FUNCTIONAL vs. NON-FUNCTIONAL HAIL DAMAGE TO CEDAR ROOFING PRODUCTS

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1.0 INTRODUCTION

The purpose of this document is to describe the difference between the various types of distress that can occur to cedar roofing products due to hailstone impact. The intention is to provide an understanding of the basic mechanics of cedar roofing, how hailstone impact can affect this product, and how these effects relate to the overall functionality and service life of the cedar roofing product.

2.0 DESCRIPTION

Cedar roofing products, called “shakes” and “shingles,” are generally either sawn or split. Each process gives the final product distinct visual characteristics. Sawn products are typically more uniform in thickness and appearance, while those that are split often have an uneven thickness and an irregular, or uneven, top surface. Cedar products are available in a wide range of qualities, which dictate where these products can be suitably installed. The service life of cedar products varies widely depending upon the thickness and quality of the cedar; the method of application and other installation-related factors; and the general climate and other site-specific factors, such as shading and moisture exposure. On average, properly installed cedar roofing products can be expected to last about 30 years.¹

3.0 INSTALLATION

As with all roof coverings, the functionality of cedar roofing lies in its ability to shed water and protect the interior of the house from water intrusion. To accomplish this, the cedar shakes must be installed in such a manner as to direct surface water run-off over consecutive underlying shakes until it is shed from the roof. Cedar shakes are installed in lapped layers in such a way that the exposed portion of the shake or shingle is less than half the overall length of the product. For example, a shake measuring 24 inches in length may only have a 10-inch exposure.
In this example, the shake would extend partially beneath two courses of overlying shakes. The amount of overlap between any given course and two courses below is referred to as headlap, and is illustrated as dimension “h” in Figure 1.

![Figure 1: Installation Illustration Showing Headlap](image)

The amount of headlap is critical to the performance of cedar roofing products. As cedar ages, the wood expands and contracts with fluctuations in moisture content and temperature. These fluctuations can cause the cedar product to curl, twist, and split. Headlap provides redundancy in the roofing system that helps maintain its water-shedding capability. A second component of the roofing system that aids in moisture resistance is asphalt-saturated felt paper (or a variety of modern synthetic materials). Depending upon the geographical climate and other factors, the underlying material is either placed between the roof sheathing and cedar roof covering (underlayment), or it is interwoven within each course of the cedar roof covering itself (interlayment).

### 4.0 HAIL DAMAGE DEFINED

Hail damage to cedar roofing is defined as “a loss of integrity, functionality, or service life of the cedar roof resulting from hail impact to the roof covering.” A loss of integrity means that the cedar product has experienced physical damage that adversely alters the shake or shingle. Oftentimes, this change in state will result in a loss of anticipated service life. For a loss of functionality to occur, the ability of the shakes or shingles to shed water and protect the interior of the building must be affected.
The effect of hail on cedar roofing has been documented by both laboratory testing and field investigations. With relative consistency, hail measuring 1 ¼ inches in diameter is capable of causing damage to sound cedar shingles, while hail of 1 ½ inches in diameter or larger is required to cause damage to sound, thicker cedar shake products.  

5.0 HAIL DAMAGE

Hail that impacts cedar roofing may affect the ability of the cedar shake or shingle to perform as intended. The immediate performance may not be affected, but instead it may accelerate the rate at which the roof degrades, resulting in premature loss of functionality and service life.

Hail damage to cedar roofing most often occurs when an impacting hailstone causes the shake to split. Splits result when an impacting hailstone applies downward pressure to the cedar product, causing tensile forces to develop in the top surface of the shake or shingle (Figure 2). This most often occurs when the cedar shake or shingle has curled or is otherwise warped, so that it does not have continuous contact with the underlying shake or shingle.

![Figure 2: Illustration of Splitting Resulting from Hail Impact](image_url)

This mode of splitting is considered to be hail damage, because it provides water with an opportunity to enter beneath the shake in a location where it otherwise would not. If the location of the split allows water to enter above the headlap, between the joint of the underlying shake, over time, this could allow the felt to be exposed to the sun’s harmful rays. In these instances, the functionality and/or service life has been compromised.
Splitting, when located above, or near, edge joints, as shown in Figure 3, has the potential to result in water intrusion. This is because water that is able to enter the split above the headlap, shown in the area marked as “a” above, will pass between the edge joint in the underlying shakes/shingles and enter below the roofing system. If the underlayment is missing, damaged, improperly applied, or deteriorated, this water can enter into the structure beneath.

New splits from hail impact are easily distinguished from aged, or natural, splits as the fracture surface inside of new splits exhibits the original color of the cedar product, whereas aged splits develop over an extended period of time. The interior surfaces of aged splits are grayed, discolored, affected by organic growth (e.g., moss and lichen), or dulled due to long-term exposure to ultraviolet rays and oxidation. Since splitting of cedar shakes can occur due to a variety of reasons, including normal age-related shrinkage and foot traffic, it is important to corroborate fresh splits with collateral indicators of hail impact, including impact marks on the cedar products themselves. New splits can remain tight and can be virtually unnoticeable for a short period after the hail event.

Figure 3: Illustration of a Split in Relation to Headlap
Therefore, hand manipulation (e.g., pressing down upon known impact locations) is necessary as part of a hail damage investigation to identify hidden splits, if present. An example of fresh splitting associated with hail impact is shown in Figure 4. Splits in cedar shakes/shingles without corresponding hail impact marks are not considered hail damage.

Figure 4: Examples of Hail-Caused Splitting

6.0 NON-HAIL DAMAGE

Hail that impacts a cedar shake or shingle, but does not result in a split, is not considered to be hail damaged. Several types of hail-related distresses can occur that do not affect the functionality or service life of the cedar product. These are clean spots, surface marring, butt-edge crushing, edge fracturing, and denting.
Clean Spots

As a cedar product ages and oxidizes, its color gradually turns from a bright, orangish-brown to a light-gray color. Some cedar products, especially when subjected to shade, will develop algae, moss, or lichen growth, or other surface stains that further discolor the shake or shingle. These discolorations can be cleaned away by impacting hail, allowing lighter colors of the shake to appear that are very noticeable, as is illustrated in Figure 5. Clean spots that occur due to hail impact will fade with time.

![Figure 5: Examples of Clean Spots](image)

Surface Marring

Larger hail can displace, break, or cause fraying of the wood fibers at the surface of the shake or shingle, as is shown in Figure 6. Similar to clean spots, these blemishes will fade with time, and possibly disappear entirely, and will not result in future splitting of the cedar product. As such, surface marring does not affect the functionality and will not reduce the service life of the cedar roofing.

![Figure 6: Examples of Surface Marring](image)
**Denting**

With sufficiently large hail, the wood fibers in the field of the shake or shingle can be compressed, resulting in an identifiable dent (Figure 7). Such denting does not compromise the functionality or service life of the shake or shingle. Research has shown that these dents will fade over time, and will not be noticeable after a few months.

![Figure 7: Examples of Surface Denting](image)

**Butt-Edge Crushing**

The bottom edges of wood shakes or shingles are often the most vulnerable to hailstone impacts. This is due to the fact that the exposed wood grain along the lower edge of the shingle more readily absorbs and retains moisture. Subsequently, these areas experience deterioration at an accelerated rate when compared to other areas of the shake/shingle. The deteriorated locations are susceptible to crushing by hail smaller than would be required to cause functional damage to the cedar roofing (Figure 8). Since these areas have become vulnerable to crushing due to degradation prior to the hail impact, and since the impact location does not affect the functionality or service life, edge crushing of the shingles is not considered to be hail damage.
Edge Fracturing

Similar to butt-edge crushing, the sides of shakes or shingles are also more vulnerable to material fracturing than the interior of the shake (Figure 9). However, unless the cedar has undergone significant deterioration, the affected material may be sound at the time of impact. Since the loss of material does not compromise the functionality or service life of the shake or shingle or its service life, the affected shake or shingle is not considered to be hail damaged. It is important to note that while edge fracturing is not considered to be hail damage, hail large enough to cause edge fracturing creates the potential for hail-induced splits at other locations on the roof.
7.0 SUMMARY

When diagnosing hail-related distress to cedar roofing products, one must consider the actual effect of the hail impact on the shake or shingle. Having an understanding of how cedar shakes and shingles are installed is important in diagnosing whether the distress will affect the functionality or service life of the cedar roofing. Hail can damage a shake or shingle at locations where it has not been previously degraded when the impacting hail causes a reduction in the shake or shingle’s ability to perform as intended, or when the service life of the shake or shingle is reduced.
