HAWORTH

The Importance Of Good Sitting

Ergonomic Seating Guide

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Improving Comfort and Support for Worker Well-Being

A large body of research shows that health and well-being are directly affected by many features of the overall physical environment.[1] When 54 percent of our waking hours are spent at work[2] and 75 percent of work in industrialized countries is performed while sitting[3], ergonomic support and seated comfort can make a crucial difference for employee well-being and engagement. Worker comfort is one of the top workplace issues challenging organizations. Providing good back support not only promotes healthy sitting, but can also support mental acuity for seated workers.

We have studied the relationship between the human body and chair to minimize discomfort and promote people's well-being—physically, emotionally, and cognitively. Through global design and development partnerships, our task chairs support the range of body sizes around the world. Our commitment to the science of sitting is grounded in our history of strong design, engineering, and manufacturing—and our ergonomic expertise—to support people at work.

Haworth and the Human Performance Institute at Western Michigan University have partnered since 2004 with the goal of investigating the physical relationship between a person and a seating surface. This effort has resulted in over 5.5 billion high resolution pressure mapping data points used to understand seating challenges, enabling Haworth to deliver the very latest science through analytics in our products.

1 National Safety Council, 2022.
2 healthycomputing.com, 2007.
3 Amick, Robertson, DeRango, Bazzani, Moore, Rooney, and Harrist, 2003.

Why You Need This Guide

In 2020, there were approximately 2.7 million non-fatal workplace injuries reported by employers, 21 percent of which were musculoskeletal disorders. One-third of these injuries resulted in days away from work. For these workers who suffered musculoskeletal injuries, the average amount of time spent out of work was 14 days.[4, 5]

With figures like these, the importance of providing a well-designed work environment—with appropriate training that could help lessen costs and days lost to injuries—is obvious. The right ergonomic chair with the proper ergonomic training can help reduce injuries—and more. When you deliver innovative, science-based, seated support to minimize worker discomfort, you can promote well-being and increase employee engagement.

Studies also show that work-related injuries can be reduced and productivity increased using an ergonomic chair and proper ergonomic training:

Proper office ergonomics training resulted in a higher quantity and quality of work produced.[6]

Use of an ergonomic chair during prolonged seated work decreases the risk of suffering musculoskeletal disorders in the neck, shoulders, arms, back, and legs.[7]

4 US Bureau of Labor Statistics, 2021.
5 National Security Council, 2022.
6 Karakolis and Callaghan, 2014.
7 Zemp et al, 2016.

A Chair is a Personal Choice

Ergonomic Seating Standards

Few things in the workplace evoke a stronger physical and emotional attachment than a person's chair. It's the center of work—and perhaps the single most important component of a healthy working environment.[8] Good ergonomic seating enables concentration and minimizes the distractions that stem from being uncomfortable.

The purpose of this guide is to highlight seating features that help improve comfort, support, and well-being to enable worker performance and keep people engaged. But the human body comes in many different sizes and shapes. A design that's comfortable for one person may be inappropriate for another. Proper fit is imperative when people physically interact with their chairs for hours at a time.

To improve chair designers' abilities to meet the needs of users, several organizations have compiled standards with the help of Human Factors and Ergonomics experts. These standards represent the combined cumulative knowledge and expertise aimed at improving the accommodation of people and reducing the risks of injury in the office environment.

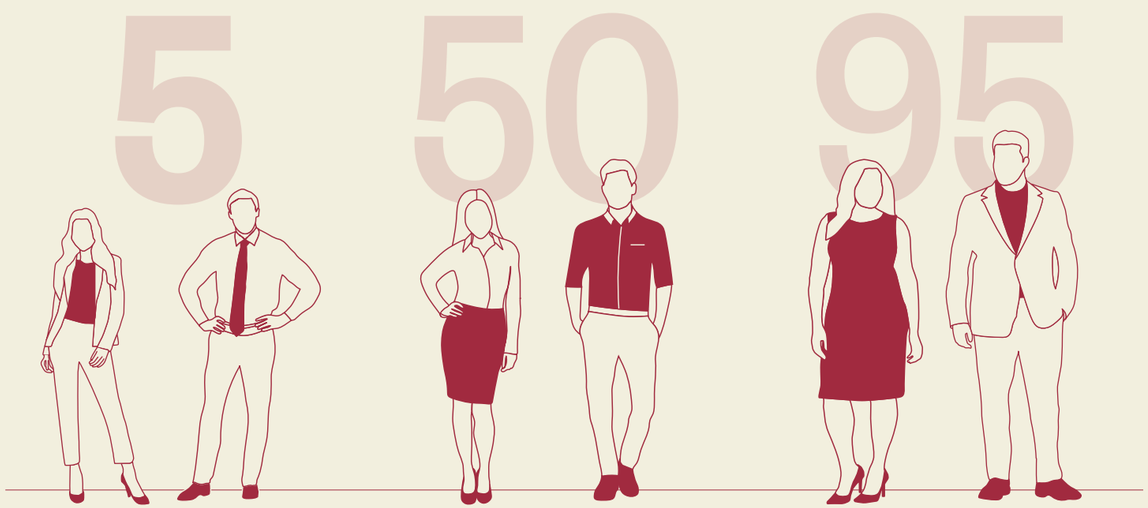
Haworth always considers global ergonomic requirements in our chair development process, in addition to the following North American standards:

- Business and Institutional Furniture Manufacturer's Association: BIFMA G1-2013 and BSR/BIFMA 10.1-202x
- Canadian General Standards Board: CGSB-44.232-2018
- Canadian Standards Association: CSA-Z412-2017

These chair standards are intended as a reference and starting point for design. They are updated periodically to reflect accepted research and best practices. The standards provide design guidance to meet minimum requirements in addition to adjustability ranges to increase the percentage of the population supported.

8 healthycomputing.com, 2007.

The standards propose dimensional specifications based on body dimensions of the 5th percentile (small) female to the 95th percentile (large) male. This range covers approximately 95 percent of the population and is intended to meet the minimum requirements of users. Haworth's ergonomic seating products are based on state-of-the-art research and are designed to exceed standards, meeting the needs of a broad range of users.



5th Percentile Female: ***109.7 lbs., 59.0"***
5th Percentile Male: ***136.0 lbs., 64.1"***
50th Percentile Female: ***161.2 lbs., 63.5"***
50th Percentile Male: ***192.6 lbs., 69.1"***
95th Percentile Female: ***263.8 lbs., 67.9"***
95th Percentile Male: ***287.2 lbs., 73.8"***

Source: US Department of Health and Human Services. "Anthropometric Reference Data for Children and Adults: United States, 2015–2018." National Health and Nutrition Examination Survey, Jan. 2021, www.cdc.gov/nchs/data/series/sr_03/sr03-046-508.pdf.

Design of Chair Controls

By design, ergonomic seating incorporates a range of adjustability. People need to be able to get into comfortable postures easily and make adjustments over time. To achieve this, accessible, responsive design and consistency in control placement and function are essential. In our chair development process, our research focuses on the user, resulting in intuitive controls that require minimal force to operate—if they're not easy to use, people won't use them.

Desirable control features include:

- Low hand and finger forces to operate
- Majority of adjustments achievable while seated
- Control motion intuitive and indicated by feel
- Control location consistent

The importance of control design and consistency increases as chairs are shared between people. This is a common requirement in multi-shift situations, such as customer support operations or call centers.

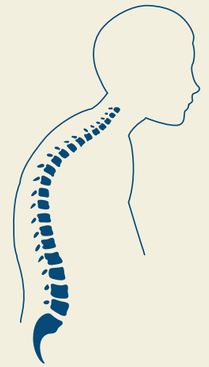
Adjustability Features

Back Support

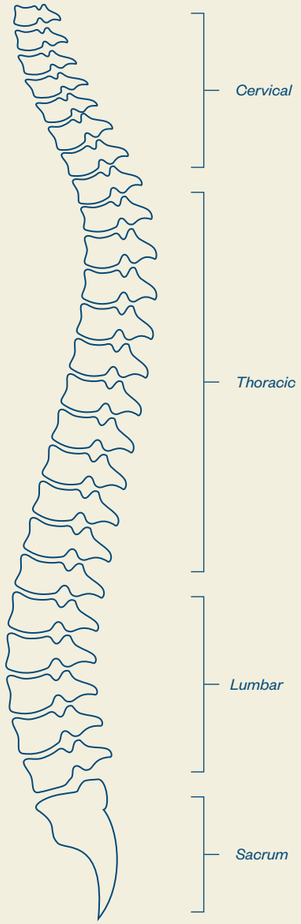
Made up of 24 vertebrae, the human spine forms an S-shape when viewed from the side. The spine's four curves—cervical (neck), thoracic (upper back/rib cage), lumbar (lower back), and sacrum (pelvis)—are designed for shock absorption, balance, and movement. It's been said that the shape of the spinal column is as unique as a fingerprint, including variations in curvature and length. True height can vary throughout the day by up to two percent.[9]

On top of that, the level of back support required when a person is seated varies. The thoracic spine is different from the lumbar spine, so it's important to consider these needs in seating design—especially in the backrest to accommodate postural differences among people.

Good Posture



Poor Posture



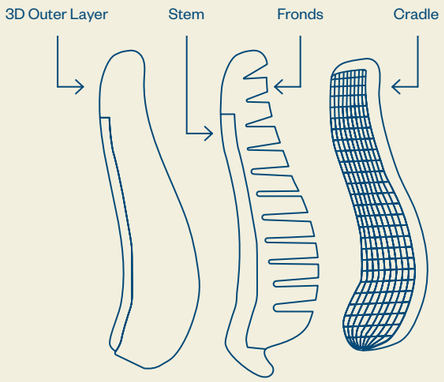
9 Martin and Richards, 2017.

Total Back Support

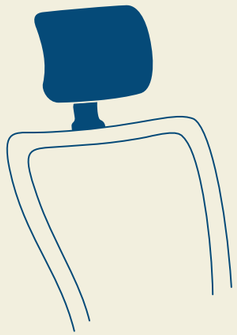
Total back support enhances the sitting experience for people by giving them the ability to move with natural freedom, comfort, and support—from the neck and thoracic spine all the way down to the pelvis.

Wave Suspension™

Wave Suspension is a new paradigm derived from research advising the need for total back support. Available only on Haworth's Fern® task seating, Wave Suspension allows the spine to serve as the pivot point of movement, providing highly customized support for each region of the back, independently undulating with the body's movements without the need for adjustment by the user. Much like the human body's spinal anatomy, Wave Suspension includes a centralized Stem™ that supports a series of Fronds™. Overlaying the Fronds and Stem, the Cradle™ works in concert with them for effortless support, cradling and suspending the user's body.



Wave Suspension



Headrest

Cervical/Thoracic

The cervical vertebrae in the neck allow the most motion in the spine.

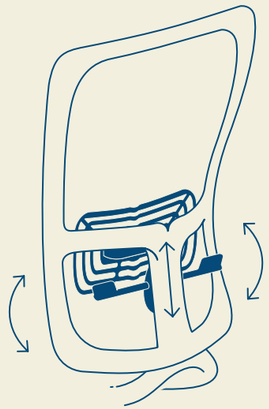
The thoracic vertebrae are designed for minimal movement and help stabilize the upper back and rib cage while protecting internal organs.

Headrests

Some people prefer the optional headrests on task seating to enhance total body support. The headrest fits the curvature of the neck while still supporting the head, flexing in response to the body's natural movements.

Lumbar

The lumbar vertebrae provide some motion but are designed to support the weight of the upper body. Since every back is different, it's important to provide lumbar support with different levels of performance.



Asymmetric Adjustable Support

Asymmetric Lumbar Support

Independent university research has indicated that over 74 percent of individuals tend to prefer more support on one side of their lower back than the other.[10]

Performance of Lumbar Support

Minimum **Fixed Support —** Based on seating standards, a curvature is designed into the lower seat back to support the lumbar spine. Unfortunately, one size does not fit all.

Good **Height-Adjustable Lumbar Support —** The lower back seat curvature is adjustable in at least one direction.

Better **Dual-Axis Adjustable Support —** The lower back seat curvature is adjustable in two directions. This would include height adjustment as well as support of the lumbar curve.

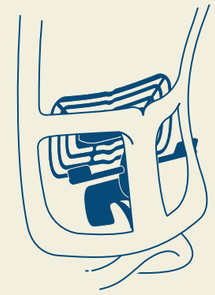
Best **Asymmetric Adjustable Support —** This offers the highest available performance. Comfort is greatly enhanced by allowing users to adjust the height as well as independently adjust support on either side of the spine.

Pelvic

The sacrum is attached to the pelvis, allowing for little to no motion, which helps strengthen and stabilize the pelvis. However, there is a tendency for the pelvis to rotate backwards into an unhealthy posture when a person is sitting. Pelvic support helps stop the progression of this backward rotation, keeping the spine in alignment.

Pelvic and Asymmetrical Lumbar (PAL) Back System

A Pelvic and Asymmetrical Lumbar (PAL) back system allows people to set their own comfort throughout the day. The pelvic support helps to maintain the spine's natural curvature while the lumbar pad is designed to fit the curve of the lower back for added spinal support.

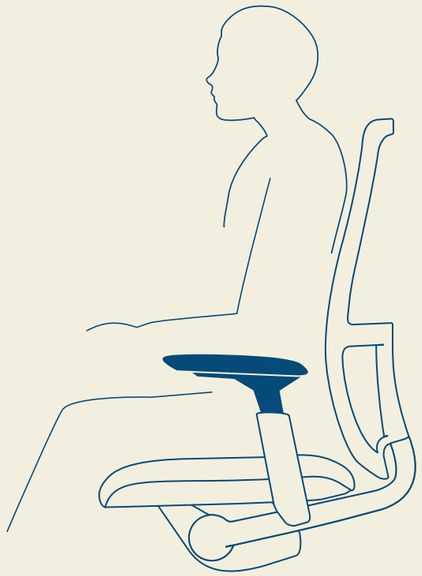


Pelvic and Asymmetrical Lumbar (PAL) Back System

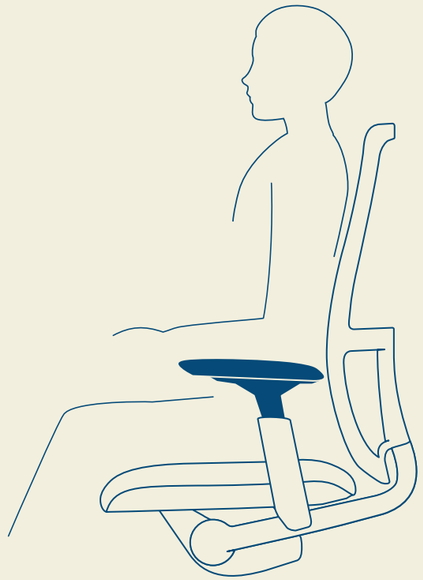
10 Fredericks and Butt, 2005.

Armrests

The arms represent approximately 10.2 percent of our total body weight, which can result in considerable exertion in the muscles of the upper back, shoulders, and neck.[11] Static exertions (exertion maintained for extended durations in a fixed posture) dramatically increase the risk of muscle fatigue and are often considered the first threshold to injury. Most people experience fatigue as soreness or discomfort in their muscles.



Incorrect

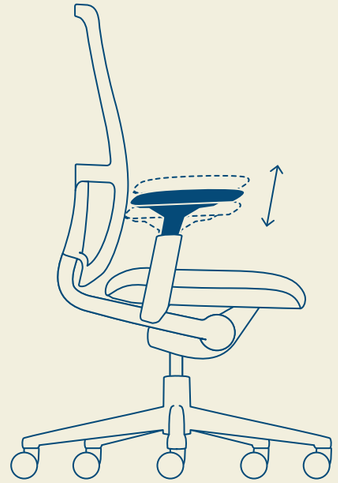


Correct

Supporting arm weight reduces the stress on the spine. However, in order to work, armrests must fit. It is also preferable that they are adequately padded.

Armrests that do not adjust can produce contact stress in the vulnerable areas of the elbow and forearm, increasing the risks of injuries to these areas. To meet the size range of users, armrests need a considerable range of adjustment so users can adjust arms differently.

11 Winter, 2009.



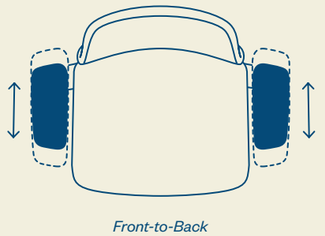
Height

Height

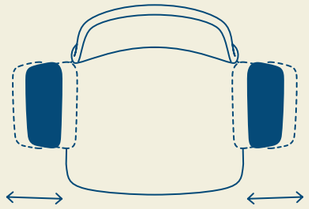
There is considerable variation in the resting seated elbow height. North American standards specify approximately 4" of vertical armrest adjustment.

Front-to-Back Adjustability

To fit the variations in body size, task requirements, and workstation layout, front-to-back armrest adjustability is essential. This can be accomplished through front-to-back movement.



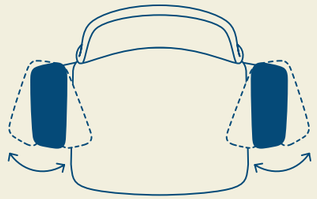
Front-to-Back



Width

Width and Pivot

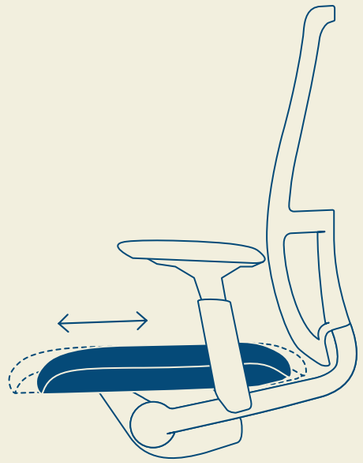
To accommodate variations in girth, width and pivot adjustments ensure a proper fit.



Pivot

Seat Depth

Good ergonomic seating incorporates several inches of adjustable seat pan depth to support a wide variety of body types. Typically, a taller person will require more seat pan length to reduce contact pressure under the thighs; a shorter person will require less seat pan length to avoid pressure behind the knees or prevent sitting on the edge without the proper back support. A mismatch in the dimensions of a chair impairs the ability of the postural muscles to support the body and can lead to strain on the neuromuscular system. Chairs with adjustable seat pans will help to mitigate and prevent this.[12] A minimum of 2"of adjustability is recommended, and 3" is preferred.

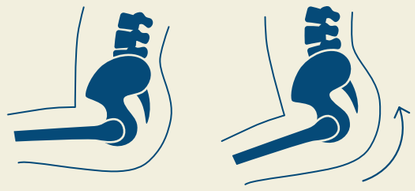


Seat Depth

Forward Tilt

Forward Tilt

Some people tend to sit on the front edge of the chair. Typically, this is associated with certain task requirements and/or an individual's adopted sitting habit. This posture may increase ergonomic risks due to reduced support from the seat back and seat pan. However, postural ergonomics can be enhanced through proper seat pan adjustment. A forward tilt of the seat pan can support this sitting style by maintaining healthy spinal alignment and relieving lower back pressure.



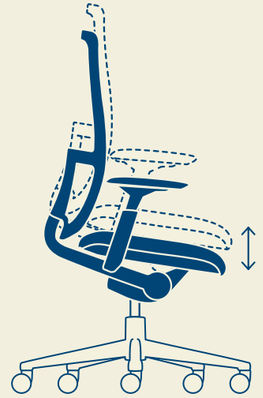
Forawrd tilt rotates the pelvis forward

12 van Niekerk, Louw, and Hillier, 2012.

Dual Posture

Designed for use with a height-adjustable table or a taller fixed-height table, this feature combines an advanced forward tilt and an additional 3.5" elevated seat height adjustment to provide support for the in-between "perch" posture of sit-to-stand. Chairs equipped with dual posture allow for a greater degree of forward tilt to keep the spine aligned when the seat is raised to complement an increased worksurface height.

Step 1: Advanced Forward Tilt



Step 2: Elevated Seat Height

Dual Posture

Seat Recline

Movement is healthy. Reclining in a chair with proper support can stimulate blood flow and relieve pressure on the spine. By reclining just 20 degrees (from 90 to 110 degrees), it can reduce stress on the spinal discs by approximately 40 percent.[13]

There are different types of seat recline mechanisms, and some provide advantages over others. The preferred designs incorporate multiple pivot points, integrate movement of the seat pan and seat back, and provide adjustable recline effort as well as stoppable/lockable settings.

Tension control is also important, as it allows users of different body types to adjust the ease of recline for individual comfort, and a variety of workstyles.

Back Adjustment Options

- **No lock**
- **Back stop –** Multi-position; allows adjustment of the recline to the preferred angle
- **Upright back lock –** Helps maintain an upright position for people who prefer not to recline

Seat Recline Mechanism Types and Performance

Single-Point Pivot – There are two different types of single-point pivot mechanisms. In one type, the seat and the back recline together, which tilts the front edge of the seat upward to the same degree. This can cause the feet to lift off the floor and create unwanted pressure under the thighs. In another type, only the back reclines, and the seat stays in place. However, this will naturally pull the seat back away from the body, decreasing lumbar support. For these reasons, the single-point mechanism can make it difficult to offer universal support and comfort for all sizes and shapes of people.

Weight-Activated Mechanism – This mechanism uses the weight of the person to recline and doesn't always have an adjustment, meaning it may not support a wide range of sizes and shapes. As with the single-point pivot, the weight-activated mechanism causes the feet to rise from the floor when the front edge of the seat rises, creating unwanted pressure under the thighs. The weight-activated mechanism, however, tends to be more intuitive for the user, as less adjustment is required.

Weight-Sensing Mechanism – This mechanism automatically senses the person's weight, automatically adjusting the chair accordingly. This allows individuals of all shapes and sizes to experience the appropriate recline support for their body type without requiring manual adjustment. However, some weight-sensing mechanisms have an additional adjustment feature that allows users the ability to fine-tune the recline support to their individual preferences.

Synchronous Tilt – With this mechanism, the motion of the seat back is linked with partial motion of the seat pan to maintain proper lower body and lumbar support throughout the recline motion. For every two degrees of back recline, the rear edge of the seat pan lowers one degree. For example, if the back reclines 15 degrees, the rear of the seat lowers 7.5 degrees. This minimizes the front-edge seat rise and helps maintain a more open angle between the back and legs, for greater comfort and easier breathing. Minimizing the front edge seat rise allows the user to keep their feet flat on the floor, for a relaxed sit with less pressure on the underside of the thighs.

3-Point Pivot – This mechanism (shown right) has all the benefits of synchronous tilt but refines the location of the mechanism's pivot points so they are aligned with the pivot points of the body—at the hip, knee, and ankle. Once the tension is adjusted correctly for an individual, little effort is needed to recline, allowing the user to stop the recline at any point while keeping the feet flat on the floor. This provides a balanced recline experience for people of all sizes and shapes. Additionally, as the user reclines, their back will not lose contact with the chair's backrest, which is important in helping maintain the natural lumbar curvature. This is achieved, as the mechanism lowers the rear of the seat pan by one degree for every 2.5–3.0 degrees of recline. For example, if the user reclines 15 degrees, the seat pan only drops 5–6 degrees. This feature, combined with the location of the pivot points, also reduces or eliminates the occurrence of "shirt-pull," so that the user's shirt is not pulled up in the back when they recline.

13 van Niekerk, Louw, and Hillier, 2012.

Critical Chair Features

Here is a summary of the recommended features considered critical to achieve acceptable levels of ergonomic performance across a broad range of users.

Minimum Recommendation

- Appropriate lumbar (lower back) support with height adjustment
- Vertically adjustable armrests with adequate padding
- Synchronous recline with tension adjustment and back lock/stop settings
- 2" seat depth adjustment
- 5" seat height adjustment

Desirable Features

- Adjustable lumbar support (height and lateral support)
- Fully-adjustable armrests (height, pivot, width, and front-to-back)
- 3" seat depth adjustment
- Forward Tilt
- Dual Posture

Special Accommodation

Most chairs will support approximately 95 percent of the population. Smaller or larger individuals not in this group may need special accommodation for the right ergonomic fit. Additionally, there may be certain environments that don't need task chairs. Variations on existing chair models may include:

- Low-height bases
- Standard support of up to 325–400 lbs. (Soji®XL supports up to 500 lbs.)
- Task stools for various applications
- De-featured chairs for conferencing

User Support and Education

The principles of ergonomic chair adjustments are very simple. However, to get them just right, some basic educational support is recommended. This may be in the form of a hang tag on the chair or, preferably, electronic documentation available online. Digital support tools enable easy distribution throughout the organization.

How They Compare

A chair is a personal choice, and our portfolio offers a variety of options. All Haworth high-performing ergonomic task chairs are supported by our 12-year, 24/7/365 warranty, and they share a focus on environmental responsibility.

Fern®

Zody® LX

Zody II

Very®

Soji®

	Fern®	Zody® LX	Zody II	Very®	Soji®
Product Line Options					
Task Chair	●	●	●	●	●
Task Stool	●	●	●	●	●
Headrest	●		●	●	
Side/Guest Seating Available			●	●	
XL Task Chair					●
Back Styles					
Mesh Back	●		●	●	
Digital Knit Back	●		●	●	●
Back Jacket			●	●	
Uphostered	●	●			●
Back Support					
Thoracic	●				
Asymmetrical Lumber Adjustment with Height Adjustability			●	●	
Height-Adjustable Lumbar	●	●	●	●	●
Pelvic	●		●		
Arms					
4-D	●	●	●	●	●
Height-Adjustable	●	●	●	●	●
Fixed	●	●	●	●	●
No Arms	●	●	●	●	●
Seat					
Seat Depth	●	●	●	●	●
Low-Position Seat Height Adjustment	●	●	●	●	●
Meets BIFMA G1 Standard	●	●	●	●	●
Extended/High-Seat Height Range	●	●	●	●	●
Mechanism					
Back Stop/Lock	●	●	●	●	●
Forward Tilt	●	●	●	●	●
Dual Posture		●	●		
Materials and Finishes					
Plastic Base	●	●	●	●	●
Aluminum Base	●	●	●	●	●
Upholstery, Leather (Seat)	●	●	●	●	●
Upholstery, Faux Leather (Seat and Back)	●	●	●	●	●
Certifications		●	●		
BIFMA Level® 3 Certified	●			●	●
GREENGUARD® Gold Certified	●	●	●	●	●
Cradle to Cradle Certified® Version 4.0		●	●		

All task seating is manufactured in the USA, ships completely assembled within a standard three-week lead time, and can be recycled through our Takeback Program. Chairs support the 5th–95th percentile, up to 325–400 lbs. Soji XL (not shown) supports up to 500 lbs. Visit haworth.com for details.

Cradle to Cradle Certified® is a registered trademark of the Cradle to Cradle Products Innovation Institute.

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