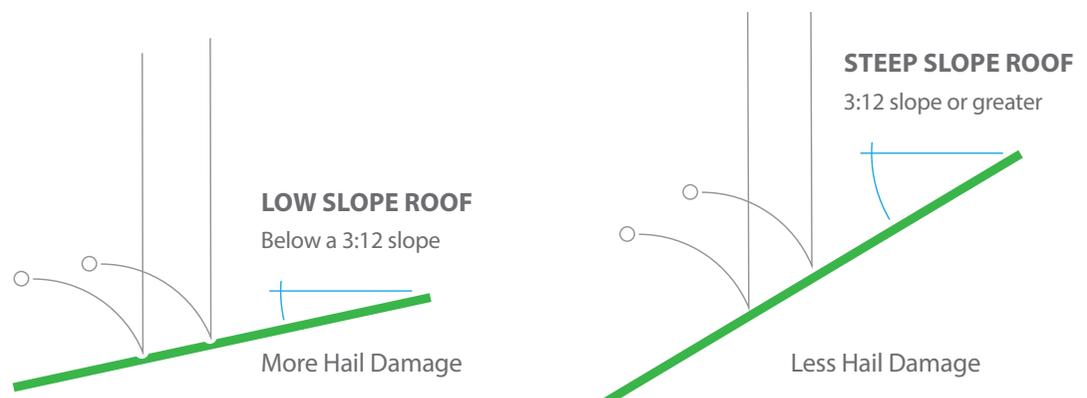




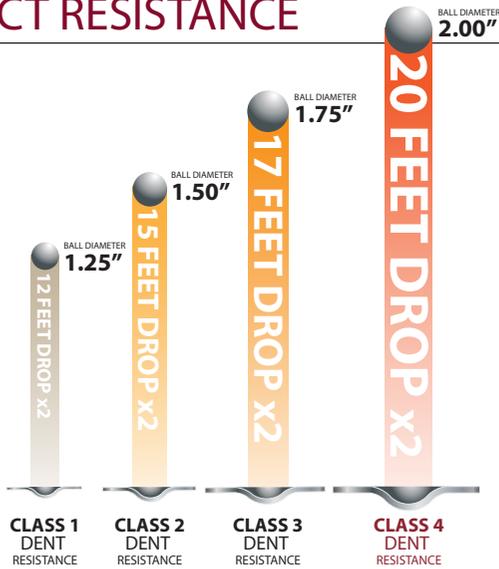
# Dent Protection Explained

Each year hail causes about 1.6 billion dollars worth of damage to residential roofs and barns in the United States. Hailstorms are most concentrated in the southern and central plain states but can occur almost anywhere there are thunderstorms. Hailstones larger than 1 inch in diameter have the potential to cause damage to any exposed object. The level of damage depends on the size, density, falling velocity and distribution of hailstones. Roofs may be especially susceptible to damage depending on the slope of the roof. Hailstones cause more damage to low slope than steep slope because the greatest damage occurs at a 90-degree angle of impact.



In general, damage can be categorized into two types: aesthetic damage and functional damage. Aesthetic damage has an adverse effect on appearance but does not effect the performance of the roof. Functional damage results in less water-shedding ability and a shorter expected service life of the roof.

# IMPACT RESISTANCE



Underwriters Laboratory has developed a test (UL 2218) to evaluate the impact resistance of roofing material. This test evaluates materials by dropping a steel ball onto the roofing panel twice at the same location. The material must show no evidence of fracture, cracking, splitting or any other failure resulting in an opening of the roofing material. The sizes of the steel balls range from 1.25" to 2.00" and are dropped twice from a height of between 12 and 20 feet.

Central States uses metal with a Class 4 impact resistance rating.

# DENT PROTECTION

According to engineers at U.S. Steel Corp., dent resistance of a coated sheet is proportional to the square of the yield strength multiplied by the fourth power of the sheet thickness.

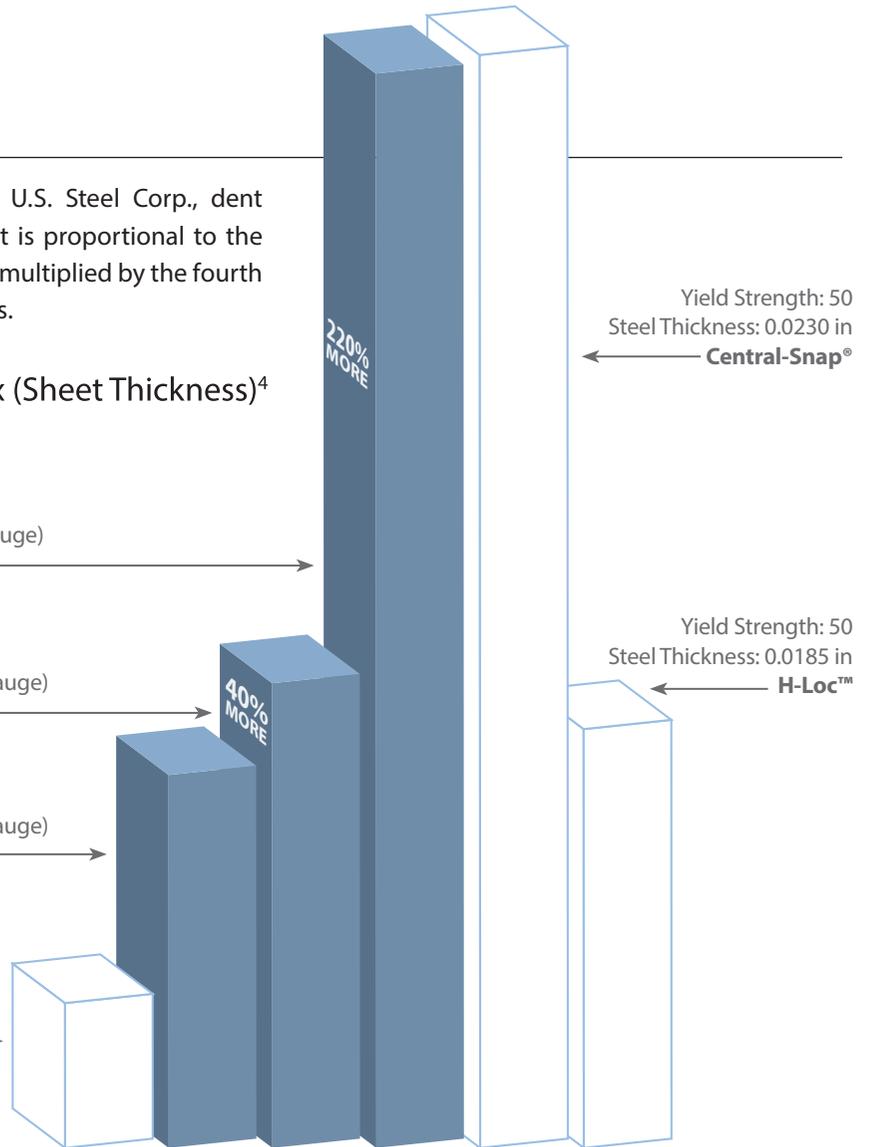
$$\text{Dent resistance} \propto (\text{Yield Strength})^2 \times (\text{Sheet Thickness})^4$$

Yield Strength: 80  
Steel Thickness: 0.0185 in (26 gauge)  
**Panel-Loc Plus™ Ultra**

Yield Strength: 80  
Steel Thickness: 0.0150 in (29 gauge)  
**Panel-Loc Plus™ Prime**

Yield Strength: 80  
Steel Thickness: 0.0138 in (29 gauge)  
**Panel-Loc Plus™ Thrifty**

Yield Strength: 33-50  
Steel Thickness: 0.0138 in  
**Most trim and trim grade material being used to roll-formed panels**



SOURCE: U.S. Steel Corporation Bulletin *Hail Damage on Coated Steel Roofing*



[www.CentralStatesMfg.com](http://www.CentralStatesMfg.com)