

Elevator Rope Rouging

Rouge (or red rouge) is a fine, red iron oxide which forms on the rope, giving it a "rusty" appearance and suggesting that advanced deterioration is taking place. Rouging is caused by fretting, a special type of abrasion which occurs when two solid surfaces bear against one another, while under a heavy load and subjected to small amplitude vibrations. The small amplitude vibrations are due to load vibrations which occur during loading and unloading, and starting and stopping of the elevator. The pressures from the heavy load and vibrations work out any lubrication that may have been present, and result in very small metal particles that have become abraded or torn out of the metal surface. These particles spontaneously oxidize in the air to form the red ferric oxide dust that is characteristic of rouging.

Rouge is different from what we commonly refer to as rust. Rust forms when moisture is introduced to a metal surface. When combined with this moisture, the metal surface, itself, rusts. Rouge does not indicate that a wire rope is beginning to rust. Rouging, instead, means that abrasion is occurring between the wire rope components and that only the small metal particles, now separate from the wire rope, are rusting.

In elevator rope, rouging begins with a lack of core support. This is usually due to a lack of proper field lubrication. The fiber core dries up and cannot provide the



Figure 1: **Cross-section of rope where rouging occurred.**

The inner wires of the strands in contact with the vegetable fiber core are worn considerably. Wear is also quite severe where adjacent strands come in contact with one another.



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strands with the necessary support. Another possibility is that a solvent or solvent-based lubricant was used, which diluted the existing lubricant and dried out the core and wires within the strands. Rouging occurs where the strands contact the fiber core, and also at the areas of contact between adjacent strands.

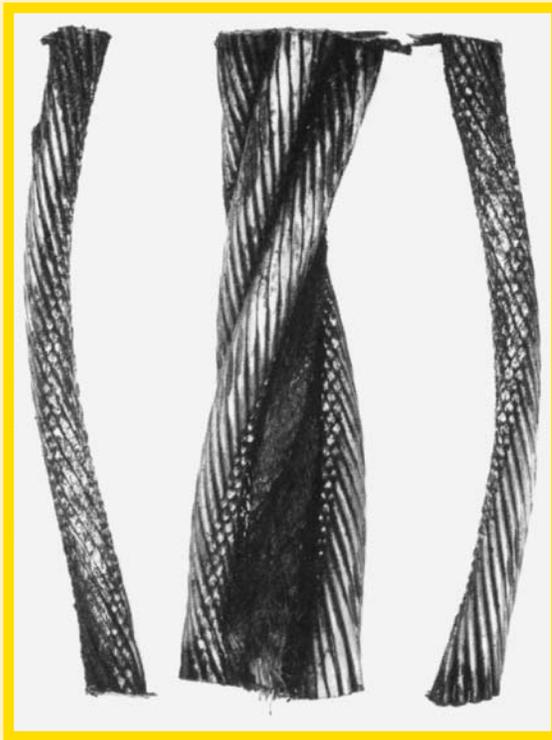


Figure 2: **An unlaidd section of wire rope which exhibited severe rouging.**

The individual strands show nicked areas caused by abrasion at points of contact between strands. Between the nicked areas is an abraded area which resulted from wear between the strands and fiber core.

Field lubrication does not counteract the effects of rouging or restore the rope to its proper operating condition; the damage has already been done. Field lubrication may appear to stop the rouging, when it actually only temporarily cleans and retards the evidence of the rouge. The evidence of rouge should not, by itself, be construed as an immediate cause for removal, for inspection guidance on the condition of rouging, refer to ASME A17.1-2004 Safety Code for Elevators and Escalators, Paragraph 8.11.2.1.3(cc).

Please note that this code reduces the number of allowable wire breaks (all types) by 50% once rouging occurs. It should also be noted that when the core no longer supports the strands, a reduction in diameter is common. Therefore, in addition to checking the criteria for allowable wire breaks, please refer to the criteria for removal due to diameter reduction. WW suggests an increase in the frequency of rope inspection, with an intent to schedule rope replacement once rouging is evident.

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