



Planning Advisory Notice

Capstan Hoists

Capstan hoists, often referred to as "catheads," make back-breaking work faster, easier and more productive. They are used for many applications in multiple industries including telecommunications, electric utility, elevator construction and repair, and others. The increased use in the telecommunication market in the last several years presents different applications of the hoist and its mounting devices. Regardless of the application, the safe use of the Capstan should always be the top priority.

A shortcut or misapplication of any type of equipment can cause damage, injury or worse, and this is very true when it comes to any type of hoisting equipment.

Care should be taken in selecting the type of hoisting system used. While Capstan hoists are very economical, they are not suitable for lifting all types of loads, such as lifting personnel or loads that exceed the equipment ratings. **Capstan hoists should never be used to lift personnel.** Employers should use good judgment when selecting the hoisting systems for different applications. The selection of the proper hoisting system is essential to avoid an accident. Although the Capstan hoist may be capable of lifting a load, it may not be the appropriate solution if the rope is vulnerable to cutting/damage and/or if the load cannot be controlled properly during the lift. Also, a Capstan hoist should not be used if safe mounting and operation of the Capstan hoist are not achievable. In these instances a safe alternative should be used such as a skid mounted hoist, crane, helicopter or other method.

Proper Mounting and Rigging

Proper mounting and rigging for a job are extremely important. Proper rigging makes a job easier and provides the crews with the mechanical advantages to do things that otherwise would not be possible. Improper rigging can impact the structure and the safety on the job site. This is why it is critical to understand the Scope of Work (SOW) and how the use of a Capstan can provide a means to make changes to the structure or the system on the site in a safe manner. The crew

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must examine each job to determine the equipment required and the possible location(s) for each piece of equipment. Several options may be available. A competent person shall apply careful thought to choose the safest arrangement possible. As with any project involving lifting of loads, a competent person must analyze the forces, direction of those forces, and consider what can happen in the event that there is a failure of a component of the rigging system. This allows the competent person to ensure the proper rope, blocks, Capstan hoist, and rigging are used to minimize risks.

When evaluating a possible mounting location for a Capstan hoist, a competent person should be aware of the structural capacity of the member and the manufacturer's recommended mounting procedures. The manufacturer's recommended attachments should be used for the intended application such as a truck mount, or tower leg of different structural shapes and materials, etc. When mounting to a tower, mount the bracket so the load pulls the bracket against, instead of away from, the tower. It is also better to pull in a direction that is "in line" with a tower leg rather than a direction that will try to turn the hoist and bracket "around" the tower leg. A mounting location should not be used until it has been deemed adequate by a competent person. **Under no circumstances should a mounting location be used if a competent person determines that location to be unsafe.** In the event that a less than ideal mounting location must be used, the competent person should determine if the job can be completed safely by increasing the factor of safety utilized (e.g. to address the possibility of the bracket shifting), or consult a qualified engineer.

When steering clear of potential dangers, the proper choice of hoist, bracket, clamping method, rope, blocks, slings, gins, and other equipment and methods should be considered. As an example, if a single sheave rope block is used to lift an antenna assembly weighing 400 lb., it must be rated for 880 lb. minimum. Why? The 400 lb. load is pulling down on the block from one side. At the same time the hoist has to pull 400 lb. from the other side to lift the load. So the 400 lb. load plus the 400 lb. pull from the hoist equals an 800 lb. downward load on the block. Friction will add additional load on the block and must be taken into account also. A rule of thumb for friction is 10 percent of the load, so in this case the total rating of 880 lb. is needed. The same is true for a gin or sling used to support the block.

Before every job, a competent person shall thoroughly inspect the worksite and equipment to spot dangers. The Capstan hoist should be inspected for proper

function and checked for damaged or missing parts. The load ratings for all equipment should be verified for compatibility and to meet job requirements. A malfunctioning, damaged, or underrated hoist should never be used.

When mounting the Capstan hoist, verify the tower, truck or other mounting structure can withstand the forces the Capstan will apply. If required, verify the rigging plan in accordance with TIA-1019-A may be required to ensure the tower will not be adversely impacted by the mounting and operation of the Capstan hoist. Caution should be used when dealing with smooth or tapered tower legs. In the event that tower legs are utilized, the following points must be addressed:

1. Will the tower leg be damaged by the mount or the loads induced?
2. Is the mount proper for the type of tower leg?
3. Is the mount located near a brace and not near the center of a tower leg span?
4. Is the rigging system going to create loads that will cause the Capstan mounting system to pivot?
5. Is there a clear working area for the hoist operator?
6. In the event of a tapered leg how will the rigging system prevent the movement of the Capstan hoist?
7. Other issues that could affect the rigging system.

The integrity of the entire system is critical for safety. This requires a competent person with the proper training and education to ensure that the SOW can be completed in the safest manner. As with any type of hoist, always follow the manufacturer's instructions



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for installing the bracket and mounting the hoist on the truck, tower, or other structure to be used. Use only the manufacturer's approved accessories. Approved accessories will be the equipment the manufacturer has tested and rated. These ratings are critical as they allow the competent person to view the rigging system as a whole with known variables. Always mount the hoist to the proper bracket using the manufacturer's high strength bolts and fasteners supplied with each hoist. If fasteners are damaged or missing, replace them with the same type and grade designation. The fasteners must be tightened evenly to the proper torque, in accordance with the manufacturer's recommendations, to insure "load sharing" by all the fasteners.

Align the Capstan drum so the rope will feed perpendicular to the drum axis and onto the large radius of the drum near the motor end. A swivel mount base helps keep the rope perpendicular to the drum without having to reposition the truck. This allows rope to feed smoothly across the drum as the load is moved. Always ensure the proper inspection of the rope prior to use. Do not allow the load line to rub on the pole



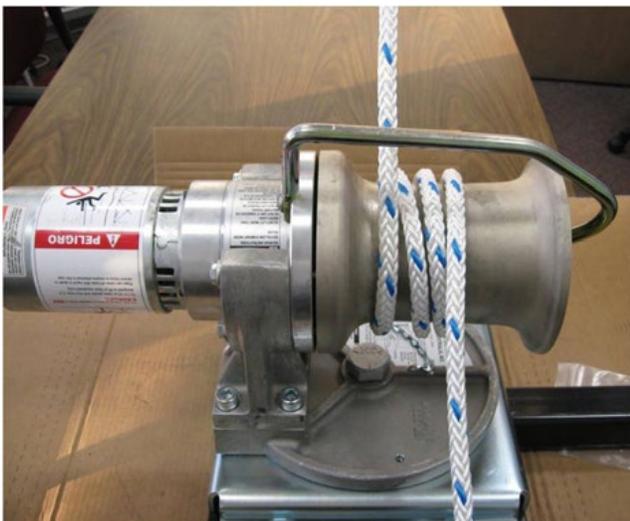
This Capstan hoist is incorrectly mounted. The drum should be over the swivel base.

or other objects as this will degrade the rope. Be sure to retighten the chain binders after initial loading to compensate for "seating" of the chain and bracket on the structure.

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For a truck mounted swivel bracket application, the Capstan drum must be oriented so that the load line will be centered over the bolt that allows the mounting base to swivel. Incorrect mounting orientations will increase the load on the swivel base and may lead to equipment failure.



Proper number of wraps of rope around the drum is critical.

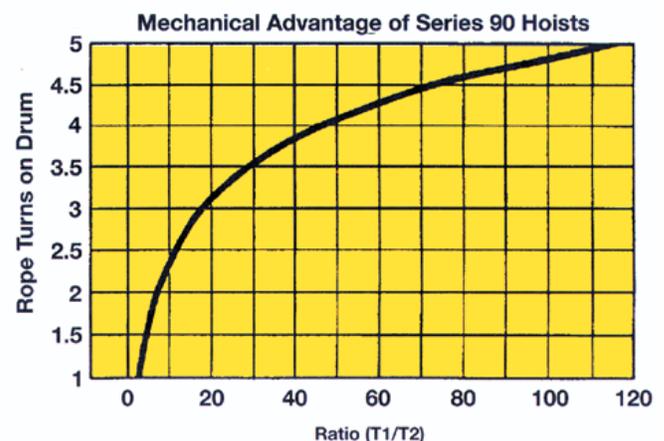
The rope to be used over a Capstan drum needs three things: adequate working load, good frictional characteristics; and a high temperature melting point. As rope goes around a Capstan drum, it must slip a small amount to advance across the drum. This creates friction which causes the drum to heat. If the drum is allowed to rotate without advancing the rope, heat builds up quickly and melts plastic ropes.

Allowing the drum to turn without advancing the rope is a dangerous condition as the melted rope may break or "weld" to the drum which will then wrap up the rope like a winch. A half inch composite fiber braided rope is recommended as it has low stretch characteristics and excellent gripping power on a Capstan.

The proper number of wraps of rope around the drum is critical. Never add or remove turns of rope while a load is suspended. Use the same number of turns to lower a load as is required to raise the load. And, never use so many turns of rope that no pull is required on the fall line to activate the load.

If any of the above rules are broken, the operator could lose control, or drop the load.

The pulling rope should be wrapped around the drum in the same direction as the rotation of the drum starting with the load line nearest the motor end of the drum. The number of turns of rope around the drum is determined by the load to be lifted. The chart below illustrates the advantage of the hoist based on the number of turns of rope on the drum. On the left-side find 3.5 turns, follow the horizontal line to the graphed line, then vertically down to the bottom which falls at 30. This means for every pound of pull on the fall line, the hoist applies 30 lb. to the load line. Thus, a 600 lb. load can be lifted with 20 lb. pull on the fall line using 3.5 turns of rope on the drum. Select the number of turns which will allow control of the load with 20 to 40 lb. pull on the fall line.



Proper Operation

Lifting the load or pulling cable is a simple matter of starting the hoist by stepping on the foot control and applying pull to the fall line. Continue a steady pull, hand over hand, to complete the lift. When the load

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is near the final point, slow down on the fall line pull to ease the load into position. With minimal practice, the operator can place the load within a fraction of an inch. Once the load is in place, lifting the foot from the control stops the hoist.

Never overload the hoist. Unlike a block and tackle, when operating a Capstan, **the operator cannot feel the weight.** This makes it nearly effortless for the operator. Because of this, the operator must know what the load on the Capstan will be before starting the job.

Capstan hoists are for lifting equipment only. Employers should ensure that hoisting equipment used to lift personnel is designed to prevent uncontrolled descent and is properly rated for the intended use. See OSHA Compliance directive CPL 02-01-056. **Capstan hoists are not designed to lift personnel.**



The Capstan hoist should be located between the operator and the load so the operator can maintain visual contact with both the Capstan load line and the material or equipment being lifted. However, if the hoist operator cannot be located in a position to view the load being moved, then communication with a second worker watching the load is necessary. Proper communication and signals must be used between crew members when lifting is occurring.

Never operate a Capstan hoist without the foot control. The Capstan hoist is started and stopped by a foot operated control. Stepping on the control starts the drum turning and releasing pressure on the control stops the hoist. As with any type of equipment the motor should be monitored for excessive heat.

The rope hook is a safety feature designed to capture the rope and hold the load in the event the rope



Rope hook

accidentally comes off the end of the drum due to improper use. It is installed with a tamper proof style bolt to prevent removal. The fall line should be positioned so it will not pull over the end of the drum, but should this happen the hook catches the rope. Should this happen, stop the hoist, secure the load and correct the rope position on the drum.

Never remove the rope hook. Removal can cause personnel injury or allow rope to feed off the end of the drum which could result in dropping the load.



Rope lock device installed

An optional rope lock attachment is a convenience feature that allows the operator to temporarily hold a load in position without having to tie knots or hold the rope. The rope lock device should not be used to park a load for an extended period of time. With the fall line

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fed through the rope lock, the device automatically grips the rope to hold the load whenever the operator stops pulling.

The anti-reversing brake is another safety feature that keeps the drum from turning backwards. This allows the load to be held in position by holding the fall line. If the load needs to be lowered, simply allow the rope to slip back around the drum slowly, allowing the operator to lower the load safely and in full control.

Training

As with any piece of equipment, safe and effective operation depends on the proper training of personnel. Each operator should be properly trained by their employer. To assist the employer, equipment manufacturers or their representatives may also have training available.

Always take the time to understand the job at hand, the equipment being used, and the procedures required to perform the task. Every Capstan comes with an instruction booklet and a label on the hoist. Safety literature and product advisories may also be available. Read these documents carefully and be sure the operator understands all the warnings before using the product.

A Capstan hoist is a versatile tool for lifting, or pulling heavy loads. A few minutes of thought and preparation will make your lifting jobs safe and efficient.

Note: The OSHA definition of competent person should be considered similar to the TIA-1019-A definition of qualified person. ■