ANSI A300 (Part 3)-2013
Revision of ANSI A300 (Part 3)-2006

American National Standard

for Tree Care Operations –

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

TCIA®
VOICE OF TREE CARE

Approved American National Standard
ANSI

ANSI A300 (Part 3)-2013 Supplemental Support Systems
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American National Standard

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Contents

Foreword This foreword is not part of American National Standard A300 (Part 3)-2013 Supplemental Support Systems.

ANSI A300 Standards are divided into multiple parts, each focusing on a specific aspect of woody plant management (e.g. Pruning, Soil Management, Supplemental Support Systems, etc.)

These standards are used to develop written specifications for work assignments. They are not intended to be used as specifications in and of themselves. Management objectives may differ considerably and therefore must be specifically defined by the user. Specifications are then written to meet the established objectives and must include measurable criteria.

ANSI A300 standards apply to professionals who provide for, or supervise the management of, trees, shrubs, and other woody landscape plants. Intended users include businesses, government agencies, property owners, property managers, and utilities. The standard does not apply to agriculture, horticultural production, or silviculture, except where explicitly noted otherwise.

This standard has been developed by the Tree Care Industry Association (TCIA), an ANSI-accredited Standards Developing Organization (SDO). TCIA is secretariat of the ANSI A300 standards, and develops standards using procedures accredited by the American National Standards Institute (ANSI).

Consensus for standards writing was developed by the Accredited Standards Committee on Tree, Shrub, and Other Woody Plant Management Operations – Standard Practices, A300 (ASC A300).

Prior to 1991, various industry associations and practitioners developed their own standards and recommendations for tree care practices. Recognizing the need for a standardized, scientific approach, green industry associations, government agencies and tree care companies agreed to develop consensus for an official American National Standard.

The result – ANSI A300 standards – unify and take authoritative precedence over all previously existing tree care industry standards. ANSI requires that approved standards be developed according to accepted principles, and that they be reviewed and, if necessary, revised every five years.

TCIA was accredited as a standards developing organization with ASC A300 as the consensus body on June 28, 1991. ASC A300 meets regularly to write new, and review and revise existing, ANSI A300 standards. The committee includes industry representatives with broad knowledge and technical expertise from residential and commercial tree care, utility, municipal and federal sectors, landscape and nursery industries, and other interested organizations.

Suggestions for improvement of this standard should be forwarded to: ANSI A300 Secretary, c/o Tree Care Industry Association, Inc., 136 Harvey Road - Suite 101, Londonderry, NH 03053.

ANSI A300 (Part 3)-2013 Supplemental Support Systems was approved as an American National Standard by ANSI on May 6, 2013. ANSI approval does not require unanimous approval by ASC A300.

The ASC A300 had the following members as of May 6, 2013:

Dane Buell, Chair
(SavATree, Inc.)

Bob Rouse, Secretary
(Tree Care Industry Association, Inc.)

Organizations Represented	***Name of Representative***
Alliance for Community Trees	*Carrie Gallagher*
American Nursery and Landscape Association	*Warren Quinn*
	Craig J. Regelbrugge (Alt.)
American Society of Consulting Arborists	*Donald Godi*
	Stephen Miller (Alt.)
American Society of Landscape Architects	*Ron Leighton*
Asplundh Tree Expert Company	*Geoff Kempter*
Bartlett Tree Expert Company	*Peter Becker*
	Dr. Thomas Smiley (Alt.)
Davey Tree Expert Company	*Chris Klimas*
	Grant Jones (Alt.)
International Society of Arboriculture	*Dr. Richard Hauer*
	Sharon Lilly (Alt.)
Professional Grounds Management Society	*Gene Pouly*
	Michael Bova (Alt.)
Professional Land Care Network	*Alice Carter*
	Tom Delaney (Alt.)
Society of Municipal Arborists	*Gordon Mann*
	Nolan Rundquist (Alt.)
Tree Care Industry Association	*Mark Stennes*
	Steve Mays Jr. (Alt.)
USDA Forest Service	*Keith Cline*
	Ed Macie (Alt.)
Utility Arborist Association	*Bill Rees*
	Matthew Simons (Alt.)

Additional organizations and individuals:

Michael Galvin (Observer)
Peter Gerstenberger (Observer)
Andy Hillman (Observer)
Tim Johnson (Observer)
Myron Laible (Observer)
Guy Meilleur (Observer)
Beth Palys (Observer)
Dr. Richard Rathjens (Observer)
Mary Reynolds (Observer)
Richard Roux (NFPA-780 Liaison)

ASC A300 Mission: To develop consensus performance standards based on current research and sound practice for writing specifications to manage trees, shrubs, and other woody plants.

ASC A300 Vision: ANSI A300 standards will be the foundation for work specifications, training materials, quality protocols, and regulations for the management of trees, shrubs, palms, and other woody plants.

American National Standard
for Tree Care Operations –

Part 3 Supplemental support systems

Subclause 1.1 to 1.3 excerpted from ANSI A300 (Part 1) – *Pruning*

1 ANSI A300 standards

1.1 Scope

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

1.2 Purpose

ANSI A300 performance standards are intended for use by federal, state, municipal and private entities including arborists, property owners, property managers, and utilities for developing written specifications.

1.3 Application

ANSI A300 performance standards shall apply to any person or entity engaged in the management of trees, shrubs, or other woody plants.

30 Part 3 – Supplement support system standards

30.1 Purpose

The purpose of this standard is to provide industry consensus guidelines for supplemental support systems and standards for writing specifications.

30.2 Reason

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

30.3 Implementation

Specifications for tree management should be written and administered by an arborist or arborist trainee who is under the supervision of an arborist.

30.3.1 Specifications shall be adhered to.

30.4 Safety

30.4.1 This performance standard shall not take precedence over applicable industry safe work practices.

30.4.2 Tree management shall be performed only by arborists or arborist trainees who, through related training or on-the-job experience, or both, are familiar with the standards, practices and hazards of arboriculture related to supplemental support systems and equipment used to install and maintain them.

30.4.2.1 Arborists shall follow appropriate safe work practices.

30.4.3 Performance shall comply with applicable Federal and State Occupational Safety and Health Administration (OSHA) standards, ANSI Z133, and other federal, state, and local regulations.

30.4.4 The sites shall be inspected for visible above ground hazards prior to beginning any tree management procedure.

30.4.5 The location and type of utilities and other obstructions both below and above ground shall be considered prior to tree management operations.

30.4.6 Job briefings shall be performed as outlined in ANSI Z133.

31 Normative references

The following standards contain provisions which, through reference in this 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 for Tree Care Operations – Tree, Shrub, and Other Woody Plant Management – Standard Practices, all Parts

ANSI B18.12, Glossary of Terms for Mechanical Fasteners

ANSI Z60, Nursery stock

ANSI Z133 for Arboricultural Operations – Safety Requirements

ASTM A-475, Standard Specification for Zinc-Coated Steel Wire Strand

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

29 CFR 1910, Occupational Safety and Health Standards (General Industry)[1]

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)]

29 CFR 1910, Subpart S – Electrical, §§ 1910.331 - 335, Safety-related work practices[1)]

[1)] *Available from U.S. Department of Labor, 200 Constitution Ave. NW, Washington, D.C. 20210, or www.osha.gov.*

32 Definitions (Definitions are considered part of the ANSI A300 Part 3 standard.)

32.1 amon-eye nut: Drop-forged eye nut, used to fashion through-hardware anchor(s).

Figure 32.1: amon-eye nut

32.2 anchor: Hardware installed to affix and/or terminate a cable or guy to the tree, ground, or other device.

32.3 anchor-tree: A tree used to provide supplemental support in a guying installation.

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 plants.

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 plants. 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 bracing: The installation of lag-thread screw or machine-thread steel rods in branches, leaders, or trunks to provide supplemental support.

32.8 cable: 1) Zinc coated strand per ASTM A-475 for dead-end grip applications. 2) Wire rope or strand for general applications. 3) Synthetic-fiber rope or synthetic-fiber webbing for general applications.

32.9 cable-end termination: Hardware designed to anchor cables installed through a branch or stem.

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 steel wire rope, steel strand, or synthetic-fiber system within a tree between branches or leaders to provide supplemental support.

32.12 compartmentalization: Physiological process that creates the chemical and physical boundaries that act to limit the spread of disease and decay organisms.

32.13 connector clamp: A multi-purpose bolt clamp that is used to bond conductors, or bond a conductor to a ground terminal or tree supplemental support system, and meets the specifications of ANSI/UL-96.

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

32.15 dead-end grip: A manufactured wire wrap designed to form a termination in the end of 1 X 7, left-hand lay cable that meets the specifications of ASTM A-475 for zinc coated strand.

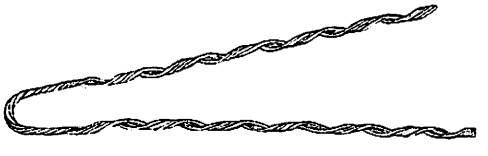


Figure 32.15: dead-end grip

32.16 dead-end hardware: Anchors or braces that are threaded directly into the tree 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.

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

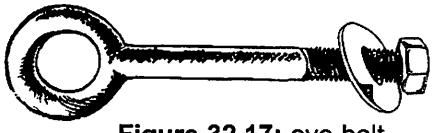


Figure 32.17: eye bolt

32.18 eye splice: A closed-eye termination formed into common grade cable by bending it back on itself and winding each wire around the cable a minimum of two complete turns.

Figure 32.18: eye splice

32.19 guying: The installation of a steel cable or synthetic-fiber cable system between a tree and an external anchor to provide supplemental support.

32.20 lag eye: Lag-thread, drop-forged, closed-eye anchor.

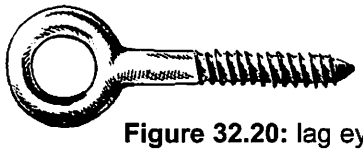


Figure 32.20: lag eye

32.21 lag hook (J-hook): Lag-thread, J-shaped anchor.

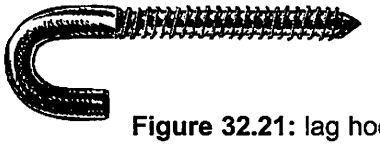


Figure 32.21: lag hook

32.22 lag thread: A coarse screw thread designed for securing into wood.

32.23 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.

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

Figure 32.24: lag-thread screw rod

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

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

32.27 machine-thread rod: A machine-thread steel rod used for through bracing installation.

32.28 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."

32.29 prop: The installation of a rigid support placed between a trunk and/or branch and another supporting sturcture.

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

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

32.32 specifications: A detailed, measurable plan or proposal for performing a work activity or providing a product, usually a written document.

32.33 stabilize: To support a tree in a new location or after root or soil failure.

32.34 standard, ANSI A300: The performance parameters established by industry consensus as a rule for the measure of extent, quality, quantity, value, or weight used to write specifications.

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

32.36 swage stop: A sleeve-type fitting used to terminate a wire rope or cable.

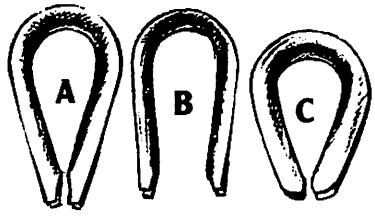
32.37 taut: Tightened to the point of eliminating visible slack.

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; thimbles used in eye-splice configurations; cable-end terminations; and, swage-stop terminations.

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

Figure 32.40: Thimble



Heavy-duty, closed | Heavy-duty, open | Extra heavy-duty

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

32.42 through-brace: A brace formed by installing hardware completely through a branch, leader, or trunk.

32.43 through-hardware: Anchors, cables, or braces that pass completely through the branch, leader, or trunk, secured with nuts and heavy-duty washers or cable-end termination. Through-hardware includes but is not limited to: cables; eyebolts; lag-thread screw rods; and, threaded-steel rods.

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

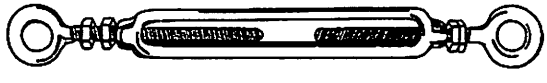


Figure 32.44: turnbuckle

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

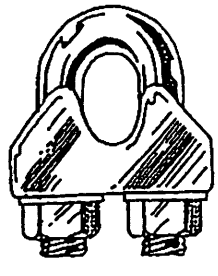


Figure 32.45: wire rope clamp

33 Supplemental support systems practices

33.1 Objectives

Objectives for supplemental support systems shall be defined prior to design, installation, or maintenance of the system.

33.1.1 Objectives should be based on the reasons for installing or maintaining the supplemental support system.

33.1.2 Supplemental support system design shall be specified. Specifications should include support method (cabling, bracing, guying, etc), system type (direct, triangular, hub and spoke, etc.), system location, and materials, including number, sizes, and types of components.

33.2 Tree inspection

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

33.2.2 Structural integrity and potential changes in tree movement and loading (dynamics) shall be considered prior to installing a tree 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 supplemetal support systems, except in the case of emergencies.

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 All necessary pruning should be performed prior to installing a tree supplemental support system. Pruning shall be in accordance with ANSI A300 Part 1 – *Pruning*.

33.4.2 Prior to installation, the owner or owner's agent shall be notified of the need for periodic inspection by an arborist of the supplemental support system's condition; position; cable tension; and the tree's structural integrity, see **Annex C.** Scheduling inspections shall be the responsibility of the tree owner.

33.4.3 Anchors and braces shall not be installed into decayed areas where sound wood is less than 30% of the trunk or branch diameter, see Figure **33.4.3.**

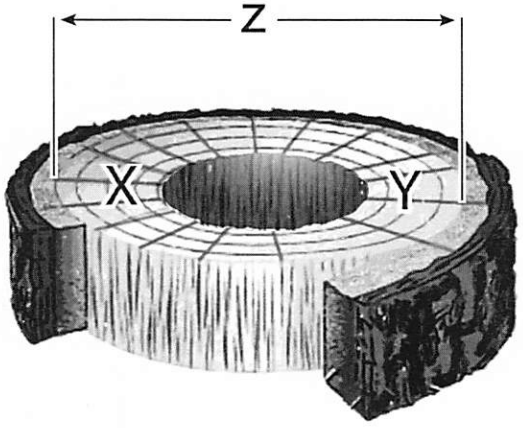


Figure 33.4.3: Equations for finding the percentage of sound wood. Symbol Key for Equations:

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.

33.4.4 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 [see *ANSI A300 (Part 4) — Lightning Protection Systems standard].*

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

33.4.6 Steel hardware shall be corrosion resistant (e.g. galvanized or stainless steel). Synthetic fiber cable systems shall be ultra-violet (UV) light resistant.

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

33.4.8 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. The diameter of the hole shall not be greater than 1/6 the diameter of the limb, trunk, or branch at the point of installation.

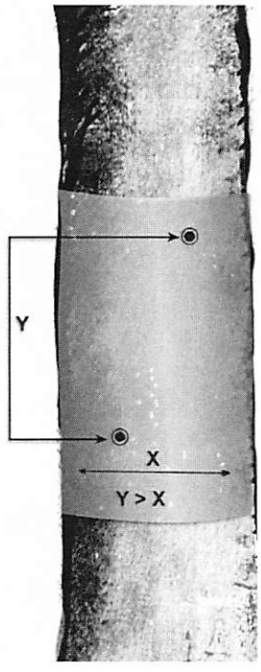


Figure 33.5.1: Brace positioning

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.

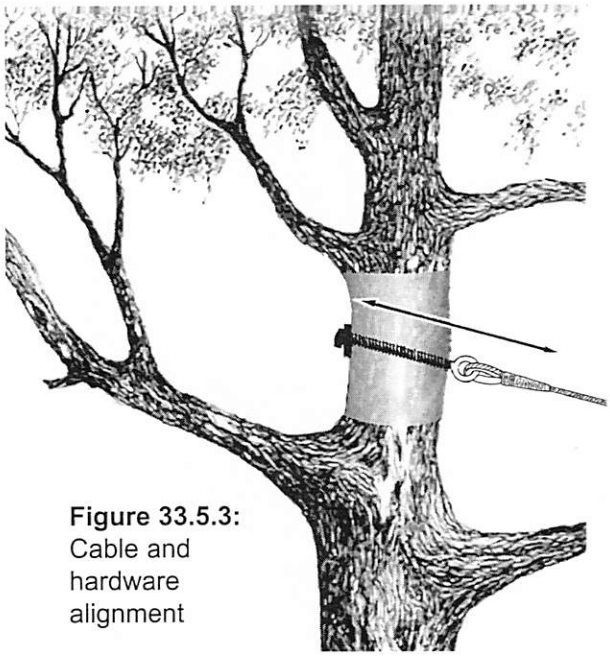


Figure 33.5.3: Cable and hardware alignment

33.5.4 Only one termination shall be attached to an anchor.

33.5.5 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.

33.5.6 Holes for through-hardware should be no greater than 1/8" (3 mm) of the diameter of the hardware being installed.

33.5.7 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.

33.5.8 Lag hooks shall be installed to prevent the cable termination from coming loose. Bark should not be damaged beyond the scope of the work during installation of the lag hook.

33.5.9 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 according to manufacturer's recommendations.

33.5.10 Washers shall not be countersunk into the wood.

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

33.5.12 Excess portion of the through-hardware shall be removed.

33.5.13 Terminations shall be specified in the system design specifications.

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

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

33.5.16 Dead-end grip terminations shall only be used on cable that meets the specifications of ASTM A-475.

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

33.5.18 All hardware within a system shall meet or exceed the minimum strength required to achieve the objective, see **Annex A**.

33.5.19 Installations shall follow manufacturers' recommendations.

34 Cabling

34.1 Cabling objectives

Objectives for cabling shall be defined prior to design, installation, or maintenance of the system.

34.1.1 Objectives should include, but are not limited to, one or more of the following:

- Limit the movement of codominant stems or branches;
- Limit the movement of weakly attached branches;
- Provide supplemental support for overextended branches; and,
- Provide supplemental support for branches that may be exposed to extra loading.

34.2 Cabling types

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

34.2.1 Direct: Direct cabling consists of a single cable between two tree parts, e.g., two branches, two stems, or a trunk and a limb (three direct cables shown).

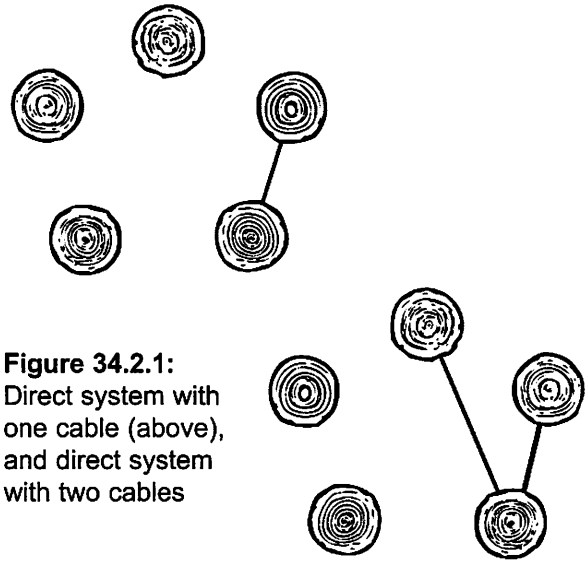


Figure 34.2.1: Direct system with one cable (above), and direct system with two cables

34.2.1.1 Location of hardware shall be specified.

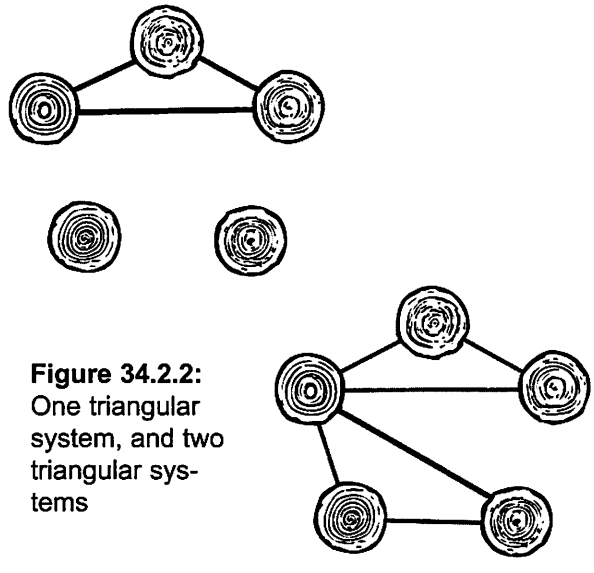


Figure 34.2.2: One triangular system, and two triangular systems

34.2.2 Triangular: Triangular cabling consists of connecting tree parts in combination of threes. This method should be preferred, when maximum support is required (two triangular systems shown).

34.2.2.1 Location of hardware shall be specified.

34.2.3 Box: Box cabling consists of connecting four or more tree parts in a closed series. This system should be used only when minimal direct support is needed.

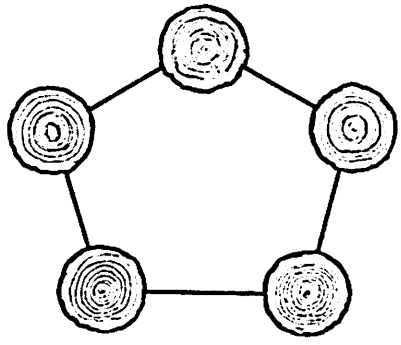


Figure 34.2.3: Box system

34.2.3.1 Location of hardware shall be specified.

34.2.4 Hub and Spoke: Hub and Spoke cabling consists of a center attachment (hub) with spans (spokes) of cable radiating to three or more leaders.

34.2.4.1 Location of hardware shall be specified.

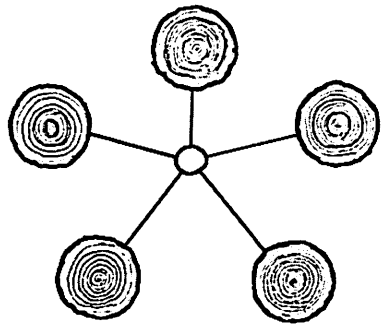


Figure 34.2.4: Hub and spoke system

34.3 Cabling installation

34.3.1 Support cables should be taut following installation.

34.3.2 Anchor(s) should be installed at or near a point two-thirds (2/3) of the length/height of the branch or leader to be supported, measured from the junction to be supported, see Figure **34.3.2**.

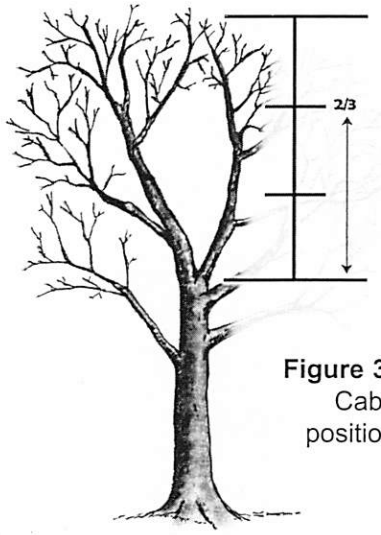


Figure 34.3.2: Cable positioning

34.3.3 The angle of cable installation should be perpendicular to an imaginary line bisecting the angle between the tree parts being cabled, see Figure **34.3.3.**

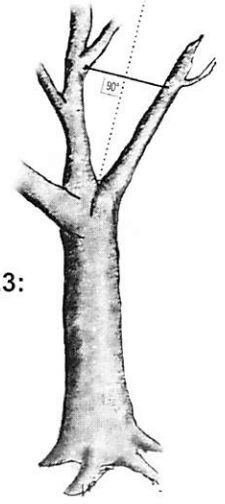


Figure 34.3.3: Cable angle

34.3.4 If existing cables are to be replaced, they shall not be removed until the new system is installed.

35 Bracing

35.1 Bracing objectives

Objectives for bracing shall be defined prior to design, installation, or maintenance of the system.

35.1.1 Objectives should include, but are not limited to, one or more of the following:

Limit the movement of codominant stems or branches;
Reinforce and/or close cracks in stems or branches; and,
Restrict movement of rubbing branches.

35.2 Bracing types

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

35.2.1 Single: Single bracing consists of one installed rod, see Figure **35.2.1.**

35.2.2 Parallel: Parallel bracing consists of two or more rods installed in vertical and directional alignment, see Figure **35.2.2.**

35.2.3 Alternating: Alternating bracing consists of two or more rods installed in directional alignment but not vertical alignment, see Figure **35.2.3.**

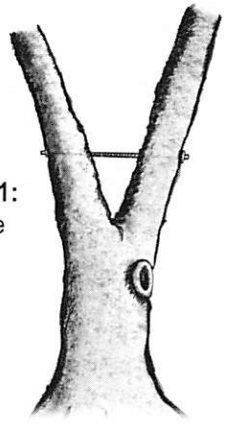


Figure 35.2.1: single brace system

Figure 35.2.2: Parallel brace system

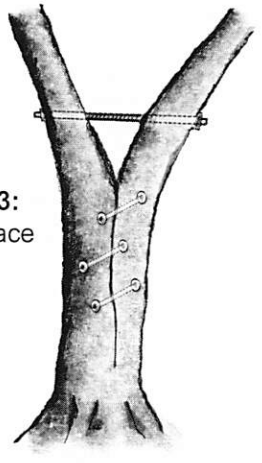


Figure 35.2.3: Alternating brace system

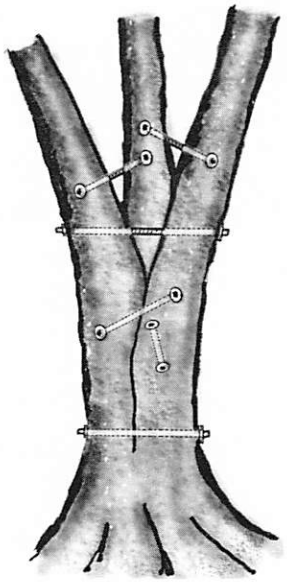


Figure 35.2.4: Crossing brace system

35.2.4 Crossing: Crossing bracing consists of two or more rods installed in a non-aligned pattern.

35.3 Bracing installation

35.3.1 When bracing installation is specified, supplement support should be installed in the crotch, before bracing installation occurs.

35.3.2 The preferred location for a single rod for a non-split crotch, should be approximately the branch diameter of the largest branch above the crotch.

35.3.2.1 Variables such as wood quality, species, form, and branch structure, should be considered when determining the distance above the crotch.

35.3.3 Bracing systems using multiple rods should have at least one rod installed above the crotch.

35.3.4 Braces shall be installed in either a through-brace or dead-end brace configuration.

35.3.5 The minimum hardware requirements for braces should be in accordance with **Table 1** Minimum hardware requirements for bracing trees.

35.3.6 Through-bracing

35.3.6.1 Through-braces shall be used when bracing through decayed area/wood or in trees that are poor compartmentalizers or have weak wood characteristics.

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

35.3.7 Dead-end bracing

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

35.3.7.2 The brace shall be installed completely through the smaller or equal portion and at least halfway into the other portion.

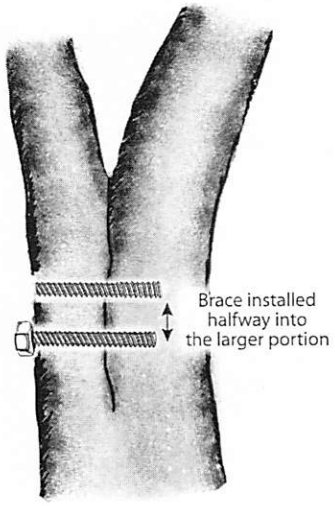


Figure 35.3.7.2: Dead-end brace installation

35.3.7.3 The 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.

36 Propping

36.1 Propping objectives

Objectives for propping shall be defined prior to design, installation, or maintenance of the system.

36.1.1 Objectives should include, but are not limited to, one or more of the following:

Support long, lateral branches;
Keep branches or leaning stems off the ground; and,
Support branches or leaning stems to provide clearance.

36.2 Propping installation

36.2.1 Props shall be of sufficient strength to hold the intended load.

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	14	2	1
36-51	17	2	1
51-102	19	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	21	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

36.2.2 Props shall be fastened to the branch in a manner that minimizes damage and prevents the branch from falling off the prop.

36.2.3 Props shall be designed and installed in a manner that minimizes restriction of plant growth.

36.2.4 Props shall be anchored so that movement does not damage the tree branch, limb, or trunk.

37 Guying established trees

37.1 Objectives for guying established trees

Objectives for guying shall be defined prior to design, installation, or maintenance of the system.

37.1.1 Objectives should include, but are not limited to, one or more of the following:

Stabilize an existing tree or shrub;
Reduce risk of windthrow; and,
Reduce other specified risks.

37.2 Guying established trees – types

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

37.2.1 Tree-to-ground: Tree-to-ground guying consists of installing at least one cable between a ground anchor and the tree to be guyed.

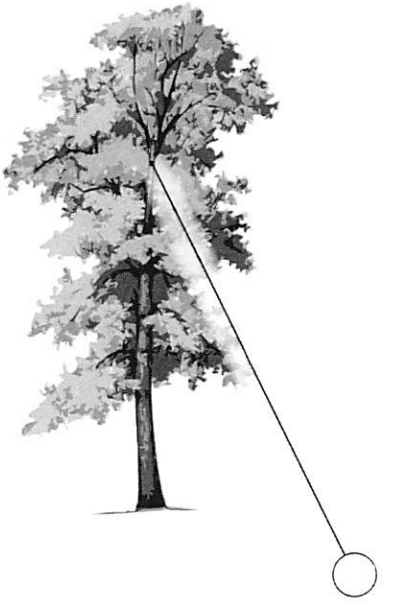


Figure 37.2.1: Tree-to-ground system

37.2.2 Tree-to-tree: Tree-to-tree guying consists of installing at least one cable between an anchor-tree and the tree to be guyed.

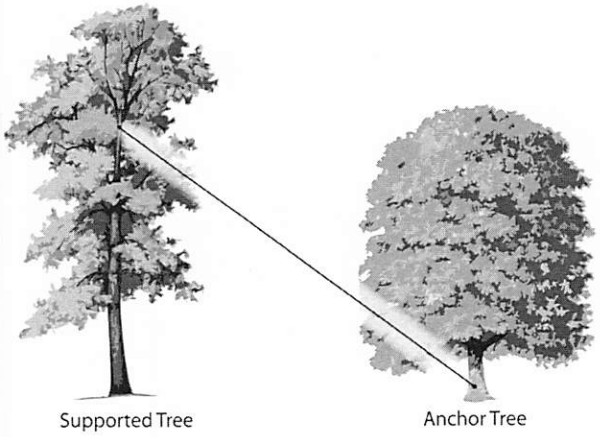


Figure 37.2.2: Tree-to-tree system

37.3 Safety

Public safety shall be considered when guying trees including, but not limited to:

Pedestrian and vehicular traffic; and,
Site and recreational use.

37.4 Guying installation

37.4.1 Hardware should be installed so that it is in alignment with the angle of pull from the guy.

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

37.4.3 A temporary guy should be considered when there is an immediate need for supplemental support.

37.4.4 Tree-to-ground guying

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

37.4.4.2 Guys should be attached to the tree at or above a point not less than one-half the height of the tree.

37.4.4.3 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.

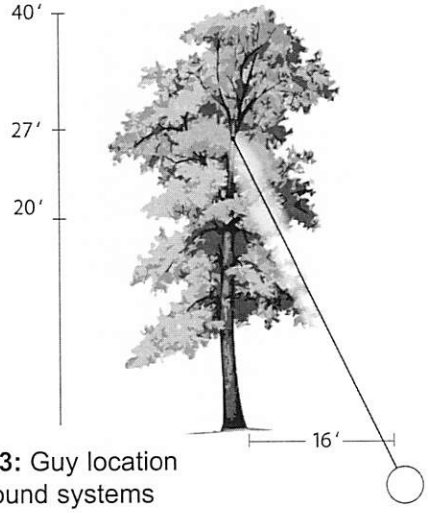


Figure 37.4.4.3: Guy location in tree-to-ground systems

37.4.5 Tree-to-tree guying

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

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

37.4.5.3 Anchors should be attached in the upper half of the tree to be supported and in the lower half of the anchor-tree(s).

38 Guying newly installed landscape plants

38.1 Objectives

Objectives for guying shall be defined prior to design, installation, or maintenance of the system.

38.1.1 Objectives should include, but are not limited to, one or more of the following:

Stabilize a larger transplanted tree or shrub;
Reduce risk of windthrow; and,
Protect a new transplant from damage, including from maintenance or vandalism.

38.1.2 Guys or other supplemental support systems should not be installed unless necessary.

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

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

38.4 For trees over 10-inch diameter, guys should be installed in accordance with subclause **37.2 Guying established tree-types.**

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

38.6 Guys or other supplemental support systems shall be maintained and be removed when they are no longer needed.

39 Supplemental support system inspection and maintenance

39.1 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, see **Annex C**.

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

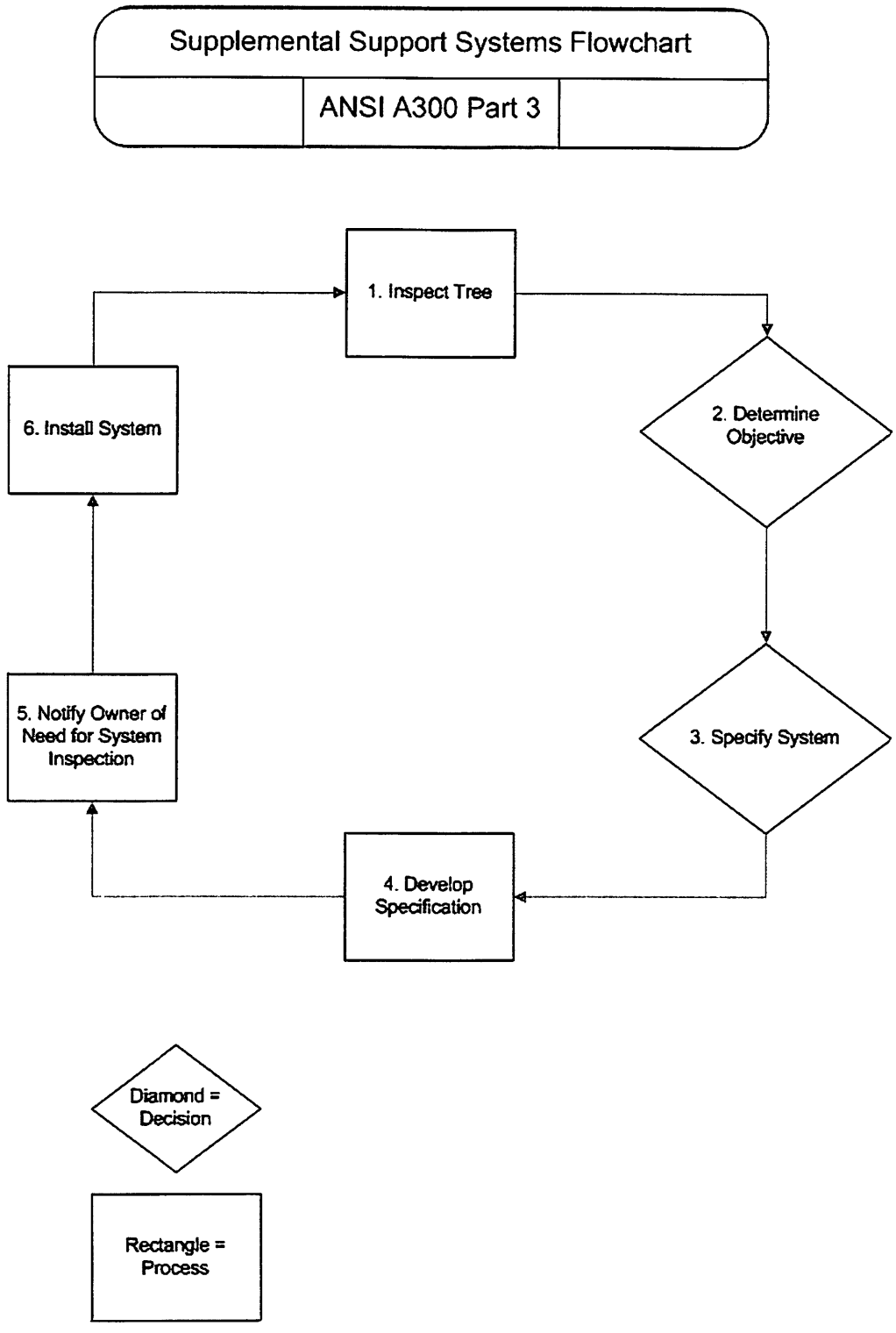
Annex A – Additional hardware information (This annex is not part of the ANSI A300 Part 3 standard.)

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 flow chart (This annex is not part of the ANSI A300 Part 3 standard.)



Annex C – Supplemental support system inspection process (This annex is not part of the ANSI A300 Part 3 standard.)

C-1 Supplemental support systems may be inspected by an arborist or arborist trainee by ground and/or aerial inspection methods on a periodic basis.

C-2 Appropriate timeframes for periodic inspections are based on the species and condition of the tree, weather events, the supplemental support system method and type, and the type and materials of components used.

C-3 Inspection checklist criteria may include, but is not limited to the:
System's current condition and position in the tree;
Integrity of system components;
Bonding to lightning protection systems, as appropriate;
Growth of the tree;
Tension in the system;
Effect of the system on the tree; and,
Structural condition of the tree.

C-4 Inspection of supplemental support systems may be considered when other maintenance tasks are being performed in the tree.

C-5 Suggested tools and equipment may include, but is not limited to:
Inspection checklist;
System tag;
Sounding hammer;
Binoculars;
Clinometer; and,
Aerial lift.

C-6 Suggested written record data may include, but is not limited to:
Inspection date;
Methods; and,
Findings.

Annex D – Applicable ANSI A300 interpretations (This annex is not part of the ANSI A300 Part 3 standard.)

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

D-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.

D-2 Revised interpretation for compliant lag hooks, orignal version from ANSI A300 (Part 3)-2000)

The intent of this interpretation remains the same as the 2000 and 2006 versions.

Excerpts:

33.5.5 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.

33.5.7 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.

33.5.8 Lag hooks shall be installed to prevent the cable termination from coming loose. Bark should not be damaged beyond the scope of the work during installation of the lag hook.

Interpretation: In normal circumstances, 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 without damaging the bark beyond the scope of the work and cannot be installed in a manner compliant with the ANSI A300 Part 3 standard.

D-3 Interpretation for cable selection when using dead-end grip terminations, update for ANSI A300 (Part 3)-2013 standard

The intent of this interpretation remains the same as the 2006 version.

The user of ANSI A300 standards is instructed to cross-reference defintion subclauses **32.8 cable** and **32.15 dead-end grip** and subclause **33.5.16**.

Interpretation: In normal circiumstances, 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 as long as they are installed correctly and according to manufacturer's instructions.

Annex E – Sample specifications (This annex is not part of the ANSI A300 Part 3 standard.)

E-1 Sample specification for tree over historic cemetery.

Cite: "All work to be done according to ANSI A300 Part 3 Supplemental Support Systems standard" or, "All tree care management to be done according to ANSI A300 standards."

Objective: Maximum, direct support of limb

Type of cabling to meet objective: Triangular system

Specification:

(6) ⅜ inch heat-treated, galvanized eyebolts shall be installed and secured with heat-treated, galvanized nuts and washers in a through-anchor configuration.

The anchor on the subject limb should be installed at a location approximately two-thirds (⅔) the height of that limb.

¼ inch EHS cable shall be secured to eyebolts with dead-end grips and thimbles, sized and matched according to manufacturers' instructions and ASTM A475. The EHS cables shall be installed between anchors to form a triangular system.

Notes:

Notes: