part 1: Inspection from the machine room

Service Bulletins are directed specifically to elevator field personnel and will deal with the hands-on issues normally faced by the group. Whereas our Technical Bulletin series addresses cause-and-effect issues related to elevator ropes, the Service Bulletins will discuss the mechanics, or how-to’s of wire rope usage.

The first Service Bulletin provides a guideline for investigating elevator problems believed to be wire rope related. Utilizing a common investigative procedure ensures the investigator (certified inspector, service mechanic, field sales representative) has covered all bases before leaving the job site. Following this outline may resolve many questions in the field. However, it should be noted that not all issues can be resolved quickly. In some cases the information gathered will be used by the wire rope manufacturer to aid in additional analysis.

Getting Started
Prior to beginning the inspection, conduct some preliminary groundwork. Documentation is very important for current and future traceability. Record:
- Job site and address
- Elevator car number(s)
- Number of floors serviced by the subject car(s)
- Type of hoist rope reeving, such as 2:1 Double Wrap
- Rope description, length and manufacturer’s reel number, if known
- Customer purchase order number
- Date of rope installation
- Groove configuration of primary and secondary sheave, if applicable
- Previous service problems or car history, if available
- Nature of problem, providing as much detail as possible, including seemingly insignificant items

Tools Needed for Inspection
WW recommends the following tools for rope inspection and investigation.
- Dial or digital gauge caliper for measuring rope diameter
- Lay paper (adding machine paper) and keel for lay length measurements
- Circumference tape to measure drum diameter
- Metal straightedge and feeler gauges for determining groove depth
- Level to check drum balance
- Chalk for performing a slippage test
- Magnet to determine metallic content of throw off
- Flashlight
- Groove gauges to check groove contours
- Torque wrench/pressure gauge
- Camera for documentation purposes

In the Machine Rooms
Record Machine Plate Information
Before inspecting the ropes, note and record the information on the machine plate—rope requirements, car weight, etc. This information is very important in the event the elevator OEM needs to be contacted for clarification.

Modernization
Has the car undergone a modernization? If so, when and to what extent? If the car weight has increased as a result of a mod job, compare its new weight with that recorded on the machine plate. An increase in car weight may cause rope slippage, particularly if the new weight requires a change in rope specification (construction or grade) that has not yet been addressed. In the event the car has become heavier, contact the elevator OEM to verify the correct rope specification for the new weight of the car.

Observe Ropes in Operation
From the machine room, observe the ropes in operation. When investigating a wear problem, ask that the car be taken to the lobby. Typically, the worst area of wear is visible at the drive sheave when the
Elevator Rope Investigation

car is in the lobby. To help in locating this section of wear when on top of the car, mark the ropes with chalk in this area while still in the machine room. As a reminder, always make sure the the car is clear before touching the ropes or any part of the elevator system.

Inspect the Drive Sheave
Using the sheave groove gauges, place the respective gauge into the first groove. Obviously, this needs to be in an area where the rope is not seated. Begin with the groove closest to the machine, and record this groove as Rope Groove 1. Hold the flashlight behind the gauge. If light passes beneath the gauge, a tight sheave condition is indicated. Light shining on either side of the gauge signals an oversized groove. Standard sheave gauges work best for U-grooves, but with a little practice can also be used with undercut U and progressive grooves.

To measure for differential groove depths, place a metal straightedge across the ropes at the drive sheave. Make sure the straightedge is a length which will not hinder its ability to properly indicate groove depths. The straightedge should sit nearly on all of the ropes without teetering or wobbling. A seesaw movement may signify differential groove depths. To verify the findings, measure the amount of space or clearance between the ropes or any part of the elevator system.

Check for Proper D/d Ratios
Using the circumference tape, measure the drum to determine the D/d ratio. Keep in mind that the minimum D/d ratio required, per code, is 40:1.

Conduct a Slippage Test
To determine slippage, place the car at the top or bottom of the shaft. Using the straightedge and chalk, draw a straight line across the ropes, and also mark both sides of the sheave. Run the car through two complete cycles and measure the distance between the lines on the rope and the lines on the drum. If after operation the lines do not match as originally marked, the ropes are slipping.

Look for Signs of Throw-Off
Check the floor around the drive sheave for throw-off. Also look in the less obvious places where a broom cannot reach. Placing a piece of lay paper over the magnet, run the magnet through the debris. A high metallic content, which will be picked up by the magnet, is indicative of a number of problems, including tight sheaves, improper tensioning, and differential groove depths.

After completing these steps, the inspection may be moved to the car top. These investigative techniques will be reviewed in Service Bulletin 2.

Wire rope products will break if abused, misused or overused. Consult industry recommendations and ASME Standards before using. Wirerope Works, Inc. warrants all Bethlehem Wire Rope® and strand products. However, any warranty, expressed or implied as to quality, performance or fitness for use of wire rope products is always premised on the condition that the published breaking strengths apply only to new, unused rope, that the mechanical equipment on which such products are used is properly designed and maintained, that such products are properly stored, handled, used and maintained, and properly inspected on a regular basis during the period of use. Manufacturer shall not be liable for consequential or incidental damages or secondary charges including but not limited to personal injury, labor costs, a loss of profits resulting from the use of said products or from said products being incorporated in or becoming a component of any project. Bethlehem Wire Rope® and the Bethlehem Wire Rope® reel logo are registered trademarks of Wirerope Works, Inc. ©2008