

## WHAT IS THE COEFFICIENT OF RESTITUTION?

The coefficient of restitution is defined as the ratio of two velocities; the velocity of a ball after impact with the surface divided by the velocity of the ball before impact. It measures the amount of kinetic energy, or motion, lost after impact.

## **HOW IS IT MEASURED?**

When a moving object such as a ball, collides with the flat playing surface, the ball will rebound with a fraction of its original energy. If the collision between the two is perfectly elastic the ball will rebound with all of the energy it started with. If this happens, the rebound velocity will be the same as the approach velocity; the coefficient of restitution would be 1.00. This means that the surface may have been hard and very little or no energy was absorbed by the surface.

However, if there is considerable deformation of the ball or the surface, then the ball will rebound with less energy than it started with. This would be a coefficient of restitution closer to zero. In this case it means the surface was soft and absorbed the energy.

The higher the coefficient of restitution, the faster the ball's momentum will be. The lower the coefficient of restitution the slower the ball will be after impacting the surface.

COEFFICIENT OF RESTITUTION (e) =

RELATIVE VELOCITY AFTER COLLISION

RELATIVE VELOCITY BEFORE COLLISION

## WHAT DOES THIS MEAN FOR MY FIELD?

The speed of the ball after impact will affect the reaction time necessary to address the ball in play. If the coefficient of restitution closely mimics that of a natural grass field, then your athletes will react naturally to the ball coming off of the surface. For example, in baseball if the coefficient is too high, the ball will skip or bounce faster off of the surface requiring a quicker reaction from the player. If the coefficient is low the surface will absorb the ball's energy and the ball will be slower getting to the player. This can present a problem when trying to quickly field a ball to throw the runner out.

These measurements are also important when it comes to the safety of your players. If the coefficient is too high it means the surface could be too hard, resulting in more impact related injuries. If the coefficient is too low the surface could be too soft which can result in more fatigue related injuries.

Shaw Sports Turf uses this calculation during testing to carefully engineer our turf surfaces for better safety and performance, delivering a playing surface that reacts more like natural grass.



