High Performance Modular Utility Poles

ENGINEERED DURABILITY
Solutions for the growing needs of today's grid infrastructure
Significant portions of the utility grid were installed decades ago. Aging structures endure constant attack from rot, corrosion, woodpeckers and termites and are regularly challenged by ice storms, hurricanes, tornadoes, vandals and even vehicular impact.

New line construction and pole replacement can be problematic with long lead times, challenging terrain, right of way issues, environmental assessments, disposal costs, power interruptions and costly equipment requirements.

The RS Pole Solution
RS Composite Utility Poles are constructed from combinations of up to eight standard-sized tubular modules to create poles with heights ranging from 30 ft. (9.1 m) to 155 ft. (47.2 m) that use standard industry hardware. RS poles deliver the following:

- **Lowest Logistics Costs**
  with industry best lead times, more efficient transportation, fast installations and cost effective inventory management.

- **Lowest Liability**
  with a limited 41 year warranty, high dielectric strength providing improved safety for workers and the public, better storm and high wind resilience, faster response times in emergencies and minimal environmental impact.

- **Longest Life**
  with an 80 year service life, integrated UV protection and immunity to rot, corrosion, woodpeckers and termites.

"The highest performing Utility Pole on the Market"

RS poles have been used by over 295 utilities worldwide, including installations in North America, Scandinavia, Australia, Europe, South America, Asia and the Caribbean.
**COMPOSITE MATERIALS**

The RS utility pole is made from an advanced composite material with integrated UV protection that combines an ultra-strong polyurethane resin and E-glass fiber rovings.

**MODULAR DESIGN**

The RS pole’s unique tapered design enables the modules to be nested in compact bundles allowing for maximized efficiencies in storage and transportation. The eight module system can be configured to build virtually any pole class up to 155 ft. [47.2 m], which lowers the lead time for deliveries, reduces inventory requirements and simplifies transportation, handling and installation.

**RS ADVANTAGES**

**Hardware Compatibility**

Every pole, be it wood, steel, concrete or composite, will perform at its best when it is matched with the correct hardware. Smooth surfaced hardware without sharp points of contact is used with RS poles and is commonly available. The RS pole’s round cross section ensures easy hardware selection.

**Superior Temperature Performance**

The composite material performs well in both hot and cold environments. The established temperature range is -76°F to +167°F [-60°C to +75°C].

**Fast Assembly**

RS pole slip joints assemble in approximately 10 minutes each or with the assembly racks entire poles can be completed in 15 minutes with a crew of four including a mechanically fastened connection. Poles can be pre-drilled for specific framing patterns prior to shipping to reduce installation time.

**Modularity**

Custom length and strength poles are created from standard sized modules for ultimate flexibility. Below are different module combinations to build a 75 ft. [22.8 m] pole:

**Case Study:**

**Storm Resilience**

RS poles can sustain a high load from hurricanes, tornados, snow and ice and return to their original position.
**LOWEST LOGISTICS COST**

The RS pole’s modular design offers the fastest delivery and lowest logistics cost of any utility pole, from the time the order is placed to the time the pole is installed.

**Industry Best Lead Times**

RS maintains a large inventory of modules which enables even large custom pole orders to be shipped within weeks and on demand production capability ensures RS has the pole inventory you require.

**Minimal Inventory**

Because the interchangeable modular system can satisfy multiple pole strength and length requirements, nested module sets that take up a fraction of the space that single piece poles require are stocked instead of many custom single piece poles. A major contributor to an effective sparing strategy, RS’s modular system keeps minimal inventory on hand, quickens turnover cycles and reduces safety stock inventory costs while effectively meeting day-to-day and emergency requirements. Downtime from grid damage is significantly reduced because the modules can be quickly configured to build almost any pole class up to 155 ft. [47.2 m].

**Case Study: Inventory Advantage**

“Having the ability to build a variety of pole lengths and classes from just eight modules gives utilities faster deployment time for emergency outages.”

Utility Products, November 2006

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**One Set of Modules can build 262 Different poles**

RS Modular Pole Combination Sampling

<table>
<thead>
<tr>
<th>M1</th>
<th>M2</th>
<th>M3</th>
<th>M4</th>
<th>M5</th>
<th>M6/7</th>
<th>M8/9</th>
<th>M10/11</th>
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<tbody>
<tr>
<td>30 ft.</td>
<td>35 ft. - 40 ft.</td>
<td>50 ft. - 60 ft.</td>
<td>65 ft. - 75 ft.</td>
<td>80 ft. - 90 ft.</td>
<td>95 ft. - 105 ft.</td>
<td>110 ft. - 120 ft.</td>
<td>125 ft. - 155 ft.</td>
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<tr>
<td>[9.1 m]</td>
<td>[10.7 m - 13.7 m]</td>
<td>[15.2 m - 18.3 m]</td>
<td>[19.8 m - 22.9 m]</td>
<td>[24.4 m - 27.4 m]</td>
<td>[29 m - 32 m]</td>
<td>[33.5 m - 36.6 m]</td>
<td>[38.1 m - 47.2 m]</td>
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</table>

STRENGTH
### Pole Capabilities From One Set of RS Modules

<table>
<thead>
<tr>
<th>Pole Lengths</th>
<th>30 ft.</th>
<th>35 ft.</th>
<th>40 ft.</th>
<th>45 ft.</th>
<th>50 ft.</th>
<th>55 ft.</th>
<th>60 ft.</th>
<th>65 ft.</th>
<th>70 ft.</th>
<th>75 ft.</th>
<th>80 ft.</th>
<th>85 ft.</th>
<th>90 ft.</th>
<th>95 ft.</th>
<th>100 ft.</th>
<th>105 ft.</th>
<th>110 ft.</th>
<th>115 ft.</th>
<th>120 ft.</th>
<th>125 ft.</th>
<th>130 ft.</th>
<th>135 ft.</th>
<th>140 ft.</th>
<th>145 ft.</th>
<th>150 ft.</th>
<th>155 ft.</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>9.1 m</td>
<td>10.7 m</td>
<td>12.2 m</td>
<td>13.7 m</td>
<td>15.2 m</td>
<td>16.8 m</td>
<td>18.3 m</td>
<td>19.8 m</td>
<td>21.3 m</td>
<td>22.9 m</td>
<td>24.4 m</td>
<td>25.9 m</td>
<td>27.4 m</td>
<td>29 m</td>
<td>30.5 m</td>
<td>32 m</td>
<td>33.5 m</td>
<td>35.1 m</td>
<td>36.6 m</td>
<td>38.1 m</td>
<td>39.6 m</td>
<td>40.2 m</td>
<td>41.7 m</td>
<td>43.2 m</td>
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</tbody>
</table>

| NESC Grade B Pole Class | H6 | H5 | H4 | H3 | H2 | H1 | 1   | 2   | 3   | 4   | 5   |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|-------------------------|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|                         | ✔  | ✔  | ✔  | ✔  | ✔  | ✔   | ✔   | ✔   | ✔   | ✔   | ✔   | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     |


Total Pole Capabilities = 262
**Efficient Transportation**

The RS pole’s nesting modules mean even the longest RS poles only require standard length trailers and they eliminate the need for slow and expensive long load permits. See the Truckload Quantity Comparison chart below to review the significant shipping efficiencies that can be realized with RS poles. Depending on pole size, RS modules can also be shipped and stored in 20 ft. [6.1 m] or 40 ft. [12.2 m] intermodal containers for international deliveries and quick deployment after natural disaster damage to the grid. Lightweight RS poles have been air freighted in bulk quantities in emergencies.

<table>
<thead>
<tr>
<th>Pole Type</th>
<th>RS</th>
<th>Steel</th>
<th>Wood</th>
<th>Concrete</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>19 ft. [5.8 m]</td>
<td>19 ft. [5.8 m]</td>
<td>45 ft. [13.7 m]</td>
<td>60 ft. [18.3 m]</td>
</tr>
<tr>
<td>Quantity</td>
<td>53 Poles</td>
<td>27 Poles</td>
<td>15 Poles</td>
<td>6 Poles</td>
</tr>
</tbody>
</table>
**Installation Flexibility**

Lightweight RS poles can be assembled in 15 minutes per pole with a four man crew. When setting the pole, in addition to using lighter duty machinery, modularity allows for installations sequencing options. The entire pole can be assembled on the ground and then installed. Alternatively, the base can be installed first and the remaining top modules added at a later time either one at a time or as a preassembled unit. On-the-fly line design changes to pole height and class are easily accomplished by simply adding or removing the desired module. Pole modularity also provides for simple circuit height adjustments, future system expansion and revenue generating joint use potential. Compared to traditional pole materials, smaller helicopters can be used to lift fully constructed H-frames for challenging location drops. RS poles are easily cut and/or drilled in the field.

**Case Study:**

**Installation Advantage**

Norwegian utility NTE has calculated that the installed cost of RS poles is about 10% less than wood when span lengths are optimized and helicopters are used for installation.
LOWEST LIABILITY

High performance RS poles reduce the risks and costs associated with managing utility infrastructure and increase grid reliability.

Reliable Storm Protection

The ultra strong RS composite pole can absorb significant elastic strain energy in high-load situations like hurricanes, tornados, ice storms and seismic events. This capability delivers infrastructure reliability far beyond the expected performance of conventional utility pole materials. The exceptional load carrying capacity combined with the RS pole’s light weight reduces the potential for cascade failures. Excellent fracture toughness protects against crack initiation and propagation. Additionally, RS poles are self-extinguishing and meet the published pole strength values from tests conducted after exposure to moderate to severe simulated wildfires.

Increased Safety

Manufactured with a non-conductive and hydrophobic material, RS poles reduce the risk of second point of contact injuries, eliminate electrical tracking and help prevent arcing due to lightning or switching. RS Composite Utility Poles pass the 100 µA test for a hotstick which makes live-line installations safer. The lightweight modules decrease the probability of worker injury and equipment fatigue. The tubular RS pole allows ground wires to be run internally.

Environmentally Responsible

RS poles are free of toxic preservatives common to wood poles and as a result they do not leach chemicals into the ground or water table. Soil remediation is never required. RS poles have been tested by using the ASTM C 1308-08 Leach Test and the water used in the test subsequently passed both Canadian and US drinking water safety standards. The RS manufacturing process releases no volatile organic compounds (VOC) or hazardous airborne pollutants (HAP).

Public Satisfaction

RS’s controlled manufacturing process ensures a consistent lifetime aesthetic. RS poles are available in either grey or brown to match existing wood and steel poles or to blend in with the scenery. The surface of the RS pole is easily cleaned of graffiti and poster glue and is resistant to staples.

Case Study: Reliability
Rio Grande EC had just finished installing a 34.5kV line when a tornado touched down. “We lost eight 40 ft. [12.2 m] Class 3 wooden poles. RGEC Operations reported that the RS composite poles that we installed in this area ‘did not budge at all’.”
Dan Laws
Rio Grande EC

Case Study: Non-Conductivity
RS poles were proven by test lab Kinectrics in Ontario, Canada to pass the test for a hot stick, making them one of the safest poles on the market.

Case Study: Environmental Advantage
“RS poles do not need to be coated with Penta, arsenic or creosote. As a result, these poles are the most environmentally friendly ones available in the market place.”
NWPPA Bulletin, January 2006

Case Study: Reliability
Rio Grande EC was just finishing installing a 34.5kV line when a tornado touched down. “We lost eight 40 ft. [12.2 m] Class 3 wooden poles. RGEC Operations reported that the RS composite poles that we installed in this area ‘did not budge at all’.”
Steve Coltharp
West Kentucky EC

Specific Strength Comparison

<table>
<thead>
<tr>
<th></th>
<th>RS poles: 630 psi.ft³/lb [271 kPa.m³/kg]</th>
<th>Wood (Douglas Fir): 272 psi.ft³/lb [117 kPa.m³/kg]</th>
<th>Steel: 119 psi.ft³/lb [51 kPa.m³/kg]</th>
<th>Concrete: 7 psi.ft³/lb [3 kPa.m³/kg]</th>
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<tbody>
<tr>
<td>700 psi</td>
<td>300 kPa</td>
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<td>575 psi</td>
<td>225 kPa</td>
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<td>350 psi</td>
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<td>175 psi</td>
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Weight Comparison

<table>
<thead>
<tr>
<th></th>
<th>RS poles: 1,181 lbs [536 kg]</th>
<th>Steel: 2,190 lbs [993 kg]</th>
<th>Wood: 3,695 lbs [1,676 kg]</th>
<th>Concrete: 8,500 lbs [3,856 kg]</th>
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</thead>
<tbody>
<tr>
<td>4,080 kgs</td>
<td>9,000 lbs</td>
<td>6,750 lbs</td>
<td>4,500 lbs</td>
<td>2,250 lbs</td>
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<tr>
<td>3,060 kgs</td>
<td>9,000 lbs</td>
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75 ft. [22.8 m] Class 1 Pole
LONGEST LIFE

Manufactured with integrated UV protection and a durable composite material, RS poles have a longer service life than any other pole alternative.

Excellent Weathering and UV Protection
High performance RS poles are engineered for an 80 year service life. This extended life expectancy is achieved from a single step manufacturing process which creates a monolithic laminate with an imbedded layer of aliphatic UV protection that cannot be scratched or flaked off. RS poles are covered by a 41 year limited warranty—see the RS Limited Warranty for complete details.

Corrosion, Rot and Pest Resistant
RS poles will not rot or corrode because the pole wall is hydrophobic. This allows for excellent wet area and coastal performance as well as resistance to salt and chemicals. RS poles are impervious to woodpeckers, termites and other pests. These performance advantages dramatically extend the life of the grid.

Maintenance Free Poles
RS poles require no scheduled maintenance, like preservative treatments or repainting, resulting in significant operational savings. Inspections are faster and less invasive and typical pole replacement frequencies are cut in half. Even hardware re-tensioning is required less often because RS poles have a similar coefficient of expansion to that of steel hardware.

Installed Cost and NPV Advantage
The RS pole delivers the lowest total ownership cost based on Net Present Value (NPV) calculations. In installations with challenging terrain, long length poles, remote locations or helicopter lifts RS poles can provide the lowest installed cost. Move beyond the material cost comparison and find out how much wood poles truly cost. A tailored analysis for your grid will be completed by RS Technologies.

Case Study: Longevity Advantage
A Pacific island utility plagued by termite damage on wood poles has increased the life of their grid 6-fold by using RS poles.

**LOWEST TOTAL OWNERSHIP COST**

- **Expected Service Life**

<table>
<thead>
<tr>
<th>Years</th>
<th>STEEL*</th>
<th>CONCRETE*</th>
<th>WOOD*</th>
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<td>120</td>
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*Grid infrastructure replaced at 2.5% annually
(100/2.5 = 40 year typical service life for traditional pole materials)
WORLD CLASS CUSTOMER SUPPORT
RS is the leader in composite utility poles. Our dedicated and qualified team of experienced engineers work with you from preliminary planning to line completion.

Design Support
The RS technical department is involved throughout the entire process to ensure you chose the right RS pole for your application. Our design support includes structural analysis or PLS-POLE™ and PLS-CADD™ where your loading requirements are reviewed and a report is generated detailing the performance of the RS pole in your application. RS poles can also be analyzed independently using the FRP library files available from Power Line Systems (PLS).

Technical Binder
All RS technical information is compiled into a single package containing:
- RS Pole Data Sheets from 30 ft. [9.1 m] to 155 ft. [47.2 m]
- Structural Design Guide
- Hardware Guide
- Maintenance and Inspection Guide
- Technical Specification
- Testing Overview
- Assembly and Installation Guide
- Frequently Asked Questions

Application and Installation
RS engineers can assist with project planning and assessment and are available to answer questions and provide support. Prior to commencing a project, we can complete a full hardware review and provide the necessary recommendations to ensure a long lasting, successful installation.

LAB TESTED, FIELD PROVEN
The RS controlled manufacturing environment produces consistent pole modules each and every time for measured, reliable performance in your grid. You can count on it.

Quality Assurance
RS is ISO 9001:2008 certified and maintains a stringent quality focus throughout the entire manufacturing process. From material inputs to formulation to final production, each step is carefully monitored to ensure you receive the best product on the market.

Testing
RS poles have been thoroughly full scale tested and verified to all relevant ASTM, ANSI and IEEE standards.

Line Installations
Current installations are subject to extreme temperatures, corrosive environments, pest attacks, heavy loading and severe weather. All poles continue to deliver superior, predictable performance.

Case Study: Hardware
Non-cleated, flat surfaced hardware is require for RS poles and hardware suppliers have compatible alternatives to wood pole hardware readily available. In most cases, existing hardware that is compatible with concrete and round steel poles can be used on RS poles.
RECOGNIZED INNOVATION
RS won the 2005 Award for Composite Excellence from the American Composites Manufacturers Association for the most creative application and innovative use of composites materials.

RS won the 2005 Innovation in Manufacturing Process Award.

“Infrastructure For Life” is a registered trademark of RS Technologies Inc. “PLS-POLE” and “PLS-CADD” are trademarks of Power Line Systems Inc.

*Disclaimer – The following contained herein is offered only as a guide for RS poles and has been prepared in good faith by technically knowledgeable personnel. This brochure is for information only and could be modified without notice.