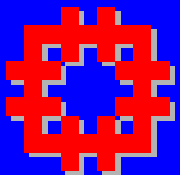




Seminar on Research and Development Work

Mr. Joseph MAK
Chief Structural Engineer
24 May 2010



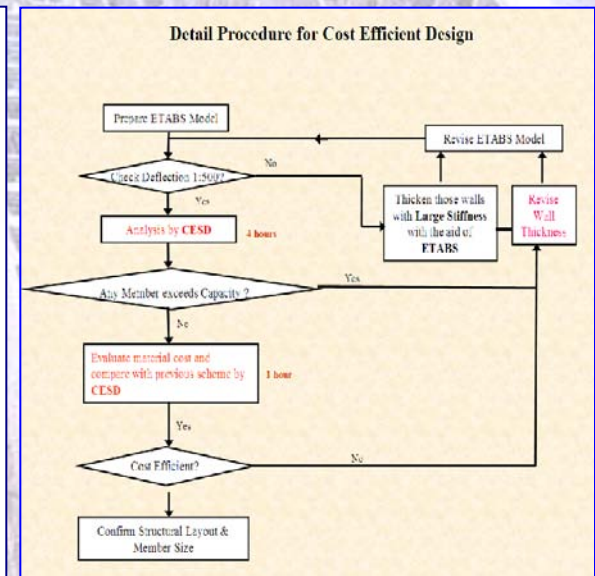
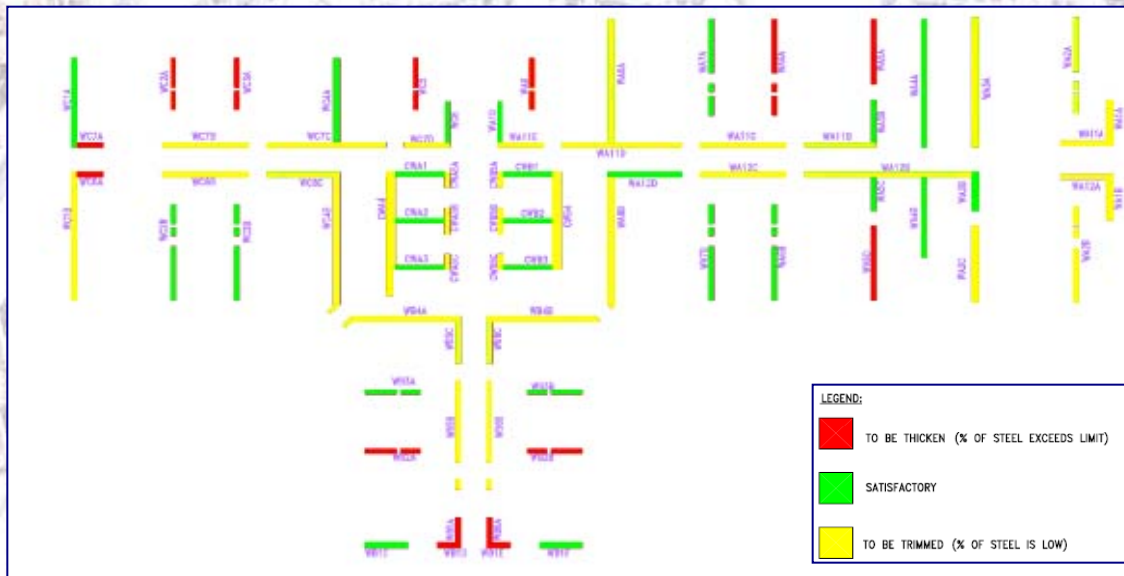
Structure & Geotechnics

1. Enhanced Structural Design
2. Recycled and Green Materials
3. Precast Components
4. Quality Control on Building Materials and Components
5. Expected Working Life of Building

Cost-Efficient Structural Design Software (CESD)

Features

- To optimize structural layout and reinforcement quantities
- In-house developed software package validated by HKUST as a proven optimization software applicable to HA residential blocks



Reduced Shear Links at Pile Cap and Transfer Structure

Features

- To optimize shear reinforcement provision for thick plate structure i.e. raft footing, pilecap and transfer plate
- Unconventional approach based on sophisticated analysis of stress distribution



Shear Reinforcement



Shear Reinforcement
REDUCED



Structure & Geotechnics

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Wider Use of Grade 200 Recycled Rock Fill

Benefits

- Sustainable
- Cost Saving
- Time Saving



Backfilling to Voids between Footings/Caps and Underside of Suspended Ground Floor Slabs



Recycle & Reuse of Marine Mud

Cement-Stabilisation for Backfilling

- Marine mud is stiff, moist, low strength and high compressibility
- Mix 5% cement and 15% granular material

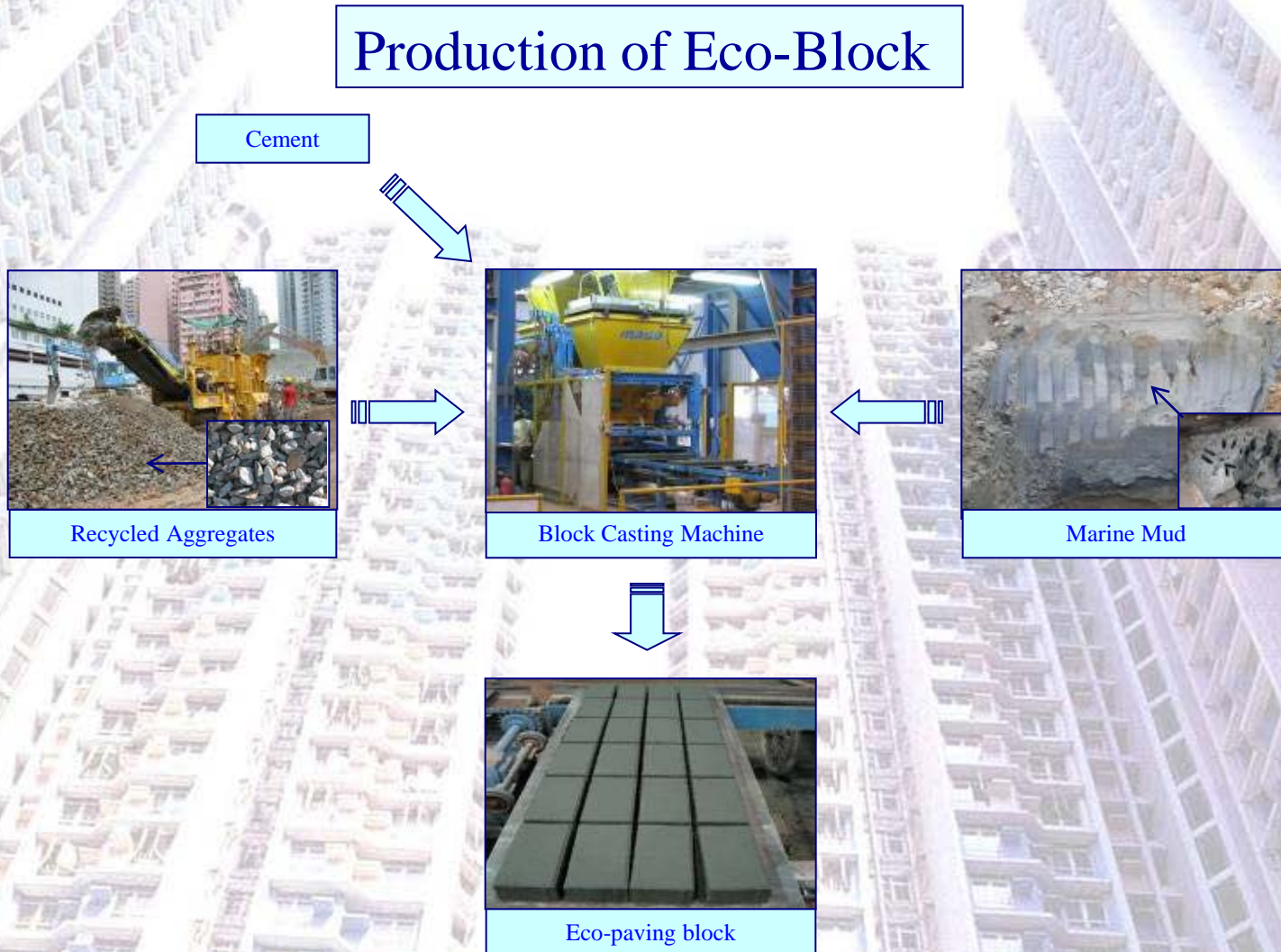


Mix marine mud with other materials



Backfill cement-stabilized marine mud around substructure

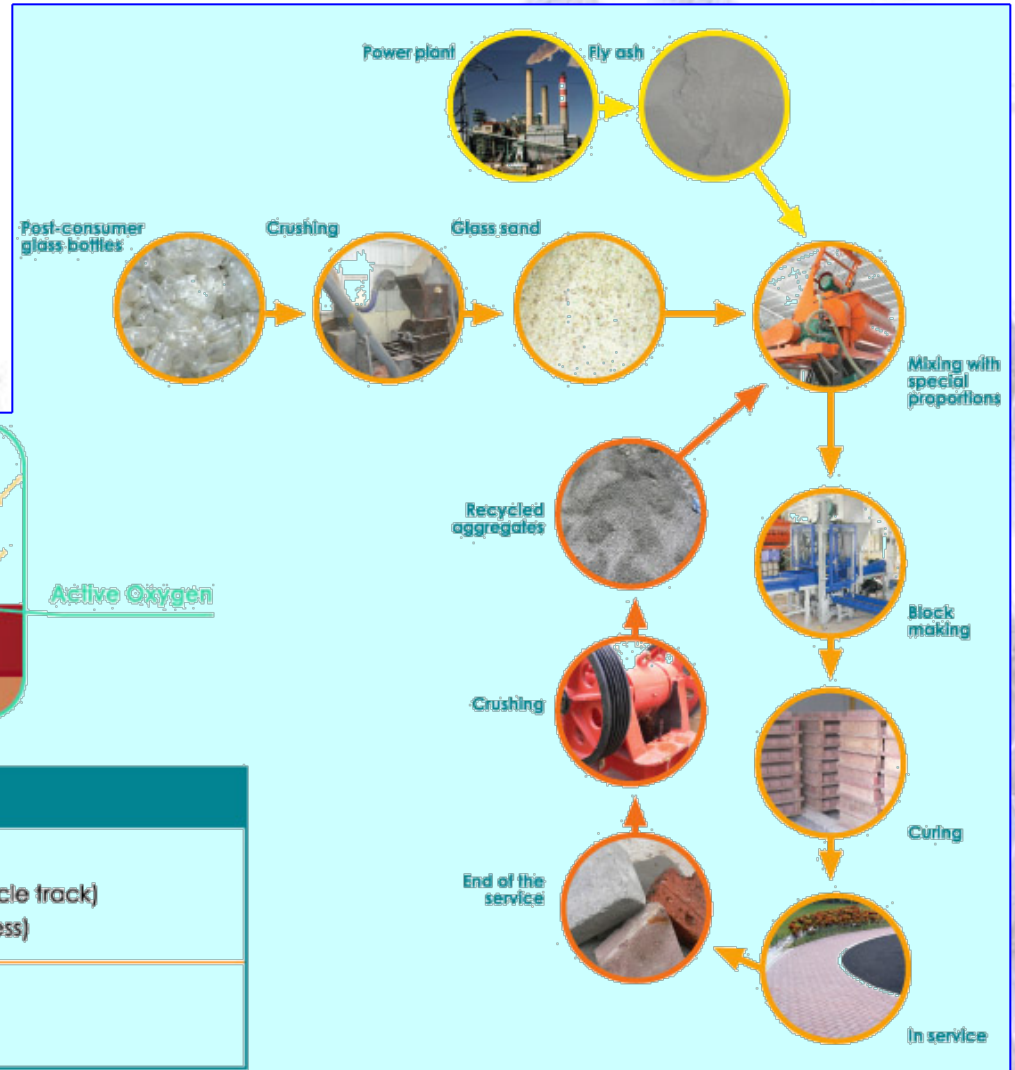
Recycle & Reuse of Marine Mud



Recycled Glass Pavers

Features

- Suitable for pedestrian and vehicular areas
- Capable of removing Nitrous Oxides by adding TiO_2



The diagram illustrates the photocatalytic process of a TiO_2 layer. It shows NO_x and NO_3 molecules being broken down by UV light and Active Oxygen on the surface of the TiO_2 layer.

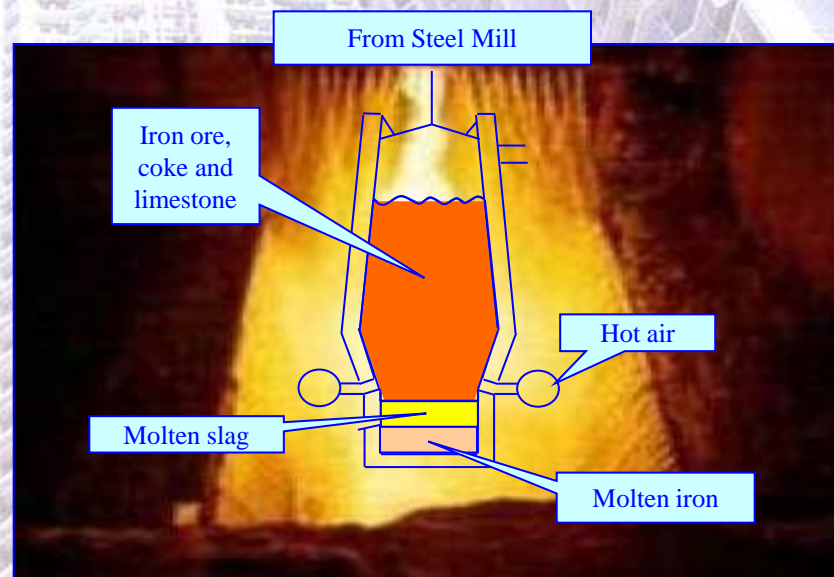
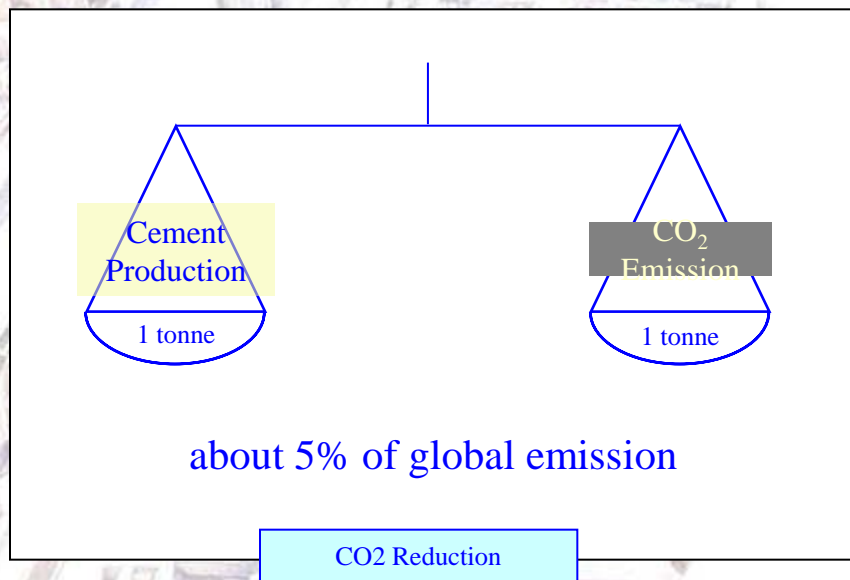
Paving
Compressive strength:
> 30 MPa (footpath or cycle track)
> 45 MPa (vehicular access)
Skid resistance:
> 45

A footpath built with eco-paving blocks made with recycled glass

Ground Granulated Blastfurnace Slag (GGBS)

Features

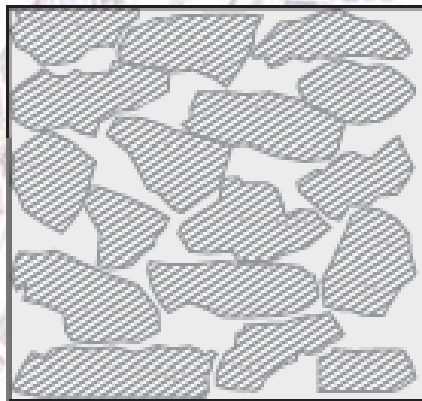
- Partial replacement of cement by GGBS from steel manufacture
- Reduction of CO₂ emission by 22%
- Enhanced durability and long-term strength



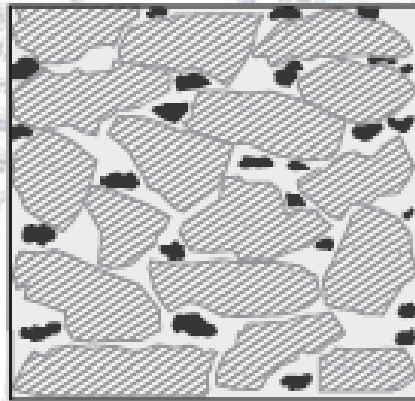
iCrete™

Features

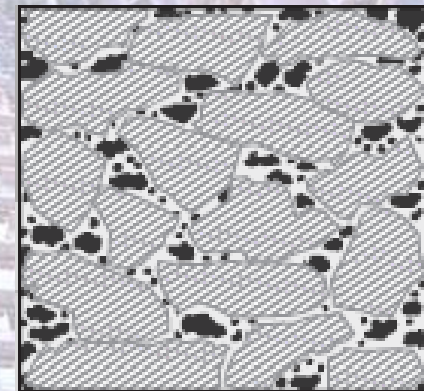
- Can reduce cement usage up to 40%
- Improve concrete properties
- Reduce batching variances and improve consistency
- Relatively easy to implement
- Mark breakthrough in concrete production technology in HK
- Have potential for application to high-rise domestic blocks



Traditional Mixes



iCrete Optimized Particle Packing
(optimum workability)



Maximum Particle Packing
(inadequate workability)

Slope Greening

Scope

- Evaluate greening techniques over various proprietary products
- Assess engineering performance and growth condition of vegetation on slopes



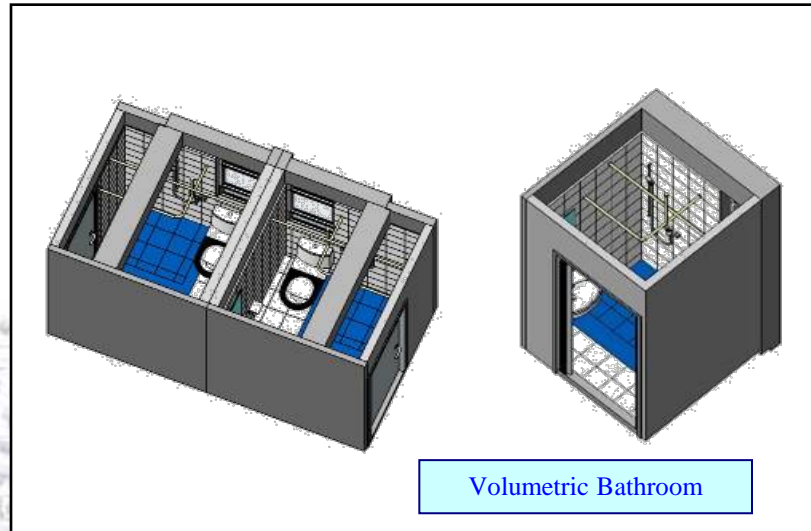
Structure & Geotechnics

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Volumetric Bathroom, Kitchen, Staircore and Lifecore

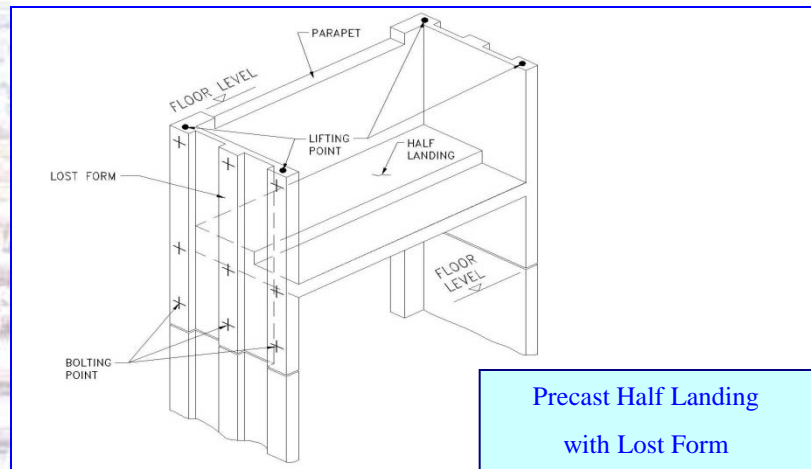
Volumetric precast elements

- give better waterproofing quality, speed of construction and economy of scale
- have great potential for large scale application



Precast Components

- Precast bathroom
- Precast bathroom-cum-kitchen
- Precast staircore
- Precast liftcore



Hard Paved Construction

Benefits

- Enhance site safety
- Improve site tidiness and environment
- Allow reuse of precast panels in subsequent contracts or other sites
- Eliminate waste disposal of in-situ concrete paving
- Eliminate dust and noise nuisance due to subsequent breaking up of in-situ concrete paving



Structure & Geotechnics

1. Enhanced Structural Design
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3. Precast Components
4. **Quality Control on Building Materials and Components**
5. Expected Working Life of Building

Product Certification

Benefits

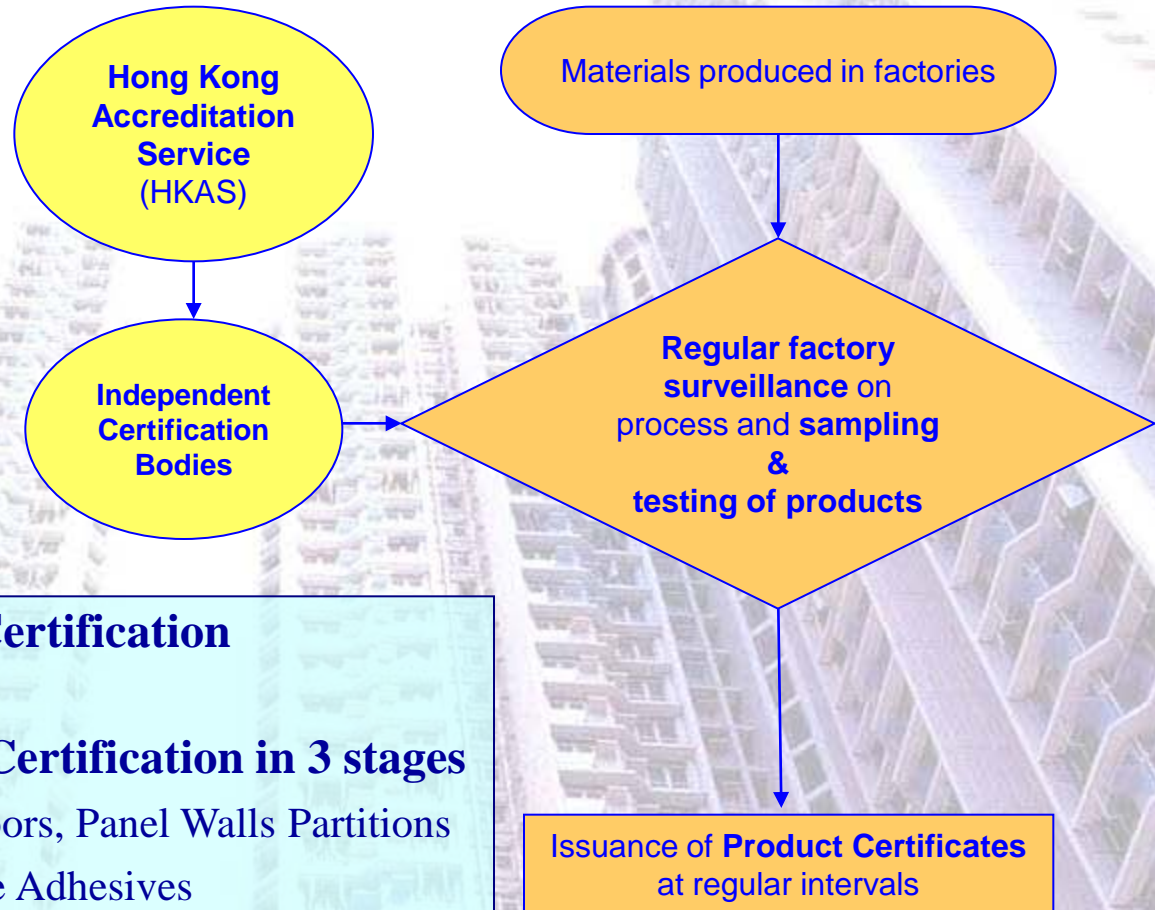
- Greater confidence
- Consistent quality
- Better image
- More business
- Higher competitiveness

Existing Product with Product Certification

- Ready mix concrete (QSPSC)

Coming Products with Product Certification in 3 stages

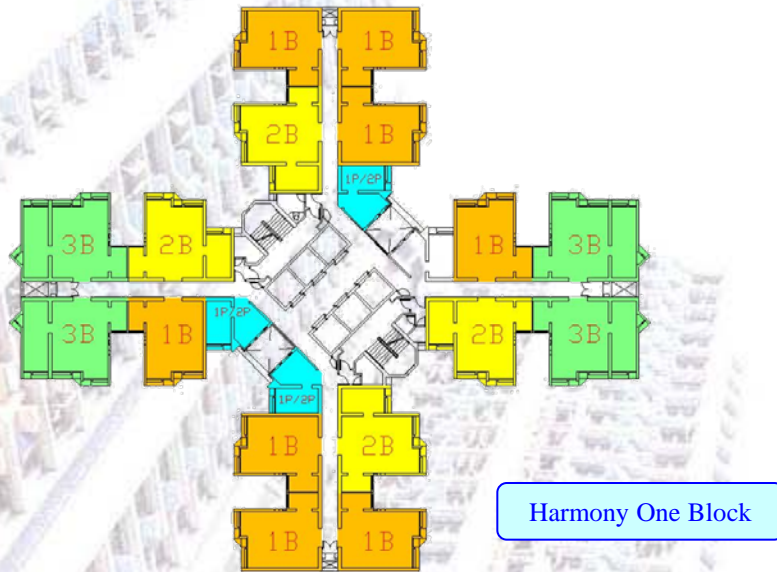
1. (by 5/10) - Fire Rated Timber Doors, Panel Walls Partitions
2. (by 8/10) - Cement Products, Tile Adhesives
3. (by 12/10) - Tiles, Repair Mortars



Structure & Geotechnics

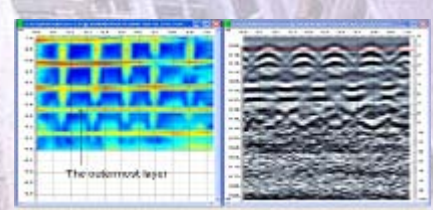
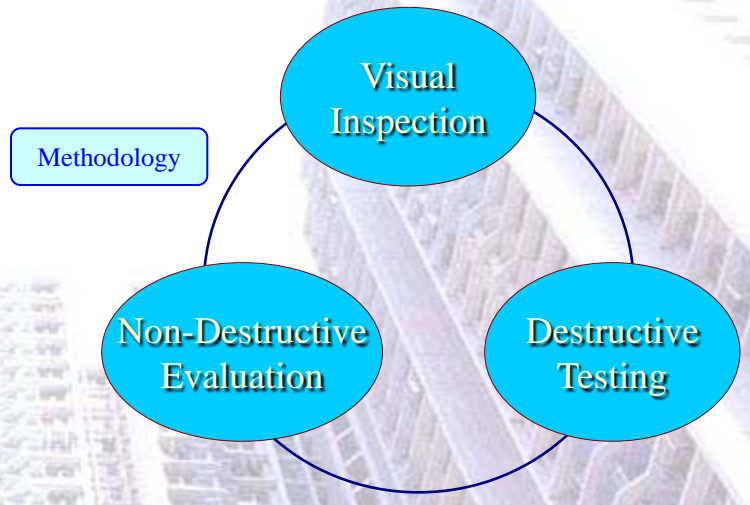
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Expected Working Life of Building

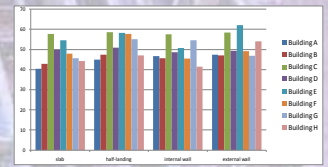


Findings

With appropriate maintenance and monitoring regime, working life for housing buildings built after 1992 is at least 100 years...



Test Results





Thank You