# Editorial

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Concrete is a construction material essential to the infrastructure of human socioeconomic activity in modern society. Despite its vital role, however, it is often castigated as symbolising the destruction of nature, probably because of the human instinct to return to natural surroundings even when one is in a solid and comfortable environment. It is nonetheless obvious that there can be no return to a world without concrete now that industrialisation has progressed dramatically and the population has increased to a level that makes the earth seem smaller. Humans must accept the fact that the earth is not capable of sustaining an ever-increasing population without making efforts toward maximising efficiency in human activity. Concrete is expected to play an important role in applying this principle.

It can be said that concrete is a material that uses the earth's resources very efficiently. Approximately 70% of concrete is aggregate that is naturally found in abundance, while cement is made of limestone and clay, which are also common natural resources. However, the amount of concrete used is enormous. Although no precise statistics are available, the current world production of cement and concrete is estimated to be approximately 2 billion and 10 billion t respectively. These amounts are expected to increase several-fold in the future.

Meanwhile, in recent years global warming has become a serious problem. With the start of the Kyoto Protocol enforcement period in 2008, developed countries are required to reduce greenhouse gas emissions for the next five years. However, the Kyoto Protocol target of an approximately 5% reduction on average from 1995 levels has no practical significance. According to the Intergovernmental Panel on Climate Change's (IPCC) fourth report,[1] warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice and rising average global sea levels, and it is therefore necessary to reduce $CO_2$ emissions by between 50% and 85% from 2000 levels by 2050 in order to limit the increase in global mean temperature to between 2 and 2·4 degrees celsius since the Industrial Revolution. The bringing into effect of the Kyoto Protocol was, however, one of the most important landmarks in history, in that it represents the decision of humans to reduce greenhouse gases for the first time.

The post-Kyoto Protocol framework is expected to be the main subject of discussion at the G8 Hokkaido Toyako summit in July 2008. Clearly, it will be essential for all the world's countries to grasp the severity of the issues at hand and strive to reduce greenhouse gases significantly. Settlement in a particular direction will be made in the future through the reconciliation of various interests on the international political scene.

A variety of industries are thus required to make efforts toward reducing greenhouse gases. The concrete/construction sector uses immeasurable amounts of resources and energy. Since greenhouse gas emissions and other consequences of such use result in a considerable environmental burden, the concrete/construction sector is in no way exempt from the responsibility of reducing its environmental footprint. However, it cannot be said that the sector is grasping the current situation objectively or establishing a unified system for the reduction of environmental burdens. In this century of the environment, the concrete/construction sector is required to take a new direction toward sustainability.

Fortunately, *fib* and the International Standards Organization (ISO) have already commenced activities in this direction. *fib* Commission 3 (Environmental aspects of design and construction), which is chaired by the author, has published documents on the environmental aspects of concrete (bulletins 18, 21, 23 and 28).[2–5] The document by Task Group 3·6, *The Environmental Design of Concrete Structures – General Principles*,[6] is also in the final stages of publication. In addition, Task Group 3·7 ('Integrated life-cycle assessment of concrete structures'), Task Group 3·8 ('Green concrete technologies for life-cycle design of concrete structures') and Task Group 3·9 ('Application of environmental design to concrete structures') are continuing in their respective research activities, which will create a collection of concrete-related environmental documents. *fib* had the foresight to establish a commission on the environment as one of its ten commissions at its foundation in 1998.

Meanwhile, the ISO has published the ISO 14000 series of environmental standards. These standards, which provide basic rules for presenting environmental product labels or declarations or for carrying out life-cycle analysis, were developed by the ISO Technical Committee 207 ('Environmental management'). ISO Technical Committee 59 ('Building construction') (TC59), subcommittees SC14 ('Design life') and SC17 ('Sustainability in building construction') have published ISO 15686-6[7] and ISO 21930[8] respectively. The former presents procedures for the assessment of environmental burdens, while the latter provides rules for the implementation of environmental declarations for building products. However, since both contain only theoretical information, problems will arise if, for example, the concrete sector tries to carry out practical tasks based on them.

The concrete/construction sector, which uses considerable amounts of resources and energy, must therefore have its own environmental standards in order to implement assessment of the environmental burdens imposed by construction projects and reduce such burdens continuously. The ISO Technical Committee 71 ('Concrete, reinforced concrete, and prestressed concrete') thus decided on the establishment of Subcommitte SC8 ('EMCC: Environmental management for concrete and concrete structures') at its 14th Plenary Meeting held in Salvador, Brazil, in 2007. The ISO secretariat held a vote on this decision among the Technical Management Board (TMB) member nations (12 nations

1464–4177 

except for the chair: Germany, USA, France, UK, Norway, Sweden, Spain, Canada, Brazil, South Africa, China and Japan). While Germany voted against it, France insisted on postponing the decision until the next TMB meeting, and a few nations sided with it. The decision was postponed to February 2008 in line with ISO rules stating that a decision must be postponed even if only one nation requests it. Germany (Deutsches Institut für Normung (DIN)) claimed that the decision was premature because concrete-related environmental issues were not suitable for international standards and the interest level of individual countries seemed to be low. France was concerned about conflict with the above-mentioned ISO 21930, which presents methods of environmental declarations for different structural elements but contains almost no information on concrete. The author had discussions with ISO TC59/SC17 and the Agence Française de Normalisation (AFNOR), explained that the standards to be developed by the ISO TC71/SC8 would facilitate the application of existing standards rather than conflicting with them, and eventually obtained France's consent. Establishment of the ISO TC71/SC8 was officially approved at the TMB meeting in February 2008. The first meeting of ISO TC71/SC8, which was established after these difficulties, was held in Los Angeles, USA, in March 2008. The meeting, chaired by the author, was attended by 38 participants from 20 countries and demonstrated the high level of interest in the issue. As a result of discussions, it was agreed to set standards consisting of the following.

Part 1: General principles for environmental consideration.
Part 2: Preparation of inventory data and system boundaries.
Part 3: Constituents and concrete production.
Part 4: Environmental design of concrete structures.
Part 5: Execution of concrete structures.
Part 6: Operation of concrete structures.
Part 7: End of life phase including recycling of concrete structures.
Part 8: Labels and declarations.

For the time being, efforts will be concentrated on the preparation of the Part 1 document, which will consist of the following.

1. Scope
2. Normative references
3. Terms and definitions
4. Description of general framework for environmental consideration
5. Assessment of environmental performance
6. Action
7. Labels and declarations
8. Critical review
9. Additional environmental information and reporting

While the details of the content will be considered in the future, this series of standards provides a platform and a set of common rules on concrete and concrete structures that enables the use of environmental assessment tools in an objective and transparent manner, rather than aiming to develop tools similar to existing ones such as Leadership in Energy and Environmental Design (LEED) and the Comprehensive Assessment System for Building Environmental Efficiency (CASBEE). The possible benefits of standardising EMCC by the concrete sector are as follow

(*a*) fulfillment of the concrete/construction sector's social accountability
(*b*) clarification of the environmental benefits of construction in civil engineering and building structures
(*c*) continuous environmental improvement led by decision-makers and markets.

Global-scale infrastructure development associated with an explosive population increase and significant industrialisation has been a true learning experience, and represents a future challenge for humankind. The concrete/construction sector must clearly recognise its responsibilities and take appropriate action. A narrow outlook and any preoccupation with immediate profits will result in the decline of the sector.

## References


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