

What makes a good positioning belt?

3. Closures

The first consideration of a seating system is usually its cushion. This aspect has been covered elsewhere in our downloadable booklet “What makes a good cushion?” An equally important component of many seating systems are the postural support devices (PSDs) provided with the seating to complement the cushion and back support elements. This is the third in a series covering PSDs, where we look at the design of different closure mechanisms and their pros and cons.

Postural support devices (PSDs) need to have a closure system (e.g. hook and loop, buckle) that allows the occupant to be secure, and released from the PSD when needed. The system needs to be simple to secure for both fastening and release, but not liable to release accidentally. When tested in accordance with BS ISO 16840-3¹, the PSDs, in combination with the prescribed closure system, are required to meet the pass criteria given therein.

When selecting a belt, the type of closure employed may be the most important element to be selected. The type of closure system chosen should suit the occupant's and/or the carer's ability to open the buckle, bearing in mind any behavioural, mental, or physical impairments.

Furthermore, closure systems need to be selected and located such that they do not create a risk of harm to the occupant by digging into soft tissues (e.g. to the stomach or genitalia) or rubbing against bony prominences. Closure systems should be positioned where they provide no risk of encroaching on moving parts of the wheelchair or seating system.

In the marketplace, there's a number of PSDs which use off-the-shelf buckles which have been designed for use on other items than positioning belts, with different kinds and directions of forces, and as a result they might not have been tested to, and passed the BS ISO 16840-3¹ tests.

In this article, we look at the pros and cons of some of the different styles of closure commonly available.

Hook and loop closures

The benefits of a hook and loop closure is that it is fast and easy to open up, and also provides for local fine adjustment

around different thickness clothing, for example. The downside to this is that this risks the belt not being done up tightly enough. Also, the hook components risk being clogged up with extraneous materials such as fluff from clothing, which can decrease their ability to attach to the loop component.

Where a hook and loop closure system is used, the hook side should be positioned such that it is not in direct contact with the occupant, as it can cause skin irritation. It is also important to note that hook and loop can be made to different grades of peelability, and different grades of slippability. If the peelability is too easy, the closure will not hold in place, whereas if it is too 'sticky', though more secure, it will be more difficult to undo.

In addition, if the grade used allows too much sideways slippability under tension, then it will fail the BS ISO 16840-3¹ tests.

Side release buckles

Side release buckles, of the type often found on back packs, are relatively inexpensive, and thus quite common. They can be released single handedly, and present the least risk of accidental release as compared with other closures.

They have the added benefit that most side release buckles can be used either for single pull belts, or for dual pull belts (see Figure 1), where in the latter they offer twice the available length of webbing for tightening. However, they are not ideal for individuals with poor manual dexterity or strength, who need to release themselves from their PSD, as these buckles require a relatively strong pinch action to release. Where the prescriber wishes to add a security feature to decrease the ability of the occupant from releasing themselves from the belts, this can be achieved by the use of a secondary sliding tab which needs to be manipulated in addition to pinching the side release.



Figure 1: Belt with side release buckle set up for dual pull operation

Push button buckles

There's a wide choice of push button buckles on the market, some of which will not pass the BS ISO 16840-3¹ tests due to their having been designed for other purposes and markets. For the 'ordinary' user, push button buckles are easy to access and operate. However, they are less suitable for some physically impaired occupants who might release themselves accidentally. The amount of force to operate the button varies from model to model, and thus some are easier to open than others. The easiest ones to get out of are those where the tongue release is facilitated by being spring-loaded.

For some occupants, who are more behaviourally or mentally impaired, there is a risk that they might jeopardise their safety by releasing the buckle at an inappropriate time. This has been addressed by some manufacturers who offer slip over 'security' covers with smaller holes over the button, which need a pointed device to open the buckle.

Bodypoint in the US has tackled this with a more refined and less bulky solution by providing a choice of three interchangeable button covers with a choice of different diameter holes to access the buttons (Figure 2).



Figure 2: Interchangeable covers with different diameter holes for a push button buckle to customise the accessibility

Latch buckles

Latch buckles are modelled on the buckles found on aircraft seat belts (Figure 3), and are appropriate for occupants with limited manual dexterity, but who can exert a pull on the latch. This can be further assisted by adding a belting strap through the top of the latch cover, which can be easily grabbed hold of. Due to ease of operation, there might be a greater risk of accidental release, though to protect against this, some designs require a greater angle of lift before the buckle is released.

Latch buckles need to be positioned such that they cannot be accidentally released, e.g. by the occupant's elbow, if the buckle has been placed off centre near the elbow's natural resting position.



Figure 3: An aircraft latch buckle, and a similar action, but more streamlined, style of latch buckle

Swivel buckles

Swivel buckles allow the two components of a PSD to rotate relative to each other. The two parts are attached by a latching action and have a push release (Figure 4). Swivel buckles are appropriate where a more dynamic relationship between the components of the PSD is required.



Figure 4: A swivel buckle provides for a more dynamic belt set up

Magnetic lock buckles

Magnetic lock buckles have been designed for people who find it difficult to connect a standard buckle as a result of their limited mobility and dexterity, such as those suffering from arthritis or hand tremors, and also those who are partially sighted. The magnets in each part of the buckle help the buckle to align and connect on their own.

A UK manufacturer, Soloc, has also created a design – Soloc Solo – which has been designed for single-handed application and release (Figure 5). The belt comprises of the Soloc magnetic buckle together with a recoiling 'Presenter Arm'.

The objective of the Presenter Arm is to hold the stud unit in a fixed position for the occupant to present the buckle: once the units are brought together the internal magnets will help align and connect the two units where the stud is mechanically locked in position.



Figure 5: Single-handed connection, adjustment, and release of the Soloc Solo buckle

Belts for easier access

For easier access to the belts, e.g for those with limited manual dexterity, Bodypoint created the Evoflex® belts which have stiffened straps that conveniently pivot out of the way when you want and stay where you put them (Figure 6a). Transfers are easier, and the straps won't twist or fall into the wheels, avoiding dirt and damage. The Soloc Freedom provides a similar facility, where the two stiffened arms are brought into the vicinity of each other, and the magnetic lock does up the belt (Figure 6b).

In conclusion

No two clients are the same. The choice of type of belt, and especially its closure, need to be considered carefully to meet the client's, and maybe also the carers', needs. Physical, mental, and behavioural abilities or impairments all need to be brought into consideration.

References

1. BS ISO 16840-3:2022 Wheelchair seating. Determination of static, impact and repetitive load strengths for postural support devices
2. BS 8625:2019 Selection, placement and fixation of flexible postural support devices in seating. Specification (Note: This standard will be available as ISO/TS 16840-15 as well)



b)



Figure 6: Evoflex(a) and Soloc Freedom(b) belts offering greater freedom of access to the wheelchair



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