



Application Summary Sheet 2

Title: FRP Pile Encapsulation

Target Audience: Marine and Geotechnical Engineers, Marine Architects

Keywords: Pile, corrosion protection, jacketing, encapsulation.

Overview of application / summary

Composite encapsulation systems consisting of fibre reinforced plastic jackets epoxy grouted to the substrate are an advanced solution to the problem of corrosion attack of seawater on structures such as marine piles, risers and platform legs. Concrete structures in the marine environment can suffer from cracks and spalling due to expansion of reinforcement as corrosion takes place. Unprotected steel corrodes rapidly in the oxygen-rich splash zone. Alternative protection systems such as coatings, mastic wrapping or concrete encasement often prove unable to withstand wave forces and can deteriorate rapidly.

The encapsulation system consists of a moulded FRP jacket which is placed around the abraded and cleaned pile. Epoxy grout and aggregate mix is then pumped from the bottom up, displacing seawater. The aggregate has the benefit of scouring the substrate further enhancing bond. The FRP jackets are translucent allowing the process to be monitored by diver. The encapsulation materials are robust, have very low permeability and are themselves durable in seawater. The systems are relatively straightforward to install and should provide maintenance free protection to the concrete structure for long periods. The system can also be used for H section steel piles, tanks, manholes and beams.

Impact of Application

Financial:

Cost-effective means of protection of both new and existing marine structures

Environmental:

Prolongs the service life of marine structures.

Engineering:

Robust, durable, UV resistant, lightweight, straightforward to install.
Translucent FRP jacket allows monitoring of grout injection to take place.

Where to get further information

Prepared by BRE and Trend 2000 Ltd (Partners in Innovation Project)

For further information please consult the project website:

www.polymercomposites.co.uk

Review papers:

Polymer pile encapsulation: factors affecting performance

Snow R K

Concrete International May 1990. p34-40

The article gives an authoritative review of the method of polymer pile encapsulation, highlighting good practice and examining potential problems such as polymer grout discontinuities and lack of bond between the polymer grout and substrate, also improper mixing of polymer grouts. Inadequate preparation of the concrete substrate by abrasive cleaning is identified as one of the major causes of premature failure.

Pile Restoration of the Lake Pontchartrain Causeway Using an All-Polymer Encapsulation (APE) Process

Dulzer, N. Ball, C.

MARKETING TECHNICAL SESSIONS OF THE COMPOSITES INSTITUTES INTERNATIONAL COMPOSITES EXPO 1999 , page(s): 4-C

Review Articles:

Underwater Magazine article reprint: Summer 1996

"The Marketplace: Pile Encapsulation and Repair Products" at <http://www.diveweb.com/uw/archives/arch/uw-su96.36.htm>

Websites:

Advanced Pile Encapsulation System
<http://www.masterbuilders.com/>

Pile Jackets
<http://www.riverbendfiberglass.com/>