

ANSI/SIA A92.5 - 2006

AMERICAN NATIONAL STANDARD

for
Boom - Supported
Elevating Work Platforms



American National Standards Institute
11 West 42nd Street
New York, New York 10036

Date of Publication: February 28, 2006

This Standard was approved by ANSI on January 17, 2006

The design and manufacturing requirements of this standard apply to all aerial platforms manufactured on or after the effective date. All other provisions of this standard apply to both new and existing units delivered by sale, lease, rental or for any form of beneficial use on or after the effective date.

The effective date is established by the standards developer and not by the American National Standards Institute.

This standard was developed under procedures accredited as meeting the criteria for American National Standards. The Consensus Committee that approved the standard was balanced to assure that individuals from competent and concerned interests have had an opportunity to participate. The proposed standard was made available for public review and comment which provides an opportunity for additional public input from industry, academia, regulatory agencies, and the public-at-large.

The Scaffold Industry Association, Inc. (SIA) does not "approve," "rate," or "endorse" any item, construction, proprietary device, or activity.

The Scaffold Industry Association, Inc. (SIA) does not take any position with respect to the validity of any patent rights asserted in connection with any items mentioned in this document, and does not undertake to insure anyone utilizing a standard against liability for infringement of any applicable Letters Patent, nor assume any such liability. Users of this standard are expressly advised that the determination of the validity of any such patent rights, and the risk of the infringement of such rights, is entirely their own responsibility.

Participation by federal agency representative(s) or person(s) affiliated within the industry is not to be interpreted as government or industry endorsement of this standard.

The Scaffold Industry Association, Inc. (SIA) accepts responsibility for only those interpretations issued in accordance with governing ANSI Essential Requirements which preclude the issuance of interpretations by individual volunteers.

**ANSI/SIA
A92.5-2006**

Revision of
ANSI A92.5-1992

**AMERICAN NATIONAL STANDARD
BOOM-SUPPORTED ELEVATING
WORK PLATFORMS**

Secretariat
Scaffold Industry Association, Inc.

Approved January 17, 2006
American National Standards Institute, Inc.

American National Standard

Approval of an American National Standard requires verification by ANSI 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 judgment 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 has approved the standards or not, from manufacturing, marketing, purchasing, or using products, 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 to reaffirm, revise, or withdraw this standard no later than five years from the date of approval. Purchasers of American National Standards may receive current information on all standards by calling or writing the American National Standards Institute.

Published by
Scaffold Industry Association, Inc. (SIA)
Post Office Box 20574 , Phoenix, AZ, 85036-0574
www.scaffold.org

Copyright ©2006 by Scaffold Industry Association, Inc.
All rights reserved.

No part of this publication may be reproduced in any form,
in an electronic retrieval system or otherwise, without
the prior written permission of the publisher.

Printed in the United States of America

Foreword This Foreword is not part of American National Standard for Boom-Supported Elevating Work Platforms, ANSI/SIA A92.5-2006.

This standard is one of a series on aerial platforms developed under the committee procedures of the American National Standards Institute. The A92 standards committee was organized by the Institute in 1948. The Scaffold Industry Association, Inc. serves as Secretariat.

The primary objective of this standard is to prevent accidents associated with the use of Self-propelled boom-supported elevating work platforms by establishing requirements for design, manufacture, maintenance, performance, use and training.

This revision to ANSI/SIA A92.5 separately addresses each entity to clearly define responsibilities. Care was taken to provide consistency between this and other A92 standards. Definitions have been expanded to clarify interpretation.

Interpretations and Suggestions for Improvement

All inquiries requesting interpretation of the Committee's approved American National Standards must be in writing and directed to the Secretariat. The A92 Committee shall approve the interpretation before submission to the inquirer. No one but the A92 Committee is authorized to provide any interpretation of this standard.

The A92 Committee solicits comments on and criticism of the requirements of the standards. The standards will be revised from time to time where necessary or desirable, as demonstrated by the experience gained from the application of the standards. Proposals for improvement of this standard will be welcome. Proposals should be as specific as possible, citing the paragraph number(s), the proposed wording, and a detailed rationale for the proposal including any pertinent documentation.

All requests for interpretation and all suggestions for improvement shall be forwarded in writing to the ASC A92 Committee, c/o Secretariat ~ Scaffold Industry Association, Post Office Box 20574, Phoenix, AZ, 85036-0574.

This standard was processed and approved for submittal to ANSI by Accredited Standards Committee Aerial Platforms, A92. The ASC A92 committee approval of the standard does not necessarily imply that all committee members voted for its approval. At the time the ASC A92 committee approved this standard, the A92 Aerial Platforms Committee had the following members.

David Merrifield - Chairman
Merrifield Safety Consulting PPC

<i>Organization Represented</i>	<i>Name of Representative</i>
Association of Equipment Manufacturers – MADDC.....	Roger Woodling
Altec Hi Line.....	Gary Werkhoven
Altec Industries.....	Bryan D. Player
American Rental Association.....	Richard Stollery
Brewington & Company.....	John J. Brewington
C.W. Wright Construction Co.....	Michael C. Stiles
Carolina Power & Light Company.....	John W. Cook, Jr.
Chuck Foster c/o Edison Electric Institute.....	James Jensen, Jr.
Diversified Inspections / ITL.....	Gene Tootle
Donald Reichert & Associates.....	Donald Reichert, P.E.
Eckstine & Associates.....	Dennis Eckstine
Equipment Safety Consultants, Inc.....	Charles "Mark" Recard
Florida Power & Light Company.....	Robert H. Sterba
Fraco Products.....	Francois Villeneuve
Genie Industries.....	Rick Curtin
George Robson Construction Ltd.....	C. Denton Elliott
Global Rental Company.....	Joshua Chard
Hayden Enterprises.....	H.B. Bud Hayden, Jr.
Hydro-Mobile, Inc.....	Vincent DeQuoy
IEEE.....	Lewis M. Whisonant
Intercontinental Equipment Company, LLC.....	Gary A. McAlexander
Intervect USA.....	Gregory E. Janda
JLG Industries, Inc.....	Stephen Forgas
Lift-A-Loft Corporation.....	William P. Fulton
MAT-3, Inc.....	John J. Mlaker
New York State Department of Transportation.....	Francis L. Bonesteel
OEM Controls.....	Lincoln F. Schoenberger
Ontario Hydro.....	Ernest A. Jones
PCD, LLC.....	Paul Young
Phenix Technologies.....	Mark A. Miller
Pike Electric, Inc.....	Zach Blackmon
Pinguley-Haulotte.....	Salah Beji
Progress Energy Florida.....	F.J. Wooldridge
Rental Service Corporation.....	Ben Fort
Reynolds Engineering Services, Inc.....	Stephen Reynolds, P.E.
Safety Dynamicon, Inc.	Ernest Merz
Scaffold Industry Association.....	David Merrifield
Skyjack, Inc.....	Brad Boehler
Snorkel International.....	Richard Hoffelmeyer
Southern Company.....	Douglas Bailey
Sunbelt Rentals.....	Byron Adkins
Terex Aerials.....	Eric Fidler
Terex-Telelect.....	Elroy D. Severson
The Von Corporation.....	Fred H. von Herrmann
Time Manufacturing Company.....	Ken Krause
United Airlines.....	Gil Menegus, Sr.
UpRight International Mfg., Ltd.	David White
USDOL/OSHA.....	Garvin Branch
Waco Boom Company.....	Bob Simon

Subcommittee A92.5 Boom-Supported Elevating Work Platforms, which developed this standard, had the following members:

Evulich & Associates – Barris Evulich, P.E. – Chairman

Byron G. Adkins, Sunbelt Rentals	Richard Hoffelmeyer, Snorkel International
Robert D. Backer, Blazing Technologies	Garvin Branch, USDOL/OSHA
James R. Tomaseski, IBEW	Kent H. Jorgensen , IATSE Motion Picture
Brad Boehler, Skyjack, Inc.	Les Knoll, Packer Engineering Inc.
Rick Curtin, Genie Industries	Evaldas Latvys, Evaldas Latvys Consulting
Dennis W. Eckstine, Eckstine & Associates	Joe Lynch, American Rental Assoc.
C. Denton Elliott, George Robson Construction Ltd.	Dave Merrifield, Merrifield Safety Consulting
Stephen Forgas, JLG Industries	Mike Paulson , Florida Power & Light Co.
Ben Fort, Rental Service Corporation	Charles Recard, Equipment Safety Consultants
Ted Graef, Intuitive Control Systems, Inc.	Paul Young, PCD, LLC
Lyle D. Grider, P.E., Consulting Services	Donald Reichert, Donald Reichert & Associates
Sean Grieve, PAT America, Inc.	OEM Controls – Lincoln F. Schoenberger
Norm Hargreaves, Terex Cranes	Richard Stollery, GAR Equipment
H.B. Bud Hayden, Jr., Hayden Enterprises	David Studdert, Mobil Oil Corporation

Contents

	Page
Foreward	
1 Scope, Purpose and Application.....	1
1.1 Scope.....	1
1.1.1 Equipment Covered.....	1
1.1.2 Effective Dates.....	1
1.1.3 Equipment Not Covered.	1
1.2 Purpose.....	2
1.3 Application.....	2
2 Referenced and Related Publications.....	2
2.1 Referenced American National Standards.....	2
2.2 Other Referenced Standards.....	3
2.3 Related American National Standards.....	3
2.4 Referenced Scaffold Industry Association publication(s).....	3
2.5 Related Scaffold Industry Association publication(s).....	3
3 Definitions.....	3
4 Responsibilities of Manufacturers.....	6
4.1 Basic Principles.....	6
4.2 Rated Work Load.....	6
4.2.1 Multiple Ratings.....	6
4.3 Quality Control.....	7
4.3.1 Proof Test.....	7
4.4 Welding Standards.....	7
4.5 Structural Safety Factors.....	7
4.5.1 Ductile Elements.....	7
4.5.2 Non-Ductile Elements.....	7
4.5.3 Structural Safety Factor Formulas.....	7
4.6 Controls.....	8
4.6.1 Upper Controls.....	8
4.6.2 Lower Controls.....	8
4.6.3 Emergency Stop Device.....	8
4.6.4 Emergency Lowering.....	8
4.6.5 Security.....	8
4.6.6 Slope Warning Devices.....	8
4.7 Stability Testing.....	9
4.7.1 Horizontal Load Test on Slope.....	9
4.7.2 Level Ground Load Test.....	9
4.7.3 Load Test on Slope.....	9
4.7.4 Tests Requirements for Driving.....	9
4.7.4.1 Curb	9

	Page
4.7.2 Level Ground Load Test.....	9
4.7.3 Load Test on Slope.....	9
4.7.4 Tests Requirements for Driving.....	9
4.7.4.1 Curb Test.....	9
4.7.4.2 Depression Test.....	9
4.8 Interlock Requirements.....	10
4.8.1 Motion.....	10
4.8.2 Electromechanical.....	10
4.8.3 Retraction.....	10
4.8.4 Stability.....	10
4.9 Bursting Safety Factors.....	10
4.10 System Protection.....	10
4.10.1 Wire Rope or Chain Safety Factor.....	10
4.10.2 Hydraulic/Pneumatic.....	10
4.11 Personnel Protection.....	10
4.12 Platforms.....	10
4.12.1 Width, Length and	10
4.12.2 Guardrail.....	10
4.12.2.1 Top Rail.....	10
4.12.2.2 Mid-Rail.....	10
4.12.2.3 Flexible Materials.....	10
4.12.2.4 Structural Integrity.....	11
4.12.3 Toeboards.....	11
4.12.4 Access.....	11
4.12.5 Anchorage(s) for Personal Fall Protection.....	11
4.13 Instructions and Markings.....	11
4.14 Brakes.....	12
4.14.1 Holding Brakes.....	12
4.14.2 Dynamic Brakes.....	12
4.14.3 Combination Brakes.....	12
4.15 Power System.....	12
4.15.1 Fuel and Exhaust.....	12
4.15.2 Battery Location.....	12
4.15.3 Hour Meter.....	12
4.16 Manuals.....	12
4.16.1 Operating and Maintenance Manuals.....	12
4.16.2 Repair and Parts Manual.....	12
4.17 Weather-resistant Storage.....	12
4.18 Electrical system.....	12

4.19 Training Information and Materials.....	13
4.20 Manufacturer as Dealer.....	13
5 Responsibilities of Dealers.....	13
5.1 Basic Principles.....	13
5.2 Manuals.....	13
5.2.1 Machine Manual(s).....	13
5.2.2 Manual of Responsibilities.....	13
5.3 Predelivery Preparation.....	13
5.4 Maintenance, Inspection and Repair.....	13
5.4.1 Maintenance.....	13
5.4.2 Inspection.....	13
5.4.3 Repairs.....	13
5.5 Maintenance Safety Precautions.....	13
5.6 Replacement Parts.....	13
5.7 Training.....	14
5.8 Familiarization Upon Delivery.....	14
5.9 Dealer as User.....	14
5.10 Assistance to Owners and Users.....	14
5.11 Record Retention and Dissemination.....	14
5.11.1 Record Retention.....	14
5.11.2 Proof of Training.....	14
5.11.3 Record Dissemination.....	14
5.12 Modifications.....	15
5.13 Manufacturer's Safety Bulletins.....	15
5.14 Responsibilities Upon Sale.....	15
6 Responsibilities of Owners.....	15
6.1 Basic Principles.....	15
6.2 Responsibilities Upon Purchase.....	15
6.3 Manuals.....	15
6.3.1 Machine Manual(s).....	15
6.3.2 Manual of Responsibilities.....	15
6.4 Maintenance, Inspection and Repair.....	15
6.4.1 Maintenance.....	15
6.4.2 Inspection.....	15
6.4.3 Repairs.....	16
6.5 Pre-delivery Preparation.....	16
6.6 Frequent Inspection.....	16
6.7 Annual Inspection.....	16
6.8 Maintenance Safety Precautions.....	16

6.9 Replacement Parts.....	16
6.10 Maintenance Training.....	16
6.11 Training.....	17
6.11.1 Operator Training.....	17
6.11.2 Assistance to User.....	17
6.12 Familiarization Upon Delivery.....	17
6.13 Operation.....	17
6.14 Assistance to Users and Operators.....	17
6.15 Record Retention and Dissemination.....	17
6.15.1 Record Retention.....	17
6.15.2 Proof of Training.....	17
6.15.3 Record Dissemination.....	18
6.16 Modifications.....	18
6.17 Manufacturer's Safety Bulletins.....	18
6.18 Responsibilities Upon Sale.....	18
7 Responsibilities of Users.....	18
7.1 Basic Principles.....	18
7.2 Manuals.....	18
7.2.1 Machine Manuals.....	18
7.2.2 Manual of Responsibilities.....	18
7.3 Inspection and Maintenance.....	18
7.3.1 Frequent Inspection.....	18
7.3.2 Annual Inspection.....	18
7.3.3 Pre-start Inspection.....	18
7.3.4 Maintenance Safety Precautions.....	19
7.4 Replacement Parts.....	19
7.5 Maintenance Training.....	19
7.6 Operator Training and Retraining.....	19
7.6.1 Trainee Records.....	19
7.7 Familiarization Before Use.....	19
7.8 Work Place Inspection.....	19
7.9 Determination of Hazardous Locations.....	20
7.10 Operator Warnings and Instructions.....	20
7.11 User as Operator.....	22
7.12 Shutdown of Aerial Platform.....	22
7.13 Record Retention and Dissemination.....	22
7.13.1 Record Retention.....	22
7.13.2 Record Dissemination.....	23
7.13.3 Proof of Training.....	23
7.14 Modifications.....	23

7.15	Manufacturer's Safety Bulletins.....	23
8	Responsibilities of Operators.....	23
8.1	Basic Principles.....	23
8.2	Manuals.....	23
8.2.1	Machine Manuals.....	23
8.2.2	Manual of Responsibilities.....	23
8.3	Prestart Inspection.....	23
8.4	Problems or Malfunctions.....	24
8.5	Training, Retraining, and Familiarization.....	24
8.5.1	General Training.....	24
8.5.2	Retraining.....	24
8.5.3	Familiarization.....	24
8.6	Before Operation.....	24
8.7	Workplace Inspection.....	24
8.8	Prior to Each Operation.....	24
8.9	Understanding of Hazardous Locations.....	25
8.10	Operator warnings and Instructions.....	25
8.11	Record of Training.....	26
9	Responsibilities of Lessors.....	26
9.1	Basic Principles.....	26
9.2	Lessor as a Dealer.....	27
9.3	Lessor as an Owner.....	27
9.4	Lessor as a User.....	27
9.5	Lessor as an Operator.....	27
10	Responsibilities of Lessees.....	27
10.1	Basic Principles.....	27
10.2	Lessee as a Dealer.....	27
10.3	Lessee as an Owner.....	27
10.4	Lessee as a User.....	27
10.5	Lessee as an Operator.....	27
11	Responsibilities of Broker.....	27
11.1	Responsibilities Upon Sale.....	27
11.2	Responsibilities with Re-rents, Leases, or Any Other Form of Beneficial Use.....	27
 Figures		
1	Examples of A92.5 Aerial Platforms.....	28
2	Horizontal Load Test on Slope - Typical Test Condition.....	29
3	Depression Test - Typical Test Conditions.....	30

ANSI/SIA A92.5 – 2006

American National Standard for Aerial Platforms

Boom-Supported Elevating Work Platforms

1 Scope, purpose and application

1.1 Scope

1.1.1 Equipment Covered. This standard applies to self-propelled integral chassis aerial platforms having a platform that can be positioned completely beyond the base and are used to position personnel, along with their necessary tools and materials, at work locations. Aerial platforms are power operated with primary functions, including drive, controlled from the platform. Such aerial platforms are intended to be occupied when driven. (See Figure 1 on Page 28).

1.1.2 Effective Dates. The standard is effective August 28, 2006 as follows:

(1) **Design, manufacture and remanufacture requirements.** The design and manufacturing requirements of this standard will apply to all aerial platforms manufactured on or after the effective date. Aerial platforms remanufactured on or after the effective date of this standard shall comply with the requirements of this standard.

(2) **Rebuild/reconditioned requirements.** Rebuilt/reconditioned aerial platforms shall comply with the standard in effect as of the date of their original manufacture.

(3) **Responsibilities for dealers, owners, users, operators, lessors, lessees and brokers.** All provisions detailed for dealers, owners, users, operators, lessors, lessees and brokers apply to both new and existing units delivered by sale, lease, rental or any form of beneficial use on or after the effective date.

1.1.3 Equipment Not Covered.

(1) Ladder and ladder stands such as those covered in American National Standards for Ladder and Ladder Stands, ANSI A14 series

(2) Scaffolding such as those covered in the American National Standard for Construction and Demolition Operations Scaffolding Safety Requirements, ANSI A10.8-1988

(3) Vehicle and trailer-mounted elevating and rotating aerial platforms such as those covered in the American National Standard for Vehicle-Mounted Elevating and Rotating Aerial Devices, ANSI/SIA A92.2- 2001

(4) Non self-propelled elevating aerial platforms such as those covered in the American National Standard for Manually Propelled Elevating Aerial Platforms, ANSI/SIA A92.3-1990

(5) Self-propelled elevating aerial platforms such as those covered in the American National Standard for Self-Propelled Elevating Work Platforms, ANSI/SIA A92.6-1999

(6) Vehicle-mounted vertical lift devices such as those covered in the American National Standard for Airline Ground Support Vehicle-Mounted Vertical Lift Devices, ANSI/SIA A92.7 –1990

(7) Vehicle-Mounted Bridge Inspection and Maintenance Devices, ANSI/SIA A92.8-1993- (reaffirmed 1998)

(8) Mast-Climbing Work Platforms, ANSI/SIA A92.9-1993 (reaffirmed 1998)

(9) Suspended Powered Platforms for exterior building maintenance, ANSI A120.1-1992

(10) Vertically adjustable equipment used primarily to raise and lower materials and equipment from one elevation to another, such as National Standards in the A17, B30 and B56 series

(11) Fire-fighting equipment such as those covered in the American National Standard for Automotive Fire Apparatus, ANSI/NFPA 1901-1991

(12) Construction and demolition

operation/digger derricks such as those covered in the American National Standard for Construction and Demolition Safety Requirements, Definitions and Specifications, ANSI A10.31-1995

(13) An attachment or device which is intended to convert a non self-propelled elevating aerial platform to a self-propelled elevating aerial platform, unless the resulting elevating aerial platform is within the scope of equipment covered as defined in Section 1.1.1 of this standard.

1.2 Purpose. This standard applies to self-propelled elevating aerial platforms to achieve the following objectives:

(1) Prevention of personal injuries and accidents

(2) Establishment of criteria for design, manufacture, remanufacture, rebuild/recondition, performance, inspection, training, maintenance, testing, and operation

(3) Establishment and understanding by, designers, manufacturers, dealers, owners, users, operators, lessors, lessees, and brokers of their respective responsibilities.

1.3 Application. The rapid development of a wide variety of boom-supported elevating work platform designs necessitates the establishment of standards for their design, manufacture, remanufacture, rebuild/recondition, performance, inspection, training, maintenance, testing and use.

Boom-supported elevating work platforms are generally intended for use on level surfaces. Normally, they are not insulated for use near electrically energized circuits, nor are they intended to be used in hazardous locations. Any boom-supported elevating work platform intended for use around electrically energized circuits shall meet the electrical requirements of ANSI/SIA A92.2-2001

The operation of any aerial platform is subject to certain hazards that can be protected against only by the exercise of intelligence, care, and common sense and not by mechanical means. It is essential to have competent, careful personnel trained in the intended use, safe operation,

maintenance and service of this type of equipment.

2 Referenced and Related American National Standards and Scaffold Industry Association publications

2.1 Referenced American National Standards.

This standard is intended to be used in conjunction with the following American National Standards. When these referenced standards are superseded by a revision approved by the American National Standards Institute, the revision shall apply:

ANSI/SIA A92.2- 2001, Vehicle-Mounted Elevating and Rotating Aerial Devices

ANSI Z535.1-2002, Safety Color Code

ANSI Z535.3-2002, Criteria for Safety Symbols
ANSI Z535.4-2002, Product Safety Signs and Labels

ANSI/AWS D1.1-98, Structural Welding Code — Steel

ANSI/AWS D1.2-97, Structural Welding Code — Aluminum

ANSI/NFPA 58- 1995, Storage and handling of Liquefied Petroleum Gases

ANSI/NFPA 70-1999, National Electrical Code

ANSI/NFPA 505- 1996, Powered Industrial Trucks, Including Type Designations, Areas of Use, Maintenance, and Operation

2.2 Other referenced standards.

This standard is also intended to be used in conjunction with the following standards:

SAE J821-1985 for Electrical Systems for Construction, Agriculture and Off-Road Machines.

Code of Federal Regulations: (CFR)
1910.333.

2.3 Related American National Standards.

The standards listed here are for information only and are not essential for the completion of the requirements of this standard. When these related standards are superseded by a revision approved by the American National Standards Institute, the revision shall apply:

ANSI A10.4-1990, Personnel Hoists and Employee Elevators for Construction and Demolition Operations Safety Requirements

ANSI A10.8-2001, Construction and Demolition Operations — Scaffolding — Safety Requirements

ANSI A10.31-1995, Construction and Demolition — Digger Derricks — Safety Requirements, Definitions, and Specifications

ANSI/SIA A92.3-1990, Manually Propelled Elevating Aerial Platforms

ANSI/SIA A92.6-1999, Self-Propelled Elevating Work Platforms

ANSI/SIA A92.7-1998, Airline Ground Support Vehicle-Mounted Vertical Lift Devices

ANSI/SIA A92.8-1993 (reaffirmed 1998), Vehicle-Mounted Bridge Inspection and Maintenance Devices

ANSI/SIA A92.9-1993 (reaffirmed 1998), Mast-Climbing Work Platforms

ANSI A120.1-1996, Suspended Powered Platforms for Exterior Building Maintenance

ANSI/NFPA 1901-1991, Automotive Fire Apparatus

2.4 Referenced Scaffold Industry Association publication(s). This standard is intended to be used in conjunction with the following SIA publication:

ANSI/SIA A92.5-2006 Manual of Responsibilities for Dealers, Owners, Users, Operators, Lessors, Lessees, and Brokers of Boom-Supported Elevating Work Platforms.

2.5 Related Scaffold Industry Association publication(s).

The publications listed here are for information only and are not essential for the completion of the requirements of this standard:

ANSI/SIA A92.2-2001 Manual of Responsibilities for Dealers, Owners, Users, Operators, Lessors, and Lessees of Vehicle-Mounted Elevating and Rotating Aerial Devices.

ANSI/SIA A92.3-1990 Manual of Responsibilities for Dealers, Owners, Users, Operators, Lessors, and Lessees of Manually Propelled Elevating Work Platforms.

ANSI/SIA A92.6-1999 Manual of Responsibilities for Dealers, Owners, Users, Operators, Lessors, Lessees, and Brokers of Self-Propelled Elevating Work Platforms.

ANSI/SIA A92.9-1998 Manual of Responsibilities for Dealers, Owners, Lessors, Lessees, and Brokers of Mast Climbing Work Platforms.

3 Definitions

Aerial platform: A mobile device that has an adjustable position platform, supported from ground level by a structure.

Alternative configuration(s): Arrangements of the aerial platform or its components which differ from each other. Alternative configurations may or may not have the same rated workload.

Anchorage(s): A secure point of attachment to be used with personal fall protection equipment (PFPE).

Authorized personnel (authorized person): Personnel approved or assigned to perform a specific type of duty or duties at a specific location or locations at a work site.

Base: The relevant contact points of the aerial platform that form the stability fulcrum (e.g., wheels, casters, outriggers, stabilizers).

Boom: A cantilever beam which supports the platform.

Broker: An independent business entity or person that arranges a lease or transfer of ownership of an aerial platform, but does not own the aerial platform. If the entity or person is an employee of the buyer, seller, lessor or lessee of the aerial platform, he shall not be considered a broker.

Chassis: The integral part of the aerial platform which provides mobility and support for the elevating assembly.

Configurations: All positions in which an aerial platform or any part thereof can be placed within its intended operating limits.

Critical component(s): Load supporting elements which support or stabilize the platform or aerial platform.

Dealer: A person or entity who buys from a manufacturer or distributor and who generally sells, rents, and services aerial platforms.

Delivery: Transfer of care, control, and custody of the aerial platform from one person or entity to another person or entity.

Directional controls: Controls that initiate functions that affect movement of the platform or the aerial platform.

Ductile materials: Materials having a minimum elongation of 10% in 2 inches (50.8mm).

Elevating assembly: The mechanisms used to position the platform relative to the aerial platform chassis.

Familiarization: Providing information regarding the control functions and safety devices for the aerial platform(s) to a qualified

person or operator who controls the movement of an aerial platform.

Guardrail system: A vertical barrier primarily intended to protect against personnel falling to lower levels.

Hazardous location: Any location that contains, or has the potential to contain an explosive or flammable atmosphere as defined in ANSI/NFPA 505 for Powered Industrial Trucks, Including Type Designations, Areas of Use, Maintenance, and Operation.

Instability: A condition of an aerial platform in which the sum of the moments which tend to overturn the unit exceeds the sum of the moments tending to resist overturning.

Insulated platform: A platform designed and tested to meet the specific electrical insulation ratings consistent with the manufacturer's identification plate.

Interlock: A control or mechanism that, under specified conditions, automatically allows or prevents the operation of another control or mechanism.

Lessee: A person(s) or entity to whom an aerial platform is provided by lease, rental, loan or other arrangement. A lessee may also be a dealer, owner, user or operator.

Lessor: A person(s) or entity who leases, rents, loans, or otherwise provides an aerial platform to another party for the beneficial use of that party (the user). A lessor may also be a dealer, owner, lessee, user, or operator.

Maintenance: The act of upkeep such as inspection, lubrication, refueling, cleaning, adjustment and scheduled part(s) replacement.

Manual of Responsibilities: A document containing the definitions (Section 3) and the requirements mandated in this Standard for the following entities: Dealers (Section 5); Owners (Section 6); Users (Section 7); Operators

(Section 8); Lessors (Section 9); Lessees (Section 10); and Brokers (Section 11).

Manufacturer: A person or entity who makes, builds, or produces an aerial platform.

Maximum travel height: The maximum platform height or the most adverse configuration(s) with respect to stability in which travel is permitted by the manufacturer.

Modification, modifies: To make a change(s) to an aerial platform which affects the operation, stability, safety factors, rated load, or safety of the aerial platform in any way.

Most adverse stability conditions: The permitted configuration of the aerial platform most likely to cause instability. Factors to be considered shall include:

- 1 With zero load to maximum test load.
2. Up to and including maximum platform height.
3. All positions and configurations of the platform(s).
4. All wheel and axle positions.
5. Forward and backward configurations of the elevating assembly.
6. All other moveable features which affect the stability of the aerial platform.

Multiple rating(s), multiple rated loads: Two or more different rated work loads based on alternative configurations of the aerial platform.

Non-ductile materials: Materials having an elongation of less than 10% in 2 inches (50.8mm).

Operation: Performance of functions of an aerial platform within the scope of its specifications and in accordance with the manufacturer's instructions, the user's work rules, and applicable governmental regulations.

Operator: A qualified person who controls the movement of an aerial platform.

Outriggers: Devices that increase the stability of the aerial platform and that are capable of lifting and leveling the aerial platform.

Override: To take over aerial platform movement control functions at the upper control station by those at the lower control station.

Owner: A person or entity who has possession of an aerial platform by virtue of proof of purchase.

Passive: Under specified conditions, automatically performed and not requiring any specific action to accomplish.

Platform: The portion of an aerial platform intended for occupation by personnel with their necessary tools and materials.

Platform height: The vertical distance measured from the floor of the platform to the surface upon which the aerial platform is being supported.

Platform reach: The horizontal distance measured from the center line of rotation to the outer most edge of the platform.

Powered functions: Those which control motion of the platform or the aerial platform and are caused by electromechanical, hydraulic, or pneumatic forces.

Qualified person: One who, by possession of a recognized degree, certificate, or professional standing, or by extensive knowledge, training, and experience, has successfully demonstrated his/her ability to solve or resolve problems related to the subject matter, the work, or the project.

Rated horizontal force: The maximum permissible horizontal force at the top rail which can be applied to the aerial platform as specified by the manufacturer.

Rated work load: The designed carrying capacity of the aerial platform as specified by the manufacturer.

Rebuild/recondition: The act of disassembly, repair or adjustment of an aerial platform or component, utilizing replacement parts and components, in accomplishing work beyond the scope of maintenance (as described and used in the standard) in order to restore, to the extent possible, the aerial platform or component to the original manufactured specifications.

Remanufacture: The modification of an aerial platform, either by its original manufacturer or another qualified entity, so that the aerial platform will comply with the ANSI standard in effect on the date the modification is completed.

Repair: The act of restoring to good condition that which has been broken, damaged or worn due to use, abuse or other reasons.

Shall: The word “shall” is to be understood as mandatory.

Should: The word “should” indicates that the rule is a recommendation, the advisability of which depends on the facts in each situation.

Stability/Stable: A condition of an aerial platform in which the sum of the moments which tend to overturn the unit is less than the sum of the moments tending to resist overturning.

Stabilizers: Devices that increase the stability of the aerial platform but are not capable of lifting or leveling the aerial platform.

Training: Instruction to enable the trainee to become a qualified person regarding the task to be performed, including knowledge regarding potential hazards.

Unintended motion or motion unintended by operator: Motion of the aerial platform or platform without activation of any control.

Unrestricted rated work load: The maximum designed carrying capacity of the aerial platform allowed by the manufacturer in all operating configurations.

User: Person(s) or entity(ies) that has care, control, and custody of the aerial platform. This person or entity may also be the employer of the operator, a dealer, employer, owner, lessor, lessee, or operator.

4 Responsibilities of Manufacturers

4.1 Basic Principles. Sound engineering principles consistent with all data available regarding the parameters of intended use and expected environment shall be applied in the design, testing and manufacture of aerial platforms, with due consideration for the knowledge that the unit will be carrying personnel.

4.2 Rated Work Load. The rated work load of an aerial platform shall not be less than 300 pounds (136Kg). Either single or multiple ratings may be used.

4.2.1 Multiple Ratings. When multiple ratings are used, the following conditions shall be complied with:

(1) When the rated work load is different for alternative configurations of the aerial platform, the manufacturer shall clearly describe these configurations, and the rated work load of each configuration, in the manual and on the platform. Examples of alternative configurations are, but shall not be limited to the following:

- (a) Outriggers or stabilizers extended to firm footing versus not extended
- (b) Extendable elevating assembly retracted versus extended
- (c) Elevating assembly elevated versus lowered
- (d) axles extended versus retracted

(2) When the rated work load of the varying configuration depends on the location of the platform in relation to the base, the manufacturer shall display the appropriate rated work load of that configuration to the operator at the control station(s).

4.3 Quality Control. The manufacturer shall establish and follow a written quality control procedure to ensure compliance with this standard.

4.3.1 Proof Test. Each production aerial platform shall be tested and shall sustain a test load equal to 150% of the rated work load, on level ground, to verify its integrity. The manufacturer shall determine the most critical configuration(s) of the aerial platform for this test. The test load shall be placed in the most adverse location with its center of gravity 12 inches (.3m) inboard from the guardrail or in the center of the platform, whichever is less. The aerial platform shall remain stable during this test. A visual inspection shall be made to determine whether this test has produced an adverse effect on any component.

4.4 Welding Standards. All welding, including pressure applications such as hydraulic cylinders, shall conform to ANSI/AWS D1.1-98 and ANSI/AWS D1.2-97, or ANSI/AWS-D14.3-94, except welder and procedure qualifications may be in accordance with one of the following:

AWS B2.1: 1998 Specification for Welding Procedure and Performance Qualification.

ANSI/AMSE: 1998 Boiler and Pressure Vessel Code, Section IX, Welding & Bracing Qualifications.

EN 287-1: 1992 Approval Testing of Welders-Fusion Welding-Part 1, Steels.

EN 287-2: 1992 Approval of Welders-Fusion Welding-Part II, Aluminum and Aluminum Alloys.

EN 288: 1992 Specifications and Approval of Welding Procedures for Metallic Materials.

4.5 Structural Safety Factors.

4.5.1 Ductile Elements. All load-supporting elements of the aerial platform shall have a structural safety factor of not less than 2 to 1 based on:

(1) The minimum yield strength of the materials used

(2) The column strength of the structure

4.5.2 Non-Ductile Elements. All load supporting elements of the aerial platform that are made of non-ductile materials shall have a

structural safety factor of not less than 5 to 1 based on the minimum ultimate strength of the materials used.

4.5.3 Structural Safety Factor Formulas.

The design stress or column load used in determining the structural safety factor shall be the maximum stresses or column load developed within the element with the machine operating at this rated work load, used in the type of service for which it was designed, and operated in accordance with manufacturer's operation instructions. The design stress shall include the effects of stress concentration and dynamic loading as shown in the following formula:

$$\text{Structural Safety Factor} = \frac{a}{(a_1 + a_2) f_1 f_2}$$

where:

a is the minimum yield strength for materials described in 4.5.1 or ultimate strength for materials described in 4.5.2

a_1 is the stress due to the weight of the structure;

a_2 is the stress due to the rated work load

f_1 is the stress concentration factor

f_2 is the dynamic loading factor

The column load shall include the effects of dynamic loading as shown in the following formula:

$$\text{Structural Safety Factor} = \frac{b}{(b_1 + b_2) f_2}$$

where:

b = column critical buckling load

b_1 = column load due to the weight of the structure

b_2 = column load due to the rated work load

f_2 = the dynamic loading factor

The values of f_1 and f_2 may be determined by experimental stress analysis on a prototype unit. Otherwise, the values of f_1 and f_2 shall be not less than 1.10 and 1.25, respectively.

4.6 Controls

4.6.1 Upper Controls. Upper controls shall be provided at the platform and shall:

- (1) Be readily accessible to the operator
- (2) Have the directional controls located and oriented to move in the approximate direction of the mechanism motion they control when the boom is in the position defined by the manufacturer and the control box is in the normal position. If not permanently attached, the normal control box location and orientation shall be clearly marked
- (3) Include a separate control which shall be continuously activated by the operator for upper directional controls to be operational, which can be released by the operator independently from the directional controls, and which render the upper directional controls inoperative when released
- (4) Be of the type that automatically returns to the "Off" or "Neutral" position when released, if used to control any movement of the aerial platform
- (5) Be protected against activation other than that initiated by the operator
- (6) Be clearly marked

4.6.2 Lower Controls. Lower controls shall be readily accessible from ground level and shall:

- (1) Override upper controls for powered functions
- (2) Be provided for all powered functions except drive and steering
- (3) Include a separate control which shall be continuously activated by the operator for the lower directional controls to be operational, which can be released by the operator independently from the directional controls, and which render the lower directional controls inoperative when released
- (4) Be of the type that automatically returns to the "Off" or "Neutral" position when released, if used to control any movement of the aerial platform

(5) Be protected against activation other than that initiated by the operator

(6) Be clearly marked

4.6.3 Emergency Stop Device. The aerial platform shall be equipped with readily identifiable emergency stop devices, located at the upper control and lower control stations, which deactivate all powered functions.

4.6.4 Emergency Lowering. All aerial platforms shall be provided with an emergency means to return the platform to a position where it is safe to exit in the event of primary power loss.

4.6.5 Security. A security means shall be provided to protect against unauthorized use of the aerial platform.

4.6.6 Slope Warning Devices. All aerial platforms shall be fitted with a warning device at the platform which activates automatically when the aerial platform is at and beyond the slope (or slopes where the slope varies by direction) established by passing the stability tests in 4.7.1 and 4.7.3. The warning device may be inoperative when in the loading or traveling position defined by the manufacturer.

The machine must pass the stability test (4.7.1 and 4.7.3) at the maximum slope on which the warning device first sounds, or at five degrees, whichever is greater.

4.7 Stability Testing. Each aerial platform shall be capable of maintaining stability while subjected to the following tests. A representative unit of each model in its most adverse stability condition shall be tested to verify compliance. If having the outriggers, stabilizers, extendable axles, or other stability-enhancing means in use is part of the normal configuration to meet the stability requirements, they shall be extended and set per manufacturer's instructions. The test load shall be applied such that the center of gravity of the load is in the vertical plane, which intersects the platform floor, 12 inches (.3m) inboard from the guardrail; or on the centerline, whichever is less, measured on the platform floor. A visual inspection shall be made to determine whether this test has produced an adverse effect on any component.

4.7.1 Horizontal Load Test on Slope. The aerial platform shall maintain stability when positioned on a five degree continuous slope in the most adverse stability condition(s), while sustaining a static test load from zero to the rated work load and a horizontal force of 150 pounds (666N) or 15% of the rated capacity, or 50 pounds (222N) per rated number of occupant(s), whichever is greater, applied to the upper periphery of the platform in the direction most likely to cause instability. (See Figure 2 on Page 29). The aerial platform must pass the stability test at the maximum slope on which the warning device first sounds or at five degrees, whichever is greater.

4.7.2 Level Ground Load Test. The aerial platform, on a level surface, shall maintain stability while sustaining a static test load equal to 150% of the rated work load.

4.7.3 Load Test on Slope. The aerial platform, while on a continuous slope of five degrees from horizontal, shall maintain stability while sustaining a static test load equal to 1-1/3 times its rated work load. The aerial platform must pass the stability test at the maximum slope on which the warning device first sounds or at five degrees, whichever is greater.

4.7.4 Tests Requirements for Driving.

4.7.4.1 Curb Test. A dynamic stability test shall be performed on the maximum slope for which the aerial platform is rated by the manufacturer, up to and including maximum travel height. The platform shall carry a test load whose center of gravity is located 6 inches (15cm) above the platform floor and distributed over the leading half of the platform and equal to 1-1/3 times the rated work load. The machine shall be driven at its maximum attainable speed for that configuration into a fixed curb high enough to stop the machine.

4.7.4.2 Depression Test. A dynamic stability test shall be performed on the maximum slope for which the aerial platform is rated by the manufacturer up to and including maximum travel height. The platform shall carry a test load(s) whose center of gravity is located 6 inches (15cm) above the platform floor(s) and distributed over the leading half of the platform and equal to the rated work load. The machine

shall be driven into a 24-inch (.60m) square hole with a vertical drop of 4 inches (10.2cm) at its maximum attainable forward speed for that configuration with one front wheel aligned perpendicular to the edge of the test hole. The test shall also be performed at the maximum attainable reverse speed for that configuration with one rear wheel aligned perpendicular to an edge of the test hole. In both the forward and reverse tests the steer wheels shall be parallel with the length of the machine.

When performing the test, the test wheel shall enter the hole at all locations along that edge of the test hole. (See Figure 3 on Page 30)

The drive control shall be maintained until the wheel bottoms in the test hole or a structural member of the machine makes contact on the surface around the test hole.

4.8 Interlock Requirements.

4.8.1 Motion. Where positioning of the platform is accomplished by wire rope or chain, the system shall prevent motion unintended by the operator in the event of failure of a single wire, rope, or chain.

4.8.2 Electromechanical. Where the elevation of the platform is accomplished by an electromechanical assembly, a system shall be so designed as to prevent unintended motion of the platform not initiated by the operator in the event of a power supply failure.

4.8.3 Retraction. Hydraulically or pneumatically actuated outriggers or stabilizers, or both, shall be constructed as to prevent unintended retraction in the event of a hydraulic or pneumatic line failure.

4.8.4 Stability. Aerial platforms requiring the use of outriggers, stabilizers, extendable axles, or other stability enhancing means to meet the stability requirements of this standard shall be provided with interlocks to ensure that the platform cannot be positioned beyond the maximum travel height unless the outriggers, stabilizers, extendable axles or other stability enhancing means are properly positioned. Interlocks shall also prevent the improper retraction of these devices while the platform is beyond the maximum travel height.

4.9 Bursting Safety Factors. All critical components and hoses of hydraulic and pneumatic systems shall have a minimum bursting strength of four times the operating pressure for which the system is designed. Non-critical components shall have a minimum bursting strength of two times the operating pressure for which the system is designed.

4.10 System Protection

4.10.1 Wire Rope or Chain Safety Factor.

Where the platform is supporting its rated work load by a system of wire ropes or chains, or both, the safety factor of the wire rope or chain system shall not be less than 8 to 1 based on ultimate strength.

4.10.2. Hydraulic/Pneumatic. Where positioning of the platform is accomplished by hydraulic or pneumatic means, the system shall be so equipped as to prevent motion unintended by the operator in the event of failure of a hydraulic or pneumatic line. This requirement does not apply to protected metallic tubing or fittings installed between a cylinder and the holding device.

4.11 Personnel Protection. Personnel on the platform shall be protected against the hazards of moving parts of the aerial platforms.

4.12 Platforms

4.12.1 Width, Length and Surface.

Platform width and length shall be at least 18 inches (46cm). The platform floor shall have a slip resistant surface.

4.12.2 Guardrail. The platform shall include a guardrail system around its periphery. If the guardrail system is removable or can be lowered, the means used to secure it in the normal operating position shall be readily accessible for inspection and maintenance.

4.12.2.1 Top rail. The guardrail system shall include a top rail around its upper periphery. The top rail shall be 42 inches (1.07m) high, plus or minus 3 inches (7.6cm) above the platform surface. Equivalent structure may be used in place of top rails, but shall meet the strength requirements of Section 4.12.2.4.

4.12.2.2 Mid-Rail. The guardrail system shall include a mid-rail approximately midway between the top rail and the platform surface. Equivalent structure may be used in place of mid-rails, but shall meet the strength requirements of Section 12.2.4.

4.12.2.3 Flexible Materials.

Flexible materials such as cables, chains, and rope shall not be used in the guardrail system.

4.12.2.4 Structural Integrity.

Each top rail, mid-rail, or equivalent barrier shall withstand a concentrated test load of 300 pounds (136Kg) applied in all directions without reaching ultimate strength.

4.12.3 Toeboards. The platform shall include toeboards on all sides. The minimum toeboard height shall be 4 inches (10.2cm). Toeboards may be omitted at the access opening(s).

4.12.4 Access. The aerial platform shall include means for personnel to use in entering to/exiting from the platform when in the lowered position. When the distance between the access level and the floor of the platform in its access position exceeds 20 inches (0.5m) the aerial platform shall be equipped with an access ladder. The steps or rungs shall not be more than 12 inches (0.3m) apart. The steps or rungs shall be divided equally over the distance between the first step or rung and the floor or the platform. The height of the first step above the ground shall be a maximum of 20 inches (0.5m). Each step or rung shall be at least 12.5 inches (0.32m) wide, at least one inch (25mm) deep, and shall be slip resistant. The front of the step or rung shall be at least 6 inches (0.15m) horizontally away from the supporting structure of any other components of the aerial work platform. The access ladder shall be symmetrical with the access opening. The access system shall permit achievement of the three point contact while ascending or descending the access system when more than 39 inches (1.0m) above the ground.

4.12.5 Anchorage(s) for Personal Fall Protection.

4.12.5.1 The manufacturer (remanufacturer) shall provide anchorage(s) on the boom or platform.

4.12.5.2 The location of the anchorage(s) shall be identified and the number of anchorages shall equal or exceed the number of rated occupants. More than one occupant may attach to a single anchorage if the anchorage is rated for more than one person.

4.12.5.3 The anchorage(s) shall be capable of withstanding the force of 3600 lbs. (16,000N) for each person allowed by the manufacturer on the attachment without reaching ultimate strength. The strength requirement shall apply only to the anchorage(s) and their attachment to the boom or platform.

4.12.5.4 The anchorage(s) shall be located to minimize lanyard slack.

4.13 Instructions and Markings. The following information shall be displayed on all aerial platforms in a clearly visible, accessible area and in a durable manner:

(1) Warnings, cautions, or restrictions for safe operation and maintenance in accordance with:

ANSI Z535.1 – Safety Color Code

ANSI Z535.3 – Criteria for Safety Symbols

ANSI Z535.4 – Product Safety Signs and Labels

(2) The make, model, serial number, and manufacturer's (remanufacturer's) name and address

(3) The unrestricted rated work load, rated number of occupants, and rated horizontal force shall be displayed at each access to the platform and at the operator control stations

(4) The maximum platform height

(5) The maximum platform reach

(6) The nominal voltage ratings of the batteries if battery powered or required operating voltage and frequency if the power source is AC electric

(7) A notice to study the operating and maintenance manual before using the equipment

(8) A notice of the inspections required by Sections 6, 7, and 8 of this standard

(9) An alternative configuration statement. If an aerial platform is capable of several alternative configurations, then the manufacturer shall clearly describe these alternatives, and the rated capacity in each situation. If the rated work load of an aerial platform is the same in all

configurations, these additional descriptions are not necessary

(10) A statement of whether or not the platform and guardrail system are electrically insulated. If equipped with an insulated platform, the level of protection and applicable test standard shall be stated, in accordance with American National Standard for Vehicle-Mounted Elevating and Rotating Aerial Devices, ANSI/SIA A92.2-2001

(11) A statement of compliance with Section 4 of this standard

(12) Warnings against replacing, without manufacturer's consent, components critical to the aerial platform stability, (e.g., batteries or ballasted tires) with lighter weight components. The minimum weights and location of such components shall be specified

(13) A statement that only properly trained and authorized personnel shall be permitted to operate the aerial platform

(14) Wheel and/or outrigger loads. Total weight of the aerial platform and wheel loading for the worst loading condition exerted by the wheels and/or outriggers

(15) The location of each anchorage point shall be clearly marked.

(16) Warnings and instructions intended to prevent electric shock and inform the operator of the minimum approach distance (MAD) requirements found in the Code of Federal Regulations (CFR) 1910.333(c).

4.14 Brakes. The aerial platform shall be equipped with a passive brake which will hold the unit on any slope it is capable of climbing.

4.14.1 Holding Brakes. The aerial platform shall be equipped with a brake which is automatically applied when the drive function is not activated and shall hold the unit on any slope it is capable of climbing subject to adequate traction on the braking wheels. The system shall provide two braking members to prevent total loss of capability should one member lose traction or supporting surface contact.

4.14.2 Dynamic Brakes. The aerial platform shall be capable of stopping on a slope having adequate traction, when descending any slope the unit is capable of climbing. The system shall provide two braking members to prevent total

loss of capability should one member lose traction or supporting surface contact.

4.14.3 Combination Brakes. Holding and dynamic brake system may be combined as one system if one system meets the requirements of paragraphs 4.14.1 and 4.14.2.

4.15 Power System

4.15.1 Fuel and Exhaust. Fuel lines of internal combustion engine powered aerial platforms shall be supported to minimize chafing and positioned to minimize exposure to engine and exhaust heat. Liquid fuel lines shall be hard lines except where isolation from vibration requires a flexible connection. LP-gas engine fuel systems shall comply with American National Standard for Storage and Handling of Liquefied Petroleum Gases ANSI/NFPA 58-1989. The exhaust system shall be provided with a muffler that is positioned to reduce exposure to noise and exhaust gas to the operators and personnel located in proximity to the aerial platform.

4.15.2 Battery Location. Battery(ies) shall be secured in a ventilated and guarded location so as to prevent damage and the build-up of hydrogen gas. Battery(ies) shall be readily accessible for inspection, service, and replacement.

4.15.3 Hour Meter. An hour meter shall be provided to record accumulated time of operation while the power system is energized or activated.

4.16 Manuals.

4.16.1 Operating and Maintenance Manuals.

The manufacturer (remanufacturer) shall provide with each aerial platform, at the time of delivery, an appropriate manual(s) containing the following:

(1) Descriptions, specification, and ratings of the aerial platform, including the data specified in Section 4.13

(2) Maximum hydraulic and pneumatic operating pressure and the maximum voltage of the electrical systems which are part of the aerial platform

(3) Instructions regarding intended use, operation, safety and maintenance

(4) Information required to perform the responsibilities set forth in Sections 3, 5, 6, 7, 8, 9, 10 and 11 of this standard, e.g. "Manual of Responsibilities"

4.16.2 Repair and parts manual. The manufacturer shall make available appropriate manual(s) listing repair and parts information.

4.17 Weather-resistant storage. The manufacturer (remanufacturer) shall provide a weather-resistant storage location on the aerial platform for the appropriate manual(s).

4.18 Electrical system. Electrical wiring and components shall comply, as applicable, with the requirements of the standard SAE J821 dated May 1985 for Electrical Systems for Construction, Agricultural and Off-Road Machines.

4.19 Training Information and Materials.

The manufacturer (remanufacturer) shall develop and offer training materials that will aid dealers, owners, and users in meeting their responsibilities as outlined in this standard.

4.20 Manufacturer as Dealer. Whenever the manufacturer (remanufacturer) sells, rents, or leases an aerial platform directly to an owner or user, the manufacturer (remanufacturer) shall assume the responsibilities of a dealer as outlined in Section 5 of this standard.

5 Responsibilities of Dealers

5.1 Basic Principles. Sound principles of safety, training, inspection, maintenance, application, and operation consistent with all data available regarding the parameters of intended use and expected environment shall be applied in the training of operators, in maintenance, application, safety provisions and operation of the aerial platform with due consideration of the knowledge that the unit will be carrying personnel.

5.2 Manuals

5.2.1 Machine Manual(s). Dealers shall keep and maintain a copy(ies) of the:

- (1) Operating manual
- (2) Maintenance manual
- (3) Parts manual
- (4) Repair manual

The operating manual and maintenance manual shall be provided with each rental, lease, or sale delivery and shall be stored in the weather resistant storage compartment on the aerial platform. Manual(s) are considered an integral part of the aerial platform and are vital to communicate necessary safety information to owners, users and operators. In addition, repair and parts manuals should be provided with each sale delivery.

5.2.2 Manual of Responsibilities. The current Manual of Responsibilities for dealers, owners, users, operators, lessors, lessees and brokers of boom-supported elevating work platforms shall be provided and stored in the weather resistant storage compartment.

5.3 Predelivery Preparation. Aerial platforms shall be inspected, serviced and adjusted to manufacturer's requirements prior to each delivery by sale, lease, or rental.

5.4 Maintenance, Inspection and Repair.

5.4.1 Maintenance. When a dealer accomplishes preventive maintenance on the aerial platform, it shall be in accordance with the manufacturer's recommendations and based on the environment and severity of use.

5.4.2 Inspection. When the dealer accomplishes frequent and annual inspections, they shall be in accordance with the manufacturer's manuals and instructions.

5.4.3 Repairs. Repairs accomplished to correct malfunctions and problems shall be in accordance with the manufacturer's manuals and instructions.

5.5 Maintenance Safety Precautions.

Before adjustments and repairs are started on an aerial platform, the following precautions shall be taken as applicable:

- (1) Power plant stopped and starting means rendered inoperative
- (2) All controls in the "Off" position and all operating systems secured from inadvertent motion by brakes, blocks, or other means

(3) Boom and platform lowered to the full down position, if possible, or otherwise secured by blocking or cribbing to prevent dropping

(4) Hydraulic oil pressure relieved from all hydraulic circuits before loosening or removing hydraulic components

(5) Safety props or latches installed where applicable as prescribed by the manufacturer

5.6 Replacement Parts. When parts or components are replaced, they shall be identical or equivalent to original aerial platform parts or components.

5.7 Training.

The dealer shall offer appropriate training to facilitate owners, users, and operators to comply with requirements set forth in this standard regarding the inspection, maintenance, use, application, and operation of the aerial platform.

5.8 Familiarization upon Delivery.

Upon delivery by sale, lease, rental or any form of use, the dealer shall have the responsibility with the person designated by the receiving entity for accepting the aerial platform to:

- (1) Identify the weather resistant compartment (for manual(s) storage)
- (2) Confirm that the manual(s), as specified by the manufacturer, are on the aerial platform
- (3) Review control functions
- (4) Review safety devices specific to the model aerial platform being delivered

5.9 Dealer as User. Whenever a dealer directs personnel to operate an aerial platform (loading, unloading, inspecting, sales demonstrations, or any form of use), the dealer shall assume the responsibilities of users as specified in Section 7 of this standard. All personnel authorized to operate the aerial platform shall have been:

- (1) Trained
- (2) Familiarized with the aerial platform to be operated
- (3) Made aware of the responsibilities of operators as outlined in Section 8 of this standard

5.10 Assistance to Owners and Users. If a dealer is unable to answer an owner's or user's question(s) relating to rated capacity, intended use, maintenance, repair, inspection, or operation of the aerial platform, the dealer shall obtain the proper information from the manufacturer or a qualified person if the manufacturer is no longer in business and provide that information to the owner or user.

5.11 Record Retention and Dissemination

5.11.1 Record Retention. The dealer shall retain the following records for at least four years:

- (1) Name and address of the purchaser of each aerial platform by serial number and date of delivery
- (2) Records of the pre-delivery preparation performed prior to each delivery
- (3) Records of frequent and annual machine inspections accomplished
- (4) Records of repairs accomplished to correct malfunctions and problems
- (5) Name of the person(s) trained
- (6) Name of the person(s) providing the training
- (7) Date of Training
- (8) Name of person(s) receiving familiarization with the aerial platform upon each delivery unless this individual has been provided with familiarization on the same model, or one having characteristics consistent with the one being delivered, within the prior 90 days

5.11.2 Proof of training. The dealer should provide trainees who successfully complete training a means to evidence they are trained. The dealer shall provide such proof if requested by the trainee. The document evidencing training shall include the following information:

- (1) Name of trainee
- (2) Name of entity providing training or retraining
- (3) Name of trainer(s)
- (4) Clear identification that training covered Boom-Supported Elevating Work Platforms
- (5) Date of training

5.11.3 Record dissemination. Upon request, the dealer shall provide the following information:

- (1) To the owner of the aerial platform, a copy of frequent or annual inspections performed
- (2) To the owner of the aerial platform, a copy of repairs accomplished
- (3) To a user, proof of training for an operator, including name of trainer and date of training
- (4) To a user, the name of the person(s) receiving familiarization upon delivery of the aerial platform

5.12 Modifications. Modification, alteration or remanufacture of an aerial platform shall be made only with prior written permission of the manufacturer.

5.13 Manufacturer's safety bulletins. The dealer shall comply with safety-related bulletins as received from the manufacturer.

5.14 Responsibilities upon sale. When the aerial platform is sold, the dealer:

- (1) Shall, upon delivery, ensure the operating and maintenance manuals are conveyed to the owner
- (2) Shall, upon delivery, provide a copy of the current Manual of Responsibilities
- (3) Should, within 60 days of sale, provide repair and parts manuals
- (4) Shall, within 60 days of the sale, notify the manufacturer or its successor (if existing) of the sale, providing the full name and address of the purchaser
- (5) Should, if the aerial platform is used, accomplish an annual machine inspection prior to delivery and provide a copy to the purchaser within 60 days of the sale
- (6) Shall, upon delivery, familiarize the person designated by the receiving entity with the aerial platform being acquired.

6 Responsibilities of Owners

6.1 Basic Principles. Sound principles of safety, training, inspection, maintenance, application, and operation consistent with all data available regarding the parameters of intended use and expected environment shall be applied in the performance of the responsibilities of owners with due consideration of the

knowledge that the aerial platform will be carrying personnel.

6.2 Responsibilities Upon Purchase. Upon purchase of the aerial platform, the buyer:

- (1) Shall ensure the operating and maintenance manuals have been received.
- (2) Should acquire repair and parts manuals within sixty days (60) of acquisition
- (3) Shall within sixty days (60) of acquisition of the aerial platform provide the manufacturer with the full name and address of the buyer along with the model and serial number of the aerial platform acquired
- (4) Shall, if the aerial platform is used, ensure the frequent inspection and annual inspections are current

(5) Shall become familiar with and conform to the responsibilities of owners as set forth in the Manual of Responsibilities for Boom-Supported Elevating Work Platforms

6.3 Manuals

6.3.1 Machine Manual(s). Owners shall provide a copy(ies) of the operating and maintenance manual(s) with each rental, lease, or sales delivery by ensuring they are properly stored in the weatherproof compartment that is part of the aerial platform. The manual(s) is considered an integral part of the aerial platform and is vital to communicate necessary safety information to owners, users and operators. In addition, repair and parts manual(s) should be provided with each sale delivery.

6.3.2 Manual of Responsibilities. The current Manual of Responsibilities for dealers, owners, users, operators, lessors, lessees and brokers of boom-supported elevating work platforms shall be provided and stored in the weather resistant storage compartment.

6.4 Maintenance, Inspection and Repair.

6.4.1 Maintenance.

The owner of an aerial platform shall arrange that the maintenance specified in this standard is properly performed on a timely basis. The owner shall establish a preventive maintenance program in accordance with the manufacturer's recommendations and in accordance with the environment and severity of use of the aerial platform.

6.4.2 Inspection.

The owner shall arrange for frequent and annual inspections to be performed in accordance with the recommendations of the manufacturer. All malfunctions and problems identified in the inspection shall be corrected before the aerial platform is returned to service.

6.4.3 Repairs. When the aerial platform is damaged or in need of repair, all malfunctions and problems identified shall be corrected before the aerial platform is returned to service.

6.5 Pre-delivery Preparation. Aerial platforms shall be inspected, serviced, and adjusted in accordance with the manufacturer's specifications prior to each delivery by sale, lease, or rental.

6.6 Frequent Inspection. The owner of an aerial platform shall ensure that a frequent inspection is performed in accordance with the manufacturer's instructions, on an aerial platform:

- (1) That was purchased used. This inspection shall be accomplished unless it is determined that the frequent and annual inspections are current
- (2) That has been in service for three months or 150 hours, whichever comes first
- (3) That has been out of service for a period longer than 3 months

The inspection shall be made by a person qualified as a mechanic on the specific type aerial platform or one having similar design characteristics. The inspection shall be in accordance with items specified by the manufacturer for a frequent inspection and shall include, but not limited to the following:

- (1) All functions and their controls for speed(s), smoothness, and limits of motion
- (2) Lower controls including the provisions for overriding of upper controls
- (3) All chain and cable mechanisms for adjustment and worn or damaged parts
- (4) All emergency and safety devices
- (5) Lubrication of all moving parts, inspection of filter element(s), hydraulic oil, engine oil, and coolant as specified by the manufacturer

- (6) Visual inspection of structural components and other critical components such as fasteners, pins, shafts, and locking devices
- (7) Placards, warnings and control markings
- (8) Items specified by the manufacturer
- (9) Emergency lowering means

6.7 Annual Inspection. The owner of an aerial platform shall ensure that an annual inspection is performed on the aerial platform no later than thirteen (13) months from the date of the prior annual inspection. The inspection shall be made by a person(s) qualified as a mechanic on the specific type of aerial platform or one having similar design characteristics. The inspection shall be in accordance with items specified by the manufacturer for an annual inspection. The owner shall not place the aerial platform into service until all malfunctions and problems have been corrected.

6.8 Maintenance safety precautions. Before adjustments and repairs are started on an aerial platform, the following precautions shall be taken as applicable:

- (1) Power plant stopped and starting means rendered inoperative
- (2) All controls in the "Off" position and all operating systems secured from inadvertent motion by brakes, blocks, or other means
- (3) Elevating assembly and platform lowered to the full down position, if possible, or otherwise secured by blocking or cribbing to prevent dropping
- (4) Hydraulic oil pressure relieved from all hydraulic circuits before loosening or removing hydraulic components
- (5) Safety props or latches installed where applicable as prescribed by the manufacturer
- (6) Precautions specified by the manufacturer

6.9 Replacement parts. When parts or components are replaced, they shall be identical or equivalent to original aerial platform parts or components.

6.10 Maintenance training. The owners shall train their maintenance personnel in inspection and maintenance of the aerial platform in

accordance with the manufacturer's recommendations and Sections 6.2, 6.3, 6.4, 6.5, 6.6, 6.7, 6.8, 6.9 and 6.11 of this standard and with the manufacturer's recommendations.

6.11 Training

6.11.1 Operator training. Whenever an owner directs or authorizes an employee to operate an aerial platform, (loading, unloading, inspecting or any form of use) the owner shall assume the responsibilities of the user as specified in Section 7 of this standard and shall ensure the person has been:

- (1) Trained
- (2) Familiarized with the aerial platform to be operated
- (3) Made aware of the responsibilities of operators as outlined in Section 8 of this standard.

6.11.2 Assistance to user. Upon request of the user, when an owner sells, leases, rents or provides an aerial platform for any form of beneficial use, the owner at that time shall offer to do training or advise the user where training may reasonably be secured.

6.12 Familiarization upon delivery. Upon delivery for lease, rental or any form of beneficial use, the owner shall have the responsibility with the person designated by the receiving entity for accepting the aerial platform to:

- (1) Identify the weather resistant compartment (for manual(s) storage)
- (2) Confirm all manuals, as specified by the manufacturer, are on the aerial platform
- (3) Review control functions with the operator or person(s) designated by the user
- (4) Review safety devices specific to the model aerial platform being delivered

6.13 Operation. When an owner operates an aerial platform, the owner shall have the responsibilities of users as specified in Section 7 of this standard and his operating personnel shall have responsibilities of operators as specified in Section 8 of this standard.

6.14 Assistance to users and operators.

If an owner is unable to answer a user's or operator's question(s) relating to rated capacity, intended use, maintenance, repair, inspection, or operation of the aerial platform, the owner shall obtain the proper information from the dealer or manufacturer and provide that information to the user or operator.

6.15 Record Retention and Dissemination.

6.15.1 Record Retention. The owner shall date and retain the following records for at least 4 years:

(1) Name and address of the purchaser of each aerial platform by serial number and date of delivery

(2) Written records of the frequent and annual inspections performed. The record shall include deficiencies found, corrective action accomplished and identification of the person(s) performing the inspection and repairs

(3) Written records of repairs accomplished on the aerial platform. The records shall include corrective action accomplished and identification of the person(s) performing the repairs

(4) Pre-delivery preparation performed prior to each delivery

(5) Name of the person(s) trained

(6) Name of person(s) providing training

(7) Name of person(s) receiving familiarization upon each delivery unless the individual has been provided with familiarization on the same model, or one having characteristics consistent with the one being delivered, within the prior 90 days

(8) Name of person(s) providing familiarization upon delivery

6.15.2 Proof of Training. Owners providing training should provide successful trainees a means to evidence their training and shall provide such proof if requested by the trainee. The document evidencing training shall include the following information:

(1) Name of entity providing training or retraining

(2) Name of trainer(s)

(3) Clear identification that training covered Boom-Supported Elevating Work Platforms

(4) Date of training

(5) Name of trainee

6.15.3 Record dissemination. Upon request, an owner accomplishing training and/or familiarization shall provide the following:

(1) To a user, proof of training for an operator, including name of trainer and date of training

(2) To a user, the name of the person(s) receiving familiarization upon delivery of the aerial platform

6.16 Modifications. The owner shall not modify or concur in modification or alteration to the aerial platform without the modifications being approved and certified in writing by the manufacturer.

6.17 Manufacturer's Safety Bulletins.

The owner shall comply with safety related bulletins as received from the manufacturer or dealer.

6.18 Responsibilities upon Sale. Upon sale of the aerial platform, the seller:

(1) Shall, upon delivery, ensure the operating and maintenance manuals are conveyed to the new owner

(2) Shall, upon delivery, provide a copy of the current Manual of Responsibilities to the new owner

(3) Should provide repair and parts manuals to the new owner

(4) Shall, upon the request of the new owner, offer training or advise where training may reasonably be obtained

7 Responsibilities of Users

7.1 Basic principles. The information in this standard must be supplemented by good job management, safety control, and the application of sound principles of safety, training, inspection, maintenance, application and operation, consistent with all data available regarding the parameters of intended use and expected environment. Since the user has direct control over the application and operation of aerial platforms, conformance with good safety practices in this area is the responsibility of the user and the operating personnel, including the

operator. Decisions on the use and operation of the aerial platform must always be made with due consideration for the fact that the aerial platform will be carrying personnel whose safety is dependent on those decisions.

7.2 Manuals

7.2.1 Machine manuals. Users shall keep and maintain a copy(ies) of the operating and maintenance manual(s) in the weather resistant storage compartment provided by the manufacturer. The manual(s) is considered an integral part of the aerial platform and is vital to communicate necessary safety information to users and operators.

7.2.2 Manual of Responsibilities. The current Manual of Responsibilities for dealers, owners, users, operators, lessors, lessees and brokers of boom-supported elevating work platforms shall be provided and stored in the weather resistant storage compartment.

7.3 Inspection and Maintenance. Users shall inspect and maintain the aerial platform as required to ensure proper operation. The frequency of inspection and maintenance shall be determined by the manufacturer's recommendations and be compatible with operating conditions and the severity of the operating environment. Aerial platforms that are not in proper operating condition shall be immediately removed from service until repaired. Repairs shall be made by a qualified person and the repairs shall be in conformance with the manufacturer's recommendations.

7.3.1 Frequent Inspection. Users of an aerial platform shall ensure that frequent inspections are conducted as outlined in Section 6.6 of this standard.

7.3.2 Annual Inspection. Users of an aerial platform shall ensure that annual inspections are conducted as outlined in Section 6.7 of this standard.

7.3.3 Pre-start inspection. Before use each day or at the beginning of each shift, the aerial platform shall be given a visual inspection and functional test including, but not limited to, the following:

- (1) Operating and emergency controls
- (2) Safety devices

- (3) Air, hydraulic and fuel system leaks
- (4) Cables and wiring harness
- (5) Loose or missing parts
- (6) Tires and wheels
- (7) Placards, warnings, control markings, and operating manual(s)
- (8) Outriggers, stabilizers, extendable axles and other structures
- (9) Guardrail system
- (10) Items specified by the manufacturer

7.3.4 Maintenance Safety Precautions.

Before adjustments and repairs are started on an aerial platform, the following precautions shall be taken as applicable:

- (1) Power plant stopped and starting means rendered inoperative
- (2) All controls in the "Off" position and all operating systems secured from inadvertent motion by brakes, blocks, or other means
- (3) Boom and platform lowered to the full down position, if possible, or otherwise secured by blocking or cribbing to prevent dropping
- (4) Hydraulic oil pressure relieved from all hydraulic circuits before loosening or removing hydraulic components
- (5) Safety props or latches installed where applicable as prescribed by the manufacturer
- (6) Precautions specified by the manufacturer

7.4 Replacement Parts. When parts or components are replaced, they shall be identical or equivalent to original aerial platform parts or components.

7.5 Maintenance Training. The user shall ensure only qualified personnel inspect and maintain the aerial platform in accordance with the manufacturer's recommendations and Section 7.3, 7.4 and 7.6 of this standard and with the manufacturer's recommendations.

7.6 Operator Training and Retraining.

Whenever a user directs or authorizes an individual to operate an aerial platform, the user shall ensure that the person has been:

- (1) Trained before being assigned to operate the aerial platform
- (2) Familiarized with the aerial platform to be operated

(3) Made aware of responsibilities of operators as outlined in Section 8 of this standard

(4) Retrained, if necessary, based on the user's observation and evaluation of the operator.

7.6.1 Trainee Records. A record of the trainee's aerial platform instruction shall be maintained by the user for at least four (4) years.

7.7 Familiarization Before Use. The user shall permit only properly trained personnel to operate an aerial platform. The user shall ensure that before use the operator is familiar with the model of the aerial platform to be operated, and specifically:

- (1) Knows where the weather resistant compartment for manual(s) storage is located
- (2) Knows the operating and maintenance manuals supplied by the manufacturer are stored in the weather resistant compartment and is familiar with the operating and safety manuals
- (3) Understands all control functions, placards and warnings
- (4) Is aware of and understands all safety devices specific to the model aerial platform being used

7.8 Work Place Inspection. Before the aerial platform is used and during use, the user shall check the area in which the aerial platform is to be used for possible hazards such as, but not limited to:

- (1) Drop-offs or holes, including those concealed by water, ice, mud, etc.
- (2) Slope(s)
- (3) Bumps and floor obstructions
- (4) Debris
- (5) Overhead obstructions and electrical conductors
- (6) Hazardous locations and atmospheres (reference ANSI/NFPA 505-1996)
- (7) Inadequate surface and support to withstand all load forces imposed by the aerial platform in all operating configurations
- (8) Wind and weather conditions
- (9) Presence of unauthorized persons
- (10) Other possible unsafe conditions

7.9 Determination of Hazardous Locations. It shall be the responsibility of the user to

determine the hazard classification of the intended location of operation. Aerial platforms operated in hazardous locations shall be approved in accordance with, and of the type required, by ANSI/NFPA 505-1996.

7.10 Operator Warnings and Instructions.

The user shall direct personnel operating the aerial platform to be in compliance with the provisions set forth in this standard. The user shall monitor their performance and supervise their work to ensure the use, application, and operation of the aerial platform is in conformance with the provisions set forth in Section 8 of this standard, warn personnel of potential hazards, provide means to protect against identified hazards, and explain the potential consequences of not following proper operating guidelines. Instructions and guidelines regarding proper operation shall include, but not necessarily be limited to the following issues and subjects:

(1) **Fall Protection.** Principal fall protection is provided by the guardrail system. The user shall direct and monitor the operator to ensure that all components of the guardrail system are in place. The user shall direct and monitor occupants of the work platform to ensure that they wear a personal fall arrest system to protect against the potential effects of ejection or a fall restraint system to prevent free fall.

(a) **Election of Systems:** The user may elect to use either a restraint or an arrest system

1. **Fall Restraint Systems** – An anchorage, belt or harness and a lanyard which prevent free fall. These systems are arranged to keep occupants in the platform in the event of dynamic forces which might cause ejection.

(1.1) Occupants shall use a restraint system to keep the occupant(s) within the platform.

(1.2) Restraint systems may include either belts or harnesses and do not include arresting or deceleration devices.

2. **Fall Arrest System** – An anchorage, full body harness and a lanyard used to arrest an employee in a fall from an aerial platform. Such systems allow a fall over the guardrail system. The force applied to the body shall be limited to 1800 lbs. (8,000N).

(2.1) A fall arrest system shall allow workers to move around the platform but provide a minimum of lanyard slack.

(2.2) A fall arrest system for aerial lifts shall include a lanyard, and full body harness. A deceleration device if used will not allow a fall further than that required to arrest the fall without exceeding 1800 lbs. (8,000N) of force on the worker. Fall arrest systems, beyond the anchorage, are not part of the aerial work platform and are to be specified and supplied by the user of the aerial work platform.

(2) **Slope and grade.** The aerial platform shall not be operated in any manner on grades, side slopes or ramps exceeding those for which the aerial platform is rated by the manufacturer.

(3) **Deployment of stability enhancing means.** Outriggers, stabilizers, extendable axles, oscillating axles or other stability enhancing means shall be deployed and locked into place as required by the manufacturer.

(4) **Guardrail system.** Guardrails shall be installed and positioned, and access gates or openings shall be properly closed per the manufacturer's instructions.

(5) **Distribution of load.** The load and its distribution on the platform and any platform extension(s) shall be in accordance with the manufacturer's rated capacity for that specific configuration.

(6) **Maintaining overhead clearance.** The operator shall be instructed to ensure that adequate clearance is maintained from overhead obstructions and energized electrical conductors and parts.

(7) **Electrocution hazard.** All applicable safety related work practices intended to prevent electric shock covered by the Code of Federal Regulations (CFR) 1910.333 shall be defined and explained to the operator by a qualified person. In particular, such person shall direct the operator commensurate with the operators qualifications to maintain the minimum approach distance (MAD) from energized power lines and covered by CFR1910.333c.

(8) **Personal protective equipment (PPE).** The user shall direct the operator to ensure all personnel on the platform wear personal protective equipment (PPE) as required.

(9) **Personnel footing.** Personnel shall maintain a firm footing on the platform floor while working thereon. Climbing by occupants on the mid-rail or top-rail of the aerial platform is prohibited. The use of planks, ladders, or any other devices on the platform for achieving additional height or reach is prohibited.

(10) **Precaution for other moving equipment.** When other moving equipment and vehicles are present, special precautions shall be taken to comply with local ordinances or safety standards established for the workplace. Warnings such as, but not limited to, flags, roped off areas, flashing lights, and barricades shall be used as appropriate.

(11) **Reporting problems or malfunctions.** The user shall direct the operator to immediately report to a supervisor any problem(s) or malfunction(s) that become evident during operation. The user shall ensure all problems and malfunctions that affect the safety of operations are repaired prior to continued use.

(12) **Reporting potentially hazardous locations.** The user shall direct the operator to immediately report to a supervisor any potentially hazardous location(s) that become evident during operation.

(13) **Hazardous location operation.** Operation of aerial platforms not approved and marked for operation in a hazardous location shall be prohibited.

(14) **Entanglement.** Care shall be taken to prevent rope, electric cords, and hoses, etc., from becoming entangled in the aerial platform.

(15) **Capacity limitations.** Rated capacities and rated number of occupants shall not be exceeded when loads are transferred to the platform at any height.

(16) **Work area.** The user shall direct the operator to ensure the area surrounding the aerial platform is clear of personnel and equipment before lowering the platform.

(17) **Fueling.** The engine (if applicable) shall be shut down while fuel tanks are being filled. Fueling shall be done in a well-ventilated area free of flame, sparks, or other hazards that may cause fire or explosion.

(18) **Battery charging.** Batteries shall be charged in a well-ventilated area free of flame,

sparks, or other hazards that may cause fire or explosion.

(19) **Improper platform stabilization.** The aerial platform shall not be positioned against another object to steady the platform or improve stability.

(20) **Misuse as a crane.** The aerial platform shall not be used as a crane.

(21) **Unusual operating support conditions.** The aerial platform shall not be operated from a position on trucks, trailers, railway cars, floating vessels, scaffolds, or similar equipment unless the application is approved in writing by the manufacturer or a qualified person.

(22) **Travel speeds.** The user shall direct the operator to limit travel speed according to conditions, including the condition of the support surface, congestion, visibility, slope, location of personnel, and other factors leading to hazards which may cause collision(s) or result in potential injury(ies) to personnel.

(23) **Driving requirements.** Before and during driving while the platform is elevated, the user shall direct the operator to:

- (a) Maintain a clear view of the support surface and route of travel
- (b) Ensure personnel in the worksite area that may be affected are aware of the movement, communicating and maneuvering the aerial platform as required to protect against personal injury
- (c) Maintain a safe distance from obstacles, debris, drop-offs, holes, depressions, ramps, and other hazards to ensure safe travel
- (d) Maintain a safe distance from overhead obstructions and energized electrical

conductors.

(24) **Stunt driving.** Stunt driving and horseplay are prohibited.

(25) **Securing the aerial platform.** The user shall direct the operator to implement means provided to protect against use by an unauthorized person(s).

(26) **Altering safety devices.** Interlocks or other safety devices shall not be altered or disabled.

(27) **Snagged platform.** If the platform or elevating assembly becomes caught, snagged, or

otherwise prevented from normal motion by adjacent structures or other obstacles such that control reversal does not free the platform, all personnel shall be removed from the platform before attempts are made to free the platform using lower controls.

(28) **Vacating (or entering) an elevated aerial platform.** If permitted by the manufacturer, personnel shall only vacate or enter a raised aerial platform by following the guidelines and instructions provided by the manufacturer.

(29) **Modifications.** Modification or alteration of an aerial platform or the fabrication and attaching of frameworks, or the mounting of attachments for holding tools or materials onto the platform or the guardrail system shall only be accomplished with the prior written permission of the manufacturer.

(30) **Assistance to the operator.** If an operator encounters any suspected malfunction of the aerial platform, or any hazard or potentially unsafe condition relating to capacity, intended use or safe operation of the aerial platform, the operator shall cease operation of the aerial platform and request further information from the user.

(31) **Problems or malfunctions.** Any problem(s) or malfunction(s) that affect the safety of operations shall be repaired prior to the use of the aerial platform.

(32) **Carrying materials (larger than the platform).** The user shall ensure that only properly secured tools and materials which are evenly distributed and can be safely handled by a person(s) working from the platform, are moved.

(33) **Rated horizontal force.** The user shall direct the operator not to exceed the manufacturer's rated horizontal force.

(34) **Bridge cranes.** When an aerial platform is to operate within the area of travel of a bridge crane or similar equipment, steps shall be taken to prevent a collision with the aerial platform.

(35) **Adequate support requirements.** The user shall ensure the support surface is adequate for the aerial platform and the load carried.

(36) **Leveling the aerial platform.** Outriggers and leveling devices supplied by the

manufacturer shall be utilized to level the aerial platform when provided.

(37) Protecting against unauthorized use.

The user shall direct the operator not to use, rent, lease, or provide the aerial platform for any form of beneficial use unless so authorized.

7.11 User as Operator. If a user is also the operator of an aerial platform, the user shall have the responsibilities of operators specified in Section 8 of this standard as well as responsibilities of users as specified in Section 7 of this standard.

7.12 Shutdown of Aerial Platform. The user shall authorize and direct the operating personnel to cease operation of the aerial platform in case of any suspected malfunction(s) of the aerial platform, or any hazard or potentially unsafe condition(s) that may be encountered and to request further information as to safe operation from the owner, dealer, or manufacturer before further operation of the aerial platform.

7.13 Record Retention and Dissemination.

7.13.1 Record Retention. The user shall retain the following records for at least 4 years:

- (1) Names of the operator(s) trained and retrained
- (2) Names of operator(s) provided familiarization
- (3) The owner (or the entity designated by the owner) is responsible to ensure frequent and annual inspections are conducted and written records are maintained. The records shall include the date of the inspection, any deficiencies found, the corrective action recommended and identification of the person(s) performing the inspection.
- (4) When employees of the user accomplish repairs on the aerial platform, the user shall maintain written records. The record shall include the date of repair, a description of the work accomplished and identification of the person(s) performing the repair.

7.13.2 Record Dissemination

- (1) When the user directs personnel to accomplish frequent or annual inspections, not later than 60 days after the inspections, the

appropriate records shall be provided to the owner of the aerial platform

- (2) When the user directs personnel to accomplish repairs on the aerial platform, not later than 60 days after the repairs are accomplished, the appropriate records shall be provided to the owner

7.13.3 Proof of Training. Users providing training should provide successful trainees a means to evidence their training and shall provide such proof if requested by the trainee. The document evidencing training shall include the following information:

- (1) Name of entity providing training or retraining
- (2) Name of trainer(s)
- (3) Clear identification that training covered Boom-Supported Elevating Work Platforms
- (4) Date of training
- (5) Name of trainee

7.14 Modifications. Modification, alteration or remanufacture of an aerial platform shall be made only with prior written permission of the manufacturer.

7.15 Manufacturer's Safety Bulletins. The user shall comply with safety related bulletins as received from the manufacturer, dealer, or owner.

8 Responsibilities of Operators

8.1 Basic Principles. The information in this standard shall be supplemented by good judgment, safety control, and caution in evaluating each situation. Since the operator is in direct control of the aerial platform, conformance with good safety practices in this area is the responsibility of the operator. The operator shall make decisions on the use and operation of the aerial platform with due consideration for the fact that his or her own safety as well as the safety of others is dependent on those decisions.

8.2 Manuals

8.2.1 Machine Manuals. The operator shall ensure the operating and maintenance manuals

are stored in the weather resistant storage compartment on the aerial platform. The manual(s) is considered an integral part of the aerial platform and is vital to communicate necessary safety information to the operator. The operator shall be familiar with the manuals and reference them as required.

8.2.2 Manual of Responsibilities. The operator shall be familiar with the requirements for operators as set forth in Section 8 of the Manual of Responsibilities for Dealers, Owners, Users, Operators, Lessors, Lessees and Brokers of Boom-Supported Elevating Work Platforms. The current Manual of Responsibilities shall be kept with the aerial platform at all times and stored in the weather-resistant compartment when not in use.

8.3 Prestart Inspection. Before use each day or at the beginning of each shift, the aerial platform shall be given a visual inspection and functional test including, but not limited to, the following:

- (1) Operating and emergency controls
- (2) Safety devices
- (3) Personal protective devices
- (4) Air, hydraulic and fuel system(s) leaks
- (5) Cables and wiring harness
- (6) Loose or missing parts
- (7) Tires and wheels
- (8) Placards, warnings, control markings and operating manual(s)
- (9) Outriggers, stabilizers, extendable axles and other structures
- (10) Guardrail system
- (11) Items specified by the manufacturer

8.4 Problems or malfunctions. Any problems or malfunctions that affect the safety of operations shall be repaired prior to the use of the aerial platform.

8.5 Training, Retraining, and Familiarization

8.5.1 General Training. Only personnel who have received general instructions regarding the inspection, application and operation of aerial platforms, including recognition and avoidance of hazards associated with their operation, shall operate an aerial

platform. Such items covered shall include, but not necessarily be limited to, the following issues and requirements:

- (1) The purpose and use of manuals
- (2) That operating manuals are an integral part of the aerial platform and must be stored properly in the weather-resistant compartment when not in use
- (3) A pre-start inspection
- (4) Responsibilities associated with problems or malfunctions affecting the operation of the aerial platform
- (5) Factors affecting stability
- (6) The purpose of placards and decals
- (7) Workplace inspection
- (8) Safety rules and regulations
- (9) Authorization to operate
- (10) Operator warnings and instructions
- (11) Actual operation of the aerial platform

Under the direction of a qualified person, the trainee shall operate the aerial platform for a sufficient period of time to demonstrate proficiency in the actual operation of the aerial platform.

8.5.2 Retraining. The operator shall be retrained, when so directed by the user, based on the user's observation and evaluation of the operator.

8.5.3 Familiarization. When an operator is directed to operate an aerial platform he/she is not familiar with, the operator shall receive instructions regarding the following items:

- (1) The location of the weather resistant compartment (for manual(s) storage)
- (2) The purpose and function of all controls
- (3) Safety devices and operating characteristics specific to the aerial platform

8.6 Before Operation. Before operation, the operator shall:

- (1) Read and understand the manufacturer's operating instruction(s) and user's safety rules, or have them explained
- (2) Understand all labels, warnings, and instructions displayed on the aerial platform or have them explained
- (3) Ensure all occupants of the aerial platform wear appropriate personal protective equipment (PPE) for the conditions, including the

environment in which the aerial platform will be operated

8.7 Workplace Inspection. Before the aerial platform is used and during use, the operator shall check the area in which the aerial platform is to be used for possible hazards such as, but not limited to:

- (1) Drop-offs or holes, including those concealed by water, ice, mud, etc.
- (2) Slope(s)
- (3) Bumps and floor obstructions
- (4) Debris
- (5) Overhead obstructions and electrical conductors
- (6) Hazardous locations and atmospheres (reference ANSI/NFPA 505-1987)
- (7) Inadequate surface and support to withstand all load forces imposed by the aerial platform in all operating configurations
- (8) Wind and weather conditions
- (9) Presence of unauthorized persons
- (10) Other possible unsafe conditions

8.8 Prior to each operation. Before each operation of the platform, the operator shall ensure:

- (1) Outriggers, stabilizers, extendable axles, or other stability enhancing means, are used as required by the manufacturer
- (2) Guardrails are installed and access gates or openings are closed per manufacturer's instructions
- (3) The load and its distribution on the platform and any platform extension(s) are in accordance with the manufacturer's rated capacity for that specific configuration
- (4) All personnel on the aerial platform have appropriate safety gear for the work and environment envisioned.

8.9 Understanding of Hazardous Locations. It shall be the responsibility of the operator to understand the hazard classification of the intended location of operation according to ANSI/NFPA 505-1996.

8.10 Operator warnings and instructions. The operator shall direct personnel operating the aerial platform to be in compliance with the

provisions set forth in this standard. The operator shall monitor their performance and supervise their work to ensure the use, application, and operation of the aerial platform is in conformance with the provisions set forth in Section 8 of this standard, warn personnel of potential hazards, provide means to protect against identified hazards, and explain the potential consequences of not following proper operating guidelines. Instructions and guidelines regarding proper operation shall include, but not necessarily be limited to the following issues and subjects:

(1) **Fall protection.** While the guardrail system of the aerial platform provides primary fall protection all occupants of the work platform shall wear either fall restraint or fall arrest equipment as directed by their employer.

(2) **Slope and grade.** The aerial platform shall not be operated in any manner on grades, side slopes, or ramps exceeding those for which the aerial platform is rated by the manufacturer.

(3) **Deployment of stability enhancing means.** Outriggers, stabilizers, extendable axles or other stability enhancing means shall be deployed and locked into place as required by the manufacturer.

(4) **Guardrail system.** Guardrails shall be installed and positioned, and access gates or openings shall be properly closed per the manufacturer's instructions.

(5) **Distribution of load.** The load and its distribution on the platform and any platform extension(s) shall be in accordance with the manufacturer's rated capacity for that specific configuration.

(6) **Maintaining overhead clearance.** The operator shall be instructed to ensure that adequate clearance is maintained from overhead obstructions and energized electrical conductors and parts.

(7) **Electrocution hazard.** The operator shall perform only the work for which he or she is qualified, in compliance with all applicable safety related work practices intended to prevent electric shock covered by the Code of Federal Regulations (CFR) 1910.333. The operator's level of competence shall be established only by persons qualified to do so. Operators shall maintain the appropriate minimum approach

distance (MAD) from energized power lines and parts covered by CFR 1910.333 (c)

(8) **Personal Protective Equipment.** The operator shall ensure all personnel on the platform wear personal protective equipment as required.

(9) **Personnel footing.** Personnel shall maintain a firm footing on the platform floor while working thereon. Climbing by occupants on the mid-rail or top-rail of the aerial platform is prohibited. The use of planks, ladders, or any other devices on the platform for achieving additional height or reach is prohibited.

(10) **Precaution for other moving equipment.** When other moving equipment and vehicles are present, special precautions shall be taken to comply with local ordinances or safety standards established for the workplace. Warnings such as, but not limited to, flags, roped off areas, flashing lights, and barricades shall be used as appropriate.

(11) **Reporting problems or malfunctions.** The operator shall immediately report to a supervisor any problem(s) or malfunction(s) that become evident during operation. The operator shall ensure all problems and malfunctions that affect the safety of operations are repaired prior to continued use.

(12) **Reporting potentially hazardous locations.** The operator shall immediately report to a supervisor any potentially hazardous location(s) that become evident during operation.

(13) **Hazardous location operation.** Operation of aerial platforms not approved and marked for operation in a hazardous location shall be prohibited.

(14) **Entanglement.** Care shall be taken to prevent rope, electric cords, and hoses, etc., from becoming entangled in the aerial platform.

(15) **Capacity limitations.** Rated capacities shall not be exceeded when loads are transferred to the platform at any height.

(16) **Work area.** The operator shall ensure the area surrounding the aerial platform is clear of personnel and equipment before lowering the platform.

(17) **Fueling.** The engine (if applicable) shall be shut down while fuel tanks are being filled. Fueling shall be done in a well-ventilated area

free of flame, sparks, or other hazards that may cause fire or explosion.

(18) **Battery charging.** Batteries shall be charged in a well-ventilated area free of flame, sparks or other hazards that may cause fire or explosion.

(19) **Improper platform stabilization.** The aerial platform shall not be positioned against another object to steady the platform or improve stability.

(20) **Misuse as a crane.** The aerial platform shall not be used as a crane.

(21) **Unusual operating support conditions.** The aerial platform shall not be operated from a position on trucks, trailers, railway cars, floating vessels, scaffolds, or similar equipment unless the application is approved in writing by the manufacturer or a qualified person.

(22) **Travel speeds.** The operator shall limit travel speed according to conditions, including the condition of the support surface, congestion, visibility, slope, location of personnel, and other factors leading to hazards which may cause collision(s) or result in potential injury(ies) to personnel.

(23) **Driving requirements.** Before and during driving while the platform is elevated, the operator shall:

(a) Maintain a clear view of the support surface and route of travel

(b) Ensure personnel in the worksite area that may be affected are aware of the movement, communicating and maneuvering the aerial platform as required to protect against personal injury

(c) Maintain a safe distance from obstacles, debris, drop-offs, holes, depressions, ramps, and other hazards to ensure safe travel

(d) Maintain a safe distance from overhead obstacles

(24) **Stunt driving.** Stunt driving and horseplay are prohibited.

(25) **Securing the aerial platform.** The operator shall implement means provided to protect against use by an unauthorized person(s).

(26) **Altering safety devices.** Interlocks or other safety devices shall not be altered or disabled.

(27) **Snagged platform.** If the platform or elevating assembly becomes caught, snagged, or

otherwise prevented from normal motion by adjacent structures or other obstacles such that control reversal does not free the platform, all personnel shall be removed from the platform before attempts are made to free the platform using lower controls.

(28) **Vacating (or entering) an elevated aerial platform.** If permitted by the manufacturer, personnel shall only vacate or enter a raised aerial platform by following the guidelines and instructions provided by the manufacturer.

(29) **Modifications.** Modification or alteration of an aerial platform or the fabrication and attaching of frameworks, or the mounting of attachments for holding tools or materials onto the platform or the guardrail system shall only be accomplished with the prior written permission of the manufacturer.

(30) **Assistance to the operator.** If an operator encounters any suspected malfunction of the aerial platform, or any hazard or potentially unsafe condition relating to capacity, intended use or safe operation of the aerial platform, the operator shall cease operation of the aerial platform and request further information from the operator.

(31) **Problem(s) or malfunction(s).** Any problems or malfunctions that affect the safety of operations shall be repaired prior to the use of the aerial platform.

(32) **Carrying materials (larger than the platform.)** The operator shall ensure that only properly secured tools and materials which are evenly distributed and can be safely handled by a person(s) working from the platform, shall be moved.

(33) **Rated horizontal force.** The operator shall not exceed the manufacturer's rated horizontal force.

(34) **Bridge cranes or contact with any electrical conductors.** When an aerial platform is to operate within the area of travel of a bridge crane or similar equipment, steps shall be taken to prevent a collision with the aerial platform.

(35) **Adequate support requirements.** The operator shall insure the support surface is adequate for the aerial platform and the load carried.

(36) **Leveling the aerial platform.**

Outriggers and leveling devices supplied by the manufacturer shall be utilized to level the aerial platform when provided.

(37) **Protecting against unauthorized use.** The operator shall not use, rent, lease, or provide the aerial platform for any form of beneficial use unless so authorized.

8.11 Record of training. When provided or when obtained upon the operator's request, proof of training by the training entity should be retained by the operator. Records shall contain the following information:

- (1) Name of entity providing training or retraining
- (2) Name of trainer(s)
- (3) Clear identification that training covered Boom-Supported Elevating Work Platforms
- (4) Date of training
- (5) Name of trainee

9 Responsibilities of Lessors

9.1 Basic principles. Sound principles of safety, training inspections, maintenance, application, and operation consistent with all data available regarding the parameters of intended use and expected environment shall be applied in the performance of responsibilities of lessors with due consideration of the knowledge that the aerial platform will be carrying personnel.

9.2 Lessor as a Dealer. When a lessor uses the aerial platform as a dealer, the lessor shall have the responsibilities of dealers as specified in Section 5 of this standard.

9.3 Lessor as an Owner. When a lessor uses the aerial platform as an owner, the lessor shall have the responsibilities of owners as specified in Section 6 of this standard.

9.4 Lessor as a User. When a lessor uses the aerial platform as a user, the lessor shall have the responsibilities of users as specified in Section 7 of this standard.

9.5 Lessor as an Operator. When a lessor uses the aerial platform as an operator, the lessor shall have the responsibilities of operators as specified in Section 8 of this standard.

10 Responsibilities of Lessees

10.1 Basic Principles. Sound principles of safety, training, inspections, maintenance, application, and operation consistent with all data available regarding the parameters of intended use and expected environment shall be applied in the performance of responsibilities of lessees with due consideration of the knowledge that the aerial platform will be carrying personnel.

10.2 Lessee as a Dealer. When a lessee uses the aerial platform as a dealer, the lessee shall have the responsibilities of dealers as specified in Section 5 of this standard.

10.3 Lessee as an Owner. When a lessee uses the aerial platform as an owner, the lessee shall have the responsibilities of owners as specified in Section 6 of this standard.

10.4 Lessee as a User. When a lessee uses the aerial platform as a user, the lessee shall have the responsibilities of users as specified in Section 7 of this standard.

10.5 Lessee as an Operator. When a lessee uses the aerial platform as an operator, the lessee shall have the responsibilities of operators as specified in Section 8 of this standard.

11 Responsibilities of Broker

11.1 Responsibilities upon sale. The broker shall:

- (1) Upon delivery, ensure the operating and maintenance manuals are provided to the new owner
- (2) Upon delivery, provide a copy of the current Manual of Responsibilities to the new owner
- (3) Maintain records of the sale for a minimum of four (4) years

11.2 Responsibilities with Re-rents, Leases, or Any Other Form of Beneficial Use. When compensation is received as a result of a re-rent, lease or any form of beneficial use of an aerial platform, the broker shall:

- (1) Upon delivery, ensure the operating and maintenance manuals are provided to the user
- (2) Upon delivery, provide a copy of the current Manual of Responsibilities
- (3) Ensure operating personnel are familiarized with the aerial platform prior to use
- (4) Retain records of the transaction for a minimum of four (4) years.

Figure 1 - Typical Examples of Equipment Covered

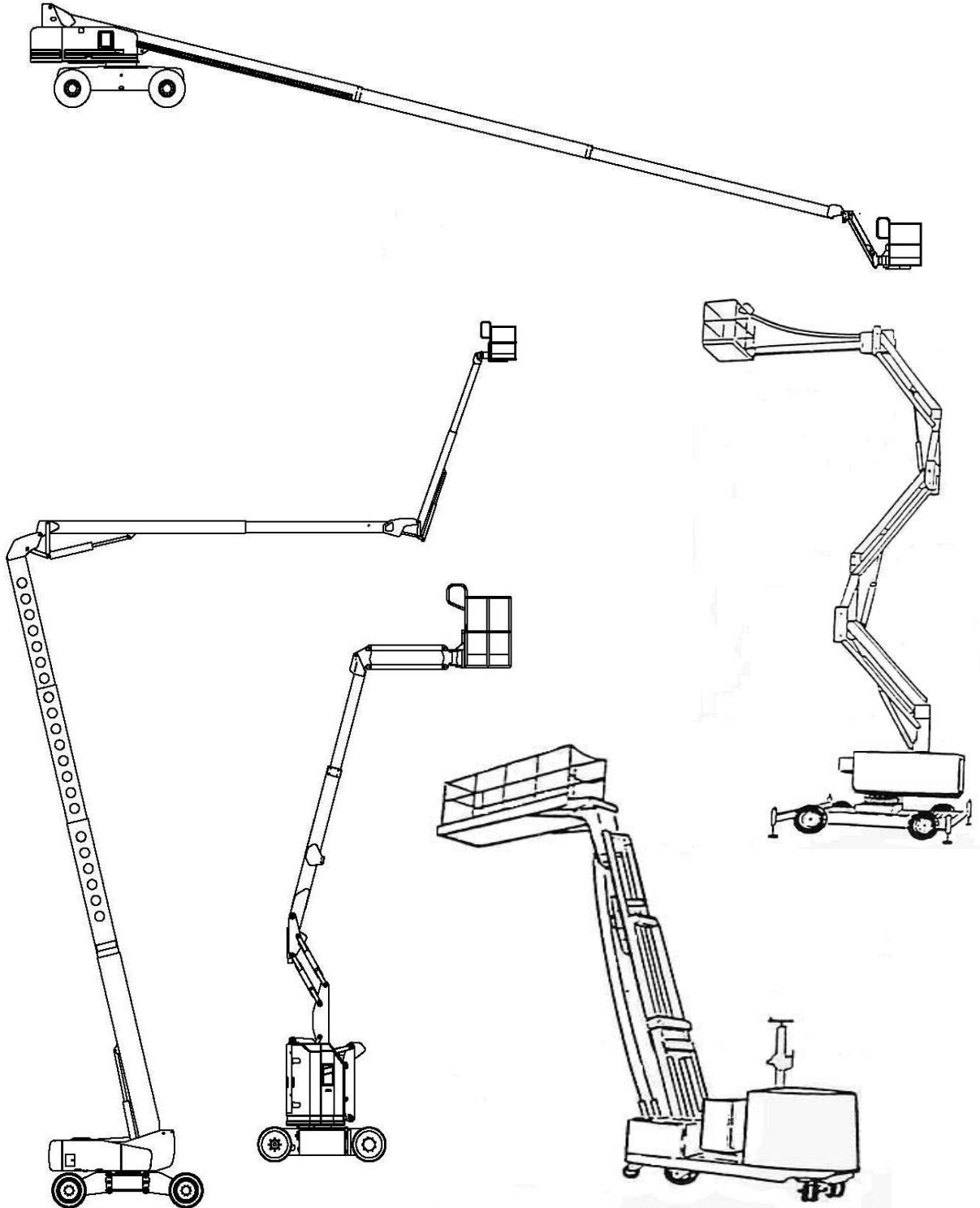
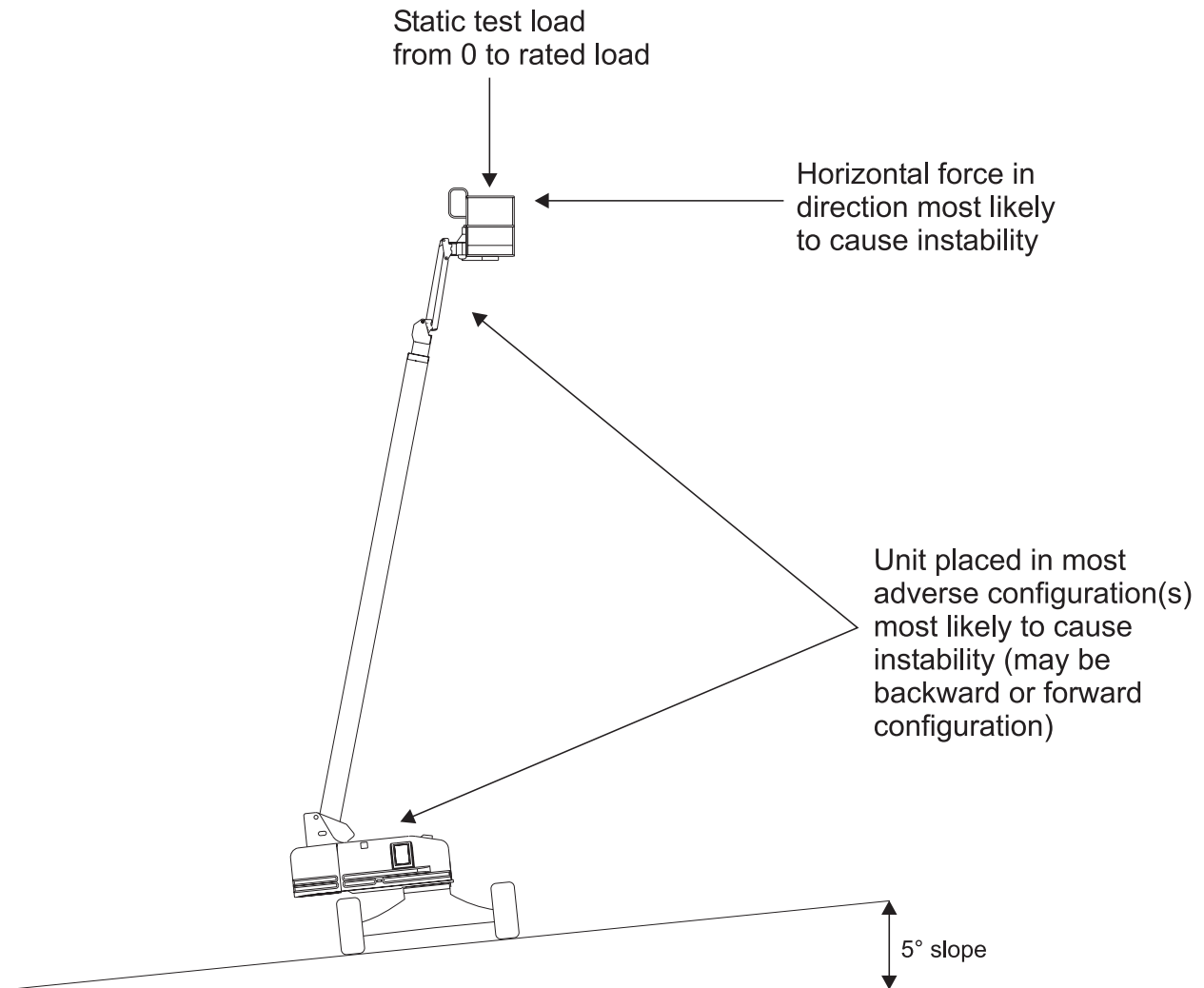
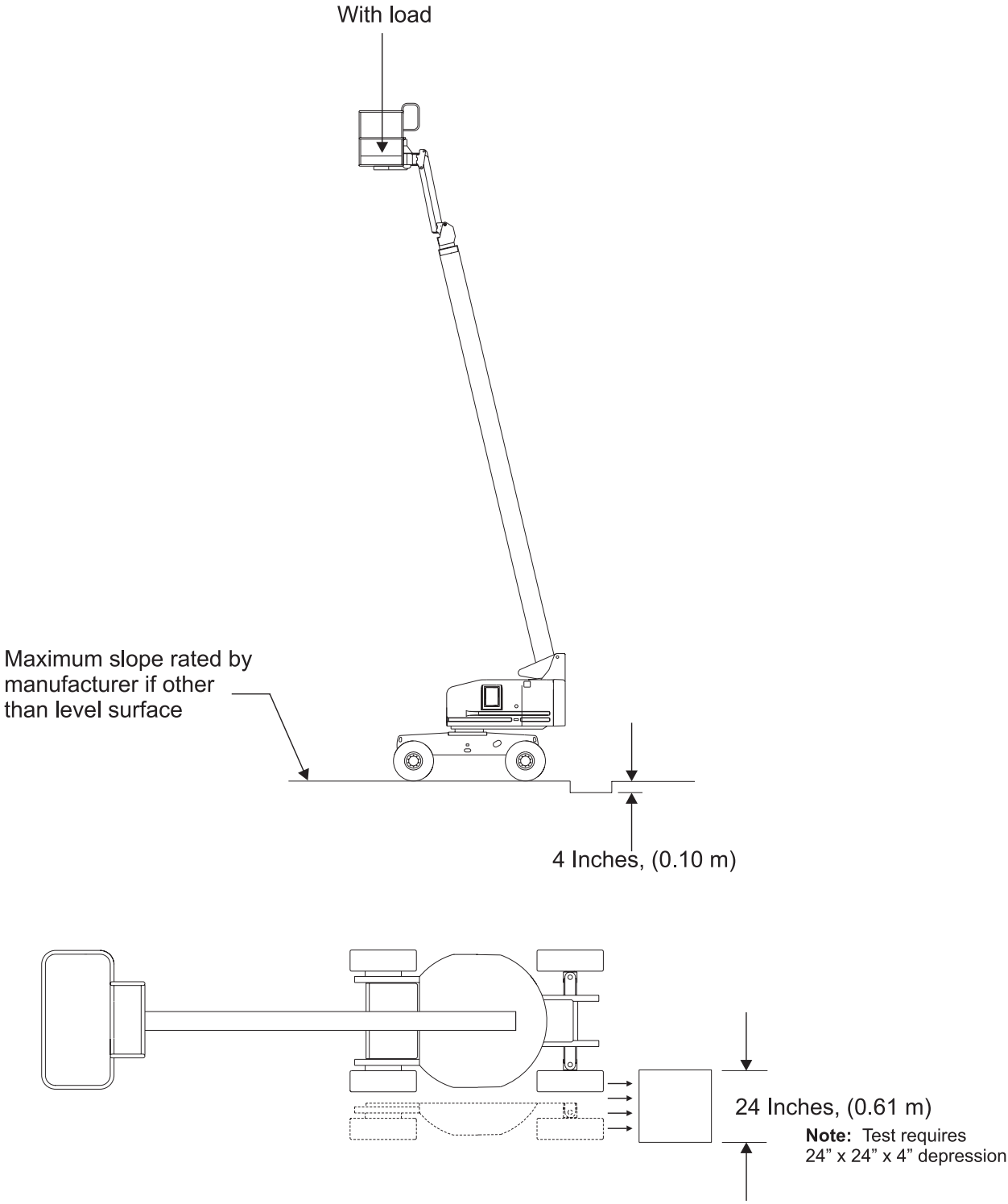


Figure 2 - Illustration Of Horizontal Load Test On Slope - Typical Test Conditions
(See Paragraph 4.7.1 on Page 9)



Caution: Diagrams shown are only for purposes of showing typical stability test position(s), **not working positions.**

Figure 3 - Illustration Of Depression Test - Typical Test Conditions
(See Paragraph 4.7.4.2 on Page 9)



ANSI/ SIA Standards Reorder Form

Standards: \$35 members/ \$45 non-members
Manuals of Responsibilities: \$4.95 members/ \$5.45 non-members

Qty	Item	Total
	A92.2 - Vehicle-Mounted Elevating and Rotating Aerial Devices	
	A92.2 Manual of Responsibilities	
	A92.3 - Manually-Propelled Elevating Work Platforms	
	A92.3 Manual of Responsibilities	
	A92.5 - Boom-Supported Elevating Work Platforms	
	A92.5 Manual of Responsibilities	
	A92.6 - Self-Propelled Elevating Work Platforms	
	A92.6 Manual of Responsibilities	
	A92.7 - Airline Ground Support Vehicle-Mounted Vertical Lift Devices	
	A92.7 Manual of Responsibilities	
	A92.8 - Vehicle-Mounted Bridge Inspection and Maintenance Devices	
	A92.8 Manual of Responsibilities	
	A92.9 - Mast-Climbing Work Platforms	
	A92.9 Manual of Responsibilities	

Name _____

Company _____

Address _____

City _____ State _____ Zip _____

Phone _____ Fax _____ Email _____

Payment Information: Visa Mastercard American Express

Credit Card #: _____

Expiration: _____ **CV Code:** _____

Scaffold Industry Association ~ P.O. Box 20574 ~ Phoenix, AZ 85036
Phone: 602.257.1144~Fax:602.257.1166
Email: info@scaffold.org

American National Standards for Aerial Work Platforms

ANSI/SIA A92.2 - 2001	Vehicle-Mounted Elevating and Rotating Aerial Devices
ANSI/SIA A92.3 - 2006	Manually Propelled Elevating Aerial Platforms
ANSI/SIA A92.5 - 2006	Boom-Supported Elevating Work Platforms
ANSI/SIA A92.6 - 1999	Self -Propelled Elevating Work Platforms
ANSI/SIA A92.7 - 1990	Airline Ground Support Vehicle-Mounted Vertical Lift Devices
ANSI/SIA A92.8 - 1993	Vehicle-Mounted Inspection and Maintenance Devices
ANSI/SIA A92.9 - 1993	Mast-Climbing Work Platforms

ANSI/SIA A92 Standards are under continual development. Contact the Scaffold Industry Association for updated information. Information is also available online at www.scaffold.org.

**Scaffold Industry Association, Inc.
'The Voice of the Scaffold and Access Industry'
Post Office Box 20574
Phoenix, Arizona 85036-0574
Telephone: 602.257.1144
Fax: 602.257.1166**

**Email: info@scaffold.org / sia@scaffold.org
Web: www.scaffold.org**

February 2006