

Douglas County Purchasing Department  
 1819 Farnam Street Room 902  
 Omaha, NE 68183-0902  
 (402)444-7155

**REQUEST FOR QUOTATION  
 ON CITY OF OMAHA  
 Safety Testing of Aerials**

**NOT AN ORDER**

<b>Publish date:</b> Friday, June 5, 2020		<b>Quote must be received and date stamped no later than:</b> 11:00 a.m. CT on Friday, June 19, 2020		<b>DEPARTMENT</b> FLEET MANAGEMENT / OFD	
<b>COMPANY NAME:</b>  <b>ADDRESS:</b> _____  <b>CITY / STATE:</b> _____  <b>ZIP CODE:</b> _____			Please use this form to quote price, terms, and delivery on the items described below. Vendor must provide all requested information and sign form to receive consideration. Quote should be mailed, faxed or emailed to the Douglas County Purchasing Department.		
			<b>WE QUOTE YOU AS BELOW</b>		
			EMAIL: _____		
			PHONE#: _____		
			FAX#: _____		
			Submitted by (print): _____		
SIGNATURE: _____			OFFICIAL TITLE: _____		DATE _____
TERMS	F.O.B. Delivered	DATE SHIPMENT CAN BE MADE		SHIPMENT VIA	
QUANTITY	DESCRIPTION			UNIT PRICE	AMOUNT
12 each	Safety Testing on fire aerial units, per specifications.			QUOTE/each: \$ _____	\$ _____ (Unit Price x 12)
30 each	Safety Testing on aerial basket/bucket-type vehicles, per specifications.			QUOTE/each: \$ _____	\$ _____ (Unit Price x 30)

Questions regarding this quote must be emailed to [bidquestions@douglascounty-ne.gov](mailto:bidquestions@douglascounty-ne.gov) and must be received by 11:00 am on Friday, June 12, 2020. Vendor must include the quote title in the subject line. Answers to questions will be posted via an addendum not later than Monday, June 15, 2020, prior to quote opening.

**Quote should be sent to Douglas County Purchasing using one of the following methods:**

**MAIL TO:** Douglas County Purchasing, 1819 Farnam St Rm 902, Omaha, NE 68183-0902

**EMAIL TO:** [quotes@douglascounty-ne.gov](mailto:quotes@douglascounty-ne.gov)

**FAX TO:** (402)444-5423

\*Emailed quotes must have the quote title in the subject line of the email.\*

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**BID CLAUSES - TERMS AND CONDITIONS**

**Conflict of Interest:** Pursuant to all state and local rules, CONTRACTOR assures the City of Omaha (CITY) that no elected Official or any officer or CITY employee shall have a financial interest, direct or indirect, in any CITY agreement. In the performance of this agreement, CONTRACTOR will avoid all conflicts of interests or appearances of conflict of interest. CONTRACTOR will report any conflict of interest immediately to the CITY. CONTRACTOR did not and will not provide any money or other benefit of any kind to any CITY employee in the procuring of, facilitation of, and execution of or during the duration of this Agreement.

**Communication with Staff:** From the date this bid is issued until a contract is awarded, communication regarding this solicitation between potential vendors and individuals employed by the City of Omaha is prohibited. Only written communication via email to bidquestions@douglascounty-ne.gov is permitted. Once an award is made the vendor will be permitted to speak with person(s) participating in contract negotiations. **Violation of these conditions may be considered sufficient cause to reject a vendor's bid and/or selection irrespective of any other condition.** The following exceptions to these restrictions are permitted: (1) Contacts made pursuant to any pre-existing contracts or obligations; (2) County staff and/or vendor staff present at a Pre-Proposal Conference, if scheduled, when recognized by the County as staff facilitating the meeting for the purpose of addressing questions; and (3) Presentations, key personnel interviews, clarification sessions or discussions to finalize a contract, as requested by Douglas County.

**Unavailability of Funding:** Due to possible future reductions including but not limited the City of Omaha (CITY), State and/or Federal appropriations, the CITY cannot guarantee the continued availability of funding for this Agreement, notwithstanding the consideration stated in this Agreement. In the event funds to finance this Agreement become unavailable either in full or in part due to such reduction in appropriations, the CITY may terminate the Agreement or reduce the consideration upon notice in writing to Contractor. The notice shall be delivered by certified mail, return receipt requested, or in person with proof of delivery. The CITY shall be the final authority as to the availability of funds. The effective date of such Agreement termination or reduction in consideration shall be specified in the notice as the date of service of the notice or the actual effective date of the CITY, State and/or Federal funding reduction, whichever is later. Provided, that reduction shall not apply to payments made for services satisfactorily completed prior to the effective date. In the event of a reduction of consideration, Contractor may cancel this Agreement as of the effective date of the proposed reduction upon the provision of advance written notice to CITY.

**Assignment and Delegation:** This Agreement is exclusive to the Parties and rights may not be assigned nor duties delegated by either Party except on prior written consent of the other. Any attempted assignment or delegation without such approval shall be void and shall constitute a material breach of contract. Any and all additional fees, charges, costs or expenses, which result from an approved assignment or delegation, shall be paid by the assigning/delegating Party.

**Termination:** The City of Omaha may terminate the awarded contract at any time if the vendor fails to carry out the terms or fails to make substantial progress toward the fulfillment of the contract obligations. In such event, the City shall provide the vendor with thirty (30) days written notice of conditions which endanger contract performance. If after such notice the vendor fails to remedy these conditions, the City may send a certified letter to the vendor for immediate cancellation of the contract. In such event, the City would receive a pro-rated portion of the value of the performance bond depending on the value of the remaining portion of the contract. The City will give the vendor sixty (60) days' notice of termination of contract if appropriations cease. The City of Omaha may also terminate the agreement for any reason upon 30 days notice.

**Payment Terms:** Net 30 payment terms shall apply to all invoices billed to the City of Omaha. Payment of invoice amount will occur within 30 days following receipt of invoice or receipt of goods/services, whichever is later.

**Drug Free Policy:** CONTRACTOR assures the City of Omaha that CONTRACTOR has established and maintains a drug free workplace policy.

**SIGN ALL COPIES**

Firm \_\_\_\_\_  
By \_\_\_\_\_  
Title \_\_\_\_\_

**CONTINUATION SHEET**

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**BID CLAUSES - TERMS AND CONDITIONS**

**INSURANCE:** Each bidder must provide a Certificate of Insurance with their bid documents which details their current levels of coverage.

**FOLLOWING AWARD OF CONTRACT:** For City projects where the scope of work will be less than \$200,000.00, it is required that the awarded contractor provide a Certificate of Insurance meeting or exceeding the following levels of insurance: (1) adequate workers' compensation (statutory); (2) commercial general liability in an amount not less than **\$250,000** for any person for any number of claims arising out of a single occurrence and not less than **\$500,000** for all claims arising out of a single occurrence; and (3) property damage insurance in an amount not less than **\$500,000**; and naming CITY OF OMAHA as an additional insured, except for Workers' Compensation policies/certificates, for the term of the agreement. **Certificates of Insurance are required before service begins.**

**FOLLOWING AWARD OF CONTRACT:** For City projects where the scope of work will exceed \$200,000.00, it is required that the awarded contractor provide a Certificate of Insurance meeting or exceeding the following levels of insurance: (1) adequate workers' compensation (statutory); (2) commercial general liability in an amount not less than **\$1,000,000** for any person for any number of claims arising out of a single occurrence and not less than **\$5,000,000** for all claims arising out of a single occurrence; and (3) property damage insurance in an amount not less than **\$500,000**; and naming CITY OF OMAHA as an additional insured, except for Workers' Compensation policies/certificates, for the term of the agreement. **Certificates of Insurance are required before service begins.**

**Liquidated damages** shall be assessed at a rate of 1% of the total purchase order amount per calendar day that satisfactory performance is not fully complete. Satisfactory performance shall occur on or before the date agreed to at the time of the bid or purchase award between the City and the awarded bidder. Satisfactory performance shall also be deemed to include product or purchase compliance with all specifications set forth in the bid award. The amount of liquidated damages shall be deducted from any monies due the awarded bidder by the City. If applicable, when the monies due to the awarded bidder are not sufficient to satisfy the City's liquidated damages, the awarded bidder shall submit payment to the City the amount to satisfy any outstanding liquidated damages owed within 10 days of the date of non-performance.

The City may, at its sole discretion, allow "excusable delays" when assessing if liquidated damages are applicable. An excusable delay is defined as a delay that causes disruption to the installation schedule but which is beyond the awarded bidder's control. Excusable delay may include delays caused by weather, strikes, or natural disasters. Any determination of excusable delay by the City shall be limited in time and scope and shall not be a guarantee or promise of future determinations of excusable delay by the City.

**INDEPENDENT VENDOR:** Both parties understand and agree that (vendor) is an independent vendor under the provisions of this Agreement and not employed by or otherwise affiliated with Douglas County (COUNTY) or the City of Omaha (CITY). Employees of vendor (if any) are not employees of COUNTY/CITY. Each Party shall pay all wages, salaries and other amounts due its employees and shall be responsible for all reports, obligations, and payments pertaining to social security taxation, income tax withholding, workers' compensation, unemployment compensation, group insurance coverage, collective bargaining agreements or any other such similar matters. Both parties understand and agree that vendor is solely responsible for acquiring and maintaining, for the term of this Agreement, adequate general and special liability insurance, including but not limited to workers' compensation insurance, sufficient to protect vendor's ability to complete performance under this Agreement. Neither Party shall have any authority to bind the other by or with any contract or agreement, nor to impose any liability upon the other. All acts and contracts of each shall be in its own name and not in the name of the other.

**EXTRAORDINARY EVENTS:** In the event of a pandemic, natural disaster, terroristic attack, or closure of a facility due to construction, remodeling or sale or any other extraordinary event which results in one, some or all of the listed facilities in this Agreement being closed for two weeks or more, the City may discontinue services upon immediate notice.

SIGN ALL COPIES

Firm \_\_\_\_\_  
By \_\_\_\_\_  
Title \_\_\_\_\_

**CONTINUATION SHEET**

# Responsible Contractor Compliance Form RC-1



1. Regulation:

A. Article IV, Division I of Chapter 10 of the Omaha Municipal Code thereon require:

1. That all contractors who submit a bid to City of Omaha shall designate a representative who on behalf of the Contractor, shall fill out completely a Responsible Contractor Compliance Form (RC-1). An incomplete or unsigned RC-1 form will make your bid null and void.

2. Filing this Report (please initial in the boxes below):

Contractor agrees that Contractor will not knowingly employ or hire an employee not lawfully authorized to perform employment in the United States and that the Contractor and all sub-contractors shall use E-Verify to determine work eligibility.

Contractor agrees that Contractor will not knowingly violate Nebraska's Misclassification of Employee law (Neb. Rev. Stat. Section 48-2901 et seq.).

Contractor agrees that Contractor will not knowingly violate Nebraska's Fair Labor Standards Law (Neb. Rev. Stat. Section 73-104 et seq.).

Contractor has not been convicted of any tax violations (local, State and Federal) within the last three years from the date this bid is submitted.

Contractor has not, upon final determination by the Occupational Safety and Health Administration, been convicted of a criminal, repeat, or willful violation of the Occupational Safety and Health Act (OSHA) or been convicted of 3 (three) separate "serious" OSHA violations within the past three (3) years.

Contractor agrees to make a good faith effort to ensure all subcontractors employed on this project comply with the provisions of the Responsible Contractor Compliance Form RC-1.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

By signing, I verify on behalf of the Contractor that the information above is true and correct. Filing false information carries a penalty of up to a \$500 fine or six months in jail. In addition, the contractor and sub-contractors can be subject to immediate disqualification and prohibited from any future City of Omaha contract for a period of 10 years.

## GENERAL INFORMATION AND SPECIFICATIONS FOR THE OPERATIONAL TESTING OF AERIAL DEVICES

### \*\*\*TEST MUST INCLUDE FIVE (5) YEAR NON-DESTRUCTIVE TEST\*\*\*

- A. It is the intent of this specification to obtain for the City of Omaha the most thorough and complete testing of twelve (12) aerial devices. For this reason, bids will be accepted only from companies which have been engaged in the inspection of fire pumpers and aerial devices for a minimum of five years. The testing corporation must employ full time ASNT-TC-1A Level 2 inspectors, certified QC-1 weld inspectors and a full time licensed professional engineer for a proper analysis of the inspection procedure. The person actually performing the non-destructive test work shall be certified as at least a Level II NDT technician in the test method used as specified in ANSICO-189. The person actually performing the non-destructive test work shall be certified, at least, as a level II NDT Technician in the test method as specified in ANSI CP-189. A list of the above may be requested, prior to award.
- B. The bidder shall include with the bid, a complete outline of services provided for evaluation by Fleet Management personnel. All deviations to the City's specifications must be noted. The absence of deviations shall be construed as total compliance to the published specifications. The bidder shall also include in the bid a list of boroughs or municipalities with the same type of devices which bidder has inspected, and indicate a minimum list of three major aerial manufacturer's devices for which testing has been performed. If awarded, proof of liability insurance coverage must be demonstrated. **Any exception may be cause for rejection of bid.** Total exception will be cause for rejection of bid.
- C. Bidder shall not represent nor be involved in the manufacture or repair of fire elevated platforms, fire aerial trucks or forestry bucket trucks. Bids shall be submitted for the complete inspection of fire elevated platforms, aerial fire trucks and elevated bucket trucks.
- D. The standards regarding certification from the following sources will apply where applicable.
1. Occupational Safety and Health Administration
  2. National Fire Protection Association.
  3. American Society of Mechanical Engineers
  4. American Welding Supply
  5. American National Standards Institute
  6. Society of Automotive Engineers
  7. Fire Equipment Manufacturers
  8. American Society for Testing Materials
- E. TEST LOCATIONS:  
Testing will be conducted at the City of Omaha's Fleet Management shop 2606 N. 26<sup>th</sup> Street, Omaha, Nebraska, during the month of September. No more than two fire vehicles will be inspected each day.
- F. The term of this agreement will be for one (1) year. The City, at its sole discretion, may extend the agreement for five (5) additional one-year terms. Following the initial contract term, the awarded bidder may propose price increases for any contract extensions offered by the City. Price increases must be requested 30 days prior to proposed increase and must be justified with documentation (e.g. reports, manufacturer statements, invoices, etc). Proposed price increases will be reviewed by the City, who at their sole discretion will either approve or reject the proposed increase.

## **AERIAL DEVICE EXAMINATION AND TEST SPECIFICATIONS**

### **1.0 GENERAL:**

- 1.1. The bidder shall submit a complete outline of his certification requirements for evaluation by the Fire Department with his bid. Failure to comply will cause automatic rejection.
- 1.2. All exceptions and deviations to the specifications shall be noted. The absence of exceptions and/or deviations shall be interpreted as total compliance to the published specifications.
- 1.3. Total exception disqualifies the bidder.
- 1.4. The bidder shall not represent nor be a manufacturer or repairer of aerial equipment, no exceptions.
- 1.5. The examination and test report provided to the city shall specify the point of inspection and the results of such examinations and test. The test report shall contain the summary of defects with a minimum of 3 ½ X 5 color photos showing each defect. The test report, as required by NFPA 1911, shall include the following:
  - 1.6. When the torque verification of mounting bolts, as required by NFPA 1911, is performed, the bolt size, grade, and torque specification shall be recorded.
  - 1.7. When NDT is conducted, the test record will indicate the NDT method used in each area inspected.
  - 1.8. Where NFPA 1911 requires measurements be taken such as bearing clearance and backlash, cylinder drift, relief pressure, ladder section twist, hardness readings, baserail thickness, extension brake drift, winch drift, and the like, these measurements shall be recorded in the test record in order that a year-to-year comparison can be made.
  - 1.9. All test work must be in compliance with NFPA 1911, Standard for Inspection, Maintenance, Testing, and Retirement of In-Service Automotive Fire Apparatus, 2012 Edition Chapter 19 -Performance Testing of Aerial Devices, NO EXCEPTIONS.

### **2.0 BIDDER REQUIREMENTS:**

- 2.1. Bidder shall be a nationally recognized testing laboratory recognized by OSHA in accordance with the OSHA regulations set forth at 29 Code of Federal Regulations, Section 1910.7, Appendix A, "OSHA Recognition Process for Nationally Recognized Testing Laboratories." NO EXCEPTIONS.
- 2.2. Bidder shall comply with the following American Society for Testing and Materials Standards. NO EXCEPTIONS.
  - A. ASTM E543, "Standard Practice for Agencies Performing Nondestructive Testing."

- B. ASTM E548, "Preparation of Criteria for Use in the Evaluation of Testing Laboratories and Inspection Bodies."

### **3.0 REFERENCES:**

- 3.1. On a separate but attached sheet on company letterhead the bidder shall submit a list of ten Fire Departments for which the bidder has tested similar aerial devices as the units to be tested.
- 3.2. On a separate but attached sheet on company letterhead the bidder shall submit a list of a minimum of six aerial apparatus manufacturers for whom testing is currently being conducted on a regular basis. NO EXCEPTION.

### **4.0 PERSONNEL:**

- 4.1. The inspectors actually performing the test work on the units shall be certified as meeting Level II requirements as outlined in American Society for Nondestructive Testing (ASNT) document CP-189 in all methods used in the aerial inspection. The inspector shall also have had training at various aerial manufacturing locations so as to become familiar with the assembly and operation of aerial devices for fire service use.
- 4.2. Prior to award of contract, the actual person(s) performing the inspection may be required to present for review proof of his Level II Certification in the required NDT methods.

### **5.0 NECESSITY OF REINSPECTIONS:**

- 5.1. If a unit shall have minor defects and not be repaired before the inspector leaves the area, the city shall make necessary repairs and notify the testing company of the completion of the repairs in writing. No reinspection shall be deemed necessary.
- 5.2. If a unit should have major defects the load test shall not be conducted until such time as repairs are made and the repair work is inspected and found to be acceptable by the testing company. Charges for reinspection shall be for actual time spent at the department conducting the required tests.

### **6.0 CERTIFICATION:**

- 6.1. When the unit successfully meets all NFPA 1911, 2012 requirements, the testing company shall issue a certificate of aerial lift device examination and test stating the units compliance with NFPA 1911, 2012 Edition.

### **7.0 NOTIFICATION TO ALL BIDDERS:**

In order to comply with this specification, the bidder must have in his possession the following tolerances from the manufacturer. NO EXCEPTIONS. Proof of compliance may be required prior to award of contract.

- 1. Rotation bearing clearance and backlash.

2. Critical mounting bolt grade and torque.
3. Elevation cylinder drift tolerance.
4. Extension cylinder drift tolerance.
5. Outrigger cylinder drift tolerance.
6. Hydraulic relief pressure.
7. Ladder section twist.
8. Hardness for aluminum devices.
9. Hollow I-beam baserails thickness.
10. Rated load of the device.
11. Maximum rated working pressure of water system.

## **8.0 WELDING STANDARDS:**

- 8.1.** All accessible structural weldments on ferrous materials will be inspected for compliance with American Welding Society (AWS) D1.1 "Structural Welding Code – Steel", 2000 edition. All structural weldments shall meet the requirements for weld quality as defined in 6.9, Visual Inspection. The acceptance criteria are outlined in Table 6.1, under the column labeled "Tubular Connections".

The following criteria will apply:

### Cracks

No cracks of any type (transverse, toe, longitudinal, crater, etc.) are permitted.

### Surface Holes

The sum of diameters of piping porosity in fillet welds shall not exceed 3/8 in. (10 mm) in any linear inch (25 mm) of weld and shall not exceed 3/4 in. (19 mm) of weld in any 12 in. (305 mm) length of weld.

Complete joint penetration groove welds in butt joints transverse to the direction of computed tensile strength shall have no piping porosity. For all other groove welds, piping porosity shall not exceed 3/8 in. (10 mm) in any linear inch (25 mm) of weld and shall not exceed 3/4 in. (19 mm) in any 12 in. (305 mm) length of weld.

### Lack of Fusion

Thorough fusion shall exist between adjacent layers of weld metal and between weld metal and base metal.

### Undercut

Undercut shall not exceed 0.01 in. (0.25 mm) deep when its direction is transverse to primary tensile stress in the part that is undercut, nor more than 1/32 in. (1 mm) for all other situations.

- 8.2.** All aluminum structural weldments shall meet the requirements in Paragraph 9.15.1 of the American Welding Society (AWS) Standard AWS D1.2 "Structural Welding Code -- Aluminum", 1997 edition.

The following criteria will apply:

### Cracks

No cracks of any type (transverse, toe, longitudinal, crater, etc.) are permitted.



Undercut

Length, each undercut	0.20 in. (5 mm), maximum
Depth	15 % of minimum base metal thickness, maximum. (See chart, below)
Distance between undercuts	2.0 in. (50 mm), minimum.

<u>Base Metal Thickness (in.)</u>	<u>Allowable Undercut Depth (in.) 15 % of Base Metal</u>
1/16	0.009 (approximately equal to 0)
1/8	0.019 (approximately equal to 1/64)
3/16	0.028 (approximately equal to 1/32)
1/4	0.038 (approximately equal to 1/32)
5/16	0.046 (approximately equal to 3/64)
3/8	0.056 (approximately equal to 3/64)
7/16	0.066 (approximately equal to 1/16)
1/2	0.075 (approximately equal to 1/16)

Scratch or Burn Marks

Depth	15 % of minimum base metal thickness, maximum.
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**8.3 Visual Inspection.** A visual inspection, prior to any operation or load testing, will be carried out in a systematic sequence with proper attention to detail. This visual inspection of the equipment will be for the detection of any visible defects, damage, or improperly secured parts.

**8.4 Weld Inspection.** All accessible structural welds will be visually inspected for fractures. When the nondestructive testing is required by 1-4.2 is performed, all accessible structural welds will be inspected by ASNT Level II NDT technicians certified in the test methods used.

- A. All accessible structural welds on steel will be inspected in accordance with the appropriate provisions of the American Welding Society (AWS) Standard AWS D1.1, Structural Welding Code--Steel. All structural welds will comply with the weld quality as defined in Table 6.1 (Visual Inspection) of AWS D1.1.
- B. All accessible structural welds on aluminum will be inspected in accordance with The appropriate provisions of the American Welding Society (AWS) Standard AWS D1.2, Structural Welding Code--Aluminum. All structural welds will comply with the weld quality as outlined in Table 9.2 of AWS D1.2.
- C. The application of a particular nondestructive weld inspection technique will be as recommended by the American Welding Society (AWS) Standard AWS B1.10, Guide for the Nondestructive Examination of Welds.

**9.0 Bolt, Pin, and Washer Inspection.** Bolts and pins subjected to ultrasonic testing shall contain no ultrasonic CRT indications that can be interpreted as cracks or elongated material. All washers will be inspected for correct installation.

## **10.0 Non-destructive Testing Procedure.**

**10.1** All ultrasonic inspections will be conducted in accordance with the following American Society for Testing and Materials (ASTM) Standards:

- (a) ASTM E114, Standard Practice for Ultrasonic Pulse-Echo Straight-Beam Examination by the Contact Method
- (b) ASTM E797, Standard Practice for Measuring Thickness by Manual Ultrasonic Pulse-Echo Contact Method
- (c) ASTM E500, Standard Terminology Relating to Ultrasonic Examination

**10.2** All magnetic particle inspection will be conducted in accordance with the following American Society for Testing and Material (ASTM) standards:

- (a) ASTM E709, Standard Guide for Magnetic Particle Examination
- (b) ASTM E269, Definitions of Terms Relating to Magnetic Particle Examination

**10.3** All liquid penetrant inspections will be conducted in accordance with the following American Society for Testing and Materials (ASTM) standards:

- (a) ASTM E165, Standard Test Method for Liquid Penetrant Examination
- (b) ASTM E270, Definitions of Terms Relating to Liquid Penetrant Inspection
- (c) ASTM E1220, Standard Test Method for Visible Penetrant Examination Using the Solvent-Removable Process
- (d) ASTM E1418, Standard Test Method for Visible Penetrant Examination Using the Water-Washable Process

**10.4** All radiographic inspection will be conducted in accordance with the following American Society for Testing and Materials (ASTM) standards:

- (a) ASTM E1032, Standard Test Method for Radiographic Examination of Weldments
- (b) ASTM E586, Standard Definitions of Terms Relating to Gamma and X-Radiography

**10.5** All hardness readings will be conducted in accordance with the following American Society for Testing and Materials (ASTM) standards:

- (a) ASTM E6, Standard Terminology Relating to Methods of Mechanical Testing
- (b) ASTM E10, Standard Test Method for Brinell Hardness of Metallic Materials
- (c) ASTM E18, Standard Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials

- (d) ASTM E92, Standard Test Method for Vickers Hardness of Metallic Materials
- (e) ASTM B647, Standard Test Method for Indentation Hardness of Aluminum Alloys by Means of a Webster Hardness Gauge
- (f) ASTM B648, Standard Test Method for Indentation Hardness of Aluminum Alloys by Means of a Barcol Impressor

## **11.0 Testing Metal Aerial Ladders**

**11.1 General.** In addition to the manufacturer's recommendations, the inspections detailed below will be performed. An inspection preceded by a plus sign (+) indicates that an appropriate nondestructive test (NDT) shall be conducted as required by 32.4 of this standard.

**11.2 Service Records.** The aerial ladders service records maybe checked for any reports that may indicate defective conditions.

**11.3 Hydraulic Components.** Hydraulic components shall show no signs of hydraulic fluid leakage.

- a) A component shall be considered leaking if hydraulic fluid (oil) droplets are forming on the component.
- b) A film of hydraulic fluid on the component shall NOT be considered severe enough to categorize the component as leaking.

**11.4 Turntable, Torque Box, Suspension, and Tractor Drawn Components Inspection and Test.** The turntable, torque box, suspension components, and tractor drawn components, where applicable, shall be inspected on all aerial ladders in accordance with 11.5 through 11.35.

**11.5 Rotation Bearing Mounting Bolts.** The rotation bearing mounting bolts will be inspected as follows:

- (a) Inspect all accessible bolts for proper grade and installation as specified by the apparatus manufacturer.
- (b) Using a properly calibrated torque wrench, verify that the bolt torque on all accessible bolts meets the apparatus manufacturer's specifications.
- (c) (+) Inspect all accessible bolts for internal flaws.

**11.6 Torque Box Mounting to Frame.** The torque box mounting to frame will be inspected as follows:

- (a) If the torque box is bolted to the frame, inspect all accessible bolts for proper grade and installation as specified by the apparatus manufacturer.
- (b) Using a properly calibrated torque wrench, verify that the torque on all accessible bolts meets the apparatus manufacturer's specification, if the torque box is bolted to the frame.
- (c) If the torque box is welded to the frame, visually inspect all accessible attaching welds for fractures.

- (d) (+) If the torque box is bolted to the frame, inspect all bolts for internal flaws.
- (e) (+) If the torque box is welded to the frame, inspect all accessible attaching welds.

**11.7 Suspension Systems.** If the suspension system components are bolted to the frame, the mounting of the suspension system components to the frame shall be inspected as follows:

- (a) Inspect all accessible bolts for proper grade and installation as specified by the apparatus manufacturer.
- (b) Using a properly calibrated torque wrench, verify that the torque on all accessible bolts meets the apparatus manufacturer's specifications.
- (c) (+) Inspect all bolts for internal flaws.

**11.8** If the suspension system components are welded to the frame, the mounting of the suspension system components to the frame shall be inspected as follows:

- (a) Visually inspect all accessible attaching welds for fractures.
- (b) (+) Inspect all accessible attaching welds.

**11.9 Rotation Gear and Bearing.** The rotation gear and bearing will be inspected as follows:

- (a) Inspect the rotation gear for missing or damaged teeth, pinion-to-gear alignment, proper lubrication, and backlash.
- (b) Inspect the bearing clearance.

**11.10 Rotation Gear Reduction Box Mounting.** The rotation gear reduction box mounting will be inspected as follows:

- (a) If the reduction box is bolted to the turntable, inspect all bolts for proper grade and installation and specified by the apparatus manufacturer.
- (b) Using a calibrated torque wrench, verify that the torque on all bolts meets the apparatus manufacturer's specification, if the reduction box is bolted to the turntable.
- (c) Visually inspect all accessible weldments for defects and welds for fractures.
- (d) (+) If the reduction box is bolted to the turntable, inspect all bolts for internal flaws.
- (e) (+) If the reduction box is welded to the turntable, inspect all reduction box attaching welds.

**11.11 Turntable Structural Components.** The turntable structural components will be inspected as follows:

- (a) Visually inspect all accessible turntable structural weldments for defects and welds for fractures.
- (b) (+) Inspect all accessible turntable structural component welds.

**11.12 Rotation Hydraulic Swivel.** Inspect the swivel for external hydraulic fluid leakage.

**11.13 Hydraulic Lines and Hoses.** Inspect all hydraulic lines and hoses for kinks, cuts and abrasions, and hydraulic fluid leakage at connectors and fittings.

**11.14 Elevation, Extension, and Rotation Lock(s).** The elevation, extension, and rotation lock(s) will be inspected as follows:

- (a) Inspect the manual valve elevation, extension, and rotation lock(s) for external hydraulic fluid leakage.
- (b) Test the manual valve elevation lock for proper operation by engaging the lock and then attempting to raise and lower the ladder with the main hydraulic system operating. No detectable movement shall occur as determined by visual inspection.
- (c) Test the manual valve extension lock for proper operation by engaging the lock and then attempting to extend or retract the ladder with the main hydraulic system operating. No detectable movement shall occur as determined by visual inspection.
- (d) Test the manual valve rotation lock for proper operation by engaging the lock and attempting to rotate the turntable clockwise and counterclockwise with the main hydraulic system. The movement shall not exceed the manufacturer's specification.

**11.15 Power Takeoff.** Inspect the power takeoff for external hydraulic fluid leakage and proper operation (engagement and disengagement).

**11.16 Hydraulic Pump.** Inspect the hydraulic pump for external hydraulic fluid leakage.

**11.17 Collector Rings.** The collector rings will be inspected as follows:

- (a) Inspect the collector rings for foreign material buildup on rings, if accessible.
- (b) If accessible, inspect the collector ring terminals for damage.
- (c) Conduct tests to ensure the proper operation of the collector rings by rotating the aerial device while electric-powered devices are in operation.
- (d) If applicable, check for indications of moisture in the electrical chamber by visually inspecting the desiccant moisture indicators.

**11.18 Elevation Cylinder Anchor Ears and Plates.** The elevation cylinder anchor ears and plates will be inspected as follows:

- (a) Visually inspect the elevation cylinder anchor ears and plates for defects and the attaching welds for fractures.
- (b) (+) Inspect the elevation cylinder anchor ears and plate-attaching welds.

**11.18.1** If the elevation cylinder anchor is bolted, it shall be further inspected as follows:

- (a) Inspect all accessible bolts for proper grade and installation as specified by the apparatus manufacturer.
- (b) Using a properly calibrated torque wrench, verify that the torque on all accessible bolts meets the apparatus manufacturer's specifications.
- (c) (+) Inspect all bolts for internal flaws.

**11.19 Elevation Cylinder Pins.** The elevation cylinder pins will be inspected as follows:

- (a) Inspect cylinder pins for alignment, proper installation, lubrication, operation, and retention.
- (b) (+) Inspect cylinder pins for internal flaws.

**11.20 Elevation Cylinders.** The elevation cylinders will be inspected as follows:

- (a) Inspect the cylinder rods for pitting, scoring, and other defects.
- (b) Inspect the cylinder rod-to-barrel seal and the end gland seal for excessive external hydraulic fluid leakage that exceeds the manufacturer's specifications.
- (c) With the hydraulic oil at ambient temperature, subject the cylinders to a drift test by placing the aerial device at a 60-degree elevation, full extension, marking the cylinder position, closing manually operated locking valves, and allowing the device to stand for 1 hr with the engine off. Measure the drift and verify that the results do not exceed the manufacturer's specifications for allowable cylinder drift.

**11.21 Holding Valves on Elevation Cylinders.** Inspect the holding valves for external hydraulic fluid leakage.

**11.22 Operating Controls.** The operating controls will be inspected as follows:

- (a) Inspect the operating controls for missing or damaged control handles, proper identification, and hydraulic fluid leakage.
- (b) Verify that the controls operate smoothly, return to neutral position when released, and do not bind during operation.
- (c) If interlocks have been provided or are required to prevent unintentional operation of the aerial device, verify that the interlocks or locking devices are operating properly.

**11.23 Load Limit Indicators.** Inspect the load limit indicators for proper operation and legibility.

**11.24 Emergency Hand Crank Controls.** Inspect the hand crank control for proper operation.

**11.25 Auxiliary Hydraulic Power.** Inspect the auxiliary hydraulic power for proper operation.

**11.26 Turntable Alignment Indicator.** Verify the presence of a turntable alignment indicator.

**11.27 Throttle Control.** The throttle control shall be inspected for proper operation. The operating speed of the engine shall be measured using a tachometer or a revolution counter and shall be checked against the manufacturer's specification.

**11.28 Communication System.** Inspect the communication system for proper installation and proper operation.

**11.29 Relief Hydraulic Pressure.** Verify that the main pump relief hydraulic pressure and compensator pressure does not exceed the manufacturer's specifications.

**11.30 Unit Main Frame.** The unit main frame will be inspected as follows:

- (a) Visually inspect the main frame for any cracks, bends, dents, twists, or other weldment defects and any welds for fractures.
- (b) (+) Inspect all main frame welds.

**11.31 Transmission/Aerial Device Interlocks.** If interlocks are provided that prevent operation of the aerial device until both the parking brakes have been set and the transmission has been positioned properly, verify that the interlocks are operating properly.

**11.32 Engine Speed Interlocks.** If interlocks are provided that allow operation of the engine speed control only after both the parking brakes have been set and the transmission has been positioned properly, verify that the interlocks are operating properly.

**11.33 Breathing Air Systems.** If a breathing air system is provided, the system will be inspected as follows:

- (a) Verify that the breathing air system is properly installed including the integrity of the air cylinder mounting, the regulator, and the air lines from the air cylinder(s) to the top of the aerial device.
- (b) Verify that all the component parts of the system are present and in serviceable condition.
- (c) Visually inspect the air cylinder mounting brackets for defects and welds for fractures.

- (d) (+) Inspect all welds on air cylinder mounting brackets.
- (e) Check that the air pressure regulator is set at the apparatus manufacturer's recommended pressure.

**11.34 Stabilizer Examination and Test.** The stabilizer components, where applicable, will be inspected on all aerial ladder apparatus in accordance with 11.37 through 11.52.

**11.35 Stabilizer Structural Components.** The stabilizer structural components will be inspected as follows:

- (a) Visually inspect all stabilizer components for defects and welds for fractures.
- (b) (+) Inspect all stabilizer structural component welds.

**11.36 Stabilizer Pads.** Verify that the stabilizer pads are present, of proper construction, and in serviceable condition.

**11.37 Stabilizer Mounting to Frame or Torque Box.** The stabilizer mounting to the frame or torque box will be inspected as follows:

- (a) Visually inspect the stabilizer to frame or torque box attachment for defects such as weld cracks, dents, and bends.
- (b) (+) If welded, inspect the stabilizer to frame or torque box mounting welds.
- (c) If bolted, inspect all bolts for proper fastener grade and installation as specified by the apparatus manufacturer.
- (d) Verify that the torque on all bolts meets the apparatus manufacturer's specification using a properly calibrated torque wrench.
- (e) (+) Inspect all bolts for internal flaws.

**11.38 Hydraulic Lines and Hoses in Stabilizer System.** Inspect the hydraulic hose lines for kinks, cuts and abrasions, and leakage at connectors and fittings.

**11.39 Stabilizer Interlock System.** Verify that the stabilizer interlock system is operating properly.

**11.40 Stabilizer Warning Device.** The stabilizer warning device shall be inspected to verify that it is operating properly.

**11.41 Stabilizer Extension Cylinder Pins and Hinge Pins.** The stabilizer extension cylinder pins and hinge pins will be inspected as follows:

- (a) Inspect all stabilizer cylinder pins and hinge pins for proper installation, lubrication, operation, and retention.
- (b) (+) Inspect all stabilizer pins and hinge pins for internal flaws.



**11.42 Stabilizer Extension Cylinder.** The stabilizer extension cylinder will be inspected as follows:

- (a) Inspect the stabilizer extension cylinder rods for pitting and scoring and other defects.
- (b) Inspect the cylinder rod to barrel seal and the end gland seal for excessive external fluid leakage.
- (c) With the hydraulic oil at ambient temperature, and with the stabilizer's cylinders properly set, measurements shall be taken to determine the amount of drift present in 1 hr with the engine off. The results shall not exceed the manufacturer's specifications for allowable stabilizer cylinder drift.

**11.43 Holding Valves on Extension Cylinders.** Inspect the holding valves for external leakage of hydraulic fluid.

**11.44 Operating Controls.** The operating controls shall be inspected as follows:

- (a) Inspect the operating controls to ensure control handles are not damaged or missing, functions are identified, operating instructions and warnings are posted, and there is no hydraulic fluid leakage.
- (b) Verify that the controls operate smoothly, return to the neutral position when released, and do not bind during operation.
- (c) If interlocks have been provided or are required to prevent unintentional operation of the aerial device, verify that the interlocks or locking devices are operating properly.

**11.45 Leveling Indicator.** If a leveling indicator(s) is provided to aid the operator in leveling the apparatus, the accuracy and legibility of the leveling indicator shall be checked.

**11.46 Diverter Valve.** Inspect the diverter valve for external hydraulic fluid leakage.

**11.47 Position Stops.** Inspect the mechanical stabilizers for proper operation of the positive stops to prevent overextension.

**11.48 Stabilizer Deployment.** If the stabilizer system is hydraulically operated, verify that the system can be deployed within the time frame designated by the aerial device manufacturer.

**11.49 Manual Spring Locks.** Inspect the condition and operation of stabilizer manual spring locks for stowed position.

**11.50 Tractor Spring Lockout Device.** If the aerial ladder is tractor drawn, inspect the spring lockout device for any discontinuities and for proper operation.

**11.51 Aerial Ladder Inspection and Test.** The aerial ladder will be inspected in accordance with 11.54 through 11.83

**11.52 Structural Modifications, Improper Repairs, or Added Weight.** The aerial ladder shall be inspected for structural modifications or improper repairs.

**A.** The aerial ladder shall be inspected to determine that no extra equipment has been added to the aerial ladder without subtracting the weight of such equipment from the rated capacity.

**B.** Details of any structural modifications, improper repairs, or added weights shall be contained in the record required by Section 22.0

**11.53 Aerial Ladder Weldments.** All aerial ladder weldments will be inspected as follows:

(a) Visually inspect all accessible aerial ladder weldments for defects and welds for fractures.

(b) (+) Inspect all accessible welds on the ladder.

**11.54 Aerial Ladder Fasteners.** All aerial ladder structural fasteners and fastened connections will be visually inspected for cracked fasteners and material cracks around the fasteners.

**11.55 Ladder Section Alignment.** Measurements will be taken to determine the amount of ladder section twist or bow in the aerial ladder. Results shall not exceed manufacturer's specifications for allowable ladder section twist or bow.

**11.56 Hydraulic, Pneumatic, and Electrical Lines in Ladder Sections.** All hydraulic, pneumatic, and electrical lines shall be inspected for proper mounting, wear, cracking, kinks, and abrasions.

**11.57 Top Rails.** The top rails will be inspected as follows:

(a) Inspect the top rails for straightness or any signs of misalignment.

(b) (+) Hardness readings shall be taken at intervals of 28 in. (710 mm) or less along the entire length of both top rails of aluminum ladders. Results of this test shall be compared with the manufacturer's specifications for the hardness of the material used for construction of the top rail.

**11.58 Vertical and Diagonal Braces.** The vertical and diagonal braces shall be inspected as follows:

(a) Inspect the verticals and diagonals for straightness, dents, and other deformities.

(b) (+) Inspect all accessible attachment welds.

**11.59 Base Rails.** The base rails will be inspected as follows:

(a) Inspect the base rail for straightness and any signs of wear, ironing, dents, and corrosion.

- (b) (+) Inspect the bottom of all hollow I-beam base rails to determine the thickness of the rail. Results shall be not less than the manufacturer's minimum specifications.
- (c) (+) Hardness readings shall be taken at intervals of 28 in. (710 mm) or less along the entire length of both base rails of aluminum ladders. Results of this test shall be compared with the manufacturer's specifications for the hardness of the material used for construction of the base rail.

**11.60 Rungs.** Inspect all rungs of the aerial ladder for straightness, signs of fly lock damage, damage or loose rung covers and rung cap castings, and signs of cracks or missing rivets, if applicable.

**11.61 Folding Steps.** The folding steps on the ladder will be inspected as follows:

- (a) Visually inspect the folding steps and folding step mounting brackets for defects and welds for fractures.
- (b) (+) Inspect all welds on the folding step(s) and folding step mounting brackets.

**11.62 Rollers.** Inspect all rollers for proper lubrication, operation, and any signs of wear.

**11.63 Guides, Babbits, Wear Strips, Pads, and Slide Blocks.** Visually inspect the guides for cracked welds, loose rivets, alignment, and any irregularities. Inspect babbits for signs of wear. Inspect wear strips, pads, and slide blocks for wear, gouging, and proper mounting.

**11.64 Extension Sheaves.** The extension sheaves will be inspected as follows:

- (a) Inspect extension sheaves for signs of wear, free movement during operation, proper retainers, and lubrication.
- (b) Visually inspect all extension sheave mounting brackets for defects and welds for fractures.
- (c) (+) Inspect all welds of extension sheave mounting brackets.

**11.65 Extension Cables.** Inspect extension cables for compliance with Appendix A of the Society of Automotive Engineers Standard SAE J959, Lifting Crane, Wire-Rope Strength Factors.

**11.66 Extension and Retraction Motor.** Inspect the extension and retraction motor for signs of external hydraulic fluid leakage and, where applicable, brake wear and brake alignment with the shaft.

**11.67 Cable Separation Guide.** During operation of the aerial ladder, visually inspect the cable separation guide for free travel and any signs of misalignment.

**11.68 Winch Holding Capacity.** Inspect the winch for holding capacity by fully elevating the aerial ladder and extending it 10 ft (3 m). Winch slippage will be measured for a 5-min period. Slippage shall not exceed the manufacturer's specification.

**11.69 Brake Holding Capacity.** Inspect the brake holding capacity of the extension motor by fully elevating the aerial ladder and extending it 10 ft (3 m). Brake slippage shall be measured for a 5-min period. Slippage shall not exceed the manufacturer's specification.

**11.70 Extension, Elevation and Rung Alignment Indicators.** The elevation, extension, and rung alignment indicators shall be inspected for legibility, clarity, and accuracy.

**11.71 Fly Locks.** Inspect the fly lock mechanisms for proper mounting, alignment, lubrication, and operation.

**11.72 Ladder Cradle.** The aerial ladder cradle shall be inspected as follows:

- (a) Inspect the ladder cradle for wear, proper alignment, and the cradle pad for damage.
- (b) Visually inspect the ladder cradle for defects such as weld cracks, dents, or bends.
- (c) (+) Inspect the ladder cradle welds and bracket attachments.
- (d) If the aerial ladder cradle is bolted, it shall be further inspected as follows:
  - 1 Inspect all accessible bolts for proper grade and installation as specified by the apparatus manufacturer.
  - 2 Using a properly calibrated torque wrench, verify that the bolt torque on all accessible mounting bolts meets the apparatus manufacturer's specification.
  - 3 (+) Inspect all accessible bolts for internal flaws.

**11.73 Ladder Bed Lock.** Inspect the ladder bed lock mechanism and hydraulic lines for proper mounting, signs of wear, and hydraulic fluid leakage at fittings.

**11.74 Stop Mechanism.** Inspect stop mechanisms to ensure that they prevent overextension or over retraction of the aerial ladder.

**11.75 Maximum Extension Warning Device.** During operation of the aerial ladder, verify the proper operation of the audible device to warn of the approach of maximum extension.

**11.76 Ladder Illumination.** Inspect the operation of the lights that are used to illuminate the ladder.

**11.77 Extension Cylinder Anchor Ears and Plates.** The extension cylinder anchor ears and plates shall be inspected as follows:

- (a) Visually inspect the extension cylinder anchor ears and plates for defects and the attaching welds for fractures.
- (b) (+) Inspect the attaching welds of the extension cylinder anchor ears and plates.
- (c) If the extension cylinder anchor is bolted, it shall be further inspected as follows:
  - (1) Inspect all accessible bolts for proper grade and installation as specified by the apparatus manufacturer.
  - (2) Using a properly calibrated torque wrench, verify that the bolt torque on all accessible mounting bolts meets the apparatus manufacturer's specification.
  - (3) (+) Inspect all accessible bolts for internal flaws.

**11.78 Extension Cylinder Pins.** The extension cylinder pins will be inspected as follows:

- (a) Inspect the cylinder pins for proper installation and retention.
- (b) (+) Inspect the cylinder pins for internal flaws.

**11.79 Extension Cylinder.** The extension cylinders will be inspected as follows:

- (a) Inspect the cylinder rods for pitting, scoring, and other defects.
- (b) Inspect the cylinder rod to barrel seal and the end gland seal for excessive external fluid leakage that exceeds the manufacturer's specifications.
- (c) With the hydraulic oil at ambient temperature, subject the cylinder(s) to drift by placing the aerial device at full elevation, 10 ft (3 m) extension, marking the cylinder position or the second section in relation to the base section, and allowing the ladder to stand for 1 hr with the engine off. The results shall not exceed the manufacturer's specifications for allowable cylinder drift.

**11.80 Holding Valves on Extension Cylinder.** Inspect the holding valves for external and internal hydraulic fluid leakage.

**11.81 Tip Controls.** If the aerial ladder is equipped with a secondary operating position at the tip, the controls shall be inspected as follows:

- (a) Check that the control handles are not damaged or missing, functions are identified, and operating instructions and warnings are posted.
- (b) Verify that the controls operate smoothly, return to neutral when released, and do not bind during operation.
- (c) Verify that the turntable or lower controls will override the tip controls.

- (d) Verify that any safety devices that are designed to operate in conjunction with the tip controls are fully operational.
- (e) If the aerial ladder was built to the 1996 or a later edition of NFPA 1901, *Standard for Automotive Fire Apparatus*, verify that the speed of the aerial ladder, when being operated from the tip controls, does not exceed the speeds allowed in the edition of NFPA 1901 to which the aerial ladder was manufactured.

## **12.0 Operating Test.**

**12.1** A complete cycle of aerial ladder operation will be carried out after starting the engine, setting the stabilizers, and transmitting power to the ladder. The ladder shall be fully elevated out of the bed, rotated 90 degrees, and extended to full extension.

**12.2** The ladder shall complete this test smoothly and without jerking or undue vibration within the time allowed by the edition of NFPA 1901, *Standard for Automotive Fire Apparatus*, in effect at the time of manufacture.

**12.3** The ladder shall be retracted, the turntable rotation completed through 360 degrees, and then the ladder lowered to its bed, after which a thorough inspection shall be made of all moving parts. Special attention will be given to the security and adjustment of the ladder cables or chains.

**12.4** The test shall demonstrate successful operation of all ladder controls.

## **13.0 Load Testing.**

**13.1** Tests shall be conducted when wind velocity is less than 10 mph (16 kmph).

**13.2** Only those personnel essential to conduct the test will be permitted near the apparatus during the test. A close watch shall be maintained during all load tests for any signs of instability, the development of conditions that could cause damage or permanent deformation, or twist that exceeds the aerial ladder manufacturer's allowance. The test shall be discontinued immediately if such conditions develop.

## **14.0 Horizontal Load Test.**

**14.1** The aerial ladder's turntable shall be level. The aerial apparatus vehicle will be on a hard level surface. All stabilizers shall be deployed in accordance with the manufacturer's instructions.

**14.2** A test cable hanger shall be attached to the top rung of the top ladder section and properly centered.

**14.3** The rated capacity in the horizontal position at full extension shall be determined from the manufacturer's load chart or operator's manual. If full extension is not permitted in the horizontal position with a specified rated capacity, then the maximum permissible extension with a specified rated capacity shall be used for the purpose of this test.

**14.4** For single chassis apparatus, the ladder will be rotated, if necessary, until the ladder is positioned over the rear and parallel to the vehicle centerline. For tractor-

drawn apparatus, the ladder shall be positioned in the most stable position as recommended by the manufacturer.

**14.5** The ladder will be placed in the horizontal position and extended to full extension or maximum permitted extension as determined in 14.3. The base section shall not be allowed to rest in the bed.

**14.6** The ladder section locks, either manual pawls or hydraulic holding valves, shall be properly closed or applied.

**14.7** The elevation cylinder integral holding valve or shutoff safety valve shall be properly closed or applied.

**14.8\*** A weight equal to the manufacturer's specified rated live load, determined in 14.3, will be gradually applied to the top rung of the aerial ladder by utilizing the test weight container or other suitable means of applying the weight.

**14.9** The test weight will be sustained by the unsupported aerial ladder for 5 min.

**14.10** The test weight that is equal to the rated capacity shall be applied gradually to the top rung of the aerial ladder utilizing a test weight container or other suitable means of applying the weight. The weight shall be suspended by a cable and shall not be more than 3 ft. (1 m) above the ground. The combined weight of the test cable hanger and cable, the test weight container, and the test weights shall not exceed the rated capacity. The weights shall be added to the ladder in a manner that does not shock load the ladder.

**14.11** The test weight shall hang freely from the tip of the aerial ladder. If the test weight hanger and ladder deflection are such that the test weight comes to rest on the ground, it shall be permissible to raise the ladder elevation slightly above the horizontal position. The ladder shall not be moved while the test weight is applied.

**14.12** After removal of the test weight, a complete visual inspection shall be made of all load-supporting elements. Any visually detectable signs of damage, permanent deformation, or twist exceeding the manufacturer's allowance shall constitute noncompliance with the load test requirements. The aerial device shall also meet the requirements of Section 2-7 after the horizontal load test.

## **15.0 Maximum Elevation Load Test.**

**15.1** The aerial ladder's turntable shall be level. The aerial apparatus vehicle shall be on a hard level surface. All stabilizers shall be-deployed in accordance with the manufacturer's instructions.

**15.2** A test cable hanger will be attached to the top rung of the top ladder section and properly centered.

**15.3** The maximum rated capacity in the maximum-elevated position at full extension will be determined from the manufacturer's load chart or operator's manuals.

**15.4** The ladder shall be rotated, if necessary, until the ladder is positioned over the rear and parallel to the vehicle centerline. Midship-mounted devices may have to be rotated

slightly off of the vehicle centerline in order to apply the test load without interference with the body of the apparatus.

**15.5** The ladder will be elevated to maximum elevation and fully extended.

**15.6** The ladder section locks, either manual pawls or hydraulic holding valves, will be properly applied.

**15.7** The elevation cylinder integral holding valve or shutoff safety valve will be properly closed or applied.

**15.8** A free-hanging weight equal to the manufacturer's specified rated capacity, determined in 15.3, shall be gradually applied to the top rung of the aerial ladder by utilizing a test weight container or other suitable means of applying the weight. The weight will be suspended by cable and shall be not more than 3 ft (1 m) above the ground. The combined weight of the test cable hanger and cable, the test weight container, and the test weights shall not exceed the rated capacity. The weights shall be added to the ladder in a manner that does not shock load the ladder.

**15.9** The test weight will be sustained by the unsupported aerial ladder for 5 min.

**15.10** The test weight will hang freely from the tip of the aerial ladder. The aerial ladder shall not be moved while the test weight is applied.

**15.11** After removal of the test weight, a complete visual inspection shall be made of all load supporting elements. Any visually detectable signs of damage, permanent deformation, or twist exceeding the manufacturer's allowance shall constitute noncompliance with the load test requirements. The aerial device shall also meet the requirements of Section 12.0 after the load test.

## **16.0 Waterway System Test.**

**16.1** The following examination and test will apply only to permanently piped aerial ladder aerial ladder waterway systems.

**16.2** The waterway system shall be inspected for proper operation of all components. It shall be free of rust, corrosion, other defects, or blockage.

**16.3** The waterway attaching brackets will be inspected as follows:

- (a) Inspect the brackets for loose bolts, weld fractures or other defects.
- (b) (+) Inspect all attaching welds.

**17.0 Pressure Test.** The water system will be pressure tested.

**17.1** The aerial ladder will be positioned between 0 and 10 degrees elevation and fully retracted. The water system shall be filled with water and the valve at the discharge end closed. If there is not a valve at the discharge end, a valve shall be attached for the purpose of this test.



**17.2** The pressure on the system will be raised to the water system manufacturer's maximum rated working pressure and maintained for the duration of the test. The aerial ladder will be raised to full elevation and rotated 360 degrees. The water system, including the turntable swivel, will be checked for leaks. Care will be taken not to overheat the water pump.

**17.3** The aerial ladder will be positioned between 0 and 10 degrees elevation and extended to its maximum permissible limit. The water system will be filled with water and the valve at the discharge end closed. If there is not a valve at the discharge end, a valve will be attached for the purpose of this test.

**17.4** The pressure on the system will be raised to the water system manufacturer's maximum rated working pressure and maintained for the duration of the test. The entire length of the water system will be checked for leaks. Care will be taken to not overheat the water pump.

**17.5** The water system will operate properly and with an absence of leaks during these tests.

**18.0 Flow Meter(s).** If the waterway system is equipped with a flow meter(s), the flow meter(s) will be checked for accuracy. Flow meters will be tested at the water system manufacturer's maximum rated water system flow. Any meter that reads off by more than 10 percent will be recalibrated, repaired, or replaced.

**19.0 Pressure Gauges.** If the waterway system is equipped with a water pressure gauge(s), each water pressure gauge will be checked for accuracy. Pressure gauges will be checked at least 3 points, at 50 psi intervals (3.45 bar) without exceeding the maximum rated working pressure of the waterway system. Any gauge that reads off by more than 10 psi (0.7 bar) shall be recalibrated, repaired or replaced.

**19.1** If the waterway system is equipped with a relief valve, this relief valve will be checked to verify that it is operational at the waterway manufacturer's recommended pressure setting.

**20.0 Signs.** Ensure that all signs are in place and legible.

**21.0 Hydraulic Fluid.** After the operational tests have been performed, a sample of the hydraulic fluid shall be removed from the hydraulic reservoir and subjected to spectrochemical analysis, particle count, viscosity check, and water content analysis.

**22.0 Records.** A comprehensive record will be completed for all tests of the aerial ladder and signed by the person responsible for the test. The test record will include the following:

- (a) When the torque verification of mounting bolts, as required by this standard, is performed, the bolt size, grade, and torque specification shall be recorded.
- (b) When NDT is conducted, the test record will indicate the NDT method used in each area inspected.
- (c) Where this standard requires measurements be taken such as bearing clearance and backlash, cylinder drift, relief pressure, ladder section twist, hardness readings, base rail thickness, extension brake drift, winch drift, and the like, these

measurements shall be recorded in the test record in order that a year-to-year comparison can be made.

## **23.0 Testing Elevating Platforms**

**23.1 General.** In addition to the manufacturer's recommendations, the inspections and tests detailed below will be performed. An inspection preceded by a plus sign (+) indicates an appropriate nondestructive test (NDT) will be conducted as required by 6.1.2 of this standard.

**23.2 Service Records.** The elevating platform's service records may be checked for any reports that may indicate defective conditions.

**23.3 Hydraulic Components.** Hydraulic components shall show no signs of hydraulic fluid leakage.

**A.** A component shall be considered leaking if hydraulic fluid (oil) droplets are forming on the component.

**B.** (A film of hydraulic fluid on the component shall **NOT** be considered severe enough to categorize the component as leaking.

**23.4 Turntable and Torque Box Inspection and Test.** The turntable and torque and torque box components, where applicable, will be inspected on all elevating platforms in accordance with 11.5 and 11.6; 11.9 through 11.19; and 11.24 through 11.35

**23.5 Stabilizer Examination and Test.** The stabilizer components, where applicable, will be inspected on all elevating platform apparatus in accordance with 11.37 through 11.52.

**23.6 Platform and Boom Inspection and Test.** All platforms and booms will be inspected in accordance with 23.7 through 23.18.

**23.7 Structural Modifications, Improper Repairs, or Added Weights.** The platform and booms shall be inspected for structural modifications or improper repairs.

**A** The platform shall be inspected to determine that no extra equipment has been Added to the platform without subtracting the weight of such equipment from the rated capacity.

**B** Details of any structural modifications or added weight shall be contained in the required report.

**23.8 Platform Mounting Brackets.** The platform mounting brackets will be inspected as follows:

(a) Visually inspect all platform mounting brackets for defects such as weld cracks, dents, or bends.

(b) (+) Inspect all welds in the platform mounting brackets.

- (c) (+) Inspect all bolts and pins structurally involved with the platform mounting to the ladder or boom for internal flaws.

**23.9 Platform.** The platform will be inspected as follows:

- (a) Visually inspect platform for defects, such as weld cracks, dents, or bends.
- (b) (+) Inspect all welds on platforms.

**23.10 Hydraulic, Pneumatic, and Electrical Lines in Platform.** Inspect all lines for proper mounting, wear, cracking, kinks, and abrasions.

**23.11 Auxiliary Winch Mounting.** The auxiliary winch mounting will be inspected as follows:

- (a) Inspect all mounting bolts for proper grade and installation as specified by the apparatus manufacturer.
- (b) Using a calibrated torque wrench, verify that the torque on all winch mounting bolts meets the apparatus manufacturer's specifications.
- (c) If welded, visually inspect the winch mounting for weld fractures.
- (d) (+) Inspect the mounting bolts for internal flaws.
- (e) (+) If brackets are welded, inspect all welds on mounting brackets.

**23.12 Winch Controls.** The winch controls will be inspected as follows:

- (a) Inspect controls for proper identification as to function and operation.
- (b) Verify smooth operation of the winch controls.

**23.13 Elevating Platform Rated Capacity Identification.** Verify that the proper platform rated capacity identification plate is present, proper, and legible.

**23.14 Platform Gate Latches and Hinge Points.** Inspect the platform gate latches for proper alignment and the latch and hinges for smooth operation.

**23.15 Platform Hinge Pins.** The platform hinge pins will be inspected as follows:

- (a) Inspect platform hinge pins for proper installation, lubrication, and any irregularities.
- (b) (+) Inspect the platform's hinge pins for internal flaws.

**23.16 Platform Controls.** The platform controls will be inspected as follows:

- (a) Inspect the platform operating controls for identification of functions, posted operating instructions, and warnings.

- (b) Verify that the controls operate smoothly, return to neutral when released, and do not bind during operation.
- (c) Verify that the turntable or lower controls will override the platform controls.

**23.17 Platform Monitor and Nozzle.** The platform monitor and nozzle will be inspected as follows:

- (a) Inspect the complete operation of the platform monitor and nozzle.
- (b) Inspect the monitor's mounting brackets for any defects and welds for fractures.

**23.18 Boom Illumination.** Verify the operation of spotlights used to illuminate the boom.

**23.19 Articulating Boom--Lower Boom Examination and Test.** For apparatus equipment with an articulating boom, the lower boom will be inspected and tested in accordance with 23.20 through 23.33.

**23.20 Hinge Pins.** The hinge pins will be inspected as follows:

- (a) Inspect the boom hinge pins for proper installation, lubrication, operation, and any discontinuities.
- (b) (+) Inspect the boom hinge pins for internal flaws.

**23.21 Lower Boom Elevation Cylinder Anchor Ears and Plates.** The lower boom elevation cylinder anchor ears and plates will be inspected as follows:

- (a) Visually inspect the anchor ears and plates for defects and the attaching welds for fractures.
- (b) (+) Inspect all welds on the anchor ears and plates.

**23.22 Lower Boom Elevation Cylinders.** The boom elevation cylinder will be inspected as follows:

- (a) Inspect the cylinder rod(s) for pitting, scoring or other defects.
- (b) Inspect the cylinder rod to barrel seal and the end gland seal for excessive external hydraulic fluid leakage.
- (c) With the hydraulic oil at ambient temperature, measurements shall be taken in accordance with the manufacturer's recommendations to determine the amount of drift present in the boom elevation cylinders. Results of this test shall not exceed the manufacturer's specifications for allowable lower boom cylinder drift.

**23.23 Holding Valves on Boom Elevation Cylinder.** Inspect the holding valves for signs of external hydraulic fluid leakage.

**23.24 Boom Assembly.** The lower boom assembly will be inspected as follows:

- (a) Visually inspect the boom for defects such as weld cracks, dents, or bends.
- (b) Visually inspect all structural fasteners and fastened connections for cracked fasteners and material cracks around the fasteners.
- (c) (+) Inspect all welds on the boom for any structural discontinuities.
- (d) (+) Hardness readings shall be taken at intervals of 28 in. (710 mm) or less on booms constructed of aluminum. Results of this test shall be compared with the manufacturer's specifications for the hardness of the material used for construction of the boom assembly.

**23.25 Cylinder Link Pins.** The cylinder link pins will be inspected as follows:

- (a) Inspect the cylinder link pins for proper installation, lubrication, operation, and any fractures.
- (b) (+) Inspect the cylinder link pins for internal flaws.

**23.26 Platform Leveling Linkages.** The platform leveling linkages will be inspected as follows:

- (a) Visually inspect linkages for defects such as weld cracks, dents, and bends.
- (b) (+) Inspect all welds of the leveling assembly.
- (c) (+) Inspect all leveling linkage pins for any internal flaws.

**23.27 Hydraulic Lines and Hoses in Lower Boom.** Inspect all hydraulic lines in the lower boom for proper mounting, abrasion, hydraulic fluid leakage, and wear.

**23.28 Hydraulic Lines in Knuckle.** Inspect all hydraulic lines in the knuckle for hydraulic fluid leakage, abrasion, and any signs of wear.

**23.29 Cables, Chains, and Rods.** Inspect all cables, chains, and rods for signs of wear and for proper adjustment.

**23.30 Sprockets, Pulleys, and Hooks.** Inspect all sprockets, pulleys, and hooks for proper lubrication, signs of wear, distortion, and proper operation.

**23.31 Boom Support.** The boom support will be inspected as follows:

- (a) Inspect the boom support for wear and proper alignment, and the cradle pad for damage.
- (b) Visually inspect the boom support for defects such as weld cracks, dents, or bends.
- (c) (+) Inspect the boom support welds and bracket attachment.
- (d) If the boom support is bolted, it shall be further inspected as follows:

- (1) Inspect all accessible bolts for proper grade and installation as specified by the apparatus manufacturer.
- (2) Using a properly calibrated torque wrench, verify that the bolt torque on all accessible mounting bolts meets the apparatus manufacturer's specification.
- (3) (+) Inspect all accessible bolts for internal flaws.

**23.32 Lower Boom Angle Indicator Lights.** Verify the proper operation of the lower boom angle indicator lights.

**23.33 Pneumatic and Electrical Lines.** Inspect all pneumatic and electrical lines in the lower boom and the knuckle for proper mounting, wear, cracking, kinks, and abrasions.

**23.34 Articulating Boom--Upper Boom Examination and Test.** For apparatus equipment with an articulating boom, the upper boom will be inspected and tested in accordance with 23.35 through 23.49.

**23.35 Upper Boom for Alignment with Lower Boom.** Verify that the upper boom is aligned with the lower boom.

**23.36 Platform Leveling Linkages.** The platform leveling linkages will be inspected as follows:

- (a) Visually inspect linkages for defects such as weld cracks, dents, or bends.
- (b) (+) Inspect all welds of leveling assemblies.
- (c) (+) Inspect all leveling linkage pins for any internal flaws.

**23.37 Boom Boost Cylinder Brackets.** The boom boost cylinder brackets will be inspected as follows:

- (a) Visually inspect the boom boost cylinder brackets for defects such as weld cracks, dents, or bends.
- (b) (+) Inspect the boom boost cylinder bracket welds.

**23.38 Boom Boost Cylinders.** Inspect the boom boost cylinders for any external hydraulic fluid leakage.

**23.39 Cylinder Link Pins.** The cylinder link pins will be inspected as follows:

- (a) Visually inspect the cylinder link pins for proper installation, lubrication, operation, and any irregularities.
- (b) (+) Inspect the cylinder link pins for internal flaws.

**23.40 Boom Assembly.** The upper assembly will be inspected as follows:

- (a) Visually inspect the boom for defects such as weld cracks, dents, or bends.
- (b) Visually inspect all structural fasteners and fastener connections for cracked fasteners and material cracks around the fasteners.
- (c) (+) Inspect all welds on the boom.
- (d) (+) Hardness readings will be taken at intervals of 28 in. (710 mm) or less on booms constructed of aluminum. Results of this test will be compared with the manufacturer's specifications for the hardness of the material used for construction of the boom assembly.

**23.41 Hydraulic Lines and Hoses in Upper Boom.** Inspect all hydraulic hoses/lines in the upper boom for proper mounting, abrasions, hydraulic fluid leakage, and wear.

**23.42 Cables, Chains, and Rods.** Inspect all cables, chains, and rods for signs of wear and for proper adjustment.

**23.43 Sprockets, Pulleys, and Hooks.** Inspect all sprockets, pulleys, and hooks for proper lubrication, signs of wear, distortion, and proper operation.

**23.44 Upper Boom Hold-Down Device.** The upper boom hold-down device will be inspected as follows:

- (a) Visually inspect the upper boom hold-down device for defects and for proper operation.
- (b) (+) Inspect all welds of the upper boom hold-down device.

**23.45 Safety Stop Mechanism.** Verify that the safety stop mechanism operates properly.

**23.46 Upper Boom Elevation Cylinder Anchor Ears and Plates.** The upper boom elevation anchor ears and plates will be inspected as follows:

- (a) Visually inspect the anchor ears and plates for defects and welds for fractures.
- (b) (+) Inspect all welds on the anchor ears and plates.

**23.47 Upper Boom Elevation Cylinder(s).** The upper boom elevation cylinder(s) will be inspected as follows:

- (a) Inspect the cylinder rod(s) for pitting, scoring, and other defects.
- (b) Inspect the cylinder rod to barrel seal and the end gland seal for excessive external hydraulic fluid leakage.
- (c) With the hydraulic oil at ambient temperature, measurements shall be taken in accordance with the manufacturer's recommendations to determine the amount

of drift present. Results of this test shall not exceed the manufacturer's tolerance for allowable upper boom cylinder drift.

**23.48 Holding Valves on Upper Boom Elevation Cylinder.** Inspect the holding valve(s) for signs of external hydraulic fluid leakage.

**23.49 Pneumatic and Electrical Lines.** Inspect all pneumatic and electrical lines in the upper boom for proper mounting, wear, cracking, kinks, and abrasions.

**23.50 Telescoping Boom Examination and Test.** For platforms equipped with a telescoping boom, the boom will be inspected and tested in accordance with 11.20 and 11.23, 23.29 through 23.31, and 23.51 through 23.64.

**23.51 Boom Assemblies.** The boom assemblies will be inspected as follows:

- (a) Visually inspect booms for defects such as weld crack, dents, or bends.
- (b) Visually inspect all structural fasteners and fastened connections for cracked fasteners and material cracks around the fasteners.
- (c) (+) Inspect all welds on booms.
- (d) (+) Hardness readings shall be taken at intervals of 28 in. (710 mm) or less on booms constructed of aluminum. Results of this test shall be compared with the manufacturer's specifications for the hardness of the material used for construction of the boom assembly.

**23.52 Ancillary Boom Ladder.** The ancillary boom ladder will be inspected as follows:

- (a) Inspect the ancillary boom ladder for any defects and welds for fractures.
- (b) Inspect the mounting brackets for loose bolts, weld fractures, or other defects.
- (c) (+) Inspect all welds on the ladder and attaching welds.

**23.53 Guides, Wear Strips and Pads, and Slide Blocks.** Inspect guides, wear strips and pads, and slide blocks for proper installation and signs of wear.

**23.54 Extension Sheaves.** The extension sheaves will be inspected as follows:

- (a) Inspect the extension sheaves for proper mounting, alignment, and signs of wear.
- (b) (+) Inspect all welds of the extension sheave mounting brackets.
- (c) (+) Inspect retaining bolt for internal flaws.

**23.55 Extension Cables.** Inspect extension cables for compliance with Appendix A of the Society of Automotive Engineers Standard SAE J959, Lifting Crane, Wire-Rope Strength Factors.



**23.56 Elevation Indicator.** Inspect the elevation cylinder indicator for legibility and clarity.

**23.57 Maximum Extension Warning Device.** During operation, verify the proper operation of the audible device to warn of the approach to maximum extension, if so equipped.

**23.58 Platform Leveling Cylinders.** The platform leveling cylinders will be inspected as follows:

- (a) Inspect the cylinder rod(s) for pitting, scoring, and other defects.
- (b) Inspect the cylinder rod to barrel seal and the end gland seal for excessive external hydraulic fluid leakage.
- (c) Visually inspect the leveling system for proper installation.
- (d) Visually inspect the mounting of the leveling system for defects and welds for fractures.
- (e) (+) Inspect all welds for mounting of the leveling system.
- (f) (+) Inspect all leveling cylinder pins for any internal flaws.

**23.59 Hydraulic Lines and Hoses in Boom Assemblies.** Inspect all hydraulic lines and hoses in the boom assemblies for hydraulic fluid leakage, abrasions, and any signs of wear.

**23.60 Extension Cylinder Anchor Ears and Plates.** The extension cylinder anchor ears and plates will be inspected as follows:

- (a) Visually inspect the extension cylinder anchor ears and plates for defects and attaching welds for fractures.
- (b) (+) Inspect the extension cylinder anchor ears and plate attaching welds.

**23.61 Extension Cylinder Pins.** The extension cylinder pins will be inspected as follows:

- (a) Inspect the cylinder pins for proper installation and retention.
- (b) (+) Inspect the cylinder pins for internal flaws.

**23.62 Extension Cylinder.** The extension cylinders will be inspected as follows:

- (a) Inspect the cylinder rods for pitting, scoring, and other defects.
- (b) Inspect the cylinder rod to barrel seal and the end gland seal for excessive external hydraulic fluid leakage.
- (c) With the hydraulic oil at ambient temperature, subject the cylinder(s) to drift by placing the aerial device at full elevation, 10 ft (3 m) extension, marking the

cylinder piston or the second section in relation to the base section, and allowing the ladder to stand for 1 hr with the engine off. The results shall not exceed the manufacturer's specifications for allowable cylinder drift.

**23.63 Holding Valves on Extension Cylinder.** Inspect the holding valves for external hydraulic fluid leakage.

**23.64 Pneumatic and Electrical Lines.** Inspect all pneumatic and electrical lines in the booms for proper mounting, wear, cracking, kinks, and abrasions.

## **24.0 Operational Tests from Lower Controls.**

**24.1** With engine speed set to allow maximum speed as permitted by the manufacturer, the elevating platform shall be operated in all positions, as allowed by the manufacturer, using the lower or ground controls.

**24.2** The operation of the elevating platform shall include, but not be limited to, movement of the platform basket from ground to maximum elevation as well as revolving the platform basket 360 degrees to the left and to the right while the unit is at its maximum horizontal reach.

**24.3** The boom shall operate without any improper or unusual motion or sound.

**24.4** All safety devices shall operate properly.

**24.5** All controls shall operate smoothly, return to the neutral position when released, and not bind during operation.

**24.6** For telescoping elevating platforms, rollers, slides, and sheave wheels shall demonstrate proper alignment, function, and free operation.

**24.7** A complete cycle of elevating platform operation shall be carried out after starting the engine, setting the stabilizers, and transmitting power to the platform booms or sections.

**24.8** Operating the machine from the lower control station, the elevating platform will be raised out of the bed, extended to full specified height, and rotated through a 90 degree turn. This shall be completed smoothly and without undue vibration within the manufacturer's recommended time.

**24.9** The elevating platform shall be retracted, and the turntable rotation completed through 360 degrees. The elevating platform shall be lowered to its bed and a thorough inspection made of all moving parts. Special attention shall be given to the platform leveling system.

**24.10** The test shall demonstrate successful operation of all elevating platform controls.

## **25.0 Operational Tests from Platform Controls.**

**25.1** With engine speed set to allow maximum speed as permitted by the manufacturer, the elevating platform will be operated in all positions, as allowed by the manufacturer, with only one operator in the platform basket operating from the platform control station.

**25.2** The operation of the elevating platform will include, but not be limited to, movement of the platform basket from ground to maximum elevation, as well as revolving the platform basket 360 degrees to the left and to the right while the unit is at its maximum horizontal reach.

**25.3** All safety devices shall operate properly.

**25.4** The platform basket deactivation control, from the ground or lower controls, shall be demonstrated to operate properly.

**25.5** The platform basket shall level properly as the booms are moved through all allowable positions.

**25.6** The mechanical override on a hydraulically leveled elevating platform basket shall operate properly during emergency lowering of the boom without hydraulic power.

## **26.0 Load Test.**

**26.1** With the unit located on a hard level surface and allowing sufficient room for unrestricted boom movements, a stability and structural test will be performed. This test shall determine the elevating platform's ability to perform properly while carrying rated capacity loads in the platform basket.

**26.2** A close watch shall be maintained during all load tests for any signs of instability, the development of conditions that could cause damage or permanent deformation, or twist that exceeds the elevating platform manufacturer's allowance. The test shall be discontinued immediately if such conditions develop.

**26.3** The unit will be properly stabilized according to the manufacturer's recommendation.

**26.4** The platform basket will be placed near the ground and loaded to the manufacturer's rated capacity. Care shall be exercised to assure that the weight of equipment added to the platform basket after delivery is subtracted from the weight of the test load being added. The platform basket load shall be properly secured.

**26.5** The unit will be operated from the lower controls through all allowable phases of operation. The manufacturer's operational limits shall not be exceeded.

**26.6** All boom movements shall exhibit no abnormal noise, vibration, or deflection.

**26.7** The platform basket shall level properly as the booms are moved through all allowable positions.

**26.8** At the conclusion of the load test, weld joints at stabilizer structure, stabilizers, frame, main frame, frame reinforcements, turntable, cylinder anchors, boom joints, leveling system, platform basket, and pivot pin bosses shall be inspected and shall show no signs of deterioration.

## **27.0 Water System Examination and Test.**

**27.1** The waterway and system will be inspected for proper operation of all components. It shall be free of rust, corrosion, other defects, or blockage.

**27.2** The waterway attaching brackets will be inspected as follows:

- (a) Inspect the brackets for loose bolts, weld fractures, or other defects.
- (b) (+) Inspect all attaching welds.

**27.3 Pressure Test.** The water system will be pressure tested.

**27.4** If the elevating platform has a telescoping boom, the water system will be tested following the procedure in 17.1 and 17.5.

**27.5** If the elevating platform has an articulating boom, the boom shall be positioned in the road travel position. The water system will be filled with water and the valve at the discharge end closed. If there is not a valve at the discharge end, a valve shall be attached for the purpose of this test.

**27.6** The pressure on the system will be raised to the water system manufacturer's maximum rated working pressure and maintained while the elevating platform is raised to its rated vertical height and rotated 360 degrees. The water system including the turntable swivel, will be checked for leaks. Care shall be taken not to overheat the water pump.

**27.7** If the elevating platform has both a telescoping boom and an articulating boom, it shall be tested in accordance with 27.4 and 27.5.

**27.8** The water system shall operate properly and with an absence of leaks during these tests.

**27.9 Flow Meter(s).** If the waterway system is equipped with a flow meter(s), the flow meter(s) will be checked for accuracy. Flow meters will be tested at the water system manufacturer's maximum rated water system flow. Any meter that reads off by more than 10 percent will be recalibrated, repaired, or replaced.

**27.10 Pressure Gauge(s).** If the waterway system is equipped with a water pressure gauge(s), each water pressure gauge will be checked for accuracy. Pressure gauges shall be checked at least 3 points at 50 psi (3.45 bar) intervals without exceeding the maximum rated working pressure of the waterway. Any gauge that reads off by more than 10 psi (0.7 bar) shall be replaced, repaired, or recalibrated.

**27.11** If the waterway system is equipped with a relief valve(s), the relief valve(s) will be checked to verify that it is operational at the waterway manufacturer's recommended pressure setting.

**27.12 Signs.** Ensure that all signs are in place and legible.

**27.13 Hydraulic Fluid.** After the operational tests have been performed, a sample of the hydraulic fluid shall be removed from the hydraulic reservoir and subjected to spectrochemical analysis, particle count, viscosity check, and water content analysis.

**27.14 Records.** A comprehensive record shall be completed for all tests of the elevating platform and signed by the person responsible for the test.

- A. When torque verification of mounting bolts is performed as required by the standard, the bolt size, grade, and torque specifications shall be recorded.
- B. When NDT is conducted, the test record shall indicate the NDT method used in each inspected area.
- C. Where this standard requires measurements to be taken – such as bearing clearance and backlash, cylinder drift, relief pressure, ladder section twist, hardness readings, base rail thickness, extension brake drift, winch drift, and the like – these measurements shall be recorded in the test record that a year-to year comparison can be made.

## **28.0 Referenced Publications**

**28.1** The following documents or portions thereof are referenced within this proposal and will be considered part of the requirements of this document. The edition indicated for each reference is the current edition as of the date of the NFPA issuance of this document.

**28.2 ASTM Publications.** American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM B648-1978 (Reconfirmed 2000), Standard Test Method for Indentation Hardness of Aluminum Alloys by Means of a Barcol Impressor

ASTM E6-1999, Standard Terminology Relating to Methods of Mechanical Testing

ASTM E114-1995, Standard Practice for Ultrasonic Pulse-Echo Straight-Beam Examination by the Contact Method

ASTM E165-1995, Standard Test Method for Liquid Penetrant Examination

ASTM E269-1988, Definitions of Terms Relating to Magnetic Particle Examination

ASTM E270-1990, Definitions of Terms Relating to Liquid Penetrant Inspection

ASTM E500-1989, Standard Terminology Relating to Ultrasonic Examination

ASTM E543-1999, Standard Practice for Agencies Performing Nondestructive Testing

ASTM E709-1995, Standard Guide for Magnetic Particle Examination

ASTM E797-1995, Standard Practice for Measuring Thickness by Manual Ultrasonic Pulse-Echo Contact Method

ASTM E1220-1999, Standard Test Method for Visible Penetrant Examination Using the Solvent-Removable Process

ASTM E1316-2000, Standard Terminology for Nondestructive Examinations

ASTM E1418- -1998, Standard Test Method for Visible Penetrant Examination Using the Water-Washable Process

**28.3 ASNT Publication.** American Society for Nondestructive Testing, Inc., 1711 Arlingate Lane, Columbus, OH 43228.

ASNT CP-189-1995, Standard for Qualification and Certification of Nondestructive Testing Personnel

**28.4 AWS Publications.** American Welding Society, Inc., 550 NW LeJeune Road, P.O. Box 351040, Miami, FL 33135.

AWS B1.10-1999, Guide for the Nondestructive Examination of Welds

AWS B1.11-2000, Guide for the Visual Examination of Welds

AWS D1.1-2000, Structural Welding Code--Steel

AWS D1.2-1997, Structural Welding Code--Aluminum

**28.5 SAE Publication.** Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096.

SAE J959-1991, Lifting Crane, Wire-Rope Strength Factors

## **Specifications For Aerial Basket Vehicles**

Tests will be performed on approximately **thirty (30)** vehicles. All tests to be performed at the City of Omaha Fleet Management Facility located at 2606 N. 26 Street, Omaha, Nebraska.

At least two (2) vehicles per day will be tested, Monday through Friday. Prior to inspection the City of Omaha personnel will clean the vehicles. All tests must meet OSHA and ANSI standards.

The tests shall include but not be limited to the following:

### **GENERAL:**

The bidder shall submit a complete outline of services for evaluation by the City of Omaha personnel. Failure to comply will cause automatic rejection of your bid. All deviations to the City of Omaha specifications shall be noted. The absence of deviations or exceptions shall be construed as total compliance to the published specifications.

The bidder must furnish proof of liability insurance. The bidder shall also include in the bid a minimum list often (10) municipalities with the same type of lifting devices, which have been tested. Personnel actively performing the examinations and testing shall be highly qualified technicians with a minimum ASNT-TC-1A Level II rating.

#### **A. VISUAL INSPECTION:** - A complete visual inspection must be made of the following:

1. Outriggers - Pads, outriggers structure and welds, bolts, hoses, fittings, cylinders, check pins and retainers.
2. Chassis - Truck, frame, aerial sub-frame mounting, suspension, PTO, brake hoses, pintle hook, hydraulic components, and microbrake lock assembly.
3. Pedestal - Mounting bolts and welds, pedestal structure, diagonal brace, attachment welds and pins, hydraulic swivel joints, hydraulic components, swing drive gear box, mounting bolts and backlash between swing pinion and bull gears.
4. Rotation Bearing - Upper and lower bearing attachment welds and bolts plus vertical movement of bearings.
5. Turntable - Turntable structure, hydraulic components, bucket leveling cylinders or devices, compensation chain, and sprockets, and lower control operation.
6. Lower Boom - Boom structure, welds lower boom lift cylinders and attachment, hydraulic. Components and lines, leveling cables and rod, upper and extended cylinders, push links, boom rests supports, tie down straps, lower boom insulator and mounting, and boom extension roller assembly and wear pads.
7. Elbow Area - Elbow structure, hydraulic hoses, and leveling cables.
8. Upper Boom Extension - Boom structure, welds, leveling cables and rods, wear pads, upper boom insulator and mounting, hydraulic lines and components, jib structures and mounting, tool circuit hoses and fittings, pole claw arms and mounting brackets.
9. Platform (Bucket) - Mounting brackets and bolts, leveling system, platform exterior condition, platform control operation, and hydraulic lines and components.
10. Winch - Winch mounting brackets, bolts, and pins, gearbox, hydraulic motor and lines, and load line condition.

11. General - Check the load rating chart, electrical hazard placards, and upper and lower control placards on the machine being tested.
12. Lift - All bolts displaying visual sign of being loose will require immediate notification of the City of Omaha representatives. Operational testing will not proceed until a City of Omaha technician tightens the loose bolts.

**B. HYDRAULIC SYSTEM:**

1. All flexible and rigid hydraulic lines installed on the turntable, aerial and outriggers are to be inspected.
2. The main hydraulic relief valve setting (p.s.i.g.) shall be checked against the operational pressure recommended by the manufacture. Actual and recommended pressures shall be recorded.
3. All hydraulic raising and extension cylinders are to be inspected. Any observation of seal wear, improper installation, and shaft scoring and pitting shall be recorded.
4. All hydraulic components are to be inspected. Any observation of internal or external oil leakage, excessive wear, or abnormal functions shall be recorded.
5. Hydraulic outriggers shall be checked for drift. Drift shall be checked while performing operational tests over a thirty (30) minute time span. Record the distance of drift.

**NOTE: VISUAL INSPECTION INCLUDES REMOVAL OF SUCH INSPECTION COVER PLATES AS NECESSARY TO PERFORM A THOROUGH INSPECTION.**

**C. ACOUSTIC EMISSION TEST**

A.E. sensor are to be placed on the structure from the bucket or platform down to the main frame, to include all fiberglass at metal components and outriggers.

The test shall be 1-1/2 times the rate load for minimum of four (4) minutes. All results shall be computed with pertinent information included on the test results.

**D. MAGNETIC PARTICLE AND/OR DYE PENETRATE INSPECTION:**

1. Magnetic Particle Inspection - All critical welds, plates, and casting of all item listed in Part A during the visual inspection.
2. Dye Penetrate Inspection - All critical welds, plates, and castings made of non-ferrous material and any area repairing verification in Part A.

**E. ULTRASONIC INSPECTION - All accessible pins including outriggers**

1. Rear tractor to axle frame spring lock out pins (tractor-trailer tiller).
2. Aerial support structure mounting bolts (main frame mounting bolts).
3. Outriggers mounting bolts and pins.
4. Turret and turntable assembly mounting and rotation bearing bolts.
5. Aerial hinge pins and raising and extension cylinder mounting pins and bolts.

**F. DIELECTRIC TEST (AC OR DC) TO 100.000 VOLTS**



1. FRP upper boom (including FRP extensions on digger derricks).
2. FRP lower boom inserts.
3. Bucket liners
4. Hydraulic oil tested to ASTM D 1816 Standards

**G. FUNCTIONAL AND OPERATIONAL TEST**

An operational and functional test shall be performed to check the operational controls, bearings, pins, bushings, cylinders, holding valves, bucket leveling mechanisms, outriggers, etc...

**H. TEST RESULTS** – Inspecting Technicians will discuss their findings at the completion of each vehicle test to a designated representative of the City of Omaha. A total of three (3) reports of the complete test and the finding in a folder are required. On the day that the unit is tested, a copy of the test report shall be given to the City of Omaha Repair Shop Foreman. The City will not provide paper or a copier.

The inspections and test shall be completed during the month of September. The City of Omaha, Fleet Management Division must have a minimum of a ten (10) day notice before the testing is to begin.

A blank copy of your test report is required when you submit your quote.