American National Standard

for Tree Care Operations –

Tree, Shrub, and Other Woody Plant Management –Standard Practices (Tree Risk Assessment a. Tree Structure Assessment)

ANSI A300 (Part 9)-2011 Tree Risk Assessment
a. Tree Structure Assessment

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Approved American National Standard
ANSI

ANSI A300 (Part 9)-2011
Tree Risk Assessment a. Tree Structure Assessment

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American National Standard

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Contents

Foreword (This foreword is not part of the A300 Part 9 American National Standard)

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 results – 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 9)-2011 Tree Risk Assessment a. Tree Structure Assessment was approved as an American National Standard by ANSI on February 17, 2011. ANSI approval does not require unanimous approval by ASC A300.

(Continued)

The ASC A300 committee had the following members as of February 17, 2011:

Tim Johnson, Chair
(Artistic Arborist, Inc.)

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

Organizations Represented	Name of Representative
Alliance for Community Trees	*Michael Galvin*
	Alice Ewen (Alt.)
American Nursery and Landscape Association	*Warren Quinn*
	Craig J. Regelbrugge (Alt.)
American Society of Consulting Arborists	*Jerry Pulley*
	Stephen Miller (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*
	Grant Jones (Alt.)
International Society of Arboriculture	*Bruce Hagen*
	Sharon Lilly (Alt.)
National Park Service	*Vacant (Robert DeFeo – Observer, designated voter)*
Professional Grounds Management Society	*Thomas Shaner*
Professional Land Care Network	*Bill Brinn*
Society of Municipal Arborists	*Gordon Mann*
	Nolan Rundquist (Alt.)
Tree Care Industry Association	*Dane Buell*
	James McGuire (Alt.)
USDA Forest Service	*Keith Cline*
	Ed Macie (Alt.)
Utility Arborist Association	*Matthew Simons*
	William Rees (Alt.)

Additional organizations and individuals:
Guy Meilleur-American Forests (Observer)
Peter Gerstenberger (Observer)
Sabeena Hickman (Observer)
Andy Hillman (Observer)
Myron Laible (Observer)
Beth Palys (Observer)
Richard Rathjens (Observer)
Mary Reynolds (Observer)
Richard Roux (NFPA-780 Liaison)
Don Zimar (Observer)

ASC A300 mission statement:

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

American National Standard for Tree Care Operations –

Part 9 – Tree risk assessment a. tree structure assessment

Subclauses 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.

90 Part 9 – Tree risk assessment standards

90.1 Purpose

The purpose of this clause is to provide guidelines for the practice of tree risk assessment and standards for writing specifications.

90.2 Reason

To assess structural integrity and other factors that affect the level of risk to people or property and to provide information for mitigating risk.

90.3 Implementation

90.3.1 Specifications for tree risk assessment and mitigation should be provided by an arborist competent in tree risk assessment.

90.3.2 Tree risk assessment specifications shall be adhered to.

90.4 Safety

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

90.4.2 Performance shall comply with applicable Federal and State Occupational Safety and Health Administration (OSHA) standards, ANSI Z133, Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), Federal Environmental Protection Agency (EPA) regulations as well as state and local regulations.

91 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 Z133, *Arboriculture – Safety requirements*

29 CFR 1910, 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]

92 Definitions (Definitions are considered part of the ANSI A300 Part 9 standard)

92.1 aerial assessment: An assessment of all or part of the crown from a position aloft.

92.2 aerial patrol: An assessment of a tree or a population of trees conducted from a helicopter, fixed-wing plane, satellite, or other means.

92.3 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.

92.4 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.

92.5 buttress roots: Roots at the trunk base that help support the tree and equalize mechanical stress.

92.6 controlling authority: An agency, organization, or corporate entity with the legal authority and/or obligation to manage individual trees or tree populations.

92.7 crown area: Crown surface area in profile relative to overall height and/or original or expected spread for that species under similar conditions. See live crown ratio.

92.8 crown density: The amount, compactness, or depth of foliage of a tree crown.

92.9 crown symmetry: The distribution of branches relative to the trunk.

92.10 failure (tree failure): Breakage of stem or branches, or loss of mechanical support in the root system.

92.11 included bark: Bark that becomes embedded in a union between branches or stems.

92.12 live crown ratio: Live crown height relative to overall plant height.

92.13 mitigation: The process of diminishing risk.

92.14 patrol: A tree condition assessment conducted, as specified, by foot, vehicle, or from aircraft or satellite.

92.15 pneumatic soil excavation: The removal of soil using pressurized air.

92.16 reaction wood: Wood formed in response to the effects of mechanical stress or loading.

92.17 residual risk: Risk remaining after mitigation.

92.18 risk: Combination of the probability of an event and its consequence.

92.19 risk analysis: Systematic use of information to identify and estimate risk.

92.20 risk assessment: Overall process of risk analysis and risk evaluation.

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

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

92.23 site history: An account of management practices, changes, events, or disturbances that have occurred at a site.

92.24 sounding: The process of striking a tree with a mallet or other appropriate tool and listening for tones that indicate certain defects.

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

92.26 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.

92.27 structural defect: A feature, condition, or deformity of a tree or tree parts that indicates a weak structure and contributes to the likelihood of failure.

92.28 target: People or property that could be injured or damaged by the failure of a tree or tree parts.

92.29 tree risk: The likelihood and consequences of failure of tree or tree parts.

92.30 tree risk assessment: A systematic process used to identify, analyze and evaluate tree risk.

93 Tree structure assessment practices

93.1 Tree structure assessment objectives

The objective shall be defined based on context, the intended use of the site, and scope of the assignment.

93.2 General

93.2.1 Arborists assessing tree structure and failure potential shall have appropriate training and experience.

93.3 Scope of work

93.3.1 The arborist should perform tree structure assessments on only those trees specifically identified in the scope of work.

93.3.2 The scope of work specification should include, but is not limited to:
1) Tree location, selection criteria;
2) Level and details of risk assessment;
3) Type of report (e.g. oral, written) to be developed;
4) The time frame for reporting;
5) To whom the report should be presented; and,
6) Mitigation.

93.3.3 The arborist shall not be required to perform a higher level of assessment than specified by the scope of work.

93.4 Levels of tree risk assessment

93.4.1 The level and detail of tree risk assessment shall be specified.

93.4.2 One or more of the following inspection levels shall be specified:

93.4.2.1 Level 1

93.4.2.1.1 Level 1 assessments shall be a limited visual assessment of an individual tree or a population of trees near specified targets, such as along roadways or utility rights-of-way, to identify specified conditions or obvious defects.

93.4.2.1.2 Level 1 assessments shall be from a specified perspective such as foot, vehicle, or aerial patrol.

93.4.2.1.3 Level 1 assessment methodology shall be specified.

93.4.2.2 Level 2

93.4.2.2.1 Level 2 assessments shall include a 360-degree, ground-based visual inspection of the tree crown, trunk, trunk flare, above-ground roots, and site conditions around the tree in relation to targets.

93.4.2.2.1.1 When sounding is specified, a mallet or equivalent tool should be used to detect large hollows and loose bark in the trunk, root collar, and above ground buttress roots.

93.4.2.2.2 Use of hand tools, trowels, binoculars, or probes, shall not be precluded from a Level 2 assessment.

93.4.2.2.3 An assessment shall include the identification of conditions indicating the presence of structural defects.

93.4.2.3 Level 3

93.4.2.3.1 Level 3 assessments shall include all Level 2 requirements.

93.4.2.3.2 A level 3 assessment employing advanced methodologies should be used when the extent and severity of conditions or defect cannot be determined by a Level 2 assessment.

93.4.2.3.3 Level 3 assessments shall include, but are not limited to, one or more of the following tree assessment methods:

- Aerial assessment of branch or stem defects;
- Drilling;
- Evaluation of target risk;
- Increment boring;
- Investigation of tree or site history related to possible or defined defects;
- Lean assessment;
- Probing;
- Pull testing;
- Radiation assessment (e.g. radar, x-ray, gamma ray);
- Resistance drilling;
- Sonic assessment;
- Sounding; and,
- Sub-surface root and/or soil assessment.

93.4.2.3.4 Tools and work practices that damage the tree beyond the scope of normal work practices shall be avoided.

93.5 Target identification

The arborist should consult with the owner, owner's agent, or controlling authority to assess known and foreseeable targets (static target, transient target, or moveable target) within likely striking distance of the specified tree(s) or tree parts.

93.6 Risk analysis and reporting

93.6.1 The analysis of the assessment data should include one or more of the following as appropriate to the level of assessment:

Specified objectives;
Tree species;
Tree condition;
Type, severity, and location of defect(s);
Presence or absence of reaction wood and compensatory growth;
Live crown ratio and crown density;
Site conditions and characteristics;
Site and maintenance history;
Past failure patterns;
Local weather, climatic events; and,
Risk mitigation.

93.6.2 The type of report (oral, written) required shall be specified in the scope of work.

93.6.2.1 Written reports should include:

Identification and location of the specified tree(s);
A description of the methods used;
Tree risk assessment data;
Recommendations for mitigating risk or additional assessments; and,
Recommendations for monitoring and follow-up.

93.6.2.1.1 All recommendations other than removal of the tree should contain an advisory that not all potential structure and stability concerns associated with trees can be eliminated.

93.6.2.1.2 All recommendations should include a statement addressing residual risk following mitigation.

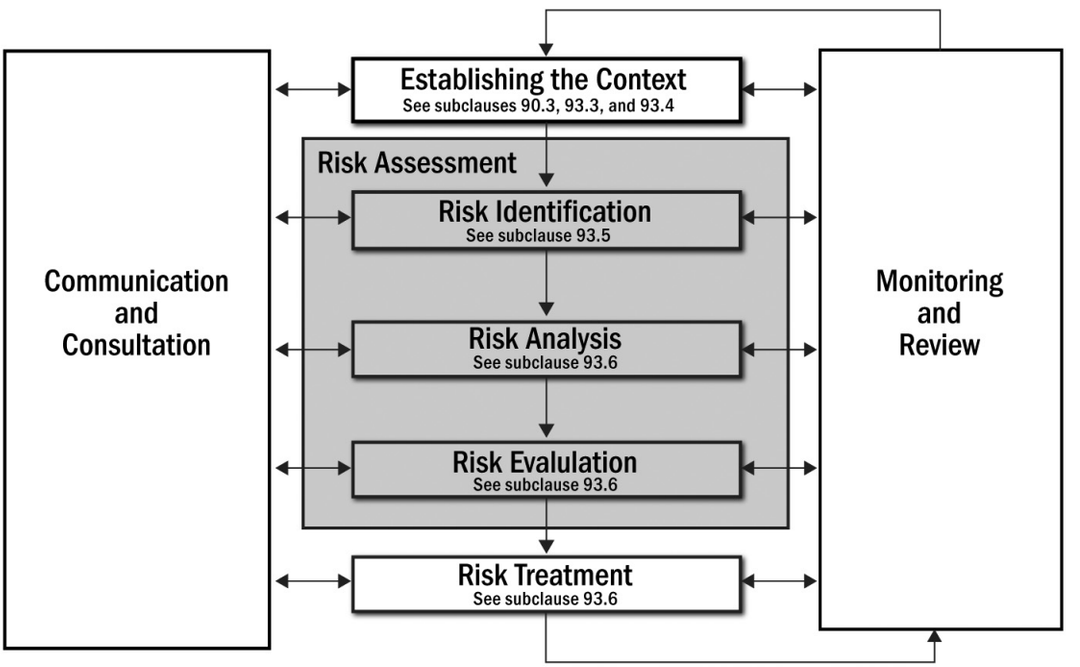
93.6.3 Monitoring and follow-up recommendations should be made based on the objective and the outcome of the mitigation.

93.6.4 Owner determination

93.6.4.1 It shall be the responsibility of the owner, the owner's agent, or the controlling authority to schedule repeat or advanced assessments, determine actions, and implement follow-up recommendations, monitoring, and/or mitigation.

Annex A – Risk assessment flow chart

(This annex is not part of the ANSI A300 Part 9 standard.)



This flow-chart adapted for ANSI A300 Part 9 Annex from an original flow chart published in ISO/IEC 31010-2009 Risk management – Risk assessment techniques international standard. Visit www.ansi.org or www.iec.ch for more information or to order.

Annex B – Tree structure assessment checklist
(This annex is not part of the ANSI A300 Part 9 standard.)

B-1 Visual tree assessments may include, but are not limited to:

1) Dead parts

2) Weakly attached branches and codominant stems
- Broken hanging branches
- Branch aspect ratio
- Included bark
- Multiple branches at one point
- Epicormic branches and shoots

3) Codominant stems
- Included bark

4) Cracks into or through the wood; ribs, seams

5) Wood decay
- Missing or decayed wood
- Potential indicators of decay
- Abnormal growth patterns
- Positive indicators of decay
- Cavities and other openings
- Fungal fruiting structures
- Carpenter ants
- Termites

6) Cankers

7) Tree architecture
- Unusual tree architecture or taper
- Live crown ratio
- Height to diameter ratio
- Lean
- Branch distribution
- Crown position – dominant, codominant, intermediate, suppressed

8) Root and Root collar
- Severed
- Decay
- Restrictions to growth
- Girdling
- Root plate lifting, soil cracks
- Undermined
- Broken
- Basal flare
- Related soil issues

B-2 Decay assessments may include, but are not limited to:

1) Sounding for bark separation and wood hollows
- Mallets

2) Probing for decay
- Increment borer
- Small diameter drill bits
- Resistance recording drill

3) Sonic measurements
- Two point sonic devices
- Multipoint sonic devices - Picus tomography

4) Other methods under development
- Radar, tree and soil applications

Thermograph
X-ray, gamma ray

5) Root collar and root inspection
6) Aerial inspection
7) Pull testing
8) Modeling wind pattern and force – Wind Rose
9) Interpreting results of advanced assessment
Weather extremes – wind, snow, and ice levels that trees can withstand
Stem and branch strength loss/decay formula
Asymmetric decay
Guideline for action
Root loss assessment