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STEERTEK NXT

STEERTEK NXT Benefits

- **Sutphen has integrated a new front axle and suspension in cooperation with Hendrickson. There are four key talking points to this option**
- **Improved Ride and Handling**

- **Tighter Turning Circle**

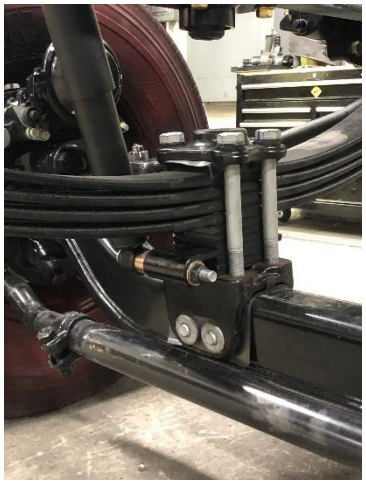
- **Service- Friendly**

- **Similar Performance to Competitors IFS**

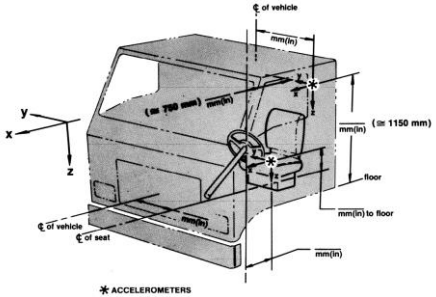
Improved Ride and Handling

Smooth Ride

- Measured by spring rate and amount of wheel travel
- SteerTek provides a 18.75% lower spring rate
- SteerTek provides a 34.7% greater wheel travel
- **Result is a 12.6% smoother ride on rough roads**



These results were proven in side-by-side measurements on real roads. The tests were conducted using accelerometers in the B-Pillar and the Driver Seat per SAE J1490 *Measurement and Presentation of Truck Ride Vibrations*. Sutphen STEERTEK NXT achieved better performance in



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Roll Stiffness

- Roll stiffness is the ability of the vehicle to resist leaning to the outside in a turn
- •STEERTEK NXT increases the width of the spring centers by 6%
- •A wider spring stance better supports the front of the apparatus in a turn
- •Roll stiffness is also improved by threaded spring pins and elastomeric bushings – which assist the springs to return to center during jounce

Sutphen STEERTEK NXT increases **Roll Stiffness** by using threaded spring pin bushings and widening the spring stance. **Control** while **Cornering** is improved by increasing the roll stiffness.

$$K_\phi = 0.5\, K_s\, s^2 \qquad (6\text{-}26)$$

where:

K_ϕ = Roll stiffness of the suspension
K_s = Vertical rate of each of the left and right springs
s = Lateral separation between the springs

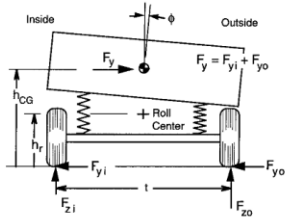


Fig. 6.12 Force analysis of a simple vehicle in cornering.

Responsiveness

- **More Responsive to Road Inputs**
  - SteerTek is a box-beam design rather than an I-beam design
  - The result is greater stiffness at lower weight
  - SteerTek is 170 lbs. lighter, giving it less “spring mass”

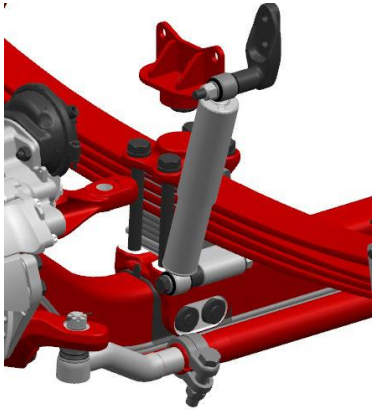
- **Soft Progressive Axle Stops**
  - SteerTek uses a **Progressive Rate** bump stop
  - Progressive rate means the spring **Slows Gradually** at the end of travel
  - Result is **Reduced Ride Harshness**

Axle components are cushioned from impact with the frame, and occupants enjoy a softer, quieter ride even over rough terrain or pot-holes.

Chassis Bounce

Tuned Damping

- The Parabolic Taper Leaf springs have less friction and a lower spring rate than Multi-Leaf style truck springs. This allows the shock absorber to do a better job of providing the damping necessary for a **Smoother, More Controlled Ride**. STEERTEK NXT includes passive hydraulic damped shock absorbers **Tuned Precisely** for the Sutphen chassis.



Spring Design

Parabolic Taper-Leaf Spring

- **Taper-Leaf** gets it's name from the way the spring leaves are thick in the middle and then taper to a thinner material at the ends. This design allows for a softer ride when the spring is lightly loaded, and increased capacity as the spring compresses and the bottom leaf begins to roll around the upper leaves.
- Another advantage is that the taper maintains a gap between the leaves except at the ends. This gap minimizes friction between the leaves. Less friction means a smoother ride 'with less harshness.
- **Parabolic** refers to the shape of the spring.

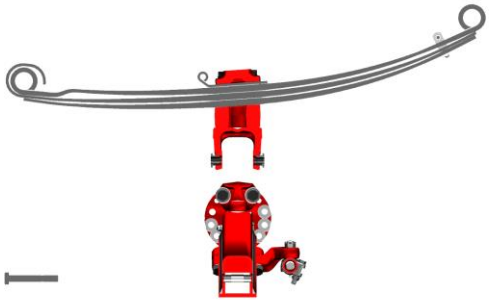
Multi-Leaf vs. Parabolic Spring

Multi-Leaf Semi-Elliptical Spring	Taper-Leaf Parabolic Spring
Basic transportation component.	Better ride quality Low interleaf friction. Allows ride tuning with shocks.
Leaves are constant thickness (flat).	Each leaf tapers from the middle to the ends.
Stress is determined by the number of leaves and leaf length. Stress rises where each supporting leaf ends.	Tapering process optimizes stresses throughout each leaf.
Less processing cost but must be replaced more frequently.	More efficient design. Can handle higher stress applications with longer life.
Interleaf contact increases frictional damping, corrosion, and wear-induced fatigue damage.	Contact between leaves only at seat and tips reduces friction and wear.

Multi-Leaf vs. Parabolic Spring

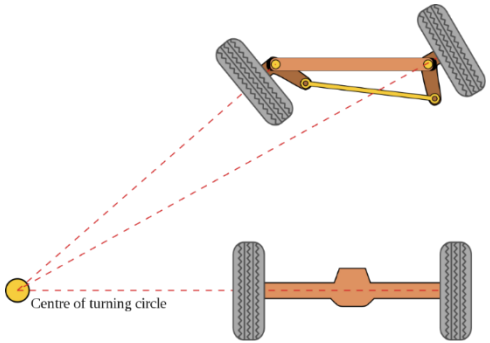
Multi-Leaf Semi-Elliptical Spring	Taper-Leaf Parabolic Spring
Primer wears away between leaves and traps moisture where corrosion accelerates.	High performance primer and taper gaps limits moisture trapping and corrosion damage.
Spring rate increases over time due to corrosion.	Maintains spring rate over time.
Heavy weight due to multiple leaves.	Lighter weight for same load capacity.
Semi-Elliptical Shape.	Parabolic Shape.

Axle Assembly



Tighter Turning Circle

- **Ackerman Tuned Steering**
  - Ackerman geometry is how you optimize the steering to the wheelbase
  - The process is to adjust the wheel movement, so the centers converge
  - Most manufacturers have a one-size fits all approach
  - Sutphen has multiple configurations selected to **Match the Wheelbase**
  - Improved tire wear due to less tire angle error



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Steering Performance

Wheel Cut

- Installation is designed for a 45 degree wheel cut* in both directions with 425 tires

  * Provided there are no interferences from front suctions or other similar features

- **Tighter Turning Circle**
  - Turning ability is improved 8.5%
  - Wheel cut is improved 11%
  - On an Aerial with a 265” wheelbase, the result is an extra 7’ of curb-to-curb clearance in a full turn!

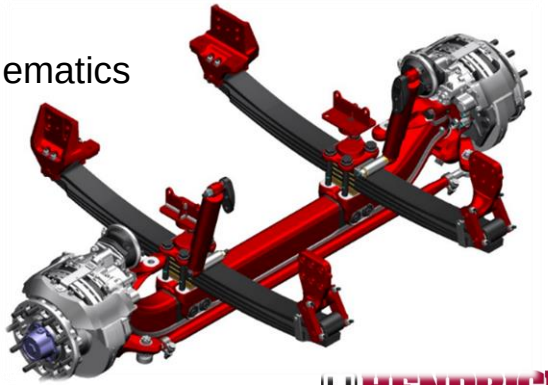
Service

- **Easy Service Access**
  - Steering gears, tie-rod, pitman arm, and steering arm are all accessible by tilting the cab
- **Longer Spring Life**
  - Reduce friction in parabolic taper-leaf equates to less rubbing, wear, and tear
- **Premium Components**
  - One-piece steering knuckle and premium kingpin bushings and seals

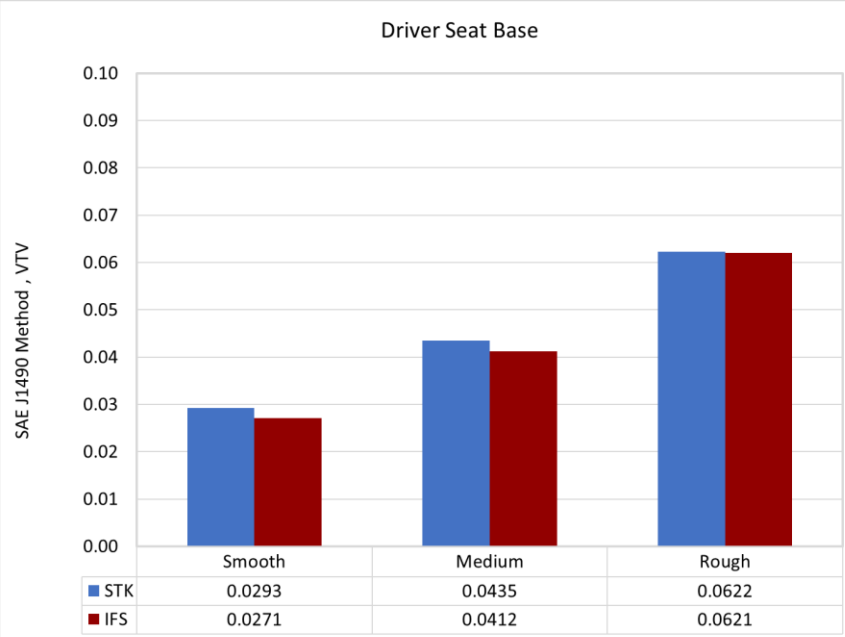
STEERTEK NXT vs. IFS

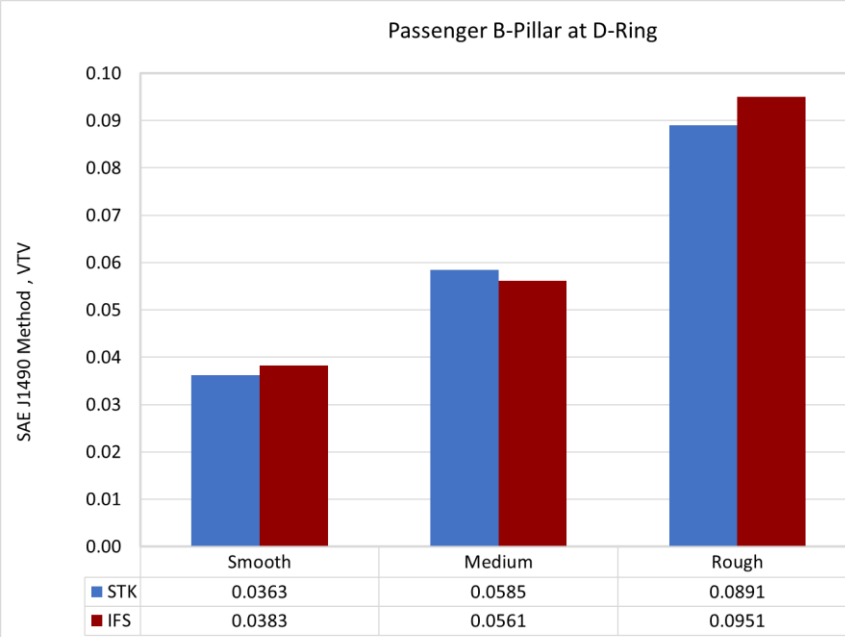
Independent Front Suspensions are obviously in use in the industry. Some manufacturers market them more than others. The STEERTEK NXT axle has some very favorable features:

- Comparable ride quality
- Service friendly
- Accessible steering gears, tie-rods, steering arms, hoses and fittings
- No ball joints that require inspection
- No expensive torsion bar springs that must be well protected
- Better Tire Wear
- Consistently higher roll(factor of 2 to 3) and lateral accelerations for the IFS truck – especially over rough road.
  - Dampers are at an angle – introducing lateral force
  - Possible effect from lower and upper control arm kinematics



SAE Ride Numbers





Summary

- **Improved Ride and Handling**
  - STEERTEK NXT offers a great ride that is smooth, stable, and with no harsh impacts over the roughest terrain.
- **Tighter Turning Circle**
  - Up to 45 degrees of wheel cut in both directions with 425 tires.
- **Service – Friendly**
  - Easy service access, longer life, and fewer parts to adjust and tighten.
- **Better Value than Competitor's IFS**
  - Great ride in an easy-to-service design that is much better suited to life in the fire service.

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