COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

NOLIN RECC	)	
	)	
	)	CASE NO. 2011-00061
ALLEGED FAILURE TO COMPLY WITH KRS 278.042	)	
	)	

ORDER

Nolin RECC ("Nolin"), a Kentucky cooperative corporation which engages in the distribution of electricity to the public for compensation for lights, heat, power, and other uses, and which was formed pursuant to KRS 279.010 to 279.220, is a utility subject to Commission jurisdiction.[1]

KRS 278.042 requires the Commission to ensure that each electric utility constructs and maintains its plant and facilities in accordance with accepted engineering practices as set forth in the Commission's administrative regulations and orders and in the most recent edition of the National Electrical Safety Code ("NESC").

KRS 278.030 requires every utility to furnish adequate, efficient and reasonable service. KRS 278.260 permits the Commission, upon its own motion, to investigate any act or practice of a utility that affects or is related to the service of a utility. KRS 278.280(1) further permits the Commission, after conducting such investigation and finding that a practice is unreasonable, unsafe, improper, or inadequate, to determine

[1] KRS 278.010(3)(a); KRS 279.210.

the reasonable, safe, proper, or adequate practice or methods to be observed and to fix same by Order.

Commission Staff submitted to the Commission an electric utility Incident Investigation Report ("Report"), dated August 20, 2009, which is attached as an Appendix to this Order. The report alleges that on July 9, 2009, at 773 Beasley Boulevard, Elizabethtown, in Hardin County, Kentucky, Pat Burman, an employee of Hamilton Construction, sustained burn injuries as a result of an accident at the site of a Nolin electric construction project.

According to the Report, at the time of the July 9, 2009 incident, Hamilton Construction was working under contract with Nolin and was installing new conductors and upgrading a single-phase line on Nolin's system to a three-phase tie circuit. The Report notes that the primary circuit voltage at that location is 7.2/12.4 kV. The first-level supervisor or person in charge at the construction site on the day of the incident was Hamilton Construction employee, Billy Hamilton.

Mr. Burman was working in an aerial lift bucket at the time of the July 9, 2009 incident. While working on the energized circuit, Mr. Burman made contact with an energized primary conductor at the same time his left arm was in contact with grounded equipment mounted on a nearby utility pole. As a result of the contact with the energized conductor, Mr. Burman received burn injuries to his back and left arm. Mr. Burman was not using required personal protective equipment ("PPE") at the time of the incident, nor had Mr. Burman or any other member of the Hamilton Construction crew installed required rubber protective equipment on the energized primary conductors prior to Mr. Burman making contact with the conductors.

Pursuant to 807 KAR 5:006, Section 26(2), Nolin provided a summary written report ("summary report") regarding the July 9, 2009 accident to Commission Staff, which is appended to Commission Staff's Report as Attachment A. According to the summary report, Mr. Burman was wearing fire retardant clothing at the time of the incident. However, according to the summary report, he was not wearing other PPE such as rubber gloves or rubber sleeves that could have insulated him from the electric charge. The summary report notes that, although the energized conductors were covered by two rubber hoses each, the areas on each conductor located closest to the utility pole, the "shoes and bells," had been covered with rubber blankets earlier in the workday, but those rubber blankets had been removed prior to the contact incident, "due to chances of severe weather."[2] The summary report states that a job briefing was conducted at approximately 8:45 a.m. on the day of the incident, but that the Hamilton Construction crew did not document in writing the contents of the job briefing or those crew members in attendance.

Nolin's summary report also contains a copy of a test record provided by Hamilton Construction showing that the aerial lift bucket used by Mr. Burman at the time of the July 9, 2009 incident had last been dielectrically tested pursuant to applicable standards on February 26, 2007. Section 8.8.2 of the American National Standards Institute ("ANSI") American National Standard Vehicle-Mounted Elevating and Rotating Aerial Devices (ANSI/SIA A92.2-1990) provides that such periodic tests must be performed, at a minimum, once every 12 months.

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[2] Both the Report and Nolin's summary report note that, prior to the contact incident, Billy Hamilton had called Nolin's operations center and, as a safety precaution, had requested that the upline protective device (OCR) be placed on non-reclose, which prevented a more serious shock and burn injury to Mr. Burman.

Based on Commission Staff's investigation of the accident and the information provided by Nolin in its summary report, Commission Staff alleges that Nolin has violated KRS 278.042 by violating the following provisions of the most recent edition (2007) of the NESC:

NESC Section 42: General Rules for Employees:

Violation 1. 411. Protective Methods and Devices
A. Methods

3. Employees shall be instructed as to the character of the equipment or lines and methods to be used before any work is undertaken thereon.

Violation 2. 420. Personal General Precautions
C. Safeguarding Oneself and Others

Employees who work on or in the vicinity of energized lines shall consider all of the effects of their actions, taking into account their own safety as well as the safety of other employees on the job site, or on some other part of the affected electric system, the property of others, and the public in general.

Violation 3: 420. Personal General Precautions
H. Tools and Protective Equipment

Employees shall use the personal protective equipment, the protective devices, and the special tools provided for their work. Before starting work, these devices and tools shall be carefully inspected to make sure that they are in good condition.

Violation 4: 421. General Operating Routines
A. Duties of a First-Level Supervisor or Person in Charge

This individual shall:

1. Adopt such precautions as are within the individual's authority to prevent accidents.

2. See that the safety rules and operating procedures are observed by the employees under the direction of this individual.

3. Make all the necessary records and reports, as required.

NESC Section 44. Additional Rules for supply employees

Violation 5: 441. Energized Conductors or Parts
A. Minimum Approach Distance to Live Parts

1. General. Employees shall not approach or bring any conductive object within the minimum approach distance listed in Table 441-1[3] or Table 441-4 to exposed parts unless one of the following is met:

a. The line or part is de-energized and grounded per Rule 444D;
b. The employee is insulated from the energized line or part. Electrical protective equipment insulated for the voltage involved, such as tools, gloves, rubber gloves, or rubber gloves with sleeves, shall be considered effective insulation for the employee from the energized part being worked on; or
c. The energized line or part is insulated from the employee and from any other line or part at a different voltage.

Table 441-1: AC Live Work Minimum Approach Distance[4]
(See Rule 441 in its entirety.)

Voltage in kilovolts phase-to-phase[2]	Distance to employee			
	Phase-to-ground		Phase-to-phase	
	(m)	(ft–in)	(m)	(ft–in)
0 to 0.050[1]	not specified		not specified	
0.051 to 0.300[1]	avoid contact		avoid contact	
0.301 to 0.750[1]	0.31	1–0	0.31	1–0
0.751 to 15	**0.65**	**2–2**	**0.67**	**2–3**
15.1 to 36.0	0.77	2–7	0.86	2–10
36.1 to 46.0	0.84	2–9	0.96	3–2
46.1 to 72.5	1.00[3]	3–3[3]	1.20	3–11

1 For single-phase systems, use the highest voltage available.
2 For single-phase lines off three phase systems, use the phase-to-phase voltage of the system.
3 The 46.1 to 72.5 kV phase-to-ground 3–3 distance contains a 1–3 electrical component and a 2–0 inadvertent movement

[3] See Report at 6.

component .
4 Distances listed are for standard atmospheric conditions. The data used to formulate this table was obtained from test data taken with standard atmospheric conditions. Standard atmospheric conditions are defined as temperatures above freezing, wind less than 15 mi per hr or 24 km per hr, unsaturated air, normal barometer, uncontaminated air, and clean and dry insulators. If standard atmospheric conditions do not exist, extra care must be taken.

Violation 6: 443. Work on Energized Lines and Equipment
A. General Requirements

1. When working on energized lines and equipment, one of the following safeguards shall be applied:
a. Insulate employee from energized parts
b. Isolate or insulate the employee from ground and grounded structures, and potentials other than the one being worked on.

Violation 7: 446. Live Work
B. Equipment

1. Insulated aerial devices, ladders, and other support equipment used in live work shall be evaluated for performance at the voltages involved. Tests shall be conducted to ensure the equipment's integrity. Insulated aerial devices used in bare-hand work shall be tested before the work is started to ensure the integrity of the insulation.

Based on its review of the Report and being otherwise sufficiently advised, the Commission finds that prima facie evidence exists that Nolin has failed to comply with KRS 278.042. We further find that a formal investigation into the incident that is the subject matter of the Report should be conducted and that this investigation should also examine the adequacy, safety, and reasonableness of Nolin's practices related to the construction, installation, and repair of electric facilities as they relate to the facts of this case.

The Commission, on its own motion, HEREBY ORDERS that:

1. Nolin shall submit to the Commission a written response to the allegations contained in the Report within 20 days of the date of this Order.

2. Nolin shall appear on May 3, 2011, at 10:00 a.m., Eastern Daylight Time, in Hearing Room 1 of the Commission's offices at 211 Sower Boulevard in Frankfort, Kentucky, for the purpose of presenting evidence concerning the alleged violations of KRS 278.042 and to show cause why it should not be subject to the penalties prescribed in KRS 278.990(1) for these alleged violations.

3. At the scheduled hearing in this matter, Nolin shall be prepared to present evidence on the adequacy, safety, and reasonableness of its practices related to the construction, installation, maintenance, inspection, and repair of electric facilities as they relate to the facts of this case and whether such practices require revision.

4. The May 3, 2011 hearing shall be recorded by videotape only.

5. The Report in the Appendix to this Order is made a part of the record in this case.

6. Any request for an informal conference with Commission Staff shall be set forth in writing and filed with the Commission within 20 days of the date of this Order.

By the Commission

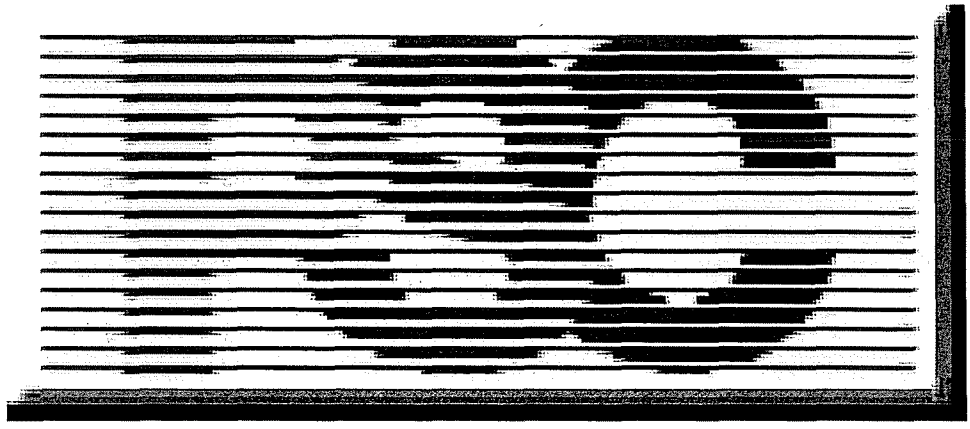
ENTERED
MAR 01 2011
KENTUCKY PUBLIC
SERVICE COMMISSION

ATTEST:

Executive Director

APPENDIX A

APPENDIX TO AN ORDER OF THE KENTUCKY PUBLIC SERVICE COMMISSION IN CASE NO. 2011-00061 DATED MAR 0 1 2011



ACCIDENT INVESTIGATION ~ Staff Report

Report Date ~ August 20, 2009

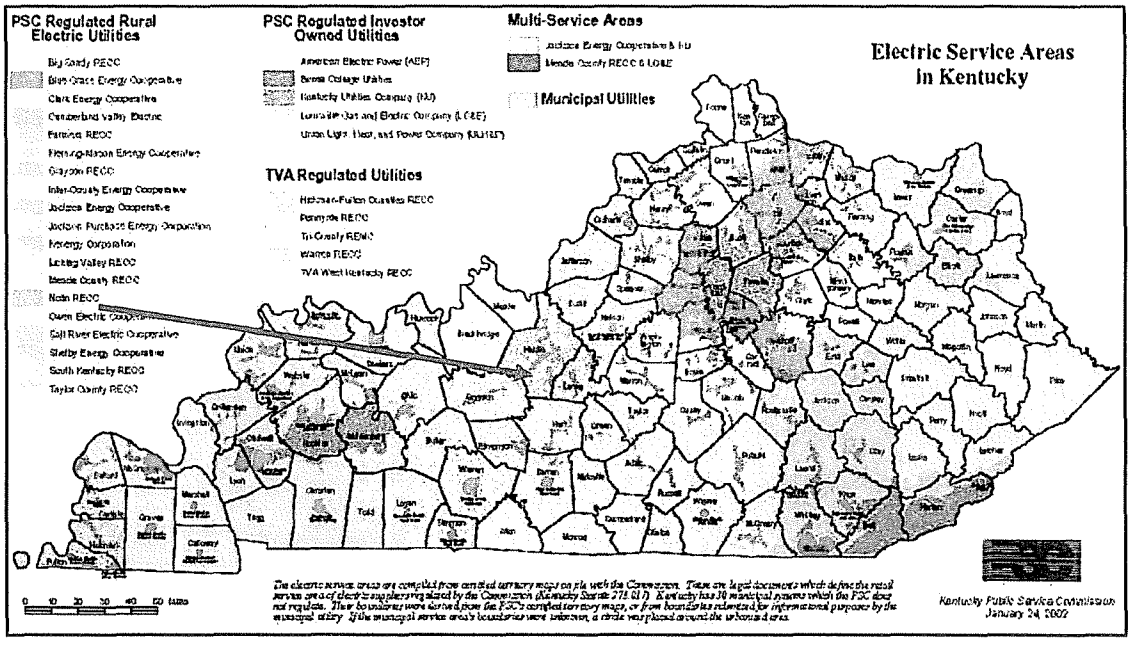
Incident Date ~ July 9, 2009

Serving Utility ~ Nolin Rural Electric Cooperative Corporation

Incident Location ~ Elizabethtown, Kentucky

Victim ~ Mr. Pat Burman

PSC Investigator ~ Steve Kingsolver



Kentucky Public Service Commission

Electric Utility Personal Injury Accident Report

Utility:

Nolin Rural Electric Cooperative Corporation
411 Ring Road
Elizabethtown, Kentucky 42701-6767

Reported By:

Vince Heuser, Vice President System Operations, Nolin RECC

Incident Occurred:

12:03 PM, July 9, 2009

Utility Notified:

12:03 PM, July 9, 2009

PSC Notified:

12:15 PM, July 9, 2009

PSC Investigated:

8:30 AM, July 10, 2009

Utility Report Received:

July 15, 2009

Incident Location:

Serene Oaks Subdivision
773 Beasley Blvd.
Elizabethtown, Kentucky 42701

Incident Description:

Hamilton Power Line Construction, LLC was performing work for Nolin RECC when Pat Burman, a journeyman lineman with Hamilton Construction, was involved in a primary voltage contact that resulted in a shock and burn accident. The victim, Pat Burman, received burns to his center upper back and left arm. At the time of this accident the crews with Hamilton Construction were in the process of installing new conductors and upgrading a single phase line to a three phase tie circuit. The victim was working out of a bucket truck, aerial lift device, at the time of this accident. It appears that the victim made contact with an energized primary conductor in the middle of the upper back and his left arm was in contact with grounded equipment that was mounted on the pole. This action caused a fault on the distribution circuit that locked out the up line protective device, (OCR), de-energizing this circuit. The morning of this accident the up line protective device was placed in non-reclose and that would not allow this device to automatically re-energize this circuit. This was done at the request of Billy Hamilton, foreman for Hamilton Construction. It appears that this accident was caused by not using the required personal protective equipment and not having the proper rubber protective equipment, (cover up), installed on the energized primary conductors. The primary circuit voltage is 7.2/12.4 kV.

Victim:

Name: Pat Burman, Age: 38, 15 Years Experience

Address: PO Box 625, Bardstown, Kentucky 40004

Employer: Hamilton Power Line Construction, LLC

Fatality: No, Shock and Burn

Witnesses:

Name: Robbie Hamilton

Address: PO Box 625, Bardstown, Kentucky 40004

Employer: Hamilton Power Line Construction, LLC

Name: Michael Shelton

Address: PO Box 625, Bardstown, Kentucky 40004

Employer: Hamilton Power Line Construction, LLC

Name: David Hamilton

Address: PO Box 625, Bardstown, Kentucky 40004

Employer: Hamilton Power Line Construction, LLC

Name: Luke Carrick

Address: PO Box 625, Bardstown, Kentucky 40004

Employer: Hamilton Power Line Construction, LLC

Information From:

Name: Vince Heuser

Position: Vice President System Operations

Employer: Nolin RECC

Name: Robert Thornton

Position: Compliance Coordinator

Employer: Nolin RECC

Name: Billy Hamilton

Position: Foreman

Employer: Hamilton Power Line Construction, LLC

Name: Robbie Hamilton

Position: Journeyman Lineman

Employer: Hamilton Power Line Construction, LLC

Name: Michael Shelton

Position: Apprentice Lineman

Employer: Hamilton Power Line Construction, LLC

Name: David Hamilton

Position: Groundman/Flagman

Employer: Hamilton Power Line Construction, LLC

Name: Luke Carrick

Position: Groundman

Employer: Hamilton Power Line Construction, LLC

Probable Violations:

KAR 278.042 **Service adequacy and safety standards for electric utilities- National Electric Safety Code**

National Electric Safety Code:

#1
411. Protective Methods and Devices

A. Methods

3. Employees shall be instructed as to the character of the equipment or lines and methods to be used before any work is undertaken thereon.

#2
420. Personal General Precautions

C. Safeguarding Oneself and Others

4. Employees who work on or in the vicinity of energized lines shall consider all of the effects of their actions, taking into account their own safety as well as the safety of other employees on the job site, or on some other part of the affected electric system, the property of others, and the public in general.

#3
420. Personal General Precautions

H. Tools and Protective Equipment

Employees shall use the personal protective equipment, the protective devices, and the special tools provided for their work. Before starting work, these devices and tools shall be carefully inspected to make sure that they are in good condition.

#4
421. General Operating Routines

A. Duties of a First-Level Supervisor or Person in Charge

This individual shall:

1. Adopt such precautions as are within the individual's authority to prevent accidents.

2. See that the safety rules and operating procedures are observed by the employees under the direction of this individual.

3. Make all the necessary records and reports, as required.

#5
441. Energized Conductors or Parts

Employees shall not approach, or knowingly permit others to approach, any exposed ungrounded part normally energized except as permitted by this rule.

A. Minimum Approach Distance to Live Parts

1. General
Employees shall not approach or bring any conductive object within the minimum approach distance listed in Table 441-1 or Table 441-4 to exposed parts unless one of the following is met:

a. The line or part is de-energized and grounded per Rule 444D.

b. The employee is insulated from the energized line or part. Electrical protective equipment insulated for the voltage involved, such as tools, gloves, rubber gloves, or rubber gloves with sleeves, shall be considered effective insulation for the employee from the energized part being worked on.

c. The energized line or part is insulated from the employee and from any other line or part at a different voltage.

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0.051 to 0.300[1]	avoid contact		avoid contact	
0.301 to 0.750[1]	0.31	1–0	0.31	1–0
0.751 to 15	0.65	2–2	0.67	2–3
15.1 to 36.0	0.77	2–7	0.86	2–10
36.1 to 46.0	0.84	2–9	0.96	3–2
46.1 to 72.5	1.00[3]	3–3[3]	1.20	3–11

#6
443. Work on Energized Lines and Equipment

A. General Requirements

1. When working on energized lines and equipment, one of the following safeguards shall be applied:

a. Insulate employee from energized parts

b. Isolate or insulate the employee from ground and grounded structures, and potentials other than the one being worked on.

#7
446. Live Work

B. Equipment

1. Insulated aerial devices, ladders, and other support equipment used in live work shall be evaluated for performance at the voltages involved. Tests shall be conducted to ensure the equipment's integrity. Insulated aerial devices used in bare-hand work shall be tested before the work is started to ensure the integrity of the insulation. See applicable references in section 3, specifically IEEE Std 516-2003 and ANSI/SIA A92.2-1992.

Temp & Weather: 85° and Sunny

Investigated By:	**Name:**	**Company:**
	Steve Kingsolver	Ky. PSC
	Utility Regulatory and Safety Investigator IV	

Signed: Steve Kingsolver

Date: 8-20-09

Reviewed By:	**Name:**	**Company:**
	John Shupp	Ky. PSC
	Manager, Electric Branch	

Signed: John V. Shupp

Date: 8/20/09

Attachments:

A. Nolin RECC Accident Report
B. KPSC Accident Location Maps
C. KPSC Photographs of Accident Site
D. ANSI A92.2-1990 Standard

Attachment A

Nolin RECC Accident Report

SEVEN DAY SUMMARY REPORT
UTILITY CONTRACTOR ACCIDENT

Conctractor:	Hamilton Power Line Construction, LLC. PO Box 625 Bardstown, KY 40004 502-348-1384
Date of Accident:	July 09, 2009
Time Accident Occurred:	12:03 p.m.
Location:	Serene Oaks Subdivision 773 Beasley Blvd Elizabethtown, KY 42701
Employee Involved:	Pat Burman, Journeyman Lineman 15 years experience
Crew Foreman:	Billy Hamilton, 30 years experience (Hamilton Power Line)
Witness 1:	Robbie Hamilton, Journeyman 8 years experience (Hamilton Power Line)
Witness 2:	Michael Shelton, Apprentice Lineman 6 months experience (Hamilton Power Line)
Witness 3:	David Hamilton, Groundman/Flagman 3 years experience (Hamilton Power Line)
Witness 4:	Luke Carrick, Groundman 2 years experience (Hamilton Power Line)
Job:	Convert single-phase line to a three-phase line, creating a three-phase tie between Stephensburg Substation feeder #1 and Tharp 2 Substation feeder #2. Crew was re-conductoring section of line when accident occurred.
Conditions:	Sunny, 85 degrees, the ground was wet due to thunderstorms the night before.

On July 09, 2009 at 12:03 p.m. the Stephensburg Substation feeder #1 opened and locked out. Donnie Propes, Maintenance Superintendent, received a "May Day" call on his Nextel phone from Billy Hamilton, Hamilton Power Line foreman. One of Billy's workers had made electrical contact and needed assistance. Donnie then notified Bobby Ash, Nolin Dispatcher, who then called 911.

Hamilton Power Line Construction, LLC. was working in the Serene Oaks Subdivision at 773 Beasley Blvd. Hamilton Power Line is a contractor for Nolin RECC that specializes in three-phase line construction. Pat Burman (Journeyman Lineman of 15 years), Robbie Hamilton (Journeyman Lineman of 8 years), David Hamilton (Groundman/Flagman of 3 years), Mike Shelton (Apprentice Lineman of 6 months), and Luke Carrick (Groundman of 2 years) were set up on a C-4 (pole #51384, new 55 class H). They had a rope machine, wire trailer, two bucket trucks, and a digger derrick. Billy Hamilton and Frankie Hamilton were set up approximately 4,200 feet away at the take-off pole with a bucket truck and a wire tensioner. They were re-conductoring the line with #336 ACSR. One side had already been completed. The B and C phases (top and bottom) feeding into the C-4 were energized. They were covered with two rubber hoses each. The shoes and bells had been covered with rubber blankets but were previously removed due to chances of severe weather. Billy did call Bobby Ash at 8:56 a.m. that morning and request that the OCR be placed on non re-close.

Pat Burman was set up at the C-4 in a single-man bucket truck (truck #100). Robbie, Mike, and Luke were on the ground. David was directing traffic (low volume road). Rope for the bottom and center phases had been sent up, run through a roller, and pulled to the take-off pole. The top (B) phase had previously been pulled. Robbie used a handline to send up a piece of #336 to Pat to splice onto the top (B) phase. Pat placed his left hand onto a grounded roller and reached for the handline with his right hand. His back brushed the energized top phase. Robbie, Mike, and Luke all saw an arc and saw Pat fall into the bucket. Robbie then notified Billy and performed bucket rescue. Pat was initially un-responsive. As Robbie, Mike, Luke, and David attempted to remove Pat from the bucket he came to. The Hardin County Ambulance Service arrived on the scene shortly after. Pat was taken to Highway 62 where the ambulance was meet by the Life Flight helicopter. He was then air lifted to the University of Louisville Burn Center.

Pat was not wearing rubber gloves or rubber sleeves. He was wearing Class II FR clothing (long sleeve shirt and pants), a hard hat, safety glasses, and a fall harness that was locked in. His shirt was burned on the back left shoulder and the lower left arm.

Vince Heuser, Vice President System Operations, notified the Public Service Commission at 12:15 p.m. Robert Thornton, Compliance Coordinator, was notified and arrived at the scene at 12:45 p.m. An in-house accident investigation was conducted. Vince Heuser and Donnie Propes assisted in the accident investigation.

During the investigation it was noted that a job briefing was conducted sometime around 8:45 a.m. There is no written documentation of the job briefing. Robbie, Mike, and Luke each confirmed that Billy had told them that the top and bottom phase feeding in was energized. David was not present during the job briefing as he was placing traffic signs.

Each witness stated that Pat seemed "normal" that morning. There had not been any confrontations or arguments that day. He was the "same old Pat." Robbie and Luke both stated that Pat was supposed to take off of work at noon in order to go to the doctor. Luke stated that he thought Pat had gotten "in a hurry."

Photographs of the accident site, a map of the area involved, a copy of an outage report from the incident, and information on the system protective devices used that day have been attached. Additionally, witness statements and dielectric test records have also been submitted.

Respectfully Submitted,

Robert Thornton
Compliance Coordinator
Nolin RECC

Standard Outage Ticket 97642

Print Date: 07/09/2009 Print Time: 4:58 PM

Consumer Information

Name:	SANDRA MORRIS	*Med Alert:*			
Cons Addr:	4120 BACON CREEK RD	*Priority:*			
	ELIZABETHTOWN, KY 42701	*Account:*	1920000216	*Sthy Gen:*	No
		Meter:	73492	*Srv Status:*	1
Service Addr:	BACON CREEK RD 4120-HOUSE	*Transf:*	8309	*CYC:*	1
	ELIZABETHTOWN, KY 42701	*Sub:*	STEPHENSBURG	*Fdr:*	1
Primary Phone:	(270) 369-0389	*Line Sect:*	REC20150002	*Phs:*	ABC
Secondary Phone:		*Eq Map Loc:*	8309		
Alternate Phone:		*Srv Map Loc:*	19200002		
:		*meterMisc1:*			
Time Called:	07/09/2009 12:21:22	*meterMisc2:*			

Outage Details

Outage Number:	97642	*Time Off:*	07/09/2009 12:09:30
Outage Status:	Restored	*Time On:*	07/09/2009 12:37:56
Outage Type:	Feeder	*Cause Code/Desc:*	19 / CONTRACTOR
Sub:	STEPHENSBURG	*Equip Code/Desc:*	90 / OPEN OCR
Feeder:	1	*Attention:*	
Line Section:	REC20150002	*Crew Code:*	
Phase:	ABC	*Protective Device:*	STEPHENSBURG
Nbr of Calls:		*Map Location:*	REC20150002
Nbr Consumers Out:	351	*User:*	

Dispatch Comments

Contractor for Nolin had accident and caused circuit to go off, 353 consumers off.

Phone Call Comments

No phone call comments found.

Miscellaneous

Time On: _____ *Date:* __/__/____ *Field Employee:* _____

Costs: Materials: _____ *Labor:* _____ *Transportation:* _____

Field Comments: _____

_____

_____

_____

This outage ticket was generated by NISC software: "Moving you @ the speed of technology"

TEST REPORT # 3

Torco TESTING SERVICES, INC.
P.O. Box 1717 - Louisville, KY 40201
(502) 581-0506
Toll Free 888-540-0065
Website: torcotesting.com

CUSTOMER Hamilton Power Lines STATE Ky TECH. Simpson DATE 2/26/07 TIME 1:30 AM PM

TRUCK # 100 S/N 525806965LAN MODEL LAM-51-2E Lift-All TEMP 46 °F R.H. 59 %

AC DIELECTRIC TEST
ANSI/SIA A92.2 SECTION 5.4.3

AREA TESTED	APPLIED VOLTAGE KVAC	TEST TIME MIN.	LEAKAGE MILLIAMP	RESULTS
BASKET SHAFT TO LOWER BOOM	69	3	.190	PASSED
LOWER BOOM INSERT	50	3	.722	PASSED
BASKET TO CHASSIS	69	3	.275	PASSED
EXTENSIBLE BOOM				
BASKET LINER	35	1		PASSED
HYDRAULIC OIL	24.7			PASSED
HOT STICKS			DIELECTRIC	
OTHER				

STRUCTURAL ANALYSIS
ANSI/SIA A92.2 5.2.4

VT – Visual Inspection
ULT – Ultrasonic Test
MT – Magnetic Particle Testing

AREA TESTED	RESULTS	AREA TESTED	RESULTS
Accessible outrigger welds	VT	Accessible outrigger pins	ULT
Lower pedestal welds	VT	Anchor bolts	—
Accessible cylinder block welds	VT, MT	Accessible turntable bolts	ULT T-11 B-9
Welds at elbow	VT, MT	Lower boom hinge pin	ULT
Welds at basket area	VT	Accessible cylinder pins	ULT
Welds on head of boom	—	Upper boom hinge pin	ULT
Boom support	VT	Basket shaft	—
Auger support brace	—	Auger hanger pins	—
Winch line hooks	—	Platte hook	VT, MT
Turret welds	VT, MT		

NONDESTRUCTIVE FIBERGLASS ANALYSIS	RESULTS

COMMENTS ON DIELECTRIC TEST

COMMENTS ON STRUCTURAL ANALYSIS

7-10-2009 9:05am

BILLY HAMILTON
WE WERE PULLING IN NEW THREE PHASE LINE, WE WERE GOING TO SLEEVE WIRE OUT, MAN ON GROUND WAS GOING TO SEND WIRE UP POLE WHEN PAT REACHED BETWEEN ENGERZED PHASE AND DEENERZED PHASE, GOT HFS BACK INTO THE ENGERZED PHASE WITH ARM UP AGAINST POLE

Robbie Hamilton 7-10-2009 9:10am

I Robbie Hamilton was packing a guide wire back when Billy Hamilton told Pat and Frankie that the center and bottom phase were hot, and cover them up, then I come down where Pat and the other guys were, we pulled the rope and then we started to pull the wire there but we need to pull more of the wire, so I went to pull the wire up to pat to leave it, when he reached to get the wire, his back got in the center phase I seen the flash, then I ran to the bucket to let him down

7·10·2009 9:25 am

We were pulling wire in and we had just sleeved a piece of wire to pull up and sleeve to the wire that was already there. We then attached the wire to the handline and Robbie Hamilton sent the wire up so I backed up and turned around that's when I heard a loud Blaze and turned and saw pat slumped over and a Blaze around him. I then yelled to see if he was okay and proceed to call for help and then got him down to the ground and out of the Bucket.

Michael Shelton

7·10·2009 9:45 am

DAVID HAMILTON· AS TOLD TO ROBERT THORNTON

WAS IN Front of Pat's truck, watching road. Heard arc, turned around. Saw fire around his face. Once fire quit, saw Pat slump down. Helped Robbie get Pat out of bucket. Was un-responsive. Came to, knew who everyone was. Pat did not have gloves & sleeves. Seemed like regular ol Pat. was joking around. Didn't seem like he was in a hurry.

[redacted]

Luke Carrick 7·10·2009 9:40 am

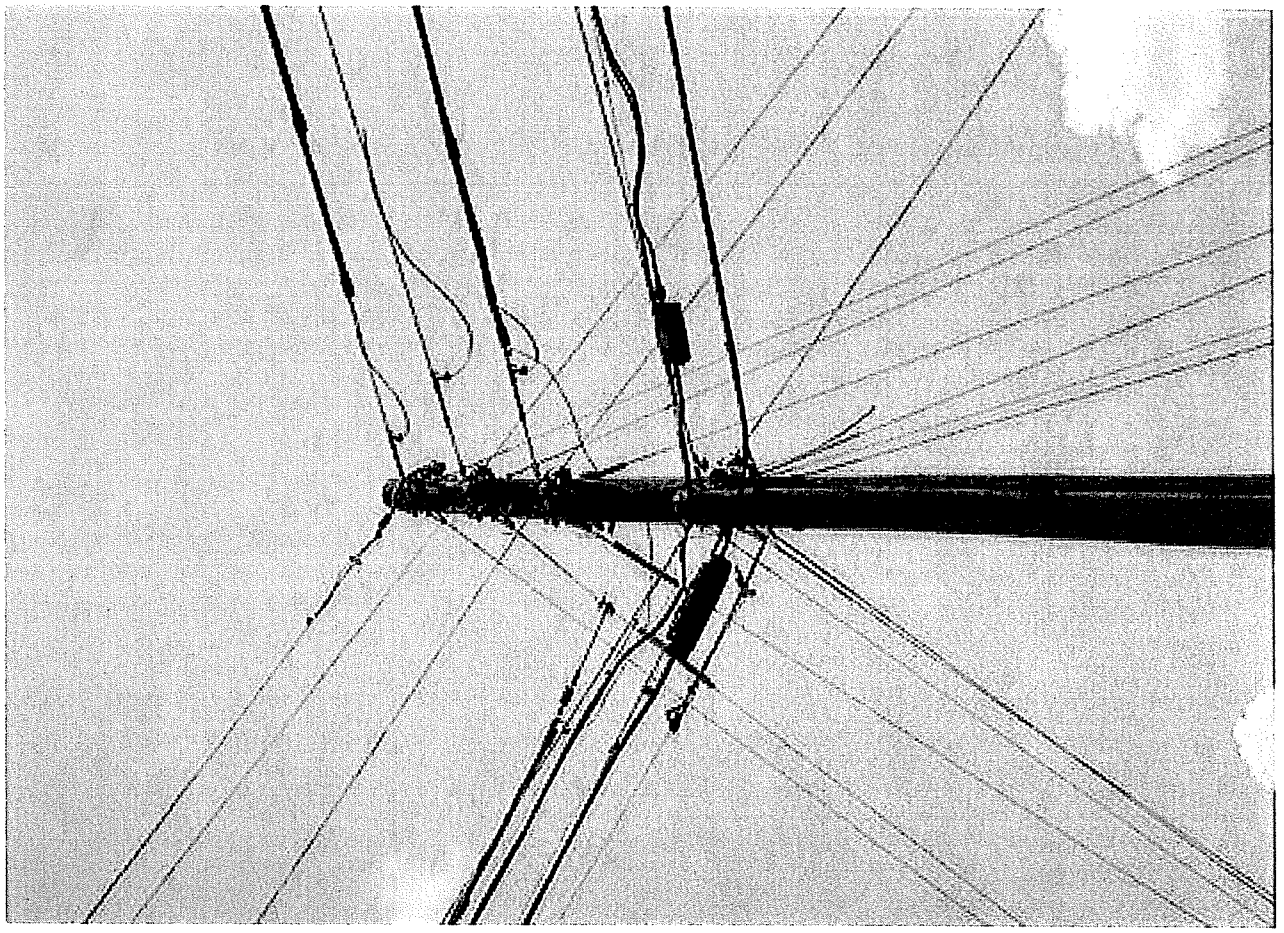
Pat was working the line, which was hot, unprotected. He had no rubber protective materials. I was standing roughly 15-20ft. away from the pole. I heard the humming, saw the arch, and ran the opposite direction. Robbie lowered the bucket onto a yard across the street, Pat was not showing consciousness. When I approached him, he was gurgling, and breathing. He eventually came to, and he was able to aid us in getting him out of the bucket. Also, before it happened, Robbie told everyone to stay off of the wire, [redacted] The EMS arrived and took over from there.

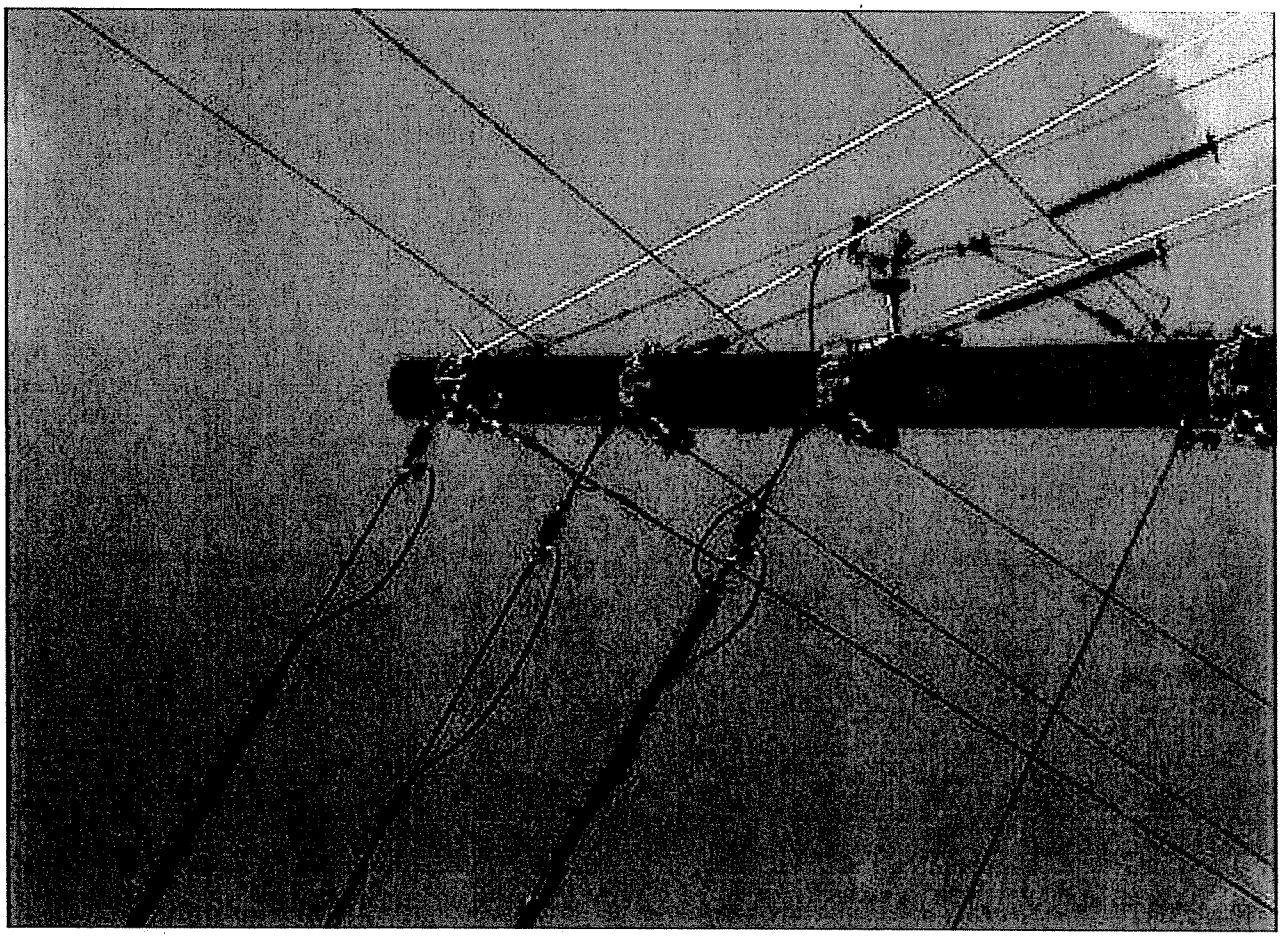
Stephensburg Substation Feeder #1:

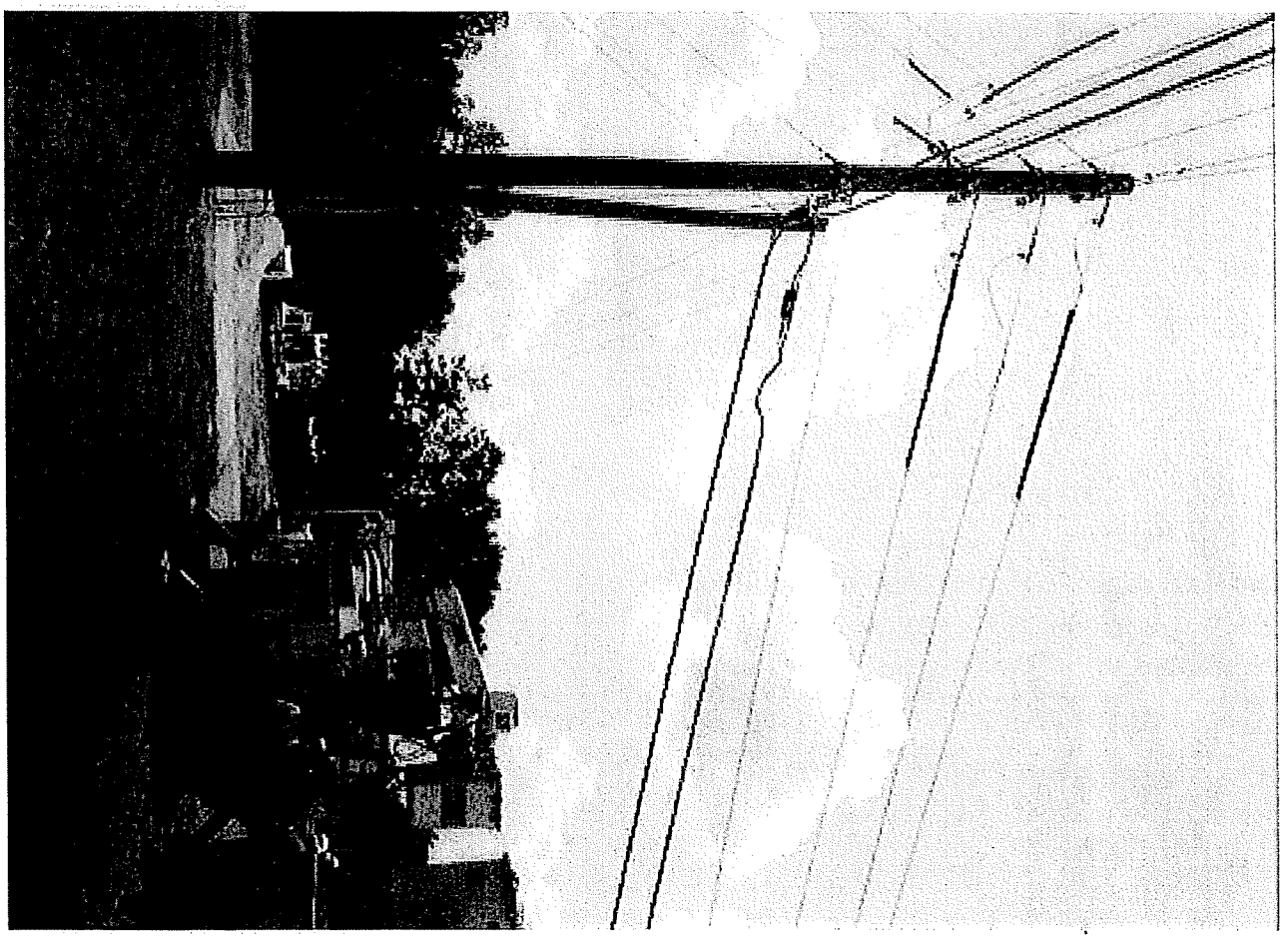
- Switzer Controls
- Phase Trip – 340 amps
- Ground Trip – 140 amps

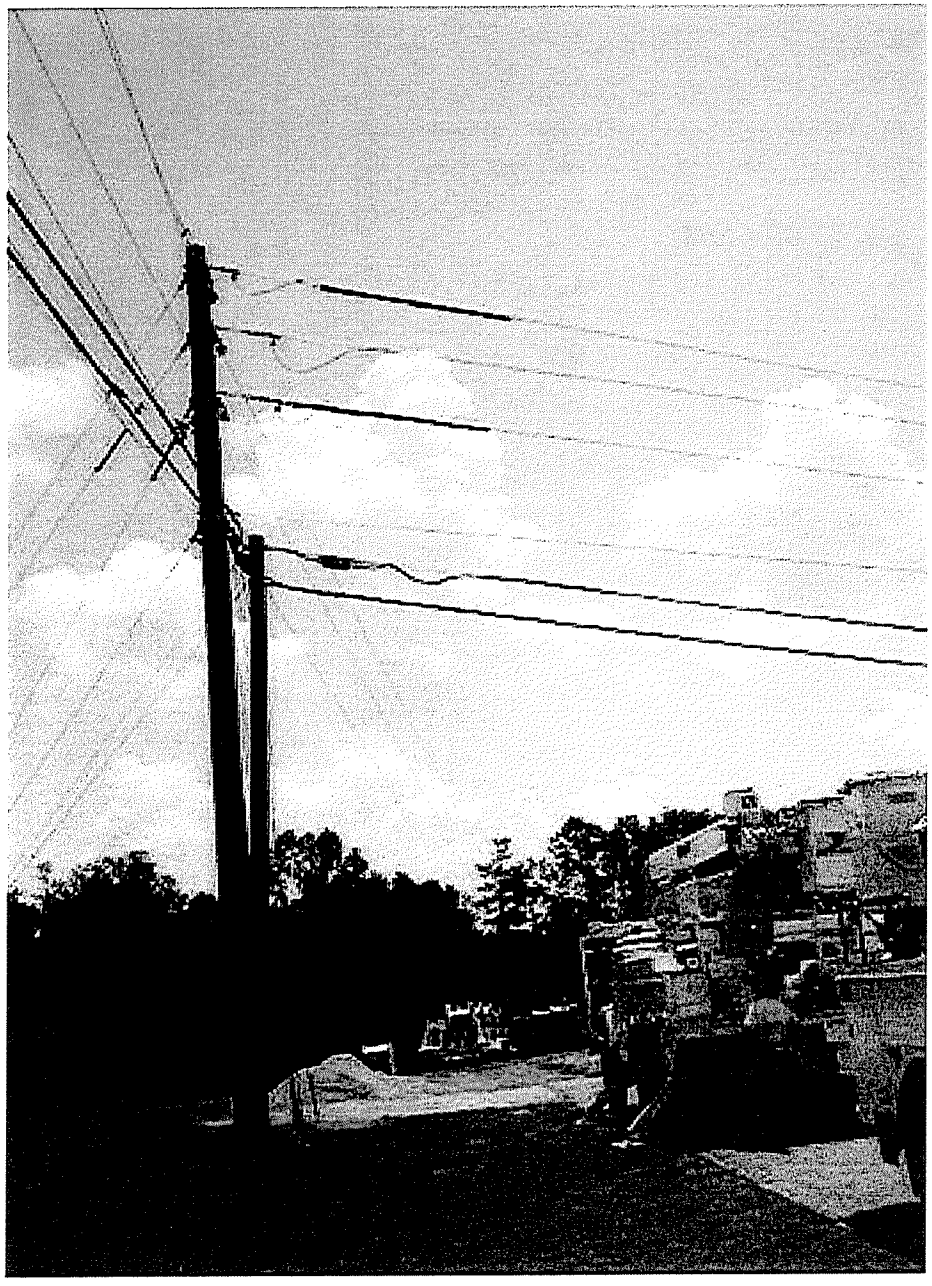
Control/Trip Settings:

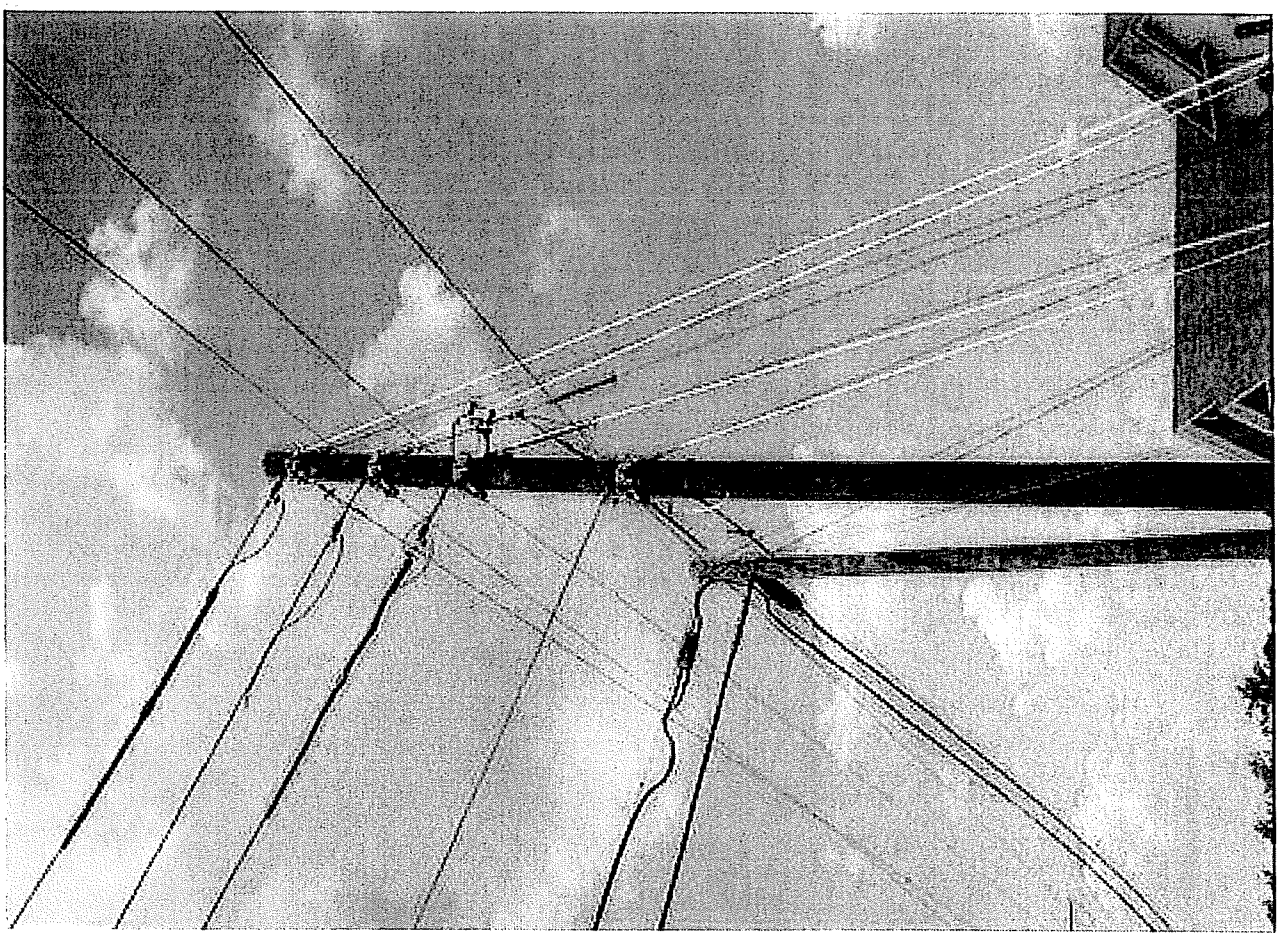
- Fast Phase Curve – 105 amps
- Fast Ground Curve – 111 amps
- Delay Phase Curve – 117 amps
- Delay Ground Curve – 135 amps

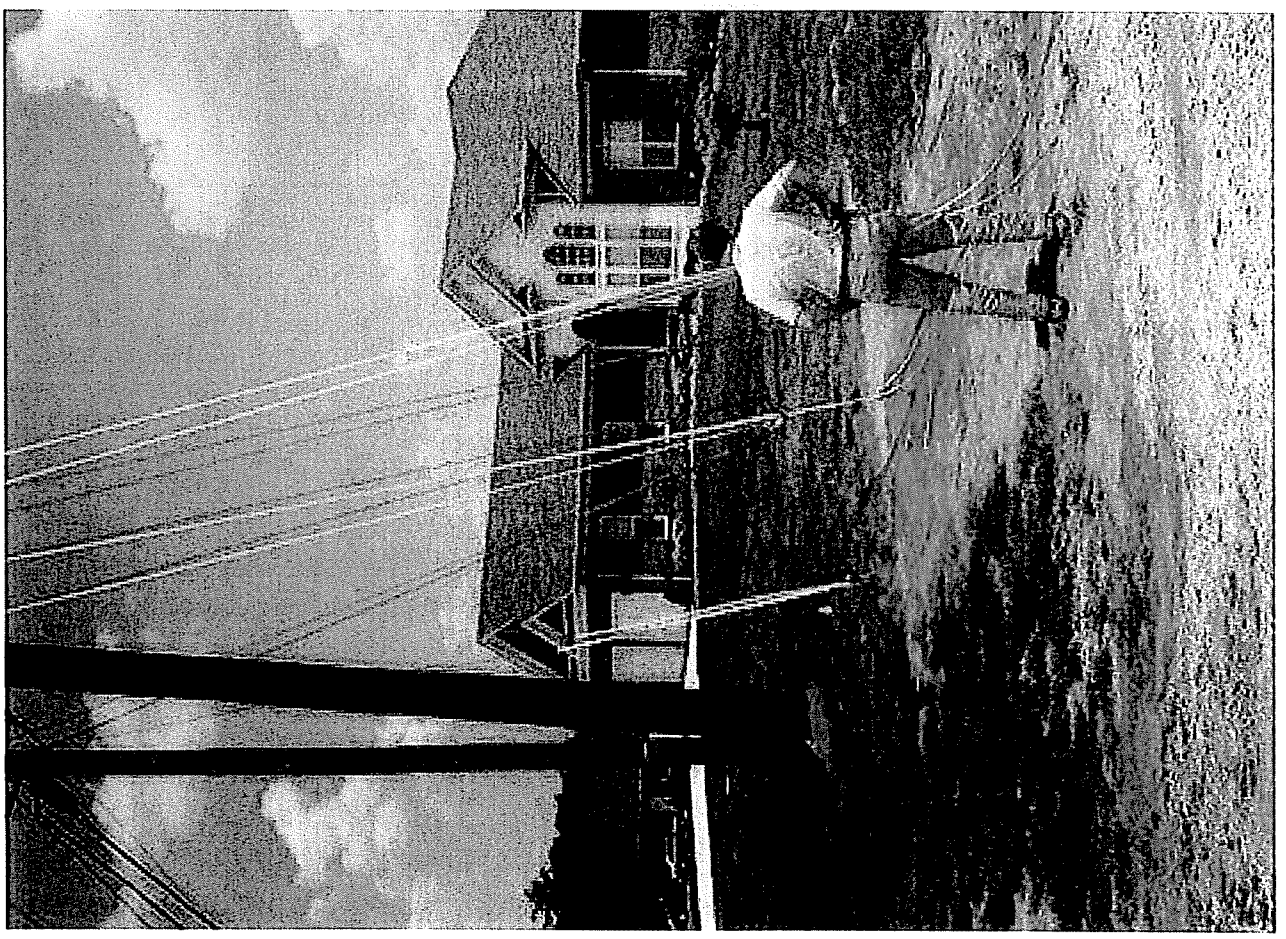


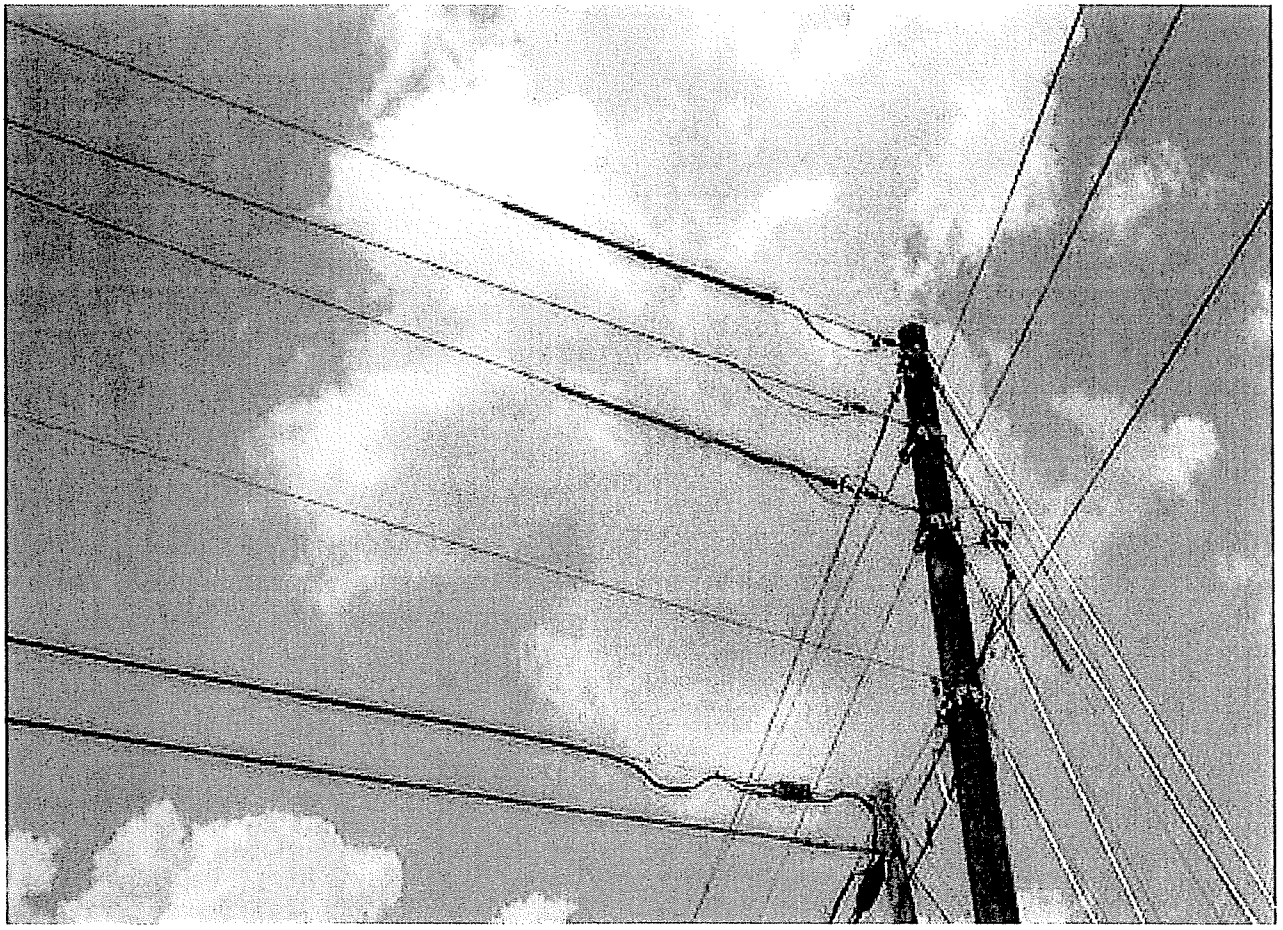


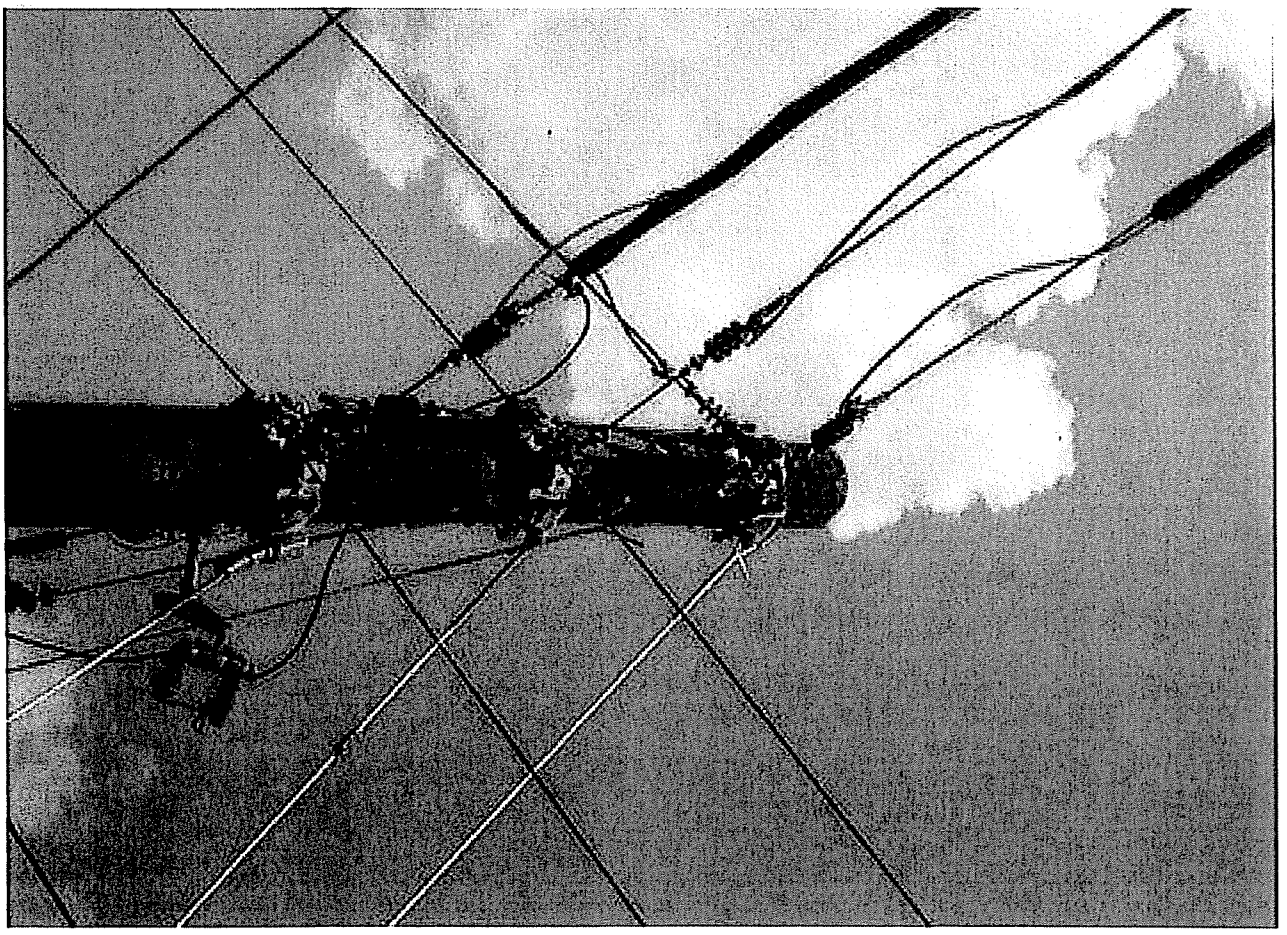


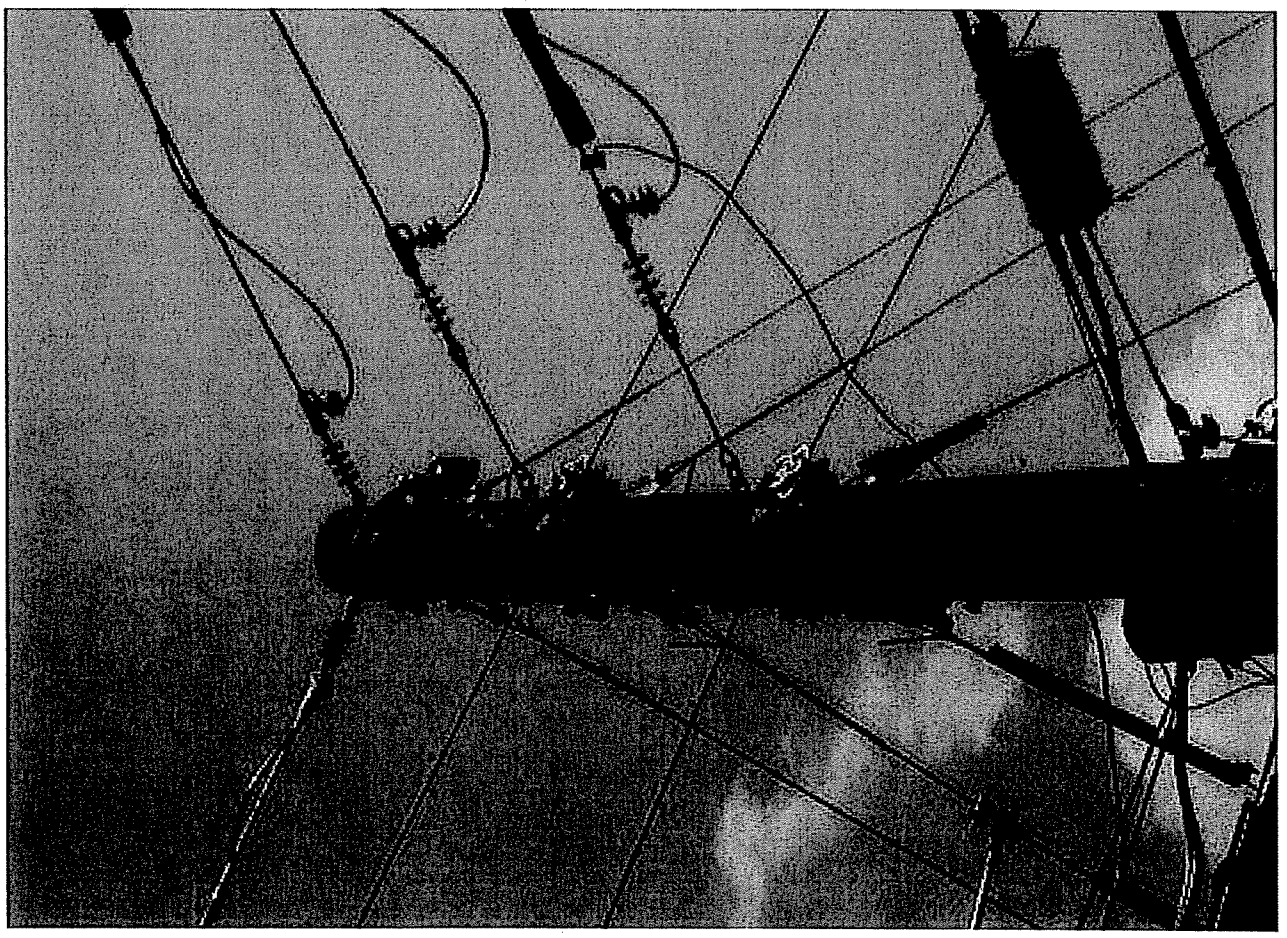










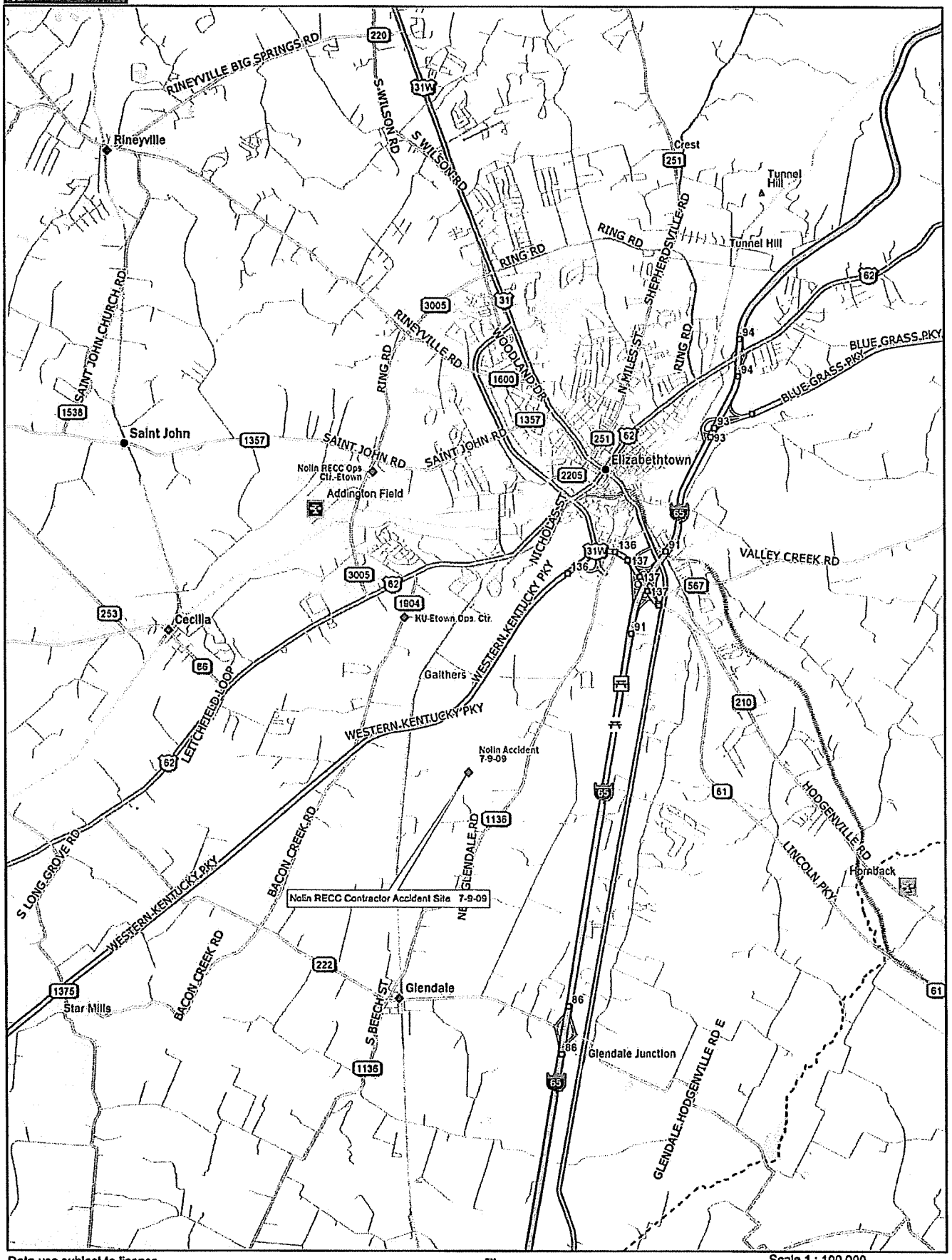


Attachment B

KPSC Accident Location Map

DeLORME

Street Atlas USA® 2008 Plus



TN

MN (4.0°W)

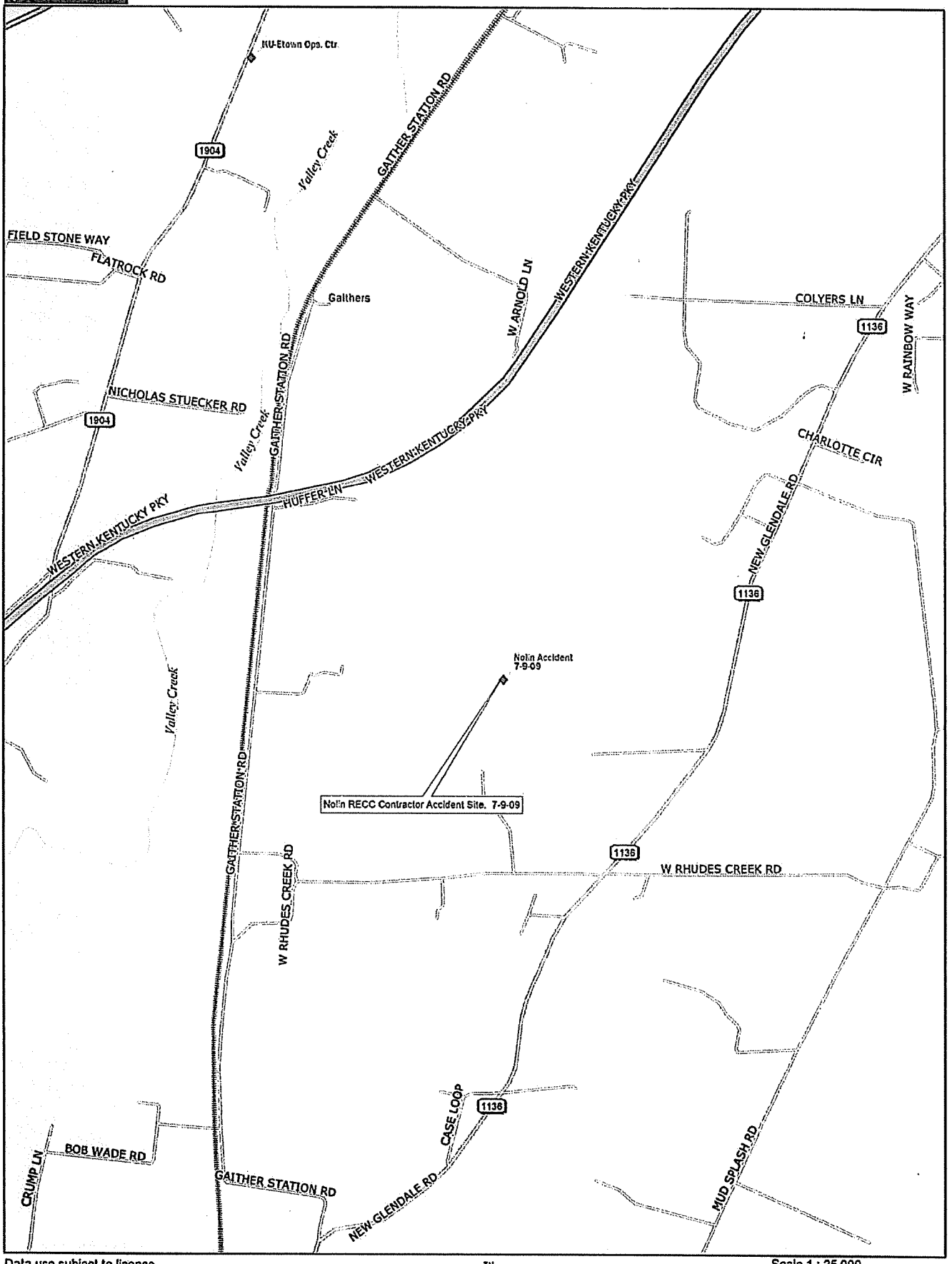
Scale 1 : 100,000

1" = 1.58 mi

Data Zoom 11-0

DeLORME

Street Atlas USA® 2008 Plus



Data use subject to license.

www.delorme.com

TN

MN (4.0°W)

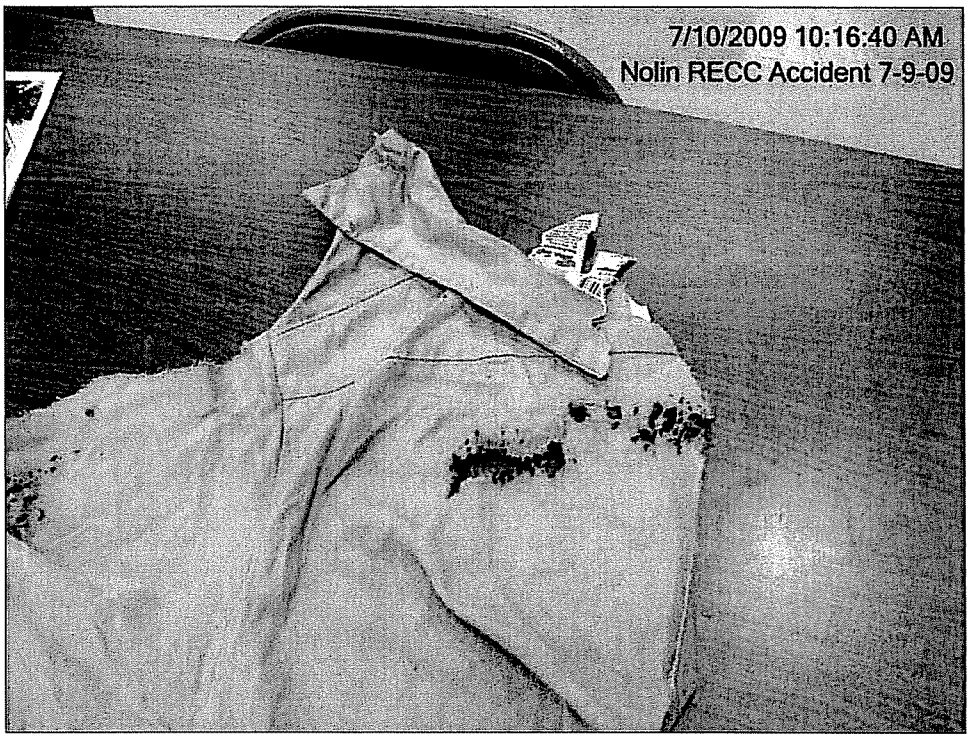
Scale 1 : 25,000

1" = 2,083.3 ft

Data Zoom 13-0

Attachment C

KPSC Photographs of Accident Site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Nolin RECC Accident 7-9-09

#1


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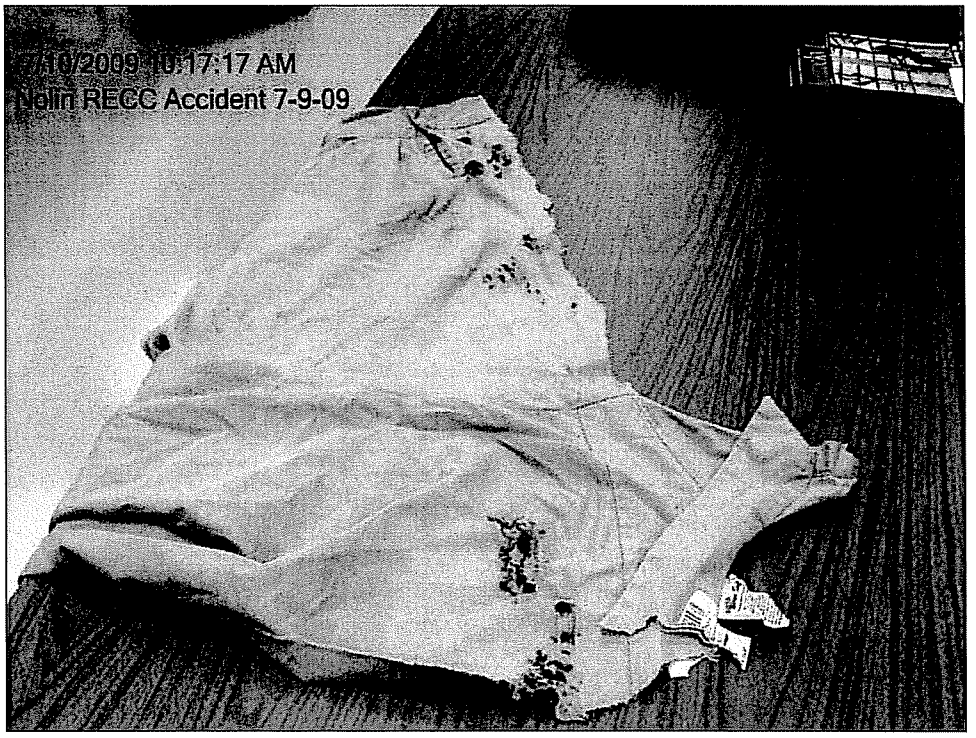
Nolin RECC Accident 7-9-09

#2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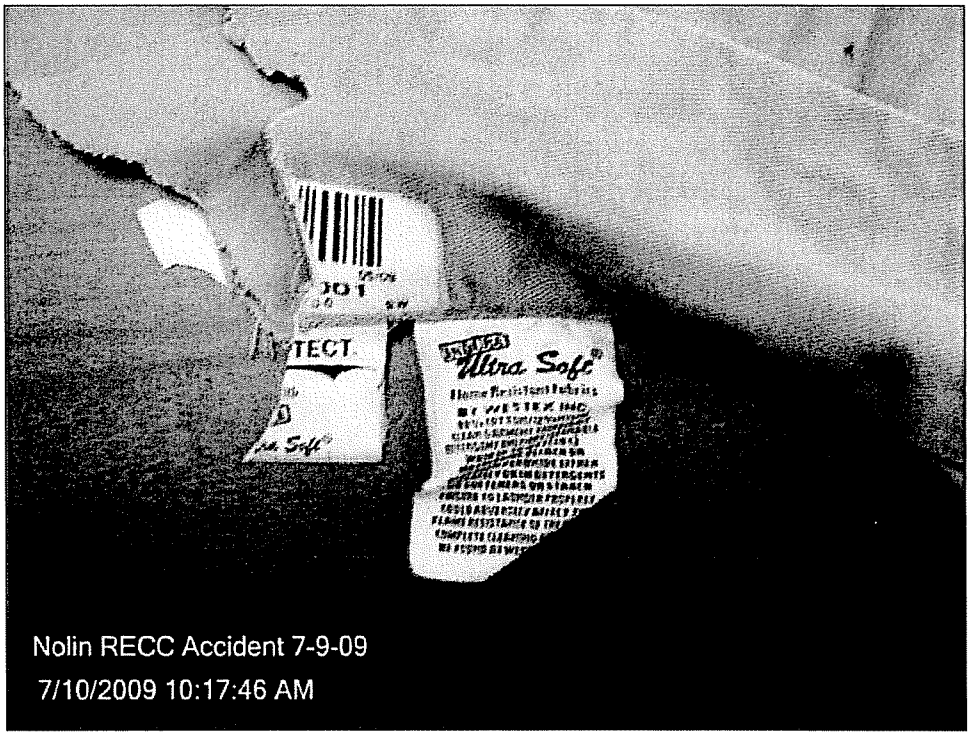

Ultra Soft
Nolin RECC Accident 7-9-09
7/10/2009 10:17:46 AM

#4


Ultra Soft
Nolin RECC Accident 7-9-09
7/10/2009 10:17:59 AM

#5


7/10/2009 10:18:22 AM
Nolin RECC Accident 7-9-09

#6


7/10/2009 10:18:29 AM

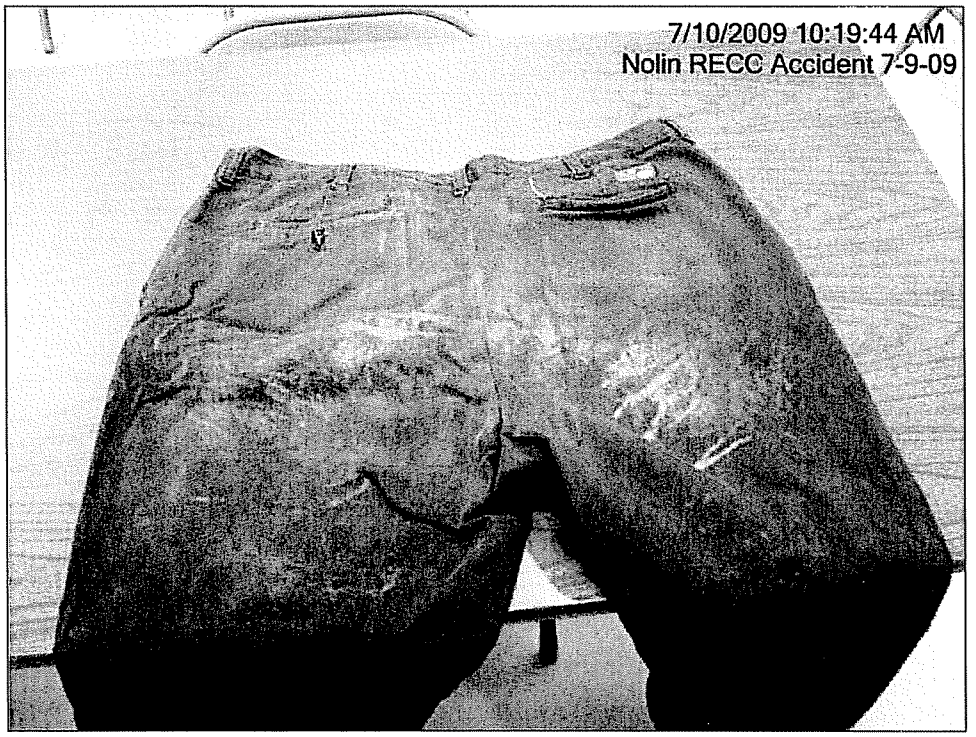
#7


7/10/2009 10:18:51 AM
Nolin RECS Accident 7-9-09

#8


7/10/2009 10:19:25 AM
Nolin RECC Accident 7-9-09

#9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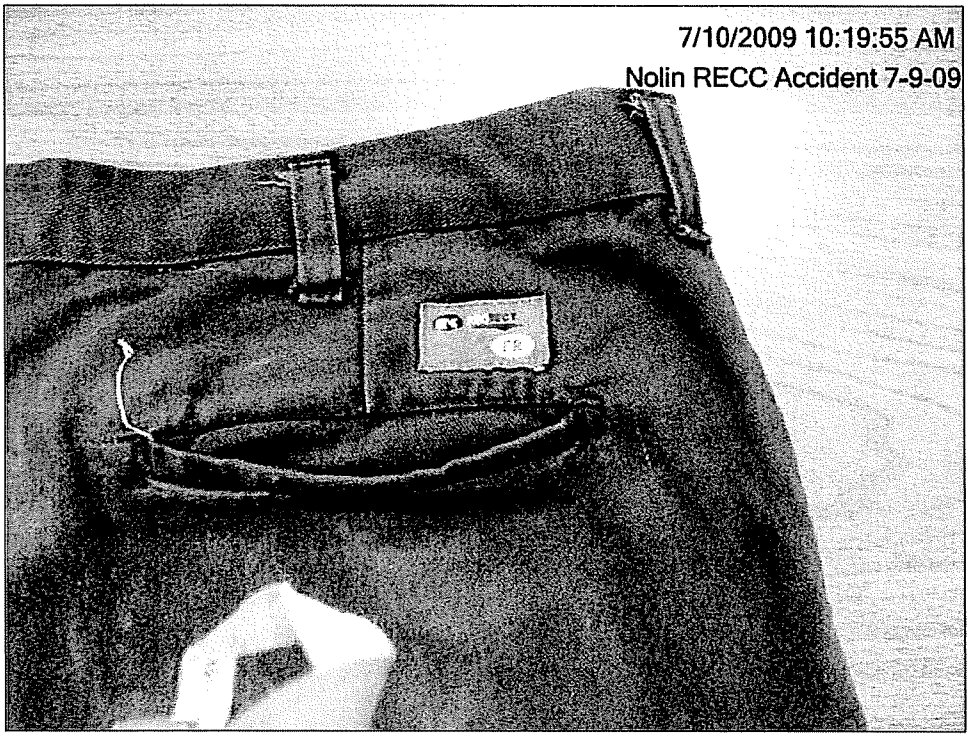
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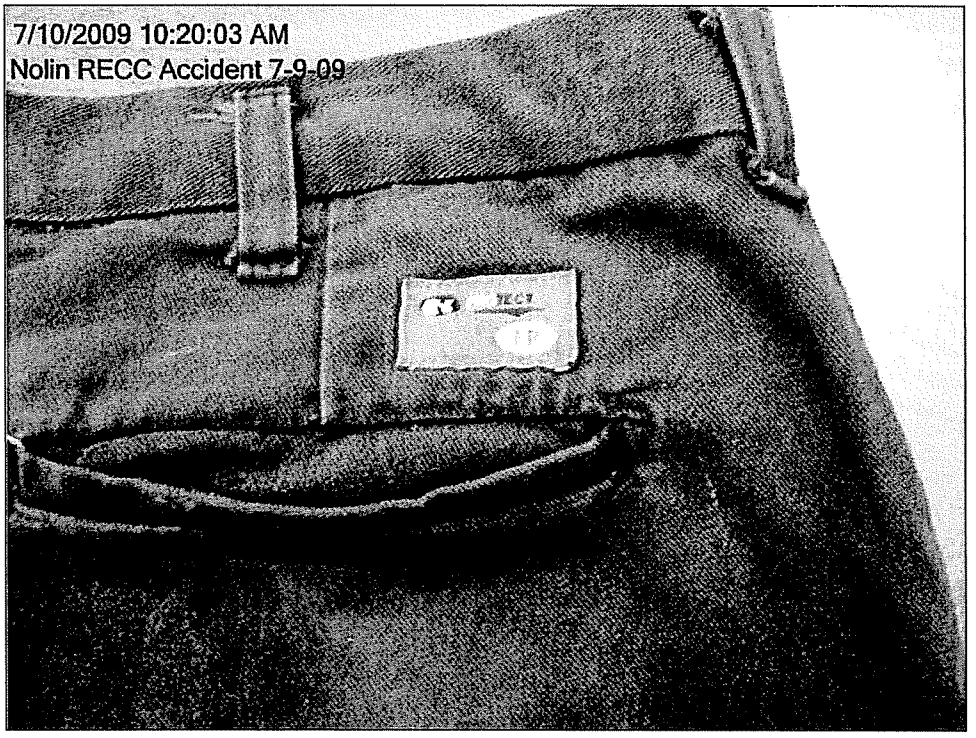
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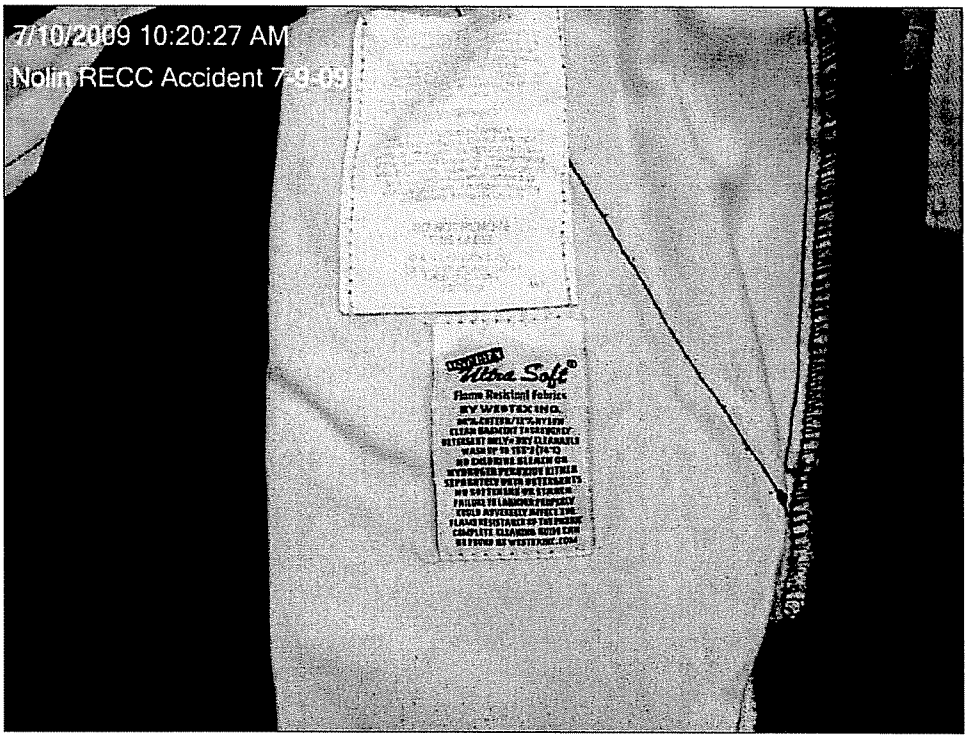
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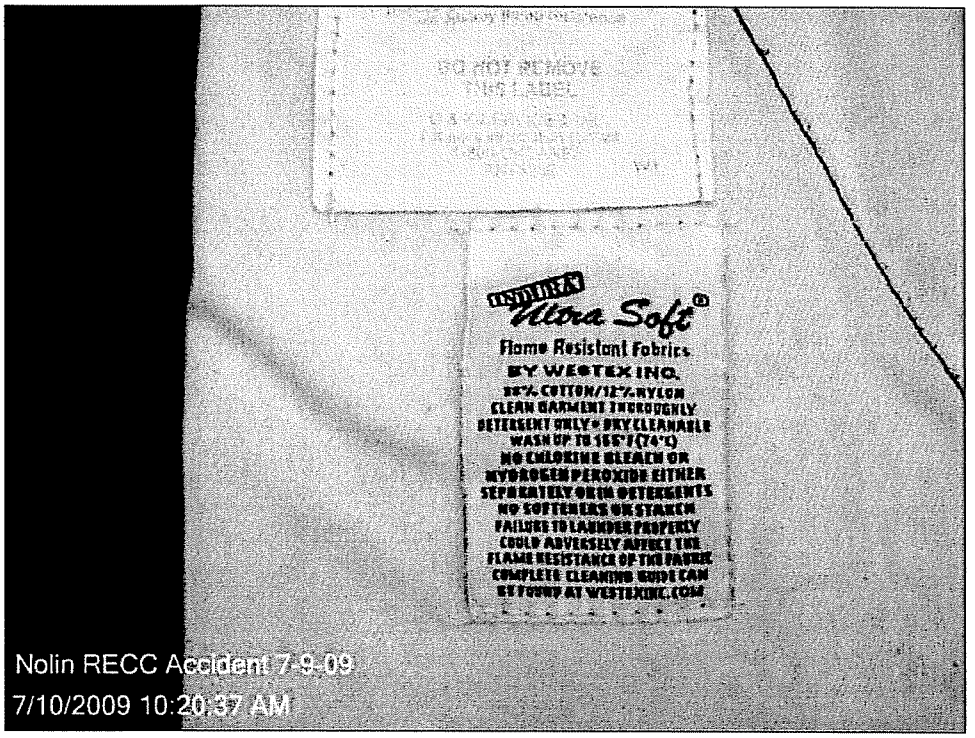
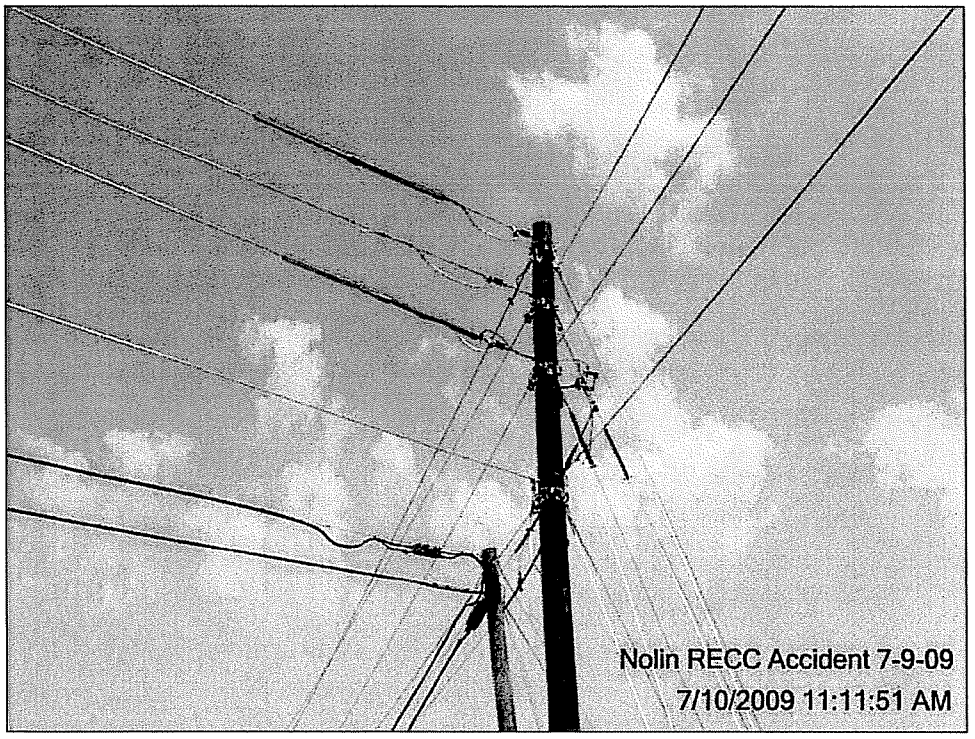
Nolin RECC Accident 7-9-09
Ultra Soft
Flame Resistant Fabrics
BY WESTEX INC.

#13


Ultra Soft
Flame Resistant Fabrics
BY WESTEX INC.
CLEAN GARMENT THOROUGHLY
DETERGENT ONLY • DRY CLEANABLE
NO CHLORINE BLEACH OR
HYDROGEN PEROXIDE EITHER
SEPARATELY OR IN DETERGENTS
NO SOFTENERS OR STARCH
FAILURE TO LAUNDER PROPERLY
COULD ADVERSELY AFFECT THE
FLAME RESISTANCE OF THE FABRIC
COMPLETE CLEANING GUIDE CAN
BE FOUND AT WESTEXINC.COM
Nolin RECC Accident 7-9-09
7/10/2009 10:20:37 AM

#14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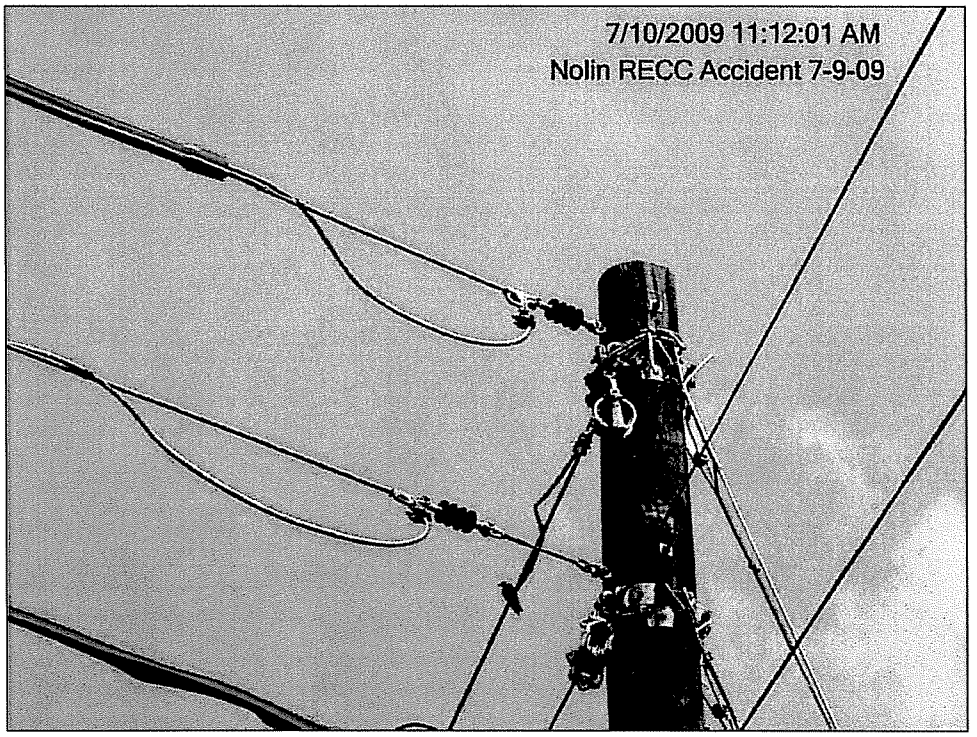
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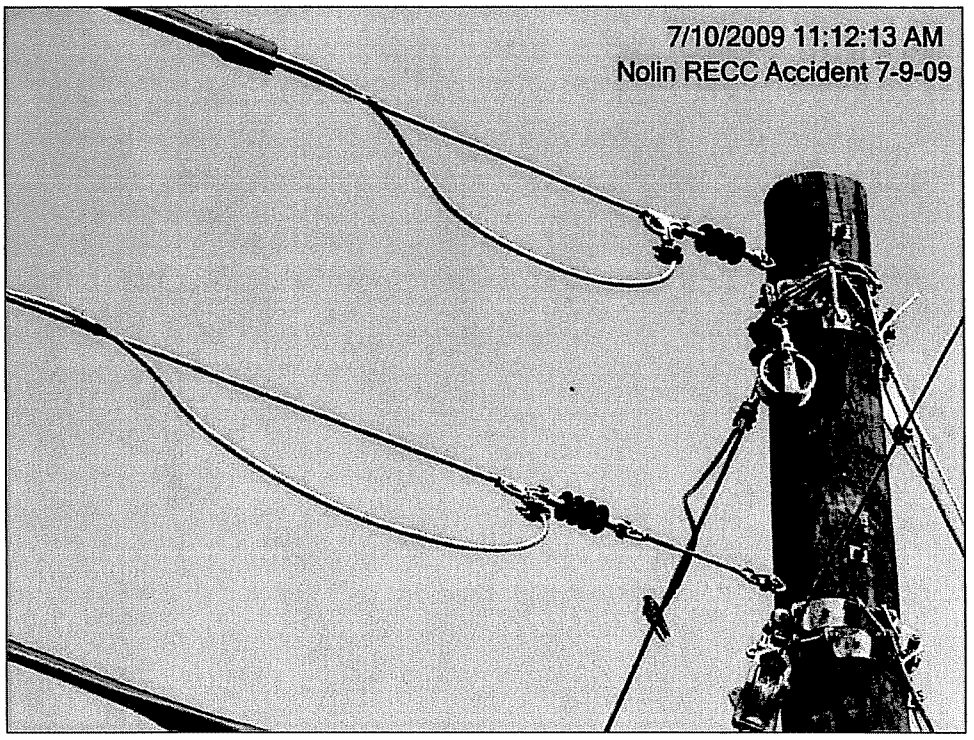
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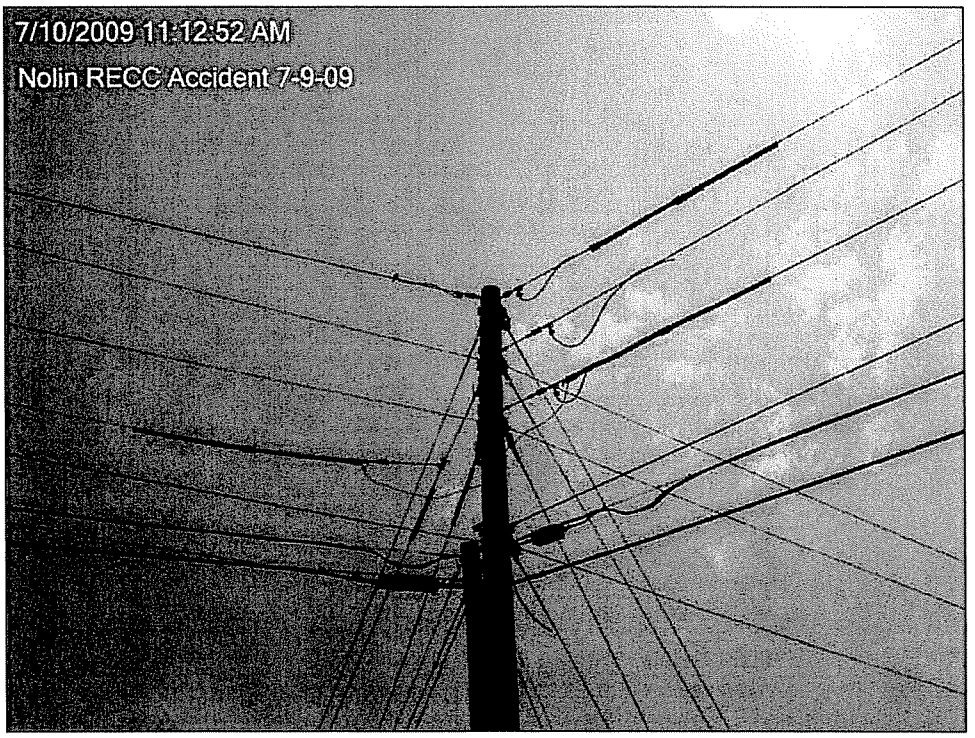
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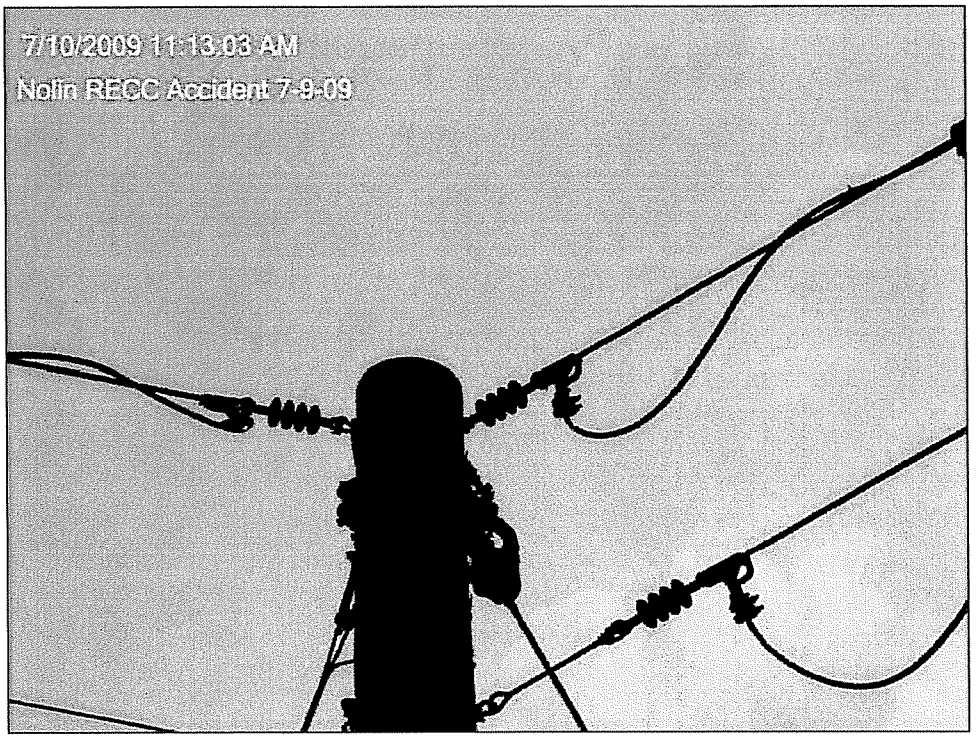
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Nolin RECC Accident 7-9-09

#19


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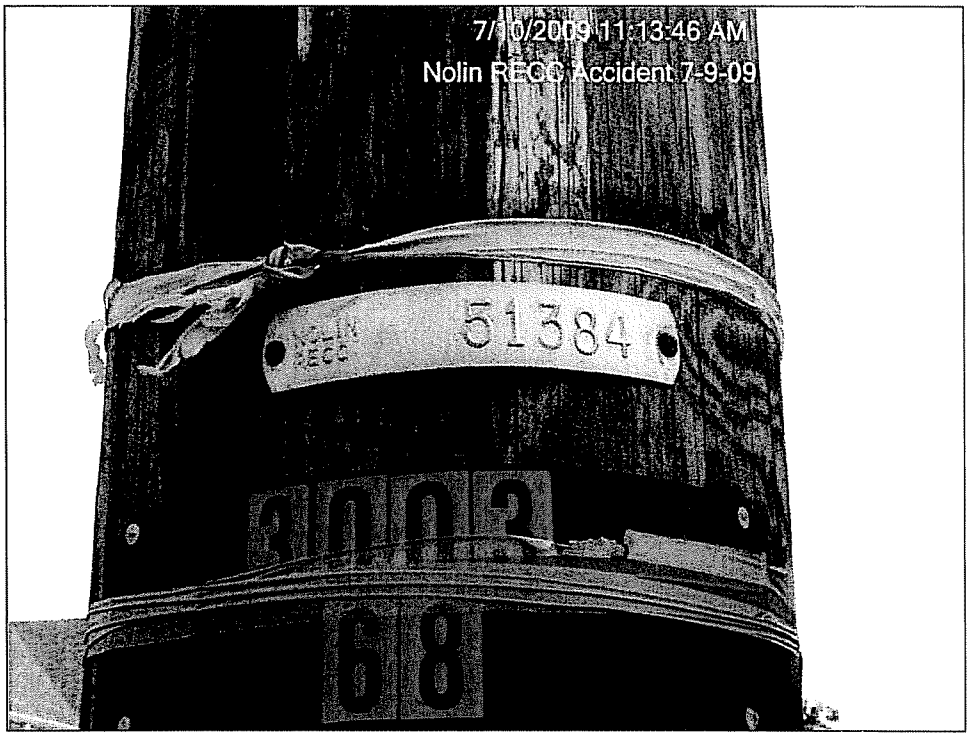
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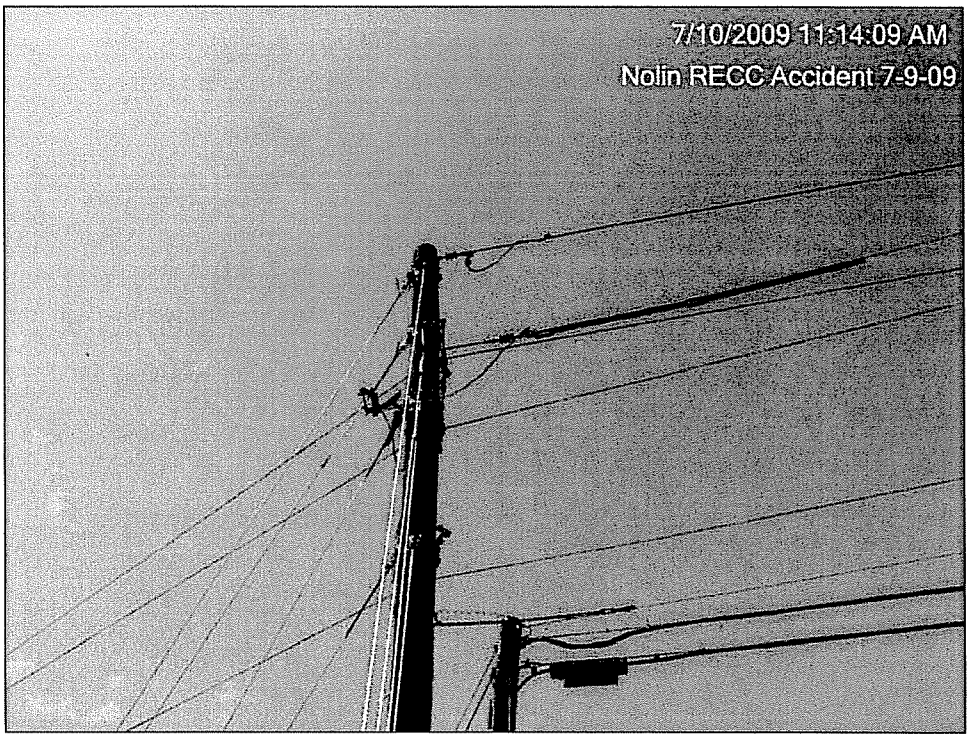
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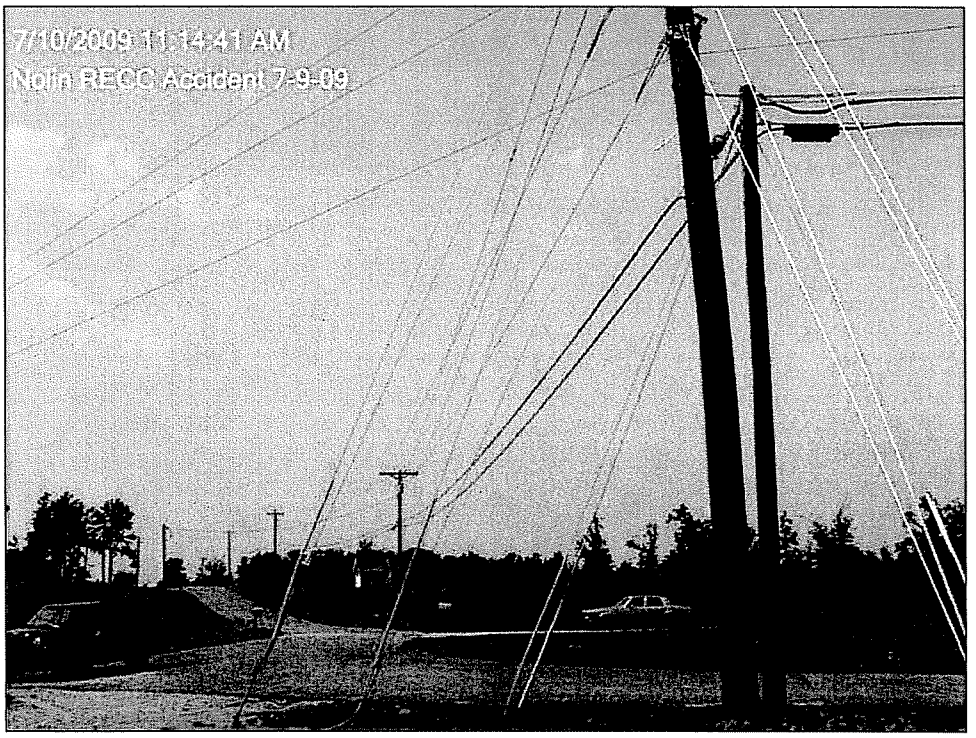
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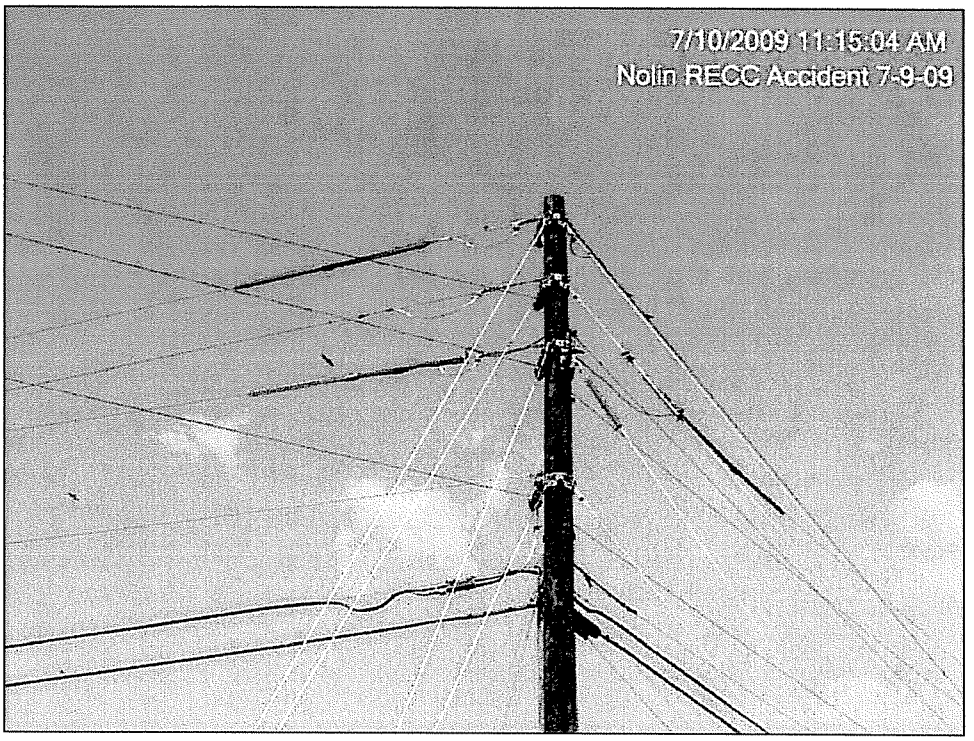
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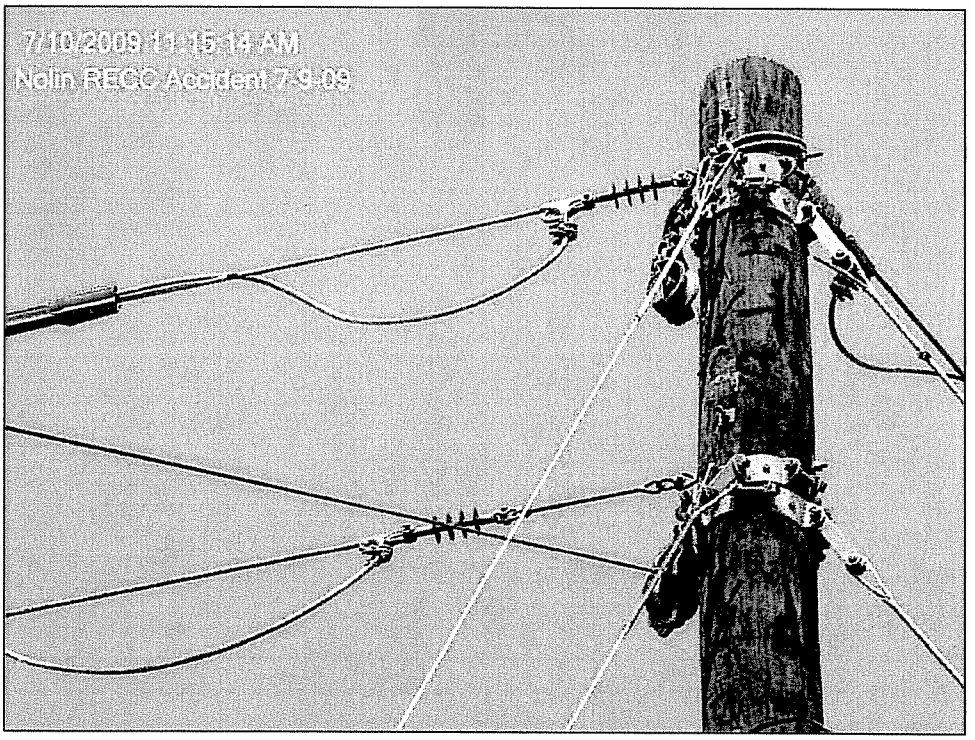
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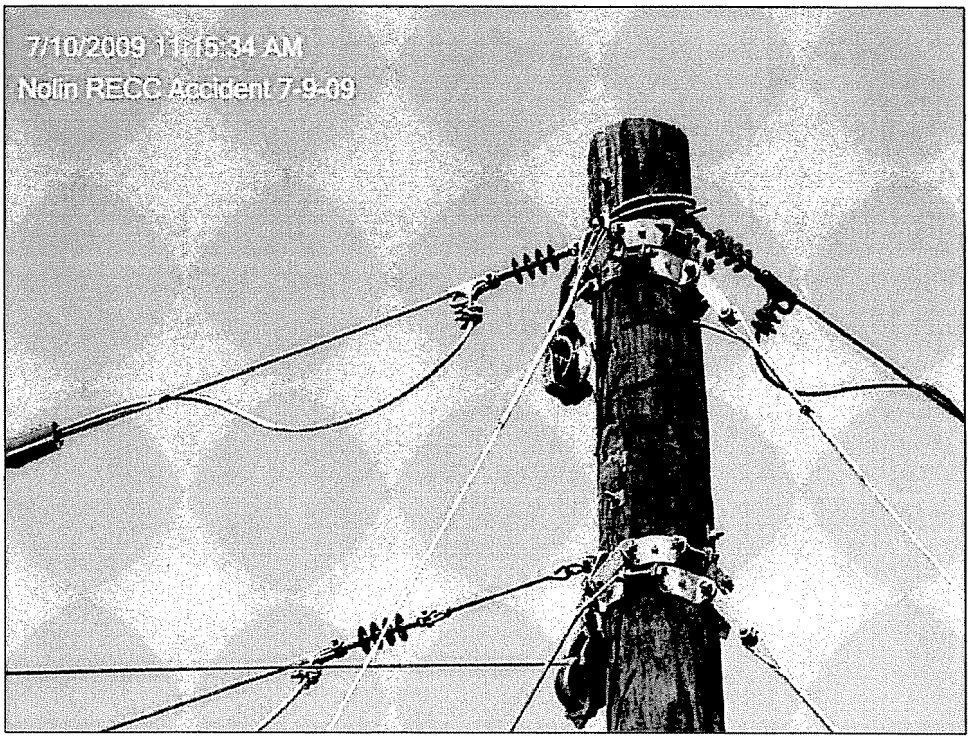
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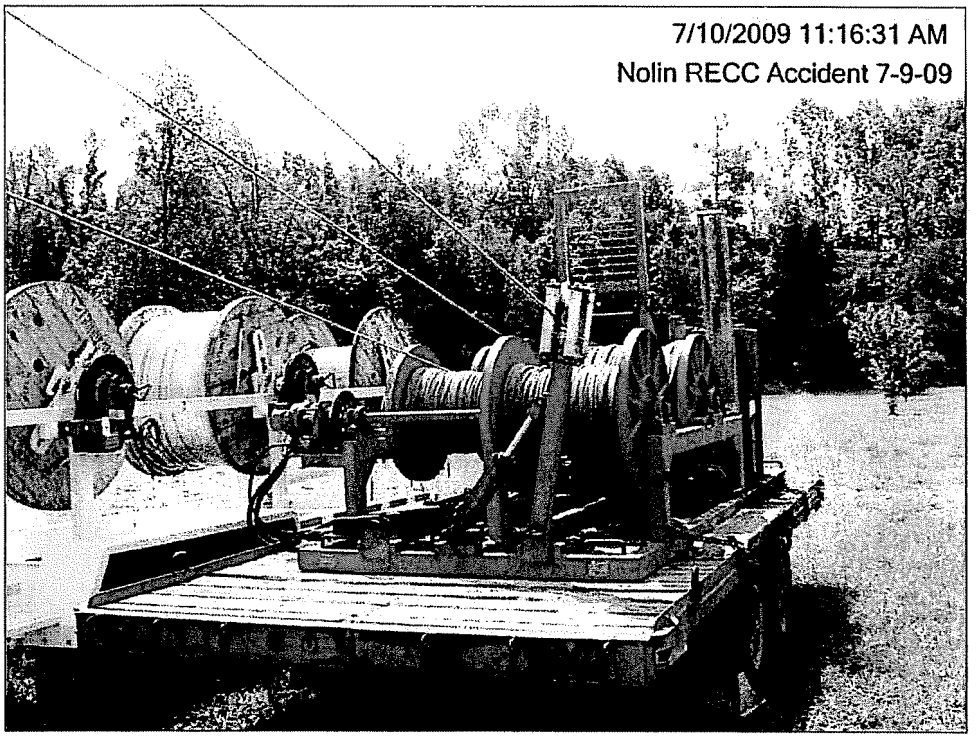
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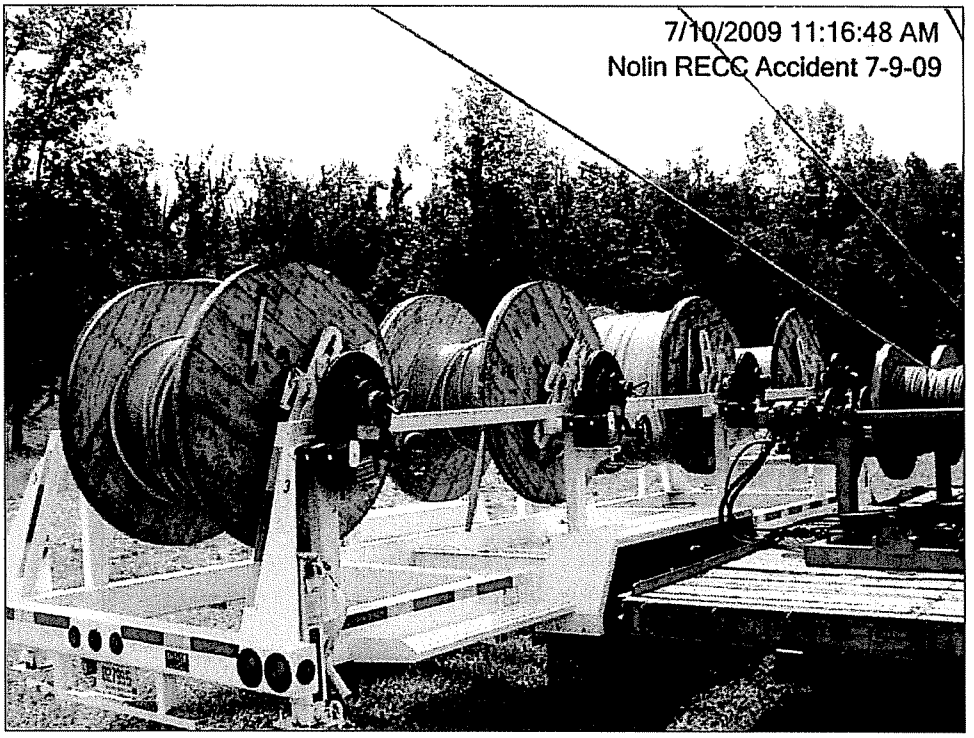
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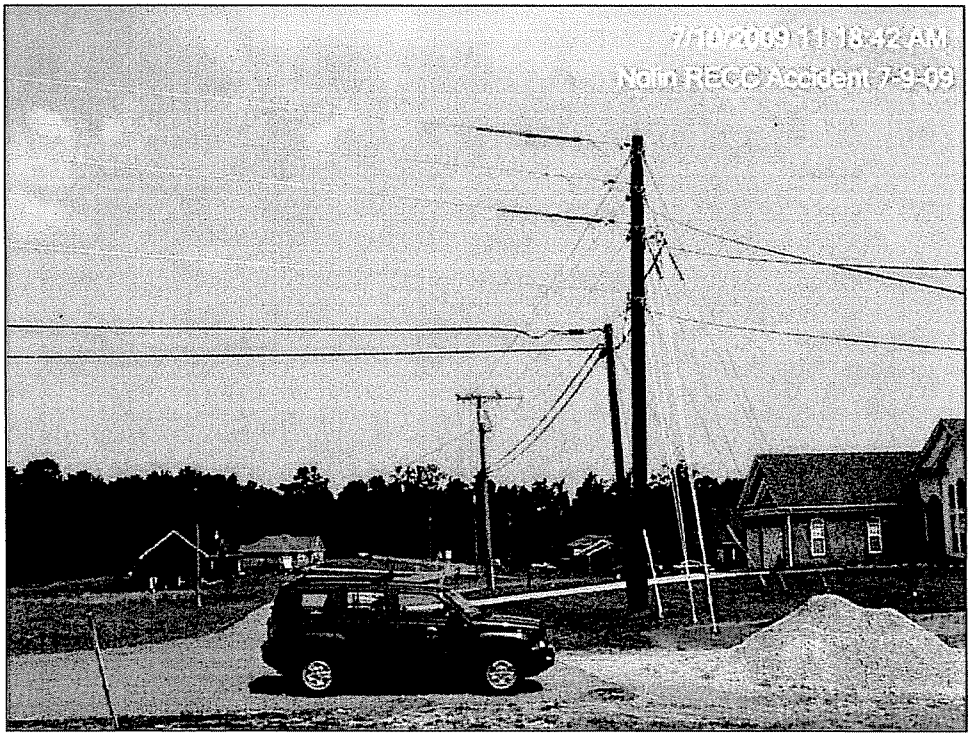
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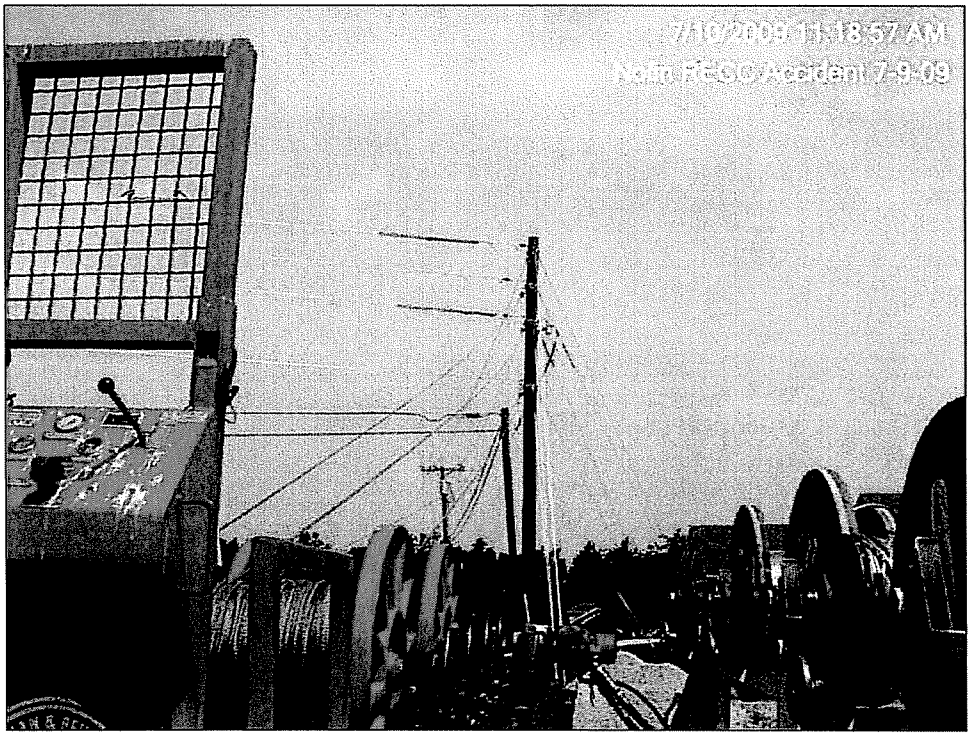
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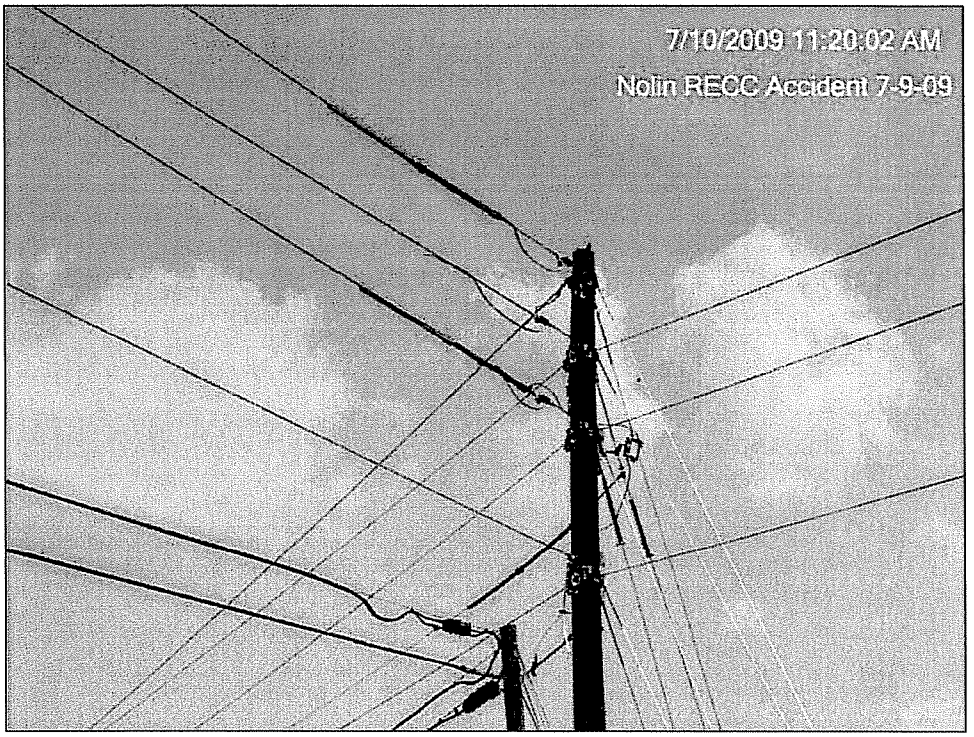
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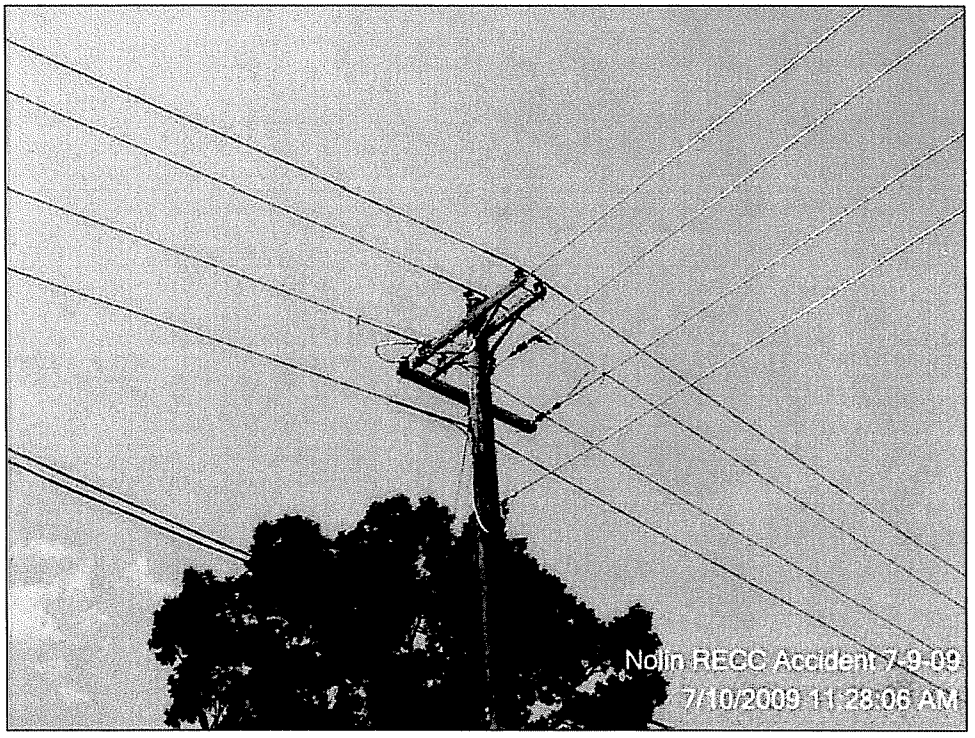
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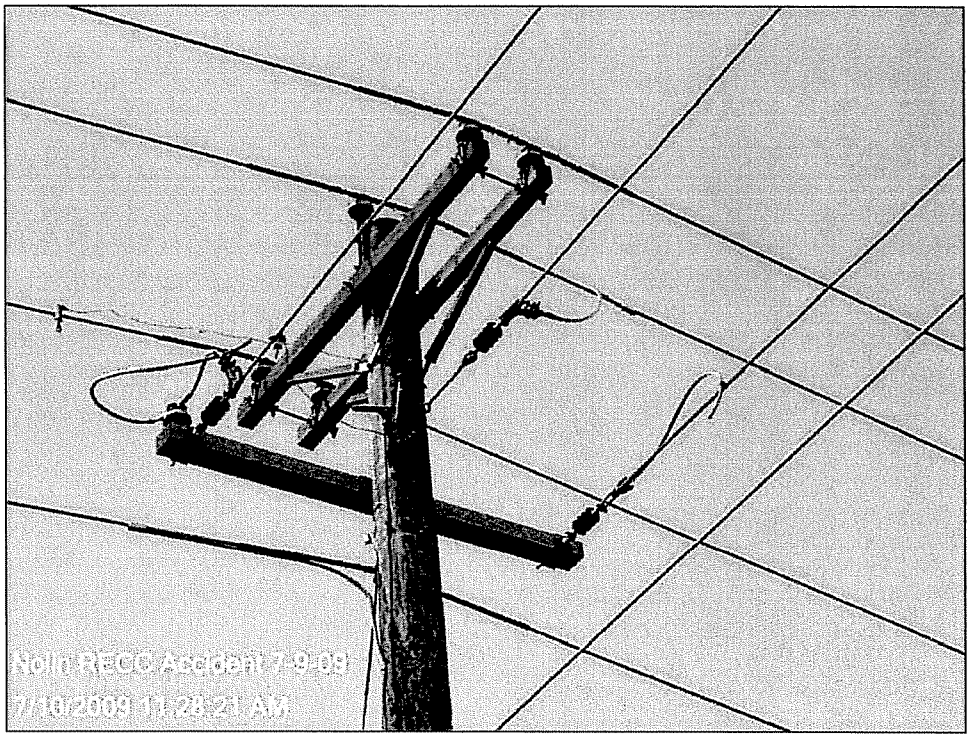
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NOLIN
RECC
63662

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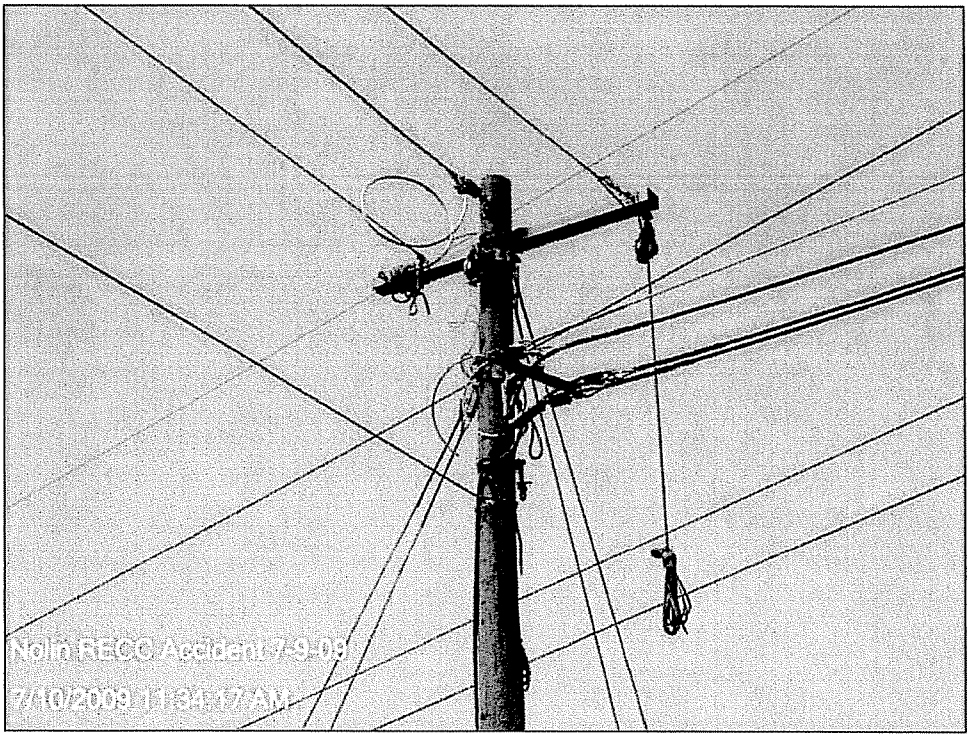

#37

Attachment D

ANSI A92.2-1990 Standard

American National Standard

for

Vehicle-Mounted Elevating and Rotating Aerial Devices

ANSI/SIA A92.2-1990

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

Date of Publication: January 2, 1991

This Standard will become effective January 2, 1992

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

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

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

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

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

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

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

ANSI/SIA
A92.2-1990
Revision of
ANSI A92.2-1979

American National Standard Vehicle-Mounted Elevating and Rotating Aerial Devices

Secretariat

Scaffold Industry Association, Inc.

Approved February 8, 1990

American National Standards Institute, Inc

American National Standard

Approval of an American National Standard requires verification by ANSI that the requirements for due process, consensus, and other criteria for approval have been met by the standards developer.

Consensus is established when, in the judgment of the ANSI Board of Standards Review, substantial agreement has been reached by directly and materially affected interests. Substantial agreement means much more than a simple majority, but not necessarily unanimity. Consensus requires that all views and objections be considered, and that a concerted effort be made toward their resolution.

The use of American National Standards is completely voluntary; their existence does not in any respect preclude anyone, whether he has approved the standards or not, from manufacturing, marketing, purchasing, or using products, processes, or procedures not conforming to the standards.

The American National Standards Institute does not develop standards and will in no circumstances give an interpretation of any American National Standard. Moreover, no person shall have the right or authority to issue an interpretation of an American National Standard in the name of the American National Standards Institute. Requests for interpretations should be addressed to the secretariat or sponsor whose name appears on the title page of this standard.

CAUTION NOTICE: This American National Standard may be revised or withdrawn at any time. The procedures of the American National Standards Institute require that action be taken to reaffirm, revise, or withdraw this standard no later than five years from the date of approval. Purchasers of American National Standards may receive current information on all standards by calling or writing the American National Standards Institute.

Published by
Scaffold Industry Association, Inc.
14039 Sherman Way, Van Nuys, California 91405-2599

Printed in the United States of America

Foreword

This Foreword is not part of American National Standard for Vehicle-Mounted Elevating and Rotating Aerial Devices, ANSI/SIA A92.2–1990.

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

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

This revision to the A92.2 1979 standard separately addresses each entity to clearly define responsibilities. Care was taken to provide consistency between this and other A92 standards. Definitions have been expanded to clarify interpretation.

Interpretations and Suggestions for Improvement

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

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

All requests for interpretation and all suggestions for improvement should be sent to the A92 Committee, Scaffold Industry Association, 14039 Sherman Way, Van Nuys, CA 91405–2599.

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

D. Victor Saleeby, Chairman
Herb Johnson, Vice Chairman
Donald Reichert, Secretary

Organization Represented	*Name of Representative*
American Rental Association	John E. Cooney
Calavar Corporation	Azam S. Qureshi
Edison Electric Institute	Tony E. Branan
	Matthew C. Mingoia (Alt)
	D.W. Richmond (Alt)
E.M.I. – Manufacturers of Aerial Devices & Digger Derricks Council	Jim Bassingthwaite
	John W. McNamee (Alt)
E.M.I. – Manufacturers of Elevating Work Platforms Council	Dennis W. Eckstine
Exchange Carriers Standards Association (ECSA)	Oscar C. Amrhyn
	O.J. Gusella, Jr. (Alt)
Victor N. Farhi, P.E.	Victor N. Farhi

General Cable Company – Apparatus Division	Stephen Reynolds
Genie Industries	Don Kimble
	Ronald W. Barnhart (Alt)
HEK America, Inc.	Bill Barrie
	George Miller (Alt)
Hi-Ranger, Inc.	William K. Holmes
High Reach Co. Inc.	Bradley W. Nester
Holan Manufacturing, Inc.	Larry Stubbs
Institute of Electrical & Electronic Engineers (IEEE)	William H. Cole
	Lewis M. Whisonant (Alt)
International Association of Machinists and Aerospace Workers	Herb Johnson
	Ed Sprang (Alt)
International Brotherhood of Electrical Workers (IBEW)	James M. Ozzello
	James L. Dushaw (Alt)
International Electrotechnical Committee	Joseph M. Van Name, Jr.
JLG Industries, Inc.	Charles M. Recard
Lift-A-Loft Corporation	Alan M. Leduc
	Jeffrey D. Hiatt (Alt)
L.W. Matthews Equipment Limited	C. Denton Elliott
Metroquip, Inc.	H.B. (Bud) Hayden, Jr.
Moore & Sons, Inc.	Joseph E. Rogers
Motor Vehicle Manufacturers' Association	Ken Krueger
	Michael Stamper (Alt)
Pacific Gas & Electric	R. Mickey Wagner
Reach All	Roman V. Dorosz
Donald Reichert Associates	Donald Reichert
Saf-T-Green	Mike Quinn
Safety Dynamicon, Inc.	Ernest J. Merz
Scaffold Industry Association	D. Victor Saleeby
	Gary W. Larson (Alt)
Scaffold Service, Inc.	Douglas Radtke
Snorkel-Economy	Kenneth Davidson
	Lyle D. Grider (Alt)
Speedway Scaffold Co.	Patrick E. Connolly
United Airlines	Harold Smith
Up-Right, Inc.	Barris Evulich
	Michael D. Ream (Alt)
USDOL/OSHA	Roy Gurnham
	Pat Cattafesta (Alt)
The Von Corporation	Fred H. von Herrmann
Wilson Professional Services Co.	W.E. (Hack) Wilson

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

Fred H. von Herrmann, Chairman

William H. Cole, Secretary

Oscar Amrhyn
Jim Bassingthwaite
Tony E. Branan
Pat Cattafesta
William H. Cole
Victor N. Farhi
Frank D. Freudenthal
Roy Gurnham
William K. Holmes
Gary A. McAlexander
Edward L. Moore
R. Vaughn Nichols, Jr.
James M. Ozzello
Joseph D. Patton
Azam S. Qureshi
Stephen Reynolds
Paul E. Skarshaug
Ed Sprang
Larry Stubbs
Joseph M. Van Name, Jr.
R. Mickey Wagner
Lewis M. Whisonant

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American National Standard for Vehicle-Mounted Elevating and Rotating Aerial Devices

1. Scope, Purpose, Requirements, and Application

1.1 Scope.

1.1.1 Equipment Covered. This standard relates to the following types of vehicle-mounted aerial devices:

(1) Extensible boom aerial device

(2) Aerial Ladder

(3) Articulating boom aerial device

(4) Vertical tower

(5) A combination of any of the above

1.1.2 Equipment Not Covered. This standard does not apply to the equipment listed below:

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

(2) Self-propelled elevating aerial platforms such as those covered in American National Standard for Boom-Supported Elevating Work Platforms, ANSI A92.5-1980

(3) Self-propelled elevating aerial platforms (such as those covered in American National Standard for Self-Propelled Elevating Work Platforms, ANSI/SIA A92.6-1990)

(4) Vehicle-mounted vertical life devices such as those covered in American National Standard for Airline Ground Supported Vehicle-Mounted Vertical Lifts, ANSI/SIA A92.7-1990

(5) Vehicle-Mounted Bridge Inspection and Maintenance Devices, ANSI/SIA A92.8[1]

(6) Mast Climbing Work Platforms, ANSI/SIA A92.9[2]

(7) Suspended powered platforms for exterior building maintenance, ANSI A120.1-1970[3]

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

(9) Fire-fighting equipment such as that covered in American National Standard for Automotive Fire Apparatus, ANSI/NFPA 1901-1985

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

(11) Construction and demolition operation/digger derricks such as those covered in American National Standard for Construction and Demolition — Safety Requirements, Definitions and Specifications, ANSI A10.31-1987

(12) Mobile and locomotive truck cranes such as those covered in American National Standard for Mobile and Locomotive Truck Cranes, ANSI/ASME B30.5-1989

(13) Powered crane tip mounted personnel carrying attachments

(14) Personnel platforms attached to the crane boom or suspended by hooks

1.2 Purpose. This standard applies to the establishment of criteria for design, manufacture, testing, inspection, installation, maintenance, use, training, and operation of vehicle-mounted aerial devices, primarily used to position personnel, installed on a chassis to achieve the following objectives:

(1) Prevention of personal injuries and accidents

(2) Uniformity in ratings

(3) Understanding by manufacturers, dealers, installers, maintenance personnel, operators, owners, and users of their respective responsibilities

1.3 Requirements. The requirements of this standard shall be met or exceeded.

1.4 Application. This standard applies only to those aerial devices manufactured after the approval of this revision.

2. Referenced and Related American National Standards

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

[1] At the time of publication of this standard, ANSI/SIA A92.8 was under development. Contact the Secretariat for more recent information.

[2] At the time of publication of this standard, ANSI/SIA A92.9 was under development. Contact the Secretariat for more recent information.

[3] At the time of publication of this standard, ANSI A120.1 was scheduled to be revised and redesignated. Contact the Secretariat for more recent information.

ANSI Z35.1-1972, Specifications for Accident Prevention Signs[4]

ANSI/AWS D1.1-90, Structural Welding Code — Steel

ANSI/AWS D1.2-90, Structural Welding Code — Aluminum

ANSI/AWS B1.10-1986, Guide for Non-Destructive Inspection of Welds

2.2 Other Referenced Standards. This standard is also intended to be used in conjunction with the following standards:

ASTM F887-1988, Specifications for Personal Climbing Equipment[5]

IEEE Std. 4, Techniques for High Voltage Testing[6,7]

Federal Motor Vehicle Safety Standards[8]

2.3 Related American National Standards. The standards listed here are for information only and are not essential for the completion of the requirements of this standard:

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

ANSI A92.5-1980, Boom-Supported Elevating Work Platforms

ANSI/SIA A92.6-1990, Self-Propelled Elevating Work Platforms

ANSI/SIA A92.7-1990, Airline Ground Support Vehicle-Mounted Vertical Lift Devices

ANSI/SIA A92.8, Vehicle-Mounted Bridge Inspection and Maintenance Devices[1]

ANSI/SIA A92.9, Mast Climbing Work Platforms[2]

ANSI A120.1-1970, Suspended Powered Platforms for Exterior Building Maintenance[3]

ANSI A10.8-1988, Construction and Demolition Operations — Scaffolding Safety Requirements

ANSI A10.31-1987, Construction and Demolition — Digger Derricks — Safety Requirements, Definitions and Specifications

ANSI/ASME B30.5-1989, Mobile and Locomotive Truck Cranes

ANSI/NFPA 1901-1985, Automotive Fire Apparatus

ANSI C2-1990 Part 4 (Sections 40-43), National Electrical Safety Code

ANSI Z133.1-1988 Tree Care Operations — Pruning, Trimming, Repairing, Maintaining, and Removing Trees and Cutting Brush

3. Definitions

aerial device. Any device, extensible, articulating, or both, which is primarily designed and used to position personnel. The device may also be used to handle material, if designed and equipped for that purpose.

aerial ladder. An aerial device consisting of a single or multiple-section rung ladder with or without a platform at the top.

articulating-boom aerial device. An aerial device with two or more hinged boom sections.

authorized personnel. A person(s) approved or assigned to perform a specific type of duty(s) or to be at specific location(s) at the job site.

bare-hand work. A technique of performing live line maintenance on energized conductors and equipment whereby one or more authorized persons work directly on an energized part after having been raised and bonded to the energized conductors or equipment.

chassis. A vehicle on which the aerial device is mounted such as a truck, a trailer or an all-terrain vehicle.

chassis insulating system. All dielectric components installed between the chassis and the structure supporting the upper insulating boom. This system will insulate the chassis should the portion of the aerial device between the upper insulated boom and this system contact an energized conductor.

conductive shield (guard ring). A device used to shield the lower test electrode system from capacitive coupling.

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[4]At the time of publication of this standard, ANSI Z35.1-1972 was scheduled to be revised and redesignated as Z535.1, Z535.2, Z535.3, and Z535.4. Contact the Secretariat for more recent information.

[5]Available from American Society for Testing & Materials, 1916 Race Street, Philadelphia, PA 19103

[6]At the time of publication of this standard, IEEE Std. 4 was under development. Contact the Secretriat for more recent information.

[7]Available from Institute of Electrical & Electronic Engineers, Service Center, 445 Hoes Lane, Piscataway, NJ 08855

[8]Available from U.S. Government Printing Office, 710 North Capitol, Washington, DC 20401

equivalent entity. An organization, agency, or individual who, by possession of an appropriate technical degree, certificate, professional standing, or skill, and who, by knowledge, training, and experience, has demonstrated the ability to deal with the problems relating to the subject matter, the work or the project.

extensible-boom aerial device. An aerial device, except the aerial ladder type, with a telescopic or extensible boom.

flashover. A disruptive electrical discharge at the surface of electrical insulation or in the surrounding medium, which may or may not cause permanent damage to the insulation.

guardrail system. A vertical barrier intended to protect personnel from falling to lower levels.

gradient control device. A device(s) at the upper end of an insulating boom that reduces electrical stress level(s) below that considered to be disruptive (commonly referred to as a "corona ring").

instability. A condition of a mobile unit in which the sum of the moments tending to overturn the unit is equal to or exceeds the sum of the moments tending to resist overturning.

insulated aerial device. An aerial device with dielectric components designed and tested to meet the specific electrical insulating rating consistent with the manufacturer's name plate.

insulating liner. An aerial device platform insert made of material having a high dielectric strength.

mobile unit. A combination of an aerial device, its chassis, and related equipment.

mobile operation. The uncradled use of the aerial device while the mobile unit is traveling.

operator. A person trained, authorized, and engaged in the operation of the aerial device.

override. The takeover of aerial device movement control functions at the platform controls by the activation of the lower control station controls.

platform. The personnel-carrying component of an aerial device, such as a bucket, basket, stand, or equivalent.

qualified person. A person who, by possession of an appropriate technical degree, certificate, professional standing, or skill, and who, by knowledge, training, and experience, has demonstrated the ability to deal with problems relating to the subject matter, the work, or the project.

rated load capacity. The maximum loads, specified by the manufacturer, which can be lifted by the aerial device through the specified range of boom elevation and extension with specified options installed and in consideration of stability requirements.

shall. The use of the word "shall" is to be understood as mandatory.

should. The use of the word "should" is to be understood as advisory.

stability. A condition of a mobile unit in which the sum of the moments which tend to overturn the unit is less than the sum of the moments tending to resist overturning.

vehicle. A carrier for an aerial device (see chassis).

vertical tower. An aerial device designed to operate about a vertical axis.

voltage.

(1) **rated line voltage:** The nominal voltage, phase to phase, at which electrical systems are rated.

(2) **design voltage:** the maximum rated line voltage for which the aerial device has been designed, and for which it can be qualified.

(3) **qualification voltage:** The rated line voltage for which the aerial device has been actually tested.

4. Design Requirements

4.1 Basic Principles. The design and manufacture of the aerial device shall comply with the principles outlined in this standard.

4.2 Structural Safety Factors. Structural elements of the aerial device which support the platform, the platform itself, and material carrying attachments, if so equipped, shall have a design stress as stated herein. The calculated design stress shall be based on the combined rated load and weight of the support structure.

For ductile materials having a minimum elongation of 10% in 2 inches the design stress shall not be more than 50% of minimum yield strength of the material.

For non-ductile material the design stress shall not be more than 20% of the minimum ultimate strength of the material.

For chain, cables, and components rated according to ultimate strength, the design stress shall not be more than 20% of the ultimate strength.

The analysis shall consider the effects of stress concentration and dynamic loading and operation on a 5 degree slope.

The analysis shall consider loads produced during travel and mobile operation.

4.3 Controls.

4.3.1 General. Aerial devices primarily designed as personnel carriers shall have both upper and lower controls for boom positioning. All controls shall be plainly identified as to their function and protected from damage and inadvertent actuation. The boom positioning controls shall return to their neutral position when released by the operator.

4.3.2 Upper Controls. Upper controls shall be in or beside the platform and readily accessible to the operator. On a two-platform device, control operation from either platform shall be accomplished with reasonable ease and without the need to disengage the safety lanyard.

In order to prevent any inadvertent actuation of the boom positioning controls at the platform, the use of an unlocking device shall precede the use of the control itself and shall be maintained simultaneously during the use of the controls. The unlocking device may be incorporated into each control.

4.3.3 Lower Controls. Lower controls shall be readily accessible and shall provide for over-riding the boom positioning upper controls provided the upper control system is intact. They shall be plainly identified as to their function and protected from damage and inadvertent actuation.

The override mode shall be capable of preventing boom movement with the lower control station unattended.

4.3.4 Emergency Stop. A control shall be provided at the platform to effect an emergency stop of platform movement. This control shall not require continuous actuation for a stop condition.

4.3.5 Outrigger Controls. When the aerial device is equipped with outrigger controls, these controls shall be guarded to protect against inadvertent operation, and shall return to neutral when released by the operator.

The controls shall be located so that the operator can see the outrigger being operated.

4.3.6 Winch Control. If the aerial device is equipped with a material handling winch at the upper boom, it shall have both upper and lower controls to operate the winch.

4.4 Travel Securing Device.

4.4.1 Ladder Securing Device. Aerial ladders that are counterbalanced for ease in raising to, and lowering from, an operating position shall be equipped with a device to secure the ladder in the traveling position.

4.4.2. Boom Securing Device. Aerial devices shall be equipped either with a device(s) to secure the boom(s) or shall be designed to ensure that the boom(s) remain in the cradled position when in transport.

4.4.3 Platform Security. Platforms shall be designed to withstand vibration and shock loading during travel.

4.5 Stability.

4.5.1 Stability on Level Surfaces. Each aerial device, when mounted on a vehicle meeting the manufacturer's minimum vehicle specifications, without readily removable tools and material and used in a specific configuration, shall comprise a mobile unit capable of sustaining a static load one and one-half times its rated load, in every position in which the load can be placed within the definition of the specific configuration, when the vehicle is on a firm and level surface.

The load shall be applied at one and one-half times the platform(s) rated load at the center of the platform simultaneously with one and one-half times the lifting device rated load at the point of load application in its position of maximum overturning moment when so equipped.

The simultaneous application of material load and platform load shall be done on the aerial devices that are designed to be used in service with both loads applied simultaneously.

If having the outriggers extended is part of the definition of the configuration, they shall be extended to provide leveling for the purpose of determining whether the mobile unit meets the stability requirements.

4.5.2 Stability on Slopes. Each aerial device, when mounted on a vehicle meeting the manufacturer's minimum vehicle specifications without readily removable tools and material and used in a specific configuration, shall comprise a mobile unit capable of sustaining a static load one and one-third times its rated load capacity in every position in which the load can be placed within the definition of the specific configuration when the vehicle is on a slope of 5 degrees downward in the direction most likely to cause overturning.

The load shall be applied at one and one-third times the platform(s) rated load at the center of the platform, simultaneously with one and one-third times the lifting device rated load at the point of load application in its position of maximum overturning moment when so equipped. If having the outriggers extended to a firm footing is part of the definition of the configuration, they shall be extended to provide leveling for the purpose of determining whether the mobile unit meets the stability requirements. If other facilities,

such as a means of turntable leveling are provided to minimize the effect of the sloping surface, then those facilities shall not be utilized for the purpose of determining whether the mobile unit meets the stability requirements.

The simultaneous application of material load and platform load shall be done only on the aerial devices that are designed to be used in service with both loads applied simultaneously.

Vertical towers designed specifically for operation only on a level surface shall be excluded from this requirement.

4.5.3 Effects of Stability Test. None of the stability tests described in 4.5.1 and 4.5.2 shall produce instability of the mobile unit or cause permanent deformation of any component.

During the stability test, the lifting of a tire or outrigger on the opposite side of the load does not necessarily indicate a condition of instability.

4.6 Bursting Safety Factors. All hydraulic components whose failure could result in motion of the platform(s) or material lifting device or both shall have a minimum bursting strength of at least four times the operating pressure for which the system is designed.

All other hydraulic components normally rated according to bursting strength, such as hose, tubing, and fittings, shall have a minimum bursting strength of at least three times the operating pressure for which the system is designed.

All other hydraulic components normally rated according to performance criteria, such as rated flow and pressure, life cycles, pressure drop, rpm, torque, and speed, shall have a minimum bursting strength of at least two times the operating pressure for which the system is designed. Such components generally include pumps, motors, directional controls, and similar functional components.

4.7 Hydraulic Cylinders.

4.7.1 Safety Factors. Cylinder components subjected to hydraulic pressure shall comply with the requirements of Section 4.6. All other components shall comply with Section 4.2.

4.7.2 Column Load. The maximum load on any cylinder at the rated capacity of the aerial device in any position, shall not exceed one half of the load which would cause permanent deformation.

4.7.3 External Load. Stresses calculated for load carrying components shall include the additive effects of both external and internal forces, such as those resulting from hydraulic pressure.

4.7.4 Threaded Components. All threaded members used to secure critical components such as hydraulic pistons, barrel bases, head glands and rod eyes, shall be secured against rotation by means of a suitable locking device.

4.7.5 Hydraulic Pressure Rise. A means shall be provided to limit pressure rise due to factors such as thermal expansion of hydraulic fluid and leakage that could result in stresses that exceed the yield strength of the material.

4.8 System Protection. Where the operation of the aerial device is accomplished by hydraulic means, the system shall be equipped with appropriate devices to prevent motion of the platform(s) or material lifting device, or both, in the event of hydraulic line failure.

This requirement does not apply to properly guarded metallic tubing installed between a holding device and the cylinder.

Where the operation of the aerial device is accomplished electrically, the system shall be designed to prevent motion in the event of power loss.

4.9 Platforms.

4.9.1 Dimensions. The platforms (buckets or baskets) shall conform to the inside dimensions shown in Figure 1.

4.9.2 Guardrail System. Platforms other than buckets or baskets shall include a guardrail system:

(1) The guardrail system shall include a top rail around its upper periphery. The top rail shall be 42 inches high, plus or minus 3 inches above the platform surface, designed to withstand 300 pounds of force.

(2) The guardrail system shall include at least one rail approximately midway between the top rail and the platform surface, designed to withstand 300 pounds of force.

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

(4) The configuration of the aerial platform shall include access for personnel entering the platform when it is in the lowered position. Access steps or rungs shall have a slip resistant surface. Flexible materials such as cables, chains, and rope may be used across access opening(s) not more than 30 inches wide.

4.9.3. Ladder Type. Ladder type platforms are permissible.

4.9.4 Folding-Type Floors. Platforms with folding-type floors and steps or rungs may be used without rails and kick plates.

4.9.5 Attachments. A restraint attachment, conforming to ASTM F887-1988, that allows personnel to attach a safety strap or lanyard to the ladder, platform or boom shall be provided.

4.9.6 Platform with Liner. A platform may have the provision to accept liner.

The liner shall be supported by the inside bottom surface of the platform.

4.9.7 Fiberglass Platforms. There shall be no open holes or passages in fiberglass platforms on insulated aerial devices.

4.10 Markings.

4.10.1 Type of Markings. An aerial device shall have the following markings:

(1) Identification markings
(2) Operational markings
(3) Instructional markings

4.10.2 Design of Markings. Color, format, and substance shall conform to ANSI Z35.1-1972[4].

5. Electrical Systems & Devices

5.1 Electrical Specifications

5.1.1 Insulation. The aerial device manufacturer shall state in the manual and on the instruction plate(s) whether the aerial device is insulating or non-insulating.

NOTE: Insulating aerial devices do not protect personnel from phase to phase or phase to ground contacts at the platform end.

5.1.2 Insulating Aerial Device Categories

(1) Category A. Aerial devices which are designed and manufactured for work in which the boom is considered primary insulation (bare-hand work) shall have all conductive components at the platform end bonded together to accomplish equipotential of all such components (See Figure 6). Such aerial devices shall be marked at the platform indicating such bonding. These aerial devices shall be equipped with a lower test electrode system (Figure 2A).

When these aerial devices are qualified for work above 138 kV, they shall be equipped with a gradient control device and conductive shield(s) over the lower test electrode system.

For those aerial devices with ratings 138 kV and below, conductive shield(s) over the lower test electrode system are required. The necessity of a gradient control device is to be determined by the Qualification test.

(2) Category B. Aerial devices which are designed and manufactured for work in which the boom is not considered as primary insulation, but secondary, such as that using insulating (rubber) gloves;

Isolation or bonding of the conductive components at the platform end is not a requirement.

These aerial devices shall be equipped with a lower test electrode system (Figure 2A).

(3) Category C. Aerial devices which are designed and manufactured for work in which the boom is not considered primary insulation, but secondary;

Isolation or bonding of the conductive components at the platform end is not a requirement.

These aerial devices are not equipped with a lower test electrode system, and are designed for 46 kV and below.

5.2 Electrical Requirements

5.2.1 Insulated Systems. All components crossing the insulated portions of the aerial device shall have electrical insulating values consistent with the design voltage rating of the boom, and when provided, of the chassis insulating system. The insulating system shall maintain the electrical insulating values in all working boom positions as defined by the manufacturer.

5.2.2 Vacuum Prevention Systems. Category A & B aerial devices with insulated hydraulic lines which cross the insulating section(s) shall have a method to prevent vacuum and resulting reduction in dielectric strength.

Category C aerial devices with a platform height greater than 50 feet shall have this provision.

5.2.3 Lower Test Electrode System for Insulating Aerial Devices. Conductive bands shall be installed permanently on the inside and outside surfaces of the insulated portion of the upper boom for the purpose of monitoring dielectric current. The conductive bands shall be 2 inches minimum from the metal portion of the lower end of the insulated upper boom.

All hydraulic, fiber optic and pneumatic lines crossing the insulated portion of the upper boom shall have conductive couplings at the lower bulkhead of the upper boom which connect the inside and outside of each line to the current monitoring circuit.

The conductive bands, fiber optic cable, hydraulic and pneumatic lines and any item such as leveling rods shall be connected individually and monitored from a common pickup point. Provisions shall be made for the isolation of individual components to identify each leakage path. A shielded lead(s) to the meter receptacle shall provide the electrical monitoring path from the lower bulkhead of the upper boom.

Suitable access shall be provided to the bulkhead and to the electrical connections inside the boom. The typical details of this system are shown in Figure 2A.

5.2.4 Gradient Control Devices & Conductive Shield(s)

5.2.4.1 Gradient Control Devices. Gradient control device(s) when required shall be installed on the platform end of the insulating section of the upper boom. All conductive items, including fittings at the platform, shall be bonded to the gradient control device. No conductive component may extend past the device(s) in any boom position.

NOTE: During the 60 Hz design voltage test, the Gradient Control Device shall not permit corona streamers to impinge on the insulating system.

5.2.4.2 Conductive Shield(s). Insulating aerial devices equipped with gradient control devices shall have the lower test electrode system equipped with a conductive shield (See Figure 2A) or an equivalent to reduce the capacitive coupling effect and to improve indication of resistive current.

5.2.5 Chassis Insulating System. Aerial devices with a chassis insulating system shall have means provided to by-pass the chassis insulating system during electrical test, or bare-hand use. (See Figure 4A.)

5.3 Electrical Tests for Insulating Aerial Devices

5.3.1 Design Voltage Test. The manufacturer shall perform a test as shown in Table 1, on a prototype aerial device, to verify the line voltage for which the aerial device has been designed.

5.3.2 Qualification Test. Each insulating aerial device shall be tested in accordance with Section 5.4.2. to insure compliance with the Electrical Qualification requirements as appropriate.

NOTE FOR THE INSTALLER: The Qualification Test shall be performed on the mobile unit for devices qualified higher than 46 kV. On devices qualified at lesser voltages, the installer may accept previously performed tests to the Qualification Voltage ratings (provided they are in accordance with the requirements of this standard), provided the device is not altered or modified, by performing the Periodic/Maintenance Test (Section 5.4.3) to insure the device has not been contaminated during shipment or installation.

If the device is altered or modified by the installer after the Qualification Test is performed, the original Qualification Test is not valid.

NOTE: Alteration or modification includes such things as additions of an additional platform, a jib, a winch, or other auxiliary devices, and other alterations. The installer should also be cautioned that addition of devices shall be with written approval of the manufacturer in order that the requirement for design testing is met.

5.3.3 Quality Assurance Test. The manufacturer shall perform an electrical test on each insulating aerial device to a Qualification voltage as shown in Table 1.

5.3.4 Periodic Electrical Test. Each insulating aerial device shall be periodically electrically tested in accordance with Section 5.4.3 to verify the dielectric resistivity and detect conductivity changes in its insulating sections.

5.3.5 Before Use (Frequent) Test. Each insulating aerial device may be electrically tested before use (frequently) in accordance with paragraphs 5.4.3.1(b), 5.4.3.1(c), and 5.4.3.2(c) to measure boom current from phase conductor to ground.

5.4 Electrical Test Procedures.

5.4.1 General. These specific electrical test procedures are designed to ensure consistency in testing practices. Sound engineering practices must be utilized when designing electrical testing programs to maintain the dielectric integrity of insulating aerial devices.

5.4.2 Design, Qualification, and Quality Assurance Test Procedures.

5.4.2.1 Test Procedures for Category A & B Aerial Devices.

(1) Bonding. All metal at the platform end of the insulated boom shall be electrically bonded during the test.

(2) A Category "A" aerial device with a non-conductive platform shall have a metal liner installed and bonded prior to test as shown in (Figure 6).

(3) The lower test electrode system shall be tested for continuity.

(4) All hydraulic lines bridging the insulating boom section shall be completely filled with oil during the test.

(5) Elbows shall be shunted as shown in Figure 2.

(6) Chassis insulating systems, if equipped, shall be shunted as shown in Figure 4A.

(7) The vehicle chassis shall be grounded.

(8) The current meter receptacle shall be connected through a shielded cable to a current meter and then to ground.

(9) Booms should be positioned as shown in Figure 2 or Figure 5.

(10) Test criteria of Table 1 shall be followed.

(11) The current value for the rated voltage shall be documented as part of the Qualification data.

5.4.2.2 Test Procedures for Category C Aerial Devices.

(1) Bonding. All metal at the platform end of the insulating boom section shall be electrically bonded during the test.

(2) All hydraulic lines bridging the insulating boom section shall be completely filled with oil during the test.

(3) Elbows shall be shunted as shown in Figure 3.

(4) Chassis insulating systems, if equipped, shall be shunted as shown in Figure 4A.

(5) The mobile unit shall be tested as shown in Figure 3 or 3A.

(6) The mobile unit or test pad shall be connected through a shielded cable to a current meter and then connected to ground.

(7) Booms should be positioned as shown in Figure 3, 3A or 5.

(8) Test criteria of Table 1 shall be followed.

(9) The current for the rated voltage test shall be documented as part of the Qualification Data.

5.4.2.3 Test Procedures for Aerial Ladders and Vertical Towers, with Insulating Boom Sections.

(1) The test for aerial ladders shall be conducted with the upper section extended only far enough to permit the ladder platform to drop into its operating position or for a predetermined extended length, as indicated on the ladder section.

(2) Aerial ladders or vertical towers that are stated by the manufacturer as insulated shall be tested in accordance with 5.4.2.1.

(3) The test for vertical towers shall be conducted with the tower platform rails in a raised position within the confines of the platform with the unit in a normally stored position or as recommended by the manufacturer.

5.4.2.4 Test Procedures for Chassis Insulating Systems.

(1) All hydraulic lines crossing the insulating system shall be filled with oil during the test.

(2) The mobile unit shall be connected to a current meter and then connected to ground through a shielded cable.

(3) Position booms and test as shown in Figure 4.

(4) Voltage shall be applied to the metal above the insulating system.

(5) Test the insulating system to 50 kV 60 Hz for 3 minutes. The current shall not exceed 3 milliamps.

5.4.2.5 Test Procedures for Insulating Liners.

Platform liners used for insulation shall be tested in a conductive liquid. The liquid level around both the inner and outer surfaces of the liner shall be within 6 inches of the top of the liner. The liner shall withstand a minimum of 50 kV 60 Hz for 1 minute without flashover or breakdown through the material.

5.4.2.6 Test Procedures for Extensible Boom Devices with Permanent Electrodes.

Follow 5.4.2.1 except that the conductive shield(s), if so equipped, may be removed.

5.4.3 Periodic/Maintenance Test Procedures.

5.4.3.1 Test Procedures for Category A & B Insulating Aerial Devices.

(1) Bonding. All conductive material at the upper end of the insulated boom shall be electrically bonded during the test.

(2) A non-conductive platform on a Category "A" aerial device shall have the metal liner installed and bonded prior to test.

(3) The lower test electrode system shall be tested for continuity.

(4) All hydraulic lines crossing the insulating boom section shall be completely filled with oil during the test.

(5) Elbows shall be shunted as shown in Figure 4A.

(6) The vehicle chassis shall be grounded.

(7) The current meter receptacle shall be connected through a shielded cable to a current meter and then to ground.

(8) Booms should be positioned as shown in Figure 2.

(9) One of the following tests shall be performed:

(a) A 60 Hz Test Voltage as shown in Table 2;

(b) A Direct Current Test Voltage as shown in Table 2;

(c) In the field, and with the vehicle grounded, the insulated boom may be raised into a high voltage line whose voltage is as high or higher than the voltage to be worked, but not to exceed the Qualification Voltage of the aerial lift unit. Current shall not exceed values as shown in Table 3. This test shall be performed on a frequent basis to meet the Periodic Test requirement. The values in Table 3 are to be used.

(d) In the field and with the vehicle grounded, a fused and protected ammeter shall be placed between the high voltage line and the bonded metal fitting at the platform. A shunting arrangement shall be used while engaging or disengaging from the power line. (This test may be used as the Periodic Test when the voltage is at least double that of any circuit on which the aerial device is to be used, but not exceeding the Qualification Voltage of the aerial device).

The ammeter should be shielded from any stray electrical currents, and should give the measurement of any leakage current across the boom and controls, or any capacitive currents involved from the platform to ground, or both. The minimum voltage of the test line should be that of any circuit on which the aerial device is to be used. This test shall be performed on a frequent basis to meet the Periodic Test requirement.

5.4.3.2 Test Procedures for Category C Aerial Devices.

(1) Bonding. All metal at the platform end of the insulating boom section shall be electrically bonded during the test.

(2) All hydraulic lines crossing the insulating boom section shall be completely filled with oil during the test.

(3) Elbows shall be shunted as shown in Figure 3 or 3A.

(4) Chassis insulating systems, if provided, shall be shunted as shown in Figure 4A.

(5) One of the following tests shall be performed:

(a) With adequate test facilities, the mobile unit shall be insulated from all paths to ground as shown in

Figure 3 and shall be connected through a coaxial cable to a current meter and then to ground. Booms are to be positioned as shown in Figure 3. The current shall not exceed the values as shown in Table 2.

(b) With adequate test facilities, the mobile unit shall be grounded, and direct current tests conducted per the alternate method in Figure 3A with a current meter connected between the voltage source and the unit. The current shall not exceed the values as shown in Table 2.

(c) In the field and with the vehicle grounded, a fused and protected ammeter shall be placed between the high voltage line and the bonded metal fitting at the platform. A shunting arrangement shall be used while engaging or disengaging from the power line.

The ammeter should be shielded from any stray electrical currents, and should give the measurement of any leakage current across the boom and controls, or any capacitive currents involved from the platform to ground, or both. The minimum voltage of the test line should be that of any circuit on which the aerial device is to be used. This test shall be performed on a frequent basis to meet the Periodic Test requirement. This test may be used as the Periodic Test when the voltage is at least double that of any circuit on which the aerial device is to be used, but not exceeding the Qualification Voltage of the aerial device. The values in Table 3 are to be used.

5.4.3.3 Test Procedures for Aerial Ladders and Vertical Towers with Insulating Boom Sections.

(1) The test for aerial ladders shall be conducted with the upper section extended only far enough to permit the ladder platform to drop into its operating position or for a predetermined extended length, as indicated on the ladder section.

(2) Vertical towers shall be tested with the tower platform rails raised within the confines of the platform, and with the unit in its normally stored position or as recommended by the manufacturer.

(3) Aerial ladders or vertical towers that are rated by the manufacturer as insulated shall be tested in accordance with 5.4.3.2.

5.4.3.4 Test Procedures for Chassis Insulating Systems.

(1) Voltage shall be applied to the metal above the insulating system.

(2) All hydraulic lines crossing the insulating system shall be filled with oil during the test.

(3) The mobile unit shall be connected through a shielded cable to a current meter and then connected to ground.

(4) Position and test booms as shown in Figure 4.

(5) One of the following tests shall be performed:

(a) A voltage of 35 kV 60 Hz for 3 minutes. The current shall not exceed 3 milliamperes.

(b) A DC test voltage of 50 kV for 3 minutes. The current shall not exceed 50 microamperes.

5.4.3.5 Test Procedures for Insulating Liners.

One of the following tests shall be performed:

(1) Platform liners used for insulation shall be tested in a conductive liquid. The liquid level around both the inner and outer surfaces of the liner shall be within 6 inches of the top of the liner. The liner shall withstand a minimum of 35 kV 60 Hz for 1 minute or 100 kV DC for 3 minutes without flashover or breakdown through the material.

(2) Alternate test method for platform liners is as follows: The four sides and the bottom of liner may be tested one side at a time on a test table with wet cellulose sponge, cloth towels, or metal foil used as electrodes. The electrodes shall adhere closely to the entire surface inside and outside to within 6 inches of the top of the liner. Make certain that the area on all corners is tested. The bottom may be tested with approximately 2 inches of water inside, and wet cellulose sponge outside.

The liner shall withstand a minimum of 35 kV 60 Hz for 1 minute, or 100 kV DC for 3 minutes without flashover or puncture of liner wall.

5.4.3.6 Test Procedures for Extensible Boom Devices Without Permanent Electrodes or With Electrodes and Tested as a Category C Device.

Follow 5.4.3.2.

5.5 Electrical Test Equipment. The test equipment shall meet the requirements of IEEE Std. 4[6]. Voltage measuring systems which provide A.C. rms may also be used. The metering systems used to measure A.C. current shall have an internal resistance of less than 1,000 ohms.

5.6 Electrical Certification. The Qualification Test required under Section 5.2.2 shall be documented by the entity performing such, with a certified report provided to the purchaser upon his request.

6. Responsibilities of Manufacturers

6.1 General Responsibilities. Each manufacturer shall comply with the requirements of this section.

6.2 Specifications.

6.2.1 Vehicle Specifications. The aerial device manufacturer shall provide to the installer the minimum values, as applicable, for the following characteristics of vehicles required to provide a stable and structurally sound vehicle for the aerial device:

(1) The front gross axle weight rating (GAWR front)

(2) The rear gross axle weight rating (GAWR rear)
(3) The gross vehicle weight rating (GVWR)
(4) The frame section modulus
(5) The yield strength of the vehicle frame
(6) The frame resisting bending moment (RBM)
(7) The wheelbase dimension (WB)
(8) The rear of cab to rear axle centerline dimension (CA)
(9) The minimum axle weights of the mobile unit to achieve stability

6.2.2 Aerial Device Specifications.

6.2.2.1 General. The aerial device manufacturer shall clearly state in the manual and on the aerial device the following information:
(1) Make and model
(2) Rated load capacity
(3) Height
(4) Maximum pressure of the hydraulic system and voltage of the electrical system
(5) Cautions and restrictions of operation
(6) Category
(7) Multiple Configurations

6.2.2.2 Capacity. Rated load capacity is of two distinct types:
(1) The platform load consisting of the weight of personnel and all items carried on or in the platform, such as a platform liner
(2) Supplemental loads which may be fixed directly to the boom(s), or to load carrying attachments on the aerial device

The capacity rating in either case shall be designated with boom or booms and load carrying attachments extended to the position of maximum overturning moment attainable throughout full rotation. Capacities of the aerial device in other positions shall be specified separately. The manufacturer shall state all applicable ratings in the manual and on placards affixed to the aerial device.

It shall be indicated if these capacity ratings are based on some fixed conditions of the load carrying attachments.

6.2.2.3 Height. Height shall be determined at maximum elevation, from the floor of the platform to the ground, with the aerial device assumed to be mounted on a vehicle having a chassis frame height of 36 inches.

6.2.2.4 Reach. Reach, as a maximum, shall be measured in the horizontal plane, from the centerline of rotation to the outer edge (rail) of the platform.

6.2.2.5 Multiple Configurations. When the aerial device supplied has multiple configurations, the manufacturer shall clearly describe these configurations, including the rated load capacity of each, in the manual and on the aerial device. Examples:

(1) With outriggers extended versus outriggers not extended
(2) With chassis suspension locking device engaged versus disengaged
(3) With one platform versus more than one platform
(4) Used as a personnel-carrying device only versus used as a personnel-carrying and material-handling device
(5) With extensible aerial device retracted or extended
(6) When using the device with the vehicle in motion

If the rated load capacity of the configuration is related to an angle which a boom(s) makes with the horizontal, the manufacturer shall install a means by which the angle of the boom(s) can be determined.

6.2.2.6 Design Voltage. The manufacturer shall state the design voltage (A.C. or D.C.) in the manual and on the instruction plate(s).

6.2.2.7 Qualification Voltage. The manufacturer shall state the qualification voltage (A.C. or D.C.) in the manual and on the instruction plate(s).

NOTE: Section 5 details the procedures for Electrical Requirements.

6.3 Quality Assurance. The manufacturer shall have a quality assurance program which will ensure compliance with this standard.

6.4 Manuals. The manufacturer shall provide a separate operators manual and a separate parts/maintenance manual for each aerial device. Two sets of manuals shall accompany each device.

The manuals shall contain:
(1) Descriptions, specifications, and ratings of the aerial device
(2) Operating instructions for the aerial device and its auxiliary systems
(3) Precautions relating to multiple configurations (6.2.2.5) such as performing aerial work from a moving vehicle
(4) Instructions regarding routine and frequency of recommended maintenance
(5) Replacement part information
(6) Instruction markings per 6.5.4

6.5 Markings. The aerial device shall have identification, operation, and instruction placards, decals, plates, or the equivalent, which are legible, and readily visible. In no event shall markings be applied which reduce the insulating properties of the aerial device.

6.5.1 Applicable Markings. The manufacturer shall install on each aerial device all applicable markings or provide these markings with appropriate

installation instructions.

6.5.2 Identification Markings. The manufacturer shall install or provide a marking to indicate the following (See Figure 7 for recommended marking format):

(1) Make
(2) Model
(3) Insulated or non-insulated
(4) Qualification voltage and date of test
(5) Serial number
(6) Year of manufacture
(7) Rated load capacity
(8) Height
(9) Aerial device system pressure or aerial device system voltage, or both
(10) Number of platforms
(11) Category of aerial device
(12) Design voltage

6.5.3 Operational Markings. The manufacturer shall install or provide markings describing the function of each control.

6.5.4 Instructional Markings. Markings shall be determined by the manufacturer or the manufacturer and user jointly to indicate hazards inherent in the operation of an aerial device. Instructional markings shall be provided for:

(1) Electrical hazards involved in the operation of the machine to warn that an aerial device does not provide protection to the operator from contact with or in proximity to electrically charged equipment, conductor or other components when the operator is in contact with or in proximity to another electrical component

(2) Electrical hazards involved in the operation of the machine to warn that an aerial device, when working on or in proximity to energized conductors, shall be considered energized, and that contact with the aerial device or vehicle (including attached trailers) under those conditions may cause serious injuries

(3) Hazards that result from failure to operate the equipment in a prescribed manner

(4) Information related to the use and load rating of the equipment for material handling

(5) Information related to the use and load rating of the aerial device for multiple configurations

(6) Information related to operator cautions

(7) Information related to the use of the aerial device for mobile operation

6.6 Mechanical Tests and Inspection.

6.6.1 Operational Tests. In addition to the manufacturer's prototype tests and quality assurance measures, each aerial device, including mechanisms, shall be tested by the manufacturer to the extent necessary to ensure compliance with the operational requirements of this section.

Some examples are:

(1) Boom(s) elevating and lowering mechanism
(2) Boom extension mechanism
(3) Rotating mechanism
(4) Stability tests
(5) Safety devices

When the complete mobile unit is not supplied by the manufacturer, such tests, which can be performed only after complete assembly and installation, shall be the responsibility of the final installer.

6.6.2 Visual Inspection. A visual inspection of the finished unit shall be made to determine that the operational test has not produced an adverse effect.

6.7 Electrical Tests. Insulating aerial devices shall be tested in accordance with the requirements of Section 5.

6.8 Installation Instructions. The manufacturer shall provide instruction for installing or mounting the aerial device to the installer.

6.9 Welding. All welds whose failure could result in motion of the platform(s) shall meet the Structural Welding Code, ANSI/AWS D1.1-90 and ANSI/AWS D1.2-90.

The manufacturer shall establish applicable welding quality assurance procedures for all weldments. Methods of non-destructive testing shall be described in the manufacturer's quality assurance procedures. The manufacturer shall designate in an appropriate manual the welds to be examined, the extent of the examination, and the method of test.

If non-destructive testing is designated, the particular method used shall be in accordance with ANSI/AWS B1.10-1986.

7. Responsibilities of Dealers and Installers

7.1 General Responsibilities. Each dealer or installer as applicable shall comply with the requirements of this section.

7.2 Vehicle Specifications. Each dealer or installer, or both, who sells an aerial device shall inform the owner or user, or both, of the manufacturer's minimum vehicle specifications.

7.3 Vehicle Weight Distribution. The installer shall be responsible for the weight distribution of the completed mobile unit in accordance with the requirements of the aerial device and the applicable regulations. Allowance shall be made for the weight of readily removable tools and material specified by the user.

7.4 Manuals. Upon delivery of the equipment to the owner or user, the dealer or installer shall provide the manuals as required by Paragraph 6.4 of this standard and manuals for its auxiliary equipment added by the installer.

7.5 Installations. The installer shall comply with Sections 5 and 6 of this standard relating to proper installation and shall follow the instructions of the manufacturer. In the event the original manufacturer no longer exists, an equivalent entity may provide these instructions.

The installer of an aerial device shall, before the mobile unit is placed in operation, perform stability tests in accordance with the requirements of 4.5.1 and 4.5.2, the operational and visual tests in accordance with the requirements of 6.6.1 and 6.6.2, and the appropriate electrical tests required in 5.4.3 of this standard. The installer shall comply with all requirements of the applicable Federal Motor Vehicle Safety Standards in effect at the time of installation. Certification as a manufacturer (alteration, intermediate or final) of a motor vehicle under the Federal Motor Vehicle Safety Standards is required. The travel height of the mobile unit shall be posted in a location that is readily visible to the vehicle operator.

For insulated aerial devices, the installer shall assure conformance to the Qualification test requirements of 5.3.2 by either obtaining certification of the test and performing a periodic test after installation, or by performing the Qualification test.

7.6 Quality Assurance. The installer shall have a quality assurance program which will ensure compliance with this standard.

7.7 Welding. All welds made by the installer, whose failure could result in motion of the platform(s) shall meet the Structural Welding Code ANSI/AWS D1.1-90 and ANSI/AWS D1.2-90. The installer shall establish applicable welding quality assurance procedures for all weldments.

7.8 Training. The dealer or installer shall offer operator training initially in the operation of the aerial device(s) to the purchaser.

8. Responsibilities of the Owners and Users

8.1 General Responsibilities. Each owner or user shall comply with the requirements of this section.

The following responsibilities pertain to owner and user inspection, testing, maintenance and modification. These activities shall be performed by qualified person(s).

8.2 Inspection and Testing Classifications

8.2.1 Initial Inspection and Test. Prior to initial use, all new or modified mobile units shall be inspected and tested to ensure compliance with the provisions of this standard. Verification by the manufacturer, the installer or an equivalent entity(s), meets this requirement.

8.2.2 Regular Inspection and Tests. The inspection procedure for mobile units is divided into two classifications based upon the intervals at which inspections and tests shall be performed. Safe intervals shall be set by the user based on the recommendations that shall be supplied by the manufacturer.

Such intervals are dependent upon component function and exposure to wear, deterioration and other agents which adversely affect component life. Two classifications are designated:

(1) Frequent Inspection and Test: Daily to monthly intervals

(2) Periodic Inspection and Test: One to twelve month intervals

8.2.3 Frequent Inspection and Test. Items determined by the user based on recommendations by the manufacturer for each specific aerial device shall be inspected for defects.

Inspection and tests referred to as critical in the manufacturer's manual shall be strictly adhered to.

The following tests and inspections shall be performed by the operator once daily, prior to first use:

(1) Operating controls and associated mechanisms for conditions interfering with proper operation

(2) Visual and audible safety devices for malfunction

(3) Hydraulic or pneumatic systems for observable deterioration or excessive leakage

(4) Fiberglass and other insulating components for visible damage or contamination

(5) Missing or illegible operational markings

(6) Electrical apparatus for malfunction, signs or excessive deterioration, dirt, and moisture accumulation

Any suspected items shall be carefully examined and a determination made by a qualified person as to whether they constitute a safety hazard. All unsafe items shall be replaced or repaired before use.

8.2.4 Periodic Inspection and Test. An inspection of the mobile unit shall be performed at the intervals defined in 8.2.2 depending upon its activity, severity of service, and environment, or as specifically indicated below. (These inspections shall include the requirements of 8.2.3).

(1) Structural members for deformation, cracks or corrosion

(2) Parts, such as pins, bearings, shafts, gears,

rollers, locking devices, chains, chain sprockets, wire ropes, and sheaves for wear, cracks or distortion

(3) Hydraulic and pneumatic relief valve settings

(4) Hydraulic system for proper oil level

(5) Hydraulic and pneumatic fittings, hoses, and tubing for evidence of leakage, abnormal deformation, or excessive abrasion

(6) Compressors, pumps, motors and generators for loose fasteners, leaks, unusual noises or vibrations, loss of operating speed, and excessive heating

(7) Hydraulic and pneumatic valves for malfunction and visible cracks in the external valve housing, leaks, and sticking spools

(8) Hydraulic and pneumatic cylinders and holding valves for malfunction and visible damage

(9) Hydraulic and pneumatic filters for cleanliness and the presence of foreign material in the system indicating other component deterioration

(10) Electrical systems and components for deterioration or wear including those not readily visible on a frequent inspection

(11) Performance test of all boom movements

(12) Condition and tightness of bolts and other fasteners

(13) Welds, as specified by the manufacturer

(14) Legible and proper markings of controls, ratings, and instructions

(15) If the aerial device is rated and used as an insulated device, the electrical insulating components and system(s), after a thorough inspection for lack of cleanliness and other hazards, shall be tested for compliance with the rating of the aerial device in accordance with one of the applicable methods and procedures as outlined in section 5.4.3 of this standard.

(a) If the aerial device is used for A.C. bare-hand work, the unit shall undergo a 60 hertz test as shown in Table 2 at least every three years.

(b) If the aerial device is used for D.C. bare-hand work, the unit shall undergo a D.C. test as shown in Table 2 at least every three years.

(c) After repair or modification of any component that crosses the insulating system(s), or the repair or replacement of an insulating component(s), the unit shall be dielectrically tested in accordance with section 5.4.3.

(d) An insulated replacement boom shall be tested to insure conformance to 5.3.3 by the supplier.

(e) Bare-hand work units shall be tested as shown in Table 1 after any major repair to the insulated boom or any insulated boom replacement.

Any suspected items shall be carefuly examined and a determination made by a qualified person as to whether they constitute a safety hazard. All unsafe items shall be replaced or repaired before use.

8.3 Inspection and Test Records.

(1) Items to be inspected shall be designated to the operator or other authorized person making frequent inspections. Records of frequent inspections need not be made. However, where a safety hazard is found, it shall be reported in writing to a person responsible for the corrective action and that report and a record of the correction shall be maintained for five years, or as required by applicable regulations.

(2) Written, dated and signed reports and records shall be made of periodic inspections and tests and retained for a period of five years or as required by applicable regulations.

8.4 Maintenance. Maintenance and frequency of maintenance shall be determined by the user based on the recommendations of the manufacturer.

Maintenance referred to as critical in the manufacturer's manual shall be strictly adhered to.

Welding repairs or components or welds, designated as critical in the manufacturer's manual, shall be made in accordance with the manufacturer's recommendations. Should the original manufacturer no longer exist an equivalent entity may determine the required procedure.

8.5 Modifications. No modifications or additions which affect the stability, mechanical, hydraulic, or electrical integrity or the safe operation of the aerial device shall be made without the written approval of the manufacturer. If such modifications or changes are made, the capacity, operation, and maintenance instruction markings shall be changed accordingly. In no case shall the safety factors be reduced below those specified in this standard or below the manufacturer's design safety factors, whichever are greater.

Should the original manufacturer no longer exist, an equivalent entity may approve required modification.

8.6 Weight Distribution. Changes in loading or additions made to the mobile unit after the final acceptance that affect weight distribution shall meet applicable regulations by governmental agencies. In no case shall axle loads of the fully loaded vehicle exceed the Gross Axle Weight Ratings (G.A.W.R.) assigned by the manufacturer.

8.7 Transfer of Ownership. When a change in ownership of an aerial device occurs, it shall be the responsibility of the seller to provide the manufacturer's manual(s) for that aerial device to the purchaser. It is the responsibility of the purchaser to notify the manufacturer of the unit model and serial number and the name and address of the new owner within 60 days.

8.8 Markings. The markings on the aerial device shall not be removed, defaced, or altered. All missing or illegible markings shall be promptly replaced.

8.9 Parts. When parts or components are replaced they shall be identical in specification and function to the original aerial device parts or components.

8.10 Safety Bulletins. Owner and user shall comply with safety related bulletins as received from the manufacturer, dealer or installer.

8.11 Manuals. The owner and user shall insure that the operating manual(s) is stored on the mobile unit.

8.12 Training of Operators. Each trainee shall be instructed in the safe and proper operation of the aerial device utilizing the manufacturer's operator's manual, the user's work instructions, and the appropriate standards referenced in Section 2.

Such training shall include "hands-on" use to successfully demonstrate the trainee's proficiency to the satisfaction of the qualified person designated to administrate the user's training program.

8.13 Operation.

8.13.1 Personnel. Only trained and authorized personnel shall be permitted to operate the aerial device.

8.13.2 Application. The employer and assigned operator shall insure that the aerial device is used only for intended applications as defined in the operating manual, and that recognized safety practices are observed.

8.13.3 Mobile Operation. Before and during driving, the driver shall:

(1) Avoid traveling on any surface that adversely effects vehicle stability

(2) Maintain a safe distance from obstacles

(3) Maintain communications between the driver and the operator

(4) Under all travel conditions, the driver shall limit travel speed in accordance with conditions of the ground surface, congestion, and slope

8.13.4 Alterations. Altering or disabling of safety devices, guards, or interlocks if so equipped, shall be prohibited.

8.13.5 Bare-Hand Work. For bare-hand work, a Category A aerial device shall be used.

8.13.6 Lower Controls. On aerial devices having both upper and lower controls, the lower controls shall not be used for continuous operation of the aerial device with individual(s) in the platform.

9. Responsibilities of Renters or Lessors

9.1 General Responsibilities. Each renter or lessor shall comply with the requirements of this section.

9.2 Ownership Duties. The renter or lessor shall carry out the duties of ownership specified in this standard which are not assumed by the renting entity or lessee as the user.

9.3 Obligations. Each renter or lessor of an aerial device shall provide a copy of user responsibilities within this standard.

9.4 Training. The renter or lessor shall offer operator training initially to the renting entity or lessee.

9.5 Communications. In the event the manufacturer or installer provides the renter or lessor manuals, bulletins, or other materials for the information of the user of an aerial device, the renter or lessor shall pass them on to the user without any undue delay.

10. Responsibilities of Operators

10.1 General Responsibilities. Each operator shall comply with the requirements of this section.

10.2 Operation. During operation of the aerial device the operator shall wear a body belt or harness and be connected to the aerial device with a lanyard at the platform position.

10.3 Work Platform. The operator shall not use railings, planks, ladders or any other device in or on the work platform for achieving additional working height or reach.

10.4 Brakes. The vehicle parking brake(s) shall be set at all times that the boom is elevated except when the aerial device is being used in accordance with 8.13.3.

10.5 Loading. Any loading which includes a horizontal load shall be avoided unless the mobile unit is designed for that application.

10.6 Observations. Observations during operation for any defects shall be conducted on an ongoing basis.

10.7 Worksite. Before the aerial device is used, the worksite shall be surveyed for hazards such as:

(1) Untamped earth fills

(2) Ditches

(3) Dropoffs and floor obstructions

(4) Debris
(5) Overhead obstructions and electrical conductors
(6) Weather conditions
(7) Presence of unauthorized persons

10.8 Precautions. Before and during each use the operator shall:
(1) Check for overhead obstructions and electrical conductors
(2) Insure that the load on the platform and/or load lifting devices are in accordance with the manufacturer's rated capacity
(3) Insure that outriggers and stabilizers are used if the manufacturer's instructions require their use
(4) Insure that guardrails are properly installed, and the gates are closed
(5) Use outrigger pads when necessary to provide firm footing

10.9 Mobile Operation. Before engaging in mobile operation the operator shall determine that the aerial device is specifically designed for mobile operation.

Table 1
Design, Quality Assurance, and Qualification Test Values for Insulating Aerial Devices
Insulating Aerial Devices with a Lower Test Electrode System
(Category A and Category B)

Unit Rating	Required 60 Hertz Rated Voltage Test		Required 60 Hertz Double-Rated Voltage Test		Either of These Withstand Tests	
Rated Line Voltage (rms kv)	One Minute Test Voltage (rms kv)	Maximum Allowable Boom Current (rms microamperes)	One Minute Test Voltage (rms kv)	Maximum Allowable Boom Current (rms microamperes)	60 hertz Momentary Withstand Voltage Test (rms kv)	Switching Surge Withstand Voltage Test (crest kv)
46 & below	27	27	54	54	80	114
69	40	40	80	80	120	170
138	80	80	160	160	240	340
230	133	133	265	265	400	565
345	200	200	400	400	600	850
500	288	288	575	575	720	1020
765	442	442	885	885	1105	1560

Insulating Aerial Devices Without Lower Test Electrode System
(Category C)

Unit Rating	60 Hertz Voltage	Maximum Allowable Current	Time of Test
46 KV & below	100 KV (rms)	1 milliampere (rms)	3 minutes

Insulating Aerial Ladders and Insulating Vertical Aerial Towers

Unit Rating	60 Hertz Voltage	Maximum Allowable Current	Time of Test
46 KV & below	100 KV (rms)	1 milliampere (rms)	3 minutes
20 KV & below	50 KV (rms)	500 microamperes (rms)	3 minutes

A method of calculating test voltages for units rated other than those tabulated here is as follows:

1. Rated voltage test is the rated line voltage divided by the square root of 3 or 1.732.
2. Double-rated test voltage is twice the rated voltage test value.
3. Momentary withstand voltage is 3.0 times the rated voltage test value for rated line voltages up to and including 345kv, and is 2.5 times the rated voltage test value for rated line voltages above 345kv.
4. Switching-surge withstand voltage is the momentary withstand voltage times the square root of 2 or 1.414. The switching surge withstand test shall consist of ten applications of both positive and negative polarity switching surge test waves having a front of 150-350 micro-seconds and a tail of 2500 to 4,000 microseconds *without flashover.*
5. Boom leakage currents for Category A and B must not exceed 1 microampere per kilovolt, line to ground for all 60 hertz test voltages.

(Continued)

Appendage for Rated Line Voltage of 500 KV and Above

The double-rated voltage and withstand voltages may be adjusted to meet the actual design requirements of a given system(s) on which the aerial device will be used. The Double-Rated Voltage Test may be replaced by a test equal to the maximum system voltage (kv max) plus the maximum voltage rise on system(s) where the switching surge factor is equal or less than 2.0 per unit. The Withstand Voltage Test may be based on the maximum system(s) value on the switching surge.

Example:
The Double-Rated Voltage Test for a typical operating voltage of 765 kv (maximum of 800kv) having a maximum switching surge factor of 1.9 per unit may be replaced with a maximum rated test equal to the maximum system voltage rise. The maximum percent system voltage rise can be as high as 30% depending on line conditions. For a 30% system voltage rise this test would equal kv max + 30% (kv max): that is 800kv + 30% (800) = 1040kv Line to Line 60 hertz or 600kv Line to Ground 60 hertz.

The Momentary Withstand Test for the same system parameters would be equal to 1.9 x kv max or 1.9 x 462 Line to Ground 60 hertz = 878kv Line to Ground 60 hertz (rms). The Switching Surge Withstand Test for the same system parameters would be equal to 1.9 x 462 x 1.414 = 1240 Line to Ground 60 hertz crest.

Table 2
Periodic Electrical Test Values for Insulating Aerial Devices
Insulating Aerial Devices with a Lower Test Electrode System
(Category A and Category B)

Unit Rating	60 Hertz (rms) Test			Direct Current Test		
	Voltage	Maximum Allowable Current	Time	Voltage	Maximum Allowable Current	Time
46KV & below	40 KV (rms)	40 microamperes	1 minute	56 KV	28 microamperes	3 minutes
69 KV	60 KV (rms)	60 microamperes	1 minute	84 KV	42 microamperes	3 minutes
138 KV	120 KV (rms)	120 microamperes	1 minute	168 KV	84 microamperes	3 minutes
230 KV	200 KV (rms)	200 microamperes	1 minute	240 KV	120 microamperes	3 minutes
345 KV	300 KV (rms)	300 microamperes	1 minute	360 KV	180 microamperes	3 minutes
500 KV	430 KV (rms)	430 microamperes	1 minute	602 KV	301 microamperes	3 minutes
765 KV	660 KV (rms)	660 microamperes	1 minute	924 KV	462 microamperes	3 minutes

Insulating Aerial Devices Without Lower Test Electrode System
(Category C)

Unit Rating	60 Hertz (rms) Test			Direct Current Test		
	Voltage	Maximum Allowable Current	Time	Voltage	Maximum Allowable Current	Time
46 KV & below	40 KV (rms)	400 microamperes	1 minute	56 KV	56 microamperes	3 minutes

Insulating Aerial Ladders and Insulating Vertical Aerial Towers

Unit Rating	60 Hertz (rms) Test			Direct Current Test		
	Voltage	Maximum Allowable Current	Time	Voltage	Maximum Allowable Current	Time
46 KV & below	40 KV (rms)	400 microamperes	1 minute	56 KV	56 microamperes	3 minutes
20 KV & below	20 KV (rms)	200 microamperes	1 minute	28 KV	28 microamperes	3 minutes

NOTE:
1. These tests are assuming adequate test facilities are available. See Table 3 for in-field tests.
2. A method of calculating test voltages for units rated other than those tabulated here is as follows:
   a. The 60 Hz test values are equal to line to ground at the unit rating value times 1.5
   b. Multiply the 60 Hz test values times 1.4 to arrive at the direct current values

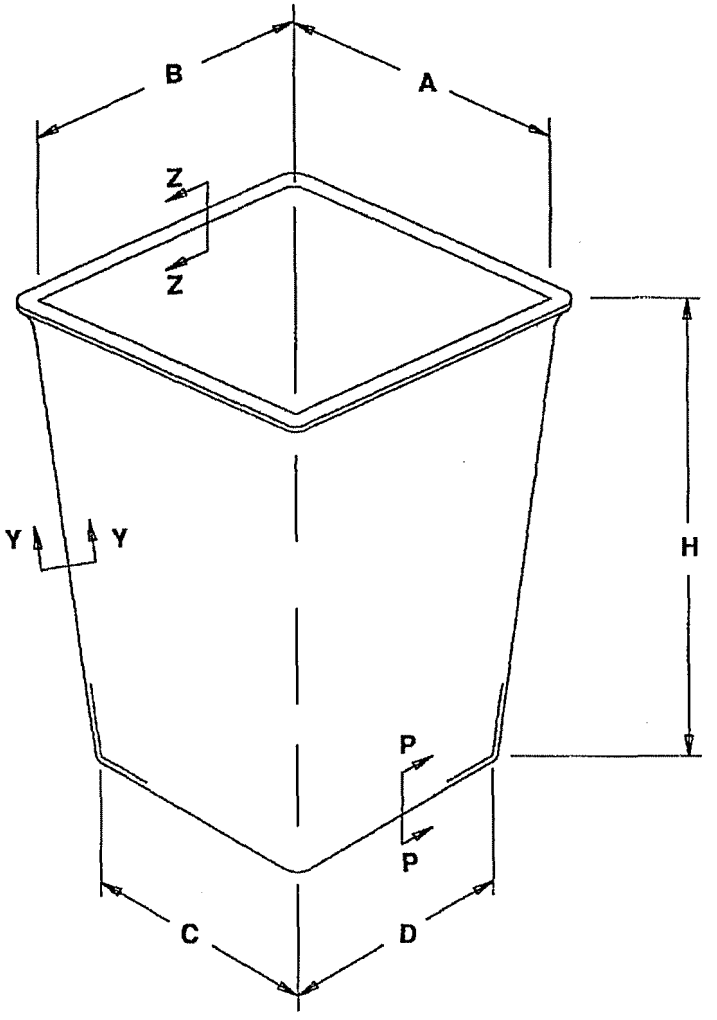
Table 3
In-Field Tests for Insulating Aerial Devices
Method Called Out In Section 5.4.3.1 Item 10(c)

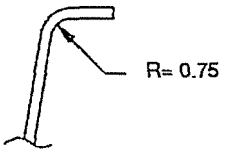
Aerial Device Category	A.C. Voltage	Maximum Allowable Current	Time of Test
A or B	Line to Ground	1 microampere/KVAC	3 minutes
A or B	Line to Ground	.5 microamperes/KVDC	3 minutes

Method Called Out In Section 5.4.3.1 Item 10(d) & Section 5.4.3.2 Item 5(c)

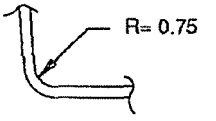
Aerial Device Category	A.C. Voltage	Maximum Allowable Current	Time of Test
All Insulating Aerial Devices	Line to Ground	30 microamperes/KVAC	3 minutes

Figure 1 – Basket Inside Dimensions (Inches)

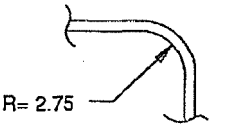




SECTION Z-Z



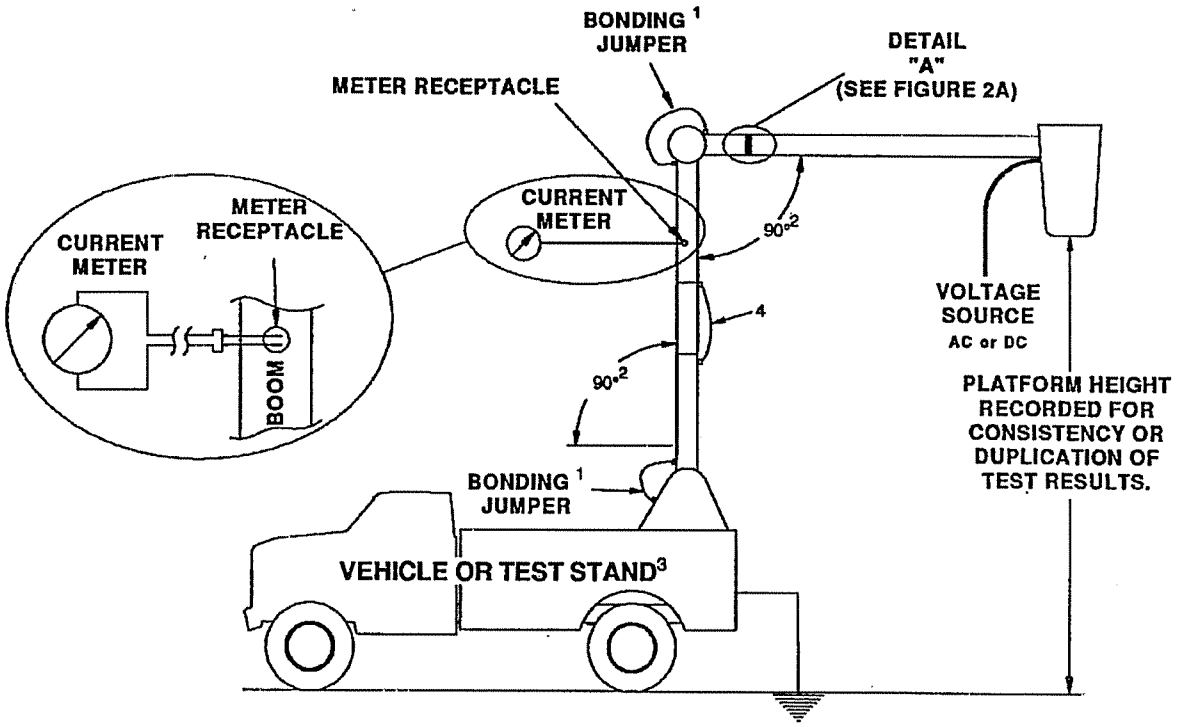
SECTION P-P



SECTION Y-Y

INDENTIFICATION	A	B	C	D	H
S-1	24	24	22	22	42
S-2	46½	22½	45¾	21¾	41⅛
S-3	28⅜	22¼	27⅞	21⅜	40⅝
S-4	24	24	22	22	39
MISCELLANEOUS	-	-	-	-	42 ± 3
NOTE: ALL DIMENSIONS ARE (+) ½", (-) 0"					

Figure 2 - Dielectric Test Configuration for Category A & B Aerial Devices



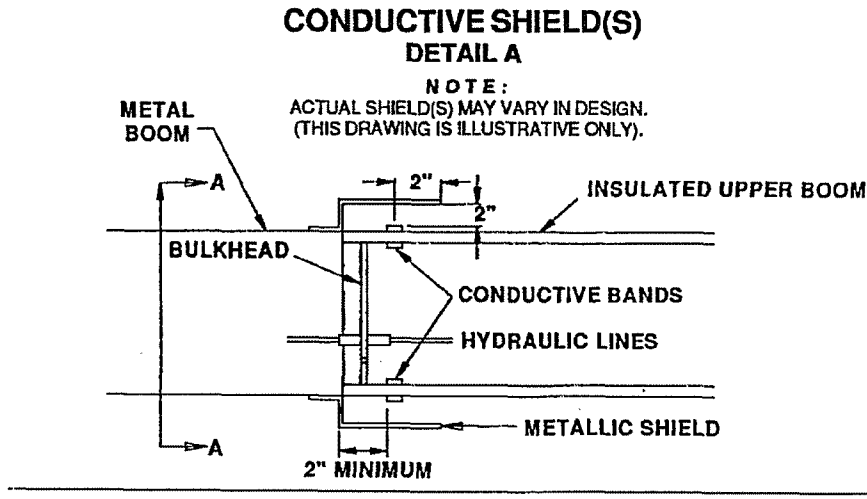
1. Bonding jumper of #2 copper, (0.029" diameter), may be installed only during test or permanently.

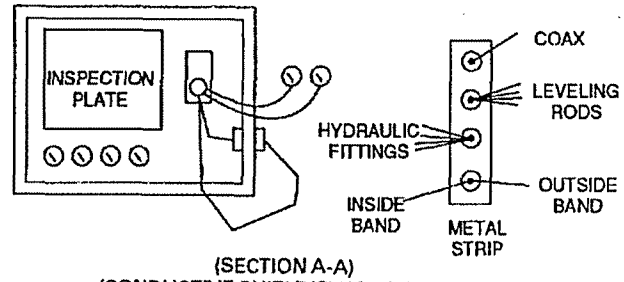
2. These boom positions are for outdoor testing. Other positions are acceptable, when indoor testing for example. The positions used for AC tests should be documented and accompany test documents for test repeatability.

3. Test stand or vehicle is to be grounded.

4. Chassis insulating system shunt, (see Figure 4A).

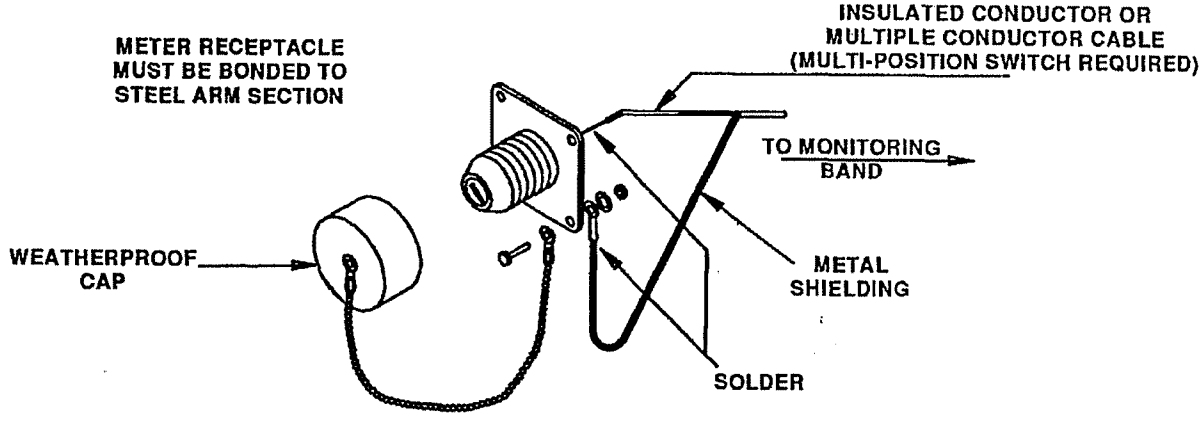
Figure 2A - Details of Lower Test Electrode Assembly & Conductive Shield





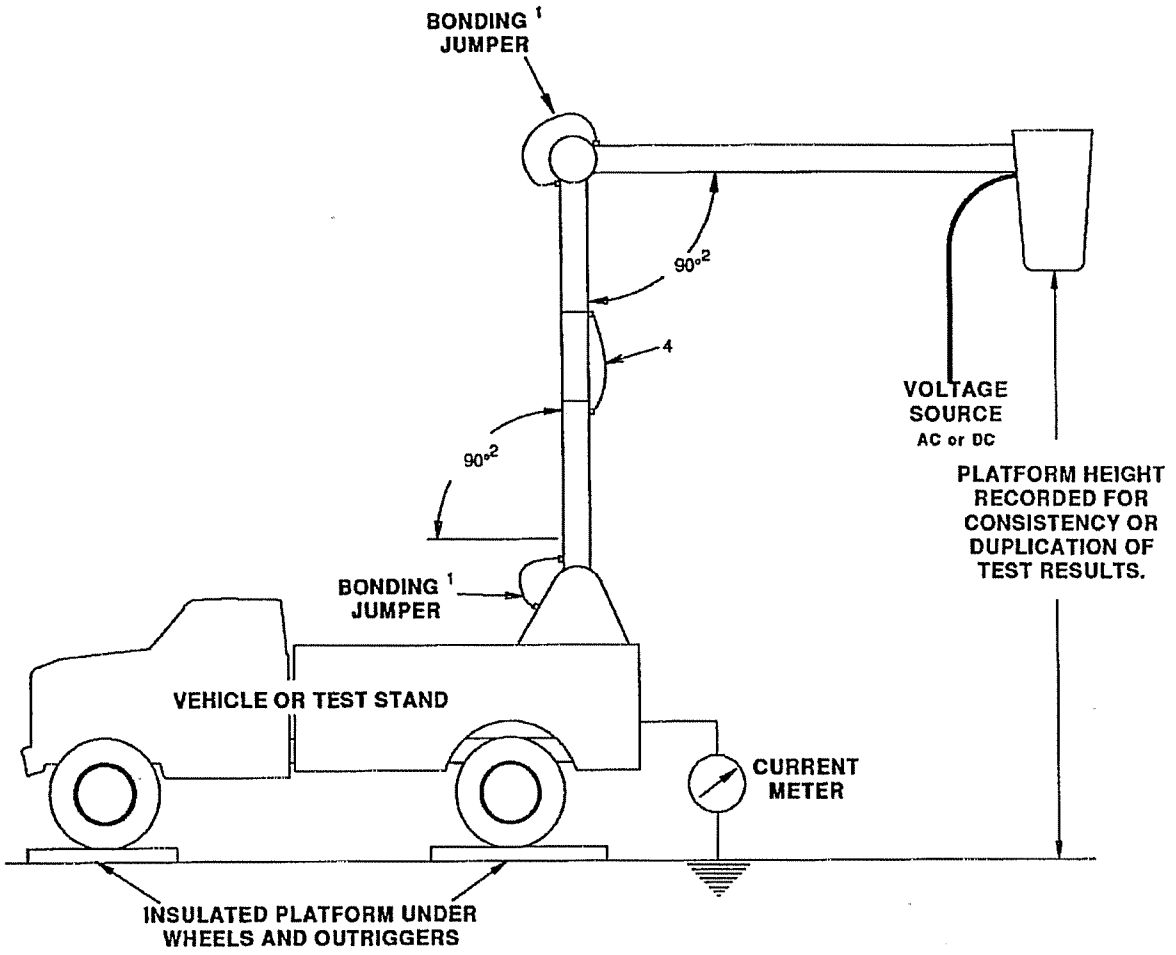
(SECTION A-A)
(CONDUCTIVE SHIELD(S) NOT SHOWN)
NOTE: PICKUPS CAN BE INDIVIDUALLY CONNECTED TO METER ASSEMBLY IF WIRING IS AS SHOWN

LOWER TEST ELECTRODE WIRING
(WIRING CAN BE MADE EITHER SERIES OR PARALLEL).
(THIS DRAWING ONLY ILLUSTRATIVE.)



METER RECEPTACLE
NOTE: METER RECEPTACLE MUST BE SHORTED WHEN NOT IN USE.

Figure 3 – Dielectric Test Configuration for Category C Aerial Devices



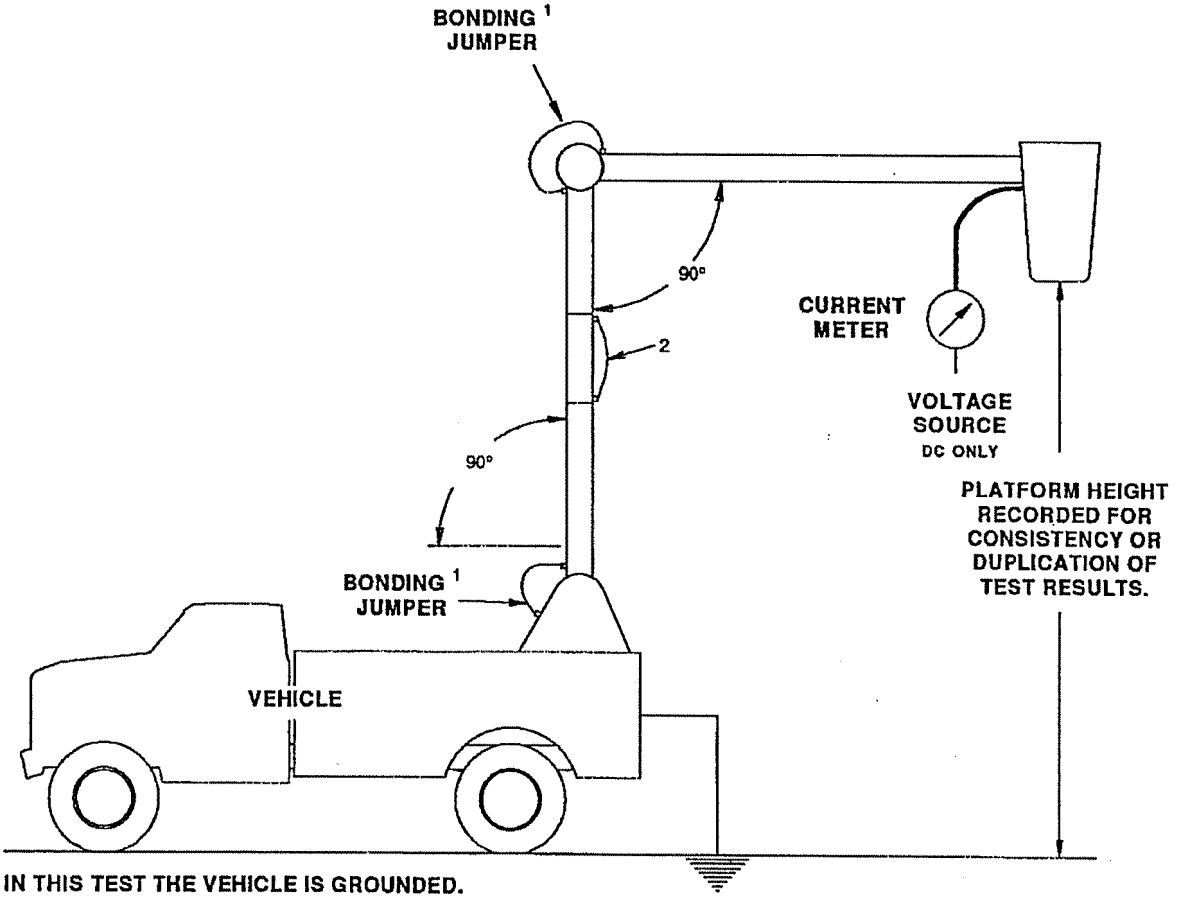
1. Bonding jumper of #2 copper, (0.029" diameter), may be installed only during test or permanently.

2. Due to capacitive currents, these boom angles are more critical than for Category A and Category B aerial devices. If boom positions are altered, care must be taken to document the positions used for repeatability.

3. These boom positions are for outdoor testing. Other positions are acceptable, when indoor testing for example. The positions used for AC tests should be documented and accompany test documents for test repeatability.

4. Chassis insulating system shunt, (see Figure 4A).

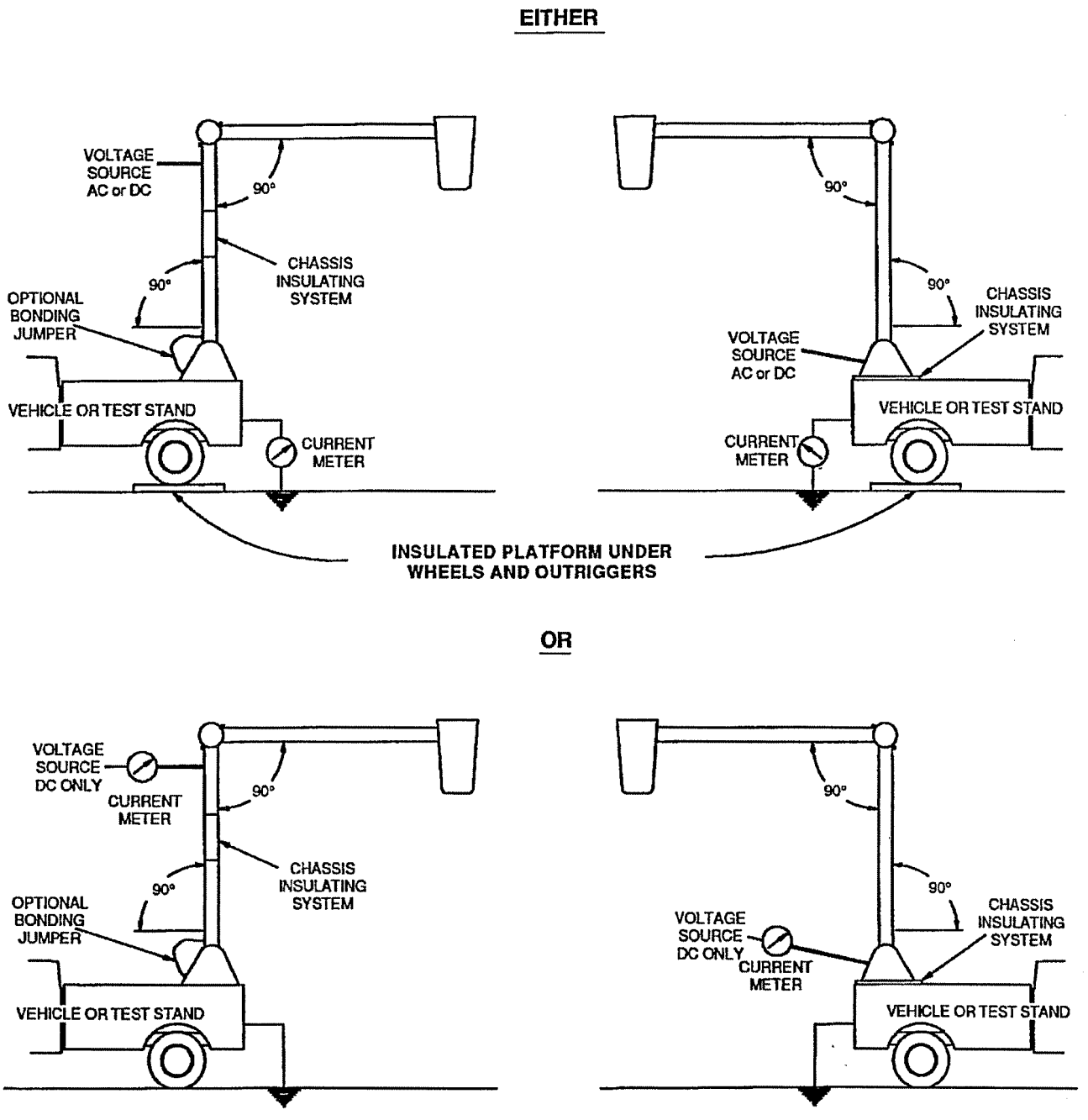
Figure 3A – Optional Dielectric Test Configuration for Category C Aerial Devices



1. Bonding jumper of #2 copper, (0.029" diameter), may be installed only during the test or permanently.

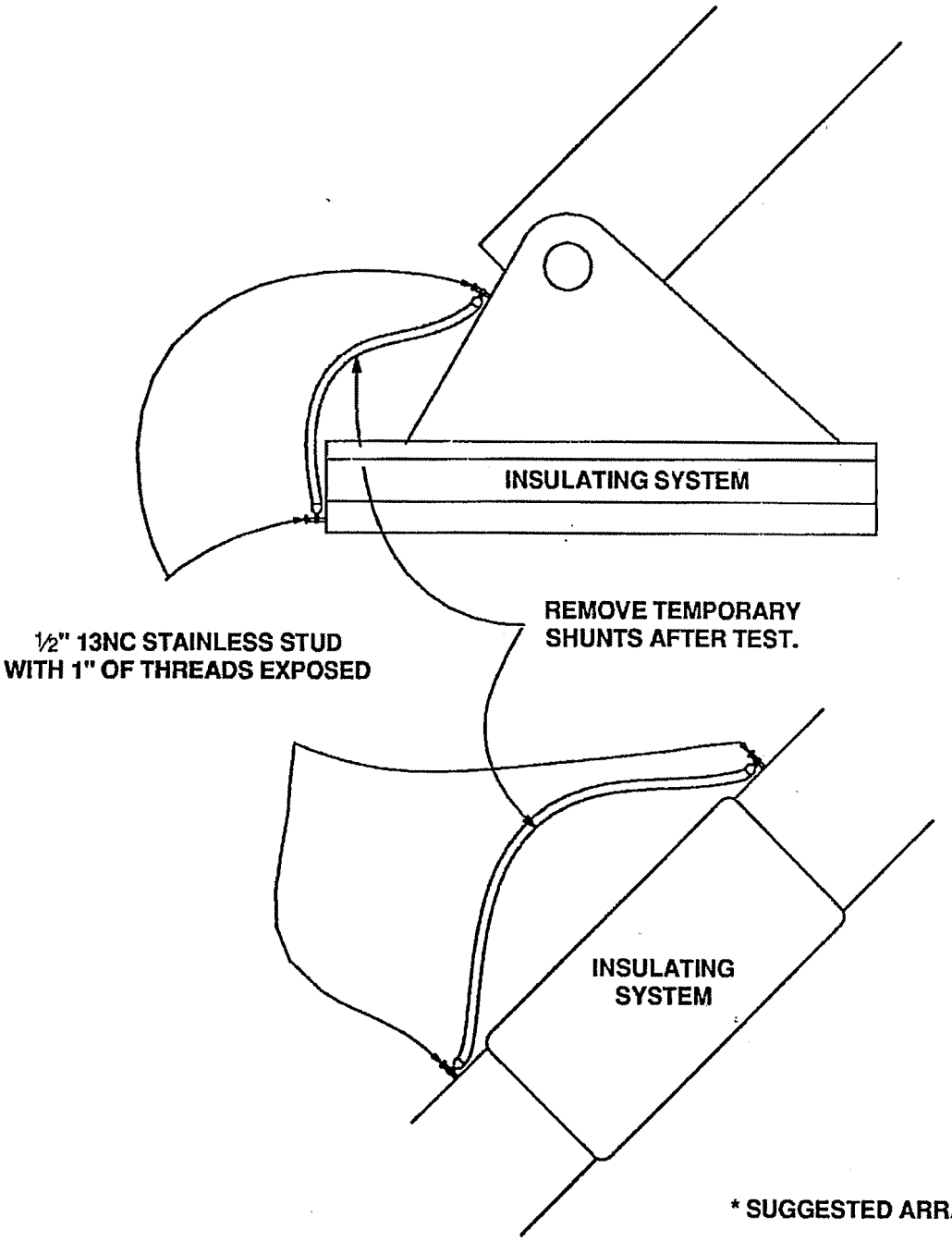
2. Chassis insulating system shunt, (see Figure 4A).

Figure 4 - Dielectric Test Configuration for Chassis Insulating Systems



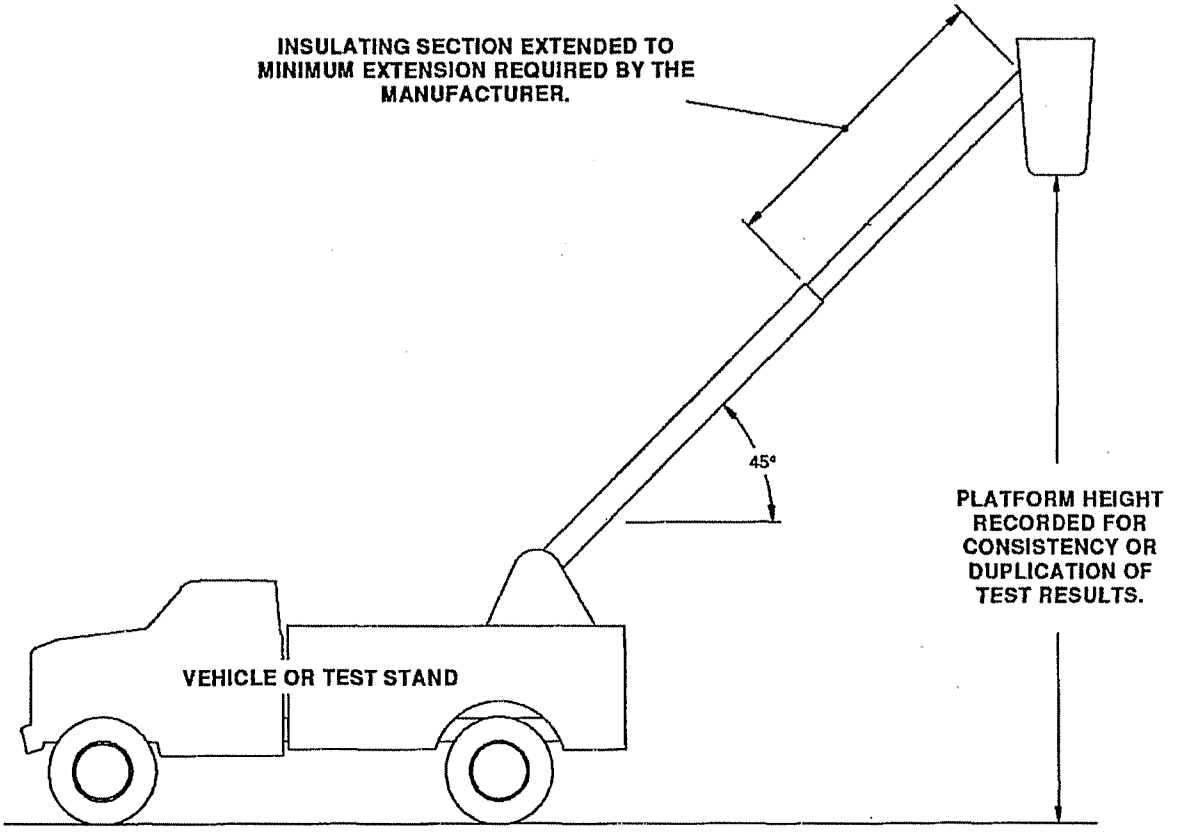
These boom positions are for outdoor testing. Other positions are acceptable, when indoor testing for example. The positions used for AC tests should be documented and accompany test documents for test repeatability.

Figure 4A – Shunting Arrangement* for Chassis Insulating Systems



* SUGGESTED ARRANGEMENTS

Figure 5 - Boom Positions for Dielectric Test of Extensible Insulating Aerial Devices



NOTE: This boom angle may be altered, however, in the case of 60 Hertz Category C Test capacitance considerations are more critical than in Category A and Category B. Therefore, care must be exercised to document the boom positions used for repeatability. Follow test procedures of paragraph 5.4.2.6 or paragraph 5.4.3.6.

Figure 6 – Typical Bonding Arrangements for Category A

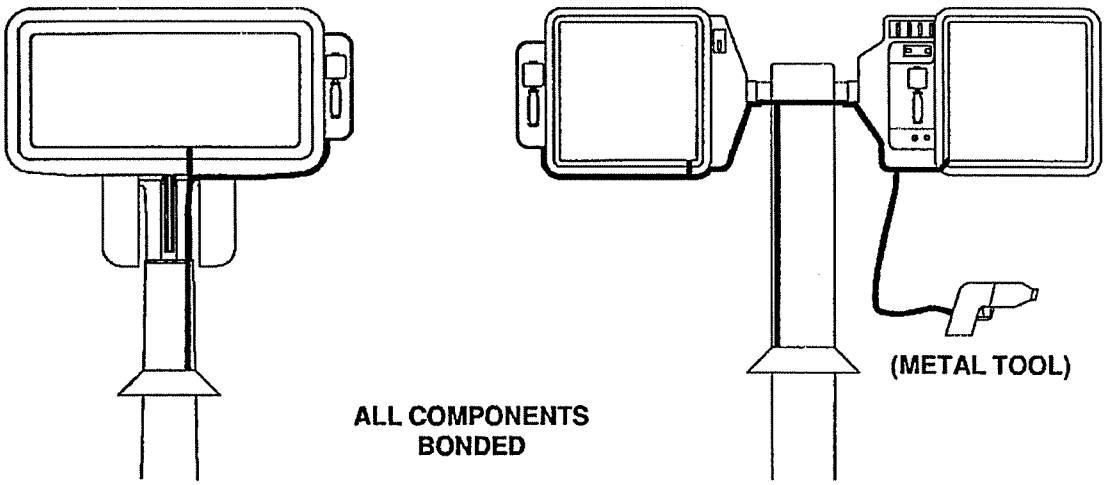


Figure 7 – Recommended Marking Format

MAKE OF AERIAL DEVICE

Model _____ Serial No. _____

Height _____ DESIGN VOLTAGE _____

Category _____

CAPACITY RATING
This Aerial Device Complies with
the Requirements of ANSI/SIA A92.2

UNIT EQUIPPED WITH _____ PLATFORMS

On a Firm and Level Surface Its Capacity Is:

_____ Lbs. per Bucket or Platform
_____ Lbs. Total (Both Buckets or Platforms)

Date of Test: _____

The Capacity with Outriggers Extended to a Solid Footing Is:

_____ Lbs. per Bucket or Platform
_____ Lbs. Total (Both Buckets or Platforms)

Date of Test: _____

_____ QUALIFICATION VOLTAGE

Date of Test: _____

UNIT EQUIPPED WITH MATERIAL HANDLING ATTACHMENT: YES ____ NO ____

AERIAL DEVICE SYSTEM PRESSURE: _____

AERIAL DEVICE SYSTEM VOLTAGE: _____

AERIAL DEVICE MANUFACTURER CITY, STATE, U.S.A.

Installed by: _____

APPENDIX A — RATIONALE FOR DESIGN, QUALIFICATION AND PERIODIC ELECTRICAL TESTS

1) When an aerial device is to be used for AC application, Design Tests shall be conducted with alternating current (60 Hz). These tests are conducted on the initial unit of a particular design.

2) Qualification tests are to be conducted per the appropriate section of Table 1, depending upon the rated voltage of intended use.

3) "Wet testing" is a description used for electrical testing after insulating components or insulating aerial devices have had water applied to them. This method is sometimes used in testing the resistivity and conductivity of insulating components, particularly the surface(s) of same. Properly maintained insulating components should not exhibit water absorption. Wet testing proponents should remember the test values contained in this standard are for dry insulating components.

4) The leakage current recorded as part of the Qualification Test is to be provided as part of the test data, and can be used as a benchmark for future testing.

5) The term "certified test" is not used. The Qualification Test is the test that is certified as being accurate and applicable to a particular unit.

APPENDIX B — D.C. APPLICATION

When an aerial device is to be used for DC application as a Category "A" device, the following applies:

			Direct Current Withstand	
Rated Line Voltage	Max* Boom Leakage Current	Time of Test	Double Rated Line Voltage	Over Voltage Test
"X"kv	0.5 microamperes/kv	3 minutes	"2X"kv	2X(F)**kv

1) The double voltage and overvoltage test are for 1 minute duration.

2) Record leakage current as data for future testing.

* The leakage current should maintain a steady value for at least one minute before the test is concluded.

**F = Switching Factor or Overvoltage Factor.

APPENDIX C — APPLICATION AND USES OF AERIAL DEVICES

Category	Bare-Hand	Gloving	Hot* Stick	Construction De-Energized
A	X	**	X	X
B	**	X	X	X
C		X	X	X
Non-Insulated			X	X

*Aerial Device is used as a work platform

**An aerial device manufactured as a Category A may be modified and used as a Category B and a Category B may be modified and used as a Category A in accordance with the manufacturer's instructions. In the event that this is done, particular attention must be given to the appropriate qualification test, gradient control devices, conductive shields, conductive liners, and bonding.

APPENDIX D — ELECTRICAL TESTS FOR AERIAL DEVICES, INSULATED PLATFORMS, AND INSULATED LADDERS FOR AC APPLICATION

	Design	Qualification	W/Adequate Periodic	Field Periodic
Category A & B	Table 1	Table 1	Table 2	Table 3
Category C	Table 1	Table 1	Table 2	Table 3
Insulated Ladder and Platform	Table 1	Table 1	Table 2	Table 3

Previous A92.2 standards allowed for dielectric ratings of insulating aerial devices at 69kv and below which do not meet this standard. Previous testing requirements may be relied upon for those machines. However, use of the applicable tests herein provides confirmation of integrity. The user of those aerial devices should be guided by Appendix C.

American National Standards for Aerial Work Platforms

ANSI/SIA	A92.2 - 1990	Vehicle-Mounted Elevating and Rotating Aerial Devices
ANSI/SIA	A92.3 - 1990	Manually Propelled Elevating Aerial Platforms
ANSI/SIA	A92.5 - 1992	Boom-Supported Elevating Work Platforms
ANSI/SIA	A92.6 - 1990	Self-Propelled Elevating Work Platforms
ANSI/SIA	A92.7 - 1990	Airline Ground Support Vehicle-Mounted Vertical Lift Devices
*ANSI/SIA	A92.8 - 199X	Vehicle-Mounted Inspection and Maintenance Devices
*ANSI/SIA	A92.9 - 199X	Mast-Climbing Work Platforms

*At the time of publication, this standard was under development. Contact the Scaffold Industry Association for more recent information.

Scaffold Industry Association
14039 Sherman Way
Van Nuys, CA 91405-2599
Telephone: (818) 782-2012 / Fax: (818) 786-3027

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Michael L Miller
President & CEO
Nolin R.E.C.C.
411 Ring Road
Elizabethtown, KY 42701-6767