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INTERNATIONAL SAFETY PANEL

SAFETY BRIEFING PAMPHLET SERIES #24

SAFE USE OF ROAD VEHICLE TWISTLOCKS

By

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ICHCA International Limited

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ICHCA International Limited - INTERNATIONAL SAFETY PANEL

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About the Author

Steve Dowson is Commercial Sales Director for William Cook Intermodal and has over 20 years experience in the road transport industry and is responsible for a number of innovative products.

William Cook Intermodal, formerly Blair Transport Technology, specialise in the innovative design and manufacture of road and rail Twistlocks and ISO Corner Castings. To date William Cook Intermodal have manufactured in excess of two million twistlocks and currently have approximately 50 off live designs in production. In excess of 20 million corner castings have been designed and manufactured for a range of applications in materials ranging from plain carbon steel through to super duplex stainless steel.

In addition to the above William Cook Intermodal also produce steel castings, to customer designs, for a wide range of industries.

Contents **Page**

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SAFE USE OF ROAD VEHICLE TWISTLOCKS

1 Foreword

This pamphlet gives guidance on the safe use of road twistlocks, the different types available, their applications and minimum maintenance standards. It is the responsibility of the trailer or chassis manufacturer to ensure that the twistlocks fitted meet both the maximum load requirements and any operating requirements of the country they will be operating in.

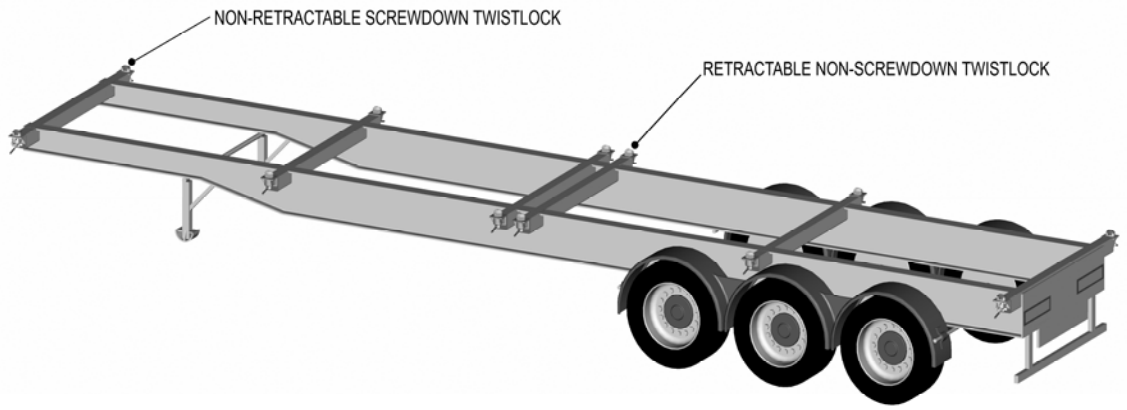


Figure 1

Typical Skeletal Trailer Showing Positions of Twistlocks

2 General

2.1 In the context of public road use, a twistlock is a device, permanently attached to a road trailer or chassis, used to safely secure containerised loads via the bottom aperture, ”twistlock aperture”, of the bottom corner fittings of the container.

2.2 It is recommended that, in addition to standard maintenance, all twistlocks are inspected annually. This is already a legal requirement in some countries.

3 Design Features

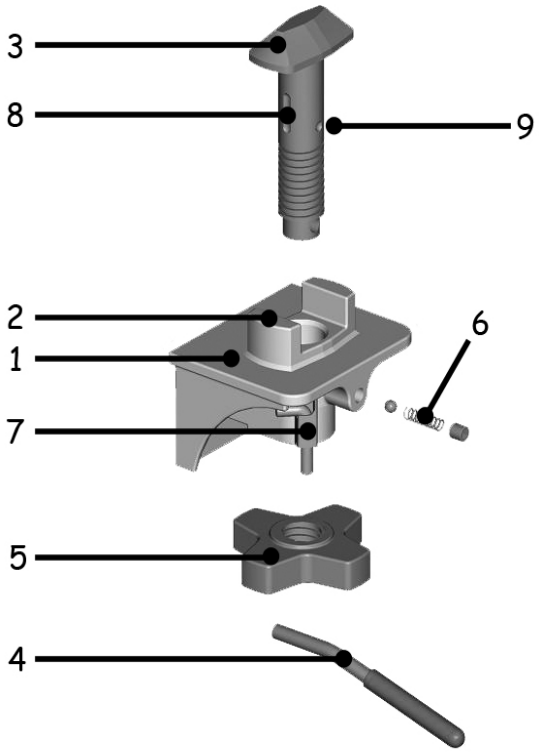
3.1 ISO 1161 C.1.2 states, “A typical twistlock assembly usually consists of the following components -

a) A horizontal load-bearing surface, capable of supporting the bottom corner fitting of a fully loaded container under dynamic conditions

b) A fixed collar, designed to project upwards into the bottom hole of a bottom corner fitting

c) A rotatable head (the twistlock proper), the head of which shall project into the corner fitting

d) An arrangement for rotating the head and securing it in the desired position (and in some cases, an arrangement whereby the rotatable head may be pulled or screwed down until it exerts a clamping force on the inner surface of a corner fitting, as well as acting to restrain the corner fitting against lift off)"



1. Top Plate
2. Shearblock
3. Stem
4. Handle
5. Handnut
6. Ball and Spring
7. Safety Locking Device
8. Vertical Recess
9. Dimple

Figure 2
Exploded View of Typical Twistlock

NOTE 1: For clarity the horizontal load-bearing surface will be entitled the Top Plate, see item 1 in figure 2.

NOTE 2: The twistlock body can be either a casting or a fabrication

NOTE 3: The fixed collar will be entitled the Shearblock, see item 2 in figure 2

NOTE 4: The rotatable head will be entitled the Stem, see item 3 in figure 2.

NOTE 5: It is strongly recommended that the stem is a one-piece forging to ensure high tensile strength

NOTE 6: The ball and spring, item 6, engages in either the dimple, item 9, or the vertical recess, item 8, to ensure that the stem, item 3, is maintained in either the locked or unlocked position. This feature is referred to as a dedent or detent system.

4 Categories

4.1 Retractable, as per figures 3a and 3b, whereby the shearblock and stem can be lowered below the level of the top plate when not required.

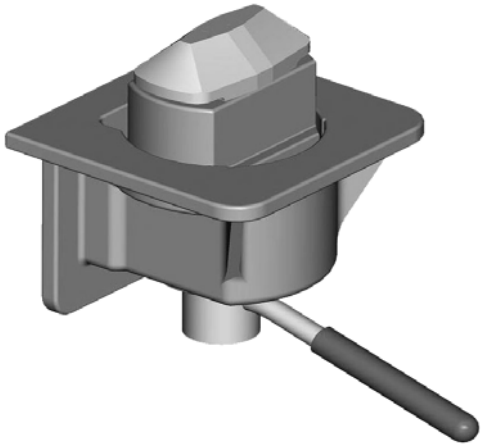


Figure 3a

Retractable Twistlock in Non Retracted Position

Figure 3b

Retractable Twistlock in Retracted Position

4.2 Non retractable, as per figure 4, whereby the shearblock is permanently raised above the top plate.

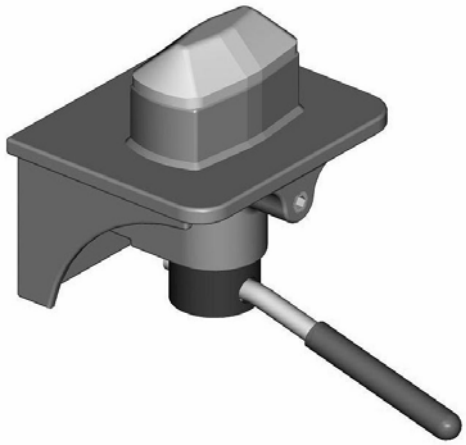


Figure 4

Non Retractable Twistlock

4.3 Retractable Screwdown, as per figures 5a and 5b. This is the same as 3a and 3b with the additional feature of the stem being able to be clamped to the inner surface of the corner fitting thereby reducing relative movement. Additional benefits are reduced noise and vibration, together with reduced stress on the chassis, container and the load.

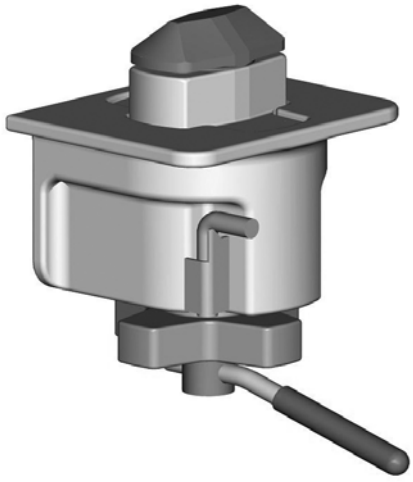


Figure 5a

Retractable Screwdown Twistlock
in Non Retracted Position

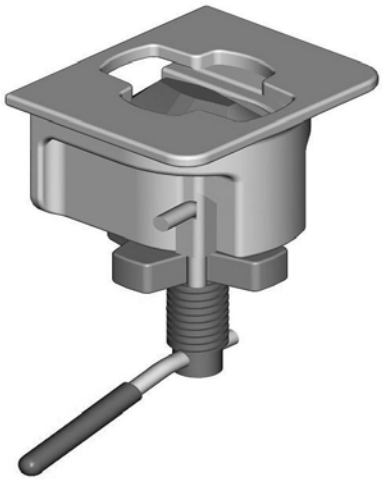


Figure 5b

Retractable Screwdown Twistlock
in Retracted Position

4.4 Non Retractable Screwdown, as per figure 6. This is the same as figure 4 with the additional feature of the stem being able to be clamped to the inner surface of the corner fitting thereby reducing relative movement. Additional benefits are reduced noise and vibration, together with reduced stress on the chassis, container and the load.

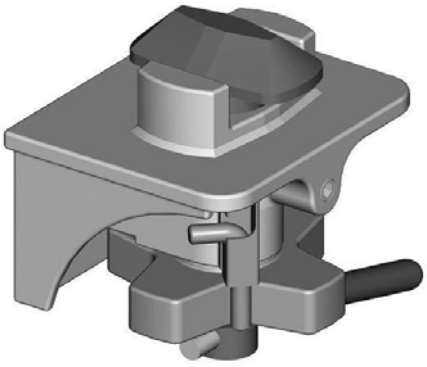


Figure 6

Non Retractable Screwdown Twistlock

4.5 Semi-automatic twistlocks can be either screwdown, or non-screwdown as per figure 7. These twistlocks offer the advantage of the stem being automatically rotated into the locked position after the corner fitting engages with the top plate.

4.5.1 It is worth noting, however, the following disadvantages –

- Screwdown versions need the handnuts manually tightening
- Both versions need to be manually unlocked
- Operators of Container Handling Equipment need to be aware that containers can not be repositioned or relifted without first manually resetting any automatically locked twistlocks

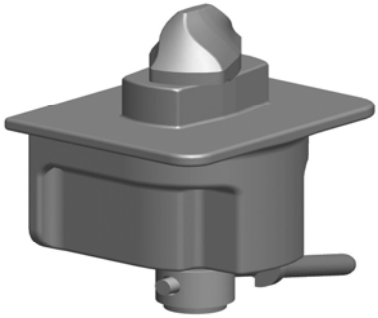


Figure 7

Semi-automatic non-screwdown Twistlock

5 Function

5.1 The most common method of rotating the stem to the locked position is by an attached handle, item 4 in figure 2. The convention is for the handles to be in line with the body when the stem is in the locked position, as per figure 7. The action of the stem turning is classed as a first or primary lock. With semi-automatic twistlocks the stem automatically rotates to the locked position as the corner fitting passes over the stem head.

5.2 The most common method of ensuring the stem stays in the locked position is by a dedent or detent system, as per figure 2, which uses a spring to engage a least one steel ball into a vertical recess in the stem, items 6 and 8 in figure 2. An alternative method is for the stem to engage in a recess in the shearblock, as per figure 8. Both methods are classed as secondary locks.

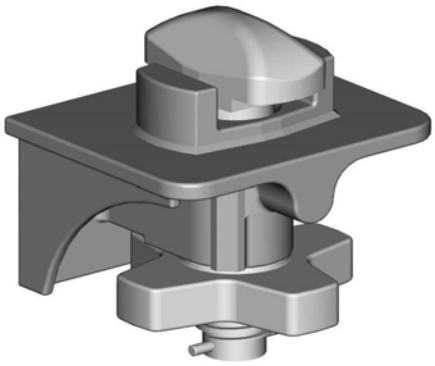


Figure 8

Non Retractable Screwdown Twistlock with Recessed Head

5.3 The handnut, item 5 in figure 2, used on the screwdown versions, is classed as a third lock, and any device used to secure the handnut, item 7 in figure 2, is classed as a fourth lock.

6 Securement

6.1 ISO 3874 9.3.3 states -

> “To ensure safe operation over public roads, the container shall be supported on the road vehicle by all four bottom corner fittings only or by the intermediate load transfer areas in the base structure only. The container shall also be secured to the road vehicle by all four corner fittings. “.

6.2 The two most common methods of securing the container are -

6.2.1 Four twistlocks mounted so the stems are vertical and can engage with the twistlock aperture of the corner fitting, as per figure 9.

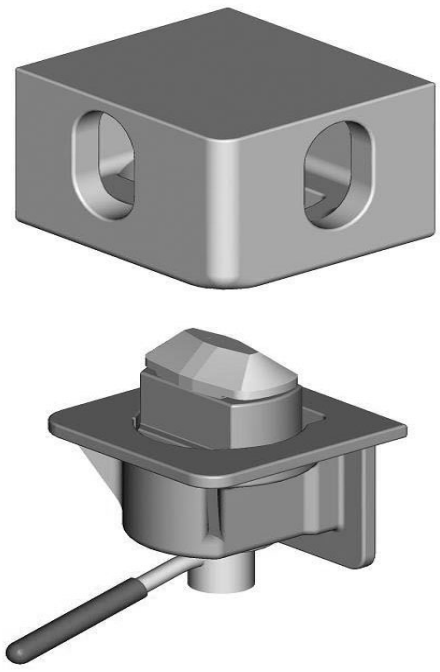


Figure 9

Twistlock About To Engage With a Corner Fitting

6.2.2 Two twistlocks mounted at the rear of the trailer with the stems vertical and two off locking pins, mounted horizontally on the bulkhead and engaging with the front apertures of the corner fittings, as per figure 10.

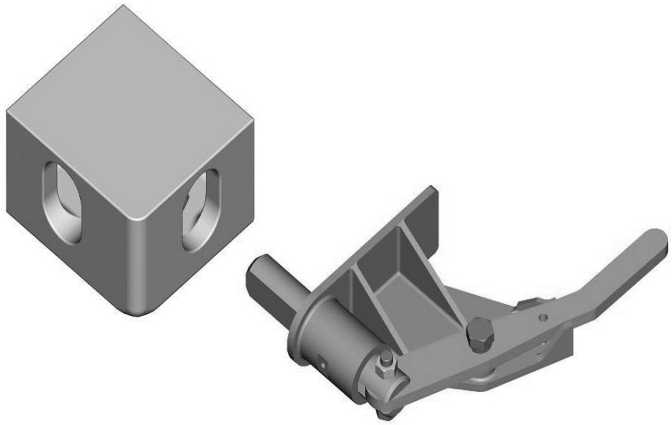


Figure 10

Locking Pin About To Engage With a Corner Fitting

7 Safety Checks before use

Before loading, the vehicle should be checked to ensure that: -

- The vehicle is on reasonably level ground
- The four required twistlocks, relating to the length of the container to be loaded, are in the raised position with the stem head unlocked. Alternatively if locking pins are fitted at the front of the vehicle then they need to be in the retracted position
- Any remaining twistlocks within the envelope of the container need to be in the retracted position

  NOTE: Retractable screwdown twistlocks should be stowed as figure 5b to reduce noise and vibration
- The four twistlocks, or two twistlocks and two locking pins, need to be checked that they are fully functional, there are no missing parts, they are fit for purpose and any distortion of the top plate will not affect their function.
- Any semi-automatic twistlocks need to have the stem checked to ensure that there is some resistance to rotation to prove that the spring is functioning

8 Operation

After the loading of the container the driver should complete the following: -

- Check that the corner fittings are seated on the top plates correctly
- Rotate the stems to the locked position. Check that the stems of any semi-automatic twistlocks have automatically indexed
- Fully run up handnuts, if fitted, and engage any fourth lock

- Locking pins, if fitted, need to be engaged into the front aperture of the corner fitting

- If any of the twistlocks, or front locking pins, will not lock then the load is to be considered unsafe

9 Special considerations concerning the use of Twistlocks on Tipper Chassis

This application subjects twistlocks to the most arduous of conditions and as such front locking pins should not be used. The following are strongly recommended as twistlock features -

- Non retractable. A retractable shearblock is inherently weaker in shear than a one-piece casting or fabrication

- High tensile stem, minimum of 850N/mm² UTS

- Screwdown. Helps to eliminate the clearance between the underside of the stem and the corner fitting, thereby reducing relative movement between the container and chassis during tipping

- A suitable fourth lock to prevent the handnut being accidentally loosened

  NOTE 1: If the twistlocks are semi-automatic then the drivers should always be instructed that the handnuts need to be manually tightened. There is a danger that semi-automatics can give a false sense of security in that drivers might feel that they do not have to leave their cabs.

  NOTE 2: If additional safety devices have been fitted then the relevant operating instructions should always be adhered to.

10 Special considerations concerning the use of Twistlocks on Swap Bodies and Demountable Bodies

10.1 Lightweight bodies, or non ISO Containers, tend to use profile or cast plates instead of ISO corner fittings and plate thickness can be as low as 10mm. As the standard height from the underside of the twistlock stem to the twistlock top plate is 35mm this can give up to 25mm clearance.

10.2 If this is considered excessive in terms of noise and vibration, especially when running empty, then consideration should be given to using a screwdown twistlock.

11 Maintenance

11.1 As a minimum, all twistlocks should always be inspected during the trailers' standard maintenance schedule. Worn, damaged or missing parts should always be replaced in line with the manufacturers' recommendations.