

Side Pulling Can be Hazardous: How To Stay Safe When Operating Wire Rope Hoists

In many heavy industries, hoists are a common tool of the trade. When used properly, wire rope hoists on overhead cranes are reliable and safe tools.

Hoists are often improperly used by lifting a load in a manner that is not vertical. This is known as side pulling, or side loading, and can create an unsafe condition for an operator. Improper use of a hoist due to side pulling poses a significant risk to operators and jeopardizes the reliability and uptime of the hoist. Injuries from side load events have resulted in serious injury and even death.

A majority of crane mounted hoists are not equipped with side pull protection. To increase crane safety and productivity, **Laser-View Technologies** offers a range of Crane Sentry® products that address this hazard on new and existing hoists.

THE DEFINITION OF SIDE PULL

A side pull event exists when a standard hoist is used in a manner other than a vertical lift. Lifting or placing a load that is not plumb with the hoist is referred to as a side pull. Side pulling in the overhead lifting industry also referred to as “side loading” or “hook centering”.

Side pulling in any direction poses a safety risk as the load swings to equalize balance.

In terms of damage to standard duty hoists and the resulting loss of production, side pulling can produce more severe results. The damage depends on the orientation of the side pull relative to the hoist body.

It is important to make the distinction between side load ratings and load capacity. All hoists are rated for a maximum load capacity and many have some form of overload indication. However, very few hoists include side pull detection as standard equipment.

Side pulling is prohibited by OSHA regulations and is not recommended by most standard hoist manufacturers. This also defies industry standards, such as ASME B30.16.

If side pulling is inherently unsafe and can cause severe hoist damage, why would an operator intentionally side pull a hoist?

Reasons for side pulling include:

- ⌚ The operator has limited access to orient the hoist as a vertical lift
- ⌚ Convenience and speed of using a hoist before fully centering then hoist over the load
- ⌚ Unbalanced load or load shift under special lifts
- ⌚ Inexperienced operator

We've found that people tend to side pull more frequently in certain applications:

- ⌚ Tandem hoist/crane picks
- ⌚ Pulling materials from a furnace
- ⌚ Unbalanced under hook lifting device lifted by 2 hoists
- ⌚ Die changing/flipping operation
- ⌚ Inserting liners into tank shells

Side pull can occur with any hoist mounted to a variety of cranes:

- ⌚ Overhead crane (top or bottom running)
- ⌚ Jib crane
- ⌚ Gantry crane
- ⌚ Boom/telescoping extension crane

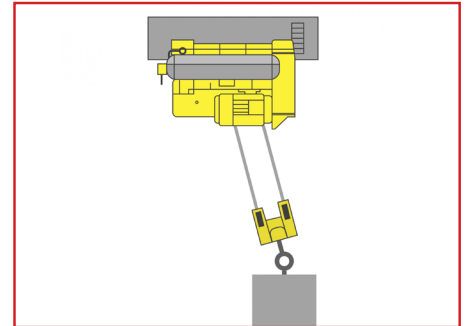
It is possible to side pull in 2-axes (East-West, North-South). For the sake of discussion, we'll use a reference to a wire rope hoist to define each axis. A wire rope hoist can be side pulled “with the drum” or “against the drum”. Against the drum typically can have more compounded implications, but both pose safety risks.

SIDE PULLING

Safety Risks

We'll consider how side pulling affects safety in 3 categories:

- ➔ Personnel injury from a load shift or load swing
- ➔ Damage to the hoist, resulting in unsafe equipment condition
- ➔ Damage to equipment nearby as a result of load swing, which can also result in an unsafe personnel condition



LOAD SWING

When an operator does not center the hoist over the load prior to lifting, gravity will take over once the load has been lifted from its resting place. The load will naturally swing to find its natural level position. This swing can be rather forceful and fast.

Cases have been documented in which operators lifting heavy dies have been pinned against a wall or column by a load swing. Operators have also been swept off their feet and pulled under a swinging load. A load swing can damage another piece of equipment nearby, rendering additional safety issues.

DAMAGE TO HOIST

Side pulling often results in damage to a wire rope hoist. The damage could be minor, resulting in the need for an inspection. In some cases it could be major, resulting in the replacement of costly parts such as the rope guide or a wire rope change. Damage to the hoist itself can trigger a safety risk by compromising the hoist's lifting capability.

Wire rope hoists are widely used, especially under high load capacity in mills and processing centers. An explanation of why a wire rope hoist is more susceptible may shed light on the importance of side pull detection.

Wire rope hoists are either of the single reeved or double reeved type. The drum of the wire rope hoist is machined with grooves, known as drum lands, in which the wire rope rests during winding/unwinding or lifting/lowering. Many of the hoists currently on the market have partial depth drum lands and utilize a rope guide over the wire rope to keep the wire rope in the lands. In the case of engineered hoists, they often include full depth drum lands, so there is no need for a rope guide. Due to these lands, side pulling against the drum or across the lands is much more problematic than with the drum or in the same direction as the winding action.

When side pulling is excessive, the wire rope wants to pull out of and across the drum lands. This will often time break the rope guide. Once the rope guide is damaged, it can no longer do its job of keeping the wire rope in the land. The winding and unwinding are not controlled and the wire rope may not fall back into the land and will get knotted.

With a full-depth land, side pulling puts the wire rope in contact with the sharp upper edge of the machined drum land and will prematurely wear the wire rope, damaging strands of wire in the twisted braid. Both conditions stated above may result in a loss of hoist control and limit the load capacity of the wire rope. This is a dangerous condition because the operator may not know that the wire rope has been compromised. The only way to resolve this issue is to take the hoist out of service and have an inspection performed.

SIDE PULLING

Methods of Detecting Side Pull

WIRE ROPE HOIST

Our Crane Sentry® Hoist Side Pull detection can be installed on new hoists and retrofitted to existing hoists in any of these 3 categories:

- ③ Single reeved hoist (includes a dead end or fixed end of the wire rope)
- ③ Dual reeved with an equalizer sheave
- ③ Dual reeved with an equalizer bar

Although mounting to the wire rope is a necessity, this method is referred to as non-contact because the sensing principle does not rely on physical contact to activate the sensor. A common method of non-contact side pull detection is to monitor the angle of the wire rope.

Laser-View Technologies' Crane Sentry® sensor is compact in size and light-weight. It can be mounted to the dead end of the wire rope, to the side of the equalize sheave, or to the dead end of the rope on the equalizer bar.

This sensor is a 2-axes sensor and there are no moving parts to wear or adjust. The control package is mounted on the hoist body itself. The control package evaluates the sensor's signal and provides the control algorithm and the relay output as the alarm that can also be used to alert an operator or disable the hoist.

One of the key benefits of our detection system is that you can monitor for a 2-axes omnidirectional condition. Omnidirectional means that a side pull in any combination of the X or Y axis can be detected.

To further the capabilities of our side pull detection, we now offer new Adaptive Hoist Sensing™ as a weighted set-point option. This innovation aids productivity by allowing more side load with the drum than against the drum and in a way that permits an operator from transitioning between the 2 orientations without hampering hoist operation. This adds to the layer of safety that a side pull detector provides.



Important Key characteristics to consider:

- ③ **Know the angle:** This is not an absolute requirement, but a nice feature to have so that you see the actual angle of a side pull at when you set the limits for the first time.
- ③ **Zero feature:** The sensor on a wire rope hoist will never sit perfectly plumb. You need to be able to zero out the sensor.
- ③ **Set alarm limits:** The ability to set alarm limits is crucial.
- ③ **Alarm output:** The ability to enable/disable a hoist motion via a relay contact is a must. The ability to also provide an audible or visual indication to operators is important so that they understand and learn from their mistakes.
- ③ **Dual axes capability:** Side pulling is just as dangerous in both axes, so the ability to measure 2-axes is important for personnel safety. Omnidirectional side pull detection is best.

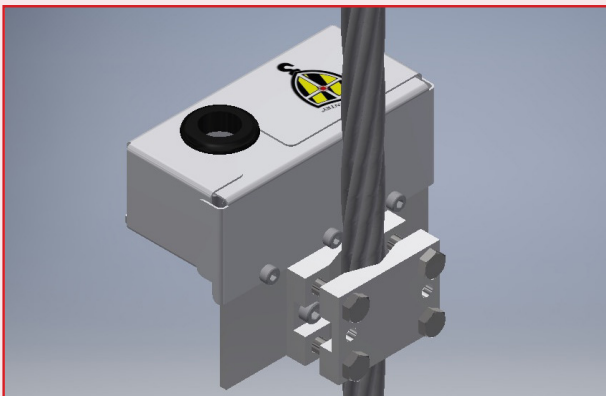
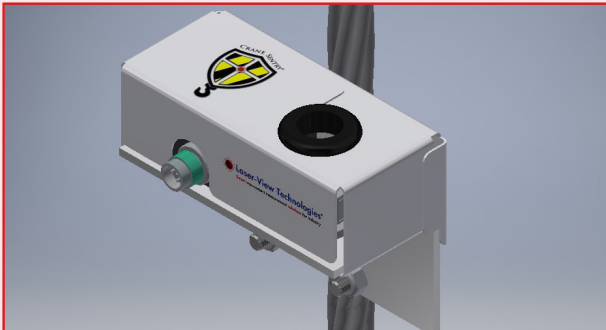
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Methods of Detecting Side Pull

RESULTS OF SIDE PULL DETECTION

When you invest in side pull detection for a hoist, you are doing this to minimize the possibility of an accident and minimize the frequency of repairs and related down-time. You should have several expectations:

- ⌚ Limit the ability to operate hoist in a side pull condition.
- ⌚ Adjust operator behavior and awareness via audible or visual indicators so that they do not intentionally side pull.
- ⌚ Promote the modification of production processes in line with safe hoist practices. When a side pull detector disables a hoist too frequently and starts affecting production, this provides an opportunity to adjust production processes to minimize the need to side pull.



SIDE PULLING

Conclusion

Side pulling is a common practice. However, this is also a well-known cause of damage to hoists and injury to personnel, sometimes resulting in death. OSHA prohibits the practice of using cranes and hoists to pull or drag a load sideways and hoist manufacturers do not rate their standard hoists for side pull either. Crane Sentry® Hoist Side Pull can be retrofitted to existing hoists or supplied on new equipment and is valuable for stopping a side pull condition and helping operators change their behavior to avoid this improper usage of hoists.