Let's Get It Clear No.19
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What makes a good positioning belt?

1. The anatomy of a belt

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?" Equally important components 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 first in a series covering PSDs, where we look at the design of different components of a positioning belt to ensure optimal results for the user.

Let's start with a reminder that positioning belts are not to be confused with 'safety' belts, as used in vehicles, which are made available as restraints. Positioning belts are intended to help position the individual to assist them in postural control and normal day-to-day functions, whereas vehicular restraints are there to restrain the body from flying out of the seat in a traffic accident. The applications, and therefore the designs, are very different for the two different types of belt, and should not be confused with each other.

Postural support devices (PSDs) are medical devices designed to control body movements, either blocking, minimising, or guiding movements of specific body segments to achieve desired outcomes, while including safety within the seating system. Typical outcomes include increased sitting stability, maintained or corrected posture, increased reach, enhanced propulsion of a mobility device, or maintenance of a desired seated position for safety purposes (including prevention of falls from the chair). In many cases, the purpose of a PSD can be a combination of one or all of these factors.

Pelvic positioning belts

Before other PSDs (e.g. ankle or shoulder supports) can be issued, the individual will need a pelvic positioning belt, and we will therefore be concentrating on these in this article. Position and control of the pelvis is critical to postural alignment and control, and there's potentially a lot of movement to control.
The lowest vertebra in the spinal column, L5, is attached to the top of the pelvis. The pelvis has scope to rotate in three dimensions: posteriorly and anteriorly as viewed from the side; obliquely to the left or right when viewed from the front; and rotationally when viewed from above. All these movements get translated into the spine via the L5 vertebra.

Postural reflexes drive people to strive to maintain their centre of gravity within this base of support. Due to the connection of L5 to the top of the pelvis, any change in pelvic position in turn affects the shape of the spinal column. For example, when the pelvis tilts posteriorly, forward flexion tends to occur in the spine leading to a kyphotic posture. When the pelvis rotates obliquely (in the frontal plane), this usually causes lateral flexion of the spine leading to a scoliotic posture.

The positioning of the pelvis is therefore also critical for the alignment of the spine. Some of these 'asymmetries' are unavoidable (or 'fixed'), and from time to time some are desirable. The important element is to control them appropriately, and that is why the selection and placement of flexible PSDs is so important (see BS 8625[1]). The position

of the pelvis also greatly changes the distribution of interface pressures between the occupant and any support surfaces, especially the seat cushion and back support. This is an important consideration for the prevention of pressure injuries.

A pelvic positioning belt is employed to bring as much control as possible to the pelvis, to the benefit of many other parts of the body, and for functional activity.

The anatomy of a flexible positioning belt

The key components of a flexible positioning belt are the webbing, the padding under the webbing, the buckle (or other closure), and the means to fix the belt to the seating system. Closures and mounting systems are covered in more detail in later articles in this series.

A description of the components of a belt are described in Figure 1.

Webbing

The webbing materials need to be strong enough to be able to withstand the forces applied to them by the chair's occupant, adjustable for a good fit, and non-slip so that they stay in place. BS 8625[1] requires that the belts be tested to ISO 16840-3[2], which covers static and repetitive load tests. Amongst the pass/fail criteria is one that specifies that the belt should not slip more than 10 mm under the repetitive load test.

In selecting an appropriate belt, the belt length needs to be long enough to be able to thread through the end fittings at the belt mounting points. The webbing width i.e. flexible PSD width: A in Fig. 1) can come in different sizes: up to 25 mm ±3 mm is Small; 26 mm to 38 mm ±3 mm is Medium; and 39 mm to 50 mm ±3 mm is Large (from BS 86251[1]).

Pressure distribution

Pressure distribution or redistribution, e.g. by padding, surface contours, or elastic fabrics, should be provided where the belt interacts with the occupant's body, in order to protect the occupant from harm from the webbing materials (e.g. where it might come in contact with bony prominences or where significant force is applied over soft tissues).

Material selection by the manufacturer is critically important. The pressure distribution elements should be designed to follow the contours of the occupant's body, and to dissipate evenly the forces of the support on the occupant's body.

The design should not allow any curling of the padded support such that the forces would no longer follow the contours of the occupant's body. Where edging is applied to the pad to stop fraying of the pad, the edging material should not provide a risk to the tissue integrity of the occupant – from wrinkling or other deformations, or from localized pressure points.

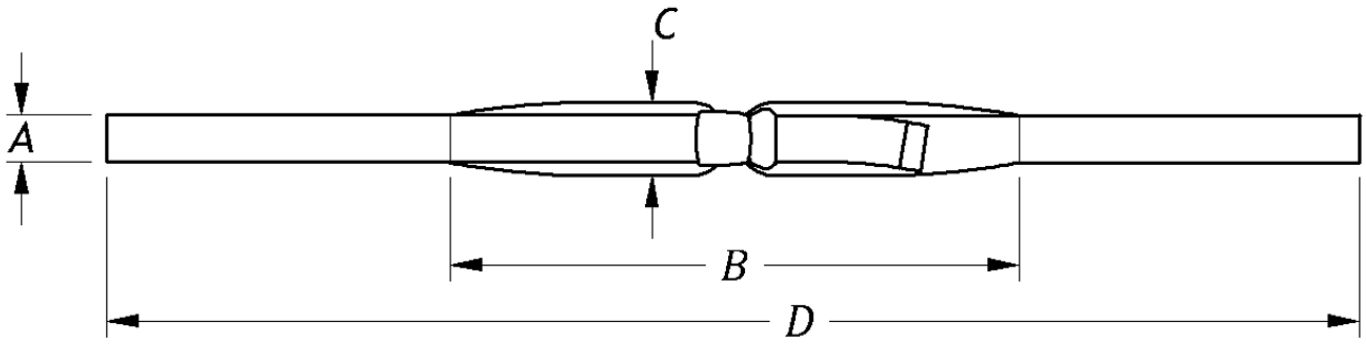

Figure 1. The components of a pelvic positioning belt

KEY

A - Flexible PSD width

B - Flexible PSD padded length

C - Flexible PSD pad width

Flexible PSD length: the distance from one end of the webbing to the other when the PSD is laid flat

Padding placement

Where the belt is placed across the occupant's thighs, to maximise pressure redistribution the pad needs to wrap around the thighs to the most lateral points of the thighs – see Figure 2. When selecting the belt to be issued, this distance should then be used to give the dimension of the 'flexible PSD pad length' (B in Fig. 1) when the belt is in place and tightened up.

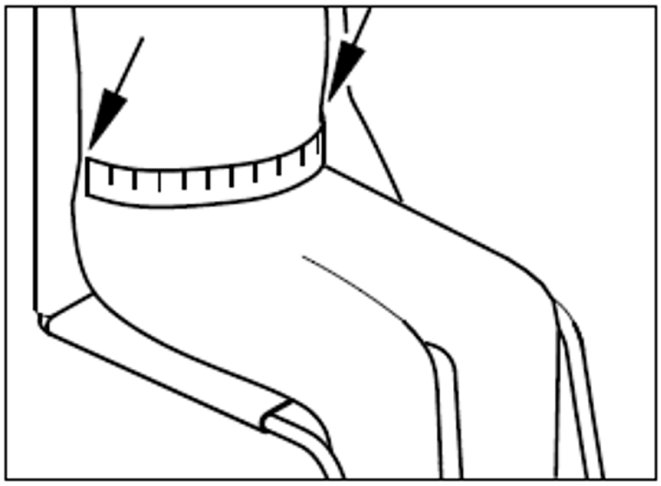

Figure 2. Body measurement needed to size a positioning belt's padded length

Further safety

ISO 16840-10[3] covers the flammability testing of PSDs, and gives specific guidance as to the process for testing the resistance to ignition of belts and harnesses.

Do no harm

Behind the philosophy of prescribing equipment that 'does no harm', being aware of the standards for testing the safety of the prescribed products, the qualities of the materials employed, and the products' use to alleviate or prevent harm is an essential part of professional equipment provision. Knowing what to look for, and indeed challenging restrictions on the availability of equipment for prescription, is essential for the well-being of your clients. Using the guidance within the latest standards ensures that you can be confident in your decisions.

References

1. BS 8625:2019 Selection, placement and fixation of flexible postural support devices in seating. Specification (Note: This standard is available as ISO/ TS 16840- 15: 2023 as well)

2. BS ISO 16840-3:2022 Wheelchair seating — Part

3: Determination of static, impact, and repetitive load strengths for postural support devices

3. ISO 16840-10:2021 Wheelchair Seating — Part 10: Resistance to ignition of postural support devices — Requirements and test methods