

25—Hoisting Apparatus and Conveyors

6 Job briefing and followup on training are essential for safe operation.

Crabs and winches

Crabs and winches (Fig 25-22) may be either hand operated or electrically driven. Some form of brake or safety lowering device should be installed, and portable units should be anchored securely against the pull of the hoisting rope or chain.

Barricade guards should be installed to protect the operator against flying strands of wire and the recoil of broken cables.

The locking pawl on the ratchet of a winch frequently presents a serious finger hazard, particularly when the operator attempts to disengage it. To reduce this hazard, a small lever can be welded to the pawl so that it can be grasped safely.

A major danger with hand-operated equipment (that has a crank handle instead of a hand wheel) is that the operator may be struck by the revolving crank handle, if he loses control while lowering a load. A dog should be provided to lock the gears.

To lower loads rapidly, a strap brake is practicable. Before using the brake, the crank should be removed, or other steps taken, to prevent the crank handle from flying around, such as replacing a spur gear and dog with a worm gear.

A pin through the end of a crank will keep it in the socket during hoisting operations.

Be sure gears are fully guarded. Power-driven crabs and winches should have their

moving parts encased and should be electrically grounded.

Blocks and tackles

A factor of safety of 10 is recommended for determining the safe working load of manila rope falls in a block and tackle assembly. The purpose of this large safety factor is to allow for error in estimating the weight of the load, for vibration or shock in handling the load on the tackle, for loss of strength at knots and bends, and for deterioration of the rope due to wear (if it has been in service more than six months) or other causes.

The governing value usually is the safe working load limit of the blocks, rather than of the falls (rope). The reason is that multiplying the number of sheaves and rope parts multiplies the weight of the load that can be handled by the rope, but does not correspondingly increase the strength of the blocks. Calculation will show that, in most instances, using a safety factor of 10 for the rope will automatically keep the load on blocks corresponding to the rope size within safe working load limits.

Blocks should be plainly marked with their safe working loads, as specified by their manufacturers, and the total weight on the tackle never should exceed this.

Breaking strengths of fiber ropes are shown in Chapter 26, "Ropes, Chains, and Slings." Safe working loads for rope used in block and tackle assemblies are conversely $1/10$ of the block's breaking strength, based on a safety factor of 10 as before.

For new rope, to find the required breaking strength, proceed as follows. For each sheave 3 in. in diameter or larger, add 10 percent to the weight of the load to compensate for friction loss. Divide this figure by the number of ropes or parts running from the movable block, and multiply the resultant figure by a safety factor of 10.

For example, a load to be lifted weighs 2000 pounds and the tackle consists of two double blocks—four sheaves, four rope parts at the movable block. Friction loss (10 percent for each sheave) = 40 percent, or 800 pounds, $2000 + 800 = 2800$ pounds, which divided by 4 (the number of parts at the movable block) = 700. Applying the safety factor of 10 (10×700) gives 7000 pounds,

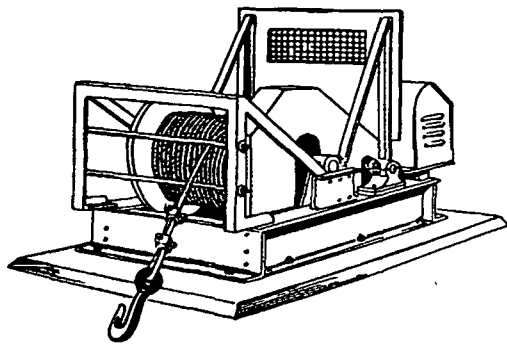


FIG 25-22—Operator of this car puller winch stands behind the shield, which protects him if the rope breaks.