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Roller Coasters – History, Design, and Function

History and Design

There are two basic kinds of roller coasters: **wooden** and **steel**. The first coasters were wooden. Walt Disney opened the first steel roller coaster, the Matterhorn Bobsled, at Disneyland in



Roller coaster cars have three sets of wheels

Anaheim, California, in 1959. To hold onto the track, roller coaster cars have three sets of wheels. One set sits on top of the track, one runs along the sides of the track, and the third runs along the bottom of the track.

Did You Know?

The idea of roller coasters began in Russia in the 1400s as ice sledding. In the 1700s, people decided they didn't want to stop sledding in the summer, so they built wooden hills with grooves and put wheels on their sleds.

Wooden: Wooden coasters are made of a **laminated**¹, or layered, wooden track with steel **running rails**². The wood is treated and painted to keep it from

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- 2,000 concrete foundations
- 1.6 million feet of wood
- 69,720 bolts
- 30,600 pounds of nails
- 9,000 gallons of paint

Wooden tracks are built to move as cars roll along the tracks to make them scarier. Wood is not as flexible as steel. Because of this, wooden coasters have gentler curves, usually don't loop, and are slower than steel coasters. New designs, however, are adding loops to modern wooden coasters.



Wooden roller coasters have complex supporting frames.

Steel: Steel roller coasters are usually one of two types. The first is



Some steel coasters are supported by thick tubes.

¹ **Laminated wood:** wood glued together in layers or glued to other materials in layers.

² **Running rails:** where the wheels run on a coaster track

a thin, crossed-frame structure, like wooden coasters. In the other, the support structure is thick

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1,270 **piles**³ (support beams anchored in the ground)

- 2,215 tons of steel
- 60,000 bolts
- 7,000 gallons of paint

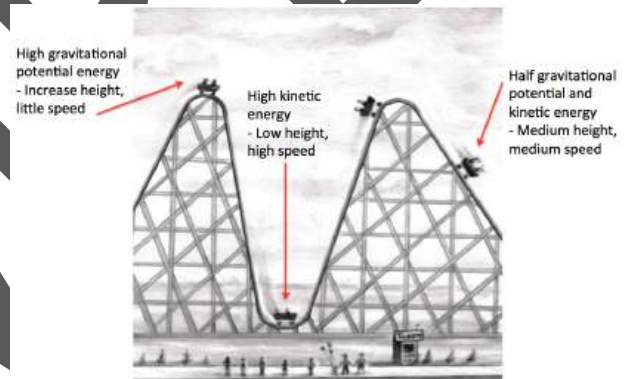
The sections of steel track are made by heating and bending the steel tubes into shapes. Because steel can handle more strain than wood, steel coasters can be higher and steeper, with more loops and tighter curves. In addition, the wheels of steel coaster cars are usually made from polyurethane or nylon, which last longer than steel wheels and glide easier for a faster ride.



Pepsi Max Big One

How they work – Energy conservation

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Roller coasters move due to potential and kinetic energy.

top, it runs the rest of the track without any more outside forces. This is possible because the potential energy stored in the car as it went up is changed into **kinetic energy**⁴ (the energy of movement). The higher the first hill, the more potential energy is stored and the faster it can go. This change of potential to kinetic energy drives the car the rest of the way. As the car runs along the track, energy is continually changed from gravitational potential energy (when it goes up) to kinetic as it glides down. Since potential energy increases as you go higher, the higher the first hill, the longer the track can be. As the car gets closer to the ground, it goes faster as more potential energy is changed to kinetic energy.

³ **Piles:** support beams anchored in the ground.

⁴ **Kinetic energy:** the energy of movement

Energy Loss

A lot of energy is lost to friction as the wheels rub on the track. Even more energy is lost when air resistance pushes back on the car as it rushes along. When the car loses energy, it slows down.

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motion. Finally, the wheels that sit on the bottom of the track lock the car onto the track even when it is upside-down. At the end of the ride a braking system (either compressed air, friction, or magnetic) stops the car by removing the remaining energy. No energy, no movement.

Reading Comprehension Questions:

1. Describe the wheel setup on a roller coaster car.
2. How
3. What
4. What are the two advantages to using polyurethane or nylon wheels on steel cars?
5. Explain

Extension Questions:

6. If the
7. What is the largest roller coaster in your area? What is its maximum height? How fast does it go?
8. Compare your answer in #7 to

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