POLYMER EMULSIFIED CONCRETE (PEC)

• Concrete - the most widely used construction material with limitations:
  – low tensile strength
  – low failure strain, i.e. brittle
  – susceptibility to freeze-thaw effects
  – low resistance to chemicals

• Polymer Modifications
  – polymer impregnated concrete (PIC)
  – polymer cement concrete (PCC)
  – polymer concrete (PC)

• Fiber Reinforced Concrete (FRC)

• A New Concept – Improving the tensile ductility of concrete using emulsified flexible polymers (PEC)
Polymer Emulsified Concrete (PEC)

Objective

• To use emulsified flexible polymers, at 1-3wt% of cement, by a standard mix design, to improve the tensile ductility and damage tolerance of conventional concrete for general construction applications.

Significance

• Development of PEC with higher damage tolerance (ductility, energy absorption, impact resistance)
• Overcoming the brittleness of conventional concrete - a bottleneck hindering structural performances
• Reducing catastrophic failures of our Nation’s constructed facilities

Liang, 2004
Work in Progress
Polymer Emulsified Concrete With Improved Tensile Ductility

Preliminary research has demonstrated that the concept is a great success in terms of the fracture behavior of concrete samples wherein failure is ductile for PEC while in conventional concrete failure is brittle and explosive.

Photos showing ductile after-fracture-appearance and deformation around the cracks with non-shattering effect for concrete cylinders with ~1wt% of emulsified polymers

Liang, 2004