MATTRESS TO GO

What is steel?

Definition: A variety of iron, intermediate in composition and properties between wrought iron and cast iron. Steel can be tempered and retains magnetism. Steel contains between .5% and 1.5% carbon (carbon being the major alloying material), not more than 1.65% manganese .6% silicon and .6% copper. It can also contain chromium, nickel, molybdenum, tungsten, vanadium and other metals. Nickel is added for tensile strength. Chromium increases hardness. Vanadium increases hardness while reducing the effects of metal fatigue. Sulfur and phosphorus create gaps in steel and are commonly removed from the ore to create a better steel.

Steel consists of an alloy of iron with an iron carbide (i.e., a mixture of iron and carbon). Carbon acts as a binding agent, locking the otherwise easily-moved iron atoms into a rigid lattice. Varying the amounts of carbon and its distribution in the alloy controls the quality of the steel. Mild steel contains less than .25% carbon; medium steel contains .25% - .45% carbon; high carbon steel contains between .45% - 1.5% carbon.
When you increase the content of carbon in steel, it becomes less malleable and more fusible (i.e., the higher the carbon content, the more brittle the steel but the stronger – better tensile strength - it has.). Adding more carbon to the steel turns it into cast iron. High carbon steel is very difficult for a shop to work with.

That's the technical part.

More than 90% of all steel is the carbon steel described above and is used in making most headboards. To make steel, iron is smelted from the ore using a variety of methods and impurities are removed. It is then reprocessed to add the correct amount of carbon and other alloying materials. The basic process of working steel is known as hot rolling. In this process, an ingot it heated until it is bright red in a furnace called a soaking pit and then it passes between pairs of metal rollers that squeeze it into its desired shape. This steel is easy to produce and can be made affordably and cut and welded into many shapes. Finally, the mixture is cooled in a way to lock in the required structure and then worked to remove mechanical defects.

What is cast iron?

Cast iron is made when you raise the carbon content of steel. It is any group of hard heavy alloys of iron containing more carbon than steel, and cast into a specific shape when molten. It is non-malleable. It contains 2% - 4.5% carbon, .5% - 3% silicone and lesser amounts of sulfur, manganese and phosphorus.

That's the technical part.

To produce cast iron, iron ore is heated to 1420 – 1470 degrees Kelvin and combined with carbon until a molten liquid is formed. This forms a combination of metals known as an alloy. Cast iron is an alloy of about 96.5% iron and 3.5% carbon. This liquid is then poured into a mold and left to cool. Once cooled, the mold is removed and the cast piece is polished or painted. This piece is not malleable, so once it cools it is in its final shape. Because of its high carbon content, cast iron is harder but more brittle than steel and can not be worked.

What is wrought iron?

Wrought iron is a mixture of refined metallic iron with 1% - 3% siliceous slag. It is easily welded and forged. It has less carbon than steel, making it easier to shape, but is not as strong as steel.

That's the technical part.

Wrought means that the iron has been heated and then shaped. Think of the blacksmith shaping a horseshoe. Wrought iron is heavy, solid and durable. It is more expensive to make because of the hand labor associated with its construction. It has a lower carbon content than steel (.1%), making it easier to pound and bend into different shapes.

Wrought iron is what was used in the middle ages to produce tools and weapons. It is quite crude in its composition. If it is worked properly the carbon content can be kept low and the steel is malleable. If carbon enters into the mixture (3% - 4%), then it becomes too brittle to work with. This is what is known as cast iron – steel that it too brittle to work with and can only be cast into shapes when in a molten state.

The Metal Scale

Less Carbon ←==========→ More Carbon

Wrought Iron ←====→ Carbon Steel ←====→ Cast Iron

What is tempering?

Tempering is the process of giving the requisite degree of hardness or softness to a substance such as steel; especially the process of giving steel the required degree of hardness for a particular purpose. Usually this is done by plunging the article into cold water when it is red hot to give an excess of hardness, then reheating it gradually until the hardness is reduced or drawn down to the level desired. This level is usually indicated by the color the steel turns on an exposed polished piece of the steel being treated.

That’s the technical part.

The key to producing strong steel is to lock in the crystal structure in a strong state before it can revert to a softer one while cooling. This is done by quenching the hot metal in water or oil, cooling it so rapidly that the transformation to ferrite or perlite does not have time to take place. However, this process of quenching also introduces tiny cracks and imperfections into the metal structure, allowing the metal to break along these points. It is important to cool the hot steel at a precise rate; cool it too fast and the steel is very strong but too brittle. After quenching, the metal is reheated and worked to force the metal cracks to close, producing a stronger metal. This is known as tempering, and tempering helps resist fatigue.

Fatigue is when a metal fails due to fractures that were worsened by repeated (cyclic) loading and unloading. Most machinery parts fail by fatigue (When you bend a paper clip back and forth until it breaks, that's fatigue fracture...). What actually happens is that when you apply a cyclic load, microscopic surface cracks grow a little bit each time you bend the metal. In addition to that, when you bend or deform a metal part, the material gets harder (work-hardening) but also gets more brittle. After the part has been bent many times, the crack is so big, and the remaining metal is so brittle, it cracks the rest of the way through. This is why steel mattress springs need to be tempered in some way – to better resist fatigue.