ANSI A300 (Part 3)-2006
Revision of ANSI A300 (Part 3)-2000

American National Standard

Tree, Shrub, and Other Woody Plant Maintenance — Standard Practices (Supplemental Support Systems)

TCIA™
VOICE OF TREE CARE

Approved American National Standard
ANSI

ANSI A300 (Part 3)-2006 Supplemental Support Systems
Revision of ANSI A300 (Part 3)-2000

ANSI®
A300 (Part 3)-2006

American National Standard
for Tree Care Operations –

Tree, Shrub, and Other Woody Plant Maintenance – Standard Practices *(Supplemental Support Systems)*

Secretariat

Tree Care Industry Association, Inc.

Approved August 4, 2006
American National Standards Institute, Inc.
Headquarters:
1819 L Street, NW
Sixth Floor
Washington, DC 20036
New York Office:
25 West 43rd Street
Fourth Floor
New York, NY 10036

www.tcia.org

American National Standard

Approval of an American National Standard requires review by ANSI to assure that the requirements for due process, consensus, and other criteria for approval have been met by the standards developer.

Consensus is established when, in the judgement of the ANSI Board of Standards Review, substantial agreement has been reached by directly and materially affected interests. Substantial agreement means much more than a simple majority, but not necessarily unanimity. Consensus requires that all views and objections be considered, and that a concerted effort be made toward their resolution.

The use of American National Standards is completely voluntary; their existence does not in any respect preclude anyone, whether he or she has approved the standards or not, from manufacturing, marketing, purchasing, or using products, processes, or procedures not conforming to the standards.

The American National Standards Institute does not develop standards and will in no circumstances give an interpretation of any American National Standard. Moreover, no person shall have the right or authority to issue an interpretation of an American National Standard in the name of the American National Standards Institute. Requests for interpretations should be addressed to the secretariat or sponsor whose name appears on the title page of this standard.

CAUTION NOTICE: This American National Standard may be revised or withdrawn at any time. The procedures of the American National Standards Institute require that action be taken periodically to reaffirm, revise, or withdraw this standard. Purchasers of American National Standards may receive current information on all standards by calling or writing the American National Standards Institute.

Published by

TCIA™
VOICE OF TREE CARE

Tree Care Industry Association, Inc., 3 Perimeter Road Unit 1, Manchester, NH 03103
Phone: (800) 733-2622 or (603) 314-5380 Fax: (603) 314-5386
E-mail: tcia@treecareindustry.org Web: www.tcia.org

Printed in the United States of America

Contents

Figures and Tables

* indicates illustration adapted and formatted, with permission, from *Arborist Equipment: A Guide to the Tools and Equipment of Tree Maintenance and Removal.* International Society of Arboriculture Publishing, Champaign, IL.

Foreword (This foreword is not part of American National Standard A300 Part 3-2006)

An industry-consensus standard must have the input of the industry that it is intended to affect. The Accredited Standards Committee A300 was approved June 28, 1991. The committee includes representatives from the residential and commercial tree care industry, the utility, municipal, and federal sectors, the landscape and nursery industries, and other interested organizations. Representatives from varied geographic areas with broad knowledge and technical expertise contributed.

The A300 standards are placed in proper context if one reads the Scope, Purpose, and Application. This document presents performance standards for the care and maintenance of trees, shrubs, and other woody plants. It is intended as a guide in the drafting of maintenance specifications for federal, state, municipal, and private authorities including property owners, property managers, and utilities.

The A300 standards stipulate that specifications for tree work should be written and administered by a professional possessing the technical competence to provide for, or supervise, the management of woody landscape plants. Users of this standard must first interpret its wording, then apply their knowledge of growth habits of certain plant species in a given environment. In this manner, the users ultimately develop their own specifications for plant maintenance.

ANSI A300 Part 3 – *Supplemental Support Systems*, should be used in conjunction with the rest of the A300 standard when writing specifications for tree care operations.

Suggestions for improvement of this standard should be forwarded to: A300 Secretary, c/o Tree Care Industry Association, 3 Perimeter Road – Unit 1, Manchester, NH 03103, USA or e-mail: tcia@treecareindustry.org

This standard was processed and approved for submittal to ANSI by the Accredited Standards Committee on Tree, Shrub, and Other Woody Plant Maintenance Operations – Standard Practices, A300. Committee approval of the standard does not necessarily imply that all committee members voted for its approval. At the time it approved this standard, the A300 committee had the following members:

Tim Johnson, Chair
(Artistic Arborist, Inc.)
Bob Rouse, Secretary
(Tree Care Industry Association, Inc.)

Organizations Represented	**Name of Representative**
American Nursery and Landscape Association	*Warren Quinn*
	Craig J. Regelbrugge (Alt.)
American Society of Consulting Arborists	*Tom Mugridge*
	Donald Zimar (Alt.)
American Society of Landscape Architects	*Ron Leighton*
Asplundh Tree Expert Company	*Geoff Kempter*
	Peter Fengler (Alt.)
Bartlett Tree Expert Company	*Peter Becker*
	Dr. Thomas Smiley (Alt.)

Davey Tree Expert Company ..... *Joseph Tommasi*
Dick Jones (Alt.)
International Society of Arboriculture ..... *Bruce Hagen*
Sharon Lilly (Alt.)
National Park Service ..... *Robert DeFeo*
Dr. James Sherald (Alt.)
Professional Landcare Network ..... *Preston Leyshon*
Tanya Tolpegin (Alt.)
Professional Grounds Management Society ..... *Tom Shaner*
Society of Municipal Arborists ..... *Andrew Hillman*
Tom Russo (Alt.)
Tree Care Industry Association ..... *Dane Buell*
James McGuire (Alt.)
U.S. Forest Service ..... *Ed Macie*
Keith Cline (Alt.)
Utility Arborist Association ..... *Matthew Simons*
Jeffrey Smith (Alt.)

Additional organizations and individuals:

American Forests (Observer)
Beth Palys (Observer)
Peter Gerstenberger (Observer)
Mike Galvin (Observer)
Myron Laible (Observer)
Richard Rathjens (Observer)
Richard Roux (NFPA-780 Liaison)

American National Standard for Tree Care Operations –

Tree, Shrub, and Other Woody Plant Maintenance – Standard Practices *(Supplemental Support Systems)*

Clause 1 excerpted from ANSI A300 (Part 1) – 2001 *Pruning*

1 ANSI A300 standards

1.1 Scope

ANSI A300 standards present performance standards for the care and maintenance of trees, shrubs, and other woody plants.

1.2 Purpose

ANSI A300 standards are intended as guides for federal, state, municipal and private authorities including property owners, property managers, and utilities in the drafting of their maintenance specifications.

1.3 Application

ANSI A300 standards shall apply to any person or entity engaged in the business, trade, or performance of repairing, maintaining, or preserving trees, shrubs, or other woody plants.

1.4 Implementation

Specifications for tree maintenance should be written and administered by an arborist.

30 Part 3 – Supplemental Support Systems standards

30.1 Purpose

The purpose of Part 3 is to provide standards for writing specifications for supplemental support systems.

30.2 Reasons for supplemental support systems

Supplemental support systems are used to provide additional support or limit movement of a tree or tree part.

30.3 Safety

30.3.1 Tree maintenance shall only be performed by an arborist or arborist trainee.

30.3.2 This standard shall not take precedence over arboricultural safe work practices.

30.3.3 Operations shall comply with applicable Occupational Safety and Health Administration (OSHA) standards, ANSI Z133.1, as well as state and local regulations.

31 Normative references

The following standards contain provisions which, through reference in the text, constitute provisions of this American National Standard. All standards are subject to revision, and parties to agreements based on this American National Standard shall apply the most recent edition of the standards indicated below.

ANSI A300 Part 1 *Pruning*

ANSI A300 Part 4 *Lightning Protection Systems*

ANSI A300 Part 6 *Transplanting*

ANSI B18.12, *Glossary of Terms for Mechanical Fasteners*

ANSI Z60.1, *Nursery stock*

ANSI Z133.1, *Arboricultural operations – safety requirements*

ANSI/UL 96, *Lightning Protection Components*

ASTM A475, *Standard Specification for Zinc-Coated Steel Wire Strand*

Federal Standard: FF-T-276b, *Thimbles, Rope*

29 CFR 1910, *General industry*[1]

[1] *Available from U.S. Department of Labor, 200 Constitution Avenue, NW, Washington, DC 20210.*

29 CFR 1910.268, *Telecommunications* [1]

29 CFR 1910.269, *Electric power generation, transmission, and distribution* [1]

29 CFR 1910.331 - 335, *Electrical safety-related work practices* [1]

32 Definitions

32.1 amon-eye nut: A drop-forged eye nut.

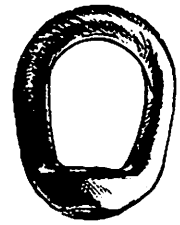


Fig. 32.1 amon-eye nut

32.2 anchor: A cable-to-tree attachment.

32.3 anchor-tree: A tree used as an anchor in guying.

32.4 arborist: An individual engaged in the profession of arboriculture who, through experience, education and related training, possesses the competence to provide for or supervise the management of trees and other woody ornamentals.

32.5 arborist trainee: An individual undergoing on-the-job training to obtain the experience and the competence required to provide for, or supervise, the management of trees and woody ornamentals. Such trainees shall be under the direct supervision of an arborist.

32.6 bond: An electrical connection between an electrically conductive object and a component of a lightning protection system that is intended to significantly reduce potential differences created by lightning currents.

32.7 brace: Lag- or machine-threaded rods installed in or through limbs, leaders, or trunks used to provide supplemental support.

32.8 bracing: The installation of a brace system.

32.9 cable: 1) Zinc-coated strand per ASTM A475, such as extra-high strength (EHS) and common-grade, 7-strand. 2) Stainless steel or galvanized wire rope, such as aircraft cable. 3) Single strand wire. 4) Synthetic-fiber rope or synthetic-fiber webbing.

32.10 cable grip: A mechanical device that temporarily grasps and holds a wire rope or strand cable during installation.

32.11 cabling: The installation of a cable system between leaders, limbs, and branches within a tree to provide supplemental support.

32.12 connector clamp: A device meeting ANSI/UL-96 standard, used to bond a conductor to a steel cable.

32.13 dead-end brace: A brace formed by threading a lag-thread screw rod directly into the limb, leader, or trunk, but not through the side opposite the installation.

32.14 dead-end grip: A manufactured wire wrap designed to form a termination at the end of 1 X 7, left-hand lay cable that meets the specifications of ASTM A475 for zinc-coated strand.

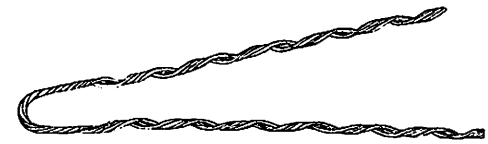


Fig. 32.14 dead-end grip

32.15 dead-end hardware: Anchors or braces that are threaded directly into the limb, leader, or trunk, but not through the side opposite the installation. Dead-end hardware includes but is not limited to: lag hooks, lag eyes, and lag-thread screw rod.

32.16 eye bolt: A drop-forged, closed-eye bolt.

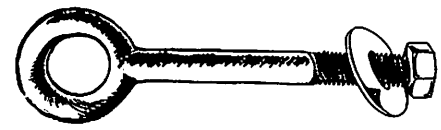


Fig. 32.16 eye bolt

32.17 eye splice: A closed-eye termination.

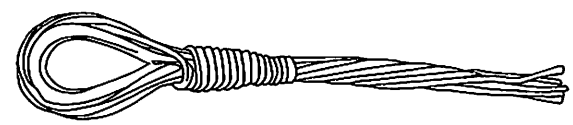


Fig. 32.17 eye splice

[1] *Available from U.S. Department of Labor, 200 Constitution Avenue, NW, Washington, DC 20210.*

32.18 ground anchor: A cable to ground attachment.

32.19 guy: A steel cable or synthetic-fiber cable system installed between a tree and an external anchor to provide supplemental support

32.20 guying: The installation of a guy system.

32.21 lag eye: A lag-thread, drop-forged, closed-eye anchor.

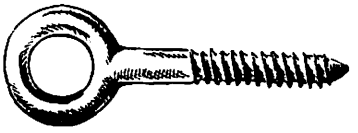


Fig. 32.21 lag eye

32.22 lag hook (J-hook): A lag-thread, J-shaped anchor.

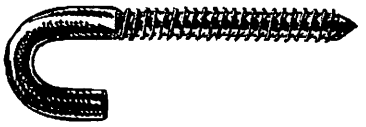


Fig. 32.22 lag hook

32.23 lag thread: A coarse screw thread designed for self-tapping into wood.

32.24 lag-thread hardware: Anchors or braces with lag-threads. Lag-thread hardware includes, but is not limited to, lag eyes, lag hooks, and lag-thread screw rod.

32.25 lag-thread screw rod: A lag-thread, steel rod used for dead-end and through-brace installations.

Fig. 32.25 lag-thread screw rod

32.26 loop anchor: A synthetic fiber termination that serves as an anchor.

32.27 machine thread: A fine screw thread designed for fittings (such as nuts).

32.28 machine-threaded rod: A machine-thread, steel rod used for through-brace installations.

32.29 peen: The act of bending, rounding or flattening the fastening end(s) of through-hardware for the purpose of preventing a nut from "backing-off."

32.30 prop: Rigid support placed between a trunk, limb, or branch and the ground.

32.31 propping: The installation of a prop to provide supplemental support.

32.32 shall: As used in this standard, denotes a mandatory requirement.

32.33 should: As used in this standard, denotes an advisory recommendation.

32.34 specifications: A document stating a detailed, measurable plan or proposal for provision of a product or service.

32.35 standards, ANSI A300: Performance parameters established by industry consensus as a rule for the measure of quantity, weight, extent, value, or quality.

32.36 supplemental support system: A system designed to provide additional support or limit movement of a tree or tree part.

32.37 taut: Tightened to the point of eliminating visible slack.

32.38 termination: A device or configuration that secures the end of a cable to the anchor in a cabling or guying installation.

32.39 termination hardware: Hardware used to form a termination. Termination hardware includes, but is not limited to, dead-end grips and thimbles used in eye-splice configurations.

32.40 thimble: An oblong galvanized or stainless steel fitting with flared margins and an open-ended base.

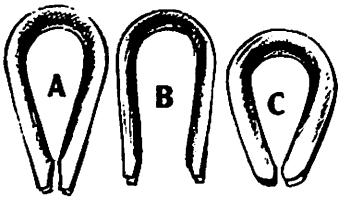


Fig. 32.40 thimble

32.41 through-brace: A brace formed by installing through-hardware into a limb, leader, or trunk completely through the side opposite the installation.

32.42 through-hardware: Anchors or braces that pass completely through a limb, leader, or trunk. Through-hardware includes but is not limited to: eye-bolts, lag-thread screw rod, and machine-threaded rod.

32.43 turnbuckle: A drop-forged, closed-eye device for adjusting tension.

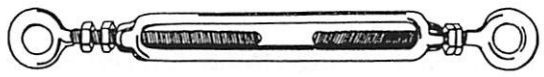
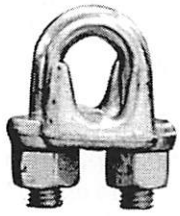


Fig. 32.43 turnbuckle

32.44 wire rope clamp: A clamp consisting of a "U" bolt, saddle plate, and fastening nuts.

Fig. 32.44 wire rope clamp



33 Supplemental support systems practices

33.1 Supplemental support systems objectives

Objectives for supplemental support systems shall be clearly defined prior to installation.

33.2 Tree inspection

33.2.1 A qualified arborist or arborist trainee shall visually inspect each tree before beginning work.

33.2.2 Structural integrity and potential changes in tree dynamics shall be considered prior to installing a supplemental support system.

33.2.3 If a condition is observed requiring attention beyond the original scope of work, the condition shall be reported to an immediate supervisor, the owner, or the person responsible for authorizing the work.

33.3 Tools and equipment

33.3.1 Climbing spurs shall not be used when climbing trees to install supplemental support systems, except in the case of emergencies, such as aerial rescue, or when the tree cannot be climbed safely by other methods.

33.3.2 Equipment and work practices that damage bark, cambium, live palm tissue, or any combination of these, beyond the scope of the work, should be avoided.

33.3.3 Cable grips used to tension the cable shall be designed for use with the type of cable being installed.

33.4 General

33.4.1 System design shall be specified.

33.4.2 When necessary to accomplish the objective, pruning should be performed prior to installing a supplemental support system. Pruning shall be in accordance with ANSI A300 Part 1 – *Pruning*.

33.4.3 Prior to installation, the owner or owner's agent should be notified of the need for periodic inspection of the supplemental support system by an arborist (see subclause 34.1). Scheduling inspections shall be the responsibility of the tree owner.

33.4.4 Anchors and braces shall not be installed into decayed areas where sound wood is less than 30 percent of the trunk or branch diameter (refer to Fig. 33.4.4).

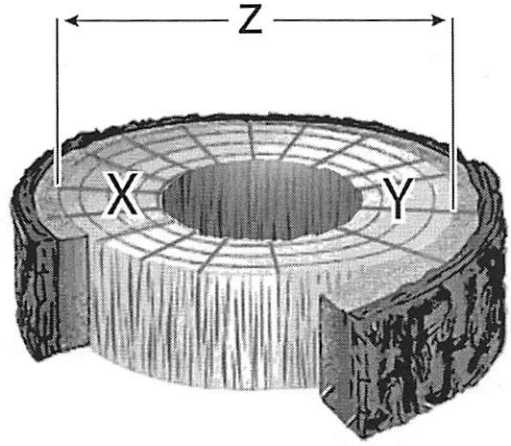


Fig. 33.4.4 Equations for finding the percentage of sound wood.

Symbol Key for Equations:
X = sound wood depth, working side.
Y = sound wood depth, opposite side.
Z = total trunk/branch diameter, bark diameter not included.

Equation for percentage of sound wood for through-bolt applications:

[(X + Y) ÷ Z] x 100 = % of sound wood for through-bolt applications.

Equation for percentage of sound wood for dead-end applications:

(X ÷ Z) x 100 = % of sound wood for dead-end applications.

33.4.5 Steel cables or guys in trees with existing lightning protection conductors shall be bonded to the lightning protection system. A connector clamp, designed for use in lightning protection systems, shall be used to bond steel cables or guys to the lightning protection system. Refer to ANSI A300 Part 4 – *Lightning Protection Systems.*

33.4.6 Supplemental support systems shall be installed in compliance with minimum distance specification in Table 1 in ANSI Z133.1 for overhead, energized conductors.

33.4.7 Steel hardware shall be corrosion resistant. Synthetic fiber cable systems shall be ultra-violet (UV) light resistant.

33.4.8 Wire rope clamps shall not be used to form terminations in cables larger than 1/8 inch (3 mm).

33.4.9 Treatment of cavities by filling shall not be considered to provide support.

33.5 Installation practices

33.5.1 Holes should not be drilled closer together than the diameter of the branch or trunk being drilled or 12 inches (30 cm), whichever is less. 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 Fig. 33.5.1).

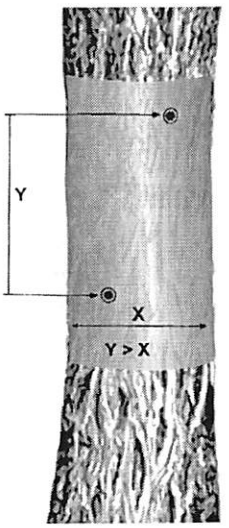


Fig. 33.5.1 Correct brace positioning

33.5.2 Longitudinal alignment of anchors and/or braces should be avoided.

33.5.3 Anchor(s) shall be installed in alignment with the cable and termination hardware, and not be subjected to side loading (see Fig. 33.5.3).

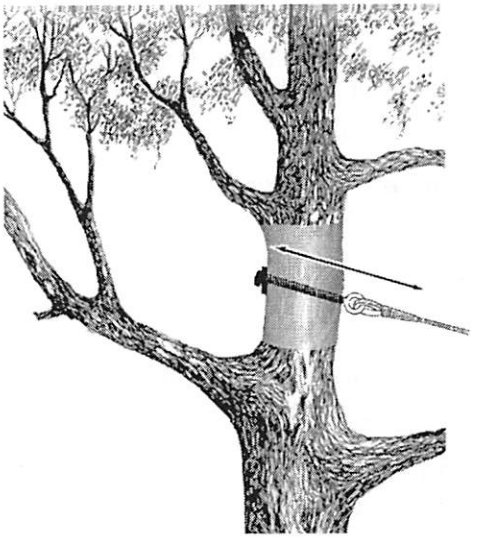


Fig. 33.5.3 Correct cable and hardware alignment

33.5.4 Synthetic cable systems shall have a restraint to prevent movement of the loop anchor and shall not girdle the trunk, limb or branch.

33.5.5 Only one termination shall be attached to an anchor.

33.5.6 Lag-thread hardware shall only be installed in sound wood. The hole shall be 1/16" to 1/8" (1.5-3 mm) smaller than the diameter of the lag-thread hardware.

33.5.7 For through-hardware applications, holes should be no greater than 1/8" (3 mm) larger in diameter than the hardware being installed.

33.5.8 Lag hooks shall only be used when they can be seated to the full length of the threads. If it is not possible to seat the full length of lag hook threads, other hardware shall be selected.

33.5.9 Lag hooks shall be installed to prevent the termination from coming off the hook. Bark should not be damaged beyond the scope of the work during installation.

33.5.10 When installing through-hardware, heavy-duty or heat-treated, heavy-duty round steel washers shall be installed between the nut(s) and the wood or bark (see Fig. 33.5.3).

33.5.11 Washers shall not be countersunk into the wood.

33.5.12 Fasteners for threaded hardware, such as nuts, amon eyes, and turnbuckles, shall be secured to prevent loosening.

33.5.13 Any excess portion of the through-hardware shall be removed.

33.5.14 Terminations shall be specified in the system design specifications.

33.5.15 Termination hardware shall be the appropriate size and type for the cable to be installed.

33.5.16 Terminations formed by eye-splice configurations shall incorporate thimbles.

33.5.17 Dead-end grip terminations shall only be used on cable that meets the specifications of ASTM A475.

33.5.18 Dead-end grip terminations shall incorporate extra heavy-duty wire rope thimbles – Type III, that meet the performance specifications of federal standard FF-T276b.

33.5.19 All hardware within a system shall meet or exceed the minimum strength required to achieve the objective.

33.5.20 Installations shall follow manufacturers' recommendations.

33.6 Cabling

33.6.1 Cabling objectives

Cabling objectives shall be established prior to beginning any cabling operation.

33.6.2 Cabling types

Cabling system specifications should include one or more of the following types:

33.6.2.1 Direct: Direct cabling consists of a single cable between two tree parts (see Fig 33.6.2.1).

33.6.2.1.1 Location of hardware shall be specified.

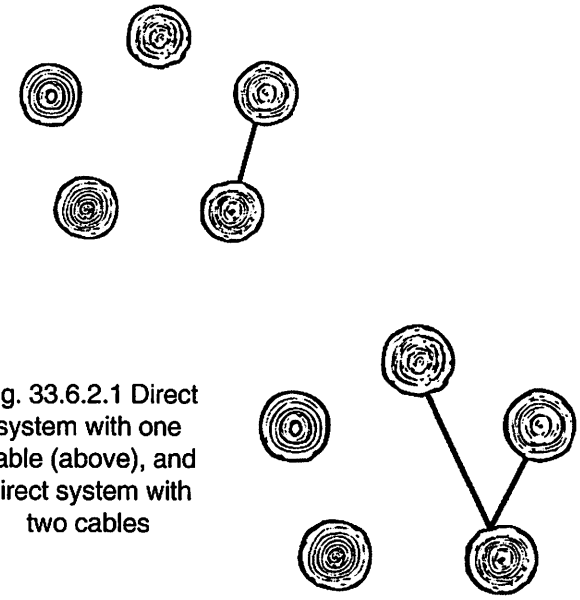


Fig. 33.6.2.1 Direct system with one cable (above), and direct system with two cables

33.6.2.2 Triangular: Consists of connecting tree parts in combination of threes. This method should be applied when maximum direct support is required (see Fig. 33.6.2.2).

33.6.2.2.1 Location of hardware shall be specified.

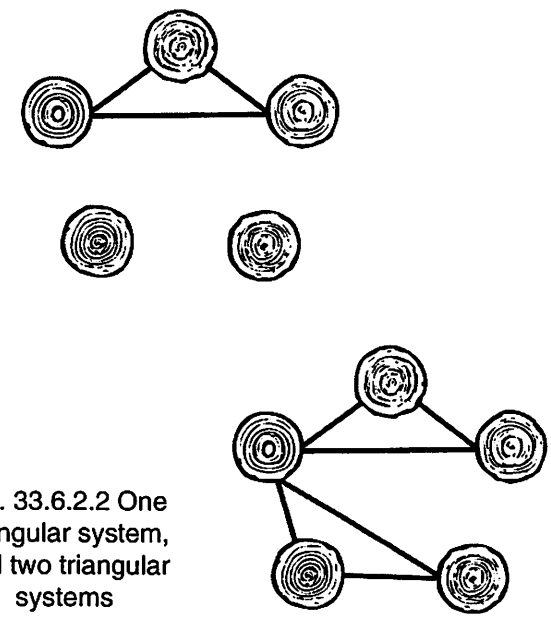


Fig. 33.6.2.2 One triangular system, and two triangular systems

33.6.2.3 Box: Consists of connecting four or more tree parts in a closed series. This system

should be used only when minimal direct support is needed (see Fig. 33.6.2.3).

33.6.2.3.1 Location of hardware shall be specified.

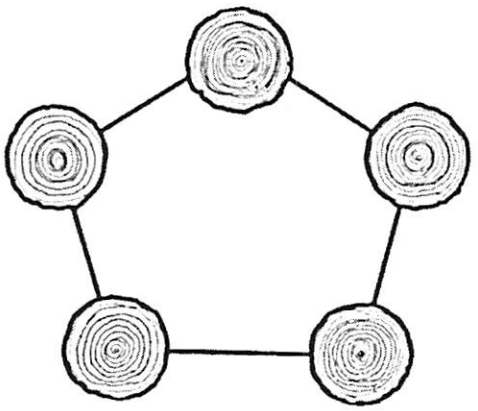


Fig. 33.6.2.3 Box system

33.6.2.4 Hub and Spoke: Consists of a center attachment (hub) with spans (spokes) of cable radiating to three or more leaders. Hub and Spoke cabling should only be used when other installation techniques cannot be installed to achieve the objective (see Fig. 33.6.2.4).

33.6.2.4.1 Location of hardware shall be specified.

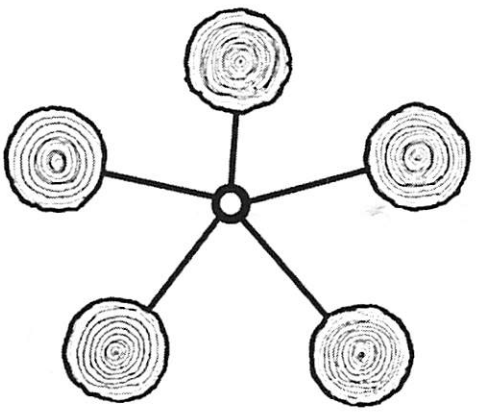


Fig. 33.6.2.4 Hub and spoke system

33.6.3 Cabling installation

33.6.3.1 Steel cables should be taut following installation.

33.6.3.2 Anchor(s) should be installed at or near a point two-thirds (2/3) of the length/height of the limb or leader to be supported (see Fig. 33.6.3.2).

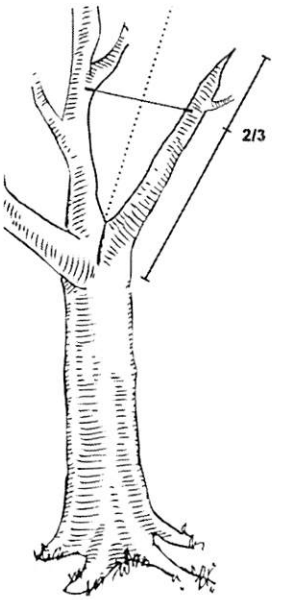


Fig. 33.6.3.2 Correct cable installation

33.6.3.3 The correct angle of cable installation should be perpendicular to an imaginary line bisecting the angle between the tree parts being cabled (see Fig. 33.6.3.2).

33.6.3.4 The continuous support function of existing cables shall be maintained when replacing or upgrading cable systems.

33.7 Bracing

33.7.1 Bracing objectives

Bracing objectives shall be established prior to beginning any bracing operation.

33.7.2 Bracing types

Bracing system specifications should include one or more of the following types:

33.7.2.1 Single: Single bracing consists of one installed rod (see Fig. 33.7.2.1).

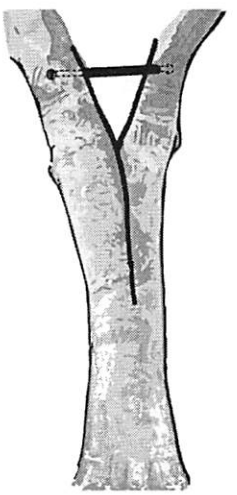


Fig. 33.7.2.1 Single brace system

33.7.2.2 Parallel: Parallel bracing consists of two or more rods installed in vertical and directional alignment (see Fig. 33.7.2.2).

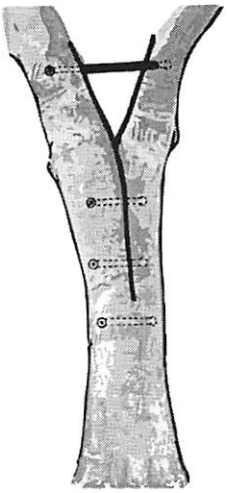


Fig. 33.7.2.2 Parallel brace system

33.7.2.3 Alternating: Alternating bracing consists of two or more rods installed in directional alignment but not in vertical alignment (see Fig. 33.7.2.3).

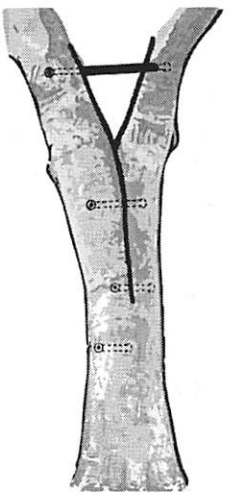


Fig. 33.7.2.3 Alternating brace system

33.7.2.4 Crossing: Crossing bracing consists of two or more rods installed in a non-aligned pattern (see Fig. 33.7.2.4).

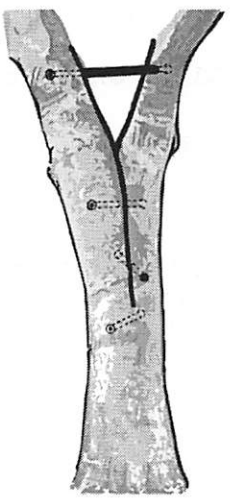


Fig. 33.7.2.4 Crossing brace system

33.7.3 Bracing installation

33.7.3.1 A cabling system should be used to provide supplemental support for the limbs forming the crotch being braced.

33.7.3.2 The preferred location for a single rod for a non-split crotch should be one to two times the branch diameter above the crotch.

33.7.3.3 Brace systems using multiple rods should have at least one rod installed above the crotch.

33.7.3.4 Bracing shall be installed in either a through-brace or dead-end brace configuration.

33.7.3.5 The minimum hardware requirements for braces should be in accordance with Table 1 (English and metric equivalent).

33.7.3.6 Through-bracing

33.7.3.6.1 Through-braces shall be used when bracing through decayed wood in trees that are prone to decay, or in trees that have weak wood characteristics.

33.7.3.6.2 Through braces shall be terminated with heavy duty washers and nuts.

33.7.3.7 Dead-end bracing

33.7.3.7.1 Dead-end bracing shall be performed with lag-thread screw rod.

33.7.3.7.2 The brace shall be installed completely through the smaller or equal portion and at least halfway into the other portion (see Fig. 33.7.3.7.2).

33.7.3.7.3 The exposed end of the lag-thread screw rod shall be inside the bark or shall be fastened with a heavy duty or heat-treated washer and a nut (see Fig. 33.7.3.7.2).

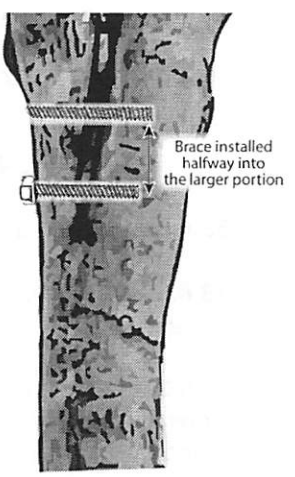


Fig. 33.7.3.7.2 Dead-end brace installation

Table 1 Minimum hardware requirements for bracing trees, English and metric equivalent

Diameter at Brace (in inches)	Brace Rod Diameter (in inches)	Minimum number of rods with split or included bark	Minimum number of rods with no apparent split or included bark
<5	1/4	1	1
5-8	3/8	1	1
8-14	1/2	2	1
14-20	5/8	2	1
20-40	3/4	3 min. with one additional for each 8" in excess of 30"	2 min. with one additional for each 8" in excess of 30"
>40	7/8	4 min. with one additional for each 8" in excess of 40"	3 min. with one additional for each 12" in excess of 40"

Diameter at Brace (in cm)	Brace Rod Diameter (in mm)	Minimum number of rods with split or included bark	Minimum number of rods with no apparent split or included bark
<13	6	1	1
13-20	10	1	1
20-36	12	2	1
36-51	16	2	1
51-102	20	3 min. with one additional for each 20 cm in excess of 76 cm	2 min. with one additional for each 20 cm in excess of 76 cm
>102	22	4 min. with one additional for each 20 cm in excess of 102 cm	3 min. with one additional for each 30 cm in excess of 102 cm

33.8 Propping

33.8.1 Propping objectives

Propping objectives shall be established prior to beginning any propping operation.

33.8.2 Propping installation

33.8.2.1 Props shall be of sufficient strength and durability to meet the objective.

33.8.2.2 Props shall be fastened to the branch in such a manner as to minimize damage and prevent the branch from falling off the prop.

33.8.2.3 Props shall be constructed in a manner so as not to restrict future growth of the branch.

33.8.2.4 Equipment and work practices that damage roots beyond the scope of the work shall be avoided.

33.8.2.5 Props shall be supported by the ground.

33.9 Guying established trees

33.9.1 Guying established trees – objectives

Objectives for guying established trees shall be established prior to beginning any guying operation.

33.9.2 Guying established trees – types

Specifications for guying established trees should include one or more of the following types:

33.9.2.1 Tree-to-ground: Tree-to-ground guying consists of installing at least one cable between a ground anchor and the tree to be guyed (see Fig. 33.9.2.1).

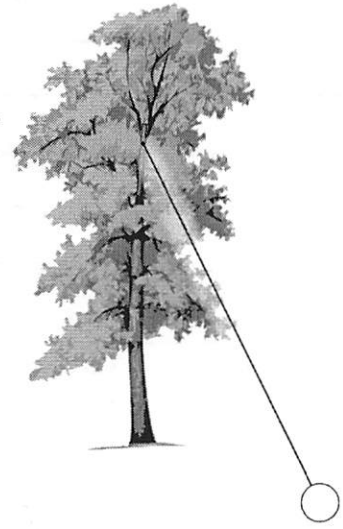


Fig. 33.9.2.1 Tree-to-ground system

33.9.2.2 Tree-to-tree: Tree-to-tree guying consists of installing at least one cable between an anchor-tree and the tree to be guyed (see Fig. 33.9.2.2).

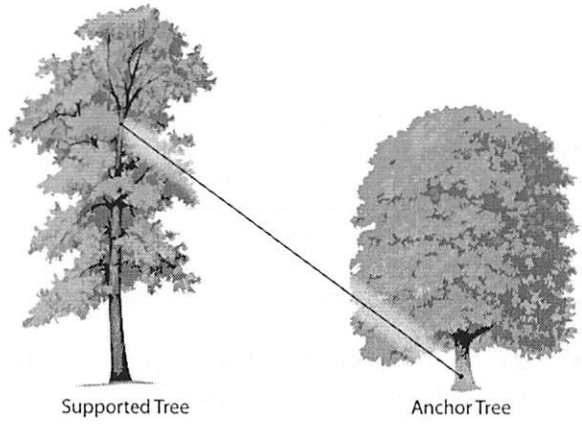


Fig. 33.9.2.2 Tree-to-tree system

33.9.3 Safety

33.9.3.1 The risk of damage or injury due to contact with guying installation components shall be considered.

33.9.4 Guying installation

33.9.4.1 Hardware in the tree shall be installed in alignment with the direction of pull and not be subjected to side loading.

33.9.4.2 Permanent guys shall be attached to the tree with dead-end hardware or through-hardware.

33.9.4.3 Tree-to-ground guying

33.9.4.3.1 Guys shall be secured to a ground-anchor(s) sufficient to achieve the objective.

33.9.4.3.2 Guys should be attached to the tree at or above a point not less than one-half the height of the tree (see Fig. 33.9.4.3.2).

33.9.4.3.3 Ground-anchor(s) should be placed no closer to the trunk than two-thirds the distance from the ground to the height of the lowest point of attachment in the tree, adjusted for slope and site conditions (see Fig. 33.9.4.3.2).

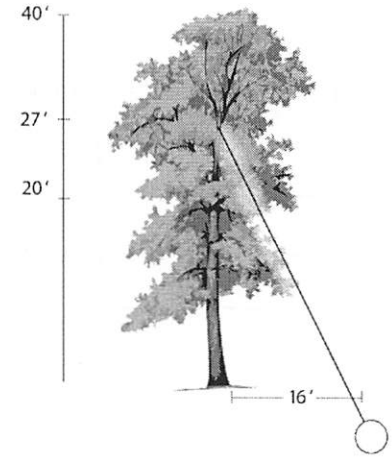


Fig. 33.9.4.3.2 Guy location in tree-to-ground systems

33.9.4.4 Tree-to-tree guying

33.9.4.4.1 Anchor-tree(s) shall be inspected for structural integrity.

33.9.4.4.2 Anchor-tree(s) shall have the ability to meet the objective.

33.9.4.4.3 Anchors shall be attached in the upper half of the tree to be guyed and in the lower half of the anchor-tree(s).

33.10 Guying newly installed landscape plants

33.10.1 Guying newly installed landscape plants – objectives

Guying objectives shall be established prior to beginning any guying operation.

33.10.2 Guying installation

33.10.2.1 Guys shall be attached using a method that minimizes damage to the tree.

33.10.2.2 A minimum of two guys should be installed at an angle sufficient to support the landscape plant.

33.10.2.3 For trees over 10-inch diameter, guys should be installed in accordance with subclause 33.9.

33.10.2.4 Guys shall be secured to a ground anchor(s) sufficient to achieve the objective.

33.10.2.5 Guys should be taut following installation.

33.10.2.6 Guys or other supplemental support systems shall be maintained and be removed when they are no longer needed as part of post planting care practices (see ANSI A300 Part 6 Transplanting).

34 Supplemental support systems inspection and maintenance

34.1 Systems should be inspected periodically for wear, corrosion, degradation of hardware and damage to the tree. The inspection should include the system's condition, position, cable tension, and the tree's structural integrity.

34.2 If problems are detected they should be corrected or the system should be repaired, replaced or modified.

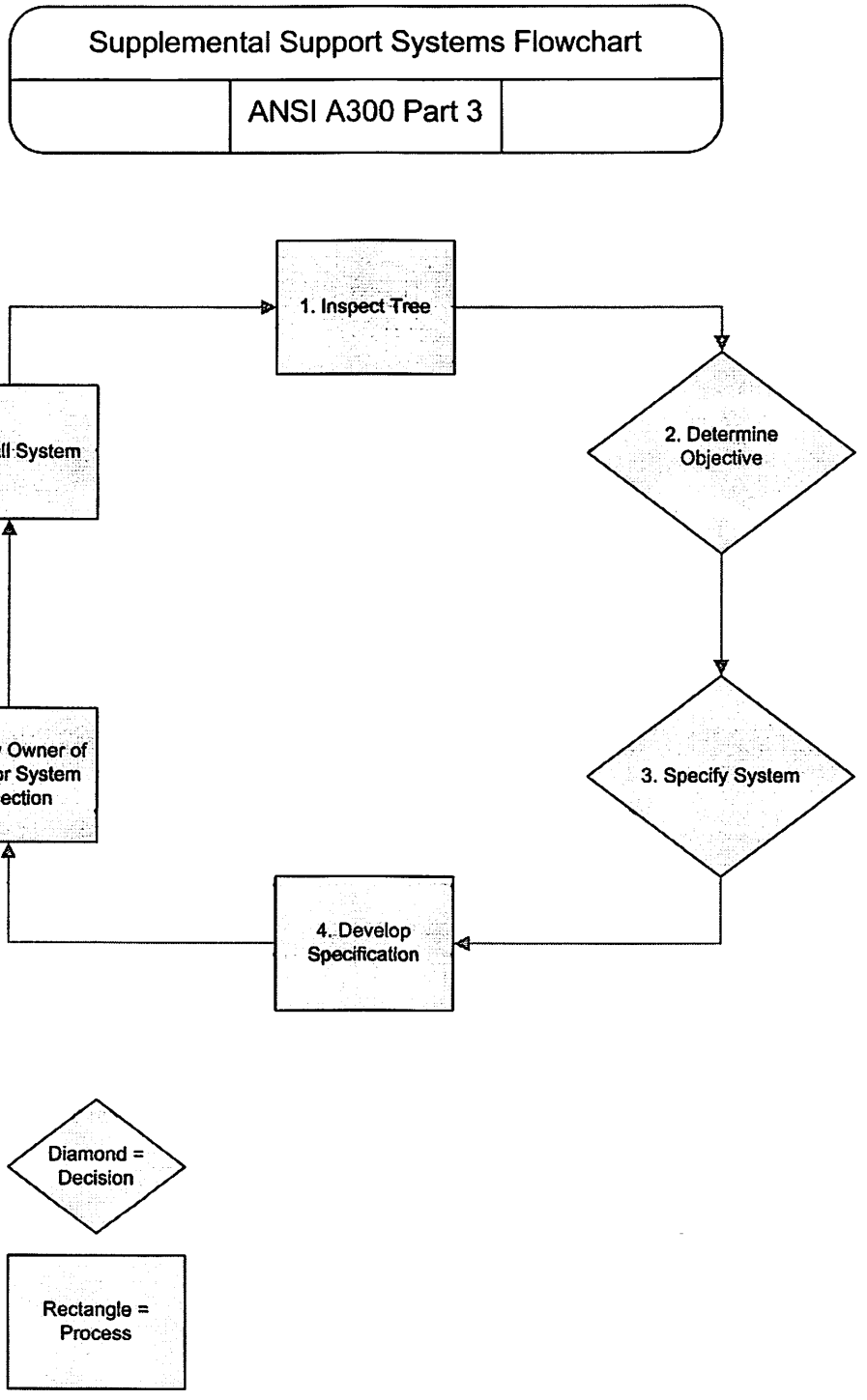
Annex A – Additional hardware information

Table A-1 Minimum hardware size for cabling trees

Maximum Limb Diameter at anchor attachment point 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

* N/A indicates not an acceptable application.

Annex B – Supplemental Support Systems specification flowchart



Annex C – Applicable ANSI A300 interpretations

The following interpretations apply to the ANSI A300 Part 3 Supplemental Support Systems standard.

C-1 Interpretation of "should" and "shall" in ANSI A300 standards

"An advisory recommendation" is the common definition of "should" used in the standards development community and the common definition of "should" used in ANSI standards. An advisory notice is not a mandatory requirement. Advisory recommendations might not be followed when defensible reasons for non-compliance exist.

C-2 Interpretation for compliant lag hooks, ANSI A300 Part 3 – 2000, subclauses 38.5 and 38.7 (see subclause 33.5.6 and 33.5.8 in ANSI A300 Part 3 – 2006)

38.5 Lag-thread hardware shall only be installed in sound wood. The hole for the lag-thread hardware shall be 1/16" to 1/8" (1.5-3 mm) smaller than the diameter of the lag.

38.7 Lag hooks shall not be used if it is not possible to seat the full length of the threads.

Interpretation: Lag hooks that have a thread depth variance greater than 1/16 inch make determination of correct hole size impossible and cannot be installed in a manner compliant with the ANSI A300 Part 3 standard. Lag hooks with threads cut beyond the bent portion of the hook cannot be installed in a manner that allows the full length of the threads to be seated and cannot be installed in a manner compliant with the ANSI A300 Part 3 standard.

C-3 Interpretation for cable selection when using dead-end grip terminations, ANSI A300 Part 3 – 2006 standard

The user of ANSI A300 standards is instructed to cross-reference definition subclauses **32.9 cable** and **32.14 dead-end grip** and subclause **33.5.17.**

Interpretation: Dead-end cable grips that meets the ANSI ASTM A475 standard specification for zinc coated steel wire strand can be used with common grade and extra high strength grade cable that also meets the ANSI ASTM A475 standard when approved by the manufacturer.