

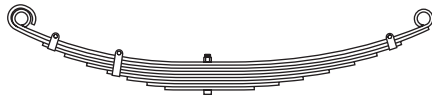
# Full Taper Springs



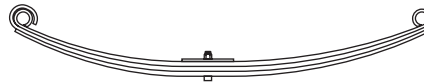
## PRODUCT EMPHASIS PROGRAM

### What does a full taper spring do?

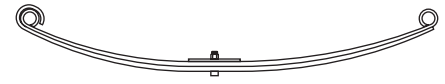
Three types of leaf springs are in use on trucks and trailers; multileaf, full taper and high stress full taper.



Multileaf springs typically use 5 to 12 or more constant thickness leaves which get progressively shorter down through the spring pack.



Full taper springs typically use 1 to 4 leaves of varying thickness all of which are approximately the same length.



High Stress full taper springs typically use 2 leaves of varying thickness both of which are approximately the same length.

With any of the types, the basic purpose of the leaf spring is the same:

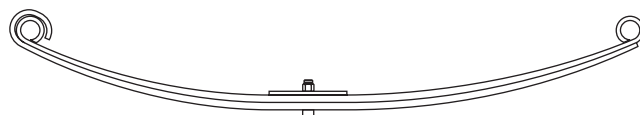
- To act as a cushion between the axle and chassis to protect the vehicle and cargo.
- And, for springs with eyes, to locate the axle to the chassis and absorb the forces due to acceleration or braking.

Full taper springs offer several distinct advantages over multileaf springs which account for their rapid growth in popularity.

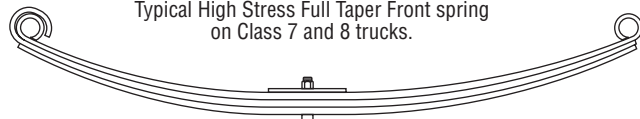
- Improved ride due to decreased spring stiffness which improves the spring's ability to cushion the vehicle and cargo.
- Reduction of spring weight by up to 50%.
- High stress full taper springs offer all the same advantages of full taper springs but utilize 6150H high stress steel allowing an additional 10% weight reduction in the spring assembly.

### Types of Full Taper Springs

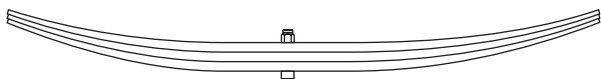
The full taper spring is currently used on heavy duty trucks and trailers in seven major areas.



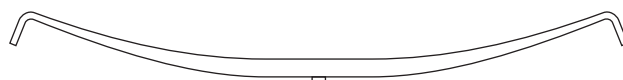
Typical High Stress Full Taper Front spring on Class 7 and 8 trucks.



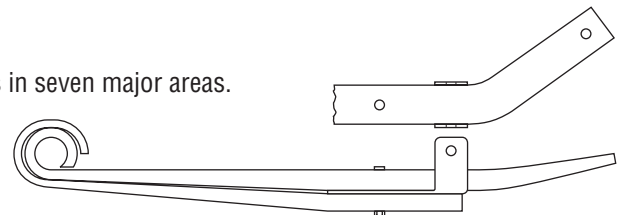
Typical Full Taper Front spring on Class 7 and 8 trucks.



Tandem 4 spring suspensions typically used on Kenworth, Peterbilt, Volvo White and Reyco.



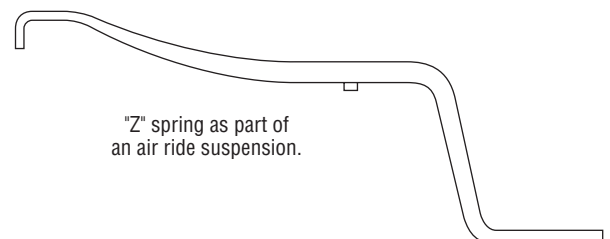
Typical Single leaf trailer spring.



"Hockey Stick" spring commonly used on Freightliner air suspensions.



"Walking Stick" spring commonly used on Freightliner air suspensions.

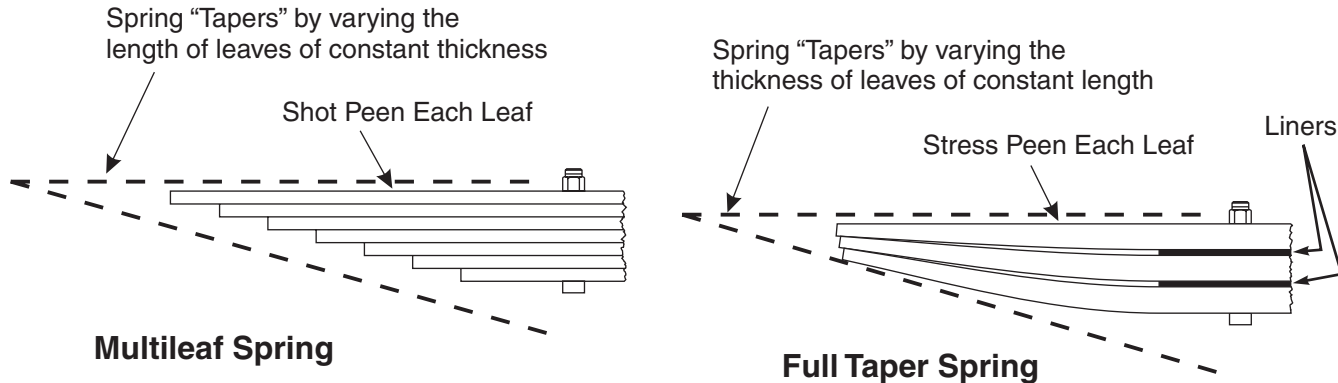


"Z" spring as part of an air ride suspension.

In addition, full taper springs are widely used on the front of four wheel drive pickup trucks and as single leaf helper springs. Full taper springs are also rapidly growing in use on other applications such as front and rear springs on medium duty trucks, single point trailer springs and class 7 and 8 rear single axle springs.

## Technical Information

Compare the differences between a multileaf and a full taper spring.



These differences are what allows a full taper spring to meet its four (4) major design goals.

### 1. Reduce spring stiffness to improve ride quality.

By tapering each leaf in the full taper spring the load or stress is spread out evenly along the entire length of the leaf. In fact, each leaf acts as a separate spring.

The multileaf spring steps the leaf lengths to spread out the load or stress. The leaves depend on each other to distribute the stress although not nearly as evenly as on a full taper spring.

Since the full taper spring does a much better job of distributing stress, this allows for a significant reduction in spring stiffness since each pound of steel in the full taper spring is carrying an equal share of the load.

### 2. Improve ride by reducing interleaf friction.

The leaves of a multileaf spring contact each other along their full length. This causes a high amount of rubbing or friction as the spring is deflected. The advantage of this interleaf friction is the dampening it provides; in effect the interleaf friction acts as a shock absorber. For this reason, many heavy multileaf spring suspensions do not use shock absorbers. The disadvantage of this interleaf friction is ride harshness; the spring may not respond to small changes in load or bumps.

The leaves of the full taper spring contact each other only at the center and at the tips. This virtually eliminates interleaf friction and allows the spring to be very responsive to small load changes thereby improving ride quality.

### 3. Reduce Spring Weight.

By evenly distributing the stresses in a full taper spring as explained above, along with the special manufacturing processes that are used, it is possible to reduce spring weight by up to 50% over a comparable multileaf spring. Typical weight savings average 30%.

### 4. Increased Spring Life.

The advanced processes used in the manufacture of full taper springs combine to improve vehicle ride, reduce spring weight and at the same time provide increased spring life over multileaf designs.

Stress peening (shot peening while the spring leaf is under load or stress) allows the full taper spring to withstand the higher stresses.

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## Service Recommendations

### Troubleshooting

Full taper springs will usually fail in one of two ways; actual breaking of one of the leaves or more commonly by settling or sagging as the spring nears the end of its useful life.

If the spring appears to have failed by sagging, make sure that the sagging is caused by the spring and not some other factor. For example, sag on a front spring can be the result of a twisted frame, uneven vehicle loading or a rear suspension requiring repair.

In either case, verify that the spring is not being overloaded; perhaps a heavier spring would be more appropriate.

Other common failures and their causes are:

Failure	Cause
Breaks through center hole	Loose U-bolts or worn axle seats and U-bolt plates.
Broken eyes	Binding spring pins due to inadequate lubrication.

### Repair or Replace?

Repair of full taper springs is not recommended.

Cracking of one leaf usually means that the others are nearing the end of their useful life.

Full taper springs begin to lose arch (sag) as the spring steel fatigues. Rearching will not bring back the spring's fatigue life.

Since a typical full taper spring has 4 or less leaves; one broken leaf reduces the number of working leaves by 25-50%. The remaining leaves have been overloaded and overstressed.

Considering all factors, including downtime, means that replacing the spring is usually more economical than a temporary repair.

Think of full taper springs as nonrepairable components.

### Installation

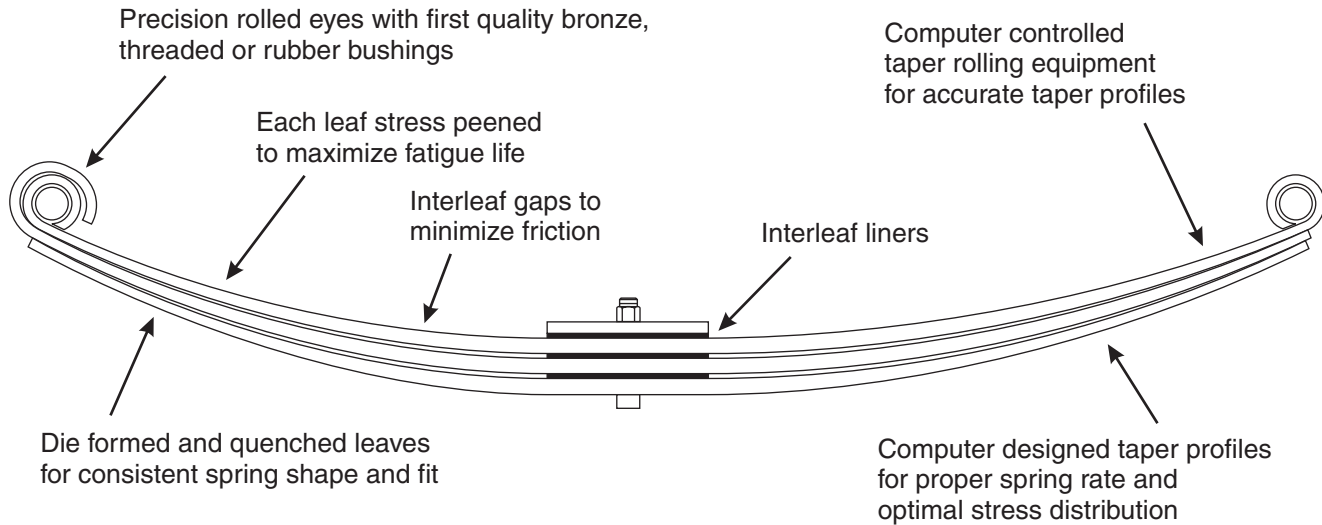
1. Replace in pairs. Failure of one spring usually indicates that both springs are nearing the end of their life.
2. Handle with care. The high stresses that full taper springs experience means that they are more sensitive to failures caused by corrosion and surface defects. Do not damage leaf edges or surface while installing. Small nicks or marks can cause rapid failure.
3. Use the plastic or metal liners supplied with the spring to protect the leaf surface from U-bolt plates or other components.
4. Inspect and replace as required the shock absorbers. Lack of interleaf friction means that full taper springs rely on shock absorbers to dampen spring movement.
5. Do not reuse U-bolts. Make sure that new U-bolts are installed and torqued to proper specifications. Recheck torque after a couple weeks of service.
6. Inspect related components for wear; shackles, spring pins, hangers and axle seats should all be in good condition.
7. Lubricate all pins and bushings as required.

### Maintenance

Properly installed a full taper spring will give many miles of trouble-free service. Preventative maintenance covering lubrication, inspection of shock absorbers and checking related components for wear, as well as avoiding overloading will extend spring life.

## Features and benefits

The combination of high quality materials and advanced manufacturing processes means that a Stanley Springs brand full taper spring from Dayton Parts will perform under the most demanding applications.



### High Stress Full Tapers

The next generation of taper springs, called High Stress, most commonly have 2 leaves and carry the same capacity as their predecessors. Even though it can't be seen, the properties of 6150H high stress steel and modern technology allow it to be tempered to a higher Brinell or Rockwell hardness and still maintain integrity under load. Higher Brinell, or harder steel, raises tensile strength allowing better steel utilization which translates to an additional 10% weight savings over traditional full taper springs.

**stanley springs**

### Related items

- U-Bolts
- Spring eye bushings
- Spring pins
- Shock absorbers
- Shackles and hangers

### Catalogs and support material

- Threaded Rod, U-Bolts and Spring Accessories
- Shock Absorbers
- Medium & Heavy Duty Suspension
- Technical bulletins
- Full taper spring stocking guide
- Promotional materials