LETTERS TO THE EDITOR

Dear Dr. Miller:

I have just read the letter from E. Thomas Smiley regarding installation of nuts and washers on eyebolts in the March issue of the Journal, and find it necessary to inform him that he is totally wrong in his statements about the strength factors of installation.

In his fifth paragraph, he states, "…Figure 1 is far less damaging to the tree and functionally just as strong, if not stronger, than depicted in Figure 2."

If the nut was tightened as illustrated in Figure 1, the rod of the eyebolt would bend downward as viewed in the drawing, forcing the rod into the wood below that point. The bending stress exerted on the rod immediately below the nut would weaken it significantly and could easily cause the failure of the system.

Installed as in Figure 1, the system would definitely be weaker and could well be more injurious to the tree than the installation in Figure 2.

James Causton
Consulting Arborist
Port Angeles, WA

Dear Dr. Miller:

I would again like to thank you for allowing me to respond to James Causton's Letter to the Editor regarding eyebolt installation. First, there are a lot of conflicting opinions regarding cabling and bracing, due mainly to the lack of published research on the subject. While much has been written on the topic, there are only three research papers that touch on the area, the most definitive being published in the 1930s.

As to the specifics of Mr. Causton's letter, I agree that the bolt in Figure 1 is likely to bend, more under the force of the cable in a strong wind than when being tightened. If the bolt is tightened to the point of bending, then tightening was excessive. I also agree that there is some stress on the bolt due to bending, but keep in mind that this is a one-time bend, maybe 10 to 15 degrees off center (Figure 3). The question then becomes, Is this enough to significantly weaken the system?

Let's take a look at Figure 1 again and put some numbers with it this time. If we say that the branch diameter is 5 in., the proposed ANSI A300 standard specifies minimum hardware as a 1/4-in. eyebolt or 3/8-in. lag hook and a 1/4-in. common-grade galvanized cable. However, due to the angle of the hole and maximum length of commercially available eyebolts, we will need to use a 5/16-in. or 3/8-in. eyebolt to go all the way through the limb. Maximum working strengths involved here are 300# for 3/8-in. lag hook, 550# for 1/4-in. eyebolts, 850# for 5/16-in. eyebolts, 1,250# for 3/8-in. eyebolts, and 380# for 1/4-in. galvanized cable.

Now let's look at the worst case: Assume we found a 1/4-in. eyebolt long enough for the job. Even if we have a 25% reduction in strength due to the bend, the strength is only down to the 412#. The weakest part of the system is still the cable at 380#. Note that if a lag hook were used instead of the eyebolt, it would have been the weakest part of the system.

In the field, on rare occasions when a failed cable system is found, the failures tend to be lag hooks, the dead-end grip due to loss of the thimble, in the cable or, very rarely, in the eyebolt. When an eyebolt does fail, it is on the "eye" side due to the higher amount of leverage in the protruding eye. We have never had a report of an eyebolt that failed on the nut side.

Our ultimate goal is to protect the limb from failure while doing as little damage as possible to the tree. Our research showed that damage was minimized by avoiding the wounding associated with countersinking into the wood of the limb. We hope to shed more light on the questions associated with cabling and bracing with the publication of ongoing research when the projects are complete.

E. Thomas Smiley, Ph.D.
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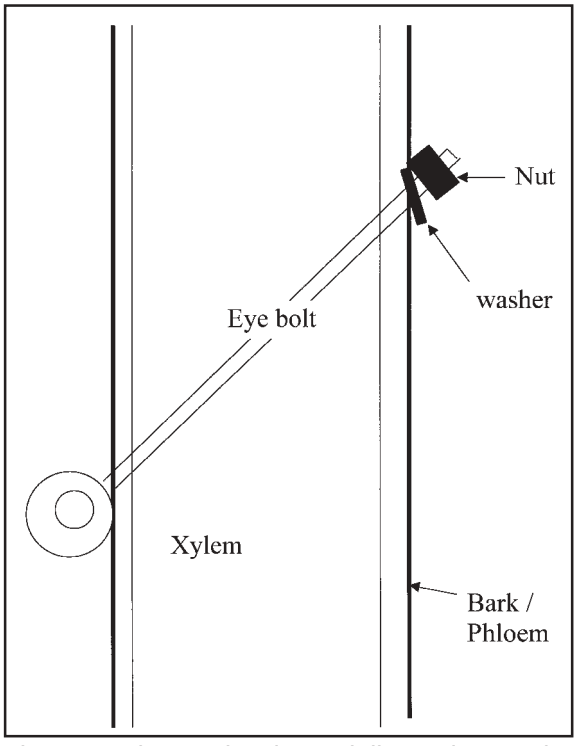

Figure 1. The washer is partially resting on the bark but not able to pull through the leader.

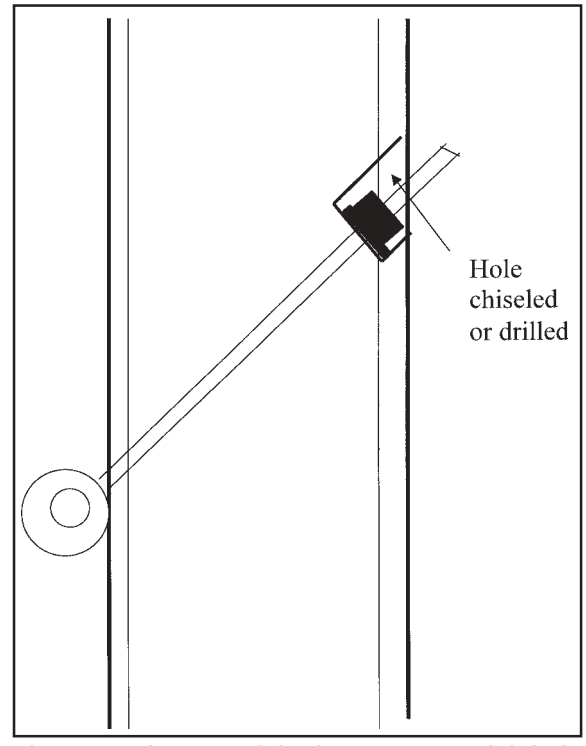

Figure 2. Diagram of the large countersink hole that would be required to seat the washer at a 90-degree angle to the bolt.

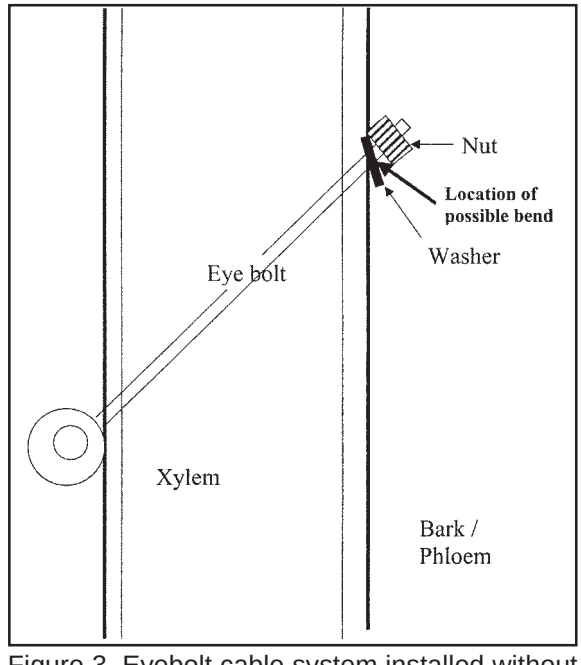

Figure 3. Eyebolt cable system installed without countersinking into the wood.

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