A fictitious insight into our future

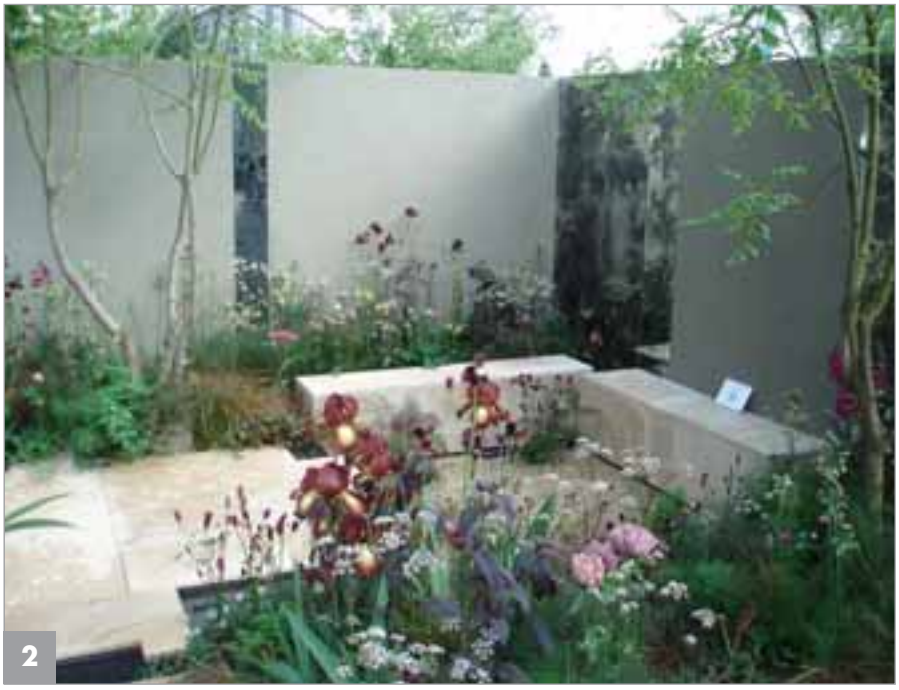
Precast concrete and masonry in 2050

Forecasting what might happen in the next 40 years is a risky business, especially in times of huge changes in climate, society and technology. With the proviso that this is a purely personal view into the future for CPI readers, this is how some aspects of the precast industry might look in 2050 – it almost certainly seriously understates the degree of change ahead. It is written as if it appears in a 2050 edition of CPI.

Martin Clarke

Developments in materials

Climate change and sustainable living continue to dictate our construction markets. The European cement industry is now recovering and storing all its process and energy carbon dioxide (CO_2) in empty underground gas and oil fields. The use of biomass and other waste fuels is now predominant in helping concrete to be seen as the most environmentally friendly construction material. With corrosion problems solved, carbonation is now recognized as a major sustainability benefit, making concrete the only available carbon-positive building product. Reinforcement materials such as the well-established C-grid guarantee no deterioration, even in the most aggressive conditions.
Textile reinforcement is commonplace, as is the use of ultra-high-performance concrete, both allowing lightweight, elegant and very slender precast sections. Precast concrete has long since been a totally predictable and reliable material, possessing dial-up qualities such as strength and durability. Cement content is now optimized every time with 100% hydration, thanks to the universal use of modern admixtures. Most demolition waste is used as concrete aggregate, with pulverized



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Precast balconies, planted extensively for shade and carbon and fume absorption, are universally designed into all buildings.

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The C-grid replaced conventional steel reinforcement to eliminate durability problems associated with reinforcement corrosion

Martin Clarke joined the precast industry in 1972 and worked for ARC (now Hanson plc) for 18 years latterly as Business Development Director, then as Director of Marketing for 12 years for the British Cement Association. Since 2002, Martin has been Chief Executive of British Precast, the trade federation for the precast concrete and concrete masonry industry.

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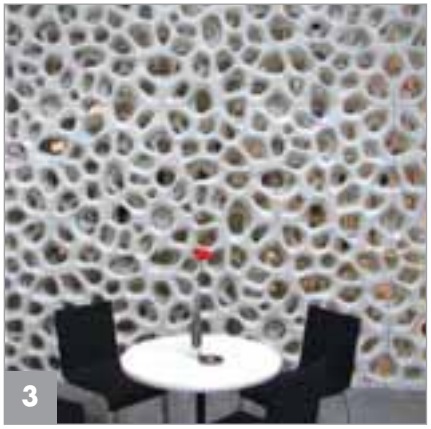
concrete rubble used as a partial feedstock for new cement. Virgin aggregates are increasingly sourced from automated underground mines. There is a total emphasis on local materials as hauling heavy materials like lumber, steel and concrete around the world has been outlawed by the GATT Environmental Pact and Europe is self-sufficient in cement and aggregates. The role of trees as carbon sinks makes them too precious to use as a temporary building material. With structural steel priced out of the market, precast concrete is now the construction material of choice, minimizing waste and optimizing sustainability. Our market share is more than double what it was in 2007. Interest in precast concrete is at a record high with attendance at the forthcoming 2050 BIBM Congress in Moscow expected to be 5,000 delegates.

Housing

Zero energy, zero carbon precast and masonry houses are now the norm with no mode of structural deterioration. 200-year life structures are the standard legal European minimum requirement for all new houses and buildings. Flexible interiors are possible with concrete, featuring movable masonry and precast panel partitions on tracked systems. The thermal mass benefits of concrete and new ventilation techniques allow houses to be habitable in these much hotter summers without air-conditioning. Lightweight housing continues to be outlawed to conserve energy and reduce emissions and fire risk. Houses and hot water are heated both by geothermal exchange systems and via photovoltaics built into masonry and external panels and fibre-cement weatherboards. All paved surfaces and precast underground water storage are designed in an integrated way to conserve precious water and mitigate against the continuing ferocity of rainstorms and resultant flooding. Since the ban on the use of timber, all new houses have to have precast floors, most now fitted with service ducts. Basements and living roof spaces are compulsory as a planning condition. Balconies, usually planted extensively for shade and carbon and fume absorption, are now universally designed into all homes, offices and apartments.

New house roofs feature hinged precast slabs to conserve energy, with concrete tiles fitted featuring 'new generation' affordable and maintenance free photovoltaics. Concrete homes, capable of floating, but anchored, are mandated by law for large swathes of Europe, especially in the Netherlands and along the Baltic and North Sea coasts that have become the "Mediterranean" of the 21st Century. Large housing estates built in timber-frame in the early years of the century have all been replaced. With termites endemic for many years, the routine retrofitting of precast floors into houses, especially in Britain, to replace wooden floors continues.



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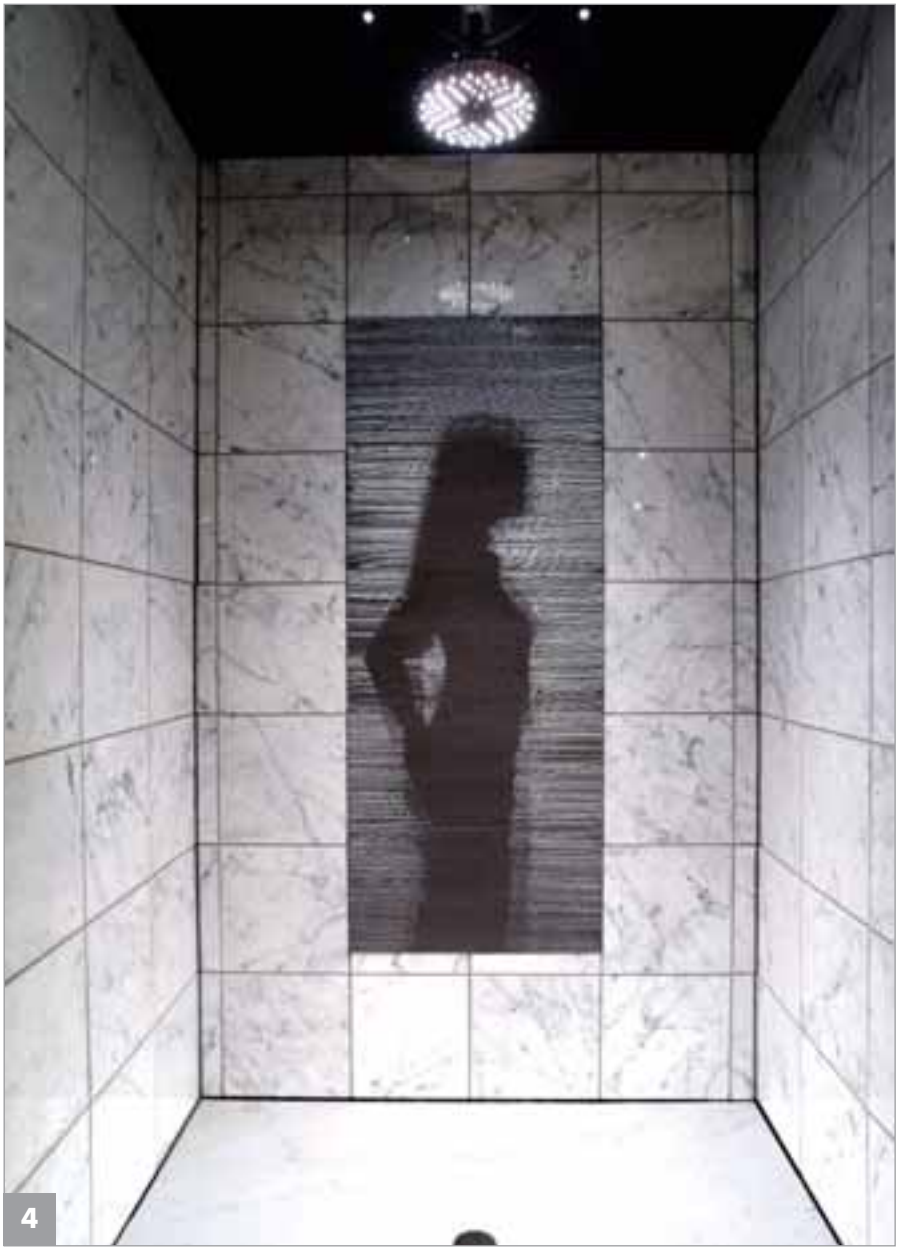

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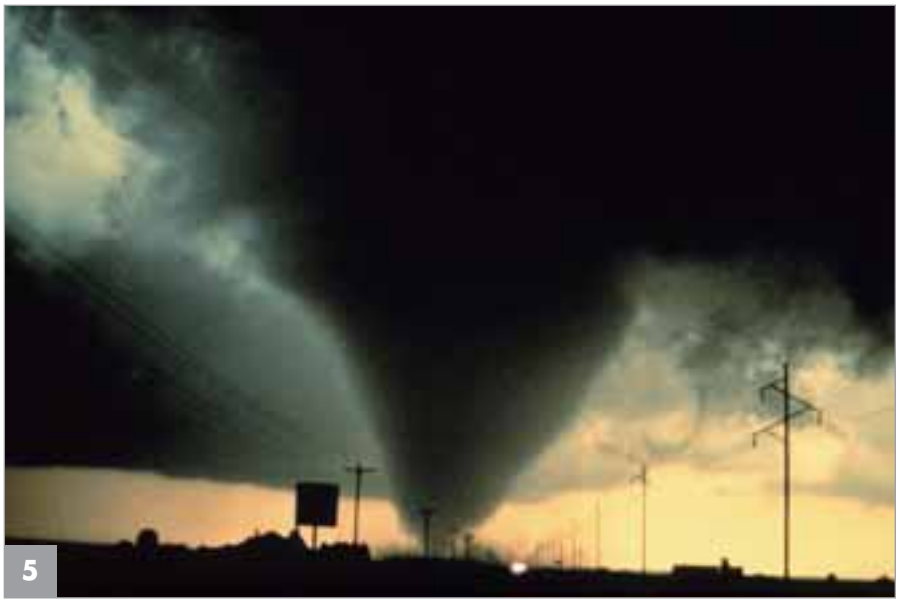
Precast concrete technology is employed in all aspects of modern life



Increasingly harsh environmental conditions have resulted in precast concrete being the most preferred method of construction

Commercial and industrial buildings

All precast concrete structures are now capable of being disassembled and re-used, and leasing is a common method of procurement. Insurers have long since favoured precast structures to minimise risk. The airtight nature of precast buildings enables minimal outlay on heating and cooling energy. Underground construction has come to the fore in the last 20 years to maximise land use and optimise energy use. All urban areas are featuring 'sky cities' in the form of precast framed buildings up to 60 storeys high. Exposed precast surfaces are all self-cleaning. White, Mediterranean-style concrete architecture is favoured, as are photoengraved personalised façades. Buildings' external finishes now feature less glaz-

ing and more solid wall area to restrict solar gain. Intelligent precast has been the structural material of choice for many years, with built-in chips and radio devices functioning as information stores, distress alarms and security devices. All concrete buildings contain memory chips with complete records of design and construction.

Civil engineering

The exploitation of underground space is now accelerating following successful trials at getting sunlight down to 60 storeys. Concrete pipe systems are now dualled between foul sewage and harvested stormwater systems. The generation of concrete pressure pipes installed over 20 years ago to transport water from the north to the south of Europe continues to give good service. All estate roads, city streets and many minor roads are permeable and blockpaved to match the new generation of electric trams and cars running on precast tracks. The use of lighter-coloured concrete paving and roofing materials is now mandatory to reduce urban heat island effects in all European towns and cities. All motorways feature parallel and raised road-train systems running on precast viaducts, with elegant slender precast bridges now commonplace. Offshore floating islands constructed from linked sections of aircrete are commonly found at strategic coastal and estuary locations. The first floating aircrete runway and air terminal will open shortly, opening the way to fully sustainable waterworlds.

Factories

Concrete product plants are now all fully automated with laser- and robot-controlled 24-hour operations. Underground and earth-sheltered factories are common. No wastage is allowed to leave the site by law. All operatives are trained right through their careers at the long-established University of Concrete and its local campuses in each country. The use of quiet self-compacting concrete, often provided by specialist on-site, ready-mixed concrete companies, is the norm. Loading and unloading onto 60-tonne road-trains is automatic. Mobile satellite precast factories are operated by several national manufacturers for the largest contracts. For many years precast products have all been made with microdot implants that contain full information on mix contents and details of origin. Structural components now feature intelligent tags with 3D details to facilitate deconstruction and re-erection. These are mandatory to minimize new element production. These tags can also relay distress to the facilities manager in the event of overloading or damage.

Construction sites

All construction projects are awarded on a whole-life cost basis to the benefit of precast concrete. Smaller, modular products, such as roof tiles, masonry and paving, are routinely laid robotically. Extendable booms work with universally used small tower cranes to place precast right next to the point of construction. Communication between architect, engineer, client and supplier is seamless and paperless. All building and engineering projects are designed, procured and managed using 4D systems. No wastage is allowed on site without large fines being incurred and any precast waste is automatically routed back at the contractor's cost to the plant of origin.

Concluding remarks [in 2007]

Some might say that thinking 43 years ahead is an unnecessary diversion. My response is that it has never been so important. Everything that we now build from precast concrete and masonry is likely to have a potential life well in excess of 43 years; in fact, well in excess of 100 years. These homes, buildings and structures will be occupied and giving service in a world that inevitably will be very different from today. By future-proofing what we offer in 2007 – and that means serious thinking and planning – we will significantly improve our competitive edge against other construction materials.

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