Bauforschung

Mitarbeit bei der internationalen Vereinheitlichung von technischen Baubestimmungen auf dem Gebiet des Stahl- und Spannbetonbaus

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COMITÉ EURO-INTERNATIONAL DU BÉTON

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7.77

CEB

Lausanne, den 25. Februar 1986
RT/IH - 75/86

Betr.: Forschungsvorhaben "Mitarbeit bei der internationalen Vereinheitlichung von technischen Baubestimmungen auf dem Gebiet des Stahl- und Spannbetonbaus" - AZ IV/1 - 5 -382/85)

hier: Abschlussbericht für das Jahr 1985

Der Schwerpunkt der Arbeiten im Berichtzeitraum lag in der Vorbereitung und Durchführung der 24. CEB-Vollversammlung in Rotterdam im Juni 1985. Dazu waren eine Vielzahl technischer Informationen zusammenzutragen:

Zum einen war der status quo in der technischen Arbeit der CEB-Kommissionen und Arbeitsgruppen zu dokumentieren und den CEB-Mitgliedern zur Verfügung zu stellen, was mit den CEB-News N° 74 geschah (Anlage 1).

Zum anderen war das technische Programm der Vollversammlung im Detail vorzubereiten und mit den Vortragenden abzustimmen. Dabei konnte eine neue Konzeption erarbeitet werden:

im traditionell unveränderten Teil wurde der Fortschritt der technischen Arbeiten auf der Basis der zwischenzeitlich in Vorbereitung der Vollversammlung veröffentlichten Bulletins d'Information diskutiert (siehe Anlage 2):

Bulletin N° 164 "Industrialization of Reinforcement"

Bulletin N° 165 Model Code for "Seismic Design of Concrete Structures"

Bulletin N° 166 Draft CEB-Guide to "Durable Concrete Structures"

Bulletin N° 167 "Thermal Effects"

Bulletin N° 168 "Punching Shear in Reinforced Concrete"

Bulletin N° 169 Draft Guide for the "Design of Precast Wall Connections"

Bulletin N° 170 "Basic Notes on Model Uncertainties"

Darüberhinaus wurden im Berichtszeitraum weitere Bulletins herausgebracht, die nicht Gegenstand der Beratungen in Rotterdam waren, sondern in Ausführung früherer Beschlüsse veröffentlicht wurden (Anlage 3).

Neu eingeführt wurden dann in Rotterdam halbtägige sogenannte "Special Discussion Sessions", bei denen zu ausgewählten Themen freie technische Diskussionen stattfanden. Diese Neuerung fand guten Anklang; die wesentlichsten Inhalte der beiden gleichzeitig parallel gelaufenen Sitzungen werden demnächst in einem kleineren Bulletin veröffentlicht.

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ANLAGE 1

CEB-NEWS

N° 74 FEBRUARY 1985

WORK IN PROGRESS 1985

and

SURVEY OF ACTIVITIES 1979-1984

in

CEB-Commissions and Task Groups

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List of CEB-BULLETINS d'INFORMATION

The intention of these News is to inform all CEB-members and friends on the recent developments of activities, especially those who did not participate in the Advisory Committee meeting in Stuttgart, May 1984. Furthermore the complete list of published Bulletins d'Information has been added.

CEB-News are published irregularly. Their primary intention is to inform CEB-members on progress of work in CEB's Commissions, Related and General Task Groups and on the programmes and resolutions of CEB-Plenary Sessions. Moreover, any other information can be included which might be of interest for CEB's members or friends.

Comm./TG	TITLE	79	80	81	82	83	1984: actual state
Comm. I	RELIABILITY AND QUALITY ASSURANCE						PERMANENT
TG I/1	*Quality Assurance*						*disbanded*
TG I/2	Design by Testing						starting
TG I/3	Qual.Ass. programme for medium size proj.						starting
Comm. II	STRUCTURAL ANALYSIS						PERMANENT
TG II/1	Thermal Design						continuing
TG II/2	*Design of Slabs*						*disbanded*
TG II/3	*Basic Behaviour of 2-Dim. Elements*						*suspended*
Comm. III	BUCKLING AND INSTABILITY						PERMANENT
TG III/1	Simplified Methods						continuing
TG III/2	Instability of Walls						continuing
TG III/3	Instability of Exceptional Structures						continuing
Comm. IV	MEMBERS DESIGN						PERMANENT
TG IV/1	Shear in Prestressed Concrete Members						continuing
TG IV/2	*Torsion under Combined Actions*						*disbanded*
TG IV/3	Punching						continuing
Comm. V	SERVICEABILITY						PERMANENT
TG V/1	*Durability*						*cont.GTG 20*
TG V/2	*Manual: Cracking and Deformations*						*disbanded*
TG V/3	*Liq. and Gastightness of Concr.Struct.*						*suspended*
TG V/4	*Vibrations*						*starting'85*
TG V/5	Minimum Reinforcement						starting
Comm. VI	DETAILING						PERMANENT
TG VI/1	Anchorage Zones						continuing
TG VI/2	*Opening in Slabs and Walls*						*disbanded*
TG VI/3	*Detailing of Lightweight Concrete*						*disbanded*
TG VI/4	Detailing of Concrete Structures						continuing
Comm. VII	REINFORCEMENT: TECHNOLOGY & QUAL. CONTR.						PERMANENT
TG VII/1	Requirements for Rc-Bars						continuing
TG VII/2	Quality Control of Rc-Bars						continuing
TG VII/3	Industrialization of Reinforcement						continuing
TG VII/4	Recommend. for Welding of Reinf.Steel						starting
TG VII/5	Ductility Requirements for Reinf.Steel						starting
TG VII/6	Recommend. for Mech.Splices of Reinf.Steel						starting
Comm. VIII	*CONCRETE: TECHNOLOGY AND QUALITY CONTROL*						*to be reorganized*
TG VIII/1	*Quality Control of Concrete*						*suspended*
Comm. IX	*BEHAVIOUR, MAINTENANCE AND REPAIR*						*to be reorganized*
TG IX/1A	*Analysis of Structural Damages*						*to be reorganized*
TG IX/1B	*Buildings*						*to be reorganized*
TG IX/2	*Maintenance & Diagn. of Concr.Structures*						*to be reorganized*

Table 1: CEB-Permanent Commissions and related Task Groups

GTG	TITLE	79	80	81	82	83	1984: actual state
1	*COMPLEMENTS*						*disbanded*
2	APPLICATION OF THE MODEL CODE						continuing
3	*SEISMIC DESIGN OF CONCRETE STRUCTURES*						*disbanded*
4	FIRE DESIGN OF CONCRETE STRUCTURES						continuing
5	*PERFORMANCE CRITERIA OF CONCRETE STRUCTURES*						*disbanded*
6	*MULTIAXIAL BEHAVIOUR OF PLAIN CONCRETE*						*disbanded*
7	*APPLICATION OF LEVEL II-METHOD*						*disbanded*
8	*STRUCT. EFFECTS OF TIME-DEP. BEHAVIOUR OF CONCR.*						*disbanded*
9	EVALUATION OF TIME-DEP. BEHAVIOUR OF CONCR.						continuing
10	*RESPONSE OF STRUCTURAL CONCRETE CRITICAL SECTIONS UNDER HIGH LEVEL REVERSED ACTIONS*						*disbanded*
11	DESIGN OF CONNECTIONS OF PREFABR. ELEMENTS						continuing
12	*ASSESSMENT OF EXISTING CONCRETE STRUCTURES AND DESIGN PROCEDURES FOR THEIR UP-GRADING*						*disbanded*
13	DESIGN VALUE FORMAT						starting
14	CONCR. STRUCT. UNDER IMPACT AND IMPULSIVE LOADING						continuing
15	FATIGUE OF CONCRETE STRUCTURES						starting
16	STRUCT. AND DEVELOPM. OF FUT. REGUL. DOCUM.						continuing
17	DESIGN OF PRESTRESSED STRUCTURES						starting
18	LINEAR PREFABRICATED ELEMENTS						starting
19	DIAGNOSIS AND ASSESSMENT OF CONCR.STRUCT.						starting
20	DURABILITY AND SERVICE LIFE						cont. TG V/1
21	RE-DESIGN OF CONCRETE STRUCTURES						planned
22	BEHAVIOUR AND ANALYSIS OF CONCR. STRUCTURES UNDER LARGE ALTERNATE ACTIONS						planned
23	FEED-BACK OF INFORMATION						planned
24	PRACTICAL DESIGN OF REINFORCED CONCRETE FOR MULTIAXIAL STATES OF STRESS						planned

Table 2: CEB - General Task Groups (directly responsible to the Administrative Council)

WORK IN PROGRESS 1985
and
SURVEY OF ACTIVITIES 1979-1984
in
CEB-Commissions and Task Groups

In preparation of the meeting of the Advisory Committee in Stuttgart, May 1984, the state of progress in CEB's Commissions, Related and General Task Groups had to be reviewed, starting with the last restructuration in 1979, relflecting the development since then and adding the present and planned initiatives.

Transmitting this information to CEB-members, these News start with a survey of all groups which have been active since 1979 (table 1 and 2 on page 2). Some of these groups have been disbanded in the meantime since fulfilment of their mission. The listing shows CEB's Commissions, Related and General Task Groups and their period of acticity. Then, in the main part of these News, beginning on page 5, the programmes, the actual state of progress and the reports published so far are given for all groups. The presently active ones are emphasized by a frame.

Some additional information may be given regarding the recent definition of objectives for CEB's work as agreed during the Advisory Committee meeting: The introductory report of the Administrative Council defined these CEB objectives as "the synthesis of research results and technical information to enable the preparation of appropriate guidance documents for use in practice." This unanimously accepted definition was based on the history and the mutual arrangements of the CEB with its sister associations.

However, the "translation" of this synthesis into documents which serve the practical engineer may be effected in different ways. Table 3 on page 4 shows the classification of CEB documents depending on their specific aim, the type of publication and the way of approval. The publication scheme of "Bulletins d'Information" also includes hardcover publications i.e. books. These "Bulletins d'Information" are sent to all full and corresponding members of the association. As stated by President T.P. Tassios during the Advisory Committee meeting, the areas of interest of the association have been extended since its foundation. Initially based on the synthesis of pre-regulatory documents for analysis and design of new structures, the enlarged field will now include practical rules and construction aspects as well as hazard situations (e.g. fire, seismic, impact) and life time problems for new and existing structures (refer to the programmes of the corresponding new General Task Group).

Therefore future efforts of the CEB will mainly have to be oriented towards a revision of the Model Code 1978 including updating and enlarging its contents especially with regard to

* life-time problems (refer e.g. to new GTG's 19, 20, 21)
* prestressing (refer e.g. to new GTG 17)
* prefabrication (refer e.g. to GTG's 11, 18) and
* quality assurance (refer e.g. to TG I/3).

	Ratification by			Publication as		
	Commiss. or GTG	Admin. Council	Plenary Session	Bulletin	Leaflet	Book
				< or >		
Model Code			■			■
Annex to MC			■			■
Manual			■			■
Guide	■	■		■	■	
Synthesis Report	■			■		
State-of-the-art Report	■			■		
Progress Report	■			■		

Table 3: Ratification and publication of CEB-documents

This need to rewrite the existing Model Code has been strongly emphasized. The aim should be a basic document which serves code drafting instances yet shows also an operational character with respect to practical engineers. The anticipated time schedule for the implementation of the revision process is shown in table 4. In parallel to the above outline, efforts will be made - especially by General Task Group 16 - to achieve a more rational presentation of the Code, using also the results of the discussion on the recently drafted Eurocodes.

May 1984 - May 1985	review of current code, brainstorming collection of all new available knowledge, scientific input, identification of gaps, mistakes, desired changes, new needs, etc. from all Commissions and Task Groups
June 1985	Plenary Session Rotterdam, possibly occasion for first exchange of ideas
June 1985 - December 1985	definitive indications of revisions, diffusion of the available material, discussions in Permanent Commissions, Administrative Council, Advisory Committee
January 1986 - June 1986	first practical formulations for amendments, first drafting of new texts
first half of 1986	programme meeting (as e.g. Athens 74 for MC 78) probable creation of an editing "horizontally working" committee
1986 - 1989	exchange of proposals, comments, criticism, etc. implementation process, editing

Table 4: Time schedule for the implementation of the Model Code revision process

C.E.B.

Commissions
Related Task Groups
General Task Groups

1979 - 1985

* Programmes
* State of Progress
* Publications

Commission I: RELIABILITY AND QUALITY ASSURANCE

Reporters: H. MATHIEU, L. ÖSTLUND

Programme:

Limit states (significance, classification and corresponding types of equations)

Reliability formats, especially simplified for the combination of actions

Model uncertainties

Safety and assessment of reliability of existing structures

Calibration

Relation between quality assurance measures and reliability

Cooperation with all other Commission and T.G.s about the reliability aspects involved in their studies

Publications:

1982: Progress Reports in CEB-Bulletin N° 147, "Conceptional preparation of future codes":

J. Ferry Borges: "Quality assurance and reliability of concrete structures"

G. König and D. Hosser: "The simplified level II method and its application on the derivation of safety elements for level I"

H. Mathieu: "Comparison of the formulae of the Model Code for combination of actions"

H. Mathieu: "Les différentes formes d'equations d'états-limites et la méthode des coéfficientes partiels"

R. Rackwitz: "First-order structural reliability - one methodological basis for the design of codes"

Further individual reports of Commission members as contribution to CEB-Bull.N°154 "Uncertainties of the structural model and randomness of the structural behaviour", April 1982:

M. Kersken-Bradley: "Statistical size effect on the structural response of parallel arrangements"

R. Rackwitz, B. Peintinger: "General structural system reliability"

Further papers presented and under discussion in the Commission (incomplete list):

A.W. Beeby, W.B. Cranston: "Loading on concrete beams and slabs" (Jan.1981)

G. König, E. Hosser: "Basic notes on model uncertainties" (3.draft, Oct. 84) expected to be published for discussion during CEB-24th Plenary Session Rotterdam, June 1985

M. Tichy: "Design and assessment of building structures subjected to reconstruction and repairs"(1. draft, 1982)

Further activities:

- Written comments by the Commission or some of its members to seismic and fire design and design of industrial chimneys
- Rapport sur certains aspects de l'harmonisation et sur la simplification des règles de calcul relatives à la sécurité dans les Eurocodes 2 et 3 (by H. Mathieu, G. Sedlacek et R.P. Johnson)

TG I/1: QUALITY ASSURANCE — disbanded Oct. 1983

Reporter: A.G. MESEGUER

Programme:
Operational Recommendations on the basis of the concepts, prepared by the JCSS

Final report available:

1982: "Quality Control and Quality Assurance for Concrete Structures", CEB-Bulletin N° 157, March 1983

TG I/2: DESIGN BY TESTING

Reporter: E. THORENFELDT, Co-reporter Th. MONNIER

Programme:
Preparation of guidelines for design by testing including test plan, evaluation of results, interpretation and use of the results. Development of Appendix b of the existing Model Code, notably in order to deduce numerical design values from results of limited series of preliminary prototype tests, with due regard to model uncertainties.

Actual state of progress:
Preliminary paper by E. Thorenfeldt: "Design by testing of concrete structures" (Dec. 82)

Task Group recently established, first meeting May 84

The first step will be a review of the state of the art.

TG I/3: QUALITY ASSURANCE PROGRAMME FOR MEDIUM SIZE PROJECT — starting

Reporter: A.G. MESEGUER

Programme:
Preparation of a practical example; considering also the situation of countries without a network of standards or experience in quality assurance systems; harmonization of useful existing material; progress in three stages: Q.A. management, development of methods and instruments, applications.

Actual state of progress

Task Group just being established, first meeting envisaged for Jan. 85

Commission II: STRUCTURAL ANALYSIS

Reporters: G. MACCHI, J. EIBL

Programme:

Critical review of Model Code chapter 9: "Structures consisting of plane elements"

Indirect actions: safety criteria, coefficients (together with Comm. I)

Thermal effects (non-environmental actions)

Uncertainties in structural analysis

Simplified loading combinations (together with Comm. I)

Application of non-linear methods

Publications:

1982: Invited contributions to an enlarged Commission meeting, published as CEB-Bull. N° 153 and 154, containing among others:

Theme 1 - Non-linear Analysis and Design of Concrete Frames

1.1 A.C. Aparicio, J.J. Arenas: "Some examples of non-linear analysis of prestressed concrete continuous bridge decks under increasing loads"

1.2 F. Braga, M. Dolce: "Non-linear simplified design of coupled shear walls"

1.3 E.C. Carvalho: "Seismic behaviour of buildings: non-linear response and ductility demand"

1.4 A. Franchi, P. Ronca: "Elastic-plastic-brittle constitutive model and structural analysis"

1.5 E. Giuriani: "Theoretical analysis of the early second stage in r.c. beams"

1.6 V.C. Kalevras: "Aids for non-linear analysis and design of concrete frames"

1.7 L.J. Lima: "A discussion about structural ductility"

1.8 J. Lima, E. Lima: "Some experimental results about the ductility of beams"

1.9 A. Mari, J. Murcia, A. Aguado: "Second order analysis of reinforced concrete frames"

Theme 2 - Non-linear Analysis and Design of Slabs

2.1 G. Creazza, E. Siviero: "Approximate theory for the deformational study of reinforced concrete bidimensional continuous: application to simply supported uniformly loaded square slab"

2.2 W. Kuczynski, S. Tkaczyk: "Non-linear analysis of reinforced concrete structures according to the continuous changes stiffness theory"

Theme 3 - Uncertainties of the Structural Model and Randomness of the Structural Behaviour

3.1 A. Cauvin, W. Moosecker: "Some problems in "level two" reliability analysis of reinforced concrete frames, taking into account non-linear behaviour"

3.2 A. Cauvin: "Influence of some factors of model uncertainty in linear and non-linear elastic r.c. frame analysis"

3.3 R. Giannini, M. Menegotto: "A reliability analysis of slender columns design rules"

Theme 4 - Thermal Effects

4.1 A. Aguado, A. Mari, E. Penon: "Non-linear analysis for thermal effects and support displacement on frame concrete structures"

4.2 A.C. Aparicio, J.J. Arenas: "The behaviour of continuous reinforced and prestressed beams subjected to a thermal gradient under loads increasing up to failure"

4.3 M.A. Chiorino, G. Losana, P. Napoli: "Influence of creep on stresses due to temperature variations in concrete structures"

4.4 J.L. Clarke: "Concrete cylinders under cyclic temperature gradients"

4.5 M. Emerson: "The influence of the environment on concrete bridge temperatures"

4.6 V.C. Kalevras: "Environmental thermal effects on r.c. structures, the greek experience"

4.7 T. Zichner: "Thermal effects on concrete bridges"

TG II/1: THERMAL EFFECTS

Reporter: H. FALKNER

Programme:

Guidance "Thermal actions in concrete structures" (environmental actions); heat transfer in the structure; structural analysis; detailing of the structure; observation of structures and feed-back

- Draft final report about to be edited in Bulletin 167, beginning 1985
- Contributions of TG members published in Bull. N° 154, part: Thermal Effects (*see above*)

TG II/2: DESIGN OF SLABS — disbanded Oct. 1983

Reporter: G. CREAZZA

Programme

Guidance "Simplified methods of calculating short term deflections of r.c. slabs"

Publications:

Final report published in Bull. N° 159, July 1983, title as quoted above

TG II/3: BASIC BEHAVIOUR OF 2-DIMENSIONAL ELEMENTS

Reporter: G. MEHLHORN — for the time being suspended

Programme

Guidance "Application of the finite element method to 2-dimensional r.c. structures"

Publications:

Final report published in Bull.N° 159, July 1983, title as quoted above

Remarks

Elaboration of practical applications and periodical updating foreseen

Commission III: BUCKLING AND INSTABILITY

Reporters: K. KORDINA, M. MENEGOTTO

Programme:

Slenderness bounds

Approximate methods and design aids for buckling design

Stability of slender exceptional members and structures

Stability of walls

Creep problems

Computer suited approach: collection and classification of suitable approaches for second order analysis in small personal computers

Publications

1983: CEB-Bull. N° 155 "Buckling and Instability" - Progress report - containing

Section 1: single columns

H. Corres, F. Moran: "Reference curvatures method"

M. Menegotto: "Observations on slenderness bounds for r.c.-columns"

R. Molzahn: "Design of single columns according to the German Code of Practice DIN 1045"

E. Poulsen: "Approximate methods of analysis"

E. Poulsen: "Approximate methods of design"

E. Poulsen: "Walls of plain concrete"

E. Poulsen: "A comparison between different model column methods"

D. Woodward: "Simplified procedure for slender column design"

Section 2: creep effects

D. Diamantidis: "On the variability of the eccentricity of slender columns under sustained load"

R. Molzahn: "MC 78 methods for calculating the creep effects with slender columns compared to test results - proposal of an improvement "

Z. Prascevic: "Influence of creep on behaviour of reinforced concrete plates and walls"

Section 3: buckling of walls

K. Aas-Jakobsen: "Buckling of walls"

Section 4: towers, piers, chimneys and masts

U. Quast: "Towers, piers, chimneys and masts

Annex

F. Levi: "List of errata to Bull. N° 123"(Manual "Buckling and Instability")

Programmes and publications of the Commission's three Task Groups are included in the Commission activities given above:

TG III/1: SIMPLIFIED METHODS

Reporter: E. POULSEN

TG III/2: INSTABILITY OF WALLS

Reporter: A. AAS-JAKOBSEN

TG III/3: INSTABILITY OF EXCEPTIONAL STRUCTURES

Reporter: U. QUAST

Additional activities:

Comments on a draft model code for the design of chimneys prepared by CICIND

Commission IV: MEMBERS DESIGN

Reporters: E. GRASSER, P. REGAN

Programme:

Development of consistent design models for bending, *shear*, *torsion* and *punching* (influences from CEB-Bull.N° 150 "Detailing of Concrete Structures") for members and connections

Improvements of Model Code design regulations (taking into consideration also CEB-Bull. *147 "Conceptional Preparation of Future Codes)*

Rational design of combined actions

Compressive membrane effects (in collaboration with PC II)

Deep beams

Corbels

Publications:

1982: CEB-Bull. 146 "Shear, Torsion and Punching", giving progress reports of Task Groups 1 and 2 (see below) and:

G. Mancini: "Prestressed sections at the ultimate limit state under normal load effects - comparison between approximated and exact checking methods"

P.E. Regan: "Longitudinal shear in the flanges of reinforced concrete beams"

Further activities:

Organization of the 3rd "European/American Workshop on Shear and Torsion" in Munich, April 82

TG IV/1: SHEAR IN PRESTRESSED CONCRETE BEAMS

Reporter: J.C. WALRAVEN

Programme:

Physical model for shear design; discussion of physical models; review of experiments; proposal of design models for recommendations

Shear resistance of members without shear reinforcement

Publications:

1982: Progress report in CEB-Bull. 146 (see above):

K.-H. Reineck: "Models for the design of reinforced and prestressed concrete members"

J. Walraven: "Shear in elements without shear reinforcement"

- further: input to chapter deformations due to shear in CEB-Bull. 158 "Manual Cracking and Deformations"

TG IV/2: TORSION UNDER COMBINED ACTIONS — disbanded

Reporter: P. MARTI

Programme:

Physical model for design, proposal for recommendations; torsional stiffness, evaluation also under combined actions

Publications:

1982: Final Report in CEB-Bull. 146 (see above):

P. Marti: "Strength and deformations of reinforced concrete members under torsion and combined actions"

- further: input to chapter deformations due to torsion in CEB-Bull. 158 "Manual: Cracking and Deformations"

TG IV/3: PUNCHING

Reporter: P. REGAN

Programme:

To review current situation, particularly in terms of Model Code (dubious for prestressed slabs, test data lacking), to prepare an improved method with a model

Draft state-of-art report under discussion in the Commission, will be extended to special subjects: punching with moment transfer, edge and corner columns, punching of prestressed slabs and column footings (including punching shear reinforcement)

expected to be published as Bulletin 168 in the beginning of 1985

Commission V: SERVICEABILITY

Reporter: M. WICKE, Å. HOLMBERG

Programme:

Performance of concrete structures under service conditions (especially cracking and deformation)

- minimum areas of reinforcement for crack control (see TG V/5)
- durability; practical guidelines (see TG V/1)
- vibrations (see TG V/4)
- longitudinal cracking

Need for exchange of information with other CEB-Groups for curing, properties of new concretes

Publications: see Task Groups

TG V/1: DURABILITY

Reporter: S. ROSTAM

Programme:

Guides and deemed-to-satisfy rules for design (at short term)

Definition of rational design procedures based on service life considerations (long term)

Publications:

1982: CEB-Bull. 148 "Durability of Concrete Structures", State-of-the-Art Report

1983: P. Schiessl: "Protection of reinforcement (final draft for a Working Guide of Durable Concrete Structures)

L. Sentler: "Service life prediction of concrete structures"

1984: CEB-Bull. N°152 "Durability of Concrete Structures", Final Report of the CEB-RILEM Workshop (see below)

Further activities:

1983: Organization of the CEB-RILEM International Workshop "Durability of Concrete Structures" in Copenhagen
(Introductory report published in 1983, workshop report see above)

Remarks:

This group will be continued as General Task Group 20, covering subjects related to the interdependencies of design and construction versus durability.

TG V/2: MANUAL CRACKING AND DEFORMATIONS — disbanded

Reporter: R. FAVRE

Programme:

Manual "Cracking and Deformations"

Publications:

1981: CEB-Bull. 143 "Manual: Cracking and Deformations" (Final Draft)

1983: CEB-Bull. 158-F "Manuel du CEB: Fissuration et Déformations" (version française)

1985: CEB-Bull. 158-E, English version

TG V/3: LIQUID AND GASTIGHTNESS OF CONCRETE STRUCTURES — suspended

Reporter: Å. HOLMBERG

Programme:

State-of-the-art report to describe the relationship between pressure, crack widths and flow through cracks for the definition of acceptable limits

Publications:

1983: Preliminary report available: "Liquid and Gastightness of Concrete Structures"; serving as input for complementary studies; Task Group for the time being suspended

TG V/4: VIBRATIONS — planned for 1985

Reporter: H. BACHMANN

Programme:

Definition of acceptable limits and preparation of analytical models for the computation of vibrations

Scheduled to start in 1985

TG V/5: MINIMUM REINFORCEMENT

Reporter: A.W. Beeby

Programme:

- new concept for crack control (revision of MC78 provisions)
- attempting to differentiate:
  * normal functions: minimum reinforcement and advice on arrangement of bars instead of crack width calculations
  * special functions (e.g. tightness): recommendations for crack width calculations

Drafting Group: TENSION STIFFENING — proposed

Reporter: Å. HOLMBERG

Commission VI: DETAILING

Reporter: J. PERCHAT, G. SOMERVILLE

Programme:

Guidance and coordination of work in Task Groups and for the edition of the Manual on Detailing of Concrete Structures

Publications: see Task Groups

TG VI/1: ANCHORAGE ZONES

Reporter: R. TEPFERS

Programme:

Critical analysis of the Model code 1978 provisions: elaboration of relevant propositions for amendments with respect to e.g.

- splitting forces at splices and anchorages (also for prestressed concrete)
- influence of concrete cover
- influence of transversal reinforcement

Publications:

1982: State-of-the-art report "Bond action and bond behaviour of reinforcement" CEB-Bull. N° 151

TG VI/2: OPENINGS IN SLABS AND WALLS disbanded

Reporter: Å. HOLMBERG

Programme:

Principles and rules for the arrangement of reinforcement in slab and wall openings not analysed by calculation

Publications:

1982: Final Report "Openings in Slabs and Walls", CEB-Bull. N° 151

TG VI/3: DETAILING OF LIGHTWEIGHT CONCRETE disbanded

Reporter: R. TEWES

Programme:

Synthesis report on the detailing of lightweight structures in comparison to the intended Manual: Detailing

Reconsideration of the subject in view of the ongoing elaboration of this Manual under new aspects (CEB-Bull. N° 150) necessary

Task transferred to TG VI/4: Detailing of concrete structures

TG VI/4: DETAILING OF CONCRETE STRUCTURES

Reporter: J. SCHLAICH

Programme:

Elaboration of a Design Manual dealing with the theory, the principles and the practical application of detailing rules

Continuation of the work published in Bull. N° 150 (see below)

Publications:

1982: J. Schlaich, D. Weischede: "Ein praktisches Verfahren zum methodischen Bemessen und Konstruieren im Stahlbetonbau" published as CEB-Bull. N° 150 "Detailing of concrete structures - first draft of a design manual"

Commission VII: REINFORCEMENT: TECHNOLOGY AND QUALITY CONTROL

Reporter: J. CALAVERA, G. REHM

Programm:

Establishment of requirements of minimum uniform elongation of reinforcement to be required from the point of view of the designer

Influence of the form of steel stress-strain diagram on structural behaviour

Definition and establishment of reinforcement characteristical diagram

Revision of bond testing methods. Possible proposal of a new method, considering the bonding exclusively as a physical property of the bar without connections with anchorage problems.

Publications: see Task Groups

TG VII/1: REQUIREMENTS FOR RC-BARS

Reporter: A. DELIBES

Programme:

Common investigation on bond of 8,10 and 16 mm RC-bars in pull-out tests

Test method of welding of wire meshes

Publications:

1982: Revised editions of the RILEM/CEB/FIP-Recommendations for reinforcement steel for reinforced concrete
- RC 2: Tensile test on reinforcement bars for reinforced concrete
- RC 4: Rebend test for reinforcement steel
- RC 5: Bond test for reinforcement steel: beam test (CEB-News N° 61 and in CEB-Bull. N° 140)

1984: RC 6: Bond test for reinforcement steel: pull-out test; Recommendation: "Measuring of the Rib-Pattern of RC-bars" } CEB-News N° 73, 1984

"Preliminary Report on the results obtained by Institute INTEMAC in the common investigation on bond of 8 to 16 mm bars in pull-out tests"

TG VII/2: QUALITY CONTROL OF RC-BARS

Reporter: D. RUSSWURM

Programme:

Elaboration of a certification scheme for production control and control on site of rc-bars and prestressing steels

Elaboration of test specifications (sampling-plans and assessment rules) for the characteristic values

At present under discussion:

Draft report "Quality Assurance System (Q.A.S.) for Concrete Reinforcement" containing:

- basic principles
- certification scheme for primary products
- delivery acceptance scheme
- modified delivery acceptance scheme for handling of reinforcing steel
- test methods and examples

expected to be published as CEB-Bulletin for discussion at the Plenary Session Rotterdam, June 85

TG VII/3: INDUSTRIALIZATION OF REINFORCEMENT

Reporter: R. ELIGEHAUSEN

Programme:

Synthesis report
List of contents:

- terminology
- parameters influencing the cost of reinforcement
- methods to reduce cost of reinforcement
- safety aspects
- tolerances
- annex: practical examples

Restricted publication of final draft: "Industrialization of Reinforcement in Reinforced Concrete Structures", distributed at the Prague Plenary Session, October 1983, final report to be published as CEB-Bulletin 164 in the beginning of 1985

TG VII/4: RECOMMENDATIONS FOR WELDED SPLICES OF REINFORCING STEEL proposed

proposed Reporter: D. RUSSWURM

Programme:

Development of the Model Code provisions for welding of splices, steel connection devices, anchors and connections to structural steel members. Future recommendations should cover steel qualities, welding processes and techniques, structural details and inspection

TG VII/5: DUCTILITY REQUIREMENTS FOR REINFORCING STEEL proposed

proposed Reporter: R. ELIGEHAUSEN

Programme:

Review of codes and literature concerning ductility requirements for reinforcing steel as a function of the method of analysis. Evaluation of ductility requirements for reinforcing with respect to the required rotation capacity of plastic hinges under static and seismic loadings.
Identification of required steel parameters as ratio rupture strength/yield strength and unit elongation, influenced mainly by gradient of moment of imposed deformations, bond quality, detailing and degree of prestressing

TG VII/6: RECOMMENDATIONS FOR MECHANICAL SPLICES OF REINF. STEEL proposed

proposed Reporter: A. DELIBES

Development of recommendations for mechanical splices (e.g. made of sleeves of different types) with respect to execution procedures (including material characteristics, tolerances, on site testing), detailing and quality control

Commission VIII: CONCRETE TECHNOLOGY AND QUALITY CONTROL — to be reorganized

Reporters: H. WEIGLER, A.G. MESEGUER

Programme:
Concrete properties other than strength - definitions, testing, control
Requirements on concrete other than strength

Remarks:
- Commission about to be reorganized
- Some topics (as e.g. "curing of concrete" and "influence of technological parameters on concrete deformability") will be entrusted in the meantime to a new Task Group, still to be established

TG VIII/1: QUALITY CONTROL OF CONCRETE — suspended

Reporter: H. LAMBOTTE

Programme:
Manual for quality control of concrete

Commission IX: BEHAVIOUR, MAINTENANCE AND REPAIR — to be reorganized

Reporter: A. MOGARAY, L. YAM

Programme:

Collection of information
- engineering structures
- buildings

Analysis
- types of damages (e.g. material deterioration, deformation, cracking, collapse)
- causes of damages (e.g. planning and design, execution, use, aging, excessive loading, hazards)
- non damaged structures

Practical recommendations for
- planning and design
- execution
- use

Publications:

1980: Preliminary report "Comportement en service, entretien et réparations", CEB-Bull. N° 138

1983: Conclusions drawn by Commission IX: "Enseignements dégagés par la Comm.IX"
"Comportement en service, entretien et réparations"
(contents → see Task Groups); CEB-Bull.N° 163

Remarks:

Commission about to be regorganized in view of intended structuring of CEB's activities in the field of life time aspects of concrete structures (→ see General Task Groups)

TG IX/1A: ANALYSIS OF STRUCTURAL DAMAGES- ENGINEERING STRUCTURES

Reporter: J.P. TEYSSANDIER — to be reorganized

Programme:
See Commission IX

Publication:
1983: E.F. Radogna: "Some relevant stages of international activity on behaviour in service, maintenance and repair of concrete bridges" (contribution to CEB-Bull. N° 163)

J.P. Teyssandier: "Lessons from observations of existing bridges" report of TG IX/1A, in CEB-Bull. N° 163

Remarks:
TG about to be reorganized (see above), possible formation of a new group ensuring the feed-back of information on the behaviour of buildings and bridges, see GTG 23

TG IX/1B: BUILDINGS — inactive

Reporter: L. YAM

Programme:

Same as TG IX/1A for buildings

Publications:

1980: C.C.P. YAM, A.C. Walker: "International investigation of structural failures (addendum to CEB-Bull. N° 138)

TG IX/2: MAINTENANCE AND DIAGNOSIS OF CONCRETE STRUCTURES — to be reorganized

Reporter: D. POINEAU

Programme:

Elaboration of synthesis report dealing with
- control of structures under service conditions
- structural investigations under service conditions
- diagnosis
- maintenance
- practical recommendations

Publications:

1983: Report on diagnosis and the process of subsequent decision finding published in Bull. N° 163:
D. Poineau: "Diagnostic et processus de décision"

Remarks:

Task Group about to be reorganized. Future General Task Group 19 "Diagnosis and Assessment of Concrete Structures" will also cover the surveillance policy to be established as needed for a feed-back to the design philosophy.

GTG/1: COMPLEMENTS — disbanded

Reporter: J. PERCHAT

Programme:

Development of the first draft "Complements" (CEB-Bull. N° 130, April 1979) in the sense of the technical resolution passed at the Rome Plenary Session in May 1979.

Publications:

1980: "Complements to the CEB/FIP Model Code 1978"
Final draft, CEB-Bull. N° 137, in English and French language

1981: "Compléments au Code-Modèle CEB-FIP 1978"
(Version finale en français, CEB-Bull. N° 139-F)

GTG/2: APPLICATION OF THE MODEL CODE

Reporter: M. MIEHLBRADT

Programme:

Preparation of a Manual; interpretation of Model Code; simplified design; trial and comparison calculations (TCC)
Publication of eight application examples as Bulletin 144 in the beginning of 1985

GTG/3: SEISMIC DESIGN OF CONCRETE STRUCTURES — disbanded

Reporter: P.E. PINTO

Programme:

Preparation of an appendix to the Model Code: "Seismic design of concrete structures", containing minimum design requirements for seismic situations

Publications:

1980: "Seismic design of concrete structures" - preliminary draft of an appendix to the CEB-FIP Model code, CEB-Bull. N° 133

1982: "Seismic design of concrete structures" - second draft, CEB-Bull. N° 149

1983: "Model Code for seismic design of concrete structures"

1 - Final draft, CEB-Bull. N° 160

2 - Trial calculations, CEB-Bull. N° 160 Bis

1984: Final edition of the Model Code to be published as CEB-Bull. N° 165

GTG/4: FIRE DESIGN OF CONCRETE STRUCTURES

Reporter: K. KORDINA

Programme:

Developping of the appendix to the Model code published in Bulletin N° 145

Future Model Code on design of concrete structures for fire resistance

Preparation of a Design Handbook for unification and facilitation of practical design work based on this code

Publications:

1982: "Design of concrete structures for fire resistance"
Preliminary draft of an appendix to the CEB-FIP Model Code, CEB-Bull. N° 145

Remarks:

Members of former FIP Commission were invited and accepted to continue within GTG/4

GTG/5: PERFORMANCE CRITERIA OF CONCRETE STRUCTURES — disbanded

Reporter: G. THIELEN

Programme:

Conceptional preparation of future technical guidance documents:

* Codes versus recommended practice
* Performance requirements
* Behaviour Models
* Classification and presentation

Publications:

1982: G. Thielen: "A Rational Concept for a Performance Based Representation of Regulatory Documents", CEB-Bull. N° 147

GTG/6: MULTIAXIAL BEHAVIOUR OF PLAIN CONCRETE — disbanded

Reporter: J. EIBL

Programme:

Definition of concrete strength under multiaxial stresses, description of constitutive equations for concrete, recommendation of failure criteria, report on experimental results

Publications:

1983: "Concrete under multiaxial states of stress - constitutive equations for practical design", CEB-Bull. N° 156

GTG/7: APPLICATION OF LEVEL-II-METHODS — disbanded

Reporter: A. GIUFFRE

Programme:

Analysis of realistic design problems in connection with various Commissions

Publications:

1982: In collaboration with Permanent Commission II
(→ publications Comm. II, contribution 3.1, Cauvin/Moosecker)

GTG/8: STRUCTURAL EFFECTS OF TIME-DEPENDENT BEHAVIOUR OF CONCRETE — disbanded

Reporter: M.A. CHIORINO

Programme:

Preparation of a design manual

Publications:

1984: "Manual: Structural effects of time dependent behaviour of concrete" CEB-Bull. N° 142

GTG/9: EVALUATION OF TIME DEPENDENT BEHAVIOUR OF CONCRETE

Reporter: H. HILSDORF

Programme:

Step I:

Optimization of present Model Code formulations for the prediction of concrete creep and shrinkage

* Preparation of list of experiments on creep and shrinkage for joint ACI/CEB data bank
* Optimization of CEB-formulations; 1st draft reported Oct.83, Prague, Plenary Session
* Comparison with the results of other prediction methods

Step II:

* Review of general approach and basic concepts of CEB-formulations
* Development of improved formulations

GTG/10: RESPONSE OF STRUCTURAL CONCRETE CRITICAL SECTIONS UNDER HIGH LEVEL REVERSED ACTIONS — disbanded

Reporter: T.P. TASSIOS

Programme:

Preparation of a state-of-the-art report dealing with material behaviour; members subjected to axial loads, combined bending, shear, structural connections

Publications:

1983: "Response of reinforced concrete critical regions under large amplitude reversed actions", CEB-Bull. 161

GTG/11: DESIGN OF CONNECTIONS OF PREFABRICATED ELEMENTS

Reporter: B. LEWICKI

Programme:

Preparation of a guidance document dealing with the resistance, rigidity and detailing of structural connections in large panel structures

1984: Final draft under discussion, expected to be published in spring 1985

Remarks:
Scope of work to be enlarged to precast slabs and two-dimensional precast element constructions, whereas work on linear prefabricated elements should be continued in General Task Group 18

GTG/12: ASSESSMENT OF EXISTING CONCRETE STRUCTURES AND DESIGN PROCEDURES FOR THEIR UP-GRADING — disbanded

Reporter: T.P. TASSIOS

Programme:

State-of-the-art report dealing with the

- diagnosis of damaged concrete structures
- repair procedures and corresponding
- verification methods

Publications:

1983: "Assessment of concrete structures and design procedures for up-grading (re-design)", CEB-Bull. N° 162

Remarks:

Work to be continued in GTG/21

GTG/13: DESIGN VALUE FORMAT

Reporter: G. KÖNIG

Programme:

Problems of daily design work which are not sufficiently well understood up to now:

- load combinations
- level II techniques for system analysis
- uncertaincies in the mechanical model and possible simplifications
- time-variant problems (creep, fatigue, corrosion)
- reference period, limit states to be checked
- study of a design value concept as an alternative to partial safety factor formats; transition between formats; consequences for load and material codes

Remarks:

First results expected for 1987

Final results at long range

GTG/14: CONCRETE STRUCTURES UNDER IMPACT AND IMPULSIVE LOADING

Reporter: J. EIBL

Programme:

Development of practical recommendations for the design of concrete structures

- definition of hard and soft impact, modelling of the acting forces
- basic material variables for modelling target-projectile interaction zone
- analytical evaluation of dynamic effects on concrete and reinforcement
- dimensioning and detailing
- structural protection against vehicle impact, airplane crash, ship collision
- protection of special structures as bridge piles, off-shore structures, containments

GTG/15: FATIGUE OF CONCRETE STRUCTURES — starting

Reporter: G.P. TILLY

Programme:

Starting from a

- review of the state-of-the-art
- synthesis of knowledge from a designer's point of view should lead to
- practical guidance by
  - . classification of fatigue phenomena
  - . classification of effects of action
  - . service life concept
  - . structural detailing
  - . inspection and monitoring

GTG/16: STRUCTURE AND DEVELOPMENT OF FUTURE TECHNICAL GUIDANCE DOCUMENTS

Reporter: G. THIELEN

Programme:

Definition of the scope and identification of the contents of future technical guidance documents for the design of concrete structures.
Preparation of a discussion paper for the frame of the next Model Code.
Elaboration of alternatives of presentation and examples of practical application.

Progress:

- General report to the Prague Plenary Session showing the practical consequences of the performance approach demonstrated on the basis of a design example treating partially prestressed concrete
- Input to performance based guidance documents for seismic and fire design

GTG/17: DESIGN OF PRESTRESSED STRUCTURES

Reporter: M. KAVYRCHINE

Programme:

Complementation of the Model Code with respect to prestressing by

- identification of missing or unsufficiently treated items in the 1978 edition
- filling these gaps with own propositions or answers to be obtained from the commissions involved
- development of a first draft proposal to be delivered later to an editorial panel for the drafting of the 1990 edition

GTG/18: LINEAR PREFABRICATED ELEMENTS — starting

Reporter: M. MENEGOTTO

Programme:

Preparation of recommendations for the verification requirements, criteria, quality control and good practice of linear prefabricated elements for precast construction; connection of these recommendations to those for common structures; treating the following subjects: conception of the structure, idealization of overall behaviour, actions, material properties, safety factors, design of connections, design and detailing of members, production procedures affecting structural behaviour.

Remarks:

Direct collaboration with GTG/11, connections with all CEB-Commissions for the respective problems, particularly with Commission I and with the FIP Commission on Prefabrication.

GTG/19: DIAGNOSIS AND ASSESSMENT OF CONCRETE STRUCTURES — starting

Reporter: H.H. GOTFREDSEN

Programme:

Schemes of application of available diagnostic methods and of their interpretation for the assessment of the performance of concrete structures and their remaining structural life

For different types of concrete structures (road bridges, other bridges etc ...) the required results will be formulated, e.g.

- up-dating of load-carrying capacity for several live load cases (rating)
- safety level for a given load
- rate of decrease in time (of capacity) etc

The assessment procedures may be based on

- sufficient original ("as-built") information
- insufficient original information, to be completed by in-situ tests, measurements and investigations

GTG/20: DURABILITY AND SERVICE LIFE — continuing former TG V/1

Reporter: S. ROSTAM

Programme:

- Development of the conceptual format for a rational service life assurance in the design and construction of new structures.
- Implementation of this concept in Model Code specifications and in guides to good practice by taking into account the structural form, the environment, the materials, the execution and the interaction thereof.

Short term task:
Working Guide for Durable Concrete Structures Draft expected to be published as CEB-Bulletin for discussion at the Plenary Session Rotterdam, June 85

GTG/21: RE-DESIGN OF CONCRETE STRUCTURES — starting

Reporter: T. MONNIER

Continuation of former GTG/12 with respect to the redesign of repaired or strengthened reinforced or prestressed concrete elements or structures.
Development od Model Code specifications, formulation of requirements, criteria and rules for the conception and design of repaired or strengthened reinforced or prestressed concrete structures.

GTG/22: BEHAVIOUR AND ANALYSIS OF CONCRETE STRUCTURES UNDER LARGE CYCLIC ACTIONS

Reporter: P.E. PINTO — planned

Programme:

In collaboration with existing Commissions and in some respects continuing the work of the former General Task Groups 3 and 10:

critical collection and diffusion (by state-of-the-art reports) of basic and applied scientific knowledge on the behaviour of component materials, elements and structures of reinforced concrete under large reversed actions

* analysis of their structural response, including past elastic states of stress and strain
* revision of the Seismic Model Code

GTG/23: FEEDBACK OF INFORMATION ON PERFORMANCE OF CONCRETE STRUCTURES — planned

Reporter: yet to be nominated

Definitive programme and organization of the group still to be established, e.g.:

- inventory of existing and collection of additional material
- analysis of data in close cooperation with CEB-Commissions and groups
- suggestions for necessary Model Code corrections

GTG/24: PRACTICAL DESIGN OF REINFORCED CONCRETE FOR MULTIAXIAL STATES OF STRESS — planned

Reporter: yet to be nominated

Programme:

- briefing of suggestions of Bulletin N° 156 for practising engineers
- development of design methods for specific requirements
- detailed design of confinement applications
- plane compressive tensile stress states: f_{ct} predictions, σ-ε-diagrammes

COMITÉ EURO-INTERNATIONAL DU BÉTON

Secrétariat Permanent: Case Postale 88 - CH 1015 Lausanne

List of Bulletins d'Information (12/84)

N° 1	*	Statuts - Liste des Membres - Programme de publication	(F)	(1957)
N° 2	*	Composition des Commissions de Travail Compte-rendu d'activité des Commissions de Travail	(F)	(1957)
N° 3	*	Editorial du Président : une invitation à la discussion sur la ligne de conduite du C.E.B. Activités des Commissions de Travail	(F)	(1957)
N° 4	*	Proposition pour le calcul de la sécurité des ouvrages en béton armé	(F) (E)	(1958)
N° 5	*	Compte-rendu des réunions du Conseil d'Administration Compte-rendu des activités des Commissions de Travail du C.E.B.	(F)	(1958)
N° 6	*	Tableaux de résultats d'essais expérimentaux en flexion simple et composée (1ère partie)	(F)	(1958)
N° 7	*	Tableaux de résultats d'essais expérimentaux en flexion simple et composée (2ème partie)	(F)	(1958)
N° 8	*	Etude préliminaire du calcul des sections en T, suivant les règlements actuels	(F) (E)	(1958)
N° 9	*	Interprétation statistique d'essais en flexion simple et composée, par le Professeur Torroja (Madrid)	(F)	(1958)
N°10	*	Rapport concernant la participation du C.E.B. à la Conférence sur le Calcul des Structures (Moscou 1958)	(F) (E)	(1959)
N°11	*	Tableaux de résultats d'essais expérimentaux en flexion simple et composée	(F)	(1959)
N°12	*	Etude comparative des différentes théories sur la formation de fissures dans les poutres en béton armé	(F) (E)	(1959)
N°13	*	Recherches sur la fissuration admissible dans les constructions en Béton Armé (traduction française du Rapport CUR-10)	(F)	(1959)
N°14	*	Interprétation statistique d'essais en flexion simple et composée	(F) (E)	(1959)
N°15	*	Rapport sur la collaboration entre le C.E.B.et l'American Concrete Institute (A.C.I.) Rapport des travaux de la Commission C.E.B. "Flexion-Compression"	(F) (E)	(1959)
N°16	*	Rapport des travaux de la Commission C.E.B. "Déformations" par le Dr. Soretz (Vienne)	(F) (E)	(1959)
N° 17	*	Rapport des travaux de la Commission C.E.B."Flambage"	(F) (E)	(1959)
N° 18	*	Rapport des travaux de la Commission C.E.B. "Poutres en T"	(F) (E)	(1959)
N° 19	*	Conclusions techniques de la 5e Session du C.E.B. (Vienne - Avril 1959)	(F) (E)	(1959)
N° 20	*	Comité de Liaison des Associations Internationales Collaboration C.E.B.-A.C.I.	(F)	(1959)
N° 21	*	Rapport des travaux de la Commission C.E.B. "Hyperstatique", par le Prof. A.L.L. Baker (Londres), Rapporteurs Y.Guyon (Paris) et G. Macchi (Turin)	(F) (E)	(1960)
N° 22	*	Rapport des travaux de la Commission C.E.B. "Flexion-Compression"	(F)	(1960)
N° 23	*	Rapport des travaux de la Commission C.E.B. "Aciers-Adhérence-Ancrages"	(F)	(1960)
N° 24	*	Compte-rendu de la 5e Session du C.E.B. (Vienne - Avril 1959) - 1ère partie	(F) (E)	(1960)
N° 25	*	Compte-rendu de la 5e Session du C.E.B. (Vienne - Avril 1959) - 2ème partie	(F) (E)	(1960)
N° 26	*	Rapport sur les travaux de la Commission C.E.B. "Effort tranchant"	(F)	(1960)
N° 27	*	Théorie des lignes de rupture. Application au calcul pratique des moments de rupture et au dimensionnement des dalles, des planchers-dalles et des planchers-champignons	(F) (E)	(1960)
N° 28	*	Traduction française des instructions soviétiques concernant le calcul des structures hyperstatiques	(F)	(1960)
N° 29	*	Rapport de la Commission C.E.B. "Dalles - Planchers-dalles". Comparaison entre les différents règlements existants - Résultats d'essais	(F)	(1961)
N° 30	*	Rapport de la Commission C.E.B. "Hyperstatique" par le Prof. A.L.L.Baker et MM. Guyon et Macchi	(F)	(1961)
N° 31	*	Rapport de la Commission C.E.B. "Flambage" par le Dr. Aas-Jakobsen (Oslo)	(F)	(1961)
N° 32	*	Conclusions techniques de la 6e Session du C.E.B. (Monaco - Janvier 1961)	(F)	(1961)
N° 33	*	Compte-rendu de la 6è Session du C.E.B.-Monaco,Janvier 1961 1ère partie : Aciers - Effort tranchant	(F)	(1961)
N° 34	*	Compte-rendu de la 6è Session du C.E.B.-Monaco,Janvier 1961 2ème partie : Dalles - Hyperstatique	(F)	(1961)
N° 35	*	"Dalles et planchers-dalles". Application de la théorie des lignes de rupture aux calculs de résistance en flexion. Formules simplifiées et calculs pratiques	(F)	(1962)
N° 36	*	"Flexion-Compression". Théorie générale du Prof.Rüsch (Munich). Liste 1962 des Membres du C.E.B. - Composition des Commissions de Travail	(F)	(1962)

(*) Bulletin out of print (épuisé, vergriffen)/(F) Français/(E) English/(D) Deutsch

N° 37	*	"Effort tranchant". La résistance à l'effort tranchant des poutres en béton armé. Compte-rendu des essais d'effort tranchant effectués à l'Institut Otto Graf à Stuttgart.	(F)	(1962)
N° 38	*	"Dalles - Planchers-dalles" Application de la méthode des adaptations au calcul des dalles. Etude expérimentale des critères de rupture par flexion. Etude de la capacité de résistance des dalles biaises élémentaires en béton armé. Programme des réunions de Wiesbaden.	(F)	(1963)
N° 39	*	Recommandations pratiques à l'usage des Constructeurs	(F)	(1963)
N° 40	*	"Effort tranchant" - Equilibre interne après fissuration (Symposium de Wiesbaden - Avril 1963)	(F) (E+D)	(1964)
N° 41	*	"Effort tranchant" - Rupture - Résistance - Dispositions constructives (Symposium de Wiesbaden - Avril 1963)	(F) (E+D)	(1964)
N° 42	*	"Effort tranchant" - Théories et règles de calcul (Symposium de Wiesbaden - Avril 1963)	(F) (E+D)	(1964)
N° 43	*	"Dalles et structures planes" I - Théories inélastiques de flexion des dalles (Colloque de Wiesbaden - Avril 1963)	(F) (E+D)	(1964)
N° 44	*	"Dalles et structures planes" II - Essais de dalles dans le domaine inélastique III- Poinçonnement inélastique (Colloque de Wiesbaden - Avril 1963)	(F) (E+D)	(1964)
N° 45	*	Dalles et planchers - Applications des Recommandations pratiques unifiées - Comparaison aux résultats expérimentaux (Etat-limite ultime, état-limite de fissuration, état-limite de déformation)	(F)	(1964)
N° 46	*	9e Session plénière du C.E.B.- Ankara - Septembre 1964 - Conclusions	(F)	(1965)
N° 47	*	Structures en panneaux - Compte-rendu de la 9e Session plénière - Ankara - Septembre 1964	(F)	(1965)
N° 48	*	Aciers - Adhérence - Ancrages Compte-rendu de la 9e Session plénière - Ankara - Septembre 1964	(F+E+D)	(1965)
N° 49	*	"Effort tranchant" - Compte-rendu de la 9e Session plénière - Ankara - Septembre 1964	(F)	(1965)
N° 50	*	Dalles - Structures planes - Compte-rendu de la 9e Session plénière - Ankara - Septembre 1964	(F+D)	(1965)
N° 51	*	Structures en bétons légers - Compte-rendu de la 9e Session plénière - Ankara - Septembre 1964	(F+E)	(1965)
N° 52	*	Structures hyperstatiques I - Lois Moments-rotations-courbures Ankara - Septembre 1964	(F)	(1965)
N° 53	*	Structures hyperstatiques II - Méthodes de calcul Ankara - Septembre 1964	(F+E)	(1966)
N° 54	*	Recommandations pratiques pour le calcul et l'exécution des ouvrages en béton précontraint Rédaction provisoire - texte original français	(F)	(1966)
N° 55	*	Sécurité dans les structures hyperstatiques Compte-rendu de la 10e Session plénière Londres - Octobre 1965	(F+E)	(1966)
N° 56	*	Dalles - Structures planes Thème I - Recherche d'une théorie générale de flexion 10e Session plénière - Londres - Octobre 1965	(F+E)	(1966)
N° 57	*	Dalles - Structures planes Thème II - Poinçonnement 1) Travaux et conclusions C.E.B. 10e Session plénière - Londres - Octobre 1965	(F+E)	(1966)
N° 58	*	Dalles - Structures planes Thème II - Poinçonnement 2) Recherches en cours Thème III - Effet d'arc-boutement 10e Session plénière - Londres - Octobre 1965	(F+E+D)	(1966)
N° 59	*	Structures en bétons légers 11e Session plénière - Bruxelles - Octobre 1966	(F+E+D)	(1967)
N° 60	*	Recommandations internationales unifiées pour le calcul et l'exécution des constructions en panneaux assemblés de grand format	(F)	(1967)
N° 61	*	Fissuration 11e Session plénière - Bruxelles - Octobre 1966	(F+E)	(1967)
N° 62		Flambement - 1ère partie 11e Session plénière - Bruxelles - Octobre 1966	(F+E)	(1967)
N° 63		Flambement - 2ème partie 11e Session plénière - Bruxelles - Octobre 1966	(E)	(1967)
N° 64		Hommage au Professeur Gvozdev (Moscou) pour son 70e anniversaire	(F)	(1967)
N° 65	*	Poutres-cloisons	(F)	(1968)
N° 66	*	Aciers - Adhérence - Ancrages Agrément et contrôle des aciers à haute adhérence Diagramme de traction des aciers Synthèse bibliographique sur l'adhérence et les ancrages	(F+E+D)	(1968)
N° 67	*	Dalles, structures planes Annexe aux Recommandations pratiques	(F)	(1968)
N° 68	*	Conclusions techniques de la 12e Session plénière Lausanne - Avril 1968 1ère partie : Accord FIP/CEB - Notations - Terminologie - Sécurité - Diagramme des aciers - Agrément et contrôle des aciers à haute adhérence	(F+E)	(1968)
N° 69	*	Conclusions techniques de la 12e Session plénière Lausanne - Avril 1968 2ème partie : Flexion Compression Flambement	(F+E)	(1968)

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N° 70	*	Conclusions techniques de la 12e Session plénière Lausanne - Avril 1968 3ème partie : Effort tranchant - Fissuration - Déformations - Poutres en T - Poutres-cloisons Exécution des ouvrages en béton armé	(F+E+D)	(1968)
N° 71		Torsion	(F+E+D)	(1969)
N° 72	*	CEB-FIP International Recommendations for the design and construction of concrete structures 1- Principles and Recommendations	(F) (E)	(1970)
N° 73		CEB-FIP International Recommendations for the design and construction of concrete structures 2 - Appendixes (Proposals)	(F) (E)	(1970)
N° 74		Propositions de Compléments aux Recommandations Internationales CEB-FIP-1970 Contribution à la 15e Session plénière du C.E.B. Léningrad - Mai 1972	(F)	(1972)
N° 75		Contribution à la préparation du Manuel CEB-FIP "Flexion - Compression" - 1ère partie	(F)	(1971)
N° 76		Contribution à la préparation du Manuel CEB-FIP "Flexion - Compression" - 2ème partie	(F)	(1971)
N° 77		1 - Flambement (Contribution au Manuel CEB-FIP) 2 - Déformations (Etat des connaissances en 1970) 3 - Structures préfabriquées en panneaux (Conception générale et technologie des joints) Contribution à la 14e Session plénière du C.E.B. Copenhague - Mai 1971	(F+E+D)	(1971)
N° 78		Structural Safety - Structural Safety for combination of loads - Definition of loads Contribution à la 14e Session plénière du C.E.B. Copenhague - Mai 1971	(E)	(1971)
N° 79		Manuel de calcul CEB-FIP "Flambement -Instabilité" (2e proposition de rédaction) Contribution à la 15e Session plénière du C.E.B. Léningrad - Mai 1972	(E)	(1972)
N° 80	*	Manual "Structural effects of time-dependent behaviour of concrete" (Second draft) Contribution à la 15e Session plénière du C.E.B. Léningrad - Mai 1972	(E)	(1972)
N° 81		Manuel de calcul CEB-FIP "Calcul et limitation des flèches" (1ère proposition de rédaction) Contribution à la 15e Session plénière du C.E.B. Léningrad - Mai 1972	(F+D)	(1972)
N° 82	*	Manuel de calcul CEB-FIP "Flexion-Compression" (2ème proposition de rédaction) Contribution à la 15e Session plénière du C.E.B. Léningrad - Mai 1972	(F+E)	(1972)
N° 83		Manuel de calcul CEB-FIP "Flexion-Compression" (Documentation complémentaire)	(E)	(1972)
N° 84	*	Recommandations Internationales CEB-FIP-1970 pour le calcul et l'exécution des ouvrages en béton (Version française définitive avec introduction des notations nouvelles)	(F)	(1972)
N° 85		CEB-FIP Manual "Lightweight Concrete" (Second draft) Contribution à la 15e Session plénière du C.E.B. Léningrad - Mai 1972	(E)	(1972)
N° 86	*	Manuel de calcul CEB-FIP "Effort tranchant - Torsion" (1ère proposition de rédaction) Contribution à la 15e Session plénière du C.E.B. Léningrad - Mai 1972	(F)	(1972)
N° 87	*	Manuel "Technologie et Industrialisation du Ferraillage" Tome I - Dispositions constructives en béton armé (Final draft) Contribution à la 16e Session plénière du C.E.B. Londres - Octobre 1973	(D)	(1973)
N° 88	*	Manuel "Technologie et Industrialisation du Ferraillage" Tome II - Optimisation, dessin et exécution du ferraillage (béton armé) (Final draft) Contribution à la 16e Session plénière du C.E.B. Londres - Octobre 1973	(F)	(1973)
N° 89	*	Fissuration 1 - Contribution aux travaux de Commission 1971-1973 2 - Manuel de calcul "Fissuration" (Preliminary draft) Contribution à la 16e Session plénière du C.E.B. Londres - Octobre 1973	(F+E+D)	(1973)
N° 90		I - Calcul des flèches (Contribution aux travaux de Commission 1971-1973) II- Deformability of concrete structures Basic assumptions (Preliminary draft) Contribution à la 16e Session plénière du C.E.B. Londres - Octobre 1973	(F+E+D)	(1973)
N° 91		Manuel de calcul "Flèches" 2e partie : Limitation des flèches (final draft) Contribution à la 16e Session plénière du C.E.B. Londres - Octobre 1973	(F+E)	(1973)
N° 92	*	Manuel de calcul "Effort tranchant - Torsion" (Final draft) Contribution à la 16e Session plénière du C.E.B. Londres - Octobre 1973	(F+E)	(1973)
N° 93		Manuel de calcul "Flambement-Instabilité" (Final draft) Contribution à la 16e Session plénière du C.E.B. Londres - Octobre 1973	(E)	(1973)

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N° 94		Manual "Structural effects of time-dependent behaviour of concrete" (Final draft) Contribution à la 16e Session plénière du C.E.B. Londres - Octobre 1973	(E)	(1973)
N° 95	*	CEB-FIP Manual "Lightweight Concrete" (Final draft - Errata and addenda) Contribution à la 16e Session plénière du C.E.B. Londres - Octobre 1973	(E)	(1973)
N° 96	*	Notations - Terminologie 1 - Résolutions internationales "Notations" (Récapitulation) 2 - Terminologie : compte-rendu des travaux en cours Contribution à la 16e Session plénière du C.E.B. Londres - Octobre 1973	(F) (E)	(1973)
N° 97		State of Art Reports 1973 (Commissions et Groupes de travail) Contribution à la 16e Session plénière du C.E.B. Londres - Octobre 1973	(F+E+D)	(1973)
N° 98	*	Annuaire C.E.B. - 1973 (Délégations nationales et Commissions de travail) Contribution à la 16e Session plénière du C.E.B. Londres - Octobre 1973	(F)	(1973)
N° 99		Couture des jonctions par adhérence Résultats des essais effectués	(F)	(1974)
N°100		Comité Européen du Béton Objectifs, réalisations et perspectives 1974 Composition 1975-1977 des Commissions et Groupes de travail	(F+E+D)	(1974)
N°101		Structures hyperstatiques 1ère partie : Documents de travail	(E+D)	(1974)
N°102		Manuel "Sécurité des Structures" Concepts généraux charges et actions (Abrégé en français)	(F)	(1974)
N°103		Manuel de calcul "Flambement-Instabilité" (Rédaction définitive - Mise à jour Octobre 1974)	(E)	(1974)
N°104	*	Aciers - Adhérence - Ancrages Caractères exigentiels des aciers Rapports et comptes-rendus 1973-1974	(F+E+D)	(1974)
N°105		Structures hyperstatiques 2ème partie : Document de travail 1974	(E)	(1974)
N°106	*	Manuel Sécurité des structures" Concepts généraux, charges et actions 1ère partie	(F)	(1975)
N°107	*	Manuel "Sécurité des structures" Concepts généraux, charges et actions 2ème partie	(F)	(1975)
N°108		Joint Committee on Structural Safety Documentation 1974 Loading specifications of the USSR - S.N.I.P. 1974 Nordic Safety Codes and Loading Regulations N.K.B. - proposal 1974	(E)	(1975)
N°109	*	Système International de réglementation technique unifiée des structures (1er draft préliminaire) Volume I - Règles unifiées communes aux différents types d'ouvrages et de matériaux Volume II- Code de référence pour les structures en béton	(F+E)	(1975)
N°110		CEB-CIB-FIP-RILEM Recommended principles for the control of quality and the judgement of acceptability of concrete	(E)	(1975)
N°111	*	Système International de réglementation technique unifiée des structures (2ème draft) Volume I - Règles unifiées communes aux différents types d'ouvrages et de matériaux Volume II- Code de référence pour les structures en béton	(F+E)	(1975)
N°112	*	CEB-CECM-CIB-FIP-IABSE Joint Committee on Structural Safety First order reliability concepts for design codes (Documentation)	(E)	(1976)
N°113		Joint ACI/CEB Symposium "Concrete Design: US and European practices" Philadelphia - 1976	(E)	(1976)
N°114		Document complémentaire au Bulletin d'Information n° 111 18e Session plénière du C.E.B. - Athènes - Mai 1976	(F+E)	(1976)
N°115		Manuel de Technologie "Coffrage" Projet Avril 1977 établi par un Groupe Inter-Associations CEB-CEB-FIP Contribution à la 19e Session plénière du C.E.B. Grenade - Septembre 1977	(F+E)	(1976)
N°116		International System of Unified Standard Codes of Practice for Structures Volume I : Common unified rules for different types of construction and material (3rd draft, Master Copy)	(F) (E) (D)	(1976)
N°117		Système International de réglementation technique unifiée des structures Volume II: Code Modèle pour les structures en béton (3ème projet, version originale)	(F) (E)	(1976)
N°118		Reinforcement, bond and anchorage State of the Art Report	(E)	(1977)
N°119		Trial and Comparison Calculations based on Bulletin d'Information n°117 Contribution to the 19th Plenary Session of CEB Granada - September 1977	(E)	(1977)
N°120		Document complémentaire au Bulletin d'Information n°117 Contribution à la 19e Session plénière du C.E.B. Grenade - Septembre 1977	(F+E+D)	(1977)

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N°121	*	CEB-FIP Manual of Lightweight Aggregate Concrete Design and Technology	(E)	(1977)
N°122		CEB Manual of Autoclaved Aerated Concrete Design and Technology	(E)	(1977)
N°123		CEB-FIP Manual of Buckling and Instability	(E)	(1977)
N°124/125		International System of Unified Standard Codes of Practice for Structures Volume I : Common unified rules for different types of construction and material Volume II: CEB-FIP Model Code for Concrete Structures	(F) (E) (D)	(1978)
N°126		Shear and torsion Explanatory and viewpoint papers on Model Code Chapters 11 and 12 prepared by members of CEB Commission V	(E)	(1978)
N°127		Manuel "Sécurité des Structures" (2e édition, révisée et complétée) Concepts généraux, actions, combinaisons et sollicitations agissantes, résistances et sollicitations résistantes, états-limites et situations, règles générales d'application 1ère partie	(F)	(1978)
N°128		Manuel "Sécurité des Structures" (2e édition, révisée et complétée) 2ème partie	(F)	(1978)
N° 129		Contribution to the Conference on Trial and Comparison Calculations based on the CEB-FIP Model Code for Concrete Structures London - November 1978	(E)	(1978)
N°130		Compléments au Code Modèle CEB-FIP 1978 (1er Draft) - Rome - Mai 1979	(F)	(1979)
N° 131		Structural Concrete under seismic actions Volume 1 - State of the Art Reports AICAP-CEB Symposium - Rome, May 1979	(E)	(1979)
N°132		Structural Concrete under seismic actions Volumes 2 et 3 - Technical papers AICAP-CEB Symposium - Rome, May 1979	(F+E)	(1979)
N°133	*	Seismic Design of Concrete Structures Preliminary draft of an appendix to the CEB-FIP Model Code Contribution à la 21e Session plénière du C.E.B. Budapest - Juin 1980	(E)	(1980)
N°134	*	Non-linear analysis of concrete structures Preprints for the 20th Plenary Session of CEB Rome, May 1979	(E)	(1979)
N°135	*	Manuel de calcul "Flexion-Compression" (Final draft) Contribution à la 21e Session plénière du C.E.B. Budapest - Juin 1980	(E)	(1980)
N°136	*	CEB Manual "Structural effects of time-dependent behaviour of concrete" Final draft Contribution à la 21e Session plénière du C.E.B. Budapest - Juin 1980	(E)	(1980)
N°137		Complement to CEB-FIP Model Code 1978 Final draft Contribution à la 21e Session plénière du C.E.B. Budapest - Juin 1980	(F+E)	(1980)
N°138		Rapport préliminaire de la Commission IX "Comportement en service, entretien et réparations" Contribution à la 21e Session plénière du C.E.B. Budapest - Juin 1980	(F)	(1980)
N°139		Compléments au Code Modèle CEB-FIP 1978 (Version finale)	(F)	(1981)
N°140		CEB-Application Manual on "Concrete Reinforcement Technology"	(E)	(1983)
N°141		CEB-FIP Manual on "Bending and Compression"	(E)	(1982)
N°142 142Bis		CEB-Manual on "Structural Effects of Time-dependent Behaviour of Concrete"	(E)	(1984)
N°143	*	CEB Manual "Cracking and Deformations" Final draft Contribution à la 22e Session plénière du C.E.B. Munich - Avril 1982	(E)	(1981)
N°144		CEB/FIP Manual on "Application of the CEB/FIP Model Code 1978 for Concrete Structures"	(E)	(1985)
N°145		"Design of concrete structures for fire resistance" Preliminary draft of an Appendix to the CEB-FIP Model Code Contribution à la 22e Session plénière du C.E.B. Munich - Avril 1982	(E)	(1981)
N°146		"Shear, Torsion and Punching" Contribution à la 22e Session plénière du C.E.B. Munich - Avril 1982	(E)	(1981)
N°147		"Conceptional preparation of future Codes" Progress Report Contribution à la 22e Session plénière du C.E.B. Munich - Avril 1982	(E)	(1982)
N°148	*	"Durability of Concrete Structures" State-of-the-Art Report Contribution à la 22e Session plénière du C.E.B. Munich - Avril 1982	(E)	(1982)
N°149		"Seismic Design of concrete structures" Second draft of an Appendix to the CEB-FIP Model Code Contribution à la 22e Session plénière du C.E.B. Munich - Avril 1982	(E)	(1982)

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N°150	"Detailing of Concrete Structures" First draft of a Design Manual Contribution à la 22e Session plénière du C.E.B. Munich - Avril 1982	(D)	(1982)
N°151	"Bond Action and Bond Behaviour of Reinforcement" State of-the-Art Report Contribution à la 22e Session plénière du C.E.B. Munich - Avril 1982	(E)	(1982)
N°152	Durability of Concrete Structures Final Report of the CEB-RILEM International Workshop Copenhagen, May 1983	(E)	(1984)
N°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	(E)	(1982)
N°154	Structural analysis - Volume II Enlarged Meeting of the Commission - Pavia - October 1981 Theme 3: Uncertainties of structural model and randomness of the structural behaviour Theme 4: Thermal effects	(E)	(1982)
N°155	"Buckling and Instability" Progress Report Contribution à la 23e Session plénière du C.E.B. Prague - October 1983	(E)	(1983)
N°156	"Concrete under multiaxial States of Stress Constitutive Equations for Practical Design" Contribution à la 23e Session plénière du C.E.B. Prague - October 1983	(E)	(1983)
N°157	"Quality Control and Quality Assurance for Concrete Structures" Contribution à la 23e Session plénière du C.E.B. Prague - October 1983	(E)	(1983
N°158	Manuel "Fissuration et déformations"	(F)	(1983)
N°159	"Application of the Finite Element-Method to Two-Dimensional Reinforced Concrete Structures" "Simplified Methods of Calculating Short Term Deflections of Reinforced Concrete Slabs" Contribution à la 23e Session plénière du C.E.B. Prague - October 1983	(E)	(1983)
N° 160	Model Code for "Seismic Design of Concrete Structures" 1 - Final Draft Contribution à la 23e Session plénière du C.E.B. Prague - October 1983	(E)	(1983)
N°160Bis	Model Code for "Seismic Design of Concrete Structures" 2 - Trial calculations Contribution à la 23e Session plénière du C.E.B. Prague - October 1983	(E)	(1983)
N°161	"Response of R.C. to Critical Regions under Large Amplitude Reversed Actions" Contribution à la 23e Session plénière du C.E.B. Prague - October 1983	(E)	(1983)
N°162	"Assessment of Concrete Structures and Design Procedures for Up-grading (re-design)" Contribution à la 23e Session plénière du C.E.B. Prague - October 1983	(E)	(1983)
N°163	"Comportement en Service, Entretien et Réparations" - Collecte et analyse d'informations sélectives - Diagnostic et processus de décision Contribution à la 23e Session plénière du C.E.B. Prague - October 1983	(F)	(1983)
N°164	"Industrialization of Reinforcement" Synthesis Report Contribution à la 24e Session plénière du C.E.B. Rotterdam - June 1985	(E)	(1985)
N°165	Model Code for "Seismic Design of Concrete Structures"	(E)	(1985)
N°166	Draft CEB-Guide to "Durable Concrete Structures" Contribution à la 24e Session plénière du C.E.B. Rotterdam - June 1985	(E)	(1985)
N°167	"Thermal Effects" Synthesis Report Contribution à la 24e Session plénière Rotterdam - June 1985	(E)	(1985)
N°168	"Punching Shear in Reinforced Concrete" State-of-the-Art Report Contribution à la 24e Session plénière du C.E.B. Rotterdam - June 1985	(E)	(1985)
N°169	Draft Guide for the "Design of Precast Wall Connections" Contribution à la 24e Session plénière du C.E.B. Rotterdam - June 1985	(E)	(1985)
N°170	"Basic Notes on Model Uncertainties" State-of-the-Art Report "Liquid and Gas Tightness of Concrete Structures" Progress Report Contribution à la 24e Session plénière du C.E.B. Rotterdam - June 1985	(E)	(1985)

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Anlage 2

Zusammenstellung der in
Vorbereitung der

24. CEB-Vollversammlung in Rotterdam 1985
veröffentlichten Bulletins

COMITE EURO-INTERNATIONAL DU BETON

BULLETIN D'INFORMATION
N° 164

Contribution à la 24è Session Plenière du C.E.B.
Rotterdam – Juin 1985
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Reinforced Concrete Structures

Janvier 1985.

SECRETARIAT PERMANENT
EPFL, Case Postale 88, CH-1015 Lausanne

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EPFL, Case Postale 88, CH-1015 Lausanne

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"THERMAL EFFECTS IN CONCRETE STRUCTURES"

Janvier 1985

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"PUNCHING SHEAR IN REINFORCED CONCRETE"

Janvier 1985

SECRETARIAT PERMANENT
EPFL, Case Postale 88, CH-1015 Lausanne

PUNCHING SHEAR IN REINFORCED CONCRETE

A State-of-the-Art Report

COMITE EURO-INTERNATIONAL DU BETON

BULLETIN D'INFORMATION N° 169

Contribution à la 24^e Session Plénière du CEB
ROTTERDAM — June 1985

DRAFT GUIDE FOR THE DESIGN
OF PRECAST WALL CONNECTIONS

APRIL 1985

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C O N T E N T S

COMITE EURO-INTERNATIONAL DU BETON

BULLETIN D'INFORMATION
N° 170

Contribution à la 24è Session Plenière du C.E.B.
Rotterdam - Juin 1985
"Basic Notes on Model Uncertainties"
"Liquid and Gas Tightness of Concrete Structures"

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BULLETIN D'INFORMATION
N° 144

CEB / FIP Design Manual on
APPLICATION of the CEB / FIP MODEL CODE 1978
for CONCRETE STRUCTURES

April 1985

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BULLETIN D'INFORMATION
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CEB Model Code for
SEISMIC DESIGN OF CONCRETE STRUCTURES

April 1985

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CEB-NEWS

N° 75 MARCH 1985

CEB 24th PLENARY SESSION

ROTTERDAM

JUNE 4-7, 1985

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P R O G R A M M E

Meeting place: ROTTERDAM HILTON - 10, Weena - NL-3012 CM ROTTERDAM

These CEB-News shall inform all CEB-members and friends on the technical and social programmes as planned and organized up to now by our Dutch hosts and the CEB-Secretariat.

ANLAGE 5

CEB-NEWS

N° 76

JULY 1985

RESOLUTIONS
of the
ORDINARY GENERAL ASSEMBLY
during the
24th PLENARY SESSION
Rotterdam, June 7, 1985

TECHNICAL ORDINARY GENERAL ASSEMBLY

Resolutions

* * * * *

ADMINISTRATIVE ORDINARY GENERAL ASSEMBLY

Financial Matters
Composition of Advisory Committee
New Technical Director in Lausanne

* * * * *

NEXT PLENARY SESSION

COMITE EURO-INTERNATIONAL DU BETON

Secrétariat Permanent: EPFL - Case Postale 88 - CH 1015 Lausanne - Tel. (021) 472747 - Telex: 24478 EPFVD CH

TECHNICAL ORDINARY GENERAL ASSEMBLY

The following Technical Resolutions were approved by the General Assembly:

Technical Resolution no. 1
Conceptual Guidelines for the Revision of the CEB Model Code

1. Adressees.
   Model Code(s) are aimed at the work of code drafting committees and clearly must be presented in an operational form ready for use by practicing engineers.

2. Types of structures to be covered:
   The Model Code(s) should be a general reference document for the design and the design related aspects of all kinds of concrete structures. This means:
   - that structural behaviour models describing load bearing, retaining and hazard shielding capacities will have to be included;
   - that practical procedures should be widely applicable;

   Functional requirements, and allowable simplifications - pertaining to distinct types of structures only - must be identified as such. They may be presented in the Model Code(s) or in separate documents.

3. Conceptual background information.
   An operational summary of the basic concepts of structural design should be drafted as soon as possible to improve on the basis of existing documents the actual chapter 6. This summary must serve for guidance of commissions and task groups. The revision of Volume I should be entrusted to the Joint Committee of Structural Safety.

4. Presentation of code clauses.
   The technical information should be presented in a logic sequence along the following lines:
   * PRINCIPLES:
     - Structural requirements
     - Engineering models
   * APPLICATION RULES:
     - Procedures
     - Practical aids

   Application rules can offer alternative solutions.
   Comments should be included in the Model Code.

5. Types of documents to be prepared
   * MODEL CODE(S), e.g.:
     - Normal use
     - Hazards
     - Assessment and redesign of damaged structures
   * PRACTICAL GUIDES, e.g.:

     Special detailed aspects of:
     - prestressing,
     - prefabrication,
     - time-dependent behaviour of concrete,
     - service life aspects

     The aim should be to finish these guides simultaneously with the completion of the Model Codes.

6. Time scale

   The Model Code should be available by the end of 1989. The information on which it is based should have been established by the middle of 1986.

7. Justifications

   Justifications of corrections, amendments and additions should be provided simultaneously with the drafting and made available in accessible documents.

8. Compatibility with computer requirements

   CEB Model Codes and Practical Guides should - whenever possible - meet requirements concerning the use of computers in structural design.

9. Presentation of the text in Model Codes and Practical Guides

   The text must be presented in a well readable form using e.g. also flow charts and figures.

10. Formation of a Drafting Group

    In order to coordinate the activities of the working bodies of CEB a drafting group for the revision of the Model Code for normal use will be formed and ratified at the next Administrative Council meeting.

    Revision of other Model Codes will be undertaken when appropriate.

    The CEB Administrative Council is going to submit to the next CEB General Assembly the ratification of the appropriate CEB-bodies and a time schedule for the ratification of drafts.

11. Guidance for drafting of revised chapters

GTG/16 is asked to prepare outline guidance for the drafting of revised Model Code chapters to be distributed as soon as possible.

12. Input from National Delegations

All National Delegations are invited to send to the secretariat - before the end of 1985 - detailed comments on the technical content of, and revision process for, the Model Code, subject to point 7 above.

Technical Resolution no. 2:
Life time aspects

1. The General Assembly acknowledges the Final Report of the CEB-Rilem International Workshop, Copenhagen, May 1983, published as CEB-Bulletin no. 152, in which much useful information is compiled.

2. The General Assembly appreciates the important written contribution by General Task Group 20 to this 24th Plenary Session:

   "Draft CEB-Guide to Durable Concrete Structures"
   CEB-Bulletin no. 166.

   The document should be finalized by the Task Group as a CEB-Guide under the responsibility of the Administrative Council, taking profit of the comments offered by the participants of the Plenary Session. National Delegations are invited to send written comments before the end of 1985, to be also considered.

3. The General Assembly fully supports the working programmes, presented by the General Task Groups:

   No. 19: Diagnosis and Assessment of Concrete Structures
   No. 20: Durability and Service Life of Concrete Structures
   No. 21: Re-design of Concrete Structures
   No. 23: Feedback of Information on the Performance of Concrete Structures

Technical Resolution no. 3:
Punching

The General Assembly acknowledges the state-of-the-art report

"Punching shear in reinforced concrete",
published as CEB-Bulletin no. 168

as a valuable updating of the available knowledge on this subject.
In view of the revision process of the Model Code the General Assembly recommends to take account of its contents and of the comments given during the session.

Technical Resolution no. 4:
Precast wall connections

1. The General Assembly acknowledges the preparation of the

   "Draft Guide for the Design of Precast Wall Connections"
   CEB-Bulletin no. 169.

   prepared by General Task Group 11 "Design of Connections of Prefabricated Elements" in cooperation with CIB-W 23.

2. The Administrative Council is asked to take the appropriate steps for the finalization of the document as a CEB-Guide, taking into account the comments given during the Plenary Session.

3. Regarding the future activities of CEB in the field of prefabricated structures the Council is invited to finalize in detail the terms of reference of GTG 18 "Design of Prefabricated Concrete Structures" under the coreportership of B. Lewicki and M. Menegotto.

Technical Resolution no. 5:
Thermal Effects

1. The General Assembly acknowledges the final report of Task Group II/1

   "Thermal Effects of Concrete Structures"
   published as CEB-Bulletin no. 167.

2. The document is considered to be a useful synthesis of the available knowledge for the estimation of the damage which may be caused in structures - mainly in bridges - by inadequate design against thermal effects.

Technical Resolution no. 6:
Basic Notes on Model Uncertainties

1. The General Assembly acknowledges the state-of-the-art report:

   "Basic Notes on Model Uncertainties",
   published as CEB-Bulletin no. 170.

2. This state-of-the-art report is considered to be a valuable document for the treatment of model uncertainties, which may be covered by safety factors or limits of application or other safety elements.

Technical Resolution no. 7:
Disbanding of General Task Groups

The General Assembly expresses its gratitude to the following General Task Groups which - having accomplished their mission - are disbanded:

GTG 2: Application of the Model Code
GTG 11: Design of connections of prefabricated elements

Technical Resolution no. 8:
Quality system for Execution of Concrete Works

In view of a preparation of future chapters regarding execution, the CEB-Administrative Council is invited to take the appropriate steps in order to harmonize the CEB, FIP, RILEM etc., activities in the field of quality assurance for the execution of concrete works (e.g. for prestressing steel, devices, etc.)

ADMINISTRATIVE ORDINARY GENERAL ASSEMBLY

1 Financial Matters

The financial report presented by the Financial Administrator, H. Motteu, giving the balance 1984, the working accounts for 1983 and 1984, and the budget 1985, was unanimously approved by the General Assembly.

2 Composition of the Advisory Committee

In view of the necessary reconsideration of membership in this committee, the Administrative Council proposed to choose as members of the Advisory Committee - after consultation with the national delegations - :

1. the members and chargés de mission of the CEB-Administrative Council
2. the reporters and coreporters of all Commissions and General Task Groups
3. a restricted number of personalities invited to participate for a limited time, selected from practicing engineers, national or international authorities or associations, or being specialists in certain fields of interest.

This proposition for terms of membership was unanimously agreed upon. The Secretariat was asked to redraft the list of membership accordingly for the reconsideration during the next Administrative Council meeting.

NEW TECHNICAL DIRECTOR IN LAUSANNE

On the expiry of my three years leave I will return to my work with the Institut für Werkstoffe im Bauwesen, Technische Universität Stuttgart, Pfaffenwaldring 4, D 7000 Stuttgart 80, in August 1985. To all who contributed to the very friendly atmosphere and the extremely good cooperation with the Secretariat during this period, I owe my deepest gratitude. It was an honour and a pleasure to work with you! I should like to wish for my successor, Roland Molzahn, who will take over on 1st October 1985 in Lausanne, that he may enjoy an equally good cooperation in the same spirit!

Hans Rüdiger Tewes

NEXT PLENARY SESSION

An invitation of the CEB-National Group of Italy - for which the General Assembly expressed its cordial gratitude - the next Plenary Session will take place in Treviso in October 1986 (probably from Tuesday October 7 to Friday October 10). Gratefully acknowledged were also the optional invitations of the Polish and Yugoslavian National Groups for one of the future Plenary Sessions or Advisory Committee meetings. In this context, other National Delegations, willing to offer similar possibilities now or in future, are kindly requested to inform the CEB-Secretariat at their earliest convenience.

CEB-News are published irregularly. Their primary intention is to inform CEB-members on progress of work in CEB's Commissions, Related and General Task Groups and on the programmes and resolutions of CEB-Plenary Sessions. Moreover, any other information can be included which might be of interest for CEB's members or friends.

COMITÉ EURO-INTERNATIONAL DU BÉTON

Dipl.-Ing. R. Tewes

CEB

Lausanne, den 17. April 1985
RT/IH - 157/85

Betr.: Forschungsvorhaben "Mitarbeit bei der internationalen Vereinheitlichung von technischen Baubestimmungen auf dem Gebiet des Stahl- und Spannbetonbaus" - AZ TV/1 - 5 -382/84)

hier: Abschlussbericht für das Jahr 1984

Der Schwerpunkt der Arbeiten im Berichtzeitraum lag in der Aufbereitung der Ergebnisse der 23. Vollversammlung des Comité Euro-International du Béton (CEB) in Prag, im Oktober 1983, auch im Rahmen einer Sitzung der deutschen CEB-Gruppe, zu der der Vorsitzende des Deutschen Ausschusses für Stahlbeton eingeladen hatte, und in der Vorbereitung und Durchführung einer Sitzung des CEB-Beirats "Forschung und Anwendung" in Stuttgart im Mai 84, zu der die Deutsche Gruppe des CEB eingeladen hatte.

Im Hinblick auf die Schwerpunkte des o.a. Forschungsvorhabens (siehe Leistungsbeschreibung zum Forschungsantrag) lassen sich die Arbeiten wie folgt einordnen:

1. Zusammenstellung von Arbeitsergebnissen des CEB:

   Detaillierte Angaben hierzu finden sich in den im Berichtszeitraum veröffentlichten

   * CEB-News 71 : CEB/FIP Model Code 1978 - National Applications and Adaptations and Recent Developments in Eurocodes (Anlage 1)

   * CEB-News 73: RILEM/CEB/FIP Recommendations on Reinforcement Steel for Reinforced Concrete (Anlage 2)

   * CEB-Bulletin 142/142BIS : CEB-Manual on Structural Effects of Time-Dependent Behaviour of Concrete (Titelblatt und Inhaltsverzeichnis als Anlage 3)

   * CEB-Bulletin 152 : CEB/RILEM-Workshop Report "Durability of Concrete Structures" (Titelblatt und Inhaltsverzeichnis als Anlage 4)

2. Aufbereitung von Unterlagen zur Information der forschungsfördernden Stelle sowie darüber hinaus der deutschen Mitarbeiter des CEB

   Unterlagen hierzu waren insbesondere in Vorbereitung des oben erwähnten Stuttgarter Treffens des CEB-Beirats "Forschung und Anwendung" zu erarbeiten, nachdem im Januar 1984 anlässlich des Treffens der Deutschen Gruppe ein mündlicher Informationsaustausch stattgefunden hatte. Die beigelegten Anlagen 5 und 6:

* Advisory Committee Stuttgart May 84 "Summary of Preparations received in answer to the consultation of National Delegations"

* Survey of activities 1979-1983 and work in progress 1984 in CEB-Commissions and Task Groups"

geben einen Überblick über den Informationsstand im Mai 1984. Die wesentlichsten Ergebnisse der Stuttgarter Beratungen wurden im Oktober 1984 auch in deutscher Sprache veröffentlicht (Anlage 7) und bilden darüber hinaus Gegenstand neuerer CEB-News (N° 74) des nächsten Berichtzeitraums 1985. Sie dienten gleichzeitig dem Sekretariat des Deutschen Ausschusses für Stahlbeton zur Vorbereitung der Jahressitzung.

Lausanne 17.4.85

Rüdiger Tewes

7 Anlagen

AMAGE 1

COMITÉ EURO-INTERNATIONAL DU BÉTON

Lausanne, March 1984

CEB

NEWS
71

CEB/FIP MODEL CODE 1978
NATIONAL APPLICATIONS AND ADAPTATIONS
AND
RECENT DEVELOPMENT IN EUROCODES

Contributions to
CEB 23rd Plenary Session
Prague, October 1983
from the
National Delegations
of

Belgium, Denmark, Finland, France, Germany, Greece, Hungary, Italy, The Netherlands, Norway, Portugal, Soviet Union, Spain and Spanish Speaking Countries, Sweden, Switzerland, Turkey, United Kingdom, Yugoslavia

Lausanne, March 1984
N/réf. RT/IH - 1027/84

CEB/FIP MODEL CODE 1978
NATIONAL APPLICATIONS AND ADAPTATIONS AND RECENT DEVELOPMENTS EUROCODES

During the CEB 23. Plenary Session at Prague in October 1983, the first technical Session was mainly dedicated to a report on the recent state of Eurocodes and, above all, to short reports from the national representatives present at Prague, outlining the

* historical development of technical guidance documents in their countries during the last decade

* influence of the CEB/FIP Model Code with respect to

  - conceptual aspects
  - adaptation of specific rules
  - terminology and notations

* problems encountered so far in practical application of the Model Code by

  - engineers
  - code-drafting authorities

* future perspectives

A circular of the Secretariate had invited to these reports and the echo was such that 22 nations contributed to the session, giving a most interesting and impressive survey. Following the demand of many participants at Prague you will find in these CEB-News a copy of most of the presentations. As quite a number of speakers in Prague had only prepared oral reports the Secretariate had to ask for written copies. Most of them are available now.

As they are individual reports, differences in the presentation will be noticed. It might have been worthwhile to elaborate these reports in detail and to sum them up to a unified survey in form of a CEB-Bulletin which would involve further considerable time and efforts from the authors. However, as a quick response to the demand of all those present at Prague who were very interested in the reports but unable to take notes in the rather short time available and for the information of all those who could not be present at Prague, the fairly rapid publication of these CEB-News seemed more appropriate. Therefore, full addresses are given beneath the titles, enabling everyone to contact the authors directly for more details.

BELGIUM

Influence of the CEB/FIP Model Code on the Revision of the Belgian Codes

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PRESENT BELGIAN CODES NBN B 15

(Concrete - Reinforced Concrete- Prestressed Concrete)

- Consist of four parts:

NBN B15 - 101 : Generalities
NBN B15 - 102 : Materials
NBN B15 - 103 : Calculation
NBN B15 - 104 : Execution

- They were published in 1976 and 1977 and are based on FIP - CEB Recommendations of 1970

* The revision of these codes started in 1980 on the basis of the CEB/FIP Model Code 1978.

* Publication foreseen in 1985 (?)

General Observations concerning the Revision:

- Principally based on Model Code 1978
  (Belgian code will probably be more restrictive than the former editions)
- Possible influences of Eurocode 2
- Introduction of concrete grades according to Model Code 78
- The design method based on allowable stresses remains valid in the second instance

Practical Problems in the Application of the Model Code

- Definitions of actions, safety factors
- Calculation of cracking and deformations for compound bending
- Durability, fire, fatigue design
- Indication of rules for maintenance and repair

Influence of CEB / FIP-Model Code on the Revision of the Belgian Codes

Revision will be executed by 12 Task Groups:

TASK GROUP	Parts of MC-1978 as a basis for redaction
1. General design data	ch. 1,2,3,4,5 - Appendix a
2. Design principles	ch. 6,7,8,9 - App. f
3. Bending	ch. 10,15,16 - App. b and e
4. Shear	ch. 11,12,13
5. Buckling	ch. 14
6. Detailing and construction details	ch. 17,18 - App. c
7. Precast concrete	ch. 19
8. Lightweight concrete	ch. 20
9. Construction and maintenance	ch. 21, 22, 23, 24
10. Concrete	ch. 21, 22, 23, 24
11. Steel	ch. 21, 22, 23, 24
12. Plain concrete	

The revising committee proposed a subdivision of the new Code in 6 parts:

I - Generalities
II - Materials
III - Calculation
IV - Execution
V - Lightweight Concrete
VI - Precast Concrete

D E N M A R K

National adaptation of the CEB/FIP-Model Code 1978 with respect to the Danish Codes

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The excellent work carried out within CEB has had a very strong influence on the preparation of Danish codes and text books on concrete structures for more than 20 years.

Our present code was published in 1973 and a revised edition is under preparation. However, as far as codes are concerned, Denmark can be regarded as a developing country.

The Danish codes are very brief, simple and liberal. Very liberal rules regarding plastic redistribution of bending moments in hyperstatic structures have been accepted in the Danish codes since 1908.

Design rules for slabs based on some kind of premature yield line principles were introduced in Denmark about 1920 and have been maintained since then with minor modifications.

A basic clause in the Danish Code states: "It is permissible to deviate from the requirements of the code provided it is shown that such a deviation is warrantable".

Such Danish traditions prevent us from adopting the Model Code without certain adaptations.

F I N L A N D

The development of concrete codes in Finland

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THE FINNISH CODE FOR CONCRETE STRUCTURES

In Finland the Concrete Association is responsible for concrete codes. Already in 1975 the first code concerning limit state design was published. The second version of that code was given in 1977.

After completion of the CEB-FIP Model Code in 1978 the national code was entirely renewed. That work was finished late in 1980. The code applies to all kinds of concrete structures, to plain concrete, and to reinforced, and prestressed structures. Both natural stone material and light weight aggregate is included.

The code deals with limit state design and, as an accepted alternative, design according to admitted stresses. Production quality control and assessment of materials and structures are included.

The Finnish Code for Concrete Structures is now available in Finnish as well as in Swedish and English.

As supplements to the code several inofficial technical recommendations have been published by the Concrete Association.

THE MODEL CODE IN THE FUTURE

As far as time for the next Model Code is concerned, something near to 1990 is preferred. Then national codes could be completed in the period 1992 to 1995 and the code cycle could be 12 to 15 years, which for many reasons seems to be suitable.

The main objective of the next Model Code should be a closer description of the characteristics of materials used for concrete structures. Another, of course, improved theories given in formulas adapted to computer technics. At the same time it should be possible to take into consideration the demands for simplicity of design work in practice.

As far as international standardization is concerned, an agreement about the coordination is needed. So, for instance, the Model Code should not concern workmanship and quality control, except the classification thereof as a basis for design according to safety levels.

F R A N C E

Adaptation of the CEB/FIP-Model Code to the French Codes for Concrete Structures

Henri Mathieu
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As can be seen from the enclosed table, which describes the present situation of codes in France, design rules are separated from execution rules and the design rules for reinforced concrete are separated from design rules for prestressed concrete, for reasons of a simpler presentation; of course both Codes are fully coordinated together.

Codes for concrete structures

Situation in France

Design	Directives communes 1979 (previous version 1971)		Independant of the material - Compatible with volume I of the Model-Code ; however the presentation is very different (more didactic and intended for direct application in special cases).
	Reinforced concrete	Prestressed concrete	
	C C B A 68	I P 1	Permissible stresses. Will be abandoned in 2 or 3 years
		I P 2 (73)	Based on CEB 70 Mandatory for pretensioning. Will be abandoned in 3 years
	B A E L 80 Presented for all types of structures. Particular rules for buildings are given separately in appendices.	B P E L 83 Presented for all types of structures. No particular rules for buildings	Based on CEB 78
Materials	Control of concrete : C 79 - 23		Based on CEB 78
	Reinforcing steel Prestressing steel Prestressing systems	Submitted to quality assurance systems	According to the general principles for quality assurance
Execution	Buildings D T U 21		35 pages ; under preparation
	Public Works and Civil Engineering	C C T G 65	200 pages ; presently submitted to discussion. Will introduce "Contrôle interne" (self control)
Seismic design	Règles parasismiques (new version)		under preparation. Takes into account E C and CEB Bulletins

The consistency of this set of Codes is widely influenced by the legal, administrative and professional French system. In particular, Codes are in France mainly contractual documents. These recent design Codes are rather well in accordance with the Model Code and its Complements. In particular not only the format, but also the γ-values are the same. However, it must be said that ultimate limit states are considered more as conventional verifications than reflecting the real failures. Serviceability limit states appear to be more important very often. For this case exist - according to the French opinion - several insufficiencies in the Model Code. The main ones are the following:

1 - The requirements with regard to cracking are not precise enough, especially for prestressed structures. The reference made to the particular contract reflects too great indetermination. For this reason the new French Code keeps classes of prestressing - with indirect, but simpler rules for passive reinforcement.

2 - The rules for taking into account the dispersion of prestressing forces are too vague. The new French Code specifies in what cases and how ΔP is to be taken into account.

3 - The supposed linearity of creep may result in serious inexactness in some cases. We have no non-linear theory of creep, however we considered a physical great error as inacceptable. Hence we prescribe corrections in particular cases.

4 - Design rules based on ultimate limit states are not safe versus serviceability limit states for shear. The new French Codes prescribe limited stresses in concrete under unfrequent combinations.

5 - Many detailing rules are missing, especially for local effects of prestressing forces.

Considering these insufficiencies it would be useful that the CEB-Commissions devote a part of their activities to improve the existing Model Code on particular points.

On the other hand general revisions of the Model Code should be widely spaced in time. The next one could be finalized for 1990. Of course the precise date could be chosen taking in consideration the possible dates for regional applications, e.g. in the European Community, if such dates could be predicted.

Successive editions of the Model Code should also not differ too much from each other. In particular the verification format should not be fundamentally different. The next edition could easily be oriented more towards a performance Code. Indeed it appears now that there is no fundamental difference between both types of Codes; the choice is only the choice of a degree between prescription and performance requirements.

Regarding materials it should be mentioned that in spite of being based on the control rules of the Model Code for concrete, the present French rules are more precise on several points.

For execution finally it has to be said that though there is no basic discrepancy between the French Codes and the corresponding chapters of the Model Code, these did not help very much because most of the acceptance criteria have remained mainly subjective up to now. Therefore, the most important in this field are the organizational and administrative aspects, which are obviously mainly depending on national conditions.

GERMANY

Model Code and German regulations for reinforced and prestressed concrete - influences, interdependencies and future aspects

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1. Retrospective: the development of German Codes for reinforced and prestressed concrete

It seems useful to reflect a little bit on the development of the German regulations for reinforced and prestressed concrete: this will show and explain to a certain degree the problematic nature of an acceptance of Model Code rules for the German system of regulations and hence for our practical construction.

The first rules for the design and the construction of buildings in reinforced concrete date back to 1904, when the "regulations for the execution of constructions of reinforced concrete" were issued officially. In the following years the development of our system of regulations was largely determined by the ever increasing requirements together with a simultaneous extension of the scope of application on the one hand, and on the other hand by the increase of knowledge and experience.

New applications for reinforced concrete were developed, improved technologies, improved material laws and a successful quality control led to more detailed and, therefore, more comprehensive regulations. As a criterion for safety they enabled on the other hand to utilize respectively "emaciate" the cross sections more and more - for the sake of economy and esthetics.

All this resulted - more or less involving competition as well as public and private law - after a period of about 80 years in a network of particular regulations and inspection, and special structures.

This network is susceptible to local changes:

It is characteristic for some parts of the structure, that newly acquired knowledge has been put on or combined with well established basic concepts. Sometimes logic concept and consistency have suffered a bit from these circumstances.

This led, for instance, to our separate regulations for reinforced concrete (DIN 1045) and prestressed concrete (DIN 4227), a separation which - on the basis of the Model Code - has internationally been abandoned for quite a while.

2. Acceptance of the Model Code respectively its influence on concept and particular regulations of the German system of codification

In my introduction I have pointed out the problem of a global acceptance of the Model Code concept for our system of regulatory documents. However, essential fundamentals for design and dimensioning have been adapted. In particular the deliberations started within CEB nearly 30 years ago - formed the design concept introduced by the 1972 DIN 1045 on the basis of stress-strain-relationship for concrete and steel, which ended the era of admissible stress design and dimensioning.

However, on account of the highly increased utilization of the concrete capacity, the design values of concrete strength were additionally reduced for higher concrete grades.

This and the definition of a global, sliding safety factor are the main reasons for the still remaining differences, when calculating the design resistant load effects in application of the Model Code and DIN 1045 respectively.

On the occasion of the reedition of the regulations for prestressed concrete in 1979, however, a further important step towards the Model Code concept was accomplished by renouncing the reduction of design values for higher concrete grades and introducing a fixed global safety factor.

The acceptance of the Model Code concept using partial safety factors causes still certain difficulties with respect to the action side because in relation to the characteristic value Q_k of variable actions according to the Model Code, the nominal values of German Standards for design loads could hardly be applied. Furthermore, with a unilateral application only in the field of reinforced and prestressed concrete distortions in the competition could scarcely be avoided. Here exists a backlog demand - seen from our national point of view.

First steps towards the application of a partial safety factor approach for the formulation of permanent loads and prestressing have been done for the new standards for prestressed concrete with unbonded tendons and for partial prestressing. At the same time, the introduction of partial prestressing may be seen as a significant step towards a common approach to reinforced and prestressed concrete. More or less for formal reasons a distinction between reinforced and prestressed concrete has been introduced by the requirement of a minimum degree of prestressing (of 10%) for the latter.

Besides, partial safety factor concepts have already been introduced into the standards for concrete chimneys and masts and are generally used for example for towers or similar buildings and outside the application of standards.

Regarding resistance to shear substantial fundamental ideas of the Model Code have also been incorporated in the 1979 edition of German regulations for prestressed concrete: with the introduction of a deduction value $1 - \frac{\Delta\tau}{\tau_R}$ the CEB standard method has been more or less pursued.

The favourable effect of axial compressions has not been taken into account so far. Therefore comparisons of calculated necessary shear reinforcement result only in small differences to the Model Code. An adjustment for reinforced concrete is under preparation.

The rules for detailing reinforcement of the Model Code correspond to a large extent with the German regulations for reinforced concrete. Besides, in my opinion this is a good example of mutual influence between national and international (CEB)-activities and for a smooth harmonization, achieved only by an international exchange of ideas.

For reasons of time I had to limit my presentation to some few fundamental examples. Further steps will follow. They set up the difficult task to adapt the proposition for an adjustment of technical rules which have been developed by the CEB and for which we have a joint responsibility - to adapt these propositions harmoniously and in a consistent way into our existing network of individual regulations developed during decades. No fundamental reservations, but primarily formal restraints caused by the existing structure of this network, compel us to make step-by-step adjustments as outlined above.

G R E E C E

National adaptations of the CEB/FIP Model Code 1978

Vladimir Kalevras
Democritus University of Thrace
Chair of Reinforced Concrete
School of Engineering
Xanthi - Greece

1. DRAFTING OF CODES - REGULATIONS - RECOMMENDATIONS

1.1 Existing basic codes

- Loading Code for Structural Works (1945), based mainly on old German standards
- Code for the Design and Construction of RC Works (1954), based on DIN 1045, working stress design method
- Seismic Code (1959), based on working stress design method.

1.2 Predraft of the new Greek RC Code

- NTU of Athens (Jan. 1980, pp. 441)
- Translation of CEB/FIP Model Code 1978 with minor modifications. Major modifications for § 23.3 "Compliance control" and Appendix d "Concrete "
  New text for Appendix g "Prefabrication"

1.3 Additional clauses for Seismic Design, added to the existing Seismic Greek Code, based on CEB-Model Code Seismic and the Seismic Behaviour of Greek RC Structures.

1.4 UNIDO Manual on Seismic Design and Construction of Reinforced Concrete Frame and Wall Buildings in the Balkan Region

1.5 UNIDO Manual on Prefabricated/Industrialized Concrete Buildings in the Balkan Region
under publication, pp. ca. 200 each, based mainly on CEB-Model Code Seismic.

1.6 Draft of the new Greek Code

under preparation, based on the existing predraft, with the following major modifications:

* Simplifications of the provisions concerning structural analysis
* Simplifications of the provisions concerning crack width checking
* Addition of a new part, in which geometrical constraints and detailing rules are presented by structural element type.

2. DRAFTING OF TECHNICAL GUIDANCE DOCUMENTS

2.1 Textbook for the Design of RC Elements for Shear & Torsion (Spyropoulos P., 1980, pp. 72), based entirely on CEB Model Code 1978.

2.2 Textbook for the Analysis & Design of RC Structures (Kalevras V., 1981, pp. 1140);
Comparative presentation of Analysis and Design methods and design aids, based on:
Existing Greek Codes and CEB Model Code 1978 + Seismic Model Code

2.3 Manual on Buckling (Giannopoulos P. + Tassios T., 1983, pp. 153): Based on CEB Manual on Buckling, but with an enriched set of design tables.

2.4 Manual on Flexure and Compression
(Giannopoulos P. + Tassios T., 1983, pp. 228):
Based on CEB Manual on Flexure + Compression, but with an enriched set of design tables.

2.5 Textbook for the Analysis and Design of PC Structures (Kalevras V., 1983, pp. 272):
Comparative presentation of Analysis & Design methods + design aids + illustrative examples, based on existing Greek Codes and CEB Model Code 1978 + Appendix Seismic.

2.6 Structural System - Infill Interaction
(Kalevras V. + Karabinis A., 6. Greek Conference on Concrete, 1983) : Design aids for the Analysis of RC structural system + infill walls.

2.7 Design Aids for Normal Force and Bending
(Kalevras V. + Karabinis A., 6. Greek Conference on Concrete, 1983): Computer programs + nomographs for the analysis of rectangular sections with N + M for cracking, yield and ultimate limit states.

2.8 Practical Checking of the LS of Cracking according to CEB Model Code 1978
(Fardis M., 6. Greek Conference on Concrete, 1983):
Design aids for checking of the LS of cracking according to CEB Model Code 1978.

3. UNDERGRADUATE TEACHING - SEMINARS

3.1 Provisions of CEB Model Code 1978 + Appendix Seismic are taught in undergraduate courses at the Department of Civil Engineering in Athens, Tessaloniki, Xanthi and Patras, to an extent of 40 to 100 %, since 1978.

3.2 Provisions of CEB Model Code 1978 have been presented in postgraduate seminars in Athens, Thessaloniki and Xanthi, during 1981.

3.3 Provisions of CEB Model Code 1978/Appendix Seismic/1982 have been presented in postgraduate seminar in Athens, during 1983.

4. COMPARATIVE STUDIES

Comparative designs of a number of reinforced concrete buildings based on: existing Greek Codes and CEB Model Code 1978 and Appendix Seismic indicate that CEB design provisions lead to the following comparative results and needs:

Provision	Results	Needs
. Structural analysis	Increased Reliability	Simplifications*
. Design for N + M	" Economy	Design aids
. " " V	" Reliability	" "
. " " T	" "	" "
. " " punching	" "	" "
. " " buckling	" "	
. " " cracking	" "	Design aids + simplifications*
. " " deform.	" "	"
. Detailing	" "	"
. Capacity design	" "	Design aids

*Especially for medium size structures

5. FUTURE PERSPECTIVE

Great influence on the state of knowledge, increased in the future, less probably on the practice directly.

H U N G A R Y

Influence of the CEB/FIP Model Code on the Hungarian Structural Codes

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The existing Hungarian Structural Codes were elaborated at the end of the 6O's, beginning of 7O's. The revision of these codes is in the final stage and it is expected that the new Hungarian Standards

- MSz 15o21/1-84 Actions on Buildings
- MSz 15o22/1-84 Reinforced Concrete Structures
- MSz 15o22/2-84 Prestressed Concrete Structures
- MSz 15o22/7-84 Detailing of Reinforced Concrete Structures

- which are the most important ones from the new series - will come in force by 1984.

During the period of their revision we took part in the Trial and Comparison Calculations (TCC). This drew our attention to that part of the existing Hungarian Standards, which has a relatively higher safety level than the CEB-FIP MC. Such parts were e.g. the eccentrically compressed members with high slenderness ratio, punching, some provisions of serviceability limit states and some detailing rules (problems connected with bond, minimal diameters of bars, biggest permissible spacing of bars, etc).

It should be mentioned, how the "relatively higher safety level" is to be understood. The TCC unambiguously showed that generally according to the Hungarian Standards at the ultimate limit states the same structures for the same purpose can be realized with smaller cross actions than according to the MC. This is due to the fact that Hungary is belonging to a group of countries (Comecon) which have smaller safety coefficients for actions and material strengths than others. Nevertheless, in the above mentioned fields the differences between the Hungarian Standards and MC were smaller or did not exist at all. And we concentrated our activity on the parts of our code which had this relatively higher safety level. Of course, the real proper safety level should be approved by the practice and everybody should think about the accurate application of the general rules.

According to the preliminary calculations, this code revision will lead to substantial improvement in economy of materials, mainly of reinforcing steel.

The new Hungarian Structural Standards will adopt the new CEB-ISO-Comecon notations, which differ only slightly from the original CEB notations (e.g. not index $\underline{c}$ for concrete but $\underline{b}$, the meaning of $\underline{Q}$ and $\underline{V}$ is interchanged, instead of $\underline{\bar{f}}$ a $\underline{R}$ is used).

Another very substantial problem should be mentioned too. Each new Code intends to make the design more accurate and economic but seems to lead to more complicated and longer calculations.

Inevitably the reaction of the profession will be negative, if the additional design costs will not be balanced by the economy of materials.

The next revision of the Hungarian Structural Codes will approximately be done in the early 90's. It is expected that these codes will then be based on a performance concept. For this reason we are interested to use the results of the CEB activity in this field for the future.

I T A L Y

The situation in Italy in the field of the codes for structural design

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The evolution of Italian standards over the last ten years in the field of ordinary and prestressed reinforced concrete has been quite typical. Until 1972, ordinary reinforced concrete design was still governed by the old 1939 regulations based on the traditional criterion of admissible stresses, with the integration of a few ministerial circulars concerning special problems, such as those involved in the utilization of improved-bond-steels. In 1972, following the publication of the 1970 CEB-FIP Recommendations, an up-dated version of the Regulations, whilst remaining essentially based on the notion of admissible stresses, opened the way to limit state design, and in this connection the procedures laid down in the CEB-FIP document were mentioned explicitly.

As for prestressed reinforced concrete, the standards issued from 1947 on were also based on the traditional approach, but they always included checking at cracking and failure.

A decisive step forward towards the adoption of the new design methods was made in 1978 with the publication of a unified code covering both ordinary and prestressed reinforced concrete, where the two methods, admissible stresses and limit states, are presented with the same emphasis and developed in detail. At the same time, new standards on structural safety based on the limit state approach were published.

In actual practice, the safety principles and design methods adopted for limit state design are quite similar to the provisions of the CEB-FIP Model Code. The only substantial differences concern the γ_c coefficient, raised to 1.6 instead of 1.5, and the γ_g coefficient (1.5 instead of 1.35). Even the procedures prescribed to determine the characteristic strength of materials are in line with international recommendations. It must be noted that the official code is accompanied by a vast collection of instructions prepared by the National Research Council which confirms and develops the new design procedures.

Thus, while we can say that, as far as the elaboration of official standards is concerned, the impact of the Model Code has been very effective, whereas in terms of practical application the utilization of limit state methods has spread with some difficulty, partly because elder designers do not find it easy to master the new procedures, and, also, because the change entails significant costs for the engineering firms. We must then frankly acknowledge that, for the time being, the percentage of designers who make consistent use of the limit state approach is small. Undoubtedly, it tends to increase since by now all universities have up-dated their teaching programmes to keep level with the modern methods.

To complete the picture of the Italian situation, mention should be made of the special regulations concerning seismic area design, precast structures, and bridges. The seismic standards currently in force are based on the working stress method. However, it is nearly certain that the revised edition, which is being drafted, will adopt the limit state concept. Bridge regulations are already based on the limit state approach and, through a special device, make it possible to extend these procedures to the seismic field. Finally, for precast structures, there is no Code at present, whilst a collection of CNR instructions based on limit states has almost been completed. And everything leads us to believe that this document will soon be ratified by the Ministry of Public Works to serve as a code.

As can be seen from these considerations, the situation in Italy, though in some respects contradictory, is largely characterized by an irreversible evolution towards the generalized adoption of the methods proposed by the International Organizations.

Finally, to answer the two questions of problems encountered and future perspectives, we can say that the real difficulties we have come across so far are not of a technical nature, but arise from a certain inertia due to engrained habits.

For the future, the up-dating of university teaching programmes and the spreading awareness of the theoretical and economic advantages of the limit state method will surely contribute to speed up its diffusion.

THE NETHERLANDS

CEB-FIP Model Code applied in the Netherlands

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On behalf of the Delegation of the Netherlands a brief report follows about the favourable influence of the CEB/FIP Model Code on the Dutch Code for concrete structures:

That influence of the CEB-Model Code was very benificial; the relation between the two Codes starts being historical.

On the basis of the principles which were part of the first Model Code of 1964, several national research committees took an active part in the development of subjects like: non-linear analysis of force distribution, strength and lateral stability of frames, deflection and crack-formation. These activities enabled us to contribute to a number of CEB-Commissions and to accept developments from CEB. The outcome was a Dutch code based on the principles of the Model Code, practically similar in presentation and with regard to the detailed rules some mixture of the CEB-Model Code 1970 and the result of our own activities. The trial- and comparison calculations have shown the good agreement as an average with the Model Code. However, the whole operation took 8 years before the several parts of our code were printed - it finished in 1978.

Nowadays the up-dating and revision of the code is going on. The national Code-committees make now an optimal use of the Model Code 1978, which , of course , fits in easily where desired.

Our experience until now leads to some conclusions worthwhile to mention. The development of a code concerned will result in a document of considerable size. The main disadvantages appear when revision and up-dating become necessary:

- the complete code must be revised and reprinted which is quite an effort and takes very much time;
- the inter-relations between rules must be considered throughout;
- the world outside the code committee receives a lot of changes at once
- many items which need no revision at all will be somehow a part of this procedure

In order to solve the problem for the future as far as possible, we decided to distinguish several levels within the code rules, such as:

* general rules and requirements which are the principles and form the basis for all the subjects of the code. These principles will be presented separately and in such a way that their revision could be unnecessary for a long time;
* the second level is a set of more specific requirements and methods, being general recognized approaches. The methods may develop in time and could be revised in parts each covering a certain subject;
* the third level contains very simple practical rules, simplifications, graphs and tables.

We recommend kindly to CEB to think along these lines for future activities. For CEB the presentation of the Model Code in such a way will have more specific advantages like:

* the fact that the principles depend less on national and local practice, circumstances and social development. This, of course, is an advantage with regard to international agreement.
  Moreover, the principles appeared to be the key-factor in harmonization;
* the general recognized approaches are generally valid, but may in their application be adapted to national or local needs;
* on the third level CEB could illustrate by various examples how national code committees could cope with the material.

It will be clear, that in general the ideas on the form of the European code may be supported if this code will be developed in the way as indicated.

N O R W A Y

Adaptation of CEB/FIP Model Code 1978 in Norway

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Background

The existing Norwegian Code for Concrete Structures (NS 3473) was first issued in 1973. Later editions contain only minor adjustments, i.e. to new codes for loads and safety requirements (NS 3478 - 1978).

Despite the fact that the Norwegian design code is 10 years old it is well in accordance with the main principles applied in CEB-documents including the Model Code 1978.

Key words:

Safety principles	:	Limit states design
		Partial safety factors
Bending and compression	:	Parabola/constant diagram
Shear and torsion	:	Standard method
Buckling	:	Model column method

Due to differences in rules for design and structural detailing the design result according to the Norwegian code may nevertheless differ substantially from the Model Code design in certain cases.

Direct application of the Model Code 1978

Refined method for shear design and the method for crack width calculation have been partially applied for off shore structures.

Future Norwegian Code

The code committee is at work. A major revision is expected in 1984/85.

The CEB/FIP-Model Code is used as an important basic reference document, but not entirely as a model for the new code.

It is, however, a general policy that accordance with the Model Code is preferred where possible amendments are not significantly important.

There is a need for further development of the codes, i.e. with respect to:

- Functional requirements
- Differentiation of safety classes
- Design by testing
- Different types of cement
- Very high strength concrete

Comparison of safety levels

A comparison of safety levels in Nordic conrete codes and the Model Code was briefly presented in the Plenary Session. The comparison is based on a further development of Example 5 in the Trial and Comparison Calculations presented in CEB-Bulletin N° 129.

Very briefly it can be stated that the safety level deduced from the Model Code roughly represents an average safety. Further harmonization of the codes in the Nordic countries is expected to give lower safety factors on an average and will generally include differentiation in safety classes.

P O R T U G A L

Portuguese Codes on Safety, Actions and Structural Concrete

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A new code regarding safety and actions to substitute the former code published in 1961 was published in Portugal in March 1983. A new code on reinforced and prestressed concrete to substitute the former code published in 1967 has been approved and is now in print (September 1983).

The need to modify the previous Portuguese code on reinforced concrete structures is chiefly due to the significant changes undergone by the concepts of structural safety. Besides, the longfelt need for regulations concerning prestressed concrete and the modern unification of concepts (which makes it possible to include prestressed concrete in the same body of knowledge as reinforced concrete) make it advisable to treat these materials jointly, in the same code.

The evolution of Portuguese Codes reflects international activity in this domain, particularly that of CEB.

It should be noted that the publication of the Portuguese code in 1967 followed the preparation of the first version of the Recommendations of CEB published in 1964 and altered in 1970 by the introduction of provisions regarding prestressed concrete. Nevertheless, the significant progress in structural safety stressed the convenience of having the general principles of this matter constitute specific regulations, therefore applicable to different types of structure and material. This policy had been adopted by CEB in the 1978 edition of the "Recommendations".

The Portuguese code now in print, which applies to reinforced and prestressed concrete structures, was prepared jointly with the Code of Safety and Actions for Buildings and Bridges in accordance with the policy referred to.

The preparation of these codes was entrusted to the Committees for the Institution and Revision of Technical Regulations of the National Council for Public Works and Transportation. As usual, however, preliminary studies and the preparation of the drafts were carried out by the Laboratorio Nacional de Engenharia Civil.

In this preparation some difficulties have been met with, as for instance:

- The quantification of the values of the actions, that is, the quantification of their characteristic values and of the coefficients ψ.

- The treatment of the limit state of buckling for sway frames.
- The problem of limit state in shear related to the practical application of the accurate method.
- The specification of detailing in a concise and efficient way.

In all these problems the solutions adopted, while keeping within CEB's guide-lines, were inspired by specialized literature.

S O V I E T   U N I O N

Influence of the CEB/FIP Model Code 1978 on Soviet National Codes

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In this brief report, with respect to the CEB/FIP Model Code 1978, I would like to compare shortly some requirements of Soviet Codes and the Model Code. The mentioned Soviet Codes are: "Structures and foundations. Basic design principles" (1972), "Specifications on Loads and Effects. Design Rules" (1976), "Concrete and Reinforced Concrete Structures. Design Rules" (1976). I think it will be worthwhile to fix your attention on the requirements, which are common for these documents and the Model Code, and on the differences between them and also on some - in our opinion - important requirements which will be useful for mutual improvement of the Model Code and Soviet Codes in the future. I will treat only those requirements which are most important and influencing on the amount of materials used for structures.

Ultimate Limit State design for reinforced and prestressed concrete structures has been used in our country for a long time, since 1955. Subdivision of Ultimate Limit States in the Model Code is close to what was accepted in the Soviet Codes. The methods of introduction of partial safety factors into calculations in our Codes are also similar to the Model Code. For concrete and steel, for example, the design strength is the characteristic strength, divided by the safety coefficient. But there are differences also. So, Soviet Codes use widely special coefficients for concrete and steel, so called "coefficients of working conditions". The design material strength is taken into account by modifying its values by these coefficients. There are alltogether 13 coefficients for concrete, taking into account a peculiarity of it's properties, the duration of action and it's repetitions, influence of low temperature, etc. There are 9 coefficients of working conditions for steel taking into account low strength of concrete, type of anchorage, welding, (shape) of stress-strain diagram for steel, etc. It should be kept in mind that our Code covers different kinds of concrete and steel. Values of these coefficients mentioned may be greater or less than unity.

After the former decision to decline the rule, that the design strength value of steel or concrete is "mean value minus three times the standard deviation", the establishment of characteristic values and introduction of safety coefficients in the design, became the most progressive CEB-step, which influenced greatly the improvement of the Soviet Code. However, values of safety factors for materials in our Codes are lower than in the Model Code. E.g. the safety factor for concrete is equal to 1.3, but for steel it depends on the type and the strength of reinforcement and varies from 1.05 for steel of low strength to 1.15 for high strength steel. This affects the amount of material used for structures, however it does not lead, as practice shows, to any undesirable consequences.

The recent introduction to our Codes of safety factors depending on the significance of the structures is one of the first important steps towards a differentiation of structures.

Concerning actions, we consider, that the CEB rules for their combination, are more preferable than other rules. Distinguishing actions in the serviceability limit state, which seldom appears, was also very useful. It was a progressive approach accepted by our Codes. However, our values of safety factors for loads are lower than in CEB Codes and we consider this quite justified.

The CEB design based on concrete grades became an undoubtedly progressive step. This decision will be used in the new edition of our Code.

Influenced by CEB we increased the values of initial prestressing for steel and introduced additional eccentricities into design, which had not been taken into account before; there were also the differentiation of demands of long duration and short duration crack openings and the increase of the value for possible short duration crack openings, based on the CEB data.

But improving of our Code based on CEB experience was no simple adoption. For example, one of the mentioned coefficients of working conditions for concrete makes allowance for the difference between concrete strength under long and short duration actions. In the case of action of short duration (wind, cranes in industrial plants) the concrete design strength is multiplied by 1.1. When these actions are not present, the design strength is multiplied by 0.85. The environmental conditions are also taken into account. Such a proposal was forwarded by the Soviet and Polish delegations also for the CEB Code during the Plenary Session in Athens. It was recognized to consider this suggestion for the future Code's edition.

Then, in our Code, differences in the inelastic properties between various kinds of concrete and concrete grades (high strength - normal) are taking into account in more detail, than the CEB Code does.

Stress-strain diagrams for concrete and steel are very useful in some design cases. Using a simplified diagram for concrete, as proposed by CEB Code, we can solve a number of new problems and obtain new data for a better understanding of the behaviour of concrete structures. Now in our country we pay great attention to this problem. Concerning the stress-strain-diagram for high strength reinforcement we avoid it's direct use for calculations in our Code. A special coefficient of working condition takes into account the behaviour of high strength reinforcement, when the stresses are higher than the limit of elasticity. The differences between the stress-strain diagrams for various kinds of steel and the influence of inelastic properties of concrete and initial prestressing are also estimated. Such an approach to the problem proved to be rather simple for practical purposes.

Some differences exist also between CEB and Soviet Codes for prestressed structures. "The limit state of decompression" is not used in our Code. For some cases, depending on the steel type used and the environmental conditions, it is required to provide a residual compressive stress in the concrete, equal to one MPa, when actions of short duration are not present. Recent investigations pointed out that this value can be reduced to O.5 MPa.

Concerning the loss of prestressing, opposite to the CEB Model Code, we do not consider as a loss the reduction of stress in the reinforcement, corresponding to the elastic strains of the surrounding concrete, because these are recovered when the structure is loaded.

Calculations of structural deflections, - this also differs somewhat from the CEB Code, - are done for various loads, depending on the technological, constructive or aesthetic requirements to the structure. In the last case, e.g. the design is carried out only for the action of long duration, supposing that overloading of structures cannot lead to undesirable consequences due to a short duration action.

It is necessary to mention that influenced by CEB Code we worked out more simple design methods of normal crack opening, improved punching design and basic principles for the calculation of shear forces.

Above all, as it was shown by the CEB trial and comparison calculations, the most important fact is the amount of materials used for structures, which is lower for the USSR Codes than for the Model Code. The main reasons are lower values of partial safety factors as well for materials, as for actions and widely spread use of "coefficients of working conditions" in the USSR Code.

In general I can say that the latest edition of the CEB/FIP Model Code, as well as the previous ones, were always of great interest for our country. The CEB/FIP Model Code, based on general experience and knowledge of different countries, is an important unified document, which is also very useful for the drafting of national Design Codes for reinforced concrete structures.

Influence of the CEB/FIP Model Code on national Codes in Spain and some countries of Spanish language in South-America

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SPAIN: Historical development

1958: Recommendations of covering materials and execution (HA-58), based on CEB ideas. In particular, the concept of characteristic strength is introduced.

1961: Recommendations of Instituto Eduardo Torroja covering design and calculations (HA-61), based on CEB ideas.

1968: Official Code (EH-68) (for reinforced concrete), based on CEB. In Spain, the Code is a law, published as a Royal Decree.

1973: Official Code (EH-73) based on CEB (reinforced concrete)

1977: Official Code (EP-77) based on CEB (prestressed concrete)

1980: Official Code (EH-80) based on Model Code (reinforced concrete) and up-dating of EP-77 to EP-80

1982: Up-dating of EH-80 to EH-82

Codes EP-80 (for prestressed concrete) and EH-82 (for reinforced concrete) are still in legal force.

Full agreement with CEB

- Notations
- Limit states
- Bending, Shear, Torsion
- Cracking, Deformations
- Deep beams

Different from CEB

- Punching
- Floors
- Two-way slabs
- Concrete quality control

Intermediate

- Simplified load definition
- Simplified load combination
- Same γ_f for variable and permanent actions, the value of which depends on two parameters: importance of structure and level of control
- Simplified buckling formula
- S.I. units not yet fully adopted

SPANISH SPEAKING COUNTRIES
(South America)

COUNTRY	CODE VALID (official)	DRAFT of NEW CODE (not yet official)	SITUATION (Remarks)
ARGENTINA	From 1964 (CEB, URSS) Future: DIN	Based on CEB	Not yet ready
CHILE	Based on an old DIN	Based on CEB	Waiting for several years
PERU ECUADOR COLOMBIA	Non existent	Normal use of DIN and ACI	
BOLIVIA	Based on CEB (through Spanish EH-82)	To be approved beginning 1984 as a public law. Intended as a Draft for Pacto Andino countries (Chile, Peru, Ecuadór, Bolivia, Colombia, Venezuela)	
VENEZUELA	Based on ACI	Based on CEB	Waiting for several years
CUBA	Non existent	Normal use of Spanish EH (CEB)	
MEXICO	Based on ACI	Strong influence of USA. Small interest in CEB	

- No further news available

- Probably: * Uruguay: situation similar to Argentina
  * Dominican Republic influenced by CEB
  * remaining countries either influenced by
    - ACI (Central America) or
    - DIN (South America)
  * French influence also common

S W E D E N

Nordic Documents based on the CEB/FIP Model Code

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After having cooperated in the work on preparing the Model Code Denmark, Finland, Norway and Sweden were able to publish late in 1978:

By the Nordic Committee on Building Regulations, NKB:

Recommendations for Loading- and Safety Regulations for Structural Design (Retninglinier for Last- og Sikkerhetsbestemmelser for Baerende Konstruktioner)

By the Nordic Concrete Committee, NBK:

Nordic Guidelines for Drafting Concrete Codes (Riktlinjer för Betongbestämmelser)

The last one has a section on

Knowledge gaps (Avslöjade Kunskapsbrister)

Following e.g. the work going on in CEB, the Nordic Concrete Committee is continuously trying to fill these gaps in time for the preparation of new guidelines and new codes in the future.

NKB is for the moment revising its recommendations.

As reported Finland has revised its concrete code, Denmark takes the last steps towards a revision and Norway has started in the same direction.

Sweden has published:

Loadbearing Structures (Bärande Konstruktioner) and

Regulations for Concrete Structures (Bestämmelser för Betonkonstruktioner)

Related to the NKB and NBK documents.

Further comments on Nordic documents by A. Holmberg

Finland has given the state of regulations only to the document on safety and load (4 pages). The one on concrete structures (26 pages) is entirely of an advisory nature. Sweden has made its two documents in running text with regulations included to roughly 15 per cent.

In this respect there is an obvious deviation from the format of the Model Code. One explanation is that, especially in the sections 17 and 18, detailing is dealt with as rules, not to be derived from performance requirements and known technique. Another is that, especially in section 22, the main part of the text on the right hand side in fact is a Code of Practice.

These comments indicate a general view on regulatory documents. They ought to be based on performance requirements and refer to standards and to codes of practice. This, however, does not mean that they have to fail where knowledge is insufficient. In some situations there are still knowledge gaps that have to be filled by experience with interpretations from the actual range. How to behave outside this range is an open question with no general answer except accidents. Inside the range the performance requirements have to be replaced by detailed rules as e.g. now shear and punching in sections 11 and 13 of the Model Code.

S W I T Z E R L A N D

National adaptation of the CEB/FIP Model Code 1978 in Switzerland

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The present Swiss Standard SIA 162 (1968) on the Design of Concrete, Reinforced Concrete and Prestressed Concrete Structures includes the concept of partial prestressing.

With few exceptions (flexural design of prestressed concrete members and shear design of beams or slabs), it is based on the concept of allowable stresses, and has therefore been completed in 1976 by two directives numbered SIA 162/34 and SIA 162/35 introducing ultimate strength design in general and for compression members in particular. For this reason, in certain cases two or more methods exist, e.g. for shear design: the Ritter/Mörsch method based on allowable stresses, the "zones" method as in the CEB/FIP Recommendations (1970), and the refined method as in the CEB/FIP Model Code (1978).

The Standard is under revision, and a complete draft is now ready for public enquiry; it will be circulated in 1984, together with the draft for new loading regulations (SIA 160) which will include the partial safety factors to be applied to the loads.

The future standard SIA 162 follows the lines (and notations) of the Model Code with some specific adaptations, e.g. by referring in the ultimate limit state analysis to the theory of plasticity or by introducing for shear design a simplified version of the refined Model Code method.

T U R K E Y

Information about the new Turkish Code on Reinforced Concrete, TS500

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In Turkey standards and codes are made by the Turkish Standards Institute (TSE). In 1977 TSE appointed a committee to study the present code and to make major revisions. At that time the Turkish Building Code for Reinforced Concrete was based on working stress design. The new committee after extensive studies made two important decisions:

1. Design procedures should be based on ultimate strength methods

2. The revised code should be based mainly on the CEB-FIP Model Code.

In 1980 the first draft of the code was published by the Ministry of Public Works and circulated to the design engineers together with a handbook which was prepared in Middle East Technical University, based on the first draft. The engineers were encouraged to design public buildings using this draft code. The designs, together with the comments from the engineers were evaluated to prepare the new draft.

The revised Code, TS-500 was published by the Turkish Standards Institute in 1982. Due to major changes in the code it was decided to allocate a transition period of 3 years during which both ultimate and working stress design methods can be used.

The new code is mainly based on the CEB-FIP Model Code with the following major differences:

1. Same notations with minor changes.

2. Same safety concept (limit state design). The load and material factors are changed slightly considering local conditions.

3. Characteristic strength is not defined with a failure probability of 5% but 10%.

4. Formulas for tensile strength and modulus of elasticity of concrete are given in simplified form to yield approximately the same values as the Model Code.

5. More emphasis is given to quality control and details about formwork.

6. Effective flange width for beams is presented in a more practical form.

7. Redistribution of beam moments is restricted to 15%.

8. In ultimate strength analysis no specific stress block is enforced. However, rectangular stress block is recommended. For maximum concrete strain a single value is specified, $\varepsilon_{cu} = 0.003$.

9. Since TS-500 is the first code based on ultimate strength design, all necessary equations based on rectangular stress block are given.

10. For second order effects in columns (length effect) instead of model code approach, the ACI approach is given.

11. For torsion a different approach, based on interaction theory is given.

12. For slabs "Equivalent Frame Method" and the method known as ACI Method no. 2 are recommended.

13. For short brackets design recommendations are based mainly on the ACI Code.

UNITED KINGDOM

British Codes of Practice and the CEB Model Code

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Building Regulations and "deemed-to-satisfy".

In the United Kingdom only the code of practice for loading is obligatory in the design of structures. With that exception there is no requirement in the Building Regulations that designers must use any particular document. It is possible to design many buildings without using any codes of practice at all, using merely the tabulated material in the Building Regulations.

The more complicated structures are, however, designed in accordance with appropriate British Standard codes of practice. A designer who proposes to make use of one of these for buildings may do so. The appropriate codes of practice have "deemed-to-satisfy" status: in other words they are deemed to satisfy the provisions of the Building Regulations.

Working Stress Codes

For many years the structural designer had only Working Stress Codes for reinforced concrete, for prestressed concrete, for precast concrete and for water-retaining structures. In 1957, to the elastic methods which until then had been paramount, was added a "load factor" method based upon a rectangular distribution of concrete compressive stress.

Limit State Codes

In 1972 a "unified code" was published. It was the intention then that this code, containing recommendations for normal, prestressed and precast construction, would within a very short time replace the permissible stress codes. Many of those concerned with the drafting of the new code were concerned also with the work of CEB, and it is not surprising that many of the concepts of CEB's work are to be found in the British code. Subsequently the code of practice for water retaining structures was issued; it contained principally detailing requirements, and leaving fundamental design to the general codes of practice, at the choice of the designer.

Revision of Codes

Recently a major revision commenced of the Unified Code. To have introduced major changes of principle would have evoked an immediate outcry from both those who opposed the Limit State procedures and those who had got used to the methods of the 1972 code. Instead it was decided to concentrate on improving presentation: sentences would be simpler, paragraphs shorter and invariably numbered, a truly comprehensive index would be included, the formulae upon which the tables have been prepared would be given and the opportunity taken to make a few technological changes. Those who had opposed the 1972 code became quite active in their opposition to the draft circulated for comment, producing a "simplified code". Those who felt that the official draft for comment was already a simplified code argued that to combine comprehensiveness with ease of use and ready access was the ideal solution: one did not make a telephone directory more useful by deleting the section from F to K. Far better to concentrate on practicability.

In addition to changes in the design of flat slabs, textual changes were made to the section dealing with concrete workmanship. Greater prominence has been given to those aspects of workmanship that can be known to the designer at the conception stage. Durability also has been given greater prominence. In response to those that maintained that there is such a thing as a Durability Limit State a paragraph has been drafted incorporating the concept, however dubious may be its logic. The likelihood is that the expression will not survive.

Expiry of earlier codes

Since, apart from one or two limited amendments, these have not been kept up to date it is likely that they will be allowed to lapse fairly soon after the emergence of the revised Limit State Code. It is important, however, to observe that the larger employers of the construction industry (the Government Departments, the larger public companies, the public authorities (railways, electricity, etc) have their own requirements. They may frequently impose upon designers procedures which may differ from those of the codes.

Bridges

At present bridge design is fundamentally on the basis of stress levels but Limit State methods are being introduced, on the lines of those for other structures.

Principal differences between British Codes and CEB Model Code

The British code is divided up according to elements, the CEB Model Code by functions. This represents the procedures favoured by British engineers. It is unlikely that any British code would achieve acceptance if it does not keep to the present arrangement.

Eurocode 2

During the concluding discussion Professor Levi, as Chairman of the drafting panel for EC2, stated that he hoped that there would be few or no comments during the consultation period. The British delegation were not happy that this should have been said, bearing in mind that in the previous round of consultations the panel had been unable to pay much attention to the large number of constructive suggestions made by the United Kingdom. It is obviously an impossible task to reconcile the conflicting interests of EC Member States but it is important that at least none should be seen to be at a disadvantage.

Fire

The existing code contains a section providing general and detailed design guidance. The latest draft separates these, combining recommendations which satisfy fire requirements with durability requirements. For the benefit of designers who wish to use a more fundamental approach a separate section is in course of preparation which examines principles.

Earth Pressures

Although in other Member-States it has been thought easy to apply the Limit State procedures to earth pressures there is considerable resistance in the United Kingdom to the concept from those who feel that it is inappropriate. To use the Limit State approach partially safety factors for soil pressures are required in order to assess movements and forces within a structure. The flexibility of the structure will be a factor. Some progress is being made and it is likely that some method will be devised which will at least provide structures not greatly differing from those produced by the previous procedures.

Y U G O S L A V I A

On today's state and influence of CEB activities and the CEB/FIP Model Code 1978 on National Codes in the field of concrete structures in Yugoslavia

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Faculty of Civil Engineering
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11000 Beograd - Yugoslavia

In the field of concrete structures two separate codes are valid in Yugoslavia today: the Code for Reinforced Concrete Structures and the Code for Prestressed Concrete Structures. Both of these codes were adopted in 1971. Codes rely to a considerable amount on the SIA Code, but the formulations in a series of clauses were influenced by the CEB-Recommendations of 1964 and particularly of 1970.

In these codes the ultimate state design, although only for bending moments and normal forces but not for other actions, was introduced in Yugoslavia for the first time. In addition, a unique global safety factor was used, independent of the type and combination of actions, characteristics of material or section properties. However, the design for ultimate limit states, in the Code for Reinforced Concrete Structures, was not established as an obligatory rule. Parallely, the possibility of design according to working stresses, which was the only way allowed for analyzing and dimensioning of concrete structures in Yugoslavia up to 1971, was kept open as well. In the Code for Prestressed Concrete Structures, the design for limit strength and crack limit state was obligatory and only full prestressing was allowed. Limited prestressing with tensile stresses in allowed limits and safety factors against crack appearance was also permitted.

Immediately after the publication, the integral text of the Model Code 1978 was translated and published in Yugoslavia, so that Yugoslavia was probably the first country which circulated the Model Code 1978 on a large scale in a language which is not one of the world languages.

Very soon after that, work began on the innovation of today's Yugoslav Codes for Reinforced and Prestressed Concrete Structures. A group of experts was asked to make suggestions for necessary corrections of existing codes but not for radical changes. This resulted in the decision that, at the present stage of the innovations of the existing codes, separate Codes for Reinforced and Prestressed Concrete Structures will remain valid.

This work is in its final stage today. A draft of the New Code for Reinforced Concrete Structures has been made and a public professional discussion has come to its end, so that it is now in the stage of the final revision. The draft of the Code for Prestressed Concrete Structures is almost finished as well. Both codes may be expected to be definitely adopted in 1984.

These two new drafts, in many of their clauses, are based on the fundamental philosophy and principles emphasized in the Model Code 1978, with indispensable corrections of some numerical values with respect to specific Yugoslav conditions. The design according to the limit states as a whole becomes a dominant way of calculation, although, for a certain number of years, the possibility will still be left open for design of reinforced concrete structures according to working stresses. The basic concept of serviceability limit states and the partial safety factors for ultimate limit states were completely accepted. The clauses on ultimate limit states make it now possible to analyze all the usual actions on structures, not only the influence of bending and normal forces as in actual codes.

The clauses concerning the quality of concrete have been made stricter. The determination of concrete strength as pressure on concrete cubes has been preserved, but the previously valid fractil for characteristic strength has been reduced from 15% to 10%, with the simultaneous satisfaction of criteria for medium and minimum concrete strength at pressure. On the basis of the Model Code 1978 and appendix e), the clauses on rheological characteristics of concrete and methods of evaluation of the influence of shrinkage and creep of concrete on the limit state of concrete structures have been considerably expanded.

The stess-strain diagram for concrete,which in the present codes is defined as a square parabola in the whole interval up to the limit value of 3.5‰ , is proposed to be the same as in the Model Code 1978, with the same simplification in cases of pronounced bending. Apart from these alterations, relating to both reinforced and prestressed concrete structures, the most significant change in the draft of the Code for Prestressed Concrete Structures, is the proposal to allow partial prestressing with cracks in definite types of structures and for particular combinations of actions.The working stresses at the serviceability stage in prestressed concrete structures should always be controlled, but such a control is understood to be the verification of the particular limit stress state within the serviceability limit states.

On the whole, it can be said that the Model Code 1978 and the total activity and rich documentation of CEB in the last few years have had a great influence upon the general decisions and individual clauses adopted in the present innovation of existing Yugoslav Codes for Concrete Structures.

However, the influence of CEB activities, the adoption of the Model Code 1978, as well as the whole series of Bulletins d'Information and State-of-the-art reports, published recently, have even more affected the postgraduate and master's degree courses in the field of concrete structures in Yugoslavia. By translating the Model Code 1978, by greater activation of Yugoslavia and its representatives in the Commissions and Task Groups of CEB in recent times, by larger circulations of CEB material at universities in Yugoslavia, a whole series of new knowledge and ideas expressed in CEB has become an integral part of university education, thus being a considerable indirect influence on the field of concrete structures in Yugoslavia.

E U R O C O D E S

CEB / FIP-Model Code 1978 and Eurocodes - recent development

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In September the Steering Committee for the Eurocodes of the European Community has taken the decision to publish and submit to an inquiry Eurocode No. 1 (safety), No. 2 (reinforced and prestressed concrete), No. 3 (steel structures) and a part of the Eurocode on seismic design. Thus ended the first stage of a process begun years ago which involved much hard work for its accomplishment. Since the documents regarding safety and reinforced concrete follow closely the contents of the 1978 edition of the CEB-FIP Model Code, volumes 1 and 2, and the subsequent developments of work carried out by the J.C.S.S., the CEB and the FIP, it can be stated that the commitment for Eurocode No. 1 and 2 has been fruitful and made a significant contribution to the consolidation of the results achieved in 30 years' activity by our Association.

To back up this statement it may be useful to quote a few points from the "Guidelines" on the basis of which the texts have been drafted which are now going to be submitted to public inquiry.

a) The Model Code has been chosen as basic document.

b) The contents of the Model Code has been subdivided into two sections: on the one hand, the "Principles" which include the "Requirements" and corresponding "Performance Criteria" set out in qualitative form, on the other, the "Rules for application" comprising the "Performance Criteria" expressed in quantitative terms and the practical rules for application.

c) Any deviations from the Model Code have been marked with special "comments" included in the "Rules for application"; these comments will provide a basis for discussion during the inquiry which is expected to lead to the choice of definitive solutions. But this concerns only a very limited number of cases.

d) To provide a useful working tool for practising designers, without making the text too onerous, it was decided to include in the "Rules for application" a number of references to the Model Code (or complementary documents: as Annexes, Complements, FIP Guides, etc.) for the treatment of special or particularly complex issues. The validity of these complementary documents in fact is regarded as amply confirmed by the wide international agreement they have obtained and by their conformity to the "Principles" of the Eurocode.

e) Finally, for special structures not covered by the Eurocode, (great bridges, nuclear reactors, etc.), the Guidelines specify that the same "Principles" also apply, though integrated, where necessary, into specific application rules.

As concerns the safety factor values, it was decided to mention in the Preface, by way of indication, the values of the γ_f and Ψ coefficients proposed by the Model Code, whilst the γ_m coefficients, on which it seems that general agreement can be more easily reached, appear in the text in which they are presented with a special notation indicating their tentative nature. At any rate, the same notation was adopted for all numerical values included in the "Rules".

Final texts are expected to be ready by the end of 1983 and published by the end of March 1984. From then on a one-year period is foreseen for the inquiry.

ANLAGE 2

COMITE EURO-INTERNATIONAL DU BETON

CEB

NEWS
N° 73

RILEM / CEB / FIP RECOMMENDATIONS ON REINFORCEMENT STEEL FOR REINFORCED CONCRETE

Revised Edition of:

RC 6 BOND TEST FOR REINFORCEMENT STEEL:
2. PULL-OUT TEST
(REVISED EDITION, MAY 1983)

Final Draft of:

MEASURING THE RIB PATTERN OF RE-BARS
(MAY 1983)

ADDENDUM TO:
CEB MANUAL ON CONCRETE REINFORCEMENT TECHNOLOGY
(Georgi Publishing Co, 1813 St-Saphorin, Switzerland, 1983, ISBN 2-604-0059-8)

The documents described below contain a new version of the bond test (pull-out test) methods, and a description of the measuring methods for the rib pattern of re-bars.

The first has been revised to include the latest experiences made in performing this type of test, similarly to what had been done before for the beam-test method. However, in the case of the pull-out test, the revision not only aimed at a more precise definition of the composition and compaction process for concrete, and at a standardization of the plastic sleeves used, but also introduced an important modification for specimens with size limited to 200 mm edge, and the application of the method limited to at least 10 mm bar diameter. Thus, in future it will be possible to take into account the abundant experience of the numerous tests carried out under those conditions, and to avoid the compaction difficulties of specimens that required cubes of edge equal to ten diameters, when small diameters were tested.

The recommendations for measuring the rib pattern of re-bars are based on the experience made with the tests performed by the former Commission II «Steel — Bond — Anchorage» of the CEB and by the present Commission VII «Reinforcement: Technology and Quality Control». This subject is of great importance for any study of the bond properties of bars.

The extensive research carried out by Dr. Soretz, who unfortunately passed away recently, deserves particular recognition. During many years, Dr. Soretz acted as Reporter of the former Commission II of the CEB and, in the new Commission VII, as Reporter of the Task Group VII/I «Technical Requirements for Reinforcement». His experience and knowledge of these problems proved always very useful for the CEB and, in particular, his co-operation contributed in an exceptional way to the activities of our Commission.

Prof. José Calavera
Reporter, Commission VII

Adolfo Delibes
Reporter, Task Group VII / 1

RC 6 —Bond Test for Reinforcement Steel
2. Pull-out Test

1 - OBJECTIVE OF THE TEST

The pull-out test, which is described below, is intended to determine the bond of non-prestressed reinforcing steel of at least 10 mm diameter and is to serve as a basis for the comparison of reinforcing bars of approximately the same bar diameter but with different deformation pattern. These tests have always to be carried out in series with at least five otherwise identical tests.

In the pull-out test, a bar incorporated in a concrete cube along a defined length is strained at one end by a tensile force, the other end remaining without stress. The relation between the tensile force and the relative displacement between steel and concrete is measured. The load is increased up to failure of the bond.

2 - DESCRIPTION OF THE TEST SPECIMEN (fig. 1)

The test specimen is a cube of concrete, the bar is incorporated in its axis.

The effective bond length of the bar is 5 ds and corresponds only to a part of the specimen: in the other part the bar does not adhere. The bar to be tested extends beyond the two sides of the specimen; the tension is applied to the longer end, and the device for measuring the displacement between steel and concrete is set on the shorter end. Fig. 1 shows the test specimen.

The sleeves shall fit with about 1 mm tolerance around the bar and its thickness shall not excede 2 mm.

3 - PREPARATION OF THE BAR TO BE TESTED

The test bar should be in the "as manufactured" condition without loose millscale, preferably entirely free from rust and, if necessary, carefully degreased with carbon tetrachloride (CCl_4) or ethylene trichloride (C_2HCl_3). When the test bar is corroded, the conditions of the bar should be described with care in the test report; eventually photographs of the surface will be taken.

The bar must not be cleaned in any way that might change its roughness.

4 - MAKING THE SPECIMENS

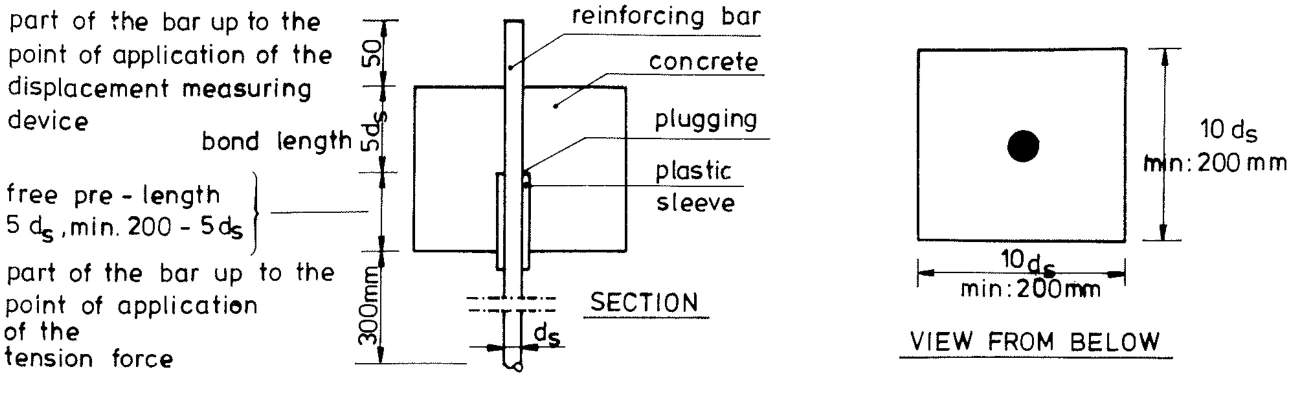
4.1 - Composition of the concrete

The grain size curve of natural gravel and sand must keep within the limits indicated in Figure 2.

Assuming the density of the agregates with 2650 kg / m³ the composition of the concrete for 1 m³ is about:

- natural gravel 4-16: 1300 kg
- Natural sand 0-2 : 600 kg
- Cement: 250 kg (of RILEM standardized strength 40 N/mm²)
- Water: 165 kg

Figure 1 Description and dimension of specimens



If necessary, water may be added to the mix to get the concrete with a slump of 5 ± 1 cm, by means of the Abram's cone, and the strength indicated at 4.5.

4.2 - Mixing the concrete

The constituents of the concrete should be mixed mechanically, preferably in a vertical-shaft pan mixer. The mixing time should be at least 3 minutes for the dry constituents and 3 minutes after water has been added.

4.3 - Placing and compacting

The fresh concrete is placed in the mould in which the bar is kept horizontal in the axis of the mould, see Figure 3.

Compaction is carried out to the same degree as for the cubes or cylinders used for the control of the strenght of concrete (see 4.5).

4.4 - Storing of test specimen

Form removal three days after placing of the concrete, during which time the specimens are covered with wet cloths.

During the 25 following days (until the time of the pull-out test) the specimens must be stored at a temperature of $20 \pm 2°$ C and a relative humidity of $60 \pm 5\%$.

4.5 - *Strength of the concrete*

Strength is checked on 150×300 mm cylinders or 150 or 200 mm cubes, prepared at the the same time as the specimens and cured under the same conditions. The test must be carried out on at last three cylinders or cubes per concrete mix. The mean strength must be between 27 and 33 N/cm² for cubes or between 23 and 28 N/cm² for cylinders.

5 - EXECUTION OF THE BOND TEST

5.1 - The testing set-up is shown in Figure 4.

5.2 - Testing machine

The load range of the testing machine must be chosen adequately to the expected failure load of the test piece.

5.3 - Testing procedure

The specimen is placed vertically on the bearing plate, provided with a central 2 d_s cavity, of the traction device. The tension force (F) is applied, at the lower extremity (the longer one), while the apparatus for measuring the displacement (Δ_o) is placed at the upper extremity of the bar.

The specimen is loaded progressively up to bond failure or the splitting of the concrete cube, hence the relation between tensile force (F) and displacement (Δ_o). In the test report shall be indicated the type of failure, bond or splitting. It may be of interest to use an electrical measuring apparatus by means of which the curve $F = f(\Delta_o)$ can be recorded.

5.4 - Loading rate

The loading rate $v_p = F/t$ must be determined for each bar diameter in order that the rate of increase of the bond stress be constant.

The value: $v_p = 0.5\ d_s^2$ (N/sec), should be aimed at, where d_s is the bar diameter in mm.

6 - TEST RESULTS

The tension forces F found in the test are transformed by the following formula into bond stresses τ_{dm} and converted linearly to the medium value of the range of the concrete strength f_{cm}

$$\tau_{dm} = \frac{1}{5\pi} \cdot \frac{F}{d_s^2} \cdot \frac{f_{cm}}{f_c}$$

where f_{cm} = 30 or 25.5 N/mm² respectively and
f_c = average of the tested specimens
both according to 4.

The pull-out test on one specimen thus gives the relation

$$\tau_{dm} = f(\Delta_o),$$

where Δ_o = the slip measured under the tension force F.

The mean curve of all the individual test results thus obtained serves as judgement of the bond.

Measuring of the Rib Pattern of Re-Bars

1 - AIM

The aim of this recommendation is to achieve uniformity for measuring methods and the most suitable instruments for measuring the geometrical properties of ribbed reinforcing bars as single bars or as part of a welded wire mesh.

2 - HEIGHT OF THE OBLIQUE RIBS

The maximum height of the oblique ribs is the distance of the highest point of the rib to the bar core, measured in a sense perpendicular to the bar axis on the axial plane.

The measurements are carried out with a dial gauge (1/100 mm scale), which must be provided with measuring feet (Fig. 1) with varying distances between the feet which can be placed on the surface of the bar core of the ribbed bar in between the oblique ribs and parallel to the bar axis. The tracer of the dial gauge touches the oblique rib.

The measuring feet must be adjusted in such a way that dial gauge reading is zero when the measuring device is placed on a plane surface. The height of the oblique ribs can thus be directly read from the dial gauge. In each measurement, three consecutive oblique ribs on each side of the bar must be measured, the average being decisive.

If the height of the oblique ribs must also be measured at other points along the length (e.g. at ¼ and ¾ of the length), these measurements are carried out in principle as described above.

3 - DISTANCE OF THE OBLIQUE RIBS (c)

For hot rolled bars this value is obtained by measuring the distance between equivalent points on ribs at least 10 spaces apart and dividing by the number of spaces ($c = G/10$). See Fig. 2a.

For twisted bars this value is obtained by counting the spaces (n) between ribs in a helical manner around the bar, thus: p = the pitch of twist and $c = p/n$. See Fig. 2b.

4 - LENGTH OF THE OBLIQUE RIBS (l)

A sheet of paper is placed on a soft base (felt or expanded rubber) and a sheet of carbon paper is placed on it. Then the bar is placed on the carbon and turned twice so that the longitudinal and oblique ribs leave marks on the paper. The length of the oblique ribs can then be directly measured on the imprint.

In each measurement, three consecutive oblique ribs on each side of the bar must be measured, the average being decisive.

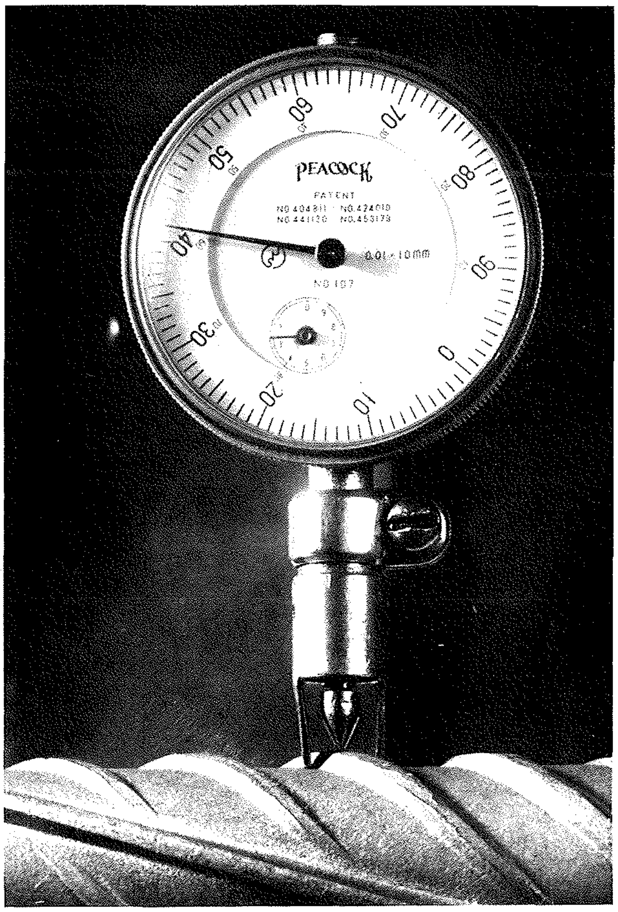
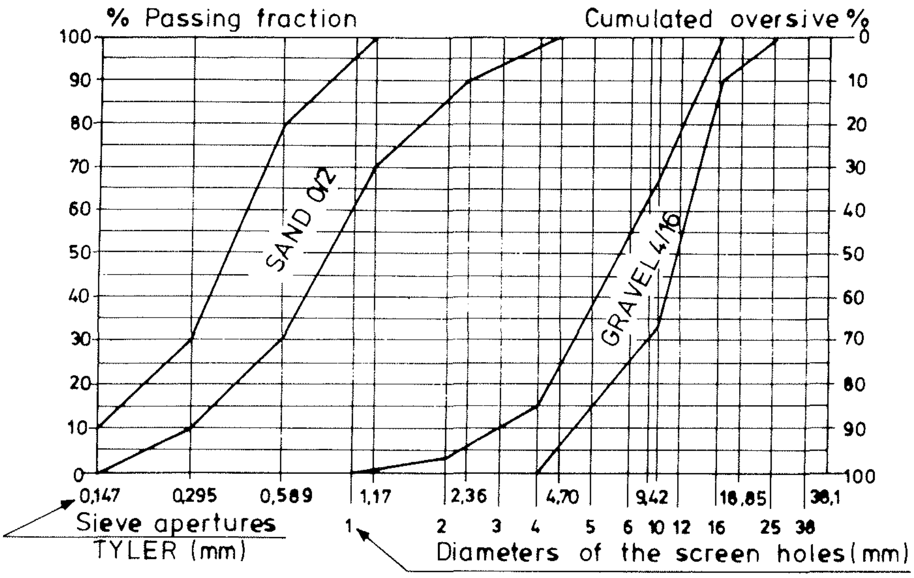


Figure 1 **Dial gauge**

Figure 2 Limit grain size curves



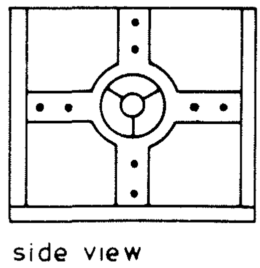


Figure 3 Sketch of the mould

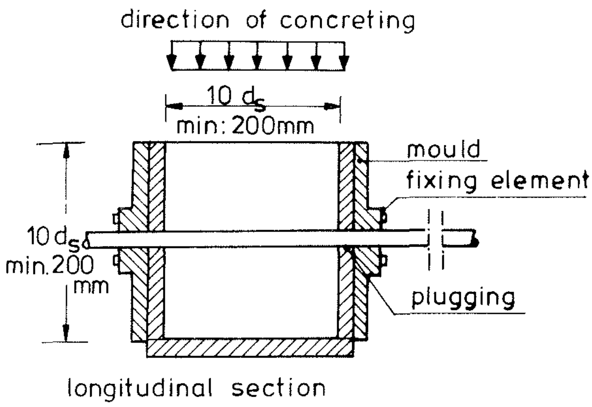


Figure 4 Testing setup

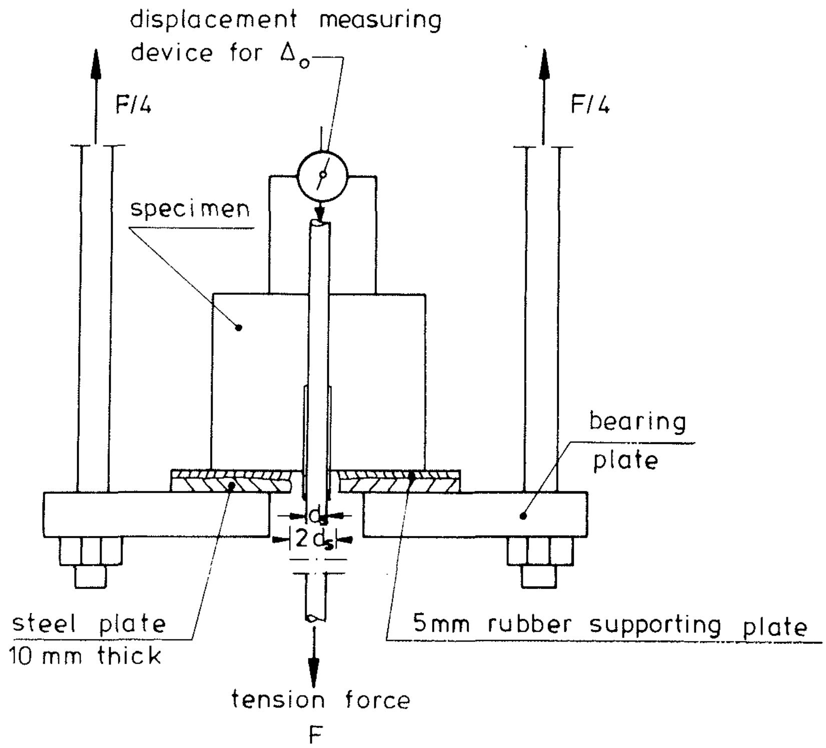
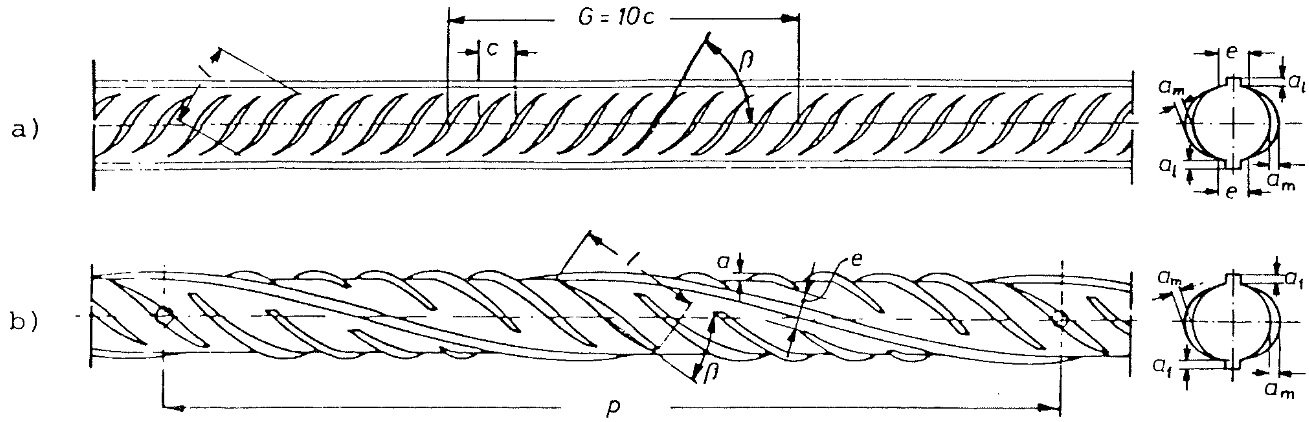


Figure 2 **Distance measurement of oblique ribs:**
(a) for hot rolled bars
(b) for twisted bars



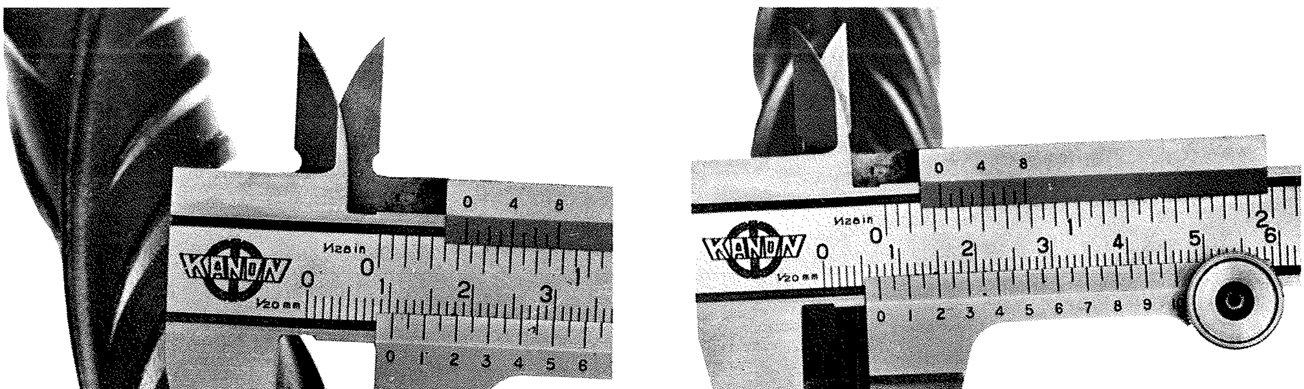
5 - ANGLE OF INCLINATION OF THE OBLIQUE RIBS (β)

A sheet of paper is placed on a soft base (felt or expanded rubber) and then covered with a sheet of carbon paper. Then the bar is turned twice on the carbon so that the pattern of the longitudinal and oblique ribs is marked on the paper. Besides, an outline of the bar is to be drawn on the carbon paper without previously lifting the bar from the base. Thus, by means of an averaged line of the outline it is possible to draw the direction of the axis of the bar on the paper and to measure the direction of the oblique ribs with a normal goniometer.

Each measurement has to be carried out three times, the average being decisive.

6 - DISTANCE BETWEEN THE ENDS OF THE OBLIQUE RIBS (e)

With the normal measuring legs of a sliding caliper, measurements are made perpendicularly to the longitudinal rib from one lug end via the longitudinal rib to the connecting line of the lug ends of the opposite band (see Figs. 3 and 4).



Figures 3 & 4 Measuring of distance between ends of oblique ribs

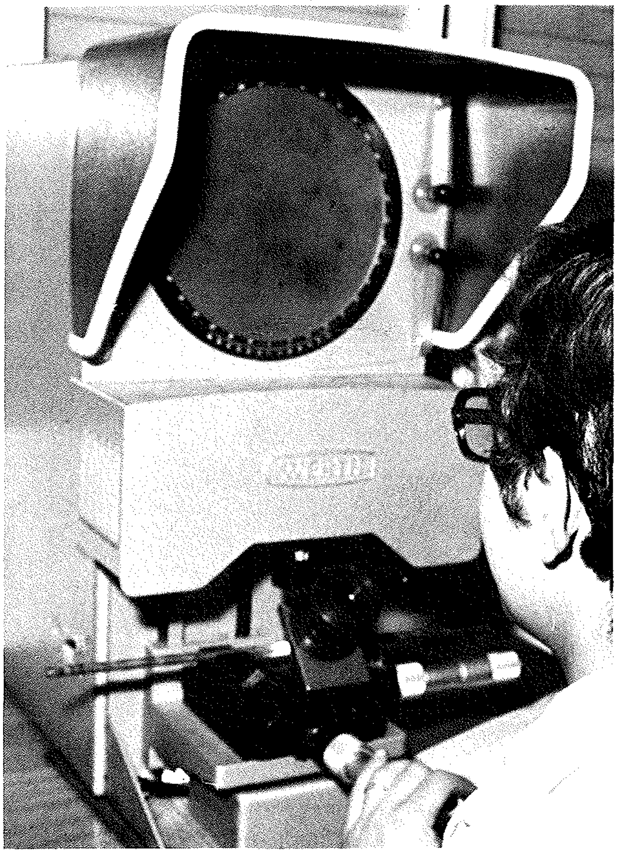


Figure 5 Optical Profile Projector

The measurement has to be carried out at the bar or at the copy as per the length of ribs. The average over at least three rib distances on each longitudinal rib is decisive.

7 - THE PITCH OF TWIST (p) is measured with the millimeter scale.

8 - THE HEIGHT OF THE LONGITUDINAL RIBS (a_1)

This is to be measured at three locations in the same way as the height of the oblique ribs, the average being decisive.

9 - OTHER MEASURING METHODS

Other methods for measuring the above stated parameters may be used, provided they lead to the same accuracy of results.

In particular, the optical profile projector (Fig. 5) may be considered to make the measurements specified in points 2, 3, 5, 8. It should be noted, however, that the use of such units will not necessarily increase the accuracy of the measurements but may reduce the time required to make them.

Anlage 3

COMITE EURO-INTERNATIONAL DU BETON

BULLETIN D'INFORMATION
N° 142/142 Bis

CEB Manual on
STRUCTURAL EFFECTS
of TIME-DEPENDENT BEHAVIOUR of CONCRETE

Mars 1984

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BUREAU DE LAUSANNE : EPFL-CP 88 – CH-1015 LAUSANNE

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II. Comité Euro-International du Béton
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Contents

ANLAGE 4

DEPARTMENT OF STRUCTURAL ENGINEERING
TECHNICAL UNIVERSITY OF DENMARK

CEB - rilem

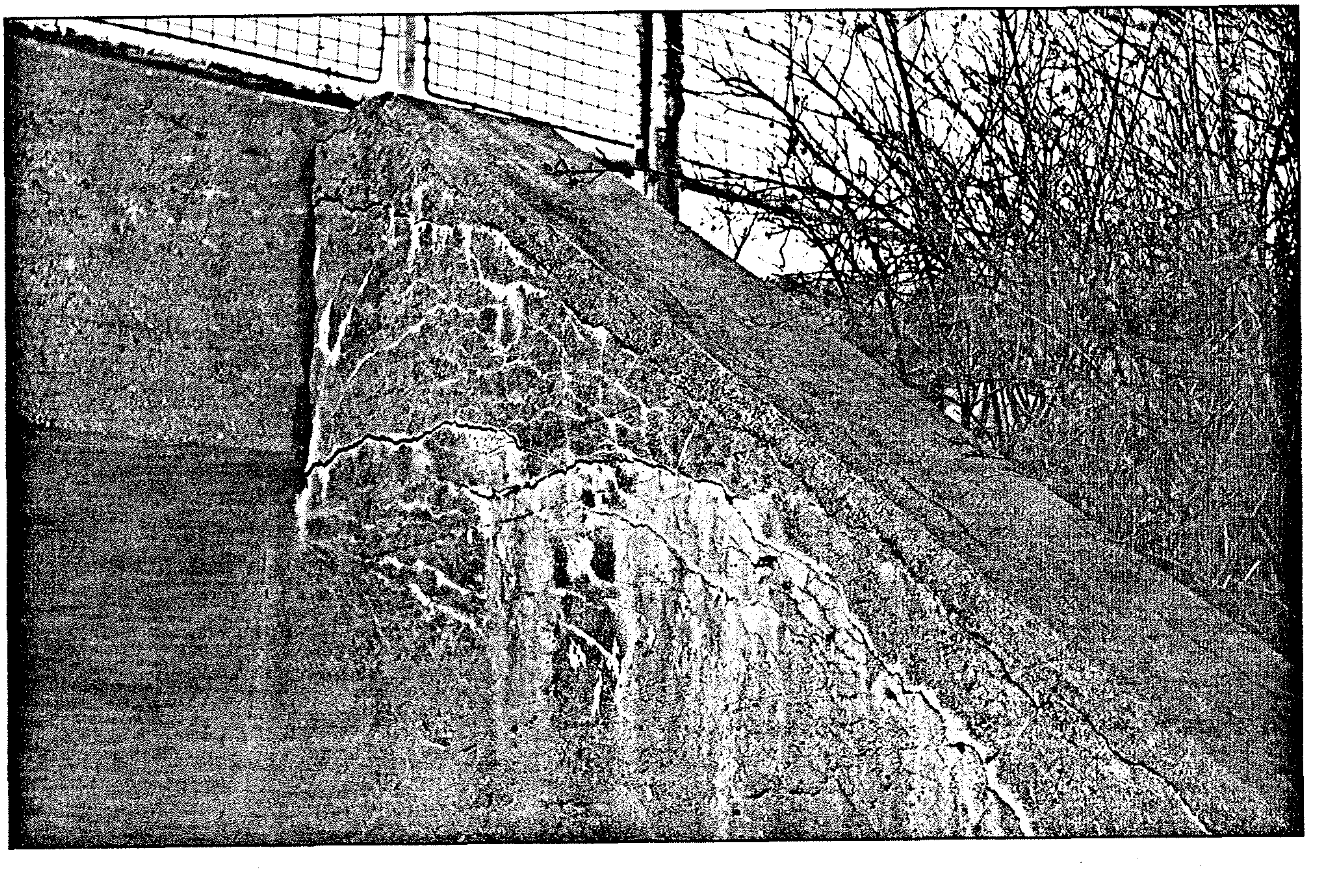
INTERNATIONAL WORKSHOP

18th - 20th MAY 1983
COPENHAGEN

DURABILITY OF CONCRETE STRUCTURES

WORKSHOP REPORT

Editor: Steen Rostam



Organized under the auspices of the LIAISON COMMITTEE

Contents

ANLAGE 5

CEB

BUREAU E.P.F.L. • LAUSANNE

CASE 88

CH 1015 LAUSANNE - Tél. (021) 47.27.41

Lausanne, 12 March 1984

Enclosure n° 2

N/réf. RT/IH - 1035/84

Advisory Committee Stuttgart May 1984

SUMMARY OF PROPOSITIONS

received in answer to the consultation of National Delegations with regard to priorities in future CEB-work

As these collected statements were given independently, they may be incomplete and contradictions were inevitable. This summary is, therefore, not meant to give a harmonized view of future desirable activities, but to serve as a basis input of ideas, to help avoiding excessive repetition of arguments and to stimulate discussion within the Committee.

1 CEB-POLICY

1.1 Vocation of CEB

Based on the history of our Association and long-lasting mutual arrangments with other sister-Associations, the mission of CEB is now very well understood as a synthesis of research findings and technical information to enable the preparation of appropriate guidance documents for use in practice.

This general vocation was enlarged by some propositions:

- CEB should, parallel to its present aims, provide - separated from any regulatory work - an international forum for discussion and exchange of knowlege and information regarding new problems in civil engineering (e.g. off-shore construction, nuclear power plants, liquid gas containments etc)

... or restricted:

- CEB should concentrate above all on the problems areas structural analysis and dimensioning, where, by impressive results, the reputation of CEB was obtained in the past

1.2 Guidance documents

- CEB should consider to publish in addition to its present publications (state-of-the-art reports, Model Code appendices, manuals)
  * leaflets or "short guidelines for practical constructions" with detailed recommendations, e.g.
    - practical recommendations for the protection of reinforcement against corrosion
    - criteria for the assessment of FE-calculations
    - practical recommendations for the liquid and gas-tightness of concrete
    - practical recommendations for fatigue life prediction
- CEB must continue to serve the profession by preparing practical rules and guidelines although some programmes may well be finished by reports (synthesis or state-of-the-art) thus providing in a first step more teaching and research and only later practical design and construction.
- However, CEB resources should <u>not</u> be devoted primarily to producing operational regulatory documents
- Technical documents produced by CEB should mainly be devoted to producing state-of-the-art reports on individual topics, including
  * a statement of gaps in knowledge
  * a statement of their relevance to the Model Code

1.3 General aspects

- number of Commissions and Task Groups should be reduced (limited resources);

- the Administrative Council should define more clearly the scope of work to achieve better cooperation;

- terms of reference should include target dates

- membership in Commissions should be restricted to <u>active</u> participants

- in case of gaps in knowledge, CEB should initiate action - through existing or new Commissions or Task Groups

2 FUTURE MODEL CODE

2.1 Conceptional approach

2.1.1 Continuity

- CEB should not change to much, but improve and shorten the actual Model Code and prepare other documents (manuals, guidelines, state-of-the-art reports) to give more information

- edition of a 1990 Model Code favoured, should neither be fundamentally changed nor stick too much to the old edition

- continuation necessary, "corrected and revised edition MC 1978" favoured

- the Model Code should be reviewed and updated on a regular basis

2.1.2 Performance concept

- performance concept should be used,
- performance concept no problem of primary importance, may be used if correctly developed
- the logic of the code should be increased, e.g. by using the performance concept

2.2 Scope and volume

- scope of new Model Code has clearly to be defined:
  is the future Model Code meant for codemakers or practical engineers?

- the new Model Code should cover also unreinforced and scarcely reinforced concrete

- the Model Code should be limited <u>not</u> to deal with loads and load combinations which belong to other bodies as e.g. JCSS

- need for precise numerical values for actions, combinations thereof, coefficients γ, ψ for "usual" (90% of all cases) structures

- a shortened version of the Model Code restricted to basic concepts for design and construction is favoured, accompanied by manuals providing the necessary means how to comply with these basic requirements and additional publication of short guidelines on selected topics.

- in favour of a more simplified code. Instead of detailed regulations, more handbooks and research results preferable

- simplified "practical guidelines" advisable, but only if in line with MC

- a future Model Code can be confined to principal matters letting all details to deemed-to-satisfy guide lines

- the MC-90 should follow the same intentions as the MC-78. It should serve as model for other (national and international) codes. It should be an offer of ideas

- Volume I should not be forgotten, has to be completely rewritten (e.g. within the Joint Committee on Structural Safety)

2.3 Degree of sophistication

- Model Code as detailed as necessary (to be useful for code makers) but giving separately

    * simple rules for simple structures (use of sophisticated regulations of no economic interest)

    * detailed and precise rules as of the latest state of knowledge to enable also highly sophisticated constructions

- explication needed for the "why" of regulations, formulae etc of a Model Code

2.4 Contents; particular aspects

Regarding the contents of the future Model Code, besides the remarks concerning particular aspects given here, all propositions emphasized the priority of certain ongoing or future CEB-activities as listed under 3.1 and 3.2.

- Model Code should repeat, very briefly but to a certain extent the basics of the underlying safety concept to give adequate emphasis as well to the importance of design and dimensioning as to construction and control

- introduction of level-II-methods not opportune

- simplified rules for combinations of actions, adaptable to different cases

- it should be made better distinction between calculation rules (e.g. cracking, deformation) and good practice regulations (e.g. durability, tightness, maintenance)

- main reference documents of the Model Code (e.g. international standards dealing with materials and actions) should be consistent with the MC.

3 CONTINUATION OF ACTUAL CEB-WORK

3.1 Existing activities

- design, dimensioning and detailing of structures under hazard situations have to be developed with very high priorities:

  * FIRE DESIGN
    including fire protection coatings

  * SEISMIC DESIGN

  * IMPACT or IMPULSIVE LOADING

- life time aspects

  * requirements for durability of concrete and steel as basic materials for reinforced and prestressed concrete constructions

  * guidelines and deemed-to-satisfy rules for the design of durable structures

  * limit states with respect to durability and serviceability, reconsideration of durability requirements (table 15.1 MC 78)

  * Observation, Maintenance and Repair:

    - behaviour of partially prestressed structures
    - assessment of existing structures and their upgrading

  * definition of limits for chloride effects (de-icing salts, PVC in case of fire)

- safety concepts and quality assurance:

  * applicability of and conditions for

    - a design value format
    - a partial safety factor concept
    - a global safety factor concept

  * elaboration of a detailed overall quality assurance system for r.c. structures

  * the effect of the development in concrete technology (use of additives as PFA, Silica fume; high strength concrete) on reliability and quality assurance should be considered

- structural analysis:
  * thermal effects

- dimensioning:
  * fatigue:
    - criteria, methods and practice for the design of concrete structures against fatigue
    - fatigue assessment for e.g. anchorage devices and connections of prestressing reinforcement

  * strength:
    - formulation of physical explanations needed, describing e.g. shear and punching, splitting, bond
    - simple but correct solution for shear design
    - especially punching of slabs, flat slabs, foundation slabs. Existing rules should be elaborated considering problems of

      * eccentricity
      * slenderness
      * practical construction

  * stability:
    - problems of stability in walls and shells, reedition of the Manual "Buckling and Instability", tension stiffening in stability assessment of extraordinary buildings (e.g. tv-towers, chimneys, masts)

  * ductility:
    - requirements with respect to the ductility of reinforcing and prestressing steels in view of their interdependancy with different design methods

      - theory of plasticity
      - yield line theory
      - superposition of direct and indirect actions

  * deformations:
    - improvement of prediction methods for time-dependent deformations of concrete
    - correct solutions for deformations of concrete structures

- detailing:
  • unified basic models for dimensioning and structural detailing
  • minimal percentage of reinforcement with reference to the safety of structures
  • stress transfer between reinforcement and concrete in case of deformed bar (anchorages, splices etc.)

3.2 New activities

In view of the future Model Code the following activities should be undertaken with priority:

- general:
  * priority must always be given to programmes facilitating the work of practical engineers
- structural analysis:
  * analytical formulation of physical models describing the (multiaxial) behaviour of concrete and of linear and plane elements of reinforced concrete structures
  * FEM-Analysis
    - refined models and calculation guides needed, based on realistic material characteristics (including inelastic strain and successful cracking)
    - recommendations for FE-application
- dimensioning, strength:
  * "tensile strength" of concrete
  * also to be considered are modern fastening techniques (mechanical extension or resin anchors, studs, anchoring devices by rail systems etc) using the tensile strength to a large extent (embedment length) and additionally influencing the structural behaviour of the reinforced concrete element
- tightness:
  * guidelines for practical construction and assessment criteria for tightness of concrete structures
  * applicability of coatings
- detailing:

  special detailing rules for necessary repair and strengthening as

  * reinforcement of slabs by glued steel sheets
  * strengthening by shotcrete etc ...
- materials:
  * development in concrete technology should be considered (e.g. additives like PFA and Silica fume, admixtures, high strength concrete, low PC-concrete which influence properties as compressive strength, tensile strength, E-Modulus, creep & shrinkage data)

    MC should give the methods to determine or estimate such data.
  * new applications for concrete requiring the definition of appropriate design criteria and methods
- prestressing with unbonded tendons
- dynamic actions on vibration-sensitive structures

-.-.-.-.-.-.-.-

ANLAGE 6(1)

COMITÉ EURO-INTERNATIONAL DU BETON

CEB

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Lausanne, 3 April 1984
N/réf. RT/IH - 1056/84

Enclosure N° 3

2 — G. (S.25)

Survey of activities 1979-1983 and work in progress 1984 in CEB-Commissions and Task Groups

This survey on programmes and publications of CEB-Commissions, Task Groups and General Task Groups since 1979 has been prepared for the information of the participants of the Advisory Committee meeting Stuttgart, May 10th and 11th, 1984. Including also already disbanded groups and giving some outlook on the future planning, it is intended to complete the information given in the "Actual state of activities" submitted to the Committee members for the Prague meeting, Oct. 1983.

CEB-PERMANENT COMMISSIONS AND RELATED TASK GROUPS

Comm./TG	TITLE	79	80	81	82	83	1984: actual state	REMARKS
Comm. I	RELIABILITY AND QUALITY ASSURANCE						continuing	
TG I/1	Quality Assurance						*disbanded*	new TG: "QA programme for medium size project" foreseen
TG I/2	Design by Testing						starting	
Comm. II	STRUCTURAL ANALYSIS						continuing	
TG II/1	Thermal Design						continuing	
TG II/2	Design of Slabs						*disbanded*	work on slabs to be continued by new TG
TG II/3	Basic Behaviour of 2-Dim. Elements						*inactive*	continued probably in new TG with modified membership
Comm. III	BUCKLING AND INSTABILITY						continuing	
TG III/1	Simplified Methods						continuing	
TG III/2	Instability of Walls						continuing	
TG III/3	Instability of Exceptional Structures						continuing	
Comm. IV	MEMBERS DESIGN						continuing	
TG IV/1	Shear in Prestressed Concrete Members						continuing	
TG IV/2	Torsion under Combined Actions						*disbanded*	
TG IV/3	Punching						continuing	
Comm. V	SERVICEABILITY						continuing	
TG V/1	Durability						continuing	
TG V/2	Manual: Cracking and Deformations						*disbanded*	
TG V/3	Liq. and Gastightness of Concr.Struct.						*suspended*	
TG V/4	Vibrations						starting	
TG V/5	Minimum Reinforcement						starting	
Comm. VI	DETAILING						continuing	
TG VI/1	Anchorage Zones						continuing	
TG VI/2	Opening in Slabs and Walls						*disbanded*	
TG VI/3	Detailing of Lightweight Concrete						*disbanded*	
TG VI/4	Detailing of Concrete Structures						continuing	
Comm. VII	REINFORCEMENT: TECHNOLOGY & QUAL.CONTR.						continuing	
TG VII/1	Requirements for Rc-Bars						continuing	
TG VII/2	Quality Control of Rc-Bars						continuing	
TG VII/3	Industrialization of Reinforcement						continuing	
Comm. VIII	CONCRETE: TECHNOLOGY AND QUALITY CONTROL						*to be reorganized*	some tasks to be continued in new TG: "Curing of concrete"
TG VIII/1	Quality Control of Concrete						*suspended*	
Comm. IX	BEHAVIOUR, MAINTENANCE AND REPAIR						*to be reorganized*	
TG IX/1A	Analysis of Structural Damages						*to be reorganized*	to be continued, probably in new TG
TG IX/1B	Building						*inactive*	
TG IX/2	Maintenance & Diagn. of Concr.Struct.						*to be reorganized*	to be continued as → GTG 19; modified membership

CEB - GENERAL TASK GROUPS

GTG	TITLE	79	80	81	82	83	1984: actual state	REMARKS
1	COMPLEMENTS						*disbanded*	
2	APPLICATION OF MODEL CODE						continuing	
3	SEISMIC DESIGN OF CONCRETE STRUCTURES						*disbanded*	work to be continued in → GTG 22
4	FIRE DESIGN OF CONCRETE STRUCTURES						continuing	
5	PERFORMANCE CRITERIA OF CONCRETE STRUCTURES						*disbanded*	
6	MULTIAXIAL BEHAVIOUR OF PLAIN CONCRETE						*disbanded*	
7	APPLICATION OF LEVEL II-METHODS						*disbanded*	
8	STRUCT. EFFECTS OF TIME-DEP. BEHAVIOUR OF CONCR.						*disbanded*	
9	EVALUATION OF TIME-DEPENDENT BEHAVIOUR OF CONCRETE						continuing	
10	RESPONSE OF STRUCTURAL CONCRETE CRITICAL SECTIONS UNDER HIGH LEVEL REVERSED ACTIONS						*disbanded*	
11	DESIGN OF CONNECTIONS OF PREFABRICATED ELEMENTS						continuing	
12	ASSESSMENT OF EXISTING CONCRETE STRUCTURES AND DESIGN PROCEDURES FOR THEIR UP-GRADING						*disbanded*	work to be continued → GTG 21
13	DESIGN VALUE FORMAT						starting	
14	CONCR.STRUCT. UNDER IMPACT AND IMPULSIVE LOADING						continuing	
15	FATIGUE OF CONCRETE STRUCTURES						starting	
16	STRUCT. AND DEVELOPM. OF FUTURE REGULATORY DOCUM.						continuing	
17	DESIGN OF PRESTRESSED STRUCTURES						planned	
18	DESIGN OF PREFABRICATED STRUCTURES						planned	
19	DIAGNOSIS AND ASSESSMENT OF CONCRETE STRUCTURES						planned	
20	DURABILITY						continuing	former TG V/1
21	RE-DESIGN OF CONCRETE STRUCTURES						planned	
22	BEHAVIOUR AND ANALYSIS OF CONCRETE STRUCTURES UNDER LARGE CYCLIC ACTIONS						planned	

Commission I: RELIABILITY AND QUALITY ASSURANCE

Reporters: H. MATHIEU, L. ÖSTLUND

Programme:

Limit states (significance, classification and corresponding types of equations)

Reliability formats, especially simplified for the combination of actions

Model uncertainties

Safety and assessment of reliability of existing structures

Calibration

Relation between quality assurance measures and reliability

Cooperation with all other Commission and T.G.s about the reliability aspects involved in their studies

Publications:

1982: Progress Reports in CEB-Bulletin N° 147, "Conceptional preparation of future codes":

J. Ferry Borges: "Quality assurance and reliability of concrete structures"

G. König and D. Hosser: "The simplified level II method and its application on the derivation of safety elements for level I"

H. Mathieu: "Comparison of the formulae of the Model Code for combination of actions"

H. Mathieu: "Les différentes formes d'equations d'états-limites et la méthode des coéfficientes partiels"

R. Rackwitz: "First-order structural reliability - one methodological basis for the design of codes"

Further individual reports of Commission members as contribution to CEB-Bull.N°154 "Uncertainties of the structural model and randomness of the structural behaviour", April 1982:

M. Kersken-Bradley: "Statistical size effect on the structural response of parallel arrangements"

R. Rackwitz, B. Peintinger: "General structural system reliability"

Further papers presented and under discussion in the Commission (incomplete list):

A.W. Beeby, W.B. Cranston: "Loading on concrete beams and slabs" (Jan.1981)

G. König, E. Hosser: "Basic notes on model uncertainties" (1.draft,Aug.82)

G. König, B. Wittke: "Model uncertainties (Preliminary draft, March 1982)

M. Tichy: "Design and assessment of building structures subjected to reconstruction and repairs (1. draft, 1982)

E. Thorenfeldt: "Design by testing of concrete structures" (Dec. 82)

Further acticities:

- Written comments by the Commission or some of its members to seismic and fire design and design of industrial chimneys
- Rapport sur certains aspects de l'harmonisation et sur la simplification des règles de calcul relatives à la sécurité dans les Eurocodes 2 et 3 (by H. Mathieu et

TG I/1: QUALITY ASSURANCE disbanded Oct. 1983

Reporter: A.G. MESEGUER

Programme:

Operational Recommendations on the basis of the concepts, prepared by the JCSS

Final report available:

1982: "Quality Control and Quality Assurance for Concrete Structures", CEB-Bull. N° 157, March 1983

Remarks:

New Task Group to be established after the Stuttgart meeting of the Advisory Committee, dealing especially with the preparation of an "Operational document describing in detail the quality assurance programme to be implemented for a medium size concrete structure project (Technical Resolution N° 5, Prague, Oct. 83, CEB-News 70)

TG I/2: DESIGN BY TESTING

Reporter: E. THORENFELDT, Co-reporter Th. MONNIER starting

Programme:

Preparation of guidelines for design by testing including test plan, evaluation of results, interpretation and use of the results. Development of Appendix b of the existing Model Code, notably in order to deduce numerical design values from results of limited series of preliminary prototype tests, with due regard to model uncertainties.

Actual state of progress:

Preliminary paper by E. Thorenfeldt: "Design by testing of concrete structures" (Dec. 82)

Task Group recently established (Jan. 1984)

The first step will be a review of the state of the art.

Commission 11: STRUCTURAL ANALYSIS

Reporters: G. MACCHI, J. EIBL

Programme:

Critical review of Model Code chapter 9: "Structures consisting of plane elements"

Indirect actions: safety criteria, coefficients

Thermal effects (non-environmental actions)

Uncertainties in structural analysis

Simplified loading combinations

Application of non-linear methods

Publications:

1982: Invited contributions to an enlarged Commission meeting, published as CEB-Bull. N° 153 and 154, containing among others:

Theme 1 - Non-linear Analysis and Design of Concrete Frames

1.1 A.C. Aparicio, J.J. Arenas: "Some examples of non-linear analysis of prestressed concrete continuous bridge decks under increasing loads"

1.2 F. Braga, M. Dolce: "Non-linear simplified design of coupled shear walls"

1.3 E.C. Carvalho: "Seismic behaviour of buildings: non-linear response and ductility demand"

1.4 A. Franchi, P. Ronca: "Elastic-plastic-brittle constitutive model and structural analysis"

1.5 E. Giuriani: "Theoretical analysis of the early second stage in r.c. beams"

1.6 V.C. Kalevras: "Aids for non-linear analysis and design of concrete frames"

1.7 L.J. Lima: "A discussion about structural ductility"

1.8 J. Lima, E. Lima: "Some experimental results about the ductility of beams"

1.9 A. Mari, J. Murcia, A. Aguado: "Second order analysis of reinforced concrete frames"

Theme 2 - Non-linear Analysis and Design of Slabs

2.1 G. Creazza, E. Siviero: "Approximate theory for the deformational study of reinforced concrete bidimensional continuous: application to simply supported uniformly loaded square slab"

2.2 W. Kuczynski, S. Tkaczyk: "Non-linear analysis of reinforced concrete structures according to the continuous changes stiffness theory"

Theme 3 - Uncertainties of the Structural Model and Randomness of the Structural Behaviour

3.1 A. Cauvin, W. Moosecker: "Some problems in "level two" reliability analysis of reinforced concrete frames, taking into account non-linear behaviour"

3.2 A. Cauvin: "Influence of some factors of model uncertainty in linear and non-linear elastic r.c. frame analysis"

3.3 R. Giannini, M. Menegotto: "A reliability analysis of slender columns design rules"

Theme 4 - Thermal Effects

4.1 A. Aguado, A. Mari, E. Penon: "Non-linear analysis for thermal effects and support displacement on frame concrete structures"

4.2 A.C. Aparicio, J.J. Arenas: "The behaviour of continuous reinforced and prestressed beams subjected to a thermal gradient under loads increasing up to failure"

4.3 M.A. Chiorino, G. Losana, P. Napoli: "Influence of creep on stresses due to temperature variations in concrete structures"

4.4 J.L. Clarke: "Concrete cylinders under cyclic temperature gradients"

4.5 M. Emerson: "The influence of the environment on concrete bridge temperatures"

4.6 V.C. Kalevras: "Environmental thermal effects on r.c. structures, the greek experience"

4.7 T. Zichner: "Thermal effects on concrete bridges"

TG II/1: THERMAL EFFECTS

Reporter: H. FALKNER

Programme:

Guidance "Thermal actions in concrete structures" (environmental actions); heat transfer in the structure; structural analysis; detailing of the structure; observation of structures and feed-back

- Draft report not yet published
- Contributions of TG members published in Bull. N° 154, part: Thermal Effects (see above)

TG II/2: DESIGN OF SLABS	disbanded Oct. 1983
Reporter: G. CREAZZA	

Programme

Guidance "Simplified methods of calculating short term deflections of r.c. slabs"

Publications:

Final report published in Bull. N° 159, July 1983, title as quoted above

TG II/3: BASIC BEHAVIOUR OF 2-DIMENSIONAL ELEMENTS	
Reporter: G. MEHLHORN	for the time being inactive

Programme

Guidance "Application of the finite element method to 2-dimensional r.c. structures"

Publications:

Final report published in Bull. N° 159, July 1983, title as quoted above

Commission III: BUCKLING AND INSTABILITY

Reporters: K. KORDINA, M. MENEGOTTO

Programme:

Slenderness bounds

Approximate methods and design aids for buckling design

Stability of slender exceptional members and structures

Stability of walls

Creep problems

Computer suited approach: collection and classification of suitable approaches for second order analysis in small personal computers

Publications

1983: CEB-Bull. N° 155 "Buckling and Instability" - Progress report - containing

Section 1: single columns

H. Corres, F. Moran: "Reference curvatures method"

M. Menegotto: "Observations on slenderness bounds for r.c.-columns"

R. Molzahn: "Design of single columns according to the German Code of Practice DIN 1045"

E. Poulsen: "Approximate methods of analysis"

E. Poulsen: "Approximate methods of design"

E. Poulsen: "Walls of plain concrete"

E. Poulsen: "A comparison between different model column methods"

D. Woodward: "Simplified procedure for slender column design"

Section 2: creep effects

D. Diamantidis: "On the variability of the eccentricity of slender columns under sustained load"

R. Molzahn: "MC 78 methods for calculating the creep effects with slender columns compared to test results - proposal of an improvement "

Z. Prascevic: "Influence of creep on behaviour of reinforced concrete plates and walls"

Section 3: buckling of walls

K. Aas-Jakobsen: "Buckling of walls"

Section 4: towers, piers, chimneys and masts

U. Quast: "Towers, piers, chimneys and masts

Annex

F. Levi: "List of errata to Bull. N° 123"(Manual "Buckling and Instability")

Programmes and publications of the Commission's three Task Groups are included in the Commission activities given above:

TG III/1: SIMPLIFIED METHODS

Reporter: E. POULSEN

TG III/2: INSTABILITY OF WALLS

Reporter: A. AAS-JAKCBSEN

TG III/3: INSTABILITY OF EXCEPTIONAL STRUCTURES

Reporter: U. QUAST

Additional activities:

Comments on a draft model code for the design of chimneys prepared by CICIND

Commission IV: MEMBERS DESIGN

Reporters: E. GRASSER, P. REGAN

Programme:

Development of consistent design models for bending, shear, torsion and punching (influences by CEB-Bull. 150 "Detailing of Concrete Structures")

Improvements of Model Code design regulations (taking into consideration also CEB-Bull. 147 "Conceptional Preparation of Future Codes)

Rational design of combined actions

Compressive membrane effects (in collaboration with PC II)

Deep beams

Corbels

Publications:

1982: CEB-Bull. 146 "Shear, Torsion and Punching", giving progress reports of Task Groups 1 and 2 (see below) and:

G. Mancini: "Prestressed sections at the ultimate limit state under normal load effects - comparison between approximated and exact checking methods"

P.E. Regan: "Longitudinal shear in the flanges of reinforced concrete beams"

Further activities:

Organization of the 3rd "European/American Workshop on Shear and Torsion" in Munich, April 82

TG IV/1: SHEAR IN PRESTRESSED CONCRETE BEAMS

Reporter: J.C. WALRAVEN

Programme:

Physical model for shear design; discussion of physical models; review of experiments; proposal of design models for recommendations

Shear resistance of members without shear reinforcement

Publications:

1982: Progress report in CEB-Bull. 146 (see above):

K.-H. Reineck: "Models for the design of reinforced and prestressed concrete members"

J. Walraven: "Shear in elements without shear reinforcement"

- further: input to chapter deformations due to shear in CEB-Bull. 158 "Manual Cracking and Deformations"

TG IV/2: TORSION UNDER COMBINED ACTIONS	disbanded

Reporter: P. MARTI

Programme:

Physical model for design, proposal for recommendations; torsional stiffness, evaluation also under combined actions

Publications:

1982: Final Report in CEB-Bull. 146 (see above):

P. Marti: "Strength and deformations of reinforced concrete members under torsion and combined actions"

- further: input to chapter deformations due to torsion in CEB-Bull. 158 "Manual: Cracking and Deformations"

TG IV/3: PUNCHING

Reporter: P. REGAN

Programme:

To review current situation, particularly in terms of Model Code (dubious for prestressed slabs, test data lacking), to prepare an improved method with a model

Draft state-of-art report under discussion in the Commission, will be extended to special subjects: punching with moment transfer, edge and corner columns, punching of prestressed slabs and column footings (including punching shear reinforcement)

Commission V: SERVICEABILITY

Reporter: M. WICKE, Å. HOLMBERG

Programme:

Performance of concrete structures under service conditions (especially cracking and deformation)

- minimum areas of reinforcement for crack control (see TG V/5)
- durability; practical guidelines (see TG V/1)
- vibrations (see TG V/4)
- longitudinal cracking

Publications: see Task Groups

TG V/1: DURABILITY

Reporter: S. ROSTAM

Programme:

Guides and deemed-to-satisfy rules for design (at short term)

Definition of rational design procedures based on service life considerations (long term)

Publications:

1982: CEB-Bull. 148 "Durability of Concrete Structures", State-of-the-Art Report

1983: P. Schiessl: "Protection of reinforcement (final draft for a Working Guide of Durable Concrete Structures)

L. Sentler: "Service life prediction of concrete structures"

Further activities:

1983: Organization of the CEB-RILEM International Workshop "Durability of Concrete Structures"
(Introductory report published in 1983, proceedings to be published in 1984)

Remarks:

In view of the intended structuring of CEB's activities in the field of life time aspects of concrete structures, this group should be continued as General Task Group covering subjects related to the interdependencies of design and construction versus durability.

TG V/2: MANUAL CRACKING AND DEFORMATIONS disbanded

Reporter: R. FAVRE

Programme:

Manual "Cracking and Deformations"

Publications:

1981: CEB-Bull. 143 "Manual: Cracking and Deformations" (Final Draft)

1983: CEB-Bull. 158-F "Manuel du CEB: Fissuration et Déformations" (version française)

1984: CEB-Bull. 158-E, English version in preparation

TG V/3: LIQUID AND GASTIGHTNESS OF CONCRETE STRUCTURES suspended

Reporter: Å. HOLMBERG

Programme:

State-of-the-art report to describe the relationship between pressure, crack widths and flow through cracks for the definition of acceptable limits

Publications:

1983: Preliminary report available: "Liquid and Gastightness of Concrete Structures"; serving as input for complementary studies; Task Group for the time being suspended

TG V/4: VIBRATIONS

Reporter: H. BACHMANN

Programme:

Definition of acceptable limits and preparation of analytical models for the computation of vibrations

Scheduled to start in 1985

TG V/5: Minimum Reinforcement starting

Reporter: A.W. Beeby

Programme:

- new concept for crack control (revision of MC78 provisions)

- attempting to differentiate:

  * normal functions: minimum reinforcement and advice on arrangement of bars instead of crack width calculations

  * special functions (e.g. tightness): recommendations for crack width calculations

Commission VI: DETAILING

Reporter: J. PERCHAT, G. SOMERVILLE

Programme:

Guidance and coordination of work in Task Groups and for the edition of the Manual on Detailing of Concrete Structures

Publications: see Task Groups

TG VI/1: ANCHORAGE ZONES

Reporter: R. TEPFERS

Programme:

Critical analysis of the Model code 1978 provisions: elaboration of relevant propositions for amendments

e.g. - splitting forces at splices and anchorages
- influence of concrete cover
- influence of transversal reinforcement

Publications:

1982: State-of-the-art report "Bond action and bond behaviour of reinforcement" CEB-Bull. N° 151

TG VI/2: OPENINGS IN SLABS AND WALLS disbanded

Reporter: Å. HOLMBERG

Programme:

Principles and rules for the arrangement of reinforcement in slab and wall openings not analysed by calculation

Publications:

1982: Final Report "Openings in Slags and Walls", CEB-Bull. N° 151

TG VI/3: DETAILING OF LIGHTWEIGHT CONCRETE disbanded

Reporter: R. TEWES

Programme:

Synthesis report on the detailing of lightweight structures in comparison to the intended Manual: Detailing

Reconsideration of the subject in view of the ongoing elaboration of this Manual under new aspects (CEB-Bull. N° 150) necessary

Task transferred to TG VI/4: Detailing of concrete structures

TG VI/4: DETAILING OF CONCRETE STRUCTURES

Reporter: J. SCHLAICH

Programme:

Elaboration of a Design Manual dealing with the theory, the principles and the practical application of detailing rules

Continuation of the work published in Bull. N° 150 (see below)

Publications:

1982: J. Schlaich, D. Weischede: "Ein praktisches Verfahren zum methodischen Bemessen und Konstruieren im Stahlbetonbau" published as CEB-Bull. N° 150 "Detailing of concrete structures - first draft of a design manual"

Commission VII: REINFORCEMENT: TECHNOLOGY AND QUALITY CONTROL

Reporter: J. CALAVERA, G. REHM

Programm:

Establishment of requirements of minimum uniform elongation of reinforcement to be required from the point of view of the designer

Influence of the form of steel stress-strain diagram on structural behaviour

Definition and establishment of reinforcement characteristical diagram

Revision of bond testing methods. Eventual proposal of a new method, considering the bonding exclusively as a physical property of the bar without connections with anchorage problems.

Publications: see Task Groups

TG VII/1: REQUIREMENTS FOR RC-BARS

Reporter: A. DELIBES

Progamme:

Common investigation on bond of 8,10 and 16 mm RC-bars in pull-out tests

Test method of welding of wire meshes

Publications:

1982: Revised editions of the RILEM/CEB/FIP-Recommendations for reinforcement steel for reinforced concrete
RC 2: Tensile test on reinforcement bars for reinforced concrete
RC 4: Rebend test for reinforcement steel
RC 5: Bond test for reinforcement steel: beam test
(CEB-News N° 61 and in CEB-Bull. N° 140)

1984: RC 6: Bond test for reinforcement steel: pull-out test
Recommendation: "Measuring of the Rib-Pattern of RC-bars"
(CEB-News: in print)

TG VII/2: QUALITY CONTROL OF RC-BARS

Reporter: D. RUSSWURM

Programme:

Elaboration of a certification scheme for production control and control on site of rc-bars and prestressing steels

Elaboration of test specifications (sampling-plans and assessment rules) for the characteristic values

At present under discussion:

Draft report "Quality Assurance System (Q.A.S.) for Concrete Reinforcement" containing:

- basic principles
- certification scheme for primary products
- delivery acceptance scheme
- modified delivery acceptance scheme for handling of reinforcing steel
- test methods and examples

TG VII/3: INDUSTRIALIZATION OF REINFORCEMENT

Reporter: R. ELIGEHAUSEN

Programme:

Synthesis report
List of contents:

- terminology
- parameters influencing the cost of reinforcement
- methods to reduce cost of reinforcement
- safety aspects
- tolerances
- annex: practical examples

Restricted publication of final draft: "Industrialization of Reinforcement in Reinforced Concrete Structures", distributed at the Prague Plenary Session, October 1983

Commission VIII: CONCRETE TECHNOLOGY AND QUALITY CONTROL

Reporters: H. WEIGLER, A.G. MESEGUER

Progamme:

Concrete properties other than strength - definitions, testing, control

Requirements on concrete other than strength

Remarks:

- Commission about to be reorganized
- Some topics (as e.g. "curing of concrete" and "influence of technological parameters on concrete deformability") will be entrusted in the meantime to a new Task Group

TG VIII/1: QUALITY CONTROL OF CONCRETE — suspended

Reporter: H. LAMBOTTE

Programme:

Manual for quality control of concrete

Commission IX: BEHAVIOUR, MAINTENANCE AND REPAIR

Reporter: A. MOGARAY, L. YAM

Programme:

Collection of information
- engineering structures
- buildings

Analysis
- types of damages (e.g. material deterioration, deformation, cracking, collapse)
- causes of damages (e.g. planning and design, execution, use, aging, excessive laoding, hazards)
- non damaged structures

Practical recommendations for
- planning and design
- execution
- use

Publications:

1980: Preliminary report "Comportement en service, entretien et réparations", CEB-Bull. N° 138

1983: Conclusions drawn by Commission IX: "Enseignements dégagés par la Comm. IX "Comportement en service, entretien et réparations" (contents → see Task Groups); CEB-Bull. N° 163

Remarks:
Commission about to be reorganized in view of intended structuring of CEB's activities in the field of life time aspects of concrete structures (→ see Task Groups)

TG IX/1A: ANALYSIS OF STRUCTURAL DAMAGES - ENGINEERING STRUCTURES

Reporter: J.P. TEYSSANDIER

Programme:

See Commission IX

Publications:

1983: E.F. Radogna: "Some relevant stages of international activity on behaviour in service, maintenance and repair of concrete bridges" (contribution to CEB-Bull. N° 163)

J.P. Teyssandier: "Lessons from observations of existing bridges" report of TG IX/1A, in CEB-Bull. N° 163

Remarks:

TG about to be reorganized (see above), possible formation of a new group ensuring the feed-back of information on the behaviour of buildings and bridges

TG IX/1B: BUILDINGS — inactive

Reporter: L. YAM

Programme:

Same as TG IX/1A for buildings

Publications:

1980: C.C.P. YAM, A.C. Walker: "International investigation of structural failures (addendum to CEB-Bull. N° 138)

TG IX/2: MAINTENANCE AND DIAGNOSIS OF CONCRETE STRUCTURES

Reporter: D. POINEAU

Programme:

Elaboration of synthesis report dealing with
- control of structures under service conditions
- structural investigations under service conditions
- diagnosis
- maintenance
- practical recommendations

Publications:

1983: Report on diagnosis and the process of subsequent decision finding published in Bull. N° 163:
D. Poineau: "Diagnostic et processus de décision"

Remarks:

Task Group about to be reorganized. Future General Task Group 19 "Diagnosis and Assessment of Concrete Structures" will also cover the surveillance policy to be established as needed for a feed-back to the design philosophy.

GTG/1: COMPLEMENTS	disbanded
Reporter: J. PERCHAT	
Programme: Development of the first draft "Complements" (CEB-Bull. N° 130, April 1979) in the sense of the technical resolution passed at the Rome Plenary Session in May 1979. Publications: 1980: "Complements to the CEB/FIP Model Code 1978" Final draft, CEB-Bull. N° 137, in English and French language 1981: "Compléments au Code-Modèle CEB-FIP 1978" (Version finale en français, CEB-Bull. N° 139-F)	
GTG/2: APPLICATION OF THE MODEL CODE	
Reporter: M. MIEHLBRADT	
Programme: Preparation of a Manual; interpretation of Model Code; simplified design; trial and comparison calculations (TCC)	
GTG/3: SEISMIC DESIGN OF CONCRETE STRUCTURES	disbanded
Reporter: P.E. PINTO	
Programme: Preparation of an appendix to the Model Code: "Seismic design of concrete structures", containing minimum design requirements for seismic situations Publications: 1980: "Seismic design of concrete structures" - preliminary draft of an appendix to the CEB-FIP Model code, CEB-Bull. N° 133 1982: "Seismic design of concrete structures" - second draft, CEB-Bull. N° 149 1983: "Model Code for seismic design of concrete structures" 1 - Final draft, CEB-Bull. N° 160 2 - Trial calculations, CEB-Bull. N° 160 Bis	

GTG/4: FIRE DESIGN OF CONCRETE STRUCTURES

Reporter: K. KORDINA

Programme:

Developping of the appendix to the Model code published in Bulletin N° 145

Future Model Code on design of concrete structures for fire resistance

Preparation of a Design Handbook for unification and facilitation of practical design work based on this code

Publications:

1982: "Design of concrete structures for fire resistance"
Preliminary draft of an appendix to the CEB-FIP Model Code, CEB-Bull. N° 145

Remarks:

Members of former FIP Commission were invited and accepted to continue within GTG/4

GTG/5: PERFORMANCE CRITERIA OF CONCRETE STRUCTURES disbanded

Reporter: G. THIELEN

Programme:

Conceptional preparation of future technical guidance documents:

* Codes versus recommended practice
* Performance requirements
* Behaviour Models
* Classification and presentation

Publications:

1982: G. Thielen: "A Rational Concept for a Performance Based Representation of Regulatory Documents", CEB-Bull. N° 147

GTG/6: MULTIAXIAL BEHAVIOUR OF PLAIN CONCRETE disbanded

Reporter: J. EIBL

Programme:

Definition of concrete strength under multiaxial stresses, description of constitutive equations for concrete, recommendation of failure criteria, report on experimental results

Publications:

1983: "Concrete under multiaxial states of stress - constitutive equations for practical design", CEB-Bull. N° 156

GTG/7: APPLICATION OF LEVEL-II-METHODS	disbanded
Reporter: A. GIUFFRE	
Programme: Analysis of realistic design problems in connection with various Commissions Publications: 1982: In collaboration with Permanent Commission II (→ publications Comm. II, contribution 3.1, Cauvin/Moosecker)	

GTG/8: STRUCTURAL EFFECTS OF TIME-DEPENDENT BEHAVIOUR OF CONCRETE	disbanded
Reporter: M.A. CHIORINO	
Programme: Preparation of a design manual Publications: 1984: (in print): "Manual: Structural effects of time dependent behaviour of concrete" CEB-Bull. N° 142	

GTG/9: EVALUATION OF TIME DEPENDENT BEHAVIOUR OF CONCRETE
Reporter: H. HILSDORF
Programme: Step I: Optimization of present Model Code formulations for the prediction of concrete creep and shrinkage * Preparation of list of experiments on creep and shrinkage for joint ACI/CEB data bank * Optimization of CEB-formulations * Comparison with the results of other prediction methods Step II: * Review of general approach and basic concepts of CEB-formulations * Development of improved formulations

GTG/10: RESPONSE OF STRUCTURAL CONCRETE CRITICAL SECTIONS UNDER HIGH LEVEL REVERSED ACTIONS	disbanded
Reporter: T.P. TASSIOS	

Programme:

Preparation of a state-of-the-art report dealing with material behaviour; members subjected to axial loads, combined bending, shear, structural connections

Publications:

1983: "Response of reinforced concrete critical regions under large amplitude reversed actions", CEB-Bull. 161

GTG/11: DESIGN OF CONNECTIONS OF PREFABRICATED ELEMENTS

Reporter: B. LEWICKI

Programme:

Preparation of a guidance document dealing with the resistance, rigidity and detailing of structural connections in large panel structures and precast frames

Publications:

1983: Internal discussion of 3rd draft

Remarks:

Scope of work to be enlarged to precast slabs, constructions with tunnel-framework

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GTG/12: ASSESSMENT OF EXISTING CONCRETE STRUCTURES AND DESIGN PROCEDURES FOR THEIR UP-GRADING	disbanded
Reporter: T.P. TASSIOS	

Programme:

State-of-the-art report dealing with the

- diagnosis of damaged concrete structures
- repair procedures and corresponding
- verification methods

Publications:

1983: "Assessment of concrete structures and design procedures for up-grading (re-design)", CEB-Bull. N° 162

Remarks:

Work to be continued in GTG/21

GTG/13: DESIGN VALUE FORMAT

Reporter: G. KÖNIG

Programme:

Problems of daily design work which are not sufficiently well understood up to now:

- load combinations
- level II techniques for system analysis
- uncertaincies in the mechanical model and possible simplifications
- time-variant problems (creep, fatigue, corrosion)
- reference period, limit states to be checked
- study of a design value concept as an alternative to partial safety factor formats; transition between formats; consequences for load and material codes

Remarks:

First results expected for 1987

Final results at long range

GTG/14: CONCRETE STRUCTURES UNDER IMPACT AND IMPULSIVE LOADING

Reporter: J. EIBL

Programme:

Development of practical recommendations for the design of concrete structures

- definition of hard and soft impact, modelling of the acting forces
- basic material variables for modelling target-projectile interaction zone
- analytical evaluation of dynamic effects on concrete and reinforcement
- dimensioning and detailing
- structural protection against vehicle impact, airplane crash, ship collision
- protection of special structures as bridge piles, off-shore structures, containments

Remarks:

Started at Prague, October 1983

GTG/15: FATIGUE OF CONCRETE STRUCTURES

Reporter: to be nominated

Programme:

Starting from a

- review of the state-of-the-art a
- synthesis of knowledge from a designer's point of view should lead to
- practical guidance by
  - . classification of fatigue phenomena
  - . classification of effects of action
  - . service life concept
  - . structural detailing
  - . inspection and monitoring

Remarks: Not yet started

GTG/16: STRUCTURE AND DEVELOPMENT OF FUTURE TECHNICAL GUIDANCE DOCUMENTS
Reporter: G. THIELEN
Progamme: Definition of the scope and identification of the contents of future technical guidance documents for the design of concrete structures Remarks: - General report to the Prague Plenary Session showing the practical consequences of the performance approach demonstrated on the basis of a design example treating partially prestressed concrete - Reference to performance based guidance documents for seismic and fire design - Demand for discussion of particular problems related to the performance approach at the meeting of the Advisory Committee

GTG/17: DESIGN OF PRESTRESSED STRUCTURES	planned
Proposed reporter: M. KAVYRCHINE	
Terms of reference to be elaborated for the Administrative Council meeting in Stuttgart, May 84. Problems mentioned in report A. Mogaray and e.g. partial prestressing, bonded and unbonded tendons, time effects on bond, prestressed pre-tensioned tendons, detailing of anchorages, dimensioning of shear, etc.	
GTG/18: DESIGN OF PRECAST STRUCTURES MADE OF LINEAR MEMBERS	planned
Proposed reporter: M. MENEGOTTO	
Terms of reference to be elaborated for the Administrative Council meeting in Stuttgart, May 84. Including: development of complementary Model Code provisions: modelling, dimensioning of connections of linear precast elements, tolerances, particular aspects of liability in the design of precast linear structures, etc	
GTG/19: DIAGNOSIS AND ASSESSMENT OF CONCRETE STRUCTURES	planned
Proposed reporter: H.H. GOTFREDSEN	
Terms of reference to be elaborated for the Administrative Council meeting Stuttgart, May 1984	

GTG/20: DURABILITY	planned
Reporter: S. ROSTAM	
Planned to continue the work of former TG V/1	
GTG/21: RE-DESIGN OF CONCRETE STRUCTURES	planned
Reporter: to be nominated	
Continuation of former GTG/12	
GTG/22: BEHAVIOUR AND ANALYSIS OF CONCRETE STRUCTURES UNDER LARGE CYCLIC ACTIONS	
Proposed reporter: P.E. PINTO	planned
Programme: In collaboration with existing Commissions and in some respects continuing the work of the former General Task Groups 3 and 10: critical collection and diffusion (by state-of-the-art reports) of basic and applied scientific knowledge on the behaviour of component materials, elements and structures of reinforced concrete under large reversed actions * analysis of their structural response, including past elastic states of stress and strain * revision of the Seismic Model Code	

ANLAGE 7

TRAGWERKE AUS STAHLBETON UND SPANNBETON DAS CEB AUF DEM WEG ZUR MUSTERVORSCHRIFT DER NEUNZIGER JAHRE

von R. Tewes

Auszug aus:

Werkstoff und Konstruktion

Prof. Dr.-Ing. Gallus Rehm

zum

60. Geburtstag

Beiträge aus der Forschungs- und Ingenieurtätigkeit
von ehemaligen und jetzigen Mitarbeitern des Instituts für Werkstoffe
im Bauwesen an der Universität Stuttgart (IWB)
und der Forschungs- und Materialprüfungsanstalt Baden-Württemberg
– Otto-Graf-Institut – (FMPA)

Oktober 1984

TRAGWERKE AUS STAHLBETON UND SPANNBETON - DAS CEB AUF DEM WEG ZUR MUSTERVORSCHRIFT DER 90-ER JAHRE

Von R. Tewes

1. EINLEITUNG

Dem 1953 gegründeten CEB gehören heute mehr als 30 Mitgliedsländer vor allem im europäischen Raum, jedoch auch in Mittel- und Südamerika, dem Nahen Osten und Japan mit ihren nationalen Delegationen an. Außerdem gibt es seit einigen Jahren auch die Möglichkeit einer direkten außerordentlichen Mitgliedschaft für natürliche oder juristische Einzelpersonen.

Zielsetzung des CEB war und ist die Umsetzung der sich ständig erweiternden wissenschaftlichen Erkenntnisse und technologischen Fortschritte auf dem Gebiet des konstruktiven Betonbaus in praktische Empfehlungen. International besetzte Kommissionen und Arbeitsgruppen, deren Mitglieder - nach Empfehlung durch die jeweilige nationale Delegation - aus Forschung, Praxis oder Bauaufsicht kommen, erarbeiten die Ergebnisse, die in einer eigenen Schriftenreihe, den "CEB-Bulletins d'Information" veröffentlicht werden. Aufbauend auf diesen Arbeiten wurde 1978 die zur Zeit geltende CEB/FIP-Mustervorschrift für Tragwerke aus Stahlbeton und Spannbeton veröffentlicht /1/.

Über die sich daraus ergebende Vereinheitlichung technischer Regelwerke in den Mitgliedsländern und die sich daran anschließenden Aufgabenstellungen, wie

- Anwendung der Mustervorschrift, ihre Erläuterung durch Beispiele und Handbücher
- Erweiterung des Anwendungsbereiches auf Berechnung, Bemessung und konstruktive Durchbildung von Betonbauwerken unter außergewöhnlichen Einwirkungen (wie z.B. Erdbeben, Brand)
- Verbesserung und Weiterentwicklung des wissenschaftlichen und technologischen Kenntnisstandes als Grundlage für den Inhalt zukünftiger technischer Regelwerke
- Erarbeitung eines verbesserten konzeptionellen Aufbaus zukünftiger technischer Regelwerke

hat der Vorgänger des Verfassers mit Stand vom Sommer 1982 in der Fachpresse berichtet /2/. Ziel der hier anschließenden Ausführungen ist es daher, die inzwischen gemachten Fortschritte der Arbeiten aufzuzeigen sowie die Zielvorstellungen zu erläutern, die während der letzten Vollversammlung in Prag im Oktober 1983 und vor allem anläßlich der Tagung des Beratenden Komitees in Stuttgart im Mai 1984 geprägt wurden. Dabei erscheint es angebracht, zunächst dem weniger informierten Leser kurz vorzustellen, wie die im CEB geleistete Arbeit der Fachöffentlichkeit zur Verfügung gestellt wird.

2. CEB-VERÖFFENTLICHUNGEN

Die technischen Arbeitsergebnisse der ständigen CEB-Kommissionen oder der ihnen zugeordneten oder selbständigen Arbeitsgruppen werden in Form von Arbeitsberichten ("progress reports"), Sachstandsberichten ("state-of-art-reports") oder übergreifenden, zusammenfassenden und wertenden Berichten ("synthesis reports") in der Regel nach ihrer Billigung durch die Kommission oder den Verwaltungsrat als "Bulletin d'Information" publiziert. Diese broschierten Hefte im DIN-A4-Format werden allen CEB-Mitgliedern und Abonnenten zugesandt und ihr Inhalt damit zur Diskussion gestellt. Sie stehen - auf Anfrage beim Sekretariat - auch Nichtmitgliedern des CEB gegen eine Druck- und Versandkostenbeteiligung zur Verfügung.

Aus diesen Ergebnissen erarbeitete technische Leitfäden werden nach Genehmigung durch den CEB-Verwaltungsrat - der hierzu auch das Beratende Komitee hören kann - in ihrer endgültigen Form entweder wiederum als Bulletin d'Information oder als separate Broschüre veröffentlicht. Die Mustervorschrift selbst ("Model Code"), eventuelle Anhänge dazu oder parallel herausgegebene Regelwerke sowie die erläuternden Handbücher erscheinen - nach Genehmigung durch die etwa alle eineinhalb Jahre zusammentretende Vollversammlung - als gebundene Bücher, die damit auch im freien Buchhandel erhältlich sind. Selbstverständlich werden sie außerdem in die Schriftenreihe des "Bulletin d'Information" integriert und damit auch allen Mitgliedern und Abonnenten zugesandt. Eine Übersicht dieser Ratifizierungs- und Veröffentlichungsmodalitäten gibt Bild 1.

	Ratification by			Publication as		
	Comm. or GTG	Admin. Council	Plenary Session	Bulletin < or >	Leaflet	Book
Model Code			▓			▓
Annex to MC			▓			▓
Manual			▓			▓
Technical Guidance Document	▓	▓		▓	▓	
Synthesis Report	▓			▓		
State-of-art Report	▓			▓		
Progress Report	▓			▓		

Bild 1: Ratifizierung und Veröffentlichung der CEB-Arbeiten

Weitere Informationen, die sich in erster Linie an CEB-Mitglieder wenden, z.B. bezüglich des Fortschritts der Arbeiten, der Programme und Ergebnisse von CEB-Vollversammlungen, werden als "CEB-News" versandt.

3. VOLLVERSAMMLUNG PRAG, OKTOBER 1983

Herausragende Ereignisse der letzten beiden Jahre - seit Sommer 1982 - waren das Treffen des Beratenden Komitees in Stuttgart im Mai 1984, über das weiter unten berichtet werden soll und die 23. Vollversammlung des CEB, die vom 4. bis 8. Oktober 1983 in Prag stattfand. Etwa 200 Teilnehmer aus 27 Ländern berieten und diskutierten in den fünf technischen Sitzungen zu den Themenkreisen: Anwendung der 1978er CEB/FIP-Mustervorschrift, deren Erweiterung auf außergewöhnliche Beanspruchungen (wie Erdbeben, Feuer, Stoßbeanspruchung und Ermüdung), Vorbereitung künftiger technischer Regelwerke, Sondergebiete der Berechnung und Bemessung sowie Fragen im Zusammenhang mit der Lebensdauer von Betonbauwerken. Die von der Vollversammlung unmittelbar gefaßten Beschlüsse ("Resolutionen" genannt) wurden zusammen mit den anderen Ergebnissen der Prager Beratungen in den CEB-News veröffentlicht /3/.

Eine weitere Ausgabe dieser Schriftenreihe /4/ gab darüber hinaus die teilweise sehr aufschlußreichen Beiträge von Referenten aus 20 Ländern wieder, die in der einleitenden Sitzung über die mit der 1978-er Mustervorschrift gemachten Erfahrungen im Hinblick auf eine vollständige oder teilweise Übernahme in das nationale Normenwerk sowie die dabei auftretenden Schwierigkeiten und Verbesserungsmöglichkeiten berichtet hatten.

Weiterhin wurde in Prag - als Anhang zur Mustervorschrift 1978 - der nach dem Performance-Konzept aufgebaute Entwurf einer CEB-Mustervorschrift für die Bemessung bei Erdbebenbeanspruchung verabschiedet /5/. Die vorgelegten Arbeitsprogramme für die Bemessung von Tragwerken gegen stoßartige, Brand- und Ermüdungsbeanspruchungen wurden gebilligt und die entsprechenden selbständigen Arbeitsgruppen - sog. "General Task Groups", die nicht einer der neun ständigen Kommisionen, sondern direkt dem Verwaltungsrat zugeordnet sind - aufgefordert, geeignete Bemessungsunterlagen zu erarbeiten.

Eine besondere Bedeutung kommt der konzeptionellen Vorbereitung künftiger technischer Regelwerke zu. Die bestehende Arbeitsgruppe wurde dementsprechend gebeten, ihre Vorstellungen in eine im Rahmen des Beratenden Komitees zu führende Diskussion einzubringen.

Das von der der Kommission I zugeordneten Arbeitsgruppe "Quality Assurance" vorgelegte Bulletin /6/ wurde als Grundlage für weiterführende Arbeiten einer neu zu gründenden Arbeitsgruppe gebilligt, der gleichzeitig der Auftrag gegeben wurde, ein praktisches Beispiel mit detaillierten Beschreibungen der Qualitätssicherungsmaßnahmen und Vorgehensweisen für ein Bauobjekt mittlerer Größe zu erarbeiten.

Der Schlußbericht der Arbeitsgruppe zum Verhalten von kritischen Bereichen in Stahlbetontragwerken unter Wechselbeanspruchungen mit großen Lastamplituden /7/ wurde zustimmend angenommen und eine Fortsetzung der Arbeiten im Hinblick auf die Berechnung von Bauwerken und die Erstellung von Bemessungshilfen empfohlen. Als weitere in Prag vorgestellte und gebilligte Beiträge aus dem Themenkreis der Sondergebiete in Berechnung und Bemessung seien genannt: der abschließende, zusammenfassende und wertende Bericht über Beton unter mehrachsiger Beanspruchung /8/, der Arbeitsbericht der Kommission "Knicken und Instabilität" /9/, der Bericht zur Anwendung der Methode der Finiten Elemente auf Flächentragwerke aus Beton /10/ sowie die Zusammenstellung vereinfachter Verfahren zur Berechnung der Kurzzeitverformungen von Stahlbetonplatten /11/.

Eine besondere Betonung erfuhr der Themenkomplex Dauerhaftigkeit, (Wieder-) Instandsetzung und erneute Bemessung (auch als "Umbemessung" bezeichnet) bestehender Bauwerke. Die hierzu vorgelegten Abschlußberichte der entsprechenden Arbeitsgruppen und Kommissionen zum Gebrauchsverhalten, der Unterhaltung und Instandsetzung /12/ sowie zur Beurteilung der (Rest-) Tragfähigkeit bestehender Stahlbetontragwerke und der Verfahren zur erneuten Bemessung (nach Instandsetzung oder Verstärkung) /13/ wurden einstimmig als Grundlage für fortführende Arbeiten dieser Zielsetzung begrüßt, die nach weiterer Diskussion im Beratenden Komitee in Angriff genommen werden sollten (siehe unten).

Es wurde deutlich, daß mit diesen Veröffentlichungen in Prag eine Reihe von Aktivitäten ihren Abschluß gefunden hatten, die 1979 bei der Vollversammlung in Rom und der damals erfolgten Neuorientierung des CEB bzw. im darauffolgenden Jahr in Angriff genommen worden waren. Der Einladung der deutschen Delegation folgend wurde das Beratende Komitee für Mai 1984 nach Stuttgart einberufen, um dort auf der Grundlage einer Bestandsaufnahme der zur Zeit laufenden und geplanten Aktivitäten für die Arbeit der nächsten Jahre Prioritäten setzen zu können.

4. MUSTERVORSCHRIFT 1990: BESTIMMUNG DER SCHWERPUNKTE KÜNFTIGER CEB-ARBEITEN ANLÄSSLICH DES TREFFENS DES BERATENDEN KOMITEES, STUTTGART, MAI 1984

Aus einer zur Vorbereitung dieses Treffens erstellten Übersicht /14/ über die seit 1979 geleisteten Arbeiten wurden die Tafeln 2 und 3 entwickelt, die alle seit jenem Zeitpunkt gebildeten Gruppen sowie die Dauer ihrer Aktivitäten erkennen lassen. Dabei wurden auch Planungen der jüngsten Zeit mit aufgenommen. Die Ergebnisse der Beratungen und die sich daraus ergebende Gewichtung für die zukünftigen CEB-Arbeiten sind im folgenden zusammengefaßt. Dabei wurde von der einstimmig getroffenen Entscheidung ausgegangen, daß gegen Ende dieses Jahrzehnts eine Neuausgabe der Mustervorschrift herausgegeben werden sollte. Der hierzu erforderliche Vorlauf in der Arbeit der Kommissionen und Gruppen macht eine umgehende Inangriffnahme sowohl der Überarbeitung des gegenwärtigen Inhalts der Mustervorschrift als auch der Ausarbeitung der als notwendig erachteten Erweiterungen und Ergänzungen erforderlich.

CEB-PERMANENT COMMISSIONS AND RELATED TASK GROUPS

Comm./TG	TITLE	79	80	81	82	83	1984: actual state
Comm. I	RELIABILITY AND QUALITY ASSURANCE						continuing
TG I/1	Quality Assurance						*disbanded*
TG I/2	Design by Testing						starting
TG I/3	Qual.Ass. programme for medium size proj.						starting
Comm. II	STRUCTURAL ANALYSIS						continuing
TG II/1	Thermal Design						continuing
TG II/2	Design of Slabs						*disbanded*
TG II/3	Basic Behaviour of 2-Dim. Elements						*inactive*
Comm. III	BUCKLING AND INSTABILITY						continuing
TG III/1	Simplified Methods						continuing
TG III/2	Instability of Walls						continuing
TG III/3	Instability of Exceptional Structures						continuing
Comm. IV	MEMBERS DESIGN						continuing
TG IV/1	Shear in Prestressed Concrete Members						continuing
TG IV/2	Torsion under Combined Actions						*disbanded*
TG IV/3	Punching						continuing
Comm. V	SERVICEABILITY						continuing
TG V/1	*Durability*						continuing
TG V/2	Manual: Cracking and Deformations						*disbanded*
TG V/3	Liq. and Gastightness of Concr.Struct.						*suspended*
TG V/4	Vibrations						starting
TG V/5	Minimum Reinforcement						starting
Comm. VI	DETAILING						continuing
TG VI/1	Anchorage Zones						continuing
TG VI/2	Opening in Slabs and Walls						*disbanded*
TG VI/3	Detailing of Lightweight Concrete						*disbanded*
TG VI/4	Detailing of Concrete Structures						continuing
Comm. VII	REINFORCEMENT: TECHNOLOGY & QUAL.CONTR.						continuing
TG VII/1	Requirements for Rc-Bars						continuing
TG VII/2	Quality Control of Rc-Bars						continuing
TG VII/3	Industrialization of Reinforcement						continuing
TG VII/4	Recomm. for Welded Splices of Reinf.Steel						planned
TG VII/5	Ductility Requirements for Reinf.Steel						planned
Comm. VIII	CONCRETE: TECHNOLOGY AND QUALITY CONTROL						*to be reorganized*
TG VIII/1	Quality Control of Concrete						*suspended*
Comm. IX	BEHAVIOUR, MAINTENANCE AND REPAIR						*to be reorganized*
TG IX/1A	Analysis of Structural Damages						*to be reorganized*
TG IX/1B	Building						*inactive*
TG IX/2	Maintenance & Diagn. of Concr.Struct.						*to be reorganized*

Tafel 2: Ständige Kommissionen und zugehörige Arbeitsgruppen im CEB

CEB - GENERAL TASK GROUPS

GTG	TITLE	79	80	81	82	83	1984: actual state
1	COMPLEMENTS						*disbanded*
2	APPLICATION OF MODEL CODE						continuing
3	SEISMIC DESIGN OF CONCRETE STRUCTURES						*disbanded*
4	FIRE DESIGN OF CONCRETE STRUCTURES						continuing
5	PERFORMANCE CRITERIA OF CONCRETE STRUCTURES						*disbanded*
6	MULTIAXIAL BEHAVIOUR OF PLAIN CONCRETE						*disbanded*
7	APPLICATION OF LEVEL II-METHODS						*disbanded*
8	STRUCT. EFFECTS OF TIME-DEP. BEHAVIOUR OF CONCR.						*disbanded*
9	EVALUATION OF TIME-DEPENDENT BEHAVIOUR OF CONCRETE						continuing
10	RESPONSE OF STRUCTURAL CONCRETE CRITICAL SECTIONS UNDER HIGH LEVEL REVERSED ACTIONS						*disbanded*
11	DESIGN OF CONNECTIONS OF PREFABRICATED ELEMENTS						continuing
12	ASSESSMENT OF EXISTING CONCRETE STRUCTURES AND DESIGN PROCEDURES FOR THEIR UP-GRADING						*disbanded*
13	DESIGN VALUE FORMAT						starting
14	CONCR.STRUCT. UNDER IMPACT AND IMPULSIVE LOADING						continuing
15	FATIGUE OF CONCRETE STRUCTURES						starting
16	STRUCT. AND DEVELOPM. OF FUTURE REGULATORY DOCUM.						continuing
17	DESIGN OF PRESTRESSED STRUCTURES						starting
18	LINEAR PREFABRICATED ELEMENTS						starting
19	DIAGNOSIS AND ASSESSMENT OF CONCRETE STRUCTURES						starting
20	DURABILITY AND SERVICE LIFE						continuing
21	RE-DESIGN OF CONCRETE STRUCTURES						planned
22	BEHAVIOUR AND ANALYSIS OF CONCRETE STRUCTURES UNDER LARGE CYCLIC ACTIONS						planned

Tafel 3: Dem CEB-Verwaltungsrat direkt verantwortliche Arbeitsgruppen

Der erste Entwurf eines Rahmenplans vermittelt einen Begriff vom geplanten zeitlichen Ablauf (Bild 4).

May 1984 - May 1985	review of current code, brainstorming collection of all new available knowledge, scientific input, identification of gaps, mistakes, desired changes, new needs, etc. from all Commissions and Task Groups
June 1985	Plenary Session Rotterdam, possibly occasion for first exchange of ideas
June 1985 - December 1985	definitive indications of revisions, diffusion of the available material, discussions in Permanent Commissions, Administrative Council, Advisory Committee
January 1986 - June 1986	first practical formulations for amendments, first drafting of new texts
first half of 1986	programme meeting (as e.g. Athens 74 for MC 78) probable creation of an editing "horizontally working" committee
1986 - 1989	horizontal exchange of proposals, comments, criticism etc, implementation process, editing

Bild 4: Rahmenzeitplan zur Fertigstellung der Mustervorschrift 1990

Die Diskussionen zeigten, daß der Charakter eines Referenzdokuments für nationale Normungsorganisationen - jedoch mit klaren, auch unmittelbar praktisch anwendbaren Regelungen - erhalten bleiben sollte.

Dabei werden Form und Aufbau dieser Mustervorschrift in Zukunft auf der Grundlage der ersten konkreten Vorschläge noch ausdiskutiert werden müssen. Insbesondere die Forderung nach einer Begrenzung des Umfangs muß zu Entscheidungen führen, was im einzelnen in die Vorschrift selbst aufgenommen und was Begleitdokumenten, wie Kommentaren und Handbüchern, zugewiesen werden kann.

Die Erweiterung des Anwendungsbereiches auf außergewöhnliche Beanspruchungen ist oben bereits angesprochen worden. Die Arbeiten laufen zur Zeit bereits, insbesondere in den selbständigen Arbeitsgruppen GTG 4 "Fire Design of Concrete Structures", GTG 14 "Concrete Structures Under Impact and Impulsive Loading", GTG 15 "Fatigue of Concrete Structures" (siehe Tafel 3). Neben der Fortführung dieser und dem bevorstehenden Abschluß der schon länger laufenden Arbeiten wurden dringliche neue

Prioritäten dort gesehen, wo die 1978-er Mustervorschrift der Ergänzung bedarf. Es sind dies:

- Fragen der Dauerhaftigkeit im Zusammenhang mit der vorgegebenen Lebens- oder Nutzungsdauer von Bauwerken ("life time aspects")
- Anwendung der Vorspannung
- Vorfertigung von Betonkonstruktionen
- Fragen der Qualitätssicherung

Hieraus ergab sich die Forderung nach Einrichtung einiger neuer Gruppen (siehe Tafeln 2 und 3).

Bis zu einer Neustrukturierung der Kommission IX werden mehrere selbständige, aber koordiniert arbeitende General Task Groups den Aufgabenbereich abdecken: Anwendungskriterien und -verfahren für die zur Zeit verfügbaren Beurteilungsmethoden zu erarbeiten, die eine Einschätzung des Bauwerkszustandes und der zu erwartenden (restlichen) Nutzungsdauer erlauben, ist das Gebiet der GTG 19 "Diagnosis and Assessment of Concrete Structures". Dabei werden die Bauwerke nach Typen unterschieden werden müssen (Straßenbrücken, andere Brücken, Gebäude usw.), jedoch soll zunächst für den bisher am besten dokumentierten Typ (Straßenbrücke) begonnen werden, Einschätzungsverfahren für bestehende Bauwerke in Abhängigkeit von den verfügbaren Informationen (Originalstatik, Belastungstests, Messungen am Bauwerk usw.) zu entwickeln.

Die Entwicklung geeigneter Regelungen zur Sicherung einer schon bei Entwurf, Berechnung und Konstruktion von neuen Bauwerken vorgegebenen Lebensdauer ist das Tätigkeitsfeld der GTG 20 "Durability and Service Life of Concrete Structures", die die Arbeit der früheren Arbeitsgruppe V/1 fortsetzt. Nahziel ist es hier, bis zur nächsten Vollversammlung im Juni 1985 in Rotterdam einen "Praktischen Leitfaden zur Errichtung dauerhafter Betonbauwerke" auszuarbeiten.

Eine weitere Gruppe (GTG 21 "Redesign of Concrete Structures") ist zur Zeit noch im Planungsstadium. Sie soll in Fortführung der von der GTG 12 erarbeiteten Ergebnisse /13/ auf längere Sicht versuchen, Regelungen zu erarbeiten, die eine Formulierung der Anforderungen, Kriterien und Bemessungsverfahren für Instandsetzung und Verstärkung von Stahl- und Spannbetonbauwerken erlauben. Ebenso erscheint es wünschenswert, die Rückkoppelung von Erfahrungen und Informationen zum Verhalten von Bauwerken im Laufe ihrer Nutzungsdauer sicherzustellen, wozu zu geeigneter Zeit die Errichtung einer Arbeitsgruppe erwogen werden sollte.

Die hinsichtlich der Behandlung von Spannbeton in der gegenwärtigen Mustervorschrift bestehenden Lücken wird die neu gegründete GTG 17 "Design of Prestressed Structures" in Zusammenarbeit mit den bestehenden Kommissionen zu schließen versuchen. Nach kritischer Durchleuchtung der gegenwärtigen Unzulänglichkeiten soll hier ein erster Formulierungsvorschlag für zukünftige Regelungen das Ziel der Arbeit sein.

Ähnliches gilt für die Behandlung der Vorfertigung. Nach den weitgehend abgeschlossenen Arbeiten der GTG 11 "Design of Connections of Prefabricated Elements" zur Bemessung und konstruktiven Durchbildung der Verbindungen, insbesondere im Großtafelbau, bedarf vor allem die Behandlung von aus linearen vorgefertigten Elementen errichteten Konstruktionen einer Überarbeitung und Ergänzung (GTG 18 "Linear Prefabricated Elements"). Auch das Gebiet der Brückenkonstruktionen in Segmentbauweise wird behandelt werden müssen.

Auf die sich innerhalb der Kommission I zur Zeit neu bildende Gruppe I/3 "Quality Assurance Programme For A Medium Size Project" wurde schon weiter oben hingewiesen. Die Bedeutung ihrer Aufgabenstellung wurde vorbehaltlos bejaht. Die Entwicklung zu weiterführenden, selbständigen und unmittelbar anwendbaren Leitlinien zur Qualitätssicherung, einschließlich der Ausdehnung dieser Sicherheitsphilosophie auf Risikosituationen wird im Zusammenhang mit der Überarbeitung der "Einheitlichen Regeln für verschiedene Bauarten und Baustoffe " /15/ und der weiteren Arbeit des Gemeinschaftsausschusses "Sicherheit von Tragwerken" (= JCSS = Joint Committee on Structural Safety) gesehen werden müssen, der die "Allgemeinen Grundlagen zur Festlegung von Sicherheitsanforderungen und zur Qualitätssicherung" /16/ erarbeitete.

5. SCHLUSSBEMERKUNG

Aus den gegenwärtigen Arbeiten und Zielsetzungen des CEB wurde unter besonderer Berücksichtigung neuerer Vorstellungen berichtet. Bewußt wurde manches nach wie vor Gültige weggelassen, so wurde beispielsweise die Arbeit der ständigen Kommissionen nur dort erwähnt, wo sie nicht bereits durch die zitierten Veröffentlichungen umfassend dokumentiert ist. Auch die fortschreitenden Arbeiten zu einem verbesserten Ordnungsprinzip für den Inhalt technischer Regelwerke (Stichwort: Performance-Konzept) sind daher nicht ausdrücklich erwähnt worden.

Das CEB steht an der Schwelle zu einer neuen Aufgabe: die gründliche Überarbeitung der Mustervorschrift erfordert eine umgehende Bestandsaufnahme der gegenwärtig erkennbaren Lücken, Fehler, wünschenswerten Veränderungen oder Weiterentwicklungen. Die Vollversammlung in Rotterdam vom 4. bis 7. Juni 1985 wird Gelegenheit zur Diskussion geben. Im Jahr darauf wird spätestens die Materialsammlung und -erarbeitung abgeschlossen werden, um bis zum Ende dieses Jahrzehnts die endgültige Formulierung, Verabschiedung und Herausgabe der Mustervorschrift 1990 erreichen zu können.

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