

WHITE PAPER

Advantages of wide body shackles in lifting

Crosby[®]

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EXECUTIVE SUMMARY

This white paper explores the use of wide body shackles, sometimes referred to as sling shackles, in lifting applications. Wide body shackles, known for their enlarged sling-bearing area, enhanced load-bearing capabilities, and improved stability, are essential lifting components in various industrial, construction, and oil & gas settings. The document provides insights into the design, engineering, testing, safety, and applications of wide body shackles, emphasizing their importance in ensuring safe and efficient lifting operations.

INTRODUCTION

Shackles are indispensable tools in the lifting and rigging industry, playing a critical role in connecting the loads to be lifted to the lifting equipment. Wide body shackles, produced as bow shackles or anchor shackles, are a specialized category with a unique design that provides several advantages over standard shackles. The features, benefits, and considerations of these versatile shackles are discussed in this paper.

BACKGROUND

Traditional shackles come in various shapes and sizes, including D-shackles, bow shackles, and other specialized shackles. While each type of shackle has its specific use cases, wide body shackles stand out due to their distinctive wide load-bearing U-shape, which provides a broader and more stable contact surface for loads. This unique shape maximises the load bearing surface, decreases the sling distortion, and increases the sling efficiencies, making wide body shackles ideal for heavy-lift applications.

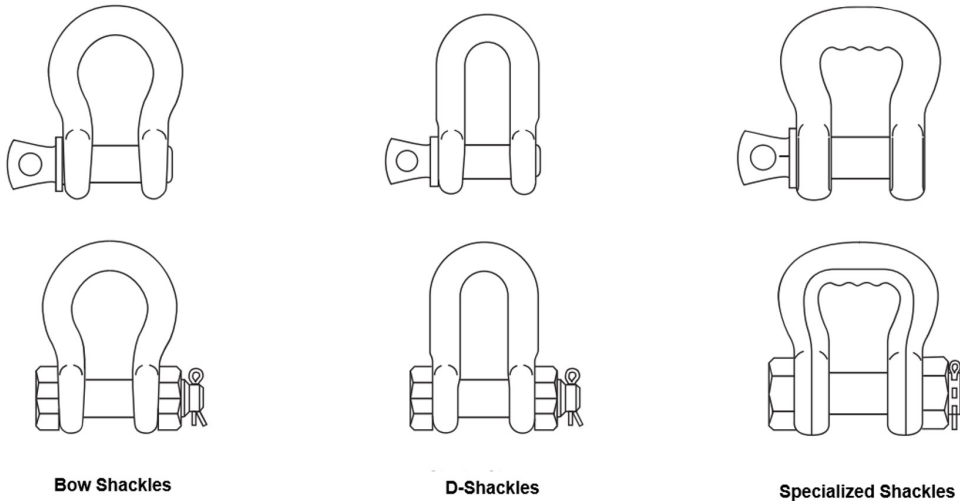
TYPES OF SHACKLES

Before delving into wide body shackles, it is essential to understand the different types of shackles commonly used in lifting operations. These include:

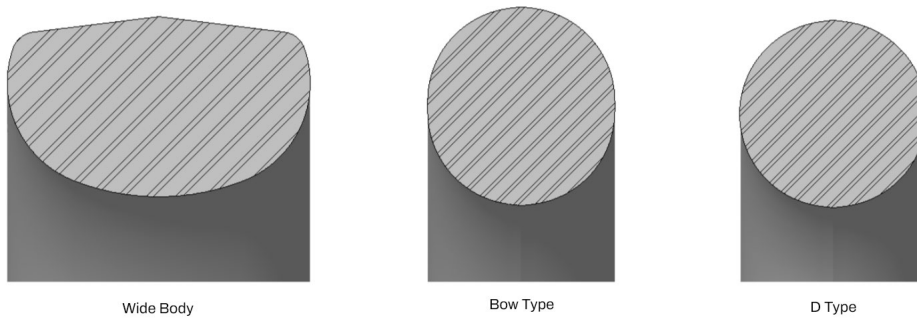
Bow Shackles: Sometimes known as anchor shackles, bow shackles are Omega-shaped and can accommodate a wider range of loads and connections.

D-Shackles: Sometimes known as chain shackles, these shackles have a D-shaped design and are widely used for their versatility, especially in anchorage applications.

Specialized Shackles: These shackles, for specific applications, can have multiple pin configurations or additional features. Examples include: ROV special releasing shackles, synthetic sling shackles, and special clevis pin shackles.



Wide body shackles are a type of bow shackle and offer unique benefits due to their design and the added load bearing surface.

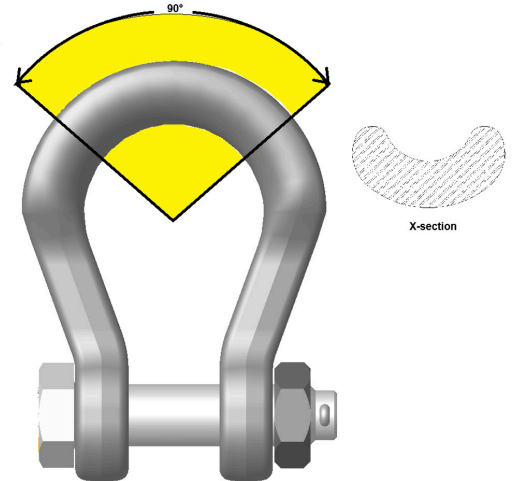


ADVANTAGES AND APPLICATIONS

Wide body shackles are characterized by their broad, curved shape, which provides several advantages:

Enhanced Stability and Load Distribution: The wider body spreads the load over a larger surface area, reducing stress on the shackle and the lifting slings.

- U-shaped design minimizes load movement, enhancing stability during lifting operations.
- Larger bearing surface increases sling life (reduces sling eye distortion)
- Thimbles not required due to large bearing area.
- Higher D/d ratio for the eye/grommet improves sling efficiency
- Wide bearing surface spans fully over a 90-degree included load angle.



Increased Compatibility: Wide body shackles can accommodate larger diameter lifting slings and hooks, making them suitable for heavy loads. Wide body shackles are compatible with the below sling types:

- Synthetic slings (smooth inner crown area)
- Grommets
- Cable laid (including braided slings)
- Single laid (soft flemish eyes)



Additional Benefits:

- Rounded sling transition area reduces distortion zone on sling body/eye
- May be equipped with pin anti-rotation devices
- May include auxiliary handling points to aid assembly

These advantages make wide body shackles ideal for the most severe applications, including heavy lift construction both onshore and offshore, where safety, schedule, and efficiency are paramount concerns.

The extensive range of wide body shackle capacities is often used for applications ranging from routine low-load tasks to the heaviest and most critical engineered high-value lifts.

DESIGN AND ENGINEERING CONSIDERATIONS

Wide body shackles are designed to meet strict industry standards and regulations. Key design and engineering considerations include:

Material: Shackles are typically made of specially treated alloy steel to withstand published Working Load Limits while keeping the weight of the shackle down.

- Material selection ensures maximum load capacity while maintaining ductility and toughness in harsh environments.
- Material testing ensures the materials meet the specification requirements. These tests may include mechanical testing, volumetric testing, and surface crack detection.

Load Ratings: Shackles are rated for specific load capacities considering required design factors.

- Users must ensure they select the appropriate shackle for the applied load based on the rigging arrangement. The applied loads are often determined in a detailed lifting plan that accounts for all aspects of the scheduled lift, to ensure a successful lifting event.
- The shackle engineering analysis considers multiple loading scenarios to ensure the shackle is suitable for a variety of loading conditions.

Shape and Dimensions: The wide load-bearing U-shaped body and dimensions of wide body shackles are critical in providing the necessary load distribution and stability. Shackle pin securement is typically achieved using threaded nut and cotter, or with removable split collar device for faster installation and removal. An additional feature of bow-to-bow compatibility provides more lifting options.

TESTING AND CERTIFICATION

To ensure the safety and reliability, wide body shackles undergo rigorous testing and certification processes. Certification bodies, such as the American Bureau of Shipping (ABS) or the Bureau Veritas, verify that shackles meet industry standards.

More popular standard in recent years are DNV standards DNV-ST-0378 and DNV-ST-0377. Users should always look for certification markings when selecting wide body shackles for lifting operations.

Proof Testing

Because wide body shackles are used in such critical applications, individual serialization and 100% proof load testing is provided on every shackle.

Comprehensive documentation packs include:

- Material Certification
- Material Test Certification
- Proof Load Test Certification
- Inspection Reports
- Non-Destructive Testing Reports
- Certificate of Conformance
- Third Party Type Approval
- Third Party Witness Certificate



SAFETY CONSIDERATIONS

Safety is paramount in lifting operations. To ensure safe use of wide body shackles, consider the following:

Regular Inspections: Inspect shackles for signs of wear, deformation, or damage before each use.

Proper Sling Configuration: Ensure proper sling configuration and alignment to prevent overloading or side loading.

Correct Load Rating: Use shackles with the appropriate load rating for the task.

Training and Education: Ensure operators are trained and educated on the safe use of shackles and lifting equipment.

CONCLUSION

Wide body shackles play a crucial role in ensuring the safety and efficiency of lifting operations in various industries. Their unique design, enhanced load-bearing capabilities, and stability make them a preferred choice for heavy-duty applications. Proper selection, inspection, and maintenance are essential to ensure their safe and effective use.

Users should always adhere to industry standards and regulations when employing wide body shackles in lifting operations to mitigate risks and ensure the safety of personnel and assets.

Please note that this white paper provides an overview of wide body shackles for lifting and should be used as a reference guide. It is essential to consult relevant industry standards and regulations and seek professional guidance when working with lifting equipment.

REFERENCES

[Relevant Industry Standards: DNV-ST-0378, DNV-ST-0377]

American Bureau of Shipping (ABS)

Bureau Veritas Certification
