

Report to the General Assembly, Rotterdam, 6/6/1985

By R. Eligehausen, University of Stuttgart

The Session on "New Concepts in Detailing" was chaired by Mr. Short and organized by Mr. Somerville and myself. In the beginning five papers were delivered which were discussed en bloc after the coffee break (Fig. 1).

In the first paper I attempted to show the current situation in the Model Code. It can be characterized as follows:

While the provisions for anchorages and splices of ordinary reinforcement are fairly complete, some areas are not covered yet appropriately. They include the anchorage of pre-tensioned and post-tensioned prestressed reinforcement, the aspects of industrialization of reinforcement and the arrangement of the reinforcement in such cases as frame corners, corbels, etc.

Prof. Jirsa explained the current status and future needs for detailing provisions in ACI. The situation is much the same as in the Model Code. It is recognized inside ACI that a more general design philosophy is needed, which the designer can rely on in any situation. The ideas put forward in Bulletin 150 or by the new Canadian Code are studied extensively. He also stressed that in general the designer wants to have simple provisions and that provisions looked on by researchers as simple might be too complicated for designers.

Dr. Regan showed the strong connection between design - or better sizing the members - and detailing using some examples, namely the curtailment of flexural reinforcement in tension zones, opening corners of frames, deep corbels and deep beams. His arguments were very convincing. The current version of the Model Code could be improved to make the relationship very clear to the designer.

The next talk was given by Prof. Schäfer, sitting in for Prof. Schlaich, who could not come because of his duties as Dean of the Faculty of Civil Engineering at the University of Stuttgart. Prof. Schäfer showed the practical application of the method put forward in Bulletin 150 on two examples, a deep corbel and a frame structure with a concrete deck. He gave some guidance how to find suitable models. Unfortunately he could not discuss the dimensioning of the structure, due to time limits.

Dr. Tepfers explained the current work of TG VI/1. The task group is studying methods to design the anchorage zone of prestressed reinforcement and it has produced a new draft of Section 17 of the Model Code which mainly deals with anchorages and splices of ordinary reinforcement. In this draft a standard and a refined method for the design of anchorages and splices is proposed. While the standard method is practically identical with the provisions given in MC 78, the refined method takes the influence of a better confinement by cover and transverse reinforcement than the required minimum values into account. It should be mentioned that this proposal is still under discussion in the task group.

The technical coordinators proposed to structure the discussions as shown in Fig. 2, which was more or less followed in the session. Let me try to give a fair summary of the discussion.

Let me start with industrialization of reinforcement, because this topic is a little bit separated from the others. It was said in the discussion that the designer must not look for a solution that gives the optimum behavior of a structure, but for the most economical solution which ensures an adequate structural behavior. The proposals for the industrialization of reinforcement given in Bulletin 164 should be incorporated in the next Model Code. However, before doing so, it should be

checked again whether they are sufficiently backed up by theoretical and experimental studies.

There was a broad consensus that the strong connection between the three steps in the design - structural analysis, sizing of members and detailing the reinforcement - should be made very clear in a code. This can be done by using suitable models which fulfill the conditions of equilibrium and compatibility at least in an approximate way. The sizing of the members in strut models - these are the compression struts, the tension ties and the nods - must be done in such a way that the resultant structure fulfills the minimum requirements given in the Model Code in the serviceability limit state and the ultimate limit state. It must be shown by comparison with suitable test results that the models really ensure an adequate safety level before they can be incorporated in the new version of the Model Code. These aspects are summarized in Fig. 3, which was prepared by Dr. Hagberg.

There was a broad consensus about the requirements the models should fulfill. However, there was some disagreement whether the models are already advanced enough to use them in every case. More guidance seems to be needed for the finding of a model and the dimensioning of the members. However, it should be recognized that having a model might be better than leaving the designer without any guidance.

Prof. Collins explained the approach in the new Canadian Code. There the strut model is accepted, and the compatibility must be checked by the designer using some formulae given in the code. It was argued that it might be better to set reasonable limits on such models - such as inclination of the struts - so that the condition of compatibility is fulfilled and must not be checked by the designer.

Now we come to a crucial point, how much of the new proposals can be incorporated in the new edition of the Model Code. To speed up the work, Com. IV and VI have formed a kind of liason group which shall work out a text for the corresponding Sections of the Model Code. These proposals will then be discussed in the Com. IV and VI. Taking into account the time frame for the input of new ideas and the reservations expressed in the discussion, I believe that only a part of these ideas will be implemented in the new Model Code. Let's hope that this part is relatively big.

Altogether I think that this Special Discussion Session was a great success.

expected times:	FOURTH SESSION - PART A: NEW CONCEPTS in DETAILING <i>(Special Discussion Session)</i> Chairman: A. SHORT Techn. Coordinators: R. ELIGEHAUSEN and G. SOMERVILLE	Introductory Speakers:
14.30 - 16.00	* RATIONALE of DETAILING PROVISIONS in MC78 and IDENTIFICATION of MISSING ITEMS * CONCEPTS for FUTURE DETAILING PROVISIONS * CONSISTENT DESIGN and DETAILING * DETAILING with the aid of STRUT MODELS - PRACTICAL APPLICATIONS * ANCHORAGE ZONES in REINFORCED and PRESTRESSED CONCRETE STRUCTURES - NEW MODEL CODE CONCEPTS of TG VI/I	R. ELIGEHAUSEN J. JIRSA P. REGAN J. SCHLAICH R. TEPPERS
16.00 - 16.30	C O F F E E B R E A K	
16.30 - 18.00	D i s c u s s i o n	

Fig. 1: Time schedule for the special discussion session

- a) Relation between design and detailing
- b) Models
 - Aims
 - Problems
 - Areas not covered yet
- c) Industrialization of reinforcement
- d) Implementation in Codes
 - Standard and refined methods
 - General vs. specific provisions for details
 - Use of models in MC 89

Fig. 2: Topics of the discussion

- * Criteria for selection of models should be clear and agreed
- * Section areas to be used for checking of capacity should be defined unigdy (Ref. check of concrete in compression)
- * The models shall be compared with and verified by sufficiently ^{documented} tests (We have no guarantee for inteligible models being correct, taking all aspects into account)
Each model needs an experimental verification (Ref. the discussions which have been going on on corner reinforcement)
- * Reinforcement lay-out shall to the greatest possible extent comply with the requirments for an industrialized (cost-effective) reinforcement Ref. Bull. No. 164.
- * It shall be clarified how the SLS - criteria are met.

Fig. 3: Member Design: Requirements to Distance Models
(prepared by Dr. Hagberg)