

One Tough PUPI™

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## PUPI® Crossarm High Voltage Tests

Tests performed at the National Electric Energy Testing Research and Applications Center (NEETRAC), Georgia Institute of Technology

### PUPI Braceless Tangents on wood pole

8' PUPI Series 2000 braceless tangent with PUPI mount

8' PUPI Series 3000 braceless tangent with PUPI mount

Test method IEEE Standard 4-1995

- Arms attached to wood power pole, three phase configuration.
- Arms tested with ANSI Class 55-5 (25 kV porcelain) insulators mounted 4" from crossarm ends and also with the insulators removed and impulses applied directly to the pin mounting hole.
- Center phase grounded, outer phase impulsed.
- Maximum output of the generator used is 500kV.

Results:

- **No flashover** at maximum output of generator of **500 kV**.
- Since flashover did not occur, **BIL level** of the PUPI Series 2000 and Series 3000 crossarms **exceeds 450kV**.

### PUPI Braceless Tangents and Deadends on steel pole

8' PUPI Series 2000 braceless tangent with PUPI mount

8' PUPI Series 2000 braceless deadend assembly with PUPI mount

Test method IEEE Standard 4-1995

- Tested with steel pole and higher power generator than above test.

Results:

- **PUPI Series 2000 tangent:** Critical impulse flashover = 577.9 kV
  - Arc from conductor tie to front and back of crossarm mounting bracket.
  - **BIL = 555kV = 15kV/inch**
- **PUPI Series 2000 deadend:** Critical impulse flashover = 578.4 kV
  - Arc from hot end of insulator to crossarm mounting bracket.
  - **BIL = 555kV = 15kV/inch**

### Tests performed at Kinetrics Inc, Toronto, Ontario, Canada

#### PUPI Braceless Tangents on fiberglass pole

10' PUPI Series 2000 braceless tangent with PUPI mount

Results:

25kV Distribution Line mockup

- Critical Lightning Impulse Flashover Voltage: **683kV (dry), 572kV (wet)**

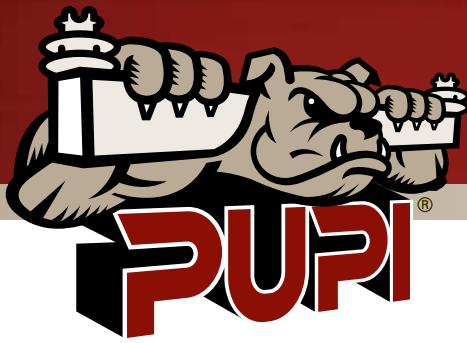
69kV Distribution line mockup

- Critical Lightning Impulse Flashover Voltage: **855kV (dry), 886kV (wet)**
- Lightning arc took air gap under dry condition, often crept along crossarm surface under wet.

#### PUPI Transmission Arms on steel lattice

275 kV Transmission Arm on steel lattices, IEC 60060-1 test (15 +impulses, 15 -impulses)

- Dry lightning impulse tests to 1050 kV



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- Dry switching impulse tests to 850 kV
- Dry power frequency tests to 460 kV
- Wet switching impulse tests to 850 kV
- Wet power frequency tests to 460 kV

Results:

- No flashover in any tests, pass all tests.

#### **PUPI Braced Tangents**

**2.4m (7.9') PUPI Series J tangent**, braced model

- J211Z steel insulator pins with 720mm spacing, no insulators on pins

Results

- Critical Lightning Impulse Flashover Voltage: **424.5kV** (+ dry) = **590V/mm** or **15.0 kV/in**
- Critical Lightning Impulse Flashover Voltage: **485.9KV** (- dry) = **675V/mm** or **17.1 kV/in**

#### **ASTM Tests**

(Coupons cut from beam walls)

**Element New Berlin laboratory, Wisconsin and Delsen Testing laboratory, Glendale, CA**

- Dielectric Strength (ASTM D149), PUPI 2000, 2200, 2500 and J Series tested
  - **200 - 320 V/mil** through beam wall, **mean 254 V/mil**
  - **141 – 196 V/mil** along beam principal axis, **mean 167 V/mil**
- Surface Resistivity (ASTM D257), PUPI 2500 & 3000 tested
  - **1 – 4 X 10<sup>15</sup> ohms**

**Trace Laboratories, Hunt Valley, MD**

- Arc Tracking (ASTM D495)
  - **131 seconds**, PUPI J Series tested

#### **Note**

- PUPI fiberglass crossarm beams are pultruded using the same base materials and all have the same UV resistance polyurethane coating thickness, polyester veil and surface construction so PUPI crossarms all have similar electrical performance to those tested.