What's New in Cabling, Bracing & Guying?

By Michael Roche

New standards for cabling, bracing, and guying trees were approved by the American National Standards Institute (ANSI) in May 2000. Professional arborists should take note of these new standards—not because it makes good bedtime reading—but because if you do read it you will become a better arborist.

Much of the information standardizes common knowledge, such as using eye bolts that go all the way through a limb or lag bolts seated to the full length of their threads. However, other areas of the standard may not be as well known. For instance, only one cable shall be installed into each bolt, and the angle of the bolts must be at the same angle as the cable. No more drilling straight across the limb if one bolt is higher than the other. More about this later. First an overview.

ANSI, which approved the new standards, is a nonprofit organization that works with different professions to help create industry-consensus standards. In essence, a committee made of a group of volunteers from the green industry and the U.S. government worked together to create standards for performing the various tasks in our trade properly. The committee follows ANSI procedures on how to develop standards, write those standards, then submit them to ANSI for approval.

The committee that wrote the standards included people from agencies and organizations, such as the National Arborist Association, International Society of Arboriculture, National Park Service, United States Forest Service, and several of the larger tree care companies. The cabling and bracing standard is the third of a potentially eight-part series and is entitled "Support Systems a. Cabling, Bracing, and Guying."

Existing ANSI standards include ones for tree pruning and fertilization. Future standards will include lightning protection, tree protection (from construction injury), tree growth regulators, pesticide application, and soil amendments. If all of the above is news to you, then you aren't doing yourself, your business or your clients any favors. These standards lay out, in great detail, how you should carry out proper tree work—staring with bid and job specifications.

The support systems standard gives information that many people might not know, so you are not out there "winging it." Frankly, it may help you from doing something, like countersinking washers into the wood, which is just plain wrong. In addition, it might save you from serious liability down the road. If for some reason a cable you installed fails, and there is a lawsuit, you can point out that the system was installed in compliance with ANSI A300 standards, thereby limiting some of your exposure.

The standards can also help when purchasing cabling gear. If you know the diameter of the limbs you are going to cable in the future, you can use the standard's hardware table to decide the size of the materials you will need (see Figure 1). For example, if you know you are going to install cables into limbs 5 inches and 15 inches in diameter, you will need one-quarter inch eye bolts and one-quarter inch common grade cable for the 5-inch limb, and 3/8-inch bolts and 7/16-inch common grade cable for the 15-inch limb.

The ANSI standards also make a good sales tool. Customers often do not understand cabling and bracing. You can show them pictures explaining how you install a cable and charts giving the exact sizes of the materials. If a customer wants more information on bracing, you can show them diagrams of brace alignment. This information may give you the necessary edge in a bid. You can also incorporate written cabling specifications into your estimate so the client can compare exactly what work you plan to do against what your competitor is planning.

Description of standard

The Support System standard starts with a forward. The most important part is that it sets the tone for the use of the standard. One thing that stands out are these three statements in the third paragraph:

1. "Users of this standard must first in-

Figure 1 = Hardware Table (Table A1, A300 Part 3)

Maximum Limb Diameter at point of attachment in inches	**Estimated Load** in pounds	**Lag Hook** diameter in inches	**Eye Bolt** diameter in inches	**Amon nut / Loop nut** Threaded-rod diameter in inches	**Common Grade Cable** (galvanized, 1 x 7) diameter in inches	**Extra High Strength Cable** (1 x 7) diameter in inches	**Aircraft Cable** (galvanized, 7 x 19) diameter in inches
2	100	1/4	1/4	1/4	1/8	3/16	1/8
3.5	200	5/16	1/4	1/4	3/16	3/16	1/8
5	300	3/8	1/4	1/4	1/4	3/16	1/8
8	600	1/2	5/16	5/16	5/16	3/16	3/16
10	900	5/8	3/8	3/8	3/8	1/4	1/4
15	1000	N/A	3/8	3/8	7/16	1/4	1/4
18	1200	N/A	3/8	3/8	1/2	1/4	1/4
20	1400	N/A	1/2	7/16	1/2	5/16	1/4
24	2200	N/A	1/2	1/2	N/A	5/16	3/8
28	3300	N/A	5/8	5/8	N/A	7/16	1/2
30	3700	N/A	N/A	7/8	N/A	7/16	1/2

terpret it's wording." Translation = Yes, you have to read and understand the standard, luckily there are many diagrams that will help you understand what the standard is saying.

2. "Then (users must) apply their knowledge of growth habits of certain plant species in a given environment." Translation = You need to consider the tree(s) your going to work on before trying to use the standard to write a work specification. You can't just write generic work specifications and keep using them over and over again.

3. "The users ultimately develops their own specification for plant maintenance." Translation = After doing number 1 and number 2 you write your own work specification using the standard for help.

A listing follows the forward of the people and organizations responsible for the standards. If you have a question about the standards, or if you would like to offer comment when the standard is revised, they're the ones to contact.

Next are the scope, purpose and application sections, which say the document is a standard for professionals who care for trees or manage trees, such as groundskeepers, facility managers, city officials, etc. No surprises here, but it does note that specifications should be written by an arborist. This does not mean you need a Ph.D. in arboriculture, but it does mean you should have experience and training in proper tree care techniques.

Where the standards get real interesting, believe it or not, are in the definitions area. By reading the definitions, you begin to see standardization of names that might change from one area of the country to another. More important are the definitions of two usually innocuous words, "shall" and "should" that are everything to the standards and the way you install cables, braces and guys.

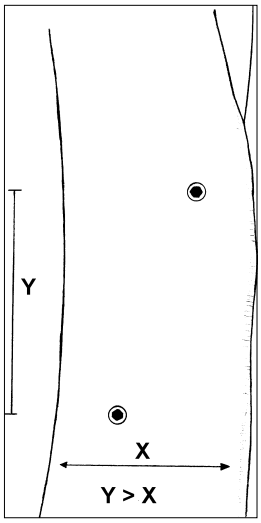

Figure 2 = Location of drill holes, (Figure 38.1, A300 Part 3)

Shall "denotes a mandatory requirement," and *should* "denotes an advisory recommendation." In other words, from here on in, if you see the word *should*, you should try to follow the standard, if you can't, you must have a good reason for not doing so. If you see the word *shall,* you must follow the standard. For that matter, the difference between shall and should *must* be understood by every arborist, for these differences extend beyond cabling. The industry-consensus standard for safe tree care operation, known as ANSI Z133, defines safe operations in ways that can help you avoid an OSHA citation … *and save your life!* If all of this is news to you, then you really aren't doing yourself, your business or your clients any favors. Where have you been?

The next section explains why you install tree support systems. Again, it is written in a technical manner. Bob Rouse, secretary of the ANSI A300 standards, explains it more simply: "Cables provide supplemental support—and are not sold as actual support—by lengthening the useful life of a tree, and reducing the chance a

split might otherwise occur."

This segment is followed by short descriptions on tree inspection and tools. It is very important that you do not gloss over paragraph 37.2. The standard places a responsibility on both you and the client in this paragraph. It is recommended that you, the arborist, notify the client, or the client's agent (groundskeepers, facility managers, city officials, etc.) *before the installation is started*, that the support system requires periodic inspections. You should also tell the client that they have the responsibility of performing the inspection and that the inspection should include the condition, position, and cable tension of the system and the structural integrity of the tree.

This is a "should" meaning it is a recommendation, since, the client could be vacationing in Cancun when you arrive to inspect the tree and write the estimate. However, there are probably very few good excuses for not getting this information to the client at some point, short of the client's death, (or worse, your death!).

A good way avoid the whole problem is to incorporate the notification of the need for periodic inspections on your estimate or bid. Also include notice that the client agrees or at least understands this provision by accepting and signing the estimate.

The next sections—general, installation practices, cabling, bracing and guying—are the meat of the document. If you are uncertain how to cable, these areas give you an idea of exactly what you should learn when you get additional training. If you already know, you should still read it. Even people who have been installing cables for years will find it useful.

For instance, section 38.4 states, "Only one termination shall be attached to an anchor."

"What about a multi-stemmed white birch?" I wondered. "If you drill a hole for each cable, won't a small tree be compromised and develop the potential to snap?"

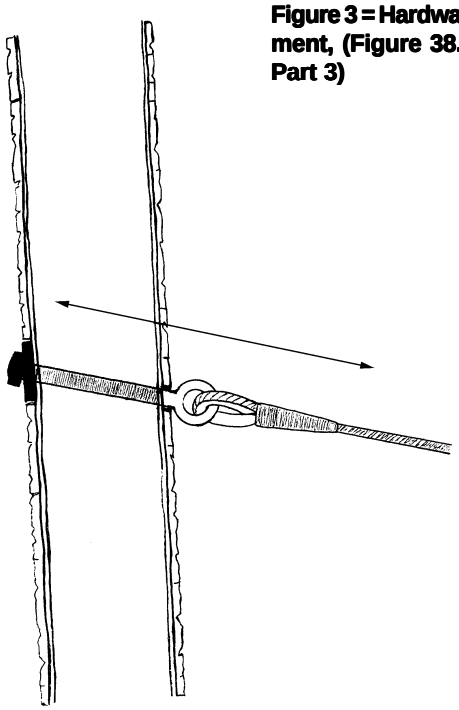

Figure 3 = Hardware alignment, (Figure 38.3, A300 Part 3)

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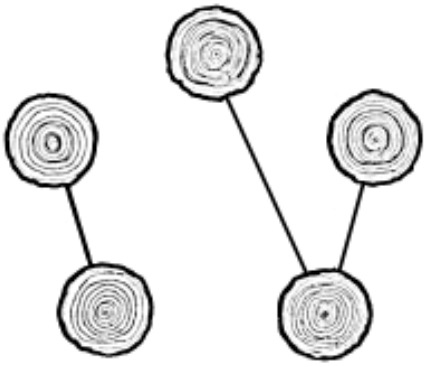
According to Rouse, "In this situation you can take a look at paragraph 38.1 (see, all that numbering really does help!). This paragraph reads: "Holes should not be drilled closer together than the diameter of the branch or trunk being drilled. The diameter of the hole shall not be greater than one-sixth (1/6) the diameter of the limb, trunk, or branch at the point of installation (see Figure 2)." If you still have concerns you could consider one of the synthetic-fiber systems like Cobra or Skybrace, they are considered a cable in the A300 standards."

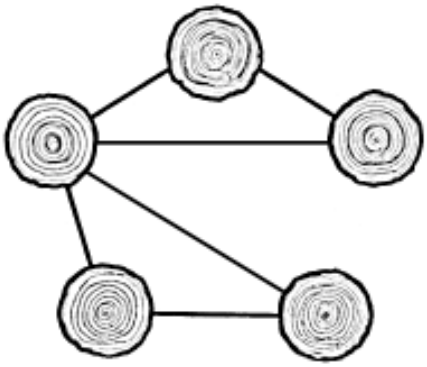
Another standard worth mentioning is section 38.3. It is a tough standard that requires bolts be set on the same angle as the cable. If the opposing bolts are on the same height, you drill straight through. However, when one bolt is higher or lower than the other, you have to drill each bolt hole at an angle into the tree so that it points toward the opposing bolt. (Figure 3)

This is difficult. Here you are, hanging way up in a hardwood with one foot dangling and the other foot throbbing because it is pinched in a narrow V-crotch. Your lower back aches because it is tweaked at an angle that would make a yoga instructor groan, your arms and shoulders feel like putty as you drill into a tree with a dull bit that you swore you would replace but forgot. And now some people have written a standard that instructs you to drill a hole longer than straight through the tree. You can't even attach another cable to it. No, you have to drill new holes for each cable. Well,

Figure 4 = Cabling system types



4a = direct system



4b = triangular system (Figure 39.2)

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you aren't going to be pleased. But the annoying part is … they're right, you're a professional, and this is the standard. Truth be told, it's correct, so you have to do it (sore arms or not).

Why is the standard right in this circumstance? It all relates to side loading. When they wrote the standard, they relied on breaking strength tests of the hardware that were done by engineers, for other industries, not the tree care industry. Engineers perform breaking strength tests on straight pulls, not sideways pulls, since the hardware is not designed for side-loading. If bolts and cables are at different angles, side loading occurs and the hardware will not perform at its strength rating. This means that if you side-load an eyebolt, the whole hardware chart becomes inaccurate. For example, a 10-inch limb requires a 3/8-inch eye bolt and 3/8-inch common grade cable. This cable has a maximum load capacity of 900 pounds. An improperly installed bolt will reduce the holding capacity of the bolt, meaning that the bolt now might not be able to support the cable even though the sizes are matched up properly according to the table.

Another standard that requires technical knowledge is section 39.3.1, which states, "Steel cables should be taut following installation." According to Rouse, the standards committee spent more time on this short phrase than almost anything else. That's because it was hard to determine just what the definition of "taut" is. (Note: the committee insists that it does know what the definition of "is" is!). What is taut by one person's definition could be tight by another's. In addition seasonal loading variation needs to be taken into account. Often a cable may be installed taut on a limb with leaves, but the cable might slacken after the leaves fall off. Also the opposite is true, if you install a cable on a limb with no leaves, it might be too tight after the leaves fall, causing undo pressure.

Well, basically "taut" is right. The cable after installation should be taut in any season, leaves or no leaves. The standard makes the arborist responsible for determining the right amount of "taut" to apply.

So after all this, you should get a copy of the ANSI A300 support systems standards (actually you should get all the ANSI A300 standards). The important sections are not that hard to read and it's only ten pages long with lots of pictures. Winter is here, so there should be time to read it. It may be a little painful at first, but once you grasp how the standards are written, it flows easily. Then next season, you can carry it in your truck, use it to write estimates and present it to customers when needed. You'll be a better arborist for it.

Here are some sample cabling and bracing specifications so you can see what a specification written according to A300 standards might look like (see Figure 4 for help):

Example #1:

All work will conform to ANSI A300 Part 3-2000 standards.

Tree: 24-inch diameter red oak with split crotch in back yard of residence.

Cabling objective(s): To provide supplemental support* to the two codominant limbs forming the split crotch in order to limit additional splitting and lengthen the useful life of the tree.

Cabling type(s) to meet objectives(s): Direct

Cable hardware#: (two) 3/8 inch eyebolt anchors; (one) 1/4 inch EHS cable span

Bracing objective(s): Prevent rubbing of the split sections and limit associated decay.

Brace type(s) to meet the objective(s): Parallel

Brace hardware#: (two) 5/8 inch through-bolts, secured with heavy-duty washers and nuts.

The ANSI300 standard is titled: Tree, Shrub, and Other Woody Plant Maintenance — Standard Practices. (Support Systems a. Cabling, Bracing, and Guying.) It is available from the National Arborist Association, 3 Perimeter Rd., Unit 1, Manchester, N.H. 03103. Phone: 800-733-2622; Email: naa@natlarb.com; Web: www.natlarb.com. Cost is $15 for members, $20 for non-members.

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Example #2

All work will conform to ANSI A300 Part 3-2000 standards.

Tree: 80-foot American elm with multiple leaders at front entrance drive of residence.

Cabling objective(s): To provide supplemental support* for leaders in order to limit limb breakage.

Cabling type(s) to meet objectives(s): Triangular

Cable hardware#: (twelve) 5/8 inch lag hook anchors; (six) 3/8 inch common grade cable spans

Example #3

All work will conform to ANSI A300 Part 3-2000 support system standards.

Tree: 18-inch diameter Japanese maple overhanging lily pond in Japanese garden.

Guying objective(s): To provide supplemental support* while the tree's root system recovers from recent landscape construction damage (severed roots).

Guying type(s) to meet objectives(s): Tree-to-tree

Guying hardware#: (four) 5/8 inch lag hook anchors; (two) 1/4 inch EHS cable spans

Guying anchor #: Trees: 24-inch diameter red maple in NW garden border; 18-inch Japanese cedar in SW garden border.

* = Never, ever, say "to provide support, prevent tree or limb failure, make the tree safe, etc." Cabling, bracing, and guying only provide additional, supplemental support. Do not imply that cables or braces, alone can support, save, or otherwise make a tree safe. If you do, you will also increase your liability should the tree you worked on fail in the future.

= ANSI A300 standards do not require that this information be provided but including it in your written work specifications can give you a business edge. Especially when you have to compete with less-reputable businesses that undercut your price by performing substandard work. It also provides clear instructions to your crew, improving communication.

Michael Roche is a certified arborist and owner of Stowe Tree and Landscape Service in Stowe, Vt.