Economic Repair of Bridge Piling (& Culverts)

Mo Ehsani, Ph.D., P.E., S.E.
*President, QuakeWrap, Inc., and Centennial Emeritus Professor of Civil Engineering, U. of Arizona*

Tony White
*General manager, QuakeWrap, Australia*
QuakeWrap® FRP Products

- Saturating Resin
- Fabric
- Tack Coat
- Strips
Advantages of FRP

➢ High Tensile Strength (**3-5 times stronger than Steel**)  
➢ Low Weight (**no foundation adjustments required**)  
➢ Corrosion Resistance & Protection  
➢ Chemical Protection  
➢ Waterproof  
➢ Speed of Construction  
➢ Versatility  
➢ Odorless & Non-Toxic (**QuakeWrap Products**)  
➢ NSF-61 Certified for pipes ≥ 8 inches  
➢ Minimal Investment
Timeline for FRP in Repair & Retrofit

- **1988-89**: Beams
- **1990**: Columns
- **1993-94**: Walls
- **1997-98**: Large Diameter Pipes
- **2004-05**: Blast Mitigation
- **2009-10**: SuperLaminate
  - *PipeMedic®*
  - *PipeMedic®*
- **2011**: StifPipe®
- **2012**: InfinitPipe®
Multi-Layered SuperLaminate™ *(Patented)*

- Multi-Axial Reinforcement
- Thickness ≈ 0.01 - 0.025 inch (0.25 - 0.67mm)
- Tensile Strength ≈ up to 155,000 psi (1030 MPa)
- Infinite combinations of strength & stiffness can be produced
- ISO 9000 Certified
PileMedic® Installation with the U.S. Military (Pearl Harbor, Hawaii)
Extensive Structural Testing

- Caltrans: *Reinforced Concrete*
- Texas DOT: *Steel H Piles*
- Nebraska DOR and the US Army Corps of Engineers: *Timber Piles*
Riverwalk Bridge
Kangaroo Point, Brisbane AU

Figure 2: Example section of encased pile detail

Photographs – Indicating vertical cracking up to 20mm wide and spalling due to corrosion of reinforcing bars
Barron River Jetty, Cairns, Australia
Sunday Creek Bridge – 16 Piles (Cardwell, Australia)
Barron River Bridge
Injection of Resin into Wooden Utility Pole

The resin fills all crevices & cracks!!
Barron Carter Bridge – Timber & Steel Piles

(*west of Cairns, Australia*)
Todds Bridge, near Brisbane Australia
Todds Bridge Australia
Lawnville Road Bridge, Noosa, QLD
Composite Sandwich Concept

Steel I-beam

<table>
<thead>
<tr>
<th>RELATIVE STIFFNESS</th>
<th>1</th>
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<tr>
<td>WEIGHT (Pounds/ft²)</td>
<td>0.910</td>
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Design of StifPipe®

Close-up view

OUTER LAYER OF FABRIC
LIGHTWEIGHT CORE
INNER LAYER OF FABRIC

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Tests at Trenchless Technology Center (LA Tech Univ.)

- Funding from the U.S. National Science Foundation
- Hand-Made samples tested
ASCE Innovation Award (2016)

World’s first Green & Sustainable Pipe!
Gillies Road Culvert

Cairns, QLD
Gillies Road Culvert
Cairns, QLD
Gillies Road Culvert

Cairns, QLD
Gillies Road Culvert
Cairns, QLD
Georgetown Road Culvert

Cairns, QLD
Thank you for your Attention!

Questions?

Email: Mo@QuakeWrap.com

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