BUSINESS PLAN
ISO/TC 71
Concrete, reinforced concrete and pre-stressed concrete

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 140 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

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 this ISO/TC, 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 variety of civil infrastructure applications. Today, concrete is 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 one ton of concrete is produced each year for every human being in the world (some 6 billions tons per year). It is estimated that the production and consumption of concrete will see a rise of about of 1% per year for next 3-5 years.

2.2 Quantitative Indicators of the Business Environment

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

Concrete is the most popular material used in the construction market. The construction market in Asia is the leading market in the world with an estimated value of about $1.2 trillion. Japan and China continue to lead the region’s construction industry. Europe’s construction market is estimated at $ 1.1 trillion. The US with world’s healthiest market and Canada with a hot market of its own puts North America at about $ 1 trillion. Latin America, led by Brazil and Mexico places South America next with a market of about $300 billion. The construction market in Middle east is about $150 billion followed by Africa with a market of about $60 billion. The world construction market is estimates to be about $ 4 billion.

The amount 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 globalisation has an impact on the 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.

On the basis of use of concrete per person per year, the worlds biggest market for concrete is North America. In the U.S, concrete is used in excess of 2.5 tons per person per year. Gross product of concrete and cement manufacturing revenue exceed $35 billion annually. In addition to concrete and cement manufacturing, the industry includes aggregates and material suppliers, designers, contractors, and repair and maintenance companies. Over 2 million jobs relate to the U.S concrete construction industry.

The significance of International Standards in the field of Concrete and its use in civil infrastructure is ever more needed as the economic development of the world continues.
The fact, that the world-wide biggest market of concrete and its use in civil infrastructure is North America and that the main importing and exporting countries are China, Japan, Brazil, it seems logical that these countries should be active in the work of ISO/TC dealing with concrete.

**Major factors related to Suppliers:**

Major factors related to suppliers include energy and environmental considerations. Cement and concrete are key components of both commercial and residential construction. In US alone there are approximately over 250 cement plants and about 5000 ready mix plants (where cement is mixed with aggregate and water to produce concrete). Energy consumption is the biggest environmental concern with cement and concrete production. Cement production is one of the most energy intensive of all industrial manufacturing processes. Including direct fuel for mining and transporting raw material, cement production takes about six million Btus per ton cement.

While cement manufacturing is energy intensive, the very high temperatures used in a cement kiln have at least one advantage: the potential for burning hazardous waste as fuel. Waste fuels that can be used in cement kilns include motor oil, spent solvents, printing inks, paint residues, cleaning fluids and scrap tires. These can be burnt relatively safely because the extremely high temperatures result in a very complete combustion with very low pollution emissions.

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. Including energy for hauling, sand and crushed stone have embodied energy values of about 50,000-100,000 Btus per ton, respectively. While the cement represents about 12% of the concrete, it accounts for 92% of the energy demand.

The environmental concerns include the C02 emissions. For every ton of cement produced, 1.3 tons of C02 is released into atmosphere. In the US, cement production accounts for approximately 100 million tons of C02 emissions, or just under 2% of the total human-generated C02. Worldwide, cement production now accounts for more than 1.6 billion tons of C02 – over 8% of total C02 emission from human activities.

The most promising way to reduce cement related C02 emission is by improving the energy efficiency of the cement kiln operations. Dramatic reductions in energy use have been realized in recent decades. Switching to lower C02 fuels such as natural gas and agricultural waste (peanut hulls, etc.) can also reduce emissions. Another strategy, which addresses the C02 emissions from calcining limestone, is to use waste lime from other industries in the kiln. Substitution of fly ash for some of the cement can have a very large effect because fly ash is by-product of the cement product and in is used as percentage replacement of cement demand in a concrete mixture.

Besides C02, both cement and concrete production generate considerable quantities of air-pollutant emissions. It is estimated that total particulate (dust) emissions is about 350 pounds per ton of cement produced, the majority of which is from cement kiln. The best way to deal with dust generated in cement manufacturing would be to collect it and put it back into the process. This is done to some extent, using mechanical collectors, electric precipitators and fabric filters. 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. This has adverse effect of the quality of the water for public use. According to the US law, the wastewater from equipment cleaning (which is discharged into settling ponds) where the solids can settle out is not considered hazardous material as long as the pH of this waste water is lower than 12.5. On the positive side, many newer ready mix plants have greatly reduced water use in recent years because of wastewater disposal issues.

While cement and concrete industries can help reduce some of the solid waste problems (burning hazardous waste as cement kiln fuel and using fly ash in concrete mixtures, for example),
concrete is the largest and most visible component of construction and demolition waste. According to estimates, concrete accounts for up to 67% by weight of construction and demolition waste with only 5% currently recycled. Of the concrete that is recycled, most is used as a highway substrate or as clean fill around buildings. As more landfills close, including specialized facilities, concrete disposal costs would increase and more concrete demolition debris will be re-processed into roadbed aggregate and other such uses.

**Major factors related to Customers:**
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.

**Major factors related to technological; and product innovations:**
Major factors related to technological changes and product innovations occurred in the later part of the 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 into the new millennium.

**Major factors related to social changes:**
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, only a few years ago, did not have the capability to produce sophisticated construction. This trend should continue indefinitely into the future.

**Major factors related to political changes:**
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. Technical barriers to trade:

The divergence of regional and national standards will develop barriers to trade. If trends continue, there is a potential to have negative impact on trade. These negative impacts are estimated to have a potential of reaching trillions of dollars if new standards are not developed.

**Legal and Regulatory Issues:**
Construction related standards are most effective when adopted by regulatory agencies. To get them adopted, standards must reflect the needs of the consumers as well as the suppliers. To facilitate development of standards suitable for international trade in construction, ISO Standards need input from the countries that have major construction industries.

**Summary:**
Cement and concrete are vital components in the building and maintenance of civil infrastructure systems. Concrete has many environmental advantages, including durability, longevity, heat storage capability, and (in general) chemical inertness. For passive solar applications, concrete’s ability to function as a structural material (reinforced and or prestressed concrete as 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. But cement production is very energy intensive—cement is among the most energy intensive materials used in the construction industry and a major contributor of C02 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.

Major factors related to customers, technological changes and product innovations, social changes and political changes affect the trade with in turns effects the usage of concrete in the civil infrastructure systems. The lack of international standards is a barrier to trade. The negative impacts are estimated to have a potential of reaching trillions of dollars.

3 BENEFITS EXPECTED FROM THE WORK OF THE ISO/TC

The benefits expected from the work of the ISO/TC include total cost savings by unifying the production 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 methodologies for design of reinforced and/or prestressed concrete structural systems, and by developing standards for simplified design approaches to be used in developing countries of the world.

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 the 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. It is estimated that world trade dealing with concrete can be increased by 1-2 % in the next decade as a result of implementation of ISO Standards.

4 REPRESENTATION AND PARTICIPATION IN THE ISO/TC

4.1 Countries/ISO members 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 technical Committee ISO/TC 71 through their national standards institutes. The member countries of ISO/TC 71 include countries like USA, China, England, Japan, Brazil, and Canada. The use of concrete in the civil infrastructure applications in these countries constitutes a major portion of the world market in concrete technology.

The most important groups represented in the committee include material scientists (with emphasis on concrete science), production and manufacturing specialists, designers, contractors, regulators, academics and representatives of national code writing organizations.
## 5 OBJECTIVES OF THE ISO/TC AND STRATEGIES FOR THEIR ACHIEVEMENT

### 5.1 Defined objectives of the ISO/TC

The objectives of the ISO/TC 71 are:

1. To develop voluntary technical standards to cover concrete materials and uses of concrete. These standards will include but not be limited to cement, aggregate, reinforcement and structures. Development of the standards will take into account widely used National and Regional Standards used in countries with major construction industries.
2. Through standards make the use of concrete more efficient, safer and cleaner.

### 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.

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, telephone conferences are being conducted and Internet is being used. The liaison committees are:
- SO/TC 59 on “Building Construction”
- ISO/TC 74 on “Cement and Lime”
- ISO/TC 92 on “Fire Safety”
- ISO/TC 98 on “Bases for Design of Structures”

The TC has been conducting plenary meetings to facilitate the planning and coordination of the work program. The *Fifth plenary meeting* was held in Vienna in 1987, the *Sixth plenary meeting* in 1995 in San Francisco, the *Seventh plenary meeting* in Bogotá in 1998, the *Eight plenary meeting* in Tokyo in 2000, the *Ninth Plenary Meeting* in Oslo, in 2001, the *Tenth Plenary Meeting* in Dundee in 2002, the *Eleventh Plenary Meeting* in Sydney in 2003, the *Twelfth Plenary Meeting* in Istanbul in 2004 and the *Thirteenth Plenary Meeting* in Seoul in 2005.
6 FACTORS AFFECTING COMPLETION AND IMPLEMENTATION OF THE ISO/TC 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 principal. The greatest risk is in developing a standard for simple buildings. Due to opposition from some countries, this effort may be postponed.

7 STRUCTURE, CURRENT PROJECTS AND PUBLICATIONS OF THE ISO/TC

This section gives an overview of the ISO/TC’s structure, scopes of the ISO/TCs and any existing subcommittees and information on existing and planned standardization projects, publication of the ISO/TC and its subcommittees.

7.1 Structure of the ISO committee

7.2 Current projects of the ISO technical committee and its subcommittees

7.3 Publications of the ISO technical committee and its subcommittees

Reference information

Glossary of terms and abbreviations used in ISO/TC Business Plans

General information on the principles of ISO’s technical work