Our Mission: Overcoming utility infrastructure challenges by merging excellence in engineering, science, & technology with a passion for client satisfaction.

Steel, Ductile Iron, and Fiberglass Overview

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Outline

- Why Not Wood
- Steel Overview
- Ductile Iron Overview
- Fiberglass Overview

Why Not Wood?

- Environment
  - Storms
  - Wildfire
  - Pests
- High volume demand
- Politics & public perception
- Niche applications

Photo by: Bloomberg Creative

STEEL
Material and Design

- Consistent material properties
  - High yield strength (50-70ksi)
  - Modulus of elasticity (29,000ksi)
  - Isotropic – Same value regardless of direction
  - High strength-to-weight ratio
- ASCE 48 – Design of Steel Transmission Pole Structures
- Tapered to optimize moment capacity
- Precise calculations for buckling and deflection

Photo by: AGA

STEEL
Material and Design

- Galvanized steel
- Weathered steel
- Ground sleeves
- Polyurethane coatings

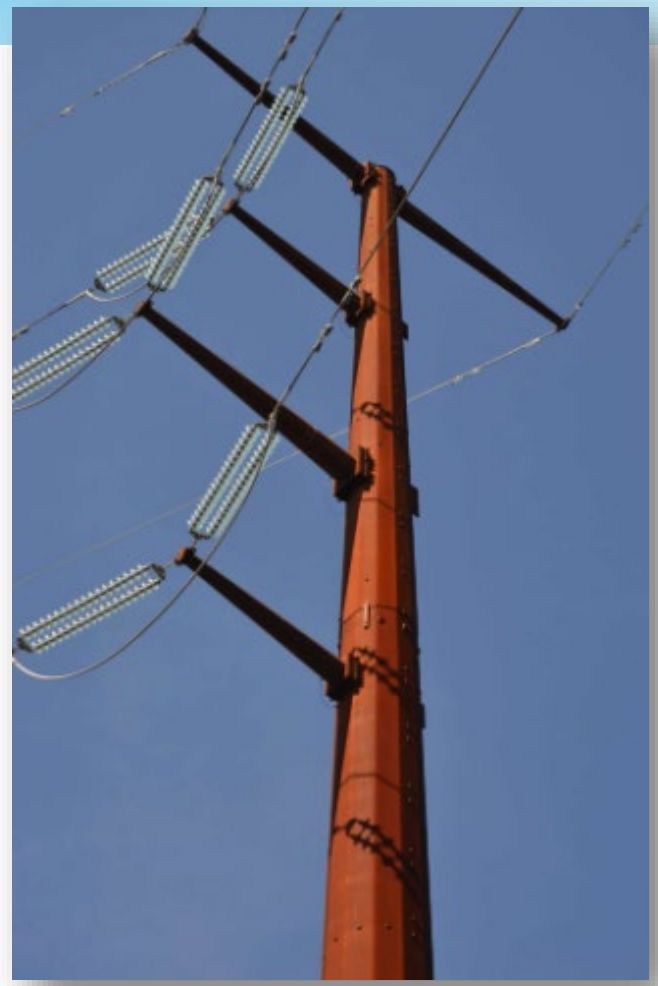


Photo by: Sabre

STEEL
Material and Design

- Manufacturing process
  - CNC cutting of plate steel
  - Bent and welded to shape
  - Baseplate and components attached
  - Finishes applied

Photo by: Meyer

STEEL
Challenges

- Conductive material
  - Grounding practices are different than wood
    - 4-wire systems can use the pole for grounding
    - 3-wire systems vary by utility
- Hot work and pole setting practices are more robust than wood
  - Highly important to have good standardization in the utility
    - NESC, GO-95, OSHA…

Photo by: Dominion Power

STEEL
Challenges

- Climbing
  - Knockout holes
  - Clips
  - Ladders
- Field attachment
  - Similar hardware as wood, pending pole shape
- Corrosivity

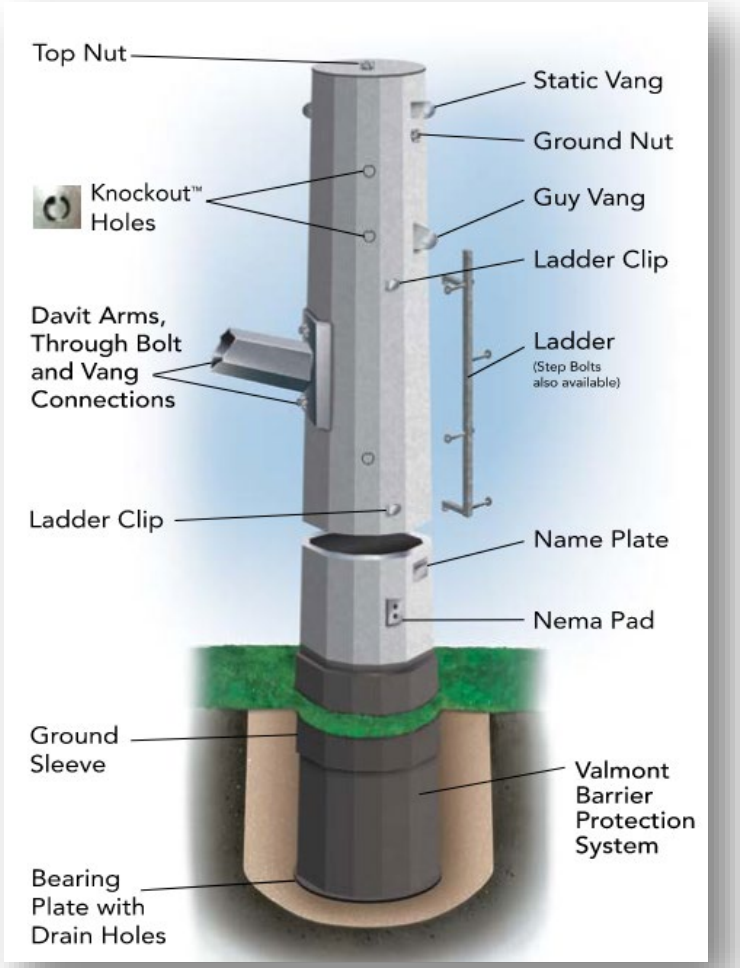


Photo by: Valmont

STEEL
Wildfire Resilience

- Noncombustible (coatings not included)
- High thermal conductivity
- Softens at 750°F (Wildfire temps are 1,500°F – 2,200°F)
- Embrittlement may occur
- Coatings may be burned or melted

Photo by: Valmont

STEEL
Logistics

- 60 year lifespan
- 16-18 week lead time
- Cost: Roughly 2X wood
- Handling: protect the galvanizing and groundline coating
- Maintenance: routine visual inspections
- End of life: recyclable

Photo by: EDM

DUCTILE IRON
Material and Design

- Non-brittle iron
- Consistent material properties
  - Moderately high yield strength (42ksi)
  - Modulus of elasticity (24,000ksi)
- ASCE 111 – Reliability-Based Design of Utility Pole Structures
- Tapered to optimize moment capacity
- Consistent strength

Photo by: McWane

DUCTILE IRON
Material and Design

- Corrosion resistant (similar to weathered steel)
- Ceramic-epoxy coating of base
- Can be coated with zinc or acrylic paint

Photo by: McWane

DUCTILE IRON
Material and Design

- Manufacturing process
  - Melted
  - Centrifugally cast
  - Annealed
  - Cut to length
  - Mechanically pinned sections
  - Drilled
  - Coated

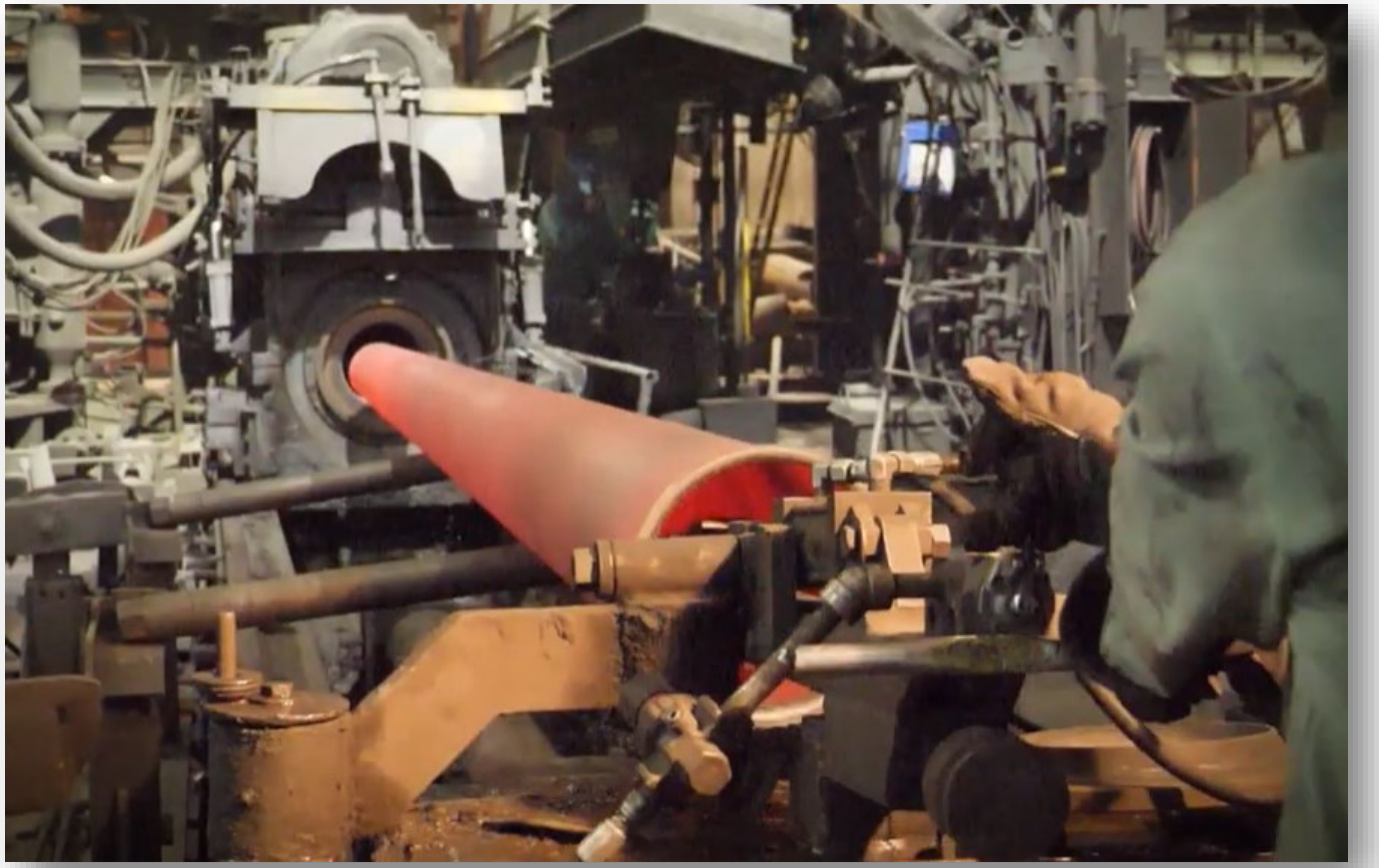


Photo by: McWane

DUCTILE IRON
Challenges

- Conductive material
- Hot work and pole setting practices are more robust than wood
- Climbing
- Field attachment
- Corrosivity

Photo by: McWane

DUCTILE IRON
Challenges

- Lower yield strength than steel (42ksi vs 65ksi)
  - Thickened to match steel strength
  - Heavier than steel (typically less than wood)
  - Less susceptible to localized buckling
- One fabricator
- Product adoption

Photo by: McWane

DUCTILE IRON
Wildfire Resilience

- Noncombustible
- High thermal conductivity
- Softens at 650°F (Wildfire temps are 1,500°F - 2,200°F)
- Tempering or re-annealing may occur

Photo by: EDM

DUCTILE IRON
Logistics

- 75 year lifespan
- 8-22 week lead time
- Cost: Similar to wood (70ft-H1)
  - 3X wood for small distribution
- Handling: protect groundline coating, can use chains
- Maintenance: routine visual inspections
- End of life: recyclable

Photo by: McWane

FIBERGLASS
Material and Design

- Composite
  - Resin (compression), Fiber (tension)
- Additives
- Fillers

Photo by: ResilientStructures

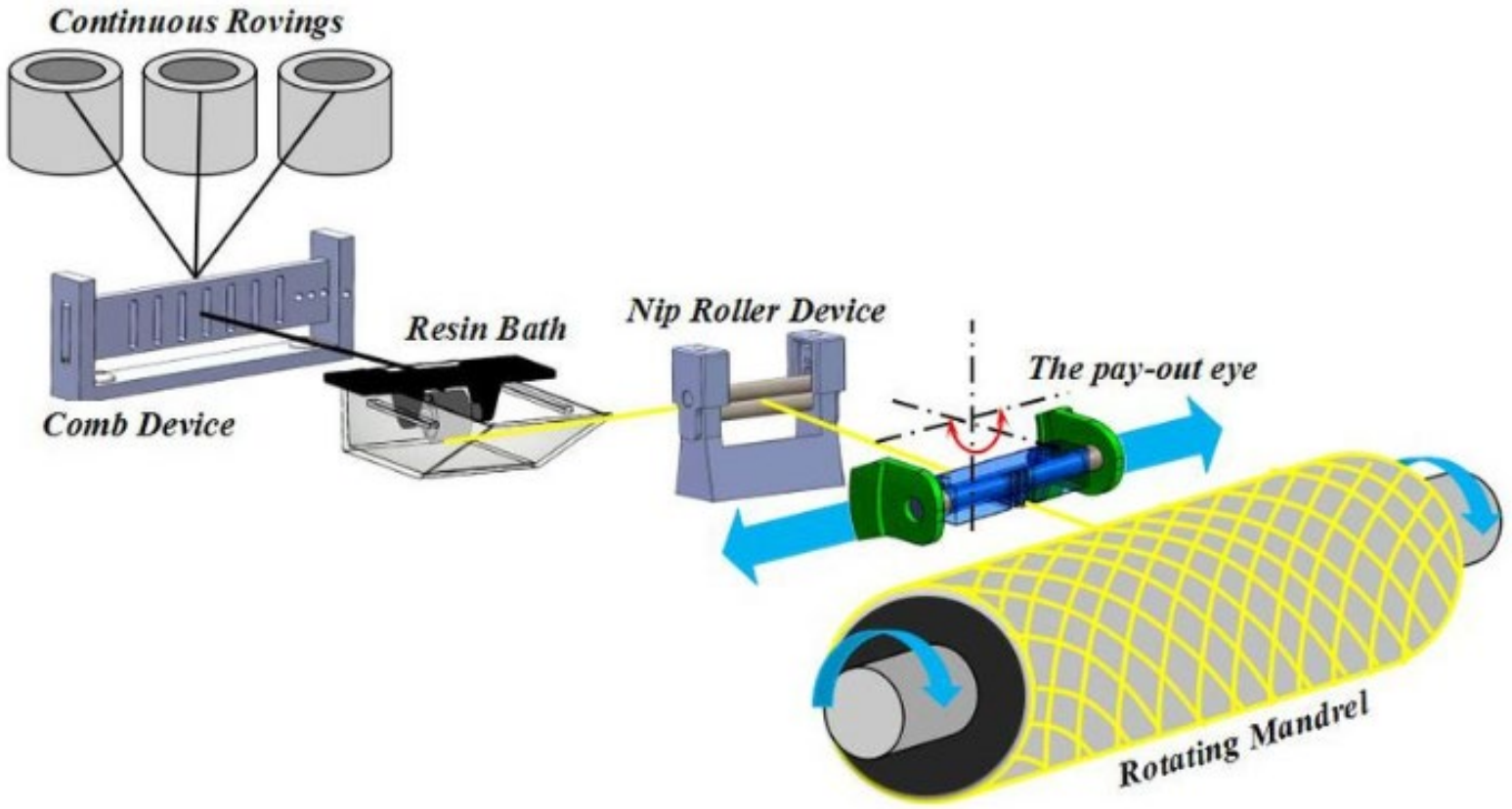
FIBERGLASS
Material and Design

- Design dependent properties
  - Ultimate moment capacity (165 to 388ft-kip)
  - Modulus of elasticity (2,000 to 5,000ksi)
  - Anisotropic – directionally dependent strength and stiffness
  - High strength-to-weight ratio
- ASCE 111 – Reliability-Based Design of Utility Pole Structures
- Tapered or uniform cross-section

Photo by: CreativeCompositesGroup

FIBERGLASS
Material and Design

- Manufacturing process (filament winding)



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FIBERGLASS
Material and Design

- Manufacturing process (pultrusion)

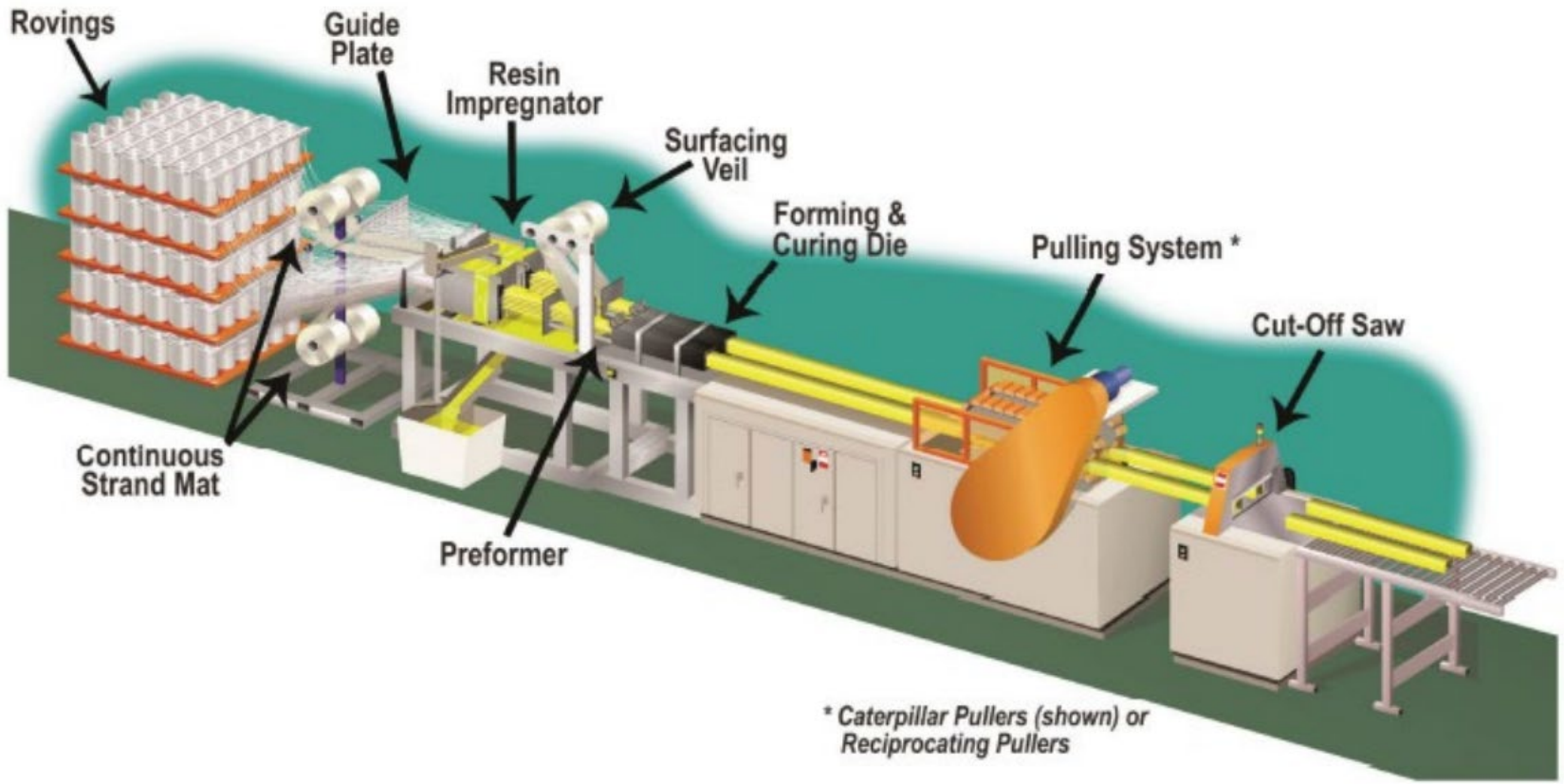

Photo by: CreativeCompositesGroup

FIBERGLASS
Challenges

- Climbing
- Field attachment
- Flexibility
- UV
- Moisture
- Temperature

Photo by: Alliance

FIBERGLASS
Wildfire Resilience

- Self-extinguishing (combustible)
- Thermal insulator
- Glass Transition Temperature ~250°F
  (Wildfire temps are 1,500°F – 2,200 °F)
- Protectants: Intumescence, endothermic, sacrificial material
- Resin can be burned or embrittled

Photo by: Hawaiian Electric

FIBERGLASS
Logistics

- 50-80 year lifespan
- 8-14 week lead time
- Cost: 1.5X wood for high class poles
  - 3-4X wood for distribution poles
- Handling: protect the surface
- Maintenance: routine visual inspections
- End of life: landfill

Photo by: Shakespeare


EDM
Questions?
SCAN ME