

CAREER**● Roller Coaster Designer**

*Roller coasters have fascinated **Steve Okamoto** ever since his first ride on one. “I remember going to Disneyland as a kid. My mother was always upset with me because I kept looking over the sides of the rides, trying to figure out how they worked,” he laughs. To satisfy his curiosity, Okamoto became a mechanical engineer. Today he uses his scientific knowledge to design and build machines, systems, and buildings. But his specialty is roller coasters.*

His West Coaster, which sits on the Santa Monica pier in Santa Monica, California, towers five stories above the Pacific Ocean. The cars on the Steel Force, at Dorney Park, in Pennsylvania, reach speeds of over 120 km/h and drop more than 60 m to disappear into a 37 m long tunnel. The Mamba, at Worlds of Fun, in Missouri, sends cars flying along as high and as fast as the Steel Force does, but it also has two giant back-to-back hills, a fast spiral, and five “camelback” humps. The camelbacks are designed to pull riders’ seats out from under them, giving the riders “air time.”

Coaster Motion

Roller-coaster cars really do coast along the track. A motor pulls the cars up a high hill to start the ride. After that, the cars are powered by gravity alone. As the cars roll downhill, they pick up enough speed to whiz through the rest of the curves, loops, twists, and bumps in the track.

Designing a successful coaster is no simple task. Steve Okamoto has to calculate the cars’ speed and acceleration on each part of the track. “The coaster has to go fast enough to make it up the next hill,” he explains. Okamoto uses his knowledge of geometry and physics to create safe but scary curves, loops, humps, and dips. Okamoto must also keep in mind that the ride’s towers and structures need to be strong enough to support both the track and the speeding cars full of people. The cars themselves need special wheels to keep them locked onto the track and seat belts or bars to keep passengers safely inside. “It’s like putting together a puzzle, except the pieces haven’t been cut out yet,” says Okamoto.

Take the Challenge

Step outside for a moment. Gather some rope and a medium-sized plastic bucket half-full of water. Can you get the bucket over your head and upside down without any water escaping? How does this relate to roller coasters?