Housing Authority Seminar on Research and Development

Structural Lightweight Concrete

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香港城市大學 City University of Hong Kong Developing Innovative Precast Systems, including Application of Structural Lightweight Aggregate and Rapid Hardening PFA concrete, for Economic Production

Housing Authority Research Fund 2003

Research on Material Properties

Study based on Lightweight Expanded Clay Aggregates (LECA)

Carried out 60 trials mixes with combinations of water/cement ratio, cement content and PFA content.

Main testing items included:

- Workability [slump]
- Density & Compressive Strength
- Static Elastic Modulus
- Shrinkage
- Water Permeability
- Bond Strength



Workability of lightweight concrete mix



Research on Material Properties

•Finalized Grade 30 and Grade 35 concrete mixes according to the strength results.

•Conducted prototype design, laboratory testing and full scale trial for design verification and modification.

Mid-span deflection under serviceability load



LWC Composite slab (6.4m x 4m)





Materials Properties

- Comparable strength
- Shrinkage of the LWAC is about 33% higher than that of NWC.
- Elastic modulus of the LWAC is about 20% lower that of NWC.
- Bonding strength and water permeability slightly lower but not significant.

Concluded

• Structural lightweight aggregate concrete be used in precast structures such as staircases, slabs, facades and water tanks

Works Forward

Both lightweight aggregate and recycled aggregate are high absorption aggregates that requires prewetting before concrete mixing. Compare with the normal aggregate, 30 minutes water absorption of the recycled aggregate ranged between 7%~15%; while for lightweight aggregate, it can be as high as 8%~20%.

证书号第481401号 发明专利证书 发 明 名 称: 泪凝土骨料表面改性的处理方法 发 用 人、卢提、崔中本 专利号: ZL 2005 1 0087913.2 专利申请日,2005年7日20日 专利 程人,委请城市十座 授权公告日: 2009年3月25日 本发明经过本局依照中华人民共和国专利法进行审查,决定投予专利权,颁发本证书 并在专利登记得上予以登记。专利双自授权会告之日起生故 本专利的专利权期限为二十年,自申请日起算。专利权人应当依照专利法及其实施加 到规定撤纳年费、缴纳本专利年费的期限是每年07月29日前一个月内。未按照规定缴纳 平费的。专利权自应当跟纳平费期课之日起终止。 专利证书记载专利权登记时的法律职况,专利权的转移、质押、无效、终止、彼复而 专利权人的姓名或名称、国籍、地址定更等事项记载在专利登记簿上, 周长 司力事 BITIS IL

三书号 第479181号 发明专利证书 发 明 名 称: 绳凝土骨料的表面改性剂及其应用 明 人: 卢耀:崔宏志 利 号; ZL 2005 1 0084957.X 专利申请日,2005年7月22日 も利収人、希謝城市大学 授权公告日:2009年3月18日 本发明经过本局依照中华人民具和国专利法进行审查,决定投予专利权、领发本证书 并在专利登记箅上币以登记,专利权自授权公告之日起生效。 本专利的专利权期限为二十年,自申请日起算,专利权人应当依照专利法及其实施细 则规定撤纳年費。撤纳本专利年费的期限是每年07月22日前一个月内。未按照规定服纳 平费的,专利权自应当撤纳平费期满之日起终止。 专利征书记载专利政告兄的物质律状况。专利权的特殊、度行、无效、终止、该定加 专利征书记载专利成长,国籍、地址定更等事项记载在专利登记簿上。 服田力書 811(+17

2 Patents in 2009 [Dr Tommy Lo/Dr Cui H Z]

Surface Absorption Modifier for High Water Absorption Aggregates

Application Process of Surface Absorption Modifier for Aggregates with High Water Absorption



Water Absorption of three kinds of lightweight aggregates

The surface absorption modifier when applied to the aggregate will form a protective coating on surface of the aggregates which will prevent the water from being absorbed into the aggregate but maintaining a reasonable bonding.

The modifier is particular useful to control the water absorption of lightweight aggregate with a porous surface and for the recycled aggregate with cement paste content, to a level suitable for concrete production similar to the normal aggregate.

Look Forwards

- Composite slab construction to reduce weight
- Concrete repair of old buildings
- Green buildings and resident comfort [noise and temperature]

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