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Introduction and Summary

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Pessimists think, that already in a near future architects, engineers and contractors will be more occupied with the existing structures - in strenghtening, repairing, restoring, transforming or demolishing them - than with the erection of new structures. In any way, for the benefit of existing and planned structures, there is in the whole world a growing interest in getting valuable lessons from the behaviour of our structures. So we have got, to our pleasure, a great number of contributions, and I will try to bring some system into the papers which have been selected for our seminary.

In the last time, more and more organisations of normally official or semi-official character are installed which deal with the registration and with satistical investigations about the reasons of b a d behaviour of structures. The first three contributions, presented by Mr. L o g e a i s , France, and Mr. M a h i e u , Belgium, show us results evaluated in such organisations.

The next group of papers, coming from Denmark (N i e l s o n), USA (B o u w k a m p) and Japan (M a e d a) are almost in the center of the topic. Not too scarce are to-day the possibilities to make measurements and other investigations on bridges or other structures which - after having served normally for some 20 or 30 years - are taken away because having become too narrow or too weak or by-passed in a new traffic situation. The lessons we get out of tests up to rupture on such buildings are highly interesting in two ways: first they include the whole impact of a realistic service - situation and secondly they don't show us only the weak points, i.e. the b a d behaviour, but also the g o o d behaviour of our structures! I think that especially Mr. Maeda in his contribution will point out very clearly this particular aspect.

The next dozen of papers is grouped with reference to the building materials: steel, concrete and timber. They show us case-studies of damages and strategies of repair or recommandations how to avoid such disorders.

The steel-group comprehends the contributions of Mr. H a l a s z (Hungary), Mrs. K a r n i k o v a (Cechoslovakia), Messrs. F i s h e r (USA), V a n d e p i t t e (Belgium), M e h u e (France) and B e y e r (Germany). Let me point out only two particularities: The strategy, which was adopted after careful investigations in the case-study exposed by Mr. Beyer was to do n o t h i n g and to accept the slightly transformed situation. This must be possible too! And in the paper of Mr. Vandepitte we will find a very original and sophisticated help for designers to avoid the described instabilities.

The concrete-group comprises contributions from France (Messrs. D a r p a s , P o i n e a u , V i r l o g e u x) from USA (Mr. B r e e n) and from Hungary (Mr. T r ä g e r). We find here of course our well known problem children like: bridges built by cantilever-method and the impact of deicing salt.

The timber-group contains two interesting contributions from USA presented by Messrs. V e r n a and S a n d e r s , showing, once more, the often unexpected possibilities of this very sympathetical building material.

Finally have been selected two contributions dealing with consolidation and restoration of historical monuments. The first, presented by Mr. S i g r a i (Hungary) concerns a remarkable steel structure of the last century, the Western Railway Station of Budapest and the second the world famous 15 centuries old Galata Tower of Istanbul. Mr. A r i o g l u speaking about. The technical problems connected to the restoration of ancient monuments are highly interesting and challenging. The engineer must leave prefabricated ideas and deal fundamentally with properties of materials like clay, brick, stone, mortrar, timber etc. and further with old and new technologies and their combination.

Now some general remarks: Not only the designer and the manufaturer of structures make mistakes which program possible bad behaviour into our buildings. The u s e r too is to be observed. He is responsible for the impact of chocs against bridges by to highly loaded vehicules (Mr. Mahieu speaking about) of ships against piers, the deicing-salt tragedy and finally for the progressive pollution of the air bringing a very severe some-times even catastrophic impact to our buildings, especially to precious ancient monuments.

But let me close nevertheless with our own mistakes; there remains enough to do. I wish to point out a specific category of errors in design which very often lead to bad cracks in concrete structures without normally being catastrophic. It deals with the problem, what really happens between the steel bars (prestresed or not) and the concrete in anchoring zones, in zones of supports or in zones where the forces are deviated, in frame corners and so on. We are too much fixed in simple model-thinking. One very common model is the Navier beam-flexion model. But this model is only accurate when the introduced forces had enough time, this means enough space and way to be distributed over the whole section. This is not the case

in the above mentioned zones and other models must be taken in consideration.

Dealing as an expert with damage problems, one is often surprised how poorly even experienced designers are aware of the real situation. But if one wants to make use of prestressed stirrups e.g., he s h o u l d be aware of what happens between bars and concrete and where it happens! Mr. Virlogeux is speaking to us about this problem.

Prof. S c h l a i c h of Stuttgart, within his activity in CEB, is preparing a handbook bringing a certain systematysation in this field. He has exposed us his ideas at Zurich recently; unfortunately he is not able to join us here. This handbook shall introduce by truss or frame analogy a restricted number of models permitting a better understanding of the flow of forces in this particular zones. I think this to be a very valuable effort and hope that we will get more detailed information about it in one of the next symposia of IABSE.

SUMMARY

The seminary "Lessons from the Behaviour of Structures" took place in the morning of september 4th 1980 in the Rittersaal of the Hofburg Vienna. Under the excellent guidance of the chairman, Mr. M a t h i e u , France, it has found great interest. The 21 registered contributions took the main part of the time. For free discussion, only twenty minutes remaind available, and the following contributions have been presented:

- Dr. A. T e d e s k o , USA, honorary member of IABSE, gives a precious information about "EPIC" Engineering Performance Information Center, Washingthon D.C.. This institution can be contacted by engineers and scientists for a wide range of problems connected with the behaviour of structures

- Dr. H. T r ä g e r , Hungary, refers to the contribution of Mr. Mahieu. According to experiences in Hungary, he proposes soft portals which get only partly damaged for the detection of too higly loaded vehicles

- Prof. M. I v a n y i , Hungary, refers to the contribution of Prof. Halasz. Plate buckling has a strong influence on load-carrying and deflection capacity of frames. By means of plastic hinge concept taking into account the plate buckling as well, both, load-carrying and deflection capacity can be analysed

- Prof. M. Y a m a d a , Japan, too, refers to the contribution of Prof. Halasz, which he completes by his own experiences carried out in Japan. He points out the influence of the cumulation of axial deformations in the columns on the bearing capacity of steel frames

- Dr. D a r v a s , Hungary, refers to the contribution of Prof. Maeda, and shows experiences with composit girder bridges in Hungary. The construction of composite steel bridges is economical in the range of 50-100 m spans. In order to improve the economy, box sections, modern erection methods, stressing of the steel structure by means of cables, precast deck slabs and field welded connections are used

- Prof. P. F e r e n c i k , CSSR, shows an analysis of the stress distribution in the anchoring zone of prestressed steel girders. The theoretical results are verified on test girders

- Mr. S c h r e c k , GFR, proposes specially implemented isostatic systems to avoid temperature cracks in concrete structures

- Mr. T. J a v o r , CSSR, refers to the activity of the RILEM "Comittee for long-time experience" and shows longterm observations on prestressed concrete bridges built by cantilever system.

The c o n c l u s i o n is made by the co-chairman Prof. K r a p f e n b a u e r , Vienna. He summarizes briefly the registered contributions. The topic is too wide and versatile for permitting general remarks and recommendations. The main interest was to get experiences on the behaviour of structures and different strategies of observation, repair and prevention of damages from countries all over the world.