International Organization for Standardization
Organisation internationale de normalisation
Международная организация по стандартизации

STRATEGIC BUSINESS PLAN

Executive summary

Concrete is the most widely used man-made product in the world. About 32 billion tons of concrete are produced annually, and the number is expected to rise.

Standards in the concrete industry help to facilitate this large world-wide trade and help create durable, cost-effective structures. The standards also promote health and safety by standardizing design procedures for structural safety, reliability, serviceability, resiliency and sustainability. New standards related to both measuring and reducing the environmental impact of concrete production and use will aid in sustainability efforts around the world.

Total cost savings for concrete production are expected through the unification of standards for production and quality assurance of concrete, test methods for evaluating concrete, and design, execution and maintenance and rehabilitation methods for reinforced concrete. Environmental management relating to concrete engineering is becoming more and more important in facing global warming concerns.

Continuing to advance the existing standards and creating new standards based on advances in both technology and knowledge is one of the primary goals for ISO/TC 71.

1 Introduction

1.1 ISO technical committees and business planning

The extension of formal business planning to ISO Technical Committees (ISO/TCs) is an important measure which forms part of a major review of business. The aim is to align the ISO work programme with expressed business environment needs and trends and to allow ISO/TCs to prioritize among different projects, to identify the benefits expected from the availability of International Standards, and to ensure adequate resources for projects throughout their development.

1.2 International standardization and the role of ISO

The foremost aim of international standardization is to facilitate the exchange of goods and services through the elimination of technical barriers to trade.

Three bodies are responsible for the planning, development and adoption of International Standards: ISO (International Organization for Standardization) is responsible for all sectors excluding Electrotechnical, which is the responsibility of IEC (International Electrotechnical Committee), and most of the Telecommunications Technologies, which are largely the responsibility of ITU (International Telecommunication Union).

ISO is a legal association, the members of which are the National Standards Bodies (NSBs) of some 164 countries (organizations representing social and economic interests at the international level), supported by a Central Secretariat based in Geneva, Switzerland.

The principal deliverable of ISO is the International Standard.

An International Standard embodies the essential principles of global openness and transparency, consensus and technical coherence. These are safeguarded through its development in an ISO Technical Committee (ISO/TC), representative of all interested parties, supported by a public comment phase (the ISO Technical Enquiry). ISO and its Technical Committees are also able to offer the ISO Technical Specification (ISO/TS), the ISO Public Available Specification (ISO/PAS) and the ISO Technical Report (ISO/TR) as solutions to market needs. These ISO products represent lower levels of consensus and have therefore not the same status as an International Standard.

ISO offers also the International Workshop Agreement (IWA) as a deliverable which aims to bridge the gap between the activities of consortia and the formal process of standardization represented by ISO and its national members. An important distinction is that the IWA is developed by ISO workshops and fora, comprising only participants with direct interest, and so it is not accorded the status of an International Standard.

2 Business Environment of the ISO/TC 71

2.1 Description of the Business Environment

The following political, economic, technical, regulatory, legal and social dynamics describe the business environment of the industry sector, products, materials, disciplines or practices related to the scope of the ISO/TC 71, and they may significantly influence how the relevant standards development processes are conducted and the content of the resulting standards:

The use of cementitious materials is as old as the ancient Egyptian civilization that used the calcined impure gypsum as cementing material. The Greeks and the Romans used calcined limestone and later added lime to water, sand and crushed stone or brick and broken tiles. This was the first use of concrete in history. Since then, concrete has been used in a variety of civil infrastructure applications as well as commercial and residential structures and has become the most widely used man-made product in the world. Over the past 100 years, concrete has made significant progress in quality and its performance through technological innovations.

About 32 billion tons of concrete are produced annually, and the number is expected to rise. It is also estimated that, as concrete structures age, a corresponding demand for maintenance and rehabilitation will grow. As a principal material of concrete, cement is a major contributor to climate change. Cement production accounts for around 8 per cent of global CO_2 emissions.

Many of the ISO member countries and regions have their own rules for the design, execution and maintenance and rehabilitation of concrete and concrete structures. However, some of the developing countries still do not have them. These rules may have significant variations between the countries and regions because of unique geographical, environmental conditions and historical, traditions backgrounds. The technological level may be also different.

Rules for design, execution and maintenance and repair of concrete and concrete structures have been shifted from traditional prescriptive specification format to performance-based format. Furthermore, most of the recently developed rules have considered sustainability aspects directly, such as resiliency, life cycle costs and environmental burdens. There have been significant developments in concrete engineering in recent years, some of which are connected with the revision of internationally widely-used rules such as EN 1992, *fib* Model Code and ACI 318 Building Code.

ISO/TC 71 is providing International Standards and ISO Technical Specifications in the field of concrete engineering, covering design, execution, maintenance and repair, and management methodologies and systems for concrete, reinforced concrete and pre-stressed concrete. These standards will move in the same direction as the recent trends. The main areas of work covered by TC 71 are:

- testing methods
- production and execution of concrete
- performance requirements of structural concrete
- simplified design of concrete structures
- non-traditional reinforcing materials
- maintenance and repair of concrete structures
- environmental management for concrete and concrete structures
- life cycle management of concrete structures

The standards prepared and published by the ISO/TC 71 are useful for various standard-writers, design offices, construction companies, universities and research institutes and test laboratories, consulting engineers, forensic experts, government agencies, etc.

The concerns and perceptions of relevant stakeholders can be:

- How to find reasonable balances between ensuring enough safety and reasonable serviceability, reducing life cycle cost, and minimizing environmental burdens for owners, materials and products suppliers, designers and constructers

2.2 Quantitative Indicators of the Business Environment

Cement and concrete are vital components in building and civil infrastructure systems. Concrete has many environmental advantages, including durability, longevity, heat storage capability, and (in general) chemical inertness. For passive solar energy applications, concrete's ability to function as a structural material (reinforced and or pre-stressed concrete as a structural element) while also providing thermal mass makes it a valuable material. In many situations concrete is superior to other materials such as wood and steel. However, cement, as a principal material producing concrete, is among the most energy intensive materials used in the construction industry and a major contributor of CO_2 emissions in the atmosphere. Cement and concrete production generate considerable quantities of air-pollutant emissions. Dust emission can be controlled through water sprays, enclosures, hoods, curtains and covered chutes. Another environmental issue with cement and concrete production is water pollution. On the positive side, many newer ready-mix plants have greatly reduced water use in recent years because of wastewater disposal issues. In consideration of the productions and environmental challenges, the development of standards that would facilitate trade and cleaner production is essential.

The following list of quantitative indicators describes the business environment in order to provide adequate information to support actions of the ISO/TC 71:

- The total annual world production of concrete is 32 billion tones and is expected to rise. As a principal material of concrete, cement is a major contributor to climate change. Cement production accounts for around 8 per cent of global CO_2 emissions.
- Major factors related to suppliers include energy and environmental considerations. Energy use for concrete production is much less than for cement. That is because the other components of concrete – fine aggregate (sand), coarse aggregate (crushed stone) and water are much less energy intensive. The environmental concerns include the greenhouse gas, especially CO_2 emissions. The most promising way to reduce cement related CO_2 emission is by improving the energy efficiency of the cement kiln operations. Besides measures for the production of cement, substitution of additives for some of the cement can have a beneficial effect because some of them are either natural products or by-products.
- While cement and concrete industries can help reduce some of the solid waste problems, concrete is the largest and most visible component of construction and demolition waste. Over 140 million tons of concrete are recycled each year [https://www.thebalancesmb.com/the-importance-of-concrete-recycling-2877756]. Most is used as a highway substrate or as clean fill around buildings. Some is also used as aggregate in new concrete. As more landfills close, including specialized facilities, concrete disposal costs will increase, and more concrete demolition debris will be re-processed into roadbed aggregate and other such uses.
- Major factors related to technological changes and product innovations occurred in the later part of 20th century. These included materials, production, design, construction and maintenance. Knowledge of the chemistry of concrete mixtures permitted greater ability to manufacture more durable and higher strength products. As a result, new uses of concrete

in structures such as long span bridges, the world's tallest building, and new products have been produced. These changes are expected to continue in the future.

- Major factors related to customers include the need to protect the life safety of the public. Both the consumer and the public expect that buildings, bridges and other concrete facilities will function safely and resiliently, be serviceable and durable, with long service lives, providing lower cost, lower environmental burdens and higher value.
- Major factors related to social changes include issues that are typically related to the welfare of the community and can encompass cultural aspects. Overall economic improvement in the last several decades has made concrete construction more affordable to more people throughout the world. As a result, world class buildings, bridges, and other facilities are now being constructed in countries that did not have the capability to produce sophisticated construction. This trend would continue indefinitely into the future. Moreover, safe, dependable structures with low maintenance permit developing nations and communities to spend their remaining income on other essential living requirements.
- The change from a more central controlled system to a democratic system in many parts of the world has removed the artificial restraints on economics and has opened many countries to increased development, resulting in new construction that will greatly increase the uses of concrete and will create a need for reliable standards. Consequently, a new demand for standards related to concrete is developing.
- The volume of world trade dealing with concrete is estimated to be about 13 to 14 trillion dollars. This includes various aspects dealing with production and use of concrete. The magnitude of this number shows that the wave of economic globalization has an impact on concrete as the basic building material for the development and maintenance of the civil infrastructure facilities which are the integral component of an economy. About 1% of the world population have jobs that directly relate to the concrete construction industry. Development of the international work in the field of concrete and concrete structures may enhance the interest of international consulting and construction companies in the standardization. The significance of International Standards in the field of concrete engineering is ever more needed as the economic development of the world continues.

3 Benefits expected from the work of the ISO/TC 71

The benefits expected from the work of the ISO/TC 71 include total cost savings by unifying the production, reducing environmental burdens and quality assurance issues of concrete as a material, standardization of test methods for evaluating the quality and performance characteristics of concrete, standardizations of design, execution, maintenance and repair methodologies for concrete, reinforced and/or prestressed concrete structural systems, by developing standards for simplified design approaches to be used in developing countries of the world, and by developing standards for non-conventional reinforcement to be used as a better substitute to conventional steel reinforcement, and by developing environmental management and life cycle management of concrete structures from structural planning to life-end stages to contribute to the sustainability goals.

The specific benefits would be an improvement in intra-country design and build projects in which various countries would be involved. A common set of documents would facilitate smoother operations of mega projects in which various codes may be used.

The developments of standards that can be used worldwide would improve safety and health and would reduce environmental effects.

Development of concrete-related standards will facilitate trade between those countries where trade agreements exist. In these countries, standards that provide needed protection of the public while permitting reasonable requirements for trade will increase commerce.

4 Representation and participation in the ISO/TC 71

4.1 Membership

Countries/ISO member bodies that are P and O members of the ISO committee

4.2 Analysis of the participation

Countries that constitute a major portion of the market share of trade in concrete are represented in the ISO/TC 71 through their national standards institutes. The member countries of ISO/TC 71 seem well balanced in terms of regions and economic levels. Since the use of concrete spread in the civil infrastructure applications worldwide, a total of 93 countries (P: 31 and O: 62) participating in the ISO/TC 71 seems insufficient. This lack of participation probably results from lack of experts, lack of significant major international industries that may be interested in standardization, and lack of travel funds. When the ISO/TC 71 meetings are planned in virtual or in hybrid, the last point may be solved.

The most important groups represented in the committee include material scientists (with emphasis on concrete materials), production and manufacturing specialists, designers, contractors, regulators, academics and representatives of national code writing organizations.

5 Objectives of the ISO/TC 71 and strategies for their achievement

5.1 Defined objectives of the ISO/TC 71

The ISO TC 71 will elaborate a package of International Standards covering concrete materials and use of concrete and best practice for design, execution, maintenance and repair, management of concrete structures. These standards will include but not be limited to cement, aggregate, reinforcing materials and structures. Development of these standards will consider widely used national and regional standards used in countries with major construction industries. The standards make the use of concrete more efficient, safer, cleaner, durable, and sustainable.

5.2 Identified strategies to achieve the ISO/TC's defined objectives

The strategy adopted for reaching the objectives is to give the highest priority to the development of materials standards. This is an important and fundamental aspect for safe, cost effective and environmentally friendly use of cement-based materials like concrete. These include the production and quality assurance of concrete. The subcommittees of ISO/TC 71 are addressing the issue of terminology, test methods etc.

High priority will also be given to the development of structural standards for complex facilities of civil infrastructure. Also attention will be given to the maintenance and service life predictions of the civil infrastructure facilities with concrete, reinforced and/or prestressed concrete. Furthermore, priority will be given to the development of standards related to environmental management and life cycle management for concrete and concrete structures.

It is recognized that in the developing countries of the world, there is an urgent need for simplified standards for simpler structures and therefore emphasis will be placed on development of simplified design standards for simple structures.

To develop suitable standards, cooperation from major developed and developing countries will be obtained. To facilitate the needs of all, existing modern national standards will be considered where appropriate. Use will also be made of the Vienna Agreement or other available sources for reference documents.

To facilitate the work of this TC, physical meetings and virtual meetings are being conducted, as well as email communication is being used.

The liaison committees are:

- ISO/TC 35/SC 15 Protective coatings: concrete surface preparation and coating application
- ISO/TC 59/SC 14 Design life
- ISO/TC 74 Cement and lime
- ISO/TC 92 Fire safety
- ISO/TC 98 Bases for design of structures
- ISO/TC 156/SC 1 Corrosion control engineering life cycle

6 Factors affecting completion and implementation of the ISO/TC 71 work programme

At this stage, risk of delay in developing standards for materials and for complex structures appears low. Influential countries have already committed to standards in principle. The ISO/TC 71 committee holds a plenary meeting basically once a year at which the subcommittees and the working group presents their status of standardization activities. Once difficulty in realization of the programme of work appears, the chair advisory group will discuss to seek suitable ways to eliminate a major barrier

Recently we have observed relatively weaker interest of experts from European countries into the activity of ISO/TC 71 which might correspond to their involvement in Eurocodes, a process which is not orthogonal to activities to technical committee thanks to the Vienna Agreement. The liaison with the EC/JRC provides an effective channel for communication. Effects of the pandemic can be described that “The COVID-19 pandemic makes us to utilize virtual meetings more. The progress of works has been slightly affected.”

7 Structure, current projects and publications of the ISO/TC 71

There are eight main areas covered by TC 71 subcommittees and a working group:

SC 1 Test methods for concrete
SC 3 Concrete production and execution of concrete structures
SC 4 Performance requirements for structural concrete
SC 5 Simplified design standard for concrete structures
SC 6 Non-traditional reinforcing materials for concrete structures
SC 7 Maintenance and repair of concrete structures
SC 8 Environmental management for concrete and concrete structures
WG 1 Life-cycle management of concrete structures

ISO/TC 71 gather 31 P-members and 62 O-members. ISO/TC 71 has developed 66 International Standards and Technical Specifications and 24 documents under development at various stages.

Priorities of the ISO/TC 71 activities are to provide information and guidance to codes writing bodies, authorities, scientists and practitioners around the world. The ISO/TC 71 gather experts from all continents, giving a wide range of concrete-related topics. The main difference with European regional standardization (CEN) lies in the freedom of choice of the developed ISO standards topics. Information on CEN's standardization activities is shared through the liaison of EC/JRC.

Any item that arises in the engineering practice can be immediately taken and elaborated by ISO/TC 71 as ISO standards, technical specifications, and technical reports.

In general, 36 months will be allocated to each project from the new work item proposal stages to the publication stage.

The stakeholders are manifold, including TC's working in the field of concrete engineering, advanced construction and civil engineering design offices, universities and research institutes and test laboratories, consulting engineers, forensic experts, government agencies, building owners, clients, occupants, investors, etc.

Information on ISO online

The link below is to the TC's page on ISO's website: ISO/TC 71 on ISO Online

Click on the tabs and links on this page to find the following information:

- About (Secretariat, Committee Manager, Chair, Date of creation, Scope, etc.)
- Contact details
- Structure (Subcommittees and working groups)
- Liaisons
- Meetings
- Tools
- Work programme (published standards and standards under development)

Reference information

Glossary of terms and abbreviations used in ISO/TC Business Plans
General information on the principles of ISO's technical work