

Overview Although you try your best to protect your rope from damage, accidents may still happen that leave you questioning the integrity of your rope. Several damage mechanisms exist, such as abrasion, contamination, and shock loading. All damage types reduce the number of effective strength-bearing fibers, though the appearance of damage, or lack thereof, varies greatly. Localized damage, caused by cutting on a finite section of rope, is a common damage type in which the effects are not well understood. It is differentiated from other damage types, such as UV degradation or contamination, by the ability to count the number of broken yarns.

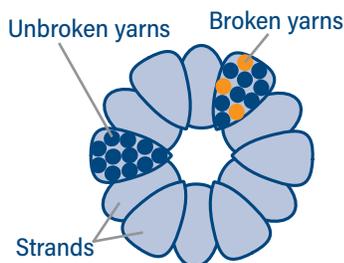
Samson has taken measures to evaluate the effects of localized damage on a rope. Studies were performed on *AmSteel®Blue*, ropes to better understand strength loss when various levels of localized damage are present.

By conducting this testing, Samson has been able to develop a predictive model for rope strength when severed yarns are present. When assessing the amount of rope damage, there are two significant factors to consider—the area loss percentage comes from determining the ratio of broken yarns to unbroken yarns, and the proximity to another localized damage area, determined by the number of picks between localized damage. The following section explains how to examine your rope to help you decide whether it is still suitable for safe operations.

Assessing Rope Damage in a Single, Localized Area

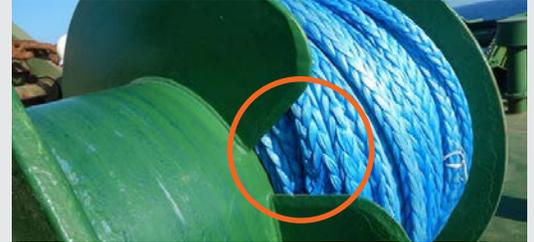
This document applies to 12-strand Class II ropes only. Seek guidance from your Samson representative if your rope does not fall into this category.

- **Count the number of broken yarns. Remember that for each cut, there will be two ends.**
- **Count the number of unbroken yarns in a single strand in an undamaged section of rope.**
- **Multiply the number of yarns in a single strand by 12.**
- **Divide the total number of broken yarns by the total yarns in the rope structure and multiply by 100% to determine the damaged area percentage.**



$$\begin{aligned}
 &11 \text{ yarns per strand} \times \\
 &12 \text{ strands} = 132 \text{ total yarns} \\
 &\frac{3 \text{ BROKEN Yarns}}{132 \text{ Total Yarns}} \times 100\% \\
 &= \mathbf{2.3\% \text{ AREA LOSS}}
 \end{aligned}$$

Common cut damage may occur from the following:



Contact with a very sharp bend or corner under tension



Sharp corner, wear pads on a crane boom



Contact with a rough surface, such as rusted surfaces



A yarn is a subcomponent of the rope strand



Determining Area Loss Percentage

To assess the strength retention in a single localized area, the ratio of damaged yarns to intact yarns is the primary indicator of the remaining rope strength. Table 1 can be used as a tool to assess the damage to the rope.

Determining Area Loss if You Have Two Damaged Sections

For ropes with more than one localized damage area, there are two important factors to determine the condition of the rope. First, the percent area loss of each damaged area should be determined, as described in the step "Determining Area Loss Percentage." Second, the distance between damaged areas will need to be measured. To measure the distance between damaged areas, count the number of picks between them as described in the step "Determining the Distance Between Damaged Areas." If the distance between damaged areas is greater than 24 picks, revert to Table 1 to assess each individual damaged area.

If the distance between damaged areas is less than 24 picks, refer to Fig. 1. Using the greater percent area loss of the two damaged areas to locate the position on the y axis and the distance between cuts in picks on the x axis, an assessment of the rope condition can be made.

DETERMINING THE DISTANCE BETWEEN DAMAGED AREAS:

A pick is considered the section of a strand as it exits and returns into the braid. Localized damage sections within 24 picks in proximity should be assessed together. At proximities greater than 24 picks, the damaged areas should be assessed on an individual basis.



Holistic Approach to Damage Assessment

Samson cares about supporting safe operations. One way to reduce risk of line failure is through routine line inspections. Please use this Localized Damage Assessment Guide as a companion tool to Samson's *Inspection and Retirement Pocket Guide*. If your rope's localized damage coincides with abrasion damage of level 4 or higher, please contact your Samson representative for damage assessment assistance.



TABLE 1 How to determine rope condition based on area loss

Assessment of Area Loss SINGLE DAMAGED AREA		
0-12% GOOD CONDITION	13-18% FAIR CONDITION	19%+ POOR CONDITION
CONTINUE USE <i>monitor for worsening conditions</i>	REPAIR OR RETIRE <i>as soon as possible</i>	REPAIR OR RETIRE <i>immediately</i>

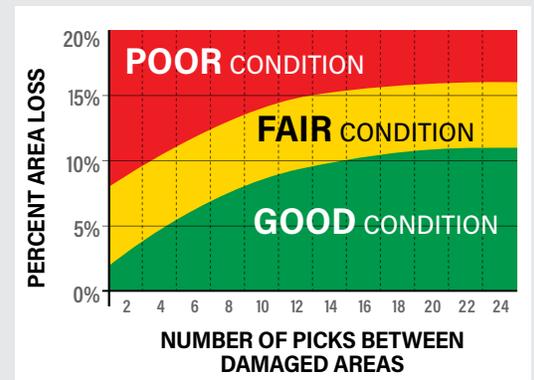


FIGURE 1 Determining rope condition when two damaged sections are present

Request a copy of this handy reference tool from your Samson representative, or download the Samson app.

