load will bend the bolt.
- allow a shackle to be pulled at an angle. The legs will open. Pack the pin with washers to center the shackle.
- use screw pin shackles or round pins in contact with moving parts if the pin can roll and unscrew. If the load shifts, the sling will unscrew the shackle pin.
- use round pin shackles restrained only by a cotter pin for overhead lifting.
- use shackles with bent pins or deformed bodies.
- force, hammer or wedge shackles into position.
- exceed 120 degrees for the angle when using multiple leg slings.

### **Inspection**

Inspect shackles regularly for bending of the body (which implies overuse of side loading), distortion of pins, wear and fractures. All pins must be straight and all screw pins must be completely seated. Replace shackles that are bent, show excessive wear by more than 10% of the original diameter, or have an elongated eye or shackle pin holes.

After inspecting your shackle visually, you can perform some basic tests. Hang the shackle without the pin on a string and tap it with a metal. Good shackle should ring. If the sound is "hollow", or dull the shackle is suspect. Now do the same to the pin.