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ROPE TENSIONING SYSTEM
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99.9% Rope Accuracy Using Rope Tension Gauges

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This article/seminar refers to the “accuracy of Equalising the Hoist Rope Tensions on a Traction Lift”, and will explain how to achieve it. Is it necessary to have equal hoist rope tensions? Why not have an accuracy of 95% or even 90% between the rope with the greatest tension and the rope with the least tension? Having the greatest accuracy will reduce the hoist rope and sheave wear to a minimum, less accuracy will cause excessive wear. How this wear takes place is explained in the article on “The Importance of Equal Rope Tension on a Traction Lift”.

The Tension in a Hoist Rope can be easily checked using a purpose made tool. Rope Tension Gauges have been available since the invention of Traction Lifts, and when it became known that the hoist ropes should be tensioned equally. Some installers thought that they could detect the difference in tension by pressing their thumb onto each rope in turn and giving it a little sideways pressure. They considered that their skills were ‘good enough’ to feel the difference between the ropes. Unfortunately these installers were not around after the lift went into service and did not know the future history of their work.

There is rapid rope stretch after a new installation goes into service causing a loss in the ‘overrun’ distances. A different person may have to re-adjust these ropes to regain the overruns, ensuring that the rope tensions are still equal after rope shortening is just as important.

When tensioning a hoist rope it is **not** necessary to know what the exact **load** is in that rope, it is only necessary to know if the tension in one rope is different to the other ropes. The lift car, and the counterweight, are supported by all of the ropes. It is therefore important that all ropes share that load equally.

There are many different types of Rope Tension Gauges available today, and some can show the actual load carried by each rope

Most rope tension gauges exert a force on the rope, either by a spring pressure or a fixed lever pushing a load transducer against the rope. The subsequent change in spring length or reading from the load transducer is used to compare the tension in different ropes. Other methods induce a frequency into the ropes and the frequency compared, and there are no doubt more devices trying to achieve the same results using a different method. **Not all of these devices are suitable for ensuring optimum accuracy in the tensions.**

With all of these tools available why do we still have a problem with excessive hoist rope and sheave wear? An obvious answer is that the tools are not being used properly, or the method used is not suitable.

What is the correct method? It is a very dynamic situation because adjustment to any one rope will also affect all of the other ropes immediately. The correct method is to know what is happening to all of the ropes under adjustment, at the same time.

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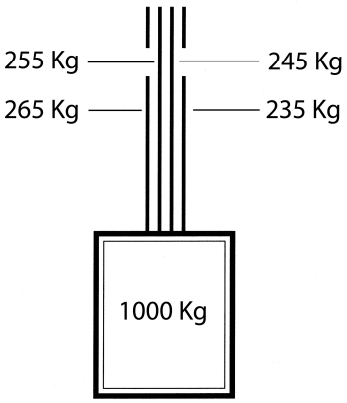
A Typical Scenario

A 1000kg load is suspended by 4 hoist ropes, each rope supporting a (not equal) proportion of the total load. There is a 10kg difference in load between the 1st and 2nd ropes. If the suspended load were increased to 2000kg then each rope would be carrying twice as much load as before, in the same proportion but, once again, not equally. There will now be a 20kg load difference between the 1st and 2nd ropes which will accelerate the rope and sheave wear. If the tension in all car ropes were equal when the lift car is empty then these ropes will always have equal tension regardless of any increase in car load.



How many Rope Tension Gauges are required?

It is possible to obtain maximum accuracy in all of the hoist ropes using 2 rope tension gauges. In order to be certain that this accuracy can be achieved then both rope tension gauges must be calibrated to ensure they each have an equal reading for the same load. The easiest way to check for this condition is to place both gauges on one hoist rope at the same time, and check their readings. Choose the rope that appears to have the greatest tension, (*it may not be possible to slacken this rope*). Both gauges will now be checking the same load and therefore the gauges should have equal readings.

If necessary adjust the gauges to obtain a deflection in the rope, deflecting the rope will ensure that the natural tension in the rope has been overcome. Continue to adjust both gauges until an equal **mid scale** reading is obtained.

If it is not possible to adjust one or both gauges then those gauges are not suitable for this operation. When the calibration has been determined then no further adjustment to the gauges should be made.

If the gauges used are displaying the actual load in the rope then an error in the readings may cause a problem. Which one is correct, if any? For the purpose of equalising hoist rope tensions it is not necessary to know the rope **load**. Once the calibration of the rope tension gauges has been determined then one gauge is now used as a reference and left **untouched** on the first rope. The second gauge is removed from the first rope and placed onto the second rope.

If the gauge readings are now different then the second rope must be adjusted until its rope tension gauge reads the same value as shown on the first rope tension gauge.

Do not readjust either Rope Tension Gauge.

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During this adjustment both gauges will alter their original readings. When both gauges have the same readings then the first and second ropes must both have the same tension.

Remove the gauge from the second rope and place it on the third rope. If necessary the third rope can now be adjusted to enable its rope tension gauge to read the same value as shown on the first rope tension gauge.

Once again during this adjustment both gauges will alter their original readings. When both gauges have the same readings then the first, second and third ropes must all have the same tension. This procedure is now repeated for all of the remaining ropes.

When the hoist ropes on one side of the traction sheave have been adjusted then repeat the procedure to the hoist ropes on the other side of the traction sheave (adjusting ropes one side of the traction sheave has no affect to the rope tensions on the other side). On completion move the lift car one round trip through the lift shaft and recheck the hoist rope tensions. Repeat the procedure if necessary.

If the installation is roped 2:1 or greater the rope tension gauges must be placed on the section of rope that is attached to the rope hitch bolts.

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