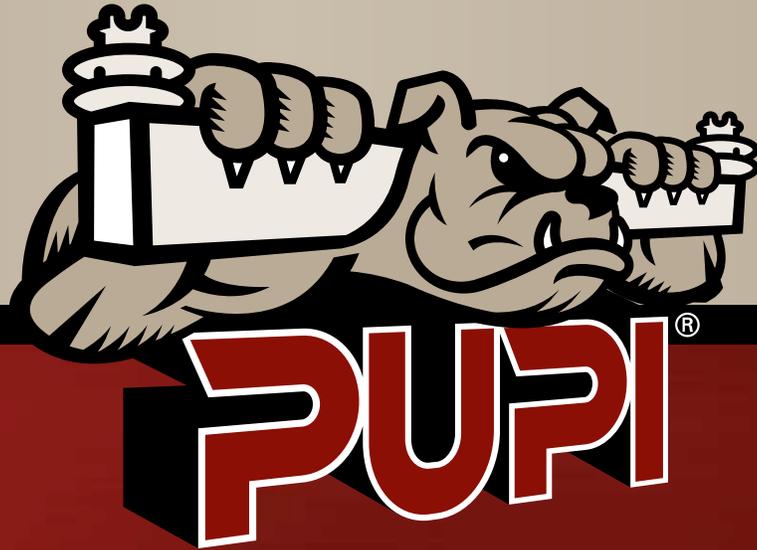


# PUPI<sup>®</sup> FEATURES & BENEFITS



One Tough PUPI<sup>™</sup>



# WHY PUPI®

**DURABILITY -** PUPI crossarms are a product of GEOTEK, an internationally recognized producer of reinforced pultruded products for the electrical utility, animal containment, nursery and consumer markets. GEOTEK brings over 40 years of pultrusion experience to the PUPI manufacturing process.

**RELIABILITY -**

**LONGEVITY -**

**CUSTOMER FOCUS -**

**LEADERSHIP -**

PUPI is the leading brand of fiberglass crossarms and an innovator in pultruded fiberglass components. We provide specially designed crossarms and components used by electrical utilities around the world. Engineered for superior load capacity and resistance to ultraviolet radiation and weathering, leading utilities choose PUPI fiberglass components for consistent performance and long-term return on investment. We provide our customers the durability, reliability, longevity, and customer responsiveness they demand.

# FEATURES & BENEFITS

## DURABILITY

PUPI fiberglass crossarms are designed to be the most durable alternative to wood, steel - even other composite crossarms! Our heavy-duty construction and exclusive TorqueGUARD™ bushings protect against damage during hardware installation and provide maximum resistance to bolt and pin torque. In many applications, a single PUPI crossarm has the strength to replace two or more wood crossarms. PUPI users have the peace of mind that they are installing the most durable crossarms available.

## RELIABILITY

PUPI crossarms are engineered products, manufactured with a fiberglass pultrusion process that creates products of the highest quality and consistency. Unlike wood, PUPI crossarms are totally free from knots and imperfections that can cause failure over time. PUPI crossarms can withstand transient loads that cause wood crossarms to fail. Because they are specifically designed for utility use, they have the strength to handle any situation, yet are also lightweight and easy to install.

## LONGEVITY

SunGUARD® UV protection is thermally-bonded to the surface of every PUPI product, providing the most durable protection available against UV damage. Rigorous testing shows that SunGUARD® UV coating will maintain its effectiveness for at least 60 years, in any climate. Additionally, every PUPI crossarm is completely filled with closed-cell sealant to lock out moisture and contaminants. There has never been a failure of a SunGUARD-treated PUPI crossarm due to environmental degradation.

## CUSTOMER FOCUS

Understanding customer needs on a deep level has been a key to the success of PUPI crossarms. We have extensive testing and design capabilities that assure the best solutions to our customers' application needs. We understand the critical nature of the services our customers provide and respond quickly to requests for emergency shipments. Every PUPI product is backed by a dedicated support team that is ready and willing to do what it takes to get the job done.

## LEADERSHIP

PUPI developed the first commercially successful composite crossarm and has led the way since our first crossarm was shipped in 1990. We have invested in materials lab and testing facilities that set us apart from our competition. Today, PUPI is the market share leader in fiberglass crossarms, giving us the largest installed base and the longest service record of any composite crossarm manufacturer. Our products are used at hundreds of utilities across North America and the World. Our track record and dedication to our customers are what keeps PUPI customers coming back year after year.

# FEATURES & BENEFITS



## PUPI® FIBERGLASS VS. WOOD CROSSARMS

PUPI crossarms are engineered for consistent strength and reliability. Wood beams, even when carefully specified to control defects, show considerable natural variances and deteriorate over time.

### PUPI FIBERGLASS:

- Up to 6 times stronger
- Up to half the weight and easy to install
- Three levels of UV protection
- Excellent dielectric properties
- Environmentally safe materials
- Impervious to insects & woodpeckers
- Free from splinters
- 60+ year service life in all climates



Over 1 million PUPI fiberglass crossarms are at work in a wide range of environments throughout North America and around the world. From hot, wet and dry climates to extreme cold – not a single PUPI crossarm has failed due to environmental degradation.

# FEATURES & BENEFITS

## SOLID RETURN ON INVESTMENT

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Count on PUPI fiberglass crossarms to deliver a stronger ROI over time than wood. Right from the start, material cost of a PUPI deadend can be less than a wood deadend assembly. PUPI tangents are a great value, too. When you consider initial material cost and installation, ongoing maintenance and replacement cost, PUPI fiberglass crossarms deliver a better long-term return on investment than wood or other composite beams. PUPI crossarms deliver proven field performance with the longest fiberglass track record to prove it. You'll see fewer replacements over time and less maintenance costs.

From tangents to transmission arms, you can specify PUPI crossarm size and drill configurations to meet your exact performance requirements. PUPI crossarms are engineered for the unique demands of the utility industry with three levels of weathering protection and unique features like exclusive TorqueGUARD™ bushings, impact-resistant end caps, and beams sealed with closed-cell foam to prevent moisture contamination. Because PUPI crossarms are lightweight for easier handling, it takes less man-hours for your field crews to install and maintain a PUPI crossarm than a wood crossarm. It all adds up to a better ROI you can count on year in and year out.

## DESIGNED FOR EASE OF USE

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PUPI fiberglass crossarms are designed for field-ready flexibility and easy, efficient installation. Sixty feet in the air, a fiberglass crossarm that weighs half the weight of a treated wood beam can make a big difference. PUPI tangents, deadends and transmission arms are ergonomically engineered for the unique demands your field teams face day in and day out. Available in standard drill patterns, or made to order and drilled to your specifications. PUPI crossarms are available with our exclusive crush-resistant TorqueGUARD bushings. PUPI crossarms with TorqueGUARD bushings are proven in the field to withstand the torque exerted by most pole line hardware. This technology prevents crossarm damage during hardware installation and increases hole strength over the life of the crossarm. Test results for specific applications are available.

Light weight for less fatigue and splinter-free for safer handling. Compared to heavier wood or other composite beams, PUPI fiberglass crossarms can take less half the time to install because they're designed to use fewer parts and pieces without any special tools – and linemen aren't exposed to creosote, chromated copper arsenate (CCA) and other chemicals used in treated wood. The closed-cell sealant that fills every PUPI crossarm allows field drilling when necessary. From safer insulating properties to impact-resistant end caps, your field teams can rely on PUPI crossarms for superior strength and consistent performance in any climate.

With three levels of UV and weathering protection you can expect less maintenance and fewer replacements. PUPI crossarms are built to last 60 or more years in any climate – with the longest field experience track record to prove it.

# FEATURES & BENEFITS

## ENGINEERED FOR STRENGTH



### TORQUEGUARD™ BUSHINGS

PUPI fiberglass crossarms are built to withstand bolt torque and increase pin connection strength. PUPI tangents, deadends and transmission arms are available with exclusive crush-resistant internal bushings to prevent damage from over-tightening. TorqueGUARD™ bushings are proven in the field to withstand the torque exerted by most pole line hardware. This technology prevents crossarm damage during hardware installation and increases hole strength over the life of the crossarm. Test results for specific applications are available. PUPI crossarms with TorqueGUARD bushings have been tested to exceed RUS requirements for transverse and longitudinal torque strength.

### PRECISION DRILLING

PUPI crossarm holes are drilled by automated equipment to meet the tightest of tolerances. Holes are carefully drilled “outside-in” to prevent any possibility of delamination or rough edges.

### CLOSED-CELL SEALANT

Inside every PUPI tangent, deadend and transmission arm, you’ll find closed-cell polyurethane foam that seals the beam to prevent moisture contamination – and allows field drilling along the length of the arm. This lightweight foam is designed to completely fill the inside of the beam and will never absorb moisture, or allow water to enter the crossarm.

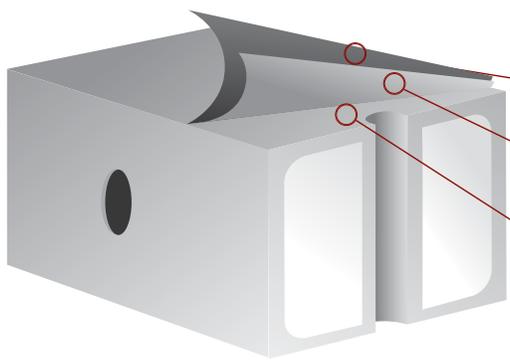
# FEATURES & BENEFITS



## SUNGUARD® UV PROTECTION

All PUPI products feature three levels of weathering protection including exclusive SunGUARD® UV coating. This proven system effectively eliminates the risk of “blooming” that can affect unprotected fiberglass.

The founders of GEOTEK have been manufacturing fiberglass structural products for outdoor applications since 1972. Since 1982, all fiberglass structures have been produced with SunGUARD® UV coating. Since then, not a single product failure of any SunGUARD® UV coated product has been noted anywhere in the world due to environmental degradation, nor has any measurable coating erosion over time been documented. That’s because patented SunGUARD® UV coating is thermally bonded to the surface of PUPI crossarms during the pultrusion process. No other crossarm offers more protection against the elements. With three levels of UV and weathering protection you can expect PUPI crossarms to last 60 or more years in any climate – and we have the longest track record to prove it.



### PUPI 3 LEVELS OF UV PROTECTION:

- LEVEL 1.** An outer surface of our exclusive thermally-bonded SunGUARD® UV coating.
- LEVEL 2.** A layer of ultraviolet-resistant polyester veil covers the beam underneath the SunGUARD® UV coating.
- LEVEL 3.** A broad spectrum UV inhibitor is used throughout the entire resin system.

# FEATURES & BENEFITS

## INDUSTRY-LEADING TESTING AND APPLICATION DEVELOPMENT CAPABILITIES

GEOTEK brings over 40 years of pultrusion and materials science experience to the PUPI crossarm and brace manufacturing processes. Engineered specifically for the critical demands of the electrical utility industry, PUPI crossarms exhibit performance and reliability that is unmatched. PUPI's reputation for durability is built upon years of intensive testing and application engineering.



### UV RESISTANCE TESTING:

- PUPI SunGUARD® UV resistant coating has been independently tested to the 2,500 hours of accelerated UV exposure specified by the U.S. Rural Utilities Service. After 2,500 hours, PUPI crossarms showed no degradation in flexural strength, modulus or deflection. There was no visible change to the color or gloss of the UV coating.
- When tested to 10,000 hours of accelerated UV exposure, PUPI crossarms showed some lightening of the SunGUARD® UV coating color but no other changes in the coating.

### STRENGTH & DEFLECTION TESTING:

- Repeated mechanical testing at independent test facilities confirms that PUPI crossarms meet or exceed stated load ratings.
- GEOTEK's on-site mechanical testing facilities can be used to test custom applications of PUPI crossarms and braces.

### ELECTRICAL TESTING:

- Leading electrical laboratories have confirmed that PUPI crossarms have superior insulating and BIL properties.

Detailed test results are available upon request.

# FEATURES & BENEFITS

## CUSTOM APPLICATION DEVELOPMENT

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- GEOTEK has worked with customers around the world to develop PUPI fiberglass solutions to their challenges.
- GEOTEK engineers have extensive experience working with fiberglass crossarms specifically for use in the electrical utility industry.
- All PUPI product recommendations benefit from years of extensive foundational testing.
- Where applicable, GEOTEK tests custom applications to assure PUPI crossarms will meet customer specifications.
- PUPI mechanical properties are available for electrical utility engineers and designers.
- A PUPI properties library file is available for use with PLS-POLE design software.

# FEATURES & BENEFITS

## PULTRUSION PROCESS

PUPI fiberglass crossarms and braces are made with a process called “pultrusion”. Pultrusion is a proven composite manufacturing technology designed to produce reinforced composite materials of the highest strength and uniformity. GEOTEK has decades of pultrusion experience and manufactures PUPI crossarms under tight quality control to give uniform, predictable properties and reliable performance.

PUPI crossarms begin with a liquid resin mixture and reinforcing materials. The reinforcement materials are rolls of fiberglass mat and spools of fiberglass roving, positioned for feeding into guide plates. For optimal performance, the reinforcements must be properly located within the composite structure, which is controlled by the reinforcement guide plates.



The raw materials are pulled (as opposed to pushed, as in extrusion) through the process using a continuous pulling device. As the reinforcements are pulled into the resin impregnator, they are wrapped with a UV-resistant veil mat that will form the surface of the crossarm.

The resin impregnator saturates (wets out) the reinforcements and veil mat with a solution containing resin, pigment, UV inhibitors and catalyst. To produce the strongest, more consistent crossarms, the resin impregnator must be carefully designed to assure that it will completely wet out the reinforcements.

On exiting the resin impregnator, the reinforcements are organized and precisely positioned for placement by a pre-former. The pre-former is an array of tooling which squeezes away excess resin and gently shapes the materials as they are pulled into the forming die. Materials are pulled through the die under tremendous pressure to assure precise alignment of the reinforcing fibers.

Heat is applied in the die, activating the thermosetting reaction that cures (hardens) the composite crossarm. Upon exiting the forming die, SunGUARD® UV protection is thermally-bonded to the surface of the beam.

The beam is pulled to a saw for cutting to length. After cutting, the fiberglass beam is drilled, foamed and assembled into a finished PUPI crossarm.

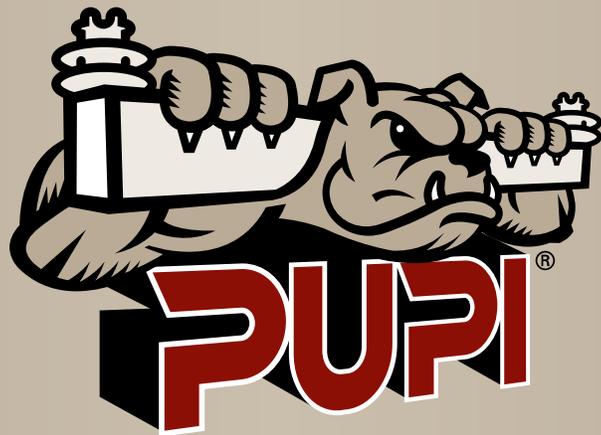
# FEATURES & BENEFITS



## PUPI CROSSARMS ARE ENVIRONMENTALLY-FRIENDLY

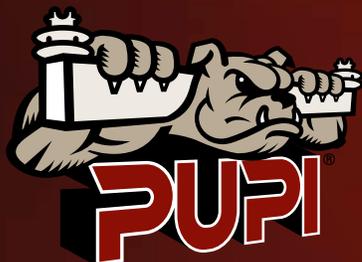
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- PUPI crossarms contain none of the toxic chemicals used to preserve wood crossarms. There is no risk that our crossarms may be harmful to people, animals, or the environment.
- PUPI crossarms last 2-3 times longer than comparable wood crossarms. Fewer replacements mean significantly less material and energy is used over the life of our crossarms.
- PUPI crossarm materials remain inert and safe throughout their life. At the end of their useful life (60+ years), our crossarms can be safely placed in landfill or recycled and used as reinforcement in other materials.
- PUPI crossarms are manufactured with materials utilizing green resin technology. These resins contain nearly 40% post-industrial recycled material.
- Lighter weight PUPI crossarms use less energy to transport.
- PUPI crossarms are more energy efficient to install. The lightweight design makes handling easier, requiring lighter machinery and less manpower.
- While wood crossarms claim to be “green,” it actually takes large amounts of energy and toxic chemicals to make trees into wood crossarms. Trees must be cut, trimmed, removed from the forest, transported to the saw mill, dried, cut into crossarms, chemically treated with toxic preservatives and then transported to customer warehouses and job sites. Considerable energy is expended and waste is created throughout these processes.



FOR MORE INFORMATION PLEASE VISIT US AT:

[www.pupicrossarms.com](http://www.pupicrossarms.com)



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