Crane Best Practices in Tree Removal Hoisting a Qualified Arborist

By Mark Adams

Many tree companies today either own or rent cranes for use in removing trees. As cranes become more and more common in the tree care industry, owners and users often have questions about the regulations, setup, operation, techniques and maintenance involved with using cranes for tree removal. Two of the most common questions that arise are, "Are climbers allowed to ride the crane to access the tree?" and, "If the climber can ride the crane, what are the best ways to do this?"

This article will focus on two things: First, it will comment on the American National Standards Institute (ANSI) standards that guide the arborist industry for the use of cranes in tree removal and how those standards relate to the Occupational Safety and Health Administration (OSHA); second, it will discuss the particular issue of the climber using the crane to access and/or work in a tree that is being removed.

OSHA or ANSI?

The majority of workplaces in the United States are covered by the Occupational Safety and Health Act (OSH Act) of 1970. For many industries there are specific standards within the OSH Act that govern workplace practices, procedures and equipment. For other industries there is no specific standard within the OSH Act, but those industries are still required to abide by what is commonly called the General Duty Clause. The General Duty Clause states that each employer must:

"...furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees."

The tree care industry is one of the industries for which there is no specific OSHA standard. To identify 'recognized hazards,' OSHA will typically look to industry consensus standards and for the tree care industry; those consensus standards are the ANSI Z133.1-2006. Through this rather circuitous route arborists are bound to follow the ANSI Z133.1-2006. State, local or company regulations may be stricter than ANSI Z133.1-2006 and, if so, they supersede the ANSI Z133.1-2006.

Before focusing on ANSI Z133.1-2006, it should be noted that there is an OSHA standard for using cranes on construction sites, and there are other ANSI standards for cranes in various industries and applications. Employers should be aware of these other standards so that if their company is cited by OSHA for violating a standard that does not pertain to the tree industry, the employer can respond with knowledge of the subject matter. Employers should also be aware that they must follow all of the ANSI Z133.1-2006. A company cannot claim to be following ANSI by allowing its employees to ride the crane to access the tree, but not enforce other ANSI requirements such as wearing proper personal protective equipment and using approved climbing gear.

Hoisting a climber with a crane: Understanding the text

ANSI Z133.1-2006 does allow arborists to attach themselves to the crane in order to access the tree. Section 5.7 is titled "Log Loaders, Knucklebooms, Cranes and Related Hoists" and addresses the general use of these pieces of equipment. Section 5.7.9 focuses on using a crane to lift and position the climber. Section 5.7.9 states:

"A qualified arborist may be hoisted into position utilizing a crane if the arborist is tied in with an arborist climbing line and arborist saddle and secured to a designated anchor point on the boom or line. The following procedures shall be followed when an arborist is to be lifted by a crane..."

The term "qualified arborist" is used because it specifies that the arborist must have the experience, skills, knowledge, and equipment to perform the work. The qualified arborist must be tied-in with a climbing line and saddle that meet the specifications stated in other parts of the ANSI Z133.1. The tie-in point on the crane has to be on the crane's boom or line (cable). The arborist may not tie-in to the hook (Fig. A). The hook appears to be the easiest place to attach the line, but there are

Fig. A: ***According to ANSI Z133.1-2006, a qualified arborist may tie-in to the crane's boom or load line (cable), but not the hook. (State, regional, or local regulations may be different, e.g. Cal-OSHA requires that the tree worker be secured to an independent line attached above the crane's hook and be "...secured to a crane's hook that shall be closed with a positive locking device".)***

several reasons that this should not be done. The latching mechanism on the hook is spring loaded and sometimes that spring is broken or the latch may not work for other reasons. Even if the latch does work, it is very easy for the arborist's line to 'roll out' of the hook because of the large mouth opening. Cranes are often used in applications that use chains and/or wire rope on the hook and these can create burs that would damage a running climbing line. Finally, it is easier to place the choker on the hook if the climbing line has a separate, secure connection – there is no chance of the climbing line becoming pinched by or entangled with the choker(s) and the climbing line does not have to be moved in order to place the choker(s) on the hook. (Note: State OSHA in California requires that the climber has an independent line attached above the crane hook and that the climber be secured to the crane's hook, which must have a positive-locking device. There may be other state or local differences and it is up to the reader to research and adhere to pertinent standards.)

There are 12 subsections under ANSI Z133.1 section 5.7.9 that prescribe the procedures and equipment that must be used when an arborist is lifted by a crane. All of these are important and all should be read and adhered to. Because of the limited space available here, however, this article

will address only two of those subsections: 5.7.9.3 and 5.7.9.11. Section 5.7.9.3 reads:

"The arborist climbing line shall be secured to the crane in such a way that it does not interfere with the function of any damage-prevention or warning device on the crane and so that no part of the crane compromises the climbing line or any part of the climbing system."

Simply put, this means that the climbing system must not interfere with or damage any part of the operation of the crane, and the crane must not interfere with or damage any part of the climbing system. The initial connection to the crane is where the climbing system is most likely to encounter burs, grease, pinch points or other hazards that might compromise the safety of the climber. There must be a smooth, safe transition from the heavy rigging of the crane to the running climbing line of the arborist. There are several ways that this can be accomplished.

Techniques for tying to the crane

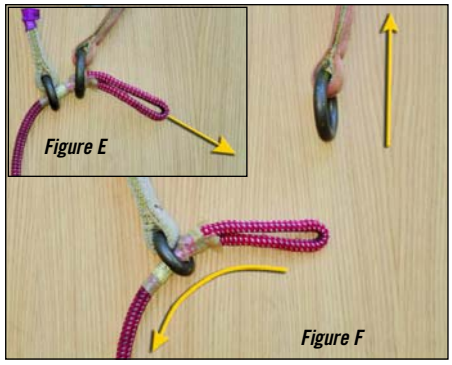
Downey Trees, Inc. outside of Atlanta, Georgia, uses a fairly simple, but effective system. A shackle is placed on the load line of the crane, just above the ball, and a sturdy weather-proof wire is used to secure the pin of the shackle (Fig. B). A false crotch is placed through the shackle and the climbing line is placed through the false crotch (Fig. C). In this setup, the initial connection to the crane is made with a rated shackle that is used only for climbing. The connection to the shackle is made with the false crotch because the false crotch does not run over the rough metal of the shackle, and because the heavy webbing of the false crotch stands up well to wear on the shackle. There is inevitably some contact with and movement against the ball, but this, too, is absorbed by the heavy webbing of the false crotch. Because the climbing line runs through standard false crotch rings, the wear on the rope and the friction experienced by the climber is exactly the same as they would be in a tree. Both the false crotch and the shackle are closely inspected each time the climber is lifted. The false crotch is removed at the end of each day, but the shackle is left in place on the cable.

Fig. B: ***One option to attach the climber to the crane is to place a shackle on the cable above the ball, secure the pin of the shackle with a piece of sturdy, weather-proof wire …***

Fig C: ***…and place a false crotch through the shackle.***

When a climbing line is threaded through a false crotch in a tree, the line should go through the small ring first, then through the big ring. Here the line is threaded the opposite way – when the climbing line is placed in the false crotch on the crane, the climbing line is threaded through the big ring first, then through the small ring (Fig. D). (In the photo the climbing line runs from left to right because it is set up for a left handed climber. Most left handed climbers run their line from left to right, and most right handed climbers run the line from right to left. But, the point here is that the line goes through the big ring first, regardless of whether the line runs from left-to-right or from right-to-left). The reason for this is that a large eye splice (such as The Fly shown in the photo) or an eye splice with a twist in it will sometimes catch on the small ring and require a good solid tug to get the rope out. If the rope is threaded through the small ring first, then through the big ring when the

Fig. D: ***The climbing line is threaded through the big ring first, then through the small ring—this is the opposite of the way that the rope is threaded when a false crotch is used in a tree.***



rope is installed (Fig. E), then the rope will exit through the big ring first, then through the small ring when the rope is retrieved. If the rope catches on the small ring (Fig. F) the rope could pull the false crotch up to and even through the shackle. By threading the rope through the big ring first then through the small ring when installed, the rope will exit through the small ring first, then through the big ring when retrieved. If the rope catches on the small ring, the small ring will just hit the big ring, allowing the climber to pull until the rope passes through the false crotch.

Figs. E&F: *When the rope is threaded through the small ring first, then through the big ring when the line is installed, then the rope will exit through the big ring first, then through the small ring when the rope is retrieved. If the rope catches on the small ring, the rope could pull the false crotch up to and even through the shackle.*

Another way to solve this problem is shown in Fig. G (this idea was shown to me by Todd Kramer of Kramer Tree Specialists in Chicago). A rated carabiner (one that is self-closing and self-locking, with a minimum tensile strength of 5,000 pounds) is placed in the false crotch right next to the small ring (Fig. H). The climbing line is threaded through the big ring and the carabiner, but not through the small ring. In this setup, the rope can go through either the big ring first or through the carabiner first. The carabiner acts as the second ring, and, because the carabiner has a large opening, even a large splice will pass through it with ease.

Fig. G: *Another way to thread the climbing line is to place a rated carabiner (one which is self-closing and self-locking, with a minimum tensile strength of 5,000 pounds) in the false crotch right next to the small ring (photo courtesy of Todd Kramer, Kramer Tree Specialists).*

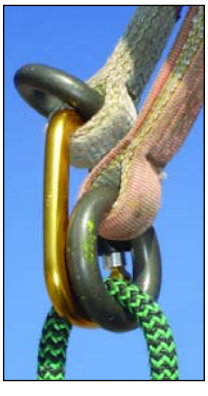


Figure H - The climbing line is threaded only through the big ring and the carabiner (not through the small ring). Because the carabiner has a large opening the rope may go through either the big ring first or through the carabiner first.

Fig. I: *Another tie-in option is to place a large (here a 17 ton) shackle above the ball and thread a false crotch through the shackle. A carabiner is placed in the eye of the pin of the shackle and around both legs of the false crotch (photo courtesy of Norm Hall, The Care of Trees).*

Another way to attach the climbing line to the crane is shown in Fig. I (this idea and photo courtesy Norm Hall, The Care of Trees, Chicago). A large (here, a 17 ton) shackle is placed immediately above the ball and a false crotch is threaded through the shackle. A carabiner is then placed through the eye of the pin of the shackle and around both legs of the false crotch. The carabiner helps hold the false crotch when the climbing line is retrieved, and prevents the pin of the shackle from coming undone.

Both of these methods are acceptable ways to attach the arborist's climbing to the crane. Points to remember are:

1) The hardware that is used for the initial connection to the cable should be sturdy enough to withstand the grease, burs, and possible pinching and twisting that could be created by the cable, the ball and the clevis. A typical carabiner should not be used and a friction-saver should not be placed directly on the cable or in the clevis.
2) The next link in the system should be sturdy enough to withstand the constant friction with the first connector, and sturdy enough to withstand frequent or constant rubbing against the ball. Lightweight nylon or Dyneema rigging slings should not be used.
3) The climbing line should run on a smooth, clean surface and should be clear of pinch points, grease and dirt.
4) The climbing line should be clear of the hook and all of the rigging.

Fig. K: *A climber has used the tie-in point on the crane to set two chokers on this partially broken, hanging tree top, descended to the break, and is positioning himself to prepare to make the cut (the climbing line will be removed from the crane before the cut is made; photo courtesy of Kramer Tree Specialists).*

Ways to work when hoisted into position

The term "hoisted into position" (ANSI Z133.1 2006 5.7.9) is usually understood to mean that the crane is used to place the climber in the tree at the beginning of the job so that the climber does not have to climb the tree with their rope and spikes . Using the crane to place the climber is faster, safer and less fatiguing to the climber. But, the qualified arborist may be "hoisted into position" for other types of work as well. In (Fig. K), the climber attached himself to the crane using one of the methods described above, was then hoisted into position above a large, broken top of a tree, set two chokers on the broken piece, and is shown descending into position to make the cut (the climbing line will be removed from the crane before the cut is made.

Fig. L: *A climber with a difficult tie-in point has placed the end of his climbing line in the false crotch on the crane, essentially double-crotching with the tie-in point in the tree, and the tie-in point on the crane, in order to make the return limb walk easier.*

In Fig. L, the climber is removing a tree that does not have a good tie-in point for working all of the branches. The climber has walked out on a limb, set a choker, and is shown using the end of his climbing line in the

false crotch as a second tie-in point in order to facilitate his return, essentially double-crotching with the tie-in point in the tree and the tie-in point on the crane.

In Fig. M, the climber has set a choker on the top of the spar and descended to the point where he will make his next cut. The photo shows the climber positioning himself at a large branch union, something that would be much more difficult if he were descending on just his spikes and a lanyard.

Fig. M: *This climber has set a choker on the top of the spar and descended to the point where he will make his next cut. He is positioning himself at a large branch union, something that would be much more difficult if he were descending on just his spikes and a lanyard.*

In Fig. N(1), the climber is cutting a piece from a large spar. He has remained tied to the crane while he begins his cut so that he can more easily work around the spar as he makes the cut. In Fig. N(2), he has removed his climbing line from the crane and now has both attachment points (a lanyard and his climbing line) on the spar.

In all of the previous examples the climber was tied-in to the tree and the crane was used to lift, remove and lower the pieces as they were cut. There are times, however, when it is not safe to tie-in to the tree that is being removed and the climber needs to find another place to set the climbing line. For these situations, it is common to use an adjacent tree or a bucket truck to access the tree that is being removed. For trees that cannot be accessed by either of these methods, a crane can be used as the tie-in point for the climber.

Fig. N1: *This climber has remained tied to the crane while he begins his cut on a large spar so that he can more easily work around the spar as he makes the cut, and then ...*

Fig. N2: *... removes the climbing line from the crane before finishing the cut. The climber places the climbing line on the spar so he still has two attachment points (a lanyard and his climbing line) when using the chain saw.*

In Fig. O (next page), the tree that is being removed had a large, open crack and a 35-degree lean. The tree could not be accessed by using any of the surrounding trees and was too tall to use a bucket truck. A crane could be driven up to the tree and the boom placed over the canopy, but there was not any room to maneuver the boom once the piece was cut. The photo shows the climber using the crane as a tie-in point while he is rigging the tree using ropes, a block and a friction device. If the tree had failed, the climber was safely suspended from the cable of the crane. This photo also shows that the crane tie-in does not interfere with the crane's anti-two-block (ATB) system at the tip of the boom.

Riding the crane with a load attached

There are also instances when it is not safe for the climber to tie-in to the tree, and the tree is judged to be too unstable to withstand the forces involved with roping and rigging. In exceptional cases, ANSI Z133.1- 2006 section 5.7.9.11 does allow for a qualified arborist to be attached to the crane while the crane is under load:

"When it has been determined that all reasonably possible alternate methods are inaccessible and attachment to the subject tree would create a greater safety risk due to its hazardous condition, the qualified crane operator and the qualified arborist shall allow the qualified arborist to remain attached to the crane when it is under load.

Fig. O: ***A climber using the crane as a tie-in point while he is rigging the tree using ropes, a block, and a friction device. If the tree had failed, the climber was safely suspended from the cable of the crane. Note that the anti-two-block system is unaffected by the tie-in system.***

Possible alternate methods include, but are not limited to,

(a) the qualified arborist securing to the tree and detaching from the crane before it comes under load;
(b) using a second crane;
(c) using an aerial lift device;
(d) using an adjacent tree.

There are several different ways to use a crane with the climber attached and the crane under load. One example is shown in Fig. P. The tree that is being removed is leaning over expensive electronic equipment that services a cell phone tower. The tree had been judged to be too dangerous to climb and too fragile to try and dismantle the tree by lowering off of the tree itself. None of the adjacent trees were large enough or close enough to provide any tie-in or rigging points. The tree could not be accessed with a bucket, but it was possible to set up a crane within working distance. There was not room for a second crane. In the photo the climber is shown tied-in to the crane. A block has been tied to the hook of the crane so that the crane acts as both the tie-in point for the climber and the lowering point for the rigging system. A tag line has been tied to the piece so that the piece may be pulled clear of the obstacles below (this removal earned Downey Trees a Grand Award for Excellence in Arboriculture from TCIA).

A climber may also ride the crane with a load attached by attaching the piece to the hook with a choker as it normally would be, and placing the climbing line on the boom of the crane. If this method is used, the crane operator must be very aware of all that is happening because as he moves the boom to lower the piece he will also be moving the climbing line of the arborist in the tree.

The techniques shown in the last two examples were used because there was concern that some part, or all, of the tree might have failed. In situations such as these, it is important that the crane be positioned so that it cannot be damaged by any part of the tree if failure should occur. It is also important for the climber to position him or herself so that neither they nor any part of the climbing system could be caught or pinned if failure should occur.

Figure P - A climber is tied-in to the crane and a block has been tied to the hook of the crane. The crane acts as both the tie-in point for the climber and the lowering point for the rigging system. A tag line has been tied to the piece so that the piece may be pulled clear of the obstacles below

Cranes can make tree removal, faster, safer and more efficient. This article has looked at just one of the many ways that crane removals differ from removals that use ropes, blocks and friction devices. The ANSI Z133.1 2006 provides further safety requirements regarding using cranes for tree removal. Training and instruction for all types of arboricultural practices is available from professional training groups, at industry seminars and trade shows, and through various educational media available from the Tree Care Industry Association and other groups. Please work and climb safely.

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References and Credits

Web sites

OSHA purpose and scope: www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9605

Employer duties: www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=OSHACT&p_id=3359

OSHA assistance for the Tree Care Industry: www.osha.gov/SLTC/treecare/index.html

Tree Care Industry Standards (from OSHA's Web site): www.osha.gov/SLTC/treecare/standards.html

Arborists and the Logging Standard:
www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=INTERPRETATIONS&p_id=25041

The crane standard for the construction industry *(does NOT apply to the tree care industry, butgood to be aware of this in case your company gets incorrectly cited)*:
www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10760

Tree Care Industry Safety and health programs: www.osha.gov/SLTC/treecare/program.html

Discussion Forum: www.treebuz.com

The Cal-OSHA Safety Order 3427 (scroll down to find the correct PDF): www.cal-osha.com/Resources.aspx

Other

ANSI Z.133.1-2006, American National Standard for Tree Care Operations–Safety Requirements, ISA.

"Z133.1 Safety Standard,2006: Using Cranes Safely," by Steve Chisholm, H. Dennis P. Ryan and Peter Gerstenberger, *Arborist News*, volume 15, Number 4, August 2006.

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