

## Designing With Forearm Support In Mind

**A soft-edged worksurface reduces the risk of injury and can help people feel better while they work.**



Healthy workplaces promote physical and mental wellbeing, thereby reducing costs and improving productivity.

Recent research confirmed that soft edges on worksurfaces ease pressure on the forearms by distributing the load over a larger, more compliant surface. That's good for arteries, tendons and nerves – and can positively affect mindsets, too.

**Prolonged computer work can strain the body** in all sorts of ways, potentially resulting in costly musculoskeletal issues that threaten comfort, health and wellbeing, and reduce productivity, too.

Workers' health, safety and wellbeing are vital concerns. Poor physical and mental health cost employers' millions of dollars every year, and musculoskeletal issues are especially high risks for workers who use computers for extended periods of time every day. Carpal tunnel syndrome, for example, has been estimated to afflict at least 2 million workers and cost American businesses alone at least \$20 billion a year. Implementing ergonomic measures can be an important investment in decreasing musculoskeletal injuries and absenteeism rates.

The hazards to hands and wrists posed by extensive computer use are fairly well known, but risks are by no means limited to just those parts of the body. Likewise, keyboards and mice aren't the only culprits for computer-related discomfort and injury.

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## RESEARCH FINDINGS

Research at a University of Washington lab revealed that a soft edge worksurface

- 1. Significantly reduced unhealthy pressure on forearms
  - 2. Significantly reduced feelings of fatigue
  - 3. Required no "learning curve" - workers immediately adapted with no negative impact on their performance of various computer tasks
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Evidence has been mounting that forearm support should not be overlooked, and it needs to extend beyond armrests on office chairs. In addition to protecting the soft, sensitive tissues in the forearm (muscles, tendons and nerves), adequate forearm support offloads the weight on the neck and shoulders, too. That means fewer aches and pains, and potentially less injury.

Armed with these insights, Steelcase designers decided to tackle the problem of forearm support in a new way. The result was Steelcase's soft edge, a low-profile, easily replaceable urethane worksurface edge that provides a more comfortable option for workers who sit at desks for most of the day.

To quantify the ergonomic impact of worksurface edges, Steelcase commissioned a study at the University of Washington in 2012. Researchers there confirmed that resting forearms on a hard-edged surface creates pressure "hot spots", presenting potential risks for harm. In contrast, with a soft-edged worksurface, contact stresses are distributed over a larger area, reducing concentrated pressure. Testing, using a pad with sensors mounted over the desk surface, showed significantly less contact stress with a soft-edge worksurface, and test participants reported feeling less fatigue in their wrists. Also significant was the finding that workers adapted easily and quickly, without any negative impact on how well they performed on a variety of computer tasks.

Because a soft edge flexes and conforms to the forearm, it may improve circulation and reduce aggravation to the sensitive, soft tissues in the forearm. Ultimately, this can reduce risks for work-related injuries such as tendonitis and carpal tunnel syndrome.

Especially in today's work environments, employer's are showing concern for worker wellbeing, signaling that they realize the value of work environments that provide supportive, user-friendly experiences. Employees also see comfort as a perk.

Based on insights from research, worker observations and design thinking, the Steelcase Soft Edge Universal Worksurface for Answer, Montage and Kick is a new way to add advanced comfort, appeal and high-performance functionality to any office environment.

## DESIGNED WITH FOREARMS IN MIND

Compared to hands and wrists (which have 27 bones), forearms are relatively simple. Each has only two bones, the radius and ulna. Forearms become more complex, however, when all the muscles, tendons and nerves are considered. The many muscles that make up the forearm transform into long tendons at the wrist, connect to the bones in the hands and fingers and provide movement. In addition to the tendons, nerves and arteries are also near the skin's surface at the wrist. This makes forearms especially susceptible to the dangers of prolonged contact pressure, also known as static loading.

Adjustable armrests on chairs can provide a level of forearm support, but many workers opt instead to rest their forearms directly on the worksurface while they're using a keyboard and mouse.

To reduce risks to forearms, ergonomic guidelines for office furniture require worksurfaces to have rounded edges with a minimum radius of 2-3 millimeters. Even with this rounding, the end result is a hard edge. The Steelcase soft edge provides a unique, new option: a soft, conforming urethane edge that creates an advanced ergonomic interface at the center section of the worksurface, while also maintaining a contemporary, clean-lined aesthetic.

"Our goal was to create an edge that was decidedly soft in its performance, but deliberately crisp in its visuals and geometry," explains Brett Kincaid, who led the Steelcase design team that created the soft edge worksurface.

Another important criterion: soft edge was designed to be easily replaced at the worksite, ensuring sustainable support at the worksurface for its entire life cycle.

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## PROVING THE VALUE

To quantify the advantages of the soft edge, Steelcase put it to the test of rigorous scientific evaluation. Because of their prominent credentials in upper body ergonomics, scientists in the Department of Environmental and Occupational Health Sciences at the University of Washington were selected to do the research.

Testing took place at the university's ergonomics lab. A group of randomly selected participants was asked to perform a series of standardized computer tasks, including typing and using a mouse. Each participant performed the same tasks for 30 minutes at two different workstations: one had a worksurface with the Steelcase soft edge and the other was a typical hard-edged worksurface. Both worksurfaces were covered so participants couldn't tell them apart, and they also weren't told there was a difference between the two. Each worksurface and chair was properly adjusted to each person before they performed the tasks.

The testing included both quantitative and qualitative measures. A pad with sensors placed on top of each worksurface measured contact pressure, and other lab instruments precisely measured forearm and shoulder muscle activity, heart rate, tissue oxygenation and wrist postures. In addition, the researchers measured task performance (speed and accuracy), perceived fatigue and user preference.

The research results showed significantly lower contact stress and reduced feelings of wrist fatigue with the soft edge compared to the hard-edged worksurface, confirming its potential for sustaining comfort over time, which may ultimately reduce longer-term musculoskeletal symptoms.

“We have nerves, arteries and tendons near the surface of our forearms. Reducing contact stress is considered beneficial because too much contact stress can affect circulation and may ultimately affect health,” says Peter Johnson, an associate professor in the Environmental and Occupational Health Sciences department at the University of Washington.

Another positive: The testing results also showed no decline in performance with the soft edge worksurface. This was an important outcome since participants had no prior experience and were not familiar with the new worksurface. There were also no appreciable differences in muscle activity and preference measures, suggesting that it’s easy to adapt to the soft edge.

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**PETER JOHNSON** | Environmental and Occupational Health Sciences, University of Washington

## **CHOOSING A HOLISTIC SOLUTION**

Beyond its ergonomic advantages, the Steelcase soft edge worksurface was designed to be smart in other ways, too. As space-per-worker is trending smaller, workers appreciate added-in support and amenities. What’s more, because of its unique design, the Steelcase soft edge preserves worksurface space for devices and tools. Its trim profile also minimizes the chances for distracting spills and desktop roll-offs.

Sustainability is another important feature. The Steelcase soft edge is a PVC-free urethane and the material is Cradle to Cradle Certified®. Moreover, because it isn’t molded into the worksurface, the soft edge can be easily replaced at the worksite, extending the life cycle of the worksurface significantly.

As with any product designed to address ergonomic issues, it’s important to consider the worksurface edge in the larger context of the total work environment, emphasizes Dave Trippany, who heads Steelcase ergonomics and wellbeing research.

“We need to look at everything that goes in a work environment,” he says. “The worksurface is one component, but there are a lot of other components that come into play – the chair, the external keyboard, the mouse, the display. How does each item bring ergonomic affordance? How is it meant to improve my experience as an investment in my health and comfort? How can it help me achieve better performance in my job? How does it add value?”

The workplace can be a competitive advantage when it’s holistically designed to provide comfort as a key aspect in people’s overall health and productivity. Research confirms that a soft worksurface edge can be a small-scale but important investment in maximizing support and minimizing risk.

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**DAVE TRIPPANY** | who heads Steelcase ergonomics and wellbeing research

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## **WORKSURFACE COMPARISON STUDY, FAST FACTS**

- Conducted by researchers in the Department of Environmental and Occupational Health Sciences at the University of Washington
  - Two worksurfaces were evaluated: a Steelcase soft edge worksurface and a worksurface with a hard edge
  - The worksurfaces were covered so participants couldn’t see the differences
  - Adult test participants were randomly selected, including men and women of various body types and ages
  - Chairs and worksurface height were adjusted for each participant
  - Data was collected while participants performed standardized computer keyboarding and mousing tasks for 30 minutes
  - Measurements included contact pressure, muscle activity, wrist posture, performance, perceived fatigue and preference
  - Test participants had significantly lower contact stress and feelings of wrist fatigue using the soft edge worksurface with no negative impact on their performance of tasks
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## **RESEARCHERS**

Peter Johnson, Associate Professor of Environmental and Occupational Health Sciences, University of Washington  
Jeong Ho “Jay” Kim, Research Scientist, Environmental and Occupational Health Sciences, University of Washington

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