AMERICAN NATIONAL STANDARD

ANSI/SAIA A92.2 – 2015

for

Vehicle-Mounted Elevating and Rotating Aerial Devices

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

Date of Publication: June 26, 2015

Effective Date: June 26, 2016

This Standard was approved by the American National Standards Institute on June 19, 2015

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 ensure 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 & Access Industry Association, Inc. (SAIA) does not “approve,” “rate,” or “endorse” any item, construction, proprietary device or activity.

The Scaffold & Access Industry Association, Inc. (SAIA) 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 ensure anyone utilizing a standard against liability for infringement of any applicable Letters Patent, nor does it 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 & Access Industry Association, Inc. (SAIA) accepts responsibility for only those interpretations issued in accordance with governing ANSI Essential Requirements, which preclude the issuance of interpretations by individual volunteers.

ANSI/SAIA
A92.2-2015

AMERICAN NATIONAL STANDARD for VEHICLE-MOUNTED ELEVATING and ROTATING AERIAL DEVICES

Secretariat
Scaffold & Access Industry Association, Inc.

Approved June 19, 2015
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 standard 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 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 & Access Industry Association, Inc.
400 Admiral Boulevard
Kansas City, MO 64106
www.saiaonline.org

Printed in the United States of America

FOREWORD

This foreword is not part of American National Standard for vehicle-mounted aerial devices, ANSI/SAIA A92.2-2015.

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 & Access Industry Association, Inc. serves as Secretariat.

The primary objective of this standard is to prevent accidents associated with the use of vehicle-mounted aerial devices by establishing requirements for design, manufacture, installation, maintenance, performance, use and training.

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 & Access Industry Association, 400 Admiral Boulevard, Kansas City, MO 64106.

This Standard was processed and approved for submittal to ANSI by Accredited Standards Committee Aerial Platforms, A92 Aerial Work Platforms. The ASC A92 committee's 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 Work Platforms Committee had the following members:

Dave Merrifield, Chairman
Frank Bonesteel, Vice-Chairman

Alimak Hek, Inc..... Gregory Janda
Altec HiLine, LLC.....Eric Lumberg
Altec Industries, Inc..... Bryan Hall
American Rental Association .....Carla Brozick
Arrowhead Aerial Products, Inc. ..... Sharon McCarty
Arrowhead Product Development, Inc. ..... Gary Werkhoven
Association of Equipment Manufacturers .....Daniel Moss
Beta Max, Inc……..……Shanon Beekman
Blazing Technologies .....Robert Backer
Brewington & Company..... John Brewington

C.W. Wright Construction ..... Michael Stiles
Century Elevators ..... Paula Manning
CPWR – The Center for Construction Research & Training ..... Pam Susi
Disneyland ..... Kenneth Colonna
Diversified Inspections/ITL ..... Leland Bisbee
Duke Energy Carolina East ..... David Benson
Duke Energy Florida ..... Daniel Mueller
Eckstine & Associates, Inc. ..... Dennis Eckstine
Elliott Equipment Company ..... Jason White
Entergy ..... Howard Guillory
Equipment Consultant Services Unlimited, Inc. ..... Bradley Nester
Equipment Safety Consultants Inc. ..... Charles "Mark" Recard
Equipment Technology LLC ..... Brian Davis
Eric A. Schmidt, P.E ..... Eric Schmidt
Evulich & Associates ..... Barris Evulich
ExxonMobil ..... Frank Radio
EZ Scaffold ..... James Hinton
Fraco Products ..... Francois Villeneuve
GAR Equipment ..... Richard Stollery
Genie Industries ..... Richard Curtin
Global Rentals ..... Joshua Chard
Global Safety & Equipment, Inc. ..... Geoffrey Arther
H&E Equipment Services ..... Frankie Wynn
Haulotte Group ..... Shahid Qureshi
Hayden Enterprises ..... Bud Hayden
Heath & Associates ..... Frederick Heath
Helac Corporation ..... Carl Kishline
Hy-Brid Lifts/Custom Equipment ..... Jeff Valind
Hydro Mobile, Inc... ..... Kevin O'Shea
Intercontinental Equipment Company LLC ..... Ron Norris
International Masonry Institute ..... Michael Kassman
IPAF, Ltd ..... Tony Groat
Irex Contracting Group ..... Tom Pokornik
Ives Training & Compliance Group, Inc. ..... Robert Vetter
JLG Industries, Inc. ..... Steven Forgas
Klimer Platforms ..... James Gordon
Lee Electrical Construction ..... John Cook
Lift-A-Loft Corporation ..... Chris Barefoot
MEC Aerial Work Platforms ..... David White
Merrifield Safety Consulting LLC ..... Dave Merrifield
Moog USA, Inc ..... Martin Schweizer
NES Rentals ..... Teresa Kee
OEM Controls, Inc. ..... Harold Meeker
Phenix Technologies ..... Mark Miller
Pike Electric, Inc. ..... Cliff Edwards
Power Equipment Leasing Company, Inc. ..... Tracy Schroeder
Reynolds Engineering Servicing Inc. ..... Stephen Reynolds
Safway Services ..... Ted Beville
SEA, Ltd ..... Brian Boggess

Sexton's Equipment Rental, Inc. ..... David Sexton
Skyjack, Inc. ..... Brad Boehler
Snorkel International, Inc. ..... Jeff Eckhardt
Southern California Edison ..... Randy Stone
Southern Company – Alabama Power Company ..... Ted Barron
Sunbelt Rentals ..... Jeff Stachowiak
Sunstate Equipment Co ..... Jake Kidd
Terex South Dakota, Inc. ..... Jim Olson
The Von Corporation ..... Fred von Herrmann
Time Manufacturing Company ..... James Christian
TRICO Lift ..... Jeff Walker
TRL Rents, LLC ..... Keith Joseph
United Rentals ..... Jim Dorris
Utility Truck Equipment & Parts, LLC ..... John Mlaker
Vollmer-Gray Engineering ..... Paul Guthorn
Waco Boom Company ..... Jonathan Woods
Wiss, Janney, Elstner Associates, Inc. ..... Jason Kamman
Xtreme Manufacturing ..... Richard Hoffelmeyer

Subcommittee A92.2 on Vehicle-Mounted Elevating and Rotating Aerial Devices, which developed this standard, had the following members:

Joshua Chard, Chairman
Ted Barron
David Benson
Robert Borer
John Brewington
Randall Breyer
James Christian
Kenneth Colonna
John Cook
Al Courchesne
Brian Davis
Cliff Edwards
Michael Fisher
Howard Guillory
Bryan Hall
Richard Hoffelmeyer
Robert Hofmiller
Keith Joseph
Jake Kidd
Eric Lumberg
Sharon McCarty
David Merrifield
Mark Miller
John Mlaker
Dan Mueller
Ron Norris
Jim Olson
Daniel Pohly
Stephen Reynolds
Tracy Schroeder
Bob Simon
David Skarshaug
Michael Stiles
Randy Stone
Jerry Tanner
Fred von Hermann
Gary Werkhoven
Jason White
Jonathan Woods

1. Scope, Purpose, Requirements, and Application 1
1.1 Scope 1
1.1.1 Equipment Covered 1
1.1.2 Equipment Not Covered 1
1.2 Purpose 1
1.3 Requirements. 1
1.4 Application. 1
2. Referenced and Related Standards 2
2.1 Referenced Standards 2
2.2 Related Standards 2
3. Definitions 3
4. Design Requirements 5
4.1 Basic Principles. 5
4.2 Structural Analysis 6
4.3 Controls 6
4.3.1 General 6
4.3.1.1 Visibility at Control Positions. 6
4.3.1.2 Unlocking or Enabling Device. 6
4.3.2 Upper Controls 6
4.3.3 Lower Controls 6
4.3.4 Ground Travel Controls 7
4.3.5 Emergency Stop 7
4.3.6 Stabilizer Controls 7
4.3.7 Winch Control 7
4.3.8 Platform Level Adjustment 7
4.3.9 Automatic or Programmed Operation 7
4.3.10 Hydraulic Isolation/Selector Device 7
4.4 Securing Devices 7
4.4.1 Ladder Securing Device 7
4.4.2 Boom Securing Device 7
4.4.3 Platform Security 7
4.4.4 Locking Pins 7
4.5 Stability 8
4.5.1 Stability on Level Surfaces. 8
4.5.2 Stability on Slopes. 8
4.5.3 Effects of Stability Test. 8
4.5.4 Slope Indicator 8
4.5.5 Stabilizer Interlock Device. 8
4.5.6 Oscillating Axle Interlock Device. 8
4.5.7 Manually Operated Stabilizers. 8
4.5.8 Parking Brake Interlock. 8
4.6 Hydraulic System 9
4.6.1 Bursting Safety Factors 9
4.6.2 Venting of Air 9
4.6.3 Resevoir Vent Filter 9
4.6.4 Fluid Level Indicators 9
4.6.5 Fluid Cleanliness 9
4.6.6 Gas-loaded Accumulators 9
4.7 Hydraulic Cylinders 9
4.7.1 Safety Factors. 9

4.7.2 Column Load. 9
4.7.3 External Load. 9
4.7.4 Threaded Components. 9
4.7.5 Hydraulic Pressure Rise. 10
4.8 Platform or Load Motion 10
4.8.1 System Protection 10
4.8.2 Platform Creep. 10
4.9 Platforms. 10
4.9.1 Guardrail System 10
4.9.2 Ladder Type 10
4.9.3 Folding Type Floors. 10
4.9.4 Anchorage(s) for Personal Fall Protection 10
4.9.4.1 Location 10
4.9.4.2 Markings 10
4.9.4.3 Strength Requirement. 10
4.9.4.4 Connector Requirement 11
4.9.4.5 Surface. 11
4.9.5 Buckets or Baskets 11
4.9.5.1 Non-insulating buckets or baskets designed for use with insulating liners 11
4.9.5.2 Non-insulating buckets or baskets designed for use without liners . 11
4.9.5.3 Insulating baskets or buckets. 11
4.9.5.4 Dimensions 11
4.10 Covers 11
4.10.1 Aerial devices intended for gloving work methods 11
4.10.2 Cover Requirements 11
4.11 Markings 11
4.11.1 Type of Markings: 11
4.11.2 Design of Markings 11
5. Electrical Systems, Devices and Test Procedures 11
5.1 Electrical Specifications 11
5.1.1 Insulation 11
5.1.2 Insulating Aerial Device Categories 12
5.2 Electrical Requirements 12
5.2.1 Insulating Systems 12
5.2.1.1 Insulating Hydraulic Hoses. 12
5.2.2 Vacuum Prevention Systems. 12
5.2.3 Lower Test Electrode System for insulating Aerial Devices 13
5.2.3.1 Conductive Bands 13
5.2.3.2 Conductive Connections. 13
5.2.3.3 Electrical Monitoring Circuit. 13
5.2.4 Gradient Control Devices & Conductive Shield(s) 13
5.2.4.1 Gradient Control Devices 13
5.2.4.2 Conductive Shield(s). 13
5.2.5 Chassis Insulating System 13
5.2.6 Upper Controls 14
5.3 Electrical Tests for Insulating Aerial Devices 14
5.3.1 Design Voltage Test. 14
5.3.2 Qualification Test 14
5.3.3 Periodic Electrical Test. 14
5.3.4 Before Use Test. 14

5.4 Electrical Test Procedures 14
5.4.1 General 14
5.4.2 Design, Qualification, and Quality Assurance Test Procedures 14
5.4.2.1 Test Procedures for Category A & B Aerial Devices 14
5.4.2.2 Test Procedures for Category C, D and E Aerial Devices 15
5.4.2.3 Test Procedures for Aerial Ladders and Vertical Towers, with Insulating Boom Sections 15
5.4.2.4 Test Procedures for Chassis Insulating Systems 15
5.4.2.5 Test Procedures for Insulating Liners 15
5.4.2.6 Confirmation Test of Upper Control Components with High Electrical Resistance.. 15
5.4.2.7 Test Procedures for Extensible Boom Aerial Devices with Permanent Electrodes... 15
5.4.3 Periodic/Maintenance Test Procedures. 15
5.4.3.1 Test Procedures for Category A and B Insulating Aerial Devices 15
5.4.3.2 Test Procedures for Category C, D and E Aerial Devices 16
5.4.3.3 Test Procedures for Aerial Ladders and Vertical Towers with Insulating Boom Sections 17
5.4.3.4 Test Procedures for Chassis Insulating Systems 17
5.4.3.5 Test Procedures for Insulating Liners 17
5.4.3.6 Test of Upper Control Components with High Electrical Resistance 17
5.4.3.7 Test Procedures for Extensible Boom Aerial Devices without Permanent Electrodes or with Electrodes and Tested as a Category C Device. 18
5.5 Electrical Test Equipment. 18
5.6 Electrical Certification 18
6. Responsibilities of Manufacturers 18
6.1 General Responsibilities 18
6.2 Specifications 18
6.2.1 Vehicle Specifications 18
6.2.2 Aerial Device Specifications 18
6.2.2.1 General 18
6.2.2.2 Capacity 18
6.2.2.3 Rated Platform Height 18
6.2.2.4 Platform Reach. 18
6.2.2.5 Multiple Configurations 18
6.2.2.6 Design Voltage. 19
6.2.2.7 Qualification Voltage. 19
6.3 Quality Assurance. 19
6.4 Manuals 19
6.5 Markings. 19
6.5.1 Application of Markings. 19
6.5.2 Identification Markings. 19
6.5.3 Operational Markings. 20
6.5.4 Instructional Markings 20
6.6 Mechanical Tests and Inspection. 20
6.6.1 Operational Tests 20
6.6.2 Visual Inspection. 20
6.7 Electrical Tests 20
6.8 Installation Instructions 21

6.9 Welding. 21
6.10 Training and Training Materials 21
7. Responsibilities of Dealers and Installers 21
7.1 General Responsibilities 21
7.2 Vehicle Specifications 21
7.3 Vehicle Weight Distribution 21
7.4 Manuals. 21
7.5 Installations. 21
7.5.1 Locking Pins. 21
7.5.2 Unauthorized Use. 21
7.6 Ingress/Egress. 22
7.6.1 Steps/Ladders. 22
7.6.2 Access Opening/Passage. 22
7.6.3 Three Point Support. 22
7.7 Quality Assurance. 22
7.8 Weldings. 22
7.9 Training. 22
7.9.1 Dealer or Installer as User. 22
7.10 Maintenance Training. 22
8. Responsibilities of Owners 22
8.1 General Responsibilities 22
8.2 Inspection and Testing Classifications 22
8.2.1 Initial Inspection and Test. 22
8.2.2 Regular Inspection and Tests 22
8.2.3 Frequent Inspection and Test: 22
8.2.4 Periodic Inspection or Test 23
8.2.5 Post Event Inspection or Test. 24
8.3 Inspection and Test Records 24
8.3.1 Frequent 24
8.3.2 Periodic. 24
8.4 Maintenance. 24
8.4.1 Maintenance Training. 24
8.4.2 Weldings. 25
8.5 Modifications. 25
8.5.1 Alterations. 25
8.5.2 Overriding Safety Devices. 25
8.6 Weight Distribution. 25
8.7 Transfer of Ownership 25
8.8 Markings. 25
8.9 Parts 25
8.10 Safety Bulletins. 25
8.11 Manuals. 25
8.12 Training, Retraining, and Familiarization of Operators 25
8.12.1 General Training. 26
8.12.2 Retraining. 26
8.12.3 Familiarization 26
8.13 Owner as a Lessor. 26
9. Responsibilities of Users 26
9.1 General Responsibilities 26
9.2 Personnel. 26

9.3 Training, Retraining, and Familiarization of Operators 26
9.3.1 General Training: 26
9.3.2 Retraining 27
9.3.3 Familiarization 27
9.3.4 Proof of Training 27
9.3.5 Record Keeping 27
9.4 Application. 27
9.5 Electrical Hazards. 27
9.6 Bare-Hand Work. 28
9.7 Lower Controls. 28
9.8 Manufacturer's Safety Bulletins. 28
10. Responsibilities of Operators 28
10.1 General Responsibilities. 28
10.2 Personnel 28
10.3 Operation. 28
10.4 Work Platform. 28
10.5 Brakes. 28
10.6 Loading. 28
10.6.1 Vacating or Entering an Elevated Aerial Device. 28
10.6.2 Carrying Materials Larger than the Platform. 28
10.7 Alterations 28
10.7.1 Overriding Safety Devices 28
10.8 Observations 29
10.8.1 Pre-start Inspection 29
10.8.2 Transporting 29
10.9 Worksite 29
10.10 Precautions 29
10.11 Mobile Operation 30
10.11.1 Driver Precautions 30
10.12 Training, Retraining, and Familiarization of Operators 30
10.12.1 General Training 30
10.12.2 Retraining. 30
10.12.3 Familiarization 30
10.13 Electrical Hazard 31
11. Responsibilities of Lessors or Lessees 31
11.1 General Responsibilities 31
11.1.1 Lessor or Lessee as Dealer or Installer. 31
11.1.2 Lessor or Lessee as Owner 31
11.1.3 Lessor or Lessee as User. 31
11.1.4 Lessor or Lessee as Operator 31
11.2 Ownership Responsibilities. 31
11.3 Obligations. 31
11.3.1 Inspection and Test. 31
11.3.2 Responsibilities 31
11.4 Training. 31
11.4.1 General Training 31
11.4.2 Familiarization 32
11.5 Communications. 32
11.6 Use of Brokers. 32
12. Responsibilities of Brokers 33

12.1 Broker Involved In a Sale....33
12.2 Broker Involved In a Lease....33

TABLES

Table 1: Design, Quality Assurance and Qualification Test Values....34
Table 2: Periodic Electrical Test Values....36
Table 3: Before Use Tests....37

FIGURES

Figure 1: Dielectric Test Configuration for Category A & B Aerial Devices....38
Figure 1A: Details of Lower Test Electrode Assembly & Conductive Shield....39
Figure 2: Dielectric Test Configuration for Category C Aerial Devices....40
Figure 2A: Optional Dielectric Test Configuration for Category C Aerial Devices....41
Figure 3: Dielectric Test Configuration for Chassis Insulating Systems....42
Figure 3A: Suggested Shunting Arrangement for Chassis Insulating System....43
Figure 4: Boom Positions for Dielectric Test of Extensible Insulating Aerial Devices....44
Figure 5: Typical Bonding Arrangements for Category A Aerial Devices....45
Figure 6: Confirmation Test of Upper Control Components w/High Electrical Resistance....46
Figure 7: Recommended Identification Plate Format....47

APPENDICES

Appendix A: Electrical Test Terminology and Clarification....48
Appendix B: DC Application....48
Appendix C: Application and Uses of Aerial Devices....49
Appendix D: Electrical Tests for Aerial Devices, Insulated Platforms and Insulated Ladders for AC Application....49
Appendix E: Electrical Tests for Aerial Devices Built in Compliance to Earlier Editions of this Standard....50
Appendix F: Precautions for Use of Aerial Devices on or near Energized Apparatus....51
Appendix G: Recommended Identification & Instruction Symbols for Control Function....55