Concrete and the Environment: From Grey to Green
Gammon Construction Limited has been involved in a wide range of construction projects in Asia for over 50 years. We are the market-leading construction contractor in Hong Kong, where we are headquartered, and also operate in China and Southeast Asia.

In 1980, Gammon established a department to produce ready-mixed concrete that adds value for our customers. A trademark was registered to characterise the department’s products and services.

The department provides a variety of concrete solutions to customers. We also combine concrete mix design and production control technology to offer the best optimised concrete solutions to customers concerned about sustainable development.
Concrete’s carbon footprint

Concrete is the most widely used construction material in the world. The production of concrete, which requires the addition of cement, generates carbon dioxide, a greenhouse gas that contributes to global warming. A small reduction of 10% in the consumption of cement can make a significant difference in protecting the environment.

Compared to conventional concrete mixes, the cement content of Gammon Green Concrete is typically 10% lower.

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1. Hysan Place is the first building in Hong Kong to achieve pre-certification of the highest Platinum level under LEED (Leadership in Energy and Environmental Design) of the US Green Building Council.
2. This residue concrete recycling system used by Gammon is a compact system that washes, separates, and dewaterers concrete, and discharges sand and aggregate separately.
3. On the Hysan Place project, concrete raw materials used for construction were all manufactured within 800km to minimise the impact on the environment.
Gammon Green Concrete ("GGC") is a high-performance concrete family that has been developed to minimise its carbon footprint and increase durability.

GGC is designed to optimise the packing density of all the solid particles, including cementitious materials and aggregates, so that the least amount of ordinary Portland cement or cementitious materials can be used.

Supplementary cementitious materials (essentially waste from the generation of electrical power or other manufacturing processes) are also added to further reduce the amount of cement.

Both the addition of supplementary cementitious materials and the optimisation of packing density substantially reduce the absorptivity and permeability of concrete, thereby improving the durability of the concrete structures such as buildings, bridges and tunnels.
Example of optimising the packing density of grade 100 MPa high-performance concrete

Cumulative particle size distribution of concrete constituent materials

Combined cumulative particle size distribution of grade 100 MPa high-performance concrete
Gammon Green Concrete typical properties

GGC typically has a chloride diffusion value of lower than 2000 coulomb. When needed, the concrete can be formulated to reduce the chloride diffusion value to 500 coulomb or less. As a result, more durable buildings cut maintenance costs significantly and their service life could be extended well beyond 50 years – the normal service life of buildings in Hong Kong.

Life cycle cost comparison

Cumulative Present Value

![Cumulative Present Value Chart]

- 45/20D normal PFA concrete
- 100/20D high-performance concrete

1. The self-consolidating concrete used for the Hong Kong – Shenzhen Western Corridor project is capable of being transported over longer distances more economically
2. The Hong Kong – Shenzhen Western Corridor
3. Gammon's concrete batching plant
4. The cable-stayed tower for the Hong Kong – Shenzhen Western Corridor
Product range

A full range of GGC specifications
In the GGC family, concrete mixes have a carbon footprint per unit volume not higher than 380 kg carbon dioxide equivalent.

The different types of GGC include various high-performance concretes such as flowing concrete, high-strength concrete, high-durability concrete, self-consolidating concrete and early strength concrete.

Concrete mixes can also be tailored for special applications upon request (2 months’ lead development time required).

Normal Concrete
Normal concrete products are designed for general purpose applications such as columns, walls, slabs, and caps of buildings and bridge structures.

These high quality products are manufactured to comply with local and international standards or specifications.

High-performance Concrete
Gammon’s high-performance concrete products have been successfully applied in many technically-demanding projects in Hong Kong.

- Flowing Concrete (Slump ≥ 190 mm)
- Tremie Concrete
- Very Long Slump Retention Concrete (Slump retention ≥ 10 hours)
- Early Strength Concrete (Cube strength ≥ 10 MPa in 12 hours)
- Very Early Strength Concrete (Cube strength ≥ 12 MPa in 4 hours)
- High-Strength Concrete (Ranged from Grade 65 to 100 MPa with high workability)
- Self-Consolidating Concrete (Slump flow ≥ 700 mm)
- Crack Control Concrete

1 The pile cap works for the Hong Kong – Shenzhen Western Corridor
2 Photomicrograph of Grade 100 MPa high-performance concrete showing enhanced aggregate-cement paste interface
3 One Island East is an example of a project constructed with Grade 100 MPa high-performance concrete. The high strength property of Grade 100 MPa concrete means less concrete or rebar are needed. As a result at One Island East, the reduction in carbon footprint per unit floor area per year of service due to the higher strength and durability of the high-performance concrete used is about 50%
Harnessing technology

In 2003, Gammon introduced an advanced Global Positioning System (GPS) Mixer Truck Tracking System to manage its mixer truck fleet more efficiently. The system performs two basic functions: data transmission and data storage/analysis. This technology offers the following benefits:

- Real-time information, updated every 30 seconds, available to the operation team
- Timely and accurate delivery information assures better responses to customer enquiries and higher levels of customer satisfaction
- Maximum efficiency
- Reduced waiting time on site
- Reduced communication time
- Safer driving speeds
- Accurate and reliable delivery of data
Residue fresh concrete recycling

Gammon understands the importance of environmental protection and has adopted sustainable practices in every branch of its business. In Gammon’s concrete batching plant, the wastage from production and delivery is processed by the use of a two-stage recycling system:

- Separation in the concrete reclaimer stage
- Dewatering in the slurry dewatering machine stage

After processing, the wastage is separated into aggregates, dewatered slurry and water. All these materials can be re-used for other engineering purposes.
Our award-winning operations

– Certified to the Quality Scheme for the Production and Supply of Concrete (QSPSC), ISO 9001, ISO 14001 and ISO 18001.

– 2007 Hong Kong Awards for Industries – Technological Achievement Award.

– 2009 Occupational Safety and Health Award – Excellent Performance in Hearing Conservation.

– 2009 Occupational Safety and Health Award – Excellent Performance in Prevention of Pneumoconiosis.

Reference projects

**Major Civil Projects (over HK$1,000 Million)**
- 2003-2006  Hong Kong - Shenzhen Western Corridor, Hong Kong
- 2003-2006  Deep Bay Link - Northern Section, Hong Kong
- 2003-2008  Route 8, Nam Wan Tunnel and West Tsing Yi Viaduct, Hong Kong
- 2009-2013  Reconstruction and Improvement of Tuen Mun Road - Eastern Section, Hong Kong
- 2009-2014  MTR West Island Line, Kennedy Town Station and Overrun Tunnel, Hong Kong

**Major Building Projects (over HK$1,000 Million)**
- 2003-2005  Bellagio Phase 2, Hong Kong
- 2006-2008  One Island East, Hong Kong
- 2007-2009  iSQUARE, Hong Kong
- 2008-2011  Tamar Development Project, Hong Kong
- 2009-2012  Hysan Place, Hong Kong
- 2009-2012  Centennial Campus, The University of Hong Kong

**Major Foundations Projects (over HK$50 Million)**
- 2003-2006  Hong Kong - Shenzhen Western Corridor, Hong Kong
- 2003-2006  Deep Bay Link - Northern Section, Hong Kong
- 2005-2006  Mixed Use Development at Lot B, Zone B, NAPE, Macau
- 2006-2007  PPC Piling and Bored Piling for Zone 4, City of Dreams at Cotai, Macau
- 2007-2009  LPM & ELS Works for Centennial Campus, The University of Hong Kong
- 2008-2009  Tseung Kwan O Complex at Area 44, Hong Kong
- 2008-2010  Tseung Kwan O at Area 85, Site A, Lot 90, Hong Kong
- 2008-2011  Tamar Development Project, Hong Kong
- 2009-2010  Kai Tak Development Site 1A, Phase 1 & 2, Hong Kong
- 2009-2010  Proposed Composite Development at 3 Chun Yan Street, Hong Kong
- 2009-2010  Reconstruction and Improvement of Tuen Mun Road - Eastern Section, Hong Kong