[2] The CEB (Comite Euro-International du Beton) -Its Nature and Work

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1. INTRODUCTION

I was delighted to receive the invitation from Dr Kameda, President of the Japan Concrete Institute, to participate in the Institute's 1988 convention and to present a paper related to the work of CEB. This invitation I accepted with alacrity because I have, for many years, followed closely the research and development work on concrete carried out in Japan and, indeed, have, through my position in the Cement and Concrete Association (now the British Cement Association), been able to exchange information with many contacts, particularly in the field of bridges, but I had never visited this country. Further, through the CEB, and the active participation of Japanese delegates in its work, I have become increasingly aware of the need for even closer contact between both organisations and individuals in the different countries to ensure the most effective use of the, unfortunately, limited resources devoted to the improvement of concrete construction, in every sense. Participation in one of the JCI Annual Conventions thus provided me with an excellent opportunity, on the one hand, to remedy a deficiency and, on the other, to create new contacts, as well as giving me considerable pleasure!

I propose to cover the nature and work of the CEB so that, hopefully, cooperation between the CEB and JCI, and their respective members can be even more fruitful in the future.

2. HISTORY AND OBJECTIVES

The CEB was created in 1953 following the initiative of leading bodies within the French Building and Civl Engineering industry and in consultation with leading civil and structural engineers throughout Europe. It was the intention that the CEB would perform a number of functions during a period of considerable increase in activity in the construction industries throughout Europe; these were:

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(i) to encourage liaison between research workers, practising designers and contractors dealing with the many facets of concrete construction and on an international basis;

(ii) to help to coordinate research activities in the various research institutes and universities on as wide a scale as possible;

(iii) by discussion and debate, to synthesise the existing knowledge on concrete, from the material and structural performance viewpoint, and to disseminate that knowledge, in an appropriate form, for the benefit of practioners in concrete construction.

Whence, the aim of the CEB could be stated as;

> the encouragement of progress in the design and construction of concrete structures, through a continuing critical review of the design basis, methods of calculation and construction techniques to achieve the appropriate economy related to adequate safety and performance levels.

In order to achieve the aim, it was essential that a series of publications should emerge from Bulletins to Guides, from Recommendations to Model Codes of Practice. Naturally, the initial dissemination was to the members of CEB but, subsequently, as the status of the work of CEB increased, it became much wider as will be indicated later.

It is also interesting to note that, in 1980 when the General Assembly revised the Statutes, the aim of CEB was written, succinctly, as:

> to develop, on an international basis, the study of scientific and technological questions which can lead to further progress in the Concrete Construction Industry.

Thus, throughout its 35 years of existence the objective has been invariant!

3. ACHIEVEMENTS

By 1959 its major objective had become a synthesis of available scientific knowledge concerning the behaviour and performance of concrete structures, and its assimilation into practical design recommendations.

The first results of CEB's early efforts were the production in 1964 of the International Recommendations in 12 languages and the general attitude was summarized in the preface as follows:

> "In the form in which they are presented, the CEB International Recommendations of 1964 appear to show the way in which we must proceed in order to plan, design, and construct structures more efficiently, that is to say in a more scientific, safer and more economical manner".

The Recommendations subsequently influenced modern national codes of practice in many countries, including the British Standard Code CP110.

In the early 1960s the CEB extended its work to prestressed concrete, in close collaboration with the International Federation for Prestressing (FIP), to precast large-panel structures and to lightweight concrete, while continuing to work on slabs and hyperstatic structures.

In that period there was also a great deal of debate about the importance of research and its application and the relationship between them. The outcome was a clear policy which concentrated on the need to translate the results of research into rules for practical application.

CEB needed money to support its various activities and, although it was originally funded in large measure by the French contractors, in the early 1970s the financial resources of the CEB were enhanced by the formation of national groups which were in future to provide regular annual contributions.

In 1978 the results of several years work culminated in the publication of the CEB/FIP Model Code (a set of international recommendations in code form to aid the harmonization of aspects of design) following very wide consultation, discussion and approval at the 1977 General Assembly of the CEB.

In parallel with the development of the Model Code, and to satisfy the need for practical design documents, work on a series of Design Manuals had started. The resulting Manuals were published after wide consultation, and most remain available today. The production of Design Manuals is followed by their publication in the form of CEB Bulletins - these cover all aspects of the CEB's work. To date, some 180 Bulletins have been published, and about 10 more are due for publication shortly, which represents both a consistent rate of production - between 5 and 6 bulletins per year - and a major contribution to our understanding of concrete structures and their performance. Details of the more recent Bulletins are given in Table 1 - it seemed appropriate to cover a 10 year period.

In 1982, the Commission of the European Communities (CEC) decided to embark upon the development of a series of European design codes (Eurocodes) for operational use in member states. For Eurocode 2 (Concrete structures), they asked the CEB to nominate engineers to form a drafting panel to prepare a first draft of Eurocode 2 based on the CEB/FIP Model Code and this work culminated in October 1984 in the circulation for national consultation of the draft Eurocode 2. The comments are now being processed in Brussels and a Eurocode 2 is likely to be published by the Commission for use in the member states and as a basis for Community-funded contracts outside the Community in 1989/90.

Work is also now inhand on a revision of the Model Code and is expected to be completed by the end of 1989. This will then become the CEB/FIP 1990 Model Code and is likely to form the basis for the first revision of Eurocode 2.

It is interesting to note that over the years the whole treatment of the philosophy of design has been changing. CEB has provided a fundamental understanding of, firstly, the need for change and, secondly, the opportunities that existed for implementing the changes. Initially, it produced recommendations for the application in practice of certain design or analytical procedures, based upon specific knowledge and research. More recently, it has been concerned with the idea of translating the recommendations into model code clauses and, with other bodies, to set up the framework for an international set of model codes. Finally, one of its objectives is to produce design aids or manuals relevant to particular aspects of design and performance. These are intended to aid the practioner by providing in one document both background information and the means of applying it to real design situations.

4. STRUCTURE

The structure of the CEB is shown in Figure 1.

The General Assembly is the principal decision-making forum of CEB, and comprises the accredited delegates of some 36 national associations (or groupings) exercising their votes in plenary session. According to the size of their respective construction industries and the membership fee, the national groupings belong to one of five classes of membership entitled to 1 to 5 votes.

Meeetings of the General Assembly take place at convenient intervals of 12 to 18 months. They establish policies, ratify and adopt or reject working documents submitted to the Assembly and constitute Working Commissions and Task Groups. Every three years the General Assembly elects the president and the members of the Administrative Council. The conference of the General Assembly takes about a week and is completed by plenary sessions at which the formal decisions and any elections are made and recorded.

The Administrative Council consists of some 18 elected and ex-officio members and is convened by the President three or four times a year to consider scientific and administrative matters and to deal with relations with other organizations including national and international technical bodies, governments and regional political entities, e.g. the Eastern European Council for Mutual Economic Assistance (CMEA).

The Praesidium consists of the President, the Vice-Presidents, and some of the ex-officio members of the Council, including the Deputy President and Honorary Presidents. It deals with urgent business.

The Advisory Committee combines members of the Council with engineers representing the many interests, e.g. research and practice; advises CEB on the progress of its current activities and suggests future policies and action.

The Working Commissions and Task Groups carry out the technical and scientific work of the CEB. They meet at intervals, possibly once or twice a year, but much of the detailed work is by correspondence.

They are supported by the Permanent Secretariat based in Lausanne.

The Secrtariat consists of a Secretary-General and a Technical Director with supporting staff. It is now accommodated in the Federal Polytechnic University in Lausanne, which provides office space and other necessary facilities.

One of the most important tasks of the Secretariat is to arrange for the editing, printing and distribution of the CEB Bulletins containing the working papers as well as the finished documents produced by the Working Commissions and Task Groups of CEB. Some 180 Bulletins have been published since the founding of CEB, representing a wealth of technical material which has proved of great value to designers and construction engineers.

The Secretariat produces and distributes CEB News periodically to acquaint members with CEB matters of current interest. The Secretariat arranges the meetings of the General Assembly and is responsible for following up the administrative and technical resolutions arrived at by successive plenary sessions.

5. LINKS WITH OTHER ORGANISATIONS

From the beginning of its work, the CEB recognized the need for effective liaison with other international bodies. It has therefore established contact with CEB, FIP, IABSE, IASS, ISO and RILEM* by direct liaison and through the Liaison Committee for International Civil Engineering Associations, Close contact is also maintained with the American Concrete Institute and other national bodies.

Over the years these links have been strengthened to ensure effective co-operation in fields of mutual interest. In the early 1970s, when the ideas of model codes based upon limit-state concepts were being contemplated in many of the organizations, it became necessary to broaden the links to other bodies concerned, for example, with the design of steel structures, so that the underlying philosophical concern would be harmonized and hence harmonization across materials achieved also. This work has been going on for a number of years and it led logically to contacts with the European Community and also the Eastern European Countries (CMEA) concerned with codes and standards. The CEB has, from its very beginning, included representatives from the Eastern Countries and they have been prominent in formulating the recommendations. Since the CEB has a number of national member groups, these in turn have links with their own national organizations and this provides a good opportunity for interplay between the government departments, national regulations,

* CIB - Conseil International du Batiment
FIP - Federation Internationale de la Precontrainte
IABSE - International Association for Bridge and Structural Engineering
IASS - International Association for Spatial Structures
ISO - International Standards Organization
RILEM - Reunion Internationale des Laboratoires d'Essais et de Recherches sur les Materiales et les constructions

and the work of the CEB in the general sense. Thus it is possible, by this route also, to achieve better harmonization in the treatment of aspects of design, construction and performance.

It is through these links and the established National Delegations of the CEB that the dissemination of information has increased over the years so that its impact is effectively enhanced. This really is recognition of the value of CEB's activities and has to be carefully guarded, a function performed by the whole of the membership of CEB but particularly by the Administrative Council and the General Assembly.

6. PROGRAMME OF WORK

In any organisation, dependent on major voluntary contributions from its members, the motivation for work on specific subjects comes from recognition of mutual interests and enthusiasms. Within CEB, the Advisory Committee, the Council and, obviously, the General Assembly provide discussion groups which identify, refine and then define areas of work, together with an indication of the experts both willing and able to contribute to that work. The framework for the ensuing activity is the set of Working Commissions and their Task Groups and the General Task Groups, as shown in Figure 1. Currently there are 8 Permanent Commissions as given in Table 2; their titles indicating their field of interest. Each Commission may set up Task Groups to undertake a well defined task within a target timescale and, having reported, the Task Group will be disbanded. Similarly, General Task Groups are set up by the Council to deal with subjects requiring an overall treatment, as opposed to one specifically related to a Commission; those currently active are given in Table 3.

Thus, through this on-going debate, at various levels, the activities of CEB are routed within its own structure and, obviously, monitored by the Secretariat and Administrative Council. The General Assembly provides the mechanism for final debate, and approval, of the most significant documents, i.e. those which are not accepted for publication directly by the Administrative Council.

It should be emphasised that, in one sense, this description of the programme of work is perhaps too modest. In reality, the people working within the various Commissions and Task Groups have access to, and maybe control of, considerable research, academic and/or professional resources, as well as being associated with other groups working in related areas. This ensures a very effective coordination and concentration of effort which enables a synthesis of available information to be achieved and, more important, a consensus judgement made of the quality, or status, of that information. When reports are received the further debates ensure that, prior to publication, there has been an international peer review system applied which, naturally, greatly assists acceptance - in effect a harmonisation procedure is achieved through the active participation of the many National Delegations. Some examples will illustrate this aspect.

When the model code was published in 1978, it appeared in two volumes (see Table 1). Volume 1, as it was known (Common unified rules for

different types of construction and material), was the culmination of work over a number of years, in very close liaison with FIP, CIB,CECM, IABSE and RILEM which, previously, had led to the publication of ISO 2394 : General principles for the verification of the safety of structures (1973).

Then Volume 1 became the basic document for the work of the European Economic Community which led to Eurocode No 1 : Common unified rules for different types of construction and material. ISO 2394 ha subsequently been revised and the work of the Joint Committee on Structural Safety has included the revision of Volume 1, due for publication shortly. The changes that have been made to the original document are not so great as to disguise its true parentage!

Similarly, the Model Code for Concrete (1978) - Vol II as it is known - was the logical follow-up to the International Recommendations of CEB in 1964 and 1971, and this group of documents had a profound effect on National Codes of Practice on a world wide basis. Thus, when the European Community desired to produce its own document it was, perhaps, not surprising that Vol. II was adopted as a basis for what is now known as Eurocode 2 - to be formally published shortly.

Much more recently, the attention devoted to Durability, Assessment and re-design and Quality Assurance has led to the production of Bulletins which have made a considerable impact on the treatment of these aspects in practice. Equally the culmination of the work of certain Task Groups e.g. GTG 14 and 15, will provide extremely valuable contributions to the treatment of impact, impulse and fatigue loading situations.

7. CONCLUDING REMARKS

I hope I have been able to convey to you the "CEB ethos", which pervades all of its activities. I'm sure that my CEB colleagues, particularly those from the Japanese Delegation, join with me in expressing our hopes for a continuing development of the cooperation between CEB and JCI - and, from my viewpoint, for an increase in the Japanese contribution to Commissions, Task Groups and so on. I am sure that the presence of Professor Ozaka on the Advisory Committee will be of great benefit to CEB in this and other respects.

TABLE I

CEB Bulletins d'information from 1978 to 1987 (in print)

Bulletin No.	Title	Date
124	International System of Unified Standard codes of Practice for Stuctures, Volume 1: Common unified rules for different types of construction and material	1978
125	International System of Unified Standard Codes of Practice for Structures, Volume II:CEB-FIP Model Code for Concrete Structures	1978
126	Shear and torsion Explanatory and viewpoint papers on Model Code chapters 11 and 12 prepared by members of CEB Commission V	1978
127	Manuel "Securite des structures" (2e edition revisee et completee) Concepts generaux, actions, combinaisons et sollicitations agissantes, resistances et sollicitations resistante, etats-limites et situations, regles generales d'application l'ere partie	1978
128	Manuel "Securite des structures" (2e edition, revisee et completee) 2eme partie	1978
129	Contribution to the Conference on Trial and comparison calculations based on the CEB-FIP Model Code for Concrete Structures. London-November 1978	1978
130	Complements au Code Modele CEB-FIP 1978 (ler draft) - Rome, Mai, 1979	1979
131	Structural concrete under seismic actions AICAP-CEB Symposium, Rome, May 1979 Volume 1 - State of the Art Reports	1979
132 132bis	Structural concrete under seismic actions AICAP-CEB Symposium, Rome, May 1979 Volumes 2 and 3 - Technical papers	1979
137	Complement to CEB-FIP Model Code 1978 Final draft	1980
138	"Comportement en service, entretien et reparations" Rapport preliminaire de la Commission IX	1980
139	Complements au Code Modele CEB-FIP 1978 (Version finale)	1981

140	CEB Application Manual on "Concrete reinforcement technology"	1983
141	CEB-FIP Manual on "Bending and compression"	1982
142 142bis	CEB Manual on "Structural effects of time-dependent behaviour of concrete"	1984
144	CEB/FIP Manual on "Application of the CEB/FIP Model Code 1978 for concrete structures"	1985
145	"Design of concrete structures for fire resistance"	1981
146	"Shear, torsion and punching" Progress Report	1981
147	"Conceptional preparation of future Codes" Progress Report	1982
149	"Seismic design of concrete structures" Second draft of an Appendix to the CEB-FIP Model Code	1982
150	"Detailing of concrete structures" First draft of a Design Manual	1982
151	"Bond action and bond behaviour of reinforcement" State of-the-Art Report	1982
152	Durability of concrete structures Final Report of the CEB-RILEM International Workshop Copenhagen, May 1983	1984
153	Structural analysis - Volume I Enlarged Meeting of the Commission, Pavia, October 1981 Theme 1: Nonlinear analysis and design of concrete frames Theme 2: Nonlinear analysis and design of slabs	1982
154	Structural analysis - Volume II Enlarged Meeting of the Commission, Pavia, October 1981 Theme 3: Uncertainties of the structural model and randomness of the structural behaviour theme 4: Thermal effects	1982
155	"Buckling and instability" Progress Report	1983
156	"Concrete under multiaxial states of stress constitutive equations for practical design"	1983
157	"Quality control and quality assurance for concrete structures"	1983
158E	CEB Manual "Cracking and deformations"	1985

159	"Application of the finite-element method to two-dimensional reinforced concrete structures" "Simplified methods of calculating short term deflections of reinforced concrete slabs"	1983
160	Model Code for "Seismic design of concrete structures" 1 - Final draft	1983
160bis	Model Code for "Seismic design of concrete structures" 2 - Trial calculations	1983
161	"Response of R.C. critical regions under large amplitude reversed actions"	1983
162	"Assessment of concrete structures and design procedures for upgrading (redesign)"	1983
163	"Comportement enservice, entretien et raparations" - Collecte et analyse d'informations selectives - Diagnostic et processus de decision	1983
164	"Industrialization of reinforcement in reinforced concrete structures" Synthesis Report	1985
165	CEB Model Code for "Seismic design of concrete structures"	1985
166	Draft CEB-Guide to "Durable concrete structures"	1985
167	"Thermal effects in concrete structures" Synthesis Report	1985
168	"Punching shear in reinforced concrete" State-of-the-Art Report	1985
169	Draft Guide for the "Design of precast wall connections"	1985
170	"Basic notes on model uncertainties" State-of-the-Art Report "Liquid and gas tightness of concrete structures" Progress Report	1985
171	New concepts in detailing, Quality control, Calibration Methods (PC I)	1986
172/3	Preliminary collation of received observations compiled by the Model Code Revision Group	1986
174	Model Code for Fire Design of Concrete Structures First Draft Oct. 1986	1987

175	Summary and analysis of observations on the CEB/FIP Model Code 1978 (Part A)	1987
176	(Part B)	1987
177	(Part C)	1987
178/9	Fundamental developments in Design Models Meeting Karlsruhe - November 1986	1987
180	Shear in Prestressed Concrete Members State-of-the-Art Report	1987
181	Anchorage zones in Prestressed Concrete Members State-of-the-Art Report	1987

TABLE 2

Permanent commissions of the CEB and related Task Groups

Commission or Task Group	Title	Bulletin No.
Commission I	Reliability and quality Assurance	147, 170
TG1/2	Design by testing	
TG1/3	Quality assurance programme	
Commission II	Structural Analysis	153, 154
Commission III	Buckling and Instability	155
TGIII/1	Simplified methods	155
TGIII/2	Instability of walls	155
TGIII/3	Instability of exceptional structures	155
Commission IV	Members Design	146
TGIV/1	Shear in prestressed concrete members	146
TGIV/3	Punching	168
Commission V	Serviceability	143, 158
TGV/1	Durability	148, 152
TGV/4	Vibrations	
TGV/5	Minimum reinforcement	
TGV/6	Tensile stiffening	
TGV/7	Deformations	
Commission VI	Detailing	
TGVI/1	Anchorage zones	151
TGVI/4	Detailing of concrete structures	150
Commission VII	Reinforcement: Technology and Quality Control	164
TGVII/1	Requirements for reinforcement-bars	
TGVII/2	Quality control of reinforcement-bars	
TGVII/4	Recommendations for welding of reinforcing steel	
TGVII/5	Ductility requirements for steel	
TGVII/6	Recommendations for mechanical splices of reinforcing steel	
Commission VIII	Concrete: Technology and Quality Control	

TABLE 3

General Task Groups of the CEB

GTG No.	Title	Bulletin No.
4	Fire design of concrete structures	145
9	Evaluation of time-dependent behaviour of concrete	
11	Design of connections of prefabricated elements	169
13	Design value format	
14	Concrete structures under impact and impulsive loading	
15	Fatigue of concrete structures	
16	Structure and development of future regulatory documents	
17	Design of prestressed structures	
18	Prefabricated structures (with FIP)	
19	Diagnosis and assessment of concrete structures	
20	Durability and service life (former TG V/1)	166
21	Re-design of concrete structures	
22	Behaviour and analysis of concrete structures under large alternate actions	
23	Feed-back of information	
24	Practical topics in designing concrete under multiaxial states of stress	

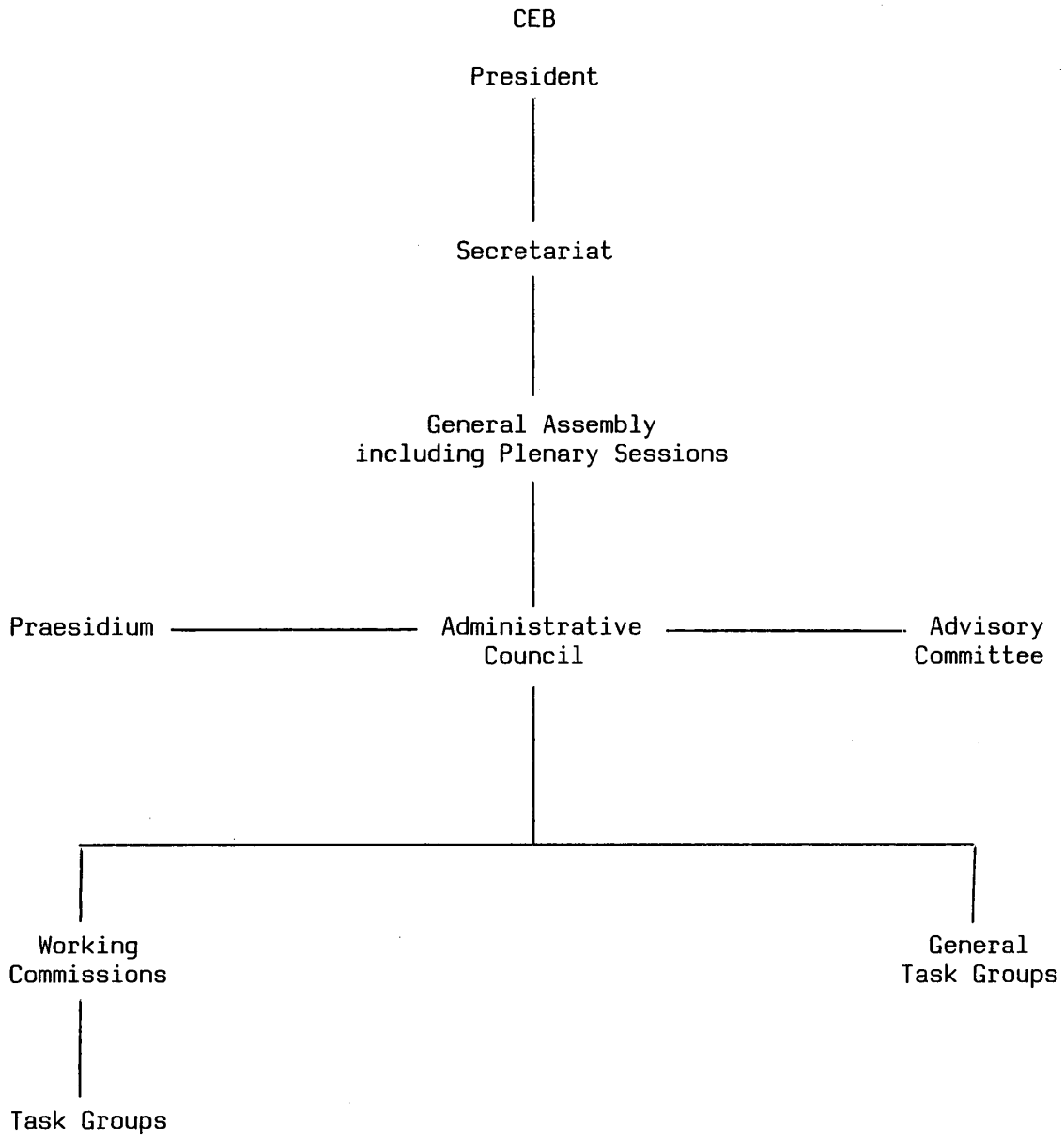

Figure 1 : Structure of CEB