



# Allsteel®

P 02	INSPIRATION
P 03	DESIGN
P 04	ERGONOMIC INNOVATIONS
P 06	PROBLEMS SOLVED
P 08	ANATOMY OF #19
P 12	SCIENTIFIC VERIFICATION
P 13	THE BODY IN MOTION
P 14	SUSTAINABILITY
P 16	LIFE CYCLE RESPONSIBILITY

#19™  
Technology

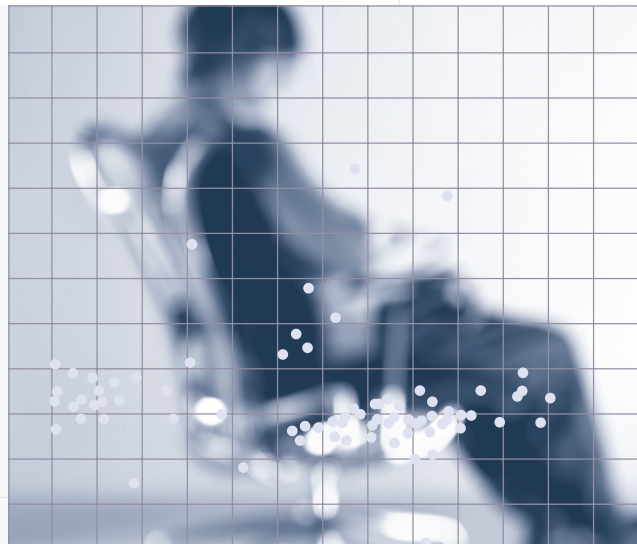
### Why another chair?

We set out to create a chair whose form and function would solve the challenges of its predecessors and dramatically improve the user's experience. This meant addressing some critical areas, including weight activation, passive recline ergonomics, construction and materials, unobtrusive lumbar support, thermal regulation, and user adjustability with minimal controls. The goal was a chair that worked integrally with the human body and supported the human body in new and innovative ways; the user, in that sense, was the most critical "part" of the system. Our effort to improve led to innovation and 47 patents and patents-pending. 18 integral parts, plus one equally integral human being resulted in #19.

#19 takes ergonomics to a new level. Its design is based on the most advanced ergonomic and technical information available. Using a combination of passive adjustments, thermal regulation, and innovative materials, #19 delivers unsurpassed comfort and performance, as well as optimal sitting health.

Allsteel makes beautiful work tools. #19 is no exception. It artfully addresses the complexities of seating, and its hyper-ergonomic capabilities are unprecedented. The chair is designed to fit multiple body types equally well; one chair fits all. #19's parts and materials were chosen—and in some cases, created—expressly for the user and the work environment. Nothing is off-the-shelf.

In the end, #19's design advances seating technology and promotes a healthy, productive work environment.



*Our goal was a seating system that worked integrally with the human body.*



*"The modern part of #19's design is its appearance, but it's also the techniques, materials, and systems used to solve the design challenge."*

*—Marcus Koepke*



## Process

#19 had to contribute to the advancement of a better user experience. During the design process, we chose not to visualize the end result. But sometimes that interferes with the creativity of engineering. The process was very flexible. For the first several months, the team concentrated exclusively on the technical side—form followed function. We wanted to define the comfort and functional aspects of working at a desk, and solve the challenges most users encounter in their work environments.

## Goal

Allsteel calls it Purposeful Design™. Function, purpose, and appearance are tied together. Something that is critical to the chair's performance can also be beautiful. The modern part of #19's design is its appearance, but it's also the techniques, materials, and systems used to solve the design challenge.

## Perspective

Frequently, chair designers focus exclusively on the user. With #19, the team focused on how the user works in his or her environment. This thought process helped us design innovative solutions to problems never before considered with other chairs. We made sure we always accounted for the human body at work, and how the environment affects productivity. That was important to us. We designed #19 for the user; no compromises were made.

## A word about our designer

Marcus Koepke is a furniture design consultant who develops products that are intuitive, purposeful, ergonomic, technologically advanced, and aesthetically pleasing. Collaborating with Allsteel, he designed #19 to be a seating system that works with the human body as an integral whole. #19 incorporates the most advanced research and ergonomic technology to date, and delivers superior comfort, performance, and style.

+



### [ PURPOSEFUL DESIGN IN ACTION ]

*A tug handle acts as both structural support and a hand-hold for chair mobility.*

*Ball joints allow the back of the chair to rotate freely as the user moves.*

*Naturally shaped, intuitive controls give a clear indication of their function.*

## Tria and VenTech—thermal regulation

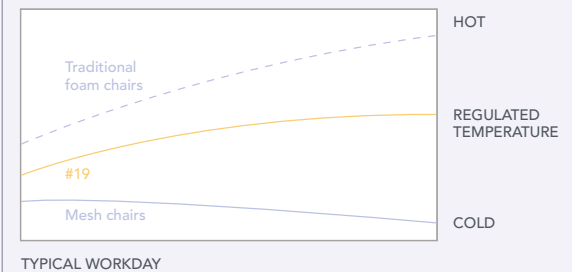
An innovative feature of #19 is its thermal characteristics, both in the seat and the back, which manage both heat accumulation and loss (see figure 1).

#19's seat technology, Tria, is a three-layer construction consisting of a specially constructed cushion form, Technogel center, and a microporous Tria compliant seat upholstery. Besides providing comfort and regulating temperature, the Technogel layer is odor- and plasticizer-free, so it will not harden over time. Technogel is the same material used in wheelchairs, bicycle seats, and running shoes. In a test conducted by the Biomechanischen Institute of Munich, Technogel's performance was measured against silicon, EVA, poron, and other PU gels. Technogel proved to be the only material that offered high shock absorption and high pressure distribution.

The Tria compliant upholstery is a double layer of interlocking loops. It is more breathable than most seating upholstery and promotes air circulation through the cushion for optimal user comfort. #19's upholstery is also designed to be durable and present a consistent appearance over time.

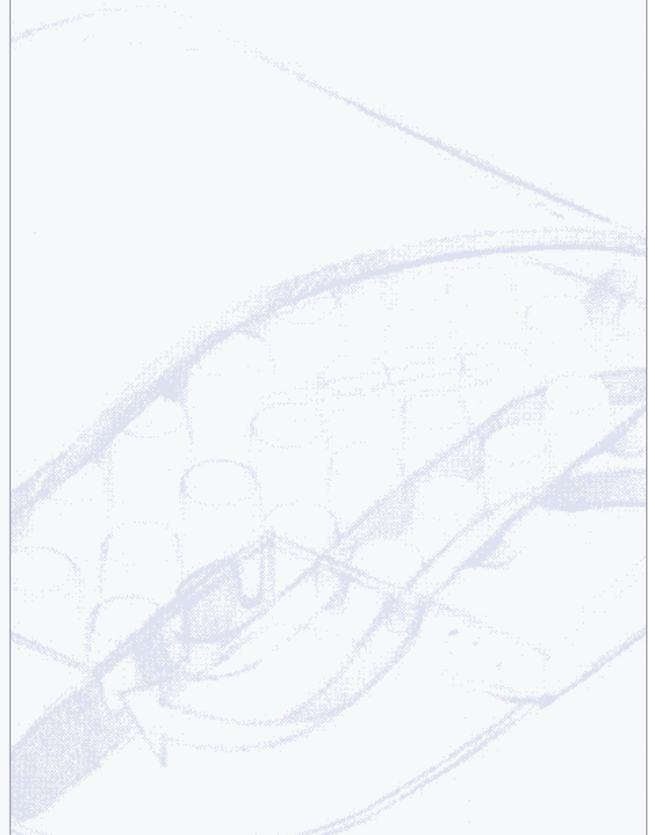
VenTech, the thermal weave used in the chair back, is exclusive to #19. Outdoor gear and athletic shoe materials were considered. In the end, VenTech was designed by Marcus Koepke and the Allsteel team. This multi-dimensional fabric is more dense than mesh, and is composed of a structural backing and a soft front designed to breathe. It has the dimensional quality needed to retain warmth while remaining slightly cooler than core body temperature.

Thermal regulation is one of the newest concepts in ergonomics and exclusive to #19's design. Working together, Tria and VenTech maintain a consistent, comfortable temperature that enhances both comfort and productivity.



[fig 1]

*Temperature accumulation in traditional foam chairs, mesh chairs, and #19 was charted and compared. #19 was the most effective in regulating and maintaining an ideal temperature.*





### Temperature regulation

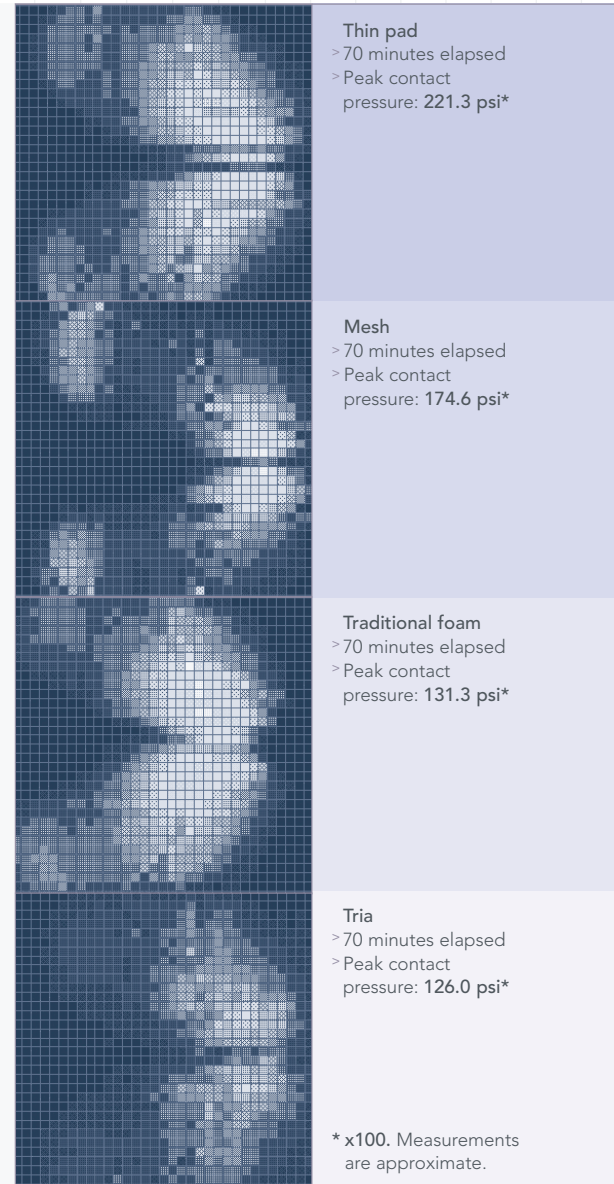
The number one complaint in offices today is temperature regulation. #19's seat and back are designed to maintain a temperature ideal for work. This keeps the user from engaging in self-regulatory processes (sweating, shivering, posture adjustments, etc.) which are direct measures of discomfort and can interfere with work. A thermal-regulating chair enhances productivity by minimizing the adjustments the user has to make to stay comfortable.

To ensure #19 had the right thermal capabilities, temperature changes were monitored at specific contact points, as well as across the user's clothing and skin. Temperature increase was recorded simultaneously at 20 critical locations while the user engaged in different tasking activities. An advanced, 64-channel system was used for real-time monitoring. In addition, the thermal properties of different fabrics were evaluated according to standard test procedures. The result: Tria and VenTech, technologies exclusive to Allsteel that regulate temperature.

### Long-term comfort

#19's seat is designed to maintain comfort at different levels of pressure and recover easily after weight is removed. Pressure calibration happens as soon as the user sits and is maintained over time. This effect was verified using digital modeling tools. #19's seat achieves pressure equilibrium without the need to shift body weight to unhealthy places—for example, the underside of the front of the thigh, which can obstruct circulation.

#19's seat also distributes and levels pressure more evenly over larger areas than most chairs (see figure 3). The layer of Technogel aids in this process. It reduces pressure concentrations typical in many conventional chairs and conforms better to the body. Technogel moves in multiple directions as the user moves, minimizing shear stress on the skin.



[ fig 3: PRESSURE MAPPING ]

*Weight was applied uniformly to different types of seats, and peak contact pressure was measured and compared. #19's Tria calibrated seat system proved to distribute weight and minimize peak pressure more effectively over time.*

The chair seat feels hard the longer I sit.

T TG

Chairs with mesh and traditional padded seats are unable to distribute pressure as effectively and eventually lose resiliency. #19's Tria calibrated seat system is made up of channeled foam, Technogel, and Tria compliant seat upholstery. The Technogel layer (the same shock-absorbing material in bicycle seats and running shoes) distributes pressure for a wide range of body weights, minimizes the pulling effect on your skin, and keeps its resiliency.

I'm often too hot or cold while I work.

V T

#19 is designed with the unprecedented ability to manage temperature. The back material, VenTech, is a multi-dimensional weave that holds warmth while remaining breathable. And the seat technology, Tria, dissipates heat buildup so you never feel too hot or cold as you work. The channeled foam pumps air through the seat; working with the breathable Tria compliant upholstery, it keeps you at a comfortable temperature as long as you're seated.

I don't understand all of these levers and knobs.

DF P

#19 can be fully adjusted using only a few intuitively designed controls. The shape of the pneumatic height adjustment and tilt limiting levers indicate their direction of movement, so adjustment is both simple and spontaneous. The Plexus lumbar support can be positioned while seated. With #19, detailed user instructions are not necessary.

My chair rolls on hardwood but not carpet.

DF

#19's 80mm diameter casters are custom designed to work on any flooring surface, including hardwood, carpet, cement, and tile. Mobility is never compromised by the type of floor you're on. The casters will not scratch or gouge delicate flooring surfaces, like hardwood.

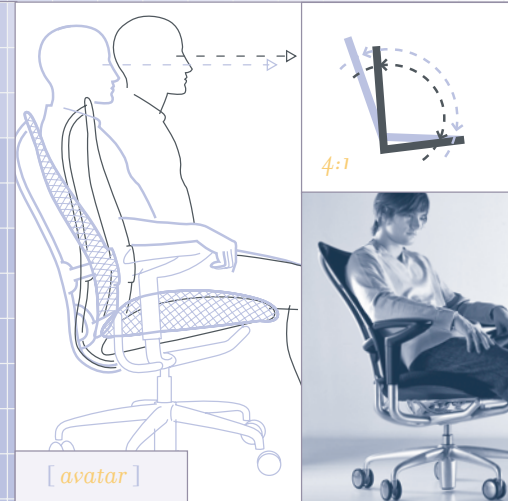


*Form was more than an aesthetic consideration—it was a necessity. Even the casters were custom designed.*



### Avatar—a healthier sit

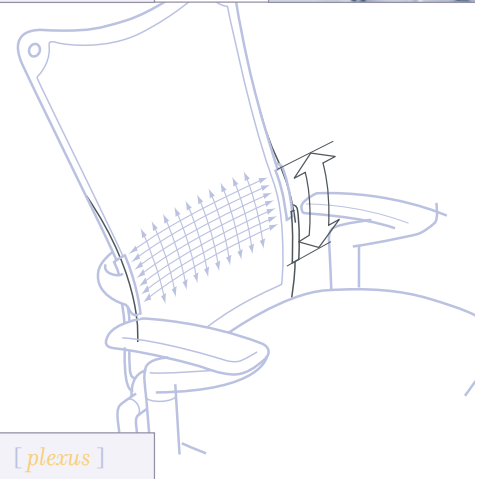
When reclining in #19, the body angle increases, and so does circulation. This delivers blood and oxygen to the extremities, and prevents fatigue and discomfort. In its fully reclined position, #19 leans back 30° from upright. The back of the seat gently rises, creating a back-to-seat ratio of 4:1, more than any other chair. The lift of the seat also provides additional pelvic support and ensures proper alignment of the spine. Avatar creates a better body angle that optimizes circulation with minimal user effort. In addition, Avatar keeps the user's line of sight steady during recline.



[ avatar ]

### Plexus—lower back support

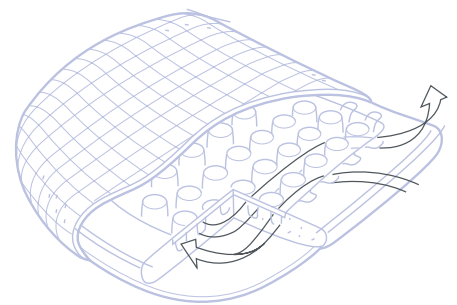
The Plexus lumbar system creates lower back support by increasing fabric tension and firmness over a vertical range of 3.25". A sliding component tenses the contoured fabric and can be easily adjusted while the user is seated. Because lower back support comes from fabric tension and not an added structural element, the breathability and thermal properties of the VenTech weave are uninterrupted.



[ plexus ]

### Tria—calibrated comfort

#19's seat incorporates two layers of foam, Technogel, and Tria compliant seat upholstery. Together, they distribute pressure evenly and take away heat buildup. The layer of Technogel rests on top of a channeled base foam. Technogel's purpose is to distribute pressure evenly over a greater area and reduce peak pressure points. It also moves in multiple directions as the user moves, reducing shear stress on the skin. The channeled foam allows air to circulate through the seat, dissipating heat for optimal temperature. And the Tria compliant upholstery, made of a double layer of interlocking loops, fits to the seat without glue. It conforms perfectly to the cushion and allows it to breathe.



[ tria ]



## PROBLEMS SOLVED

**I have to adjust my chair's tension in order to recline.**

A

#19's passive recline is weight-activated. When pressure is applied to the back, it reclines easily and fluidly, and the back of the seat rises gently while perfectly balancing the user. This simultaneous motion is enabled by Avatar's synchronizing link located under the seat towards the back. Avatar is designed to be smooth and silent, and minimize muscle strain.

**My back is not properly supported when I work.**

A

FBC

V

#19 ensures your spine and pelvis get exceptional, continuous support. This is the result of: (1) the weight-activated Avatar motion, which keeps the chair's back with you as you move; (2) a flexible back carrier, which is pliable to pressure and attached with ball joints for flexibility; and (3) the VenTech weave, which conforms to your shape in every position.

**My chair doesn't allow me to shift or change positions comfortably.**

A

4:1

Moving while you work is healthy. Ideally, your chair should facilitate natural motion. #19's Avatar technology uses your body's weight and motion to find the best ergonomic position. When you recline fully, the back-to-seat ratio is 4:1. This angle enhances circulation to your extremities, so your lower body and legs never feel fatigued.

**As I recline, I must continually refocus.**

A

4:1

DF

#19's perfectly balanced recline motion, Avatar, lifts the pelvis during recline, maintaining your line of sight to the worksurface. The back also moves independently of the armrests, which remain in position to support your arms. No matter which recline position you're in, you can continue to work easily and naturally.

**The lumbar support is uncomfortable and difficult to adjust.**

P

FBC

V

Plexus, #19's lumbar system, does not position a solid object at your back. Instead, a mechanism moves up and down the chair's flexible back carrier, tensing the VenTech fabric where you need it. Your back receives solid, pliant support in just the right place.

A

AVATAR™

4:1

4:1 BACK-TO-SEAT RATIO

DF

DESIGN FEATURE

FBC

FLEXIBLE BACK CARRIER

P

PLEXUS™

TG

TECHNOGEL®

T

TRIA™

V

VENTECH™

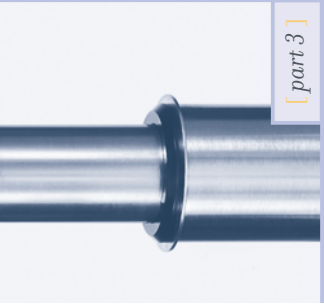




[ part 1 ]



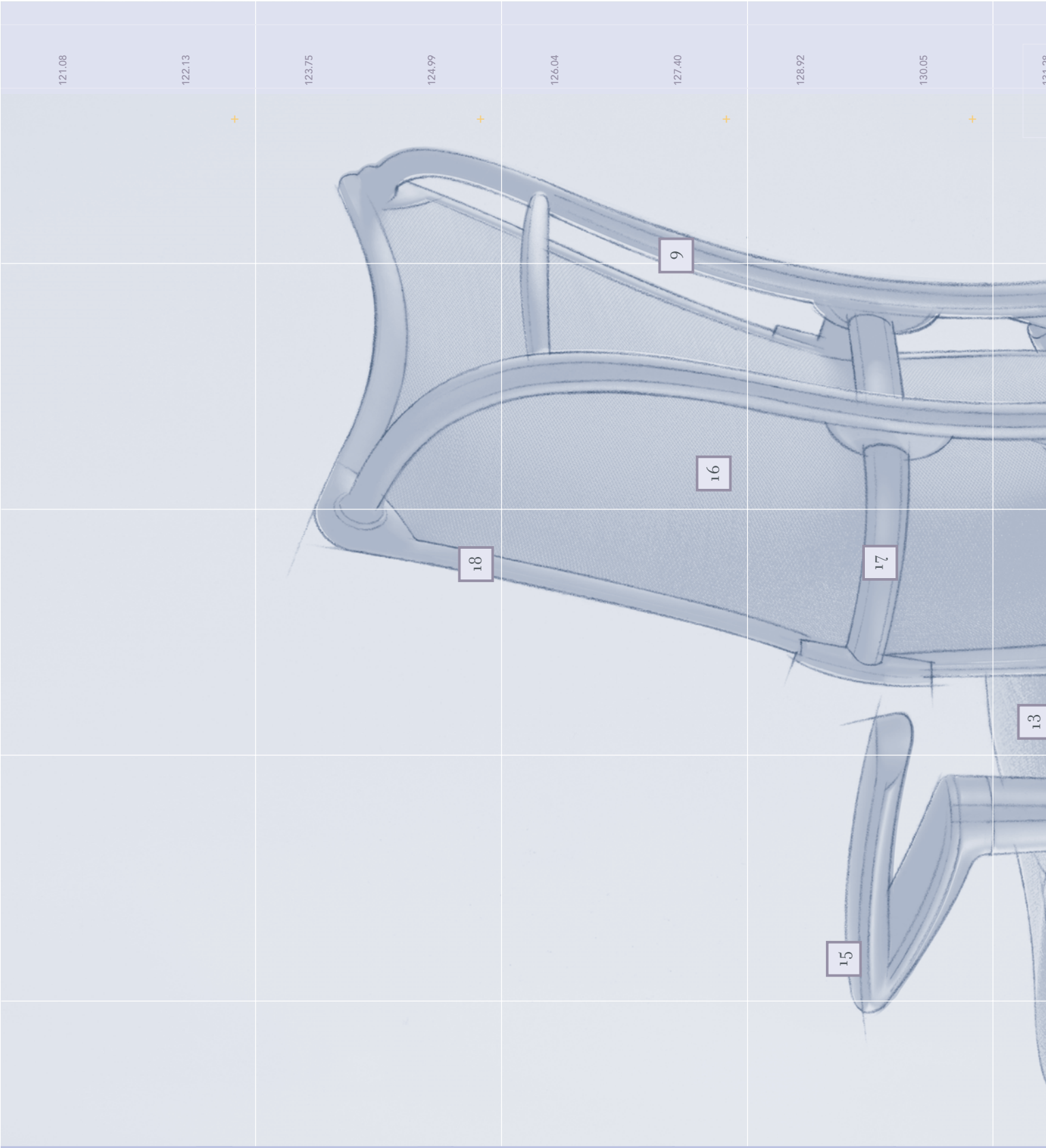
[ part 2 ]

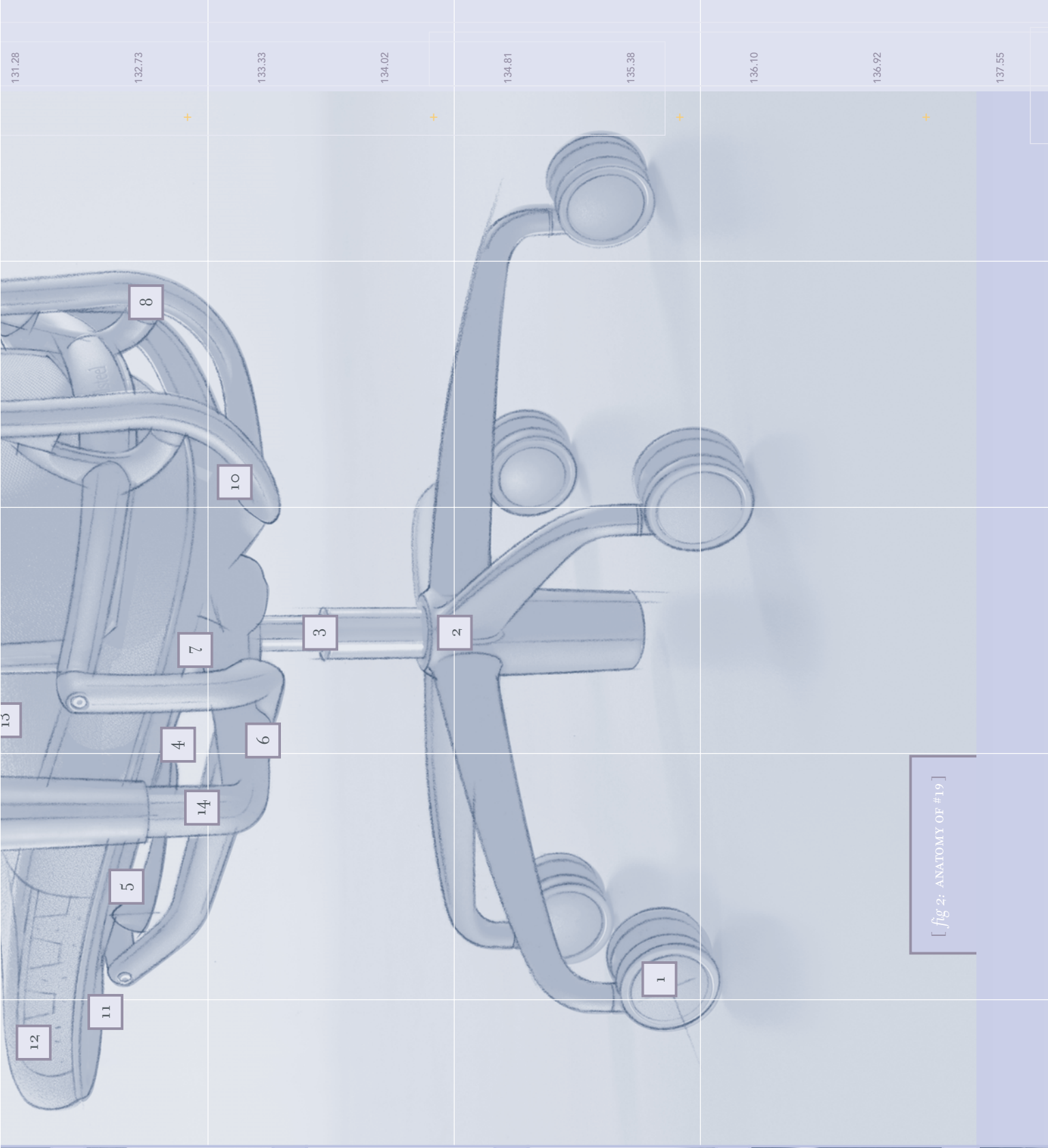


[ part 3 ]



[ part 4 ]





[ fig 2: ANATOMY OF #19 ]

[illegible]





[ part 14 ]



[ part 15 ]



[ part 16 ]



[ part 17 ]



[ part 18 ]

BACK SUPPORTS			support for the flexible back carrier. Ball joints, the connection point for the back material, allow the back of the chair to rotate freely as the user moves.	143.28
10	AVATAR SYNCHRONIZING LINK		Creates the chair's perfectly balanced recline motion. #19 automatically balances itself with the user's body weight to allow easy, smooth reclining, with a maximum tilt angle of 30°.	144.15
11	SEAT CONTOUR PANEL		Provides the platform for the Tria calibrated seat system.	+
12	TRIA CALIBRATED SEAT SYSTEM		Includes two layers of foam, Technogel, and Tria compliant seat upholstery. Together, they distribute pressure evenly and dissipate heat buildup. Technogel rests on top of the channeled base foam to eliminate peak pressure points and minimize shear stress on the skin.	144.99
13	TRIA COMPLIANT SEAT UPHOLSTERY		Conforms perfectly to the seat cushion and enables air circulation in and out of the seat.	
14	ALUMINUM ARM SUPPORTS		Provide support for the adjustable armrests and allow maximum adjustability.	145.43
15	ADJUSTABLE ARMRESTS		Pivot 30° inward and 15° outward, and adjust vertically 4" for different heights, widths, and angles. Accommodate multiple users and body types.	+
16	VENTECH THERMAL WEAVE		Forms the chair's back and is contained within a flexible back carrier. Breathable and thermal-regulating, it ensures a steady temperature slightly lower than body temperature and warmer than the environment, enhancing user productivity.	146.07
17	PLEXUS LUMBAR SYSTEM		Creates lower back support by increasing fabric tension over a 3.25" range for firm, contoured support. Because support is achieved through fabric tension and not a solid component, the breathability of the VenTech material is maintained.	146.86
18	FLEXIBLE BACK CARRIER		Supports the VenTech thermal weave and provides flexible support for the back structure.	147.31
				148.16
				+



Movement is critical to maintaining body health. The level of ease a user experiences when changing positions correlates to how often he or she moves throughout the day. #19's self-balancing, passive recline motion and smooth recline-support-return action encourage movement and promote a continuously healthy sit.

### Spine

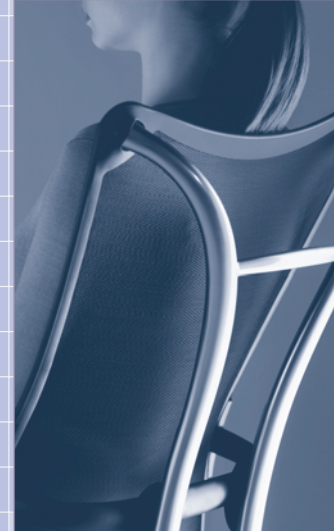
When you go from a standing to a sitting position, the natural curvature of the spine changes and the pelvis tilts. A well-designed ergonomic chair, like #19, maintains that natural curvature and provides constant, conforming support, cradling the spine in its natural position. This means there is less stress on the spine, and you don't pay a price, in terms of comfort and health, while sitting.

### Hip joint

As we shift postures from sitting forward to sitting back, the body pivots naturally at the hip joint. #19 has been designed to do the same thing. It maintains the spine's curvature, and the chair's perfectly balanced recline gives the user fluid, smooth movement from one position to the next, minimizing muscle strain in the back and abdominal muscles. #19 encourages continual motion, which is ideal, since the best posture is a variety of postures throughout the workday.

### Anthropometrics

People vary in shape and size. We wanted #19 to fit the smallest female as well as the largest male. It also had to accommodate the relative proportions of the different parts of their bodies. #19 takes these factors into account by incorporating adjustable-height, pivoting arms, a seat height adjustment from 17"-22" (standard cylinder) or 15"-20" (two-stage cylinder), a seat depth range of 1.5", and a lumbar support range of 3.25".



[fig 4]

*#19 maintains the spine's curvature and gives the user fluid, smooth movement from one position to the next.*



## Background

Prior to the development of #19, our teams had been trained in life-cycle analysis, which looks at the overall impact a material has from the time it's mined to the time it's finished its useful life. They also understood biomimicry, which takes inspiration and guidance from nature's design solutions. By the time #19 came along, we were ready to make environmentally conscious decisions. It wasn't a matter of, "Do this," but rather, "How can we do this?" As a result, we followed a hierarchy of recycling that uses a minimum number of materials in the product. #19's frame and base are made from 100% post-consumer recycled aluminum; 88% of the materials in the chair are recyclable.

## Content

#19 uses a minimum number of different materials, including aluminum, steel, and some polymers. Materials are joined in a way that makes them easy to disassemble for recycling. Being able to recycle nearly all the materials in the chair is a critical end-of-life issue.

## Assembly

How a product is assembled is crucial to recyclability. If it's glued and welded, it is difficult to reconfigure later. Individual components also can't be separated. By using simple mechanical fasteners, components can be disassembled and/or traded. For example, the entire Tria seat system and flexible back carrier are attached to the frame with simple fasteners and can be easily disengaged and re-attached. The benefit of using mechanical fasteners rather than gluing or welding is that it doesn't generate potentially hazardous waste in the workplace. In the end, nearly everything that goes into #19 can be disassembled and returned to the resource stream for reuse in another form.

## [ DURABILITY ]

*#19 was rigorously tested to measure its durability and functionality over time, and under different conditions. The chair withstood maximum loads for more than 100,000 cycles, assuring its performance in the field. The casters were loaded with 300 pounds and run over bump strips for 95 miles to ensure integrity. Testing chair prototypes on different surfaces—carpet, tile, hardwood—guaranteed the casters would be appropriate for all flooring surfaces.*

*#19 is weight-activated. As you go from reclining to sitting upright, the back stays with you. This action was put through hundreds of thousands of test cycles to make sure it performed consistently. #19's recline action is extremely smooth and will remain this way after years of use.*



## Air quality

The chair's emissions are tested by placing it in a large stainless steel box. The contaminants in the air are measured before the chair goes in and after it comes out. We measure for a tremendous number of contaminants and then separate them into different chemical classes, as well as individual compounds. We're able to measure emissions off-gassing in parts per billion; one part per billion is the equivalent of one penny to \$100,000. The testing reveals very, very low-level emissions and ensures #19 meets stringent indoor air quality standards.

## Extendability

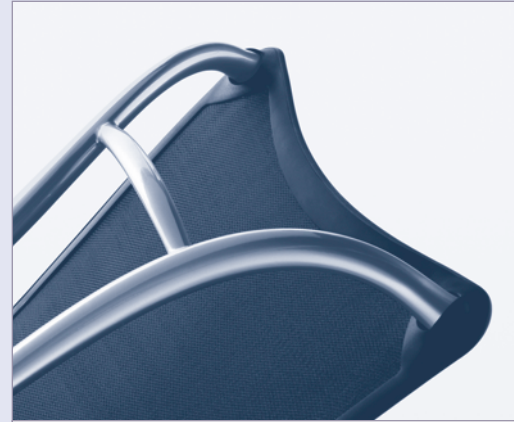
Another one of #19's important features is that it's designed for an extendable life. The frame and base are so strong and dependable, chairs can be rebuilt on them. In that sense, #19 could be the last chair you're ever going to need. It's available in two powder-coat colors. Powder-coating is essentially a non-emitting process that provides a solid, durable product.

As Allsteel develops new components and technologies, the chair can be upgraded. This is extendable life. It's far more efficient to use a product for its original design function than to recycle it when you no longer need it.

## Result

#19 is the culmination of the changes that have been happening at Allsteel over the past few years. It's not just about the chair, it's about the philosophy that went into it. It involves careful materials selection, waste elimination, judicious design options, intended customer use, future customer use, and end-of-life management, all at the same time.

This is the first time Allsteel has designed an entire product from the ground up with an extendable life. And this is just the beginning.



[fig 5]

*Biomimicry takes inspiration from nature and applies it to design challenges. The more a product looks and functions like the natural world, the more likely we are to understand and use it.*

[RIGHT-SIZED]

*The Allsteel team wanted the production of #19 to be as sustainable as the materials used to build the chair. This led to the creation of an inventive, U-shaped platform for the chair's construction. No automated belts are needed; assembly begins with the casters and base, and the chair rolls around the platform during production. Parts are delivered to the assembly site using their own weight. In total, #19's production uses only 110 volts of electricity to operate the work cell. Fewer resources in production mean the environment is taxed less.*

## + Our commitment

As new features are developed, #19 can be easily upgraded, minimizing manufacturing's demand on the environment and extending the life of the chair.

Every part is fully covered by the #19 Lifetime Warranty. That means #19 will fulfill its design function as long as your workplace needs it. And if you so choose, Allsteel will take back your #19 at the end of its useful life.

+ This is Allsteel's commitment to life cycle responsibility.

### Recycled material content

Material	% by weight	Recycled content	End-of-life management*
Aluminum	61%	100% post-consumer	Recycle
Nylon/plastic polymer	20%	21% post-industrial	Recycle where possible, landfill if necessary
Steel	7%	30% post-industrial/post-consumer	Recycle
Misc.	12%	NA	Not easily disassembled components
Corrugated packaging	NA	74% average	Recycle

\*Allsteel complies with the Federal Trade Commission's Part 260 Guide for the Use of Environmental Marketing Claims. Product recyclability depends on local recycling programs.

### Indoor air emissions

#19 meets the requirements of:

State of Washington—office seating

Title VI of the 1990 Clean Air Act

United States Environmental Protection Agency (EPA)—indoor air guidelines

Occupational Safety and Health Administration (OSHA)—formaldehyde

World Health Organization (WHO)—formaldehyde

Leadership in Energy and Environmental Design (LEED-CI)—office seating

### Additionally, #19 meets or exceeds the following:

ANSI/BIFMA

State of California Tech. Bulletin 117 and 133—flammability

Greenguard™—registered

For more information about #19, visit [allsteeloffice.com/number19](http://allsteeloffice.com/number19)

# Allsteel®

Allsteel Inc.  
Muscatine, Iowa 52761-5257  
[allsteeloffice.com](http://allsteeloffice.com)

Form # A7322 (08/02)

Printed in USA

©2002 Allsteel Inc.  
Allsteel is a registered trademark and #19, Avatar, Plexus, Purposeful Design, Tria and VenTech are trademarks. Technogel is a registered trademark of Otto Bock Orthopaedische Industrie GmbH Co. Greenguard is a trademark of Air Quality Sciences.

Product meets or exceeds ANSI/BIFMA performance standards for business and institutional furniture, and is backed by the Allsteel Lifetime Warranty.

