Posters

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STUDI di BARI
FACOLTA' di INGEGNERIA
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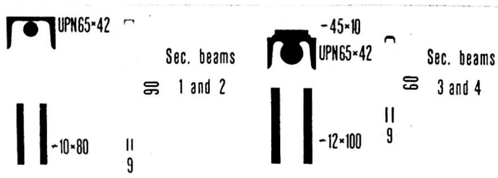
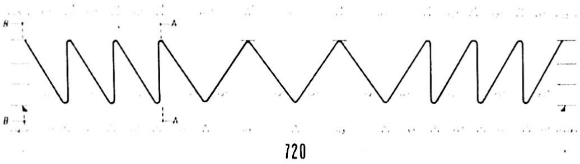
viale Japigia, 182 Bari (Italy)

TRIALS ON BEAMS IN METAL TRESTLE BURIED IN CONCRETE

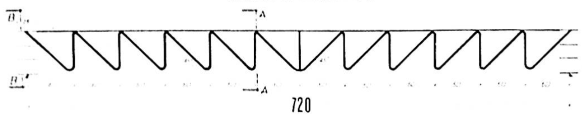
G. DONATONE - G. FRADDOSIO - A. SOLLAZZO



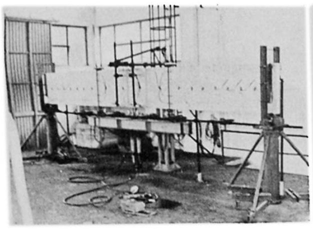
TRESTLE OF THE BEAMS 1-2

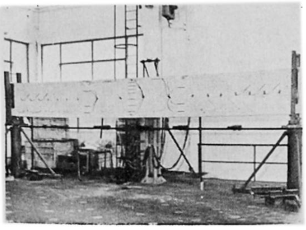


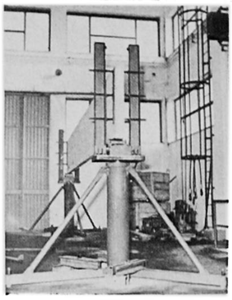
TRESTLE OF THE BEAMS 3-4



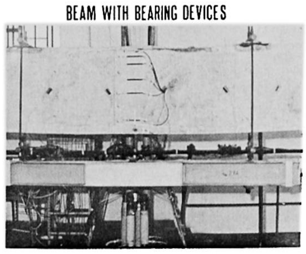
LOAD DEVICES AND BEAM AFTER CRACKING



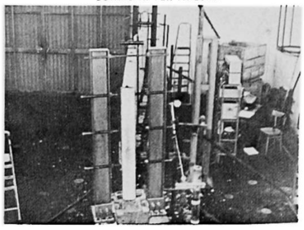


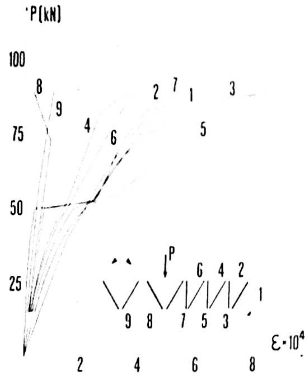


BEAM WITH BEARING DEVICES

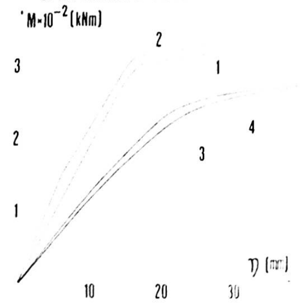


BEAMS AFTER FAILURE





STRAINS IN VERTICAL RODS AND DIAGONALS OF THE TRESTLE OF THE BEAM 1



DIAG. MOMENTS - DEFLECTIONS FOR THE BEAMS 1 2 3 4

TRIALS ON BEAMS IN METAL TRESTLE BURIED IN CONCRETE

Giovanni DONATONE - Giuseppe FRADDOSIO - Alfredo SOLLAZZO
Istituto di Scienza delle Costruzioni - Facoltà d'Ingegneria
Università degli Studi di Bari - (Italy)

SUMMARY

The research aims to investigate in theoretical and experimental way the behaviour of beams, with rectangular cross section, made by a welded metal trestle buried in concrete.

Have been tested four beams on a span of 7,20 m; the first two (n.1 and n.2) have a cross section of 9x90 cm while the other two (n.3 and n.4) have a cross section of 9x90 cm. Such beams must be considered as the webs of structural elements to complete during the installation by means of an upper slab in such way to give them a T section. They are to be used for a particular prefabrication system of multistoried buildings in which beam and partition are made by an only prefabricated block.

In the poster are shown the construction details of the prototypes, the load and bearing devices and the beams after failure.

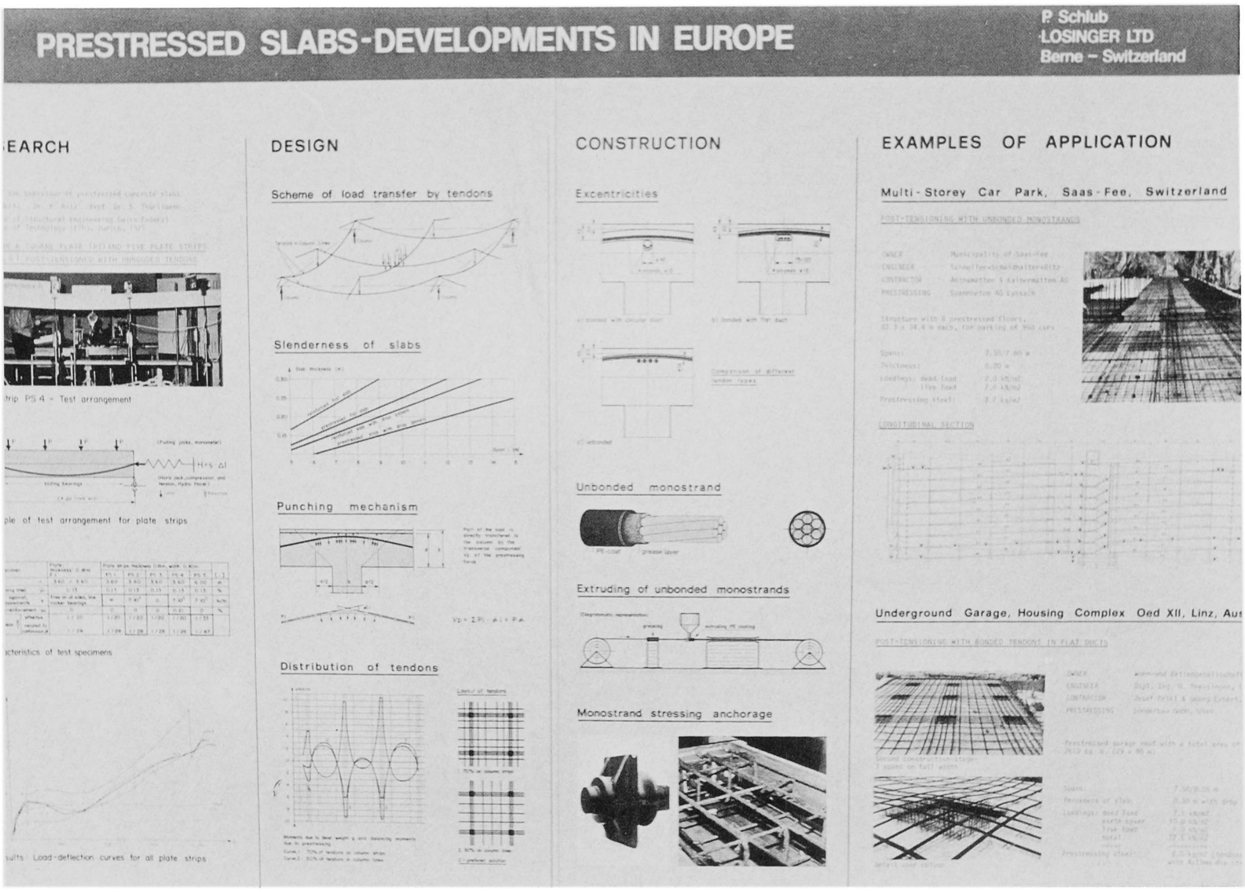
Special "diapason" bearings have been designed to prevent only the beam rotation around its longitudinal axis and loads have been applied by means of previously calibrated hidraulic jacks.

Experimental results obtained point out that the considered beams have a behaviour very near to that of reinforced concrete beams, both under exercise loads and up to the rupture. In fact, as it is possible to see from the diagram shown in the poster for the beam 1, not only the diagonals near bearings, but also the vertical rods have resulted stretched; besides stresses in the former have always been higher than in the latter, as commonly happens for bended bars and stirrups. Rupture experimental moments, besides, are near enough to the theoretical ones valued by means of limit design theory for reinforced concrete beams, with deviations respectively of 1,5% and 7,5 for the beams n.1 and n.2 and of 5% for the beams n. 3 and n.4. Also compression strains in concrete and steel have been near enough to the theoretical ones. Failure announced by the appearance of many cracks, manifested itself through a sudden lateral buckling of structures under loads lightly higher than those for which strains in stretched steel, corresponding to yield point, had been measured. Thus it is to think that collapse happened just for reaching, in center line, of theoretical crisis situation and that only consequently, because of beams slenderness, lateral buckling occurred with contemporary instability of compressed stringer.

REFERENCES

1 - G. DONATONE - G. FRADDOSIO - A. SOLLAZZO: Risultati di esperienze su prototipi di travi a traliccio metallico immerso nel conglomerato cementizio. Atti dell' Istituto di Scienza delle Costruzioni dell'Università di Bari, n. 126; 1979.

2 - G. DONATONE - G. FRADDOSIO - N. SCATTARELLI: In tema di sperimentazione su travi a traliccio metallico immerso nel conglomerato cementizio. Atti dell'Istituto di Scienza delle Costruzioni dell'Università di Bari, n. 130, 1980


PRESTRESSED SLABS-DEVELOPMENTS IN EUROPE
P. Schlub
LOSINGER LTD
Berne – Switzerland
EARCH
Strip PS 4 – Test arrangement
ple of test arrangement for plate strips
acteristics of test specimens
sults: Load-deflection curves for all plate strips
DESIGN
Scheme of load transfer by tendons
Slenderness of slabs
Punching mechanism
Distribution of tendons
CONSTRUCTION
Excentricities
Unbonded monostrand
Extruding of unbonded monostrands
Monostrand stressing anchorage
EXAMPLES OF APPLICATION
Multi-Storey Car Park, Saas-Fee, Switzerland
Underground Garage, Housing Complex Oed XII, Linz, Aus

PRESTRESSED SLABS DEVELOPMENTS IN EUROPE

Peter Schlub
Project Engineer
Losinger Ltd.,

Berne, Switzerland

The development of prestressed slabs in Europe was delayed in comparison with the USA and Australia.

Main reason for that delay was the missing of suitable standards and simplified design methods. With the research done (specially in Germany and Switzerland), standards and design methods could be established.

Today, recommendations are available in the United Kingdom (1) and have also been published by FIP (2). In Germany (3), Switzerland (4) and the Netherlands these standards are under preparation and will be issued shortly.

Most of the questions during the poster-session at the congress did concerne bonded versus unbonded solution, e.g. protection against corrosion, fire and earthquake behaviour.

Following the advantages respectively of unbonded and bonded systems.

<u>Unbonded</u>

- Maximum possible tendon drape
- No grouting required
- Corrosion protection of tendons also during transport, handling and placing
- Simple and fast placing of tendons
- Small friction losses
- Considerable dissipation of energy

<u>Bonded</u>

- Increased ultimate moment
- Local failures of tendons have only localised effects (e.g. in the case of fire, explosion and earthquake)

Finally, a summary of advantages of prestressed slabs:
. Economical
. Increased span lengths and span/depth ratios
. Reduced dead weights and building heights
. Deflection and crack free under permanent loading
. Improved punching shear resistance
. Reduced construction time due to early stripping

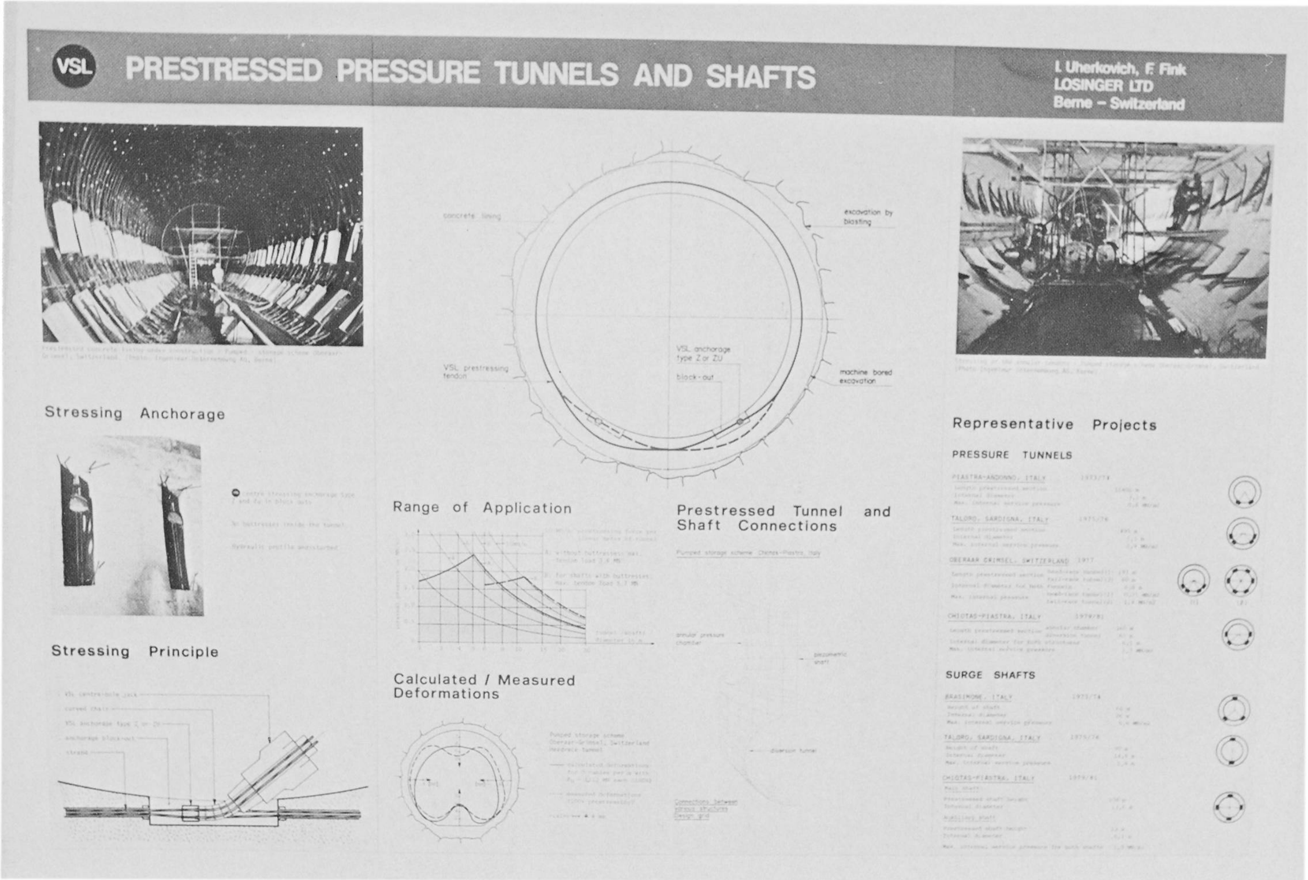
References:

1. Flat slabs in post-tensioned concrete with particular regard to the use of unbonded tendons-design recommendations.
   Concrete Society Technical report No. 17, published 1979 by C & CA, Wexham Springs, Slough SL3 6PL.

2. Recommendations for the design of flat slabs in post-tensioned concrete (using unbonded and bonded tendons), FIP/2/5, May 1980, published by C & CA, Wexham Springs, Slough SL3 6PL.

3. DIN 4227, Teil 6 "Bauteile mit Vorspannung ohne Verbund"

4. SIA 162, Arbeitsgruppe 5, "Bruchverhalten von Platten"


VSL
PRESTRESSED PRESSURE TUNNELS AND SHAFTS
I. Uherkovich, F. Fink
LOSINGER LTD
Berne – Switzerland
Stressing Anchorage
Stressing Principle
concrete lining
excavation by blasting
VSL prestressing tendon
VSL anchorage type Z or ZU
block-out
machine bored excavation
Range of Application
Calculated / Measured Deformations
Prestressed Tunnel and Shaft Connections
Representative Projects
PRESSURE TUNNELS
SURGE SHAFTS

PRESTRESSED PRESSURE TUNNELS AND SHAFTS

Igor Uherkovich, Francis Fink
LOSINGER LTD., VSL International

Where in tunnels and shafts the lack of sufficient overburden does not permit the rock to accept the internal pressure, or where this pressure is so high that the watertightness is in doubt although the stability of the tunnel shell is not in question, the structure is usually provided with a steel lining. Very often, however, transportation to remote sites as well as difficult installation condition make such a lining very expensive. The idea was to use the already existing concrete backfill as an autonomous lining without the need of a steel shell. This is possible with the help of the prestressing technique, using annular tendons acting like barrel hoops. To avoid the need of buttresses to anchor the tendons a special "floating" type of anchorage and the relevant stressing equipment as shown on the opposite page have been developed.

Many problems in the structural design and the construction had to be solved since in view of the often unpredictable behaviour and embedment the design and construction of underground constructions cannot entirely be carried out on the basis of the principles applied for open-air structures. Prestressed tunnel linings subject to high water pressures require a special treatment of the contract surface between rock and concrete. After pressing the resulting gap between rock and concrete has to be filled using the traditional grouting techniques. Also important is the use of a suitable formwork construction to ensure a complete concrete filling.

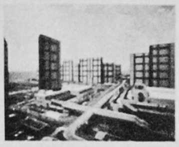
The proposed solution is not only limited to straight cylindrical sections of tunnels and shafts but can also be applied economically for tunnel and shaft connections, by-passes, etc.

A number of prestressed pressure shaft and surge chamber projects have been carried out successfully using this method. Noticeable reductions in construction time and cost savings were achieved. Although all completed projects were done in highly developed countries, still further advantages can be expected by using this solution in developing countries.

ASTM

A unique system of High-Rise Residential Buildings by Large Steel Structural Framework

Toshiharu Hisatoku*
Ryoji Tamura**
Yuzo Kato***



This project is a plan for constructing residential buildings higher than 14 stories with a total of some 3,400 residential units by different owners on the reclaimed land off the coast (see, Fig. 1). They are 14, 19, 24 and 29 stories and the variations of 11 in the type (see, Fig. 2). Fig. 3 shows an example of the plans of the residential units.

* Chief Structural Engineer, Dr. Eng., Division of Structural Design, Takenaka Komuten Co., Ltd.

** Chief Structural Engineer, Division of Structural Design, Nippon Steel Corporation

*** Chief Structural Engineer, Division of Structural Design, Takenaka Komuten Co., Ltd.

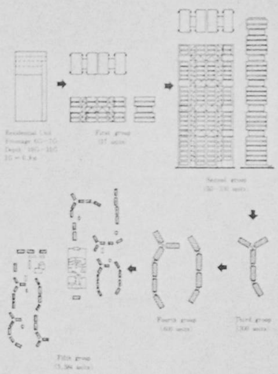


Fig. 1 System of High-Rise Residential Buildings

Fig. 2 Composition of Stories

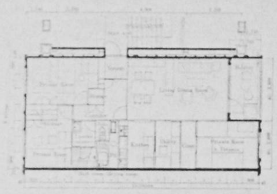


Fig. 3 Plan of A Residential Unit

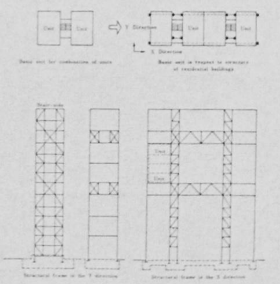


Fig. 4 Structural Framework

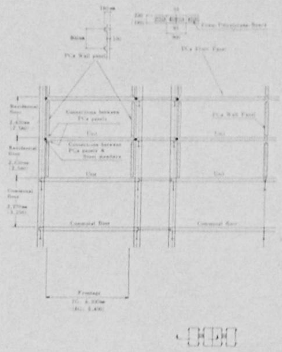


Fig. 5 Structure of Residential Units

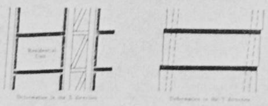


Fig. 6 Deformation of Residential Units

A Unique System of High-Rise Residential Buildings by Large Steel Structural Framework

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Osaka, Japan

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Chief Structural Engineer,
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Tokyo, Japan

Y. KATO
Chief Structural Engineer,
Takenaka Komuten Co., Ltd.
Osaka, Japan

1. THE OUTLINE OF PROJECT

This project (about 3,400 Residential units in 52 buildings) was completed in July, 1979. The name "ASTM" is the combination of the first letters of Ashiyahama, (name of the city where these buildings were built) and the five participating companies in Japan.
The plan submitted by the ASTM won the first prize for its unique system utilizing prefabrication and industrialization in August 1973 in the competition for High-Rise Housing Complex at Ashiyahama.
This project is a plan for constructing residential buildings higher than 14 stories with a total of some 3,400 residential units by different owners on the reclaimed land off the coast (see, Fig. 1). They are 14, 19, 24 and 29 stories and the variations of 11 in the type (see, Fig. 2). Fig. 3 shows an example of the plans of the residential units.

2. THE OUTLINE OF THE STRUCTURAL DESIGN

2.1 The Structural Frame

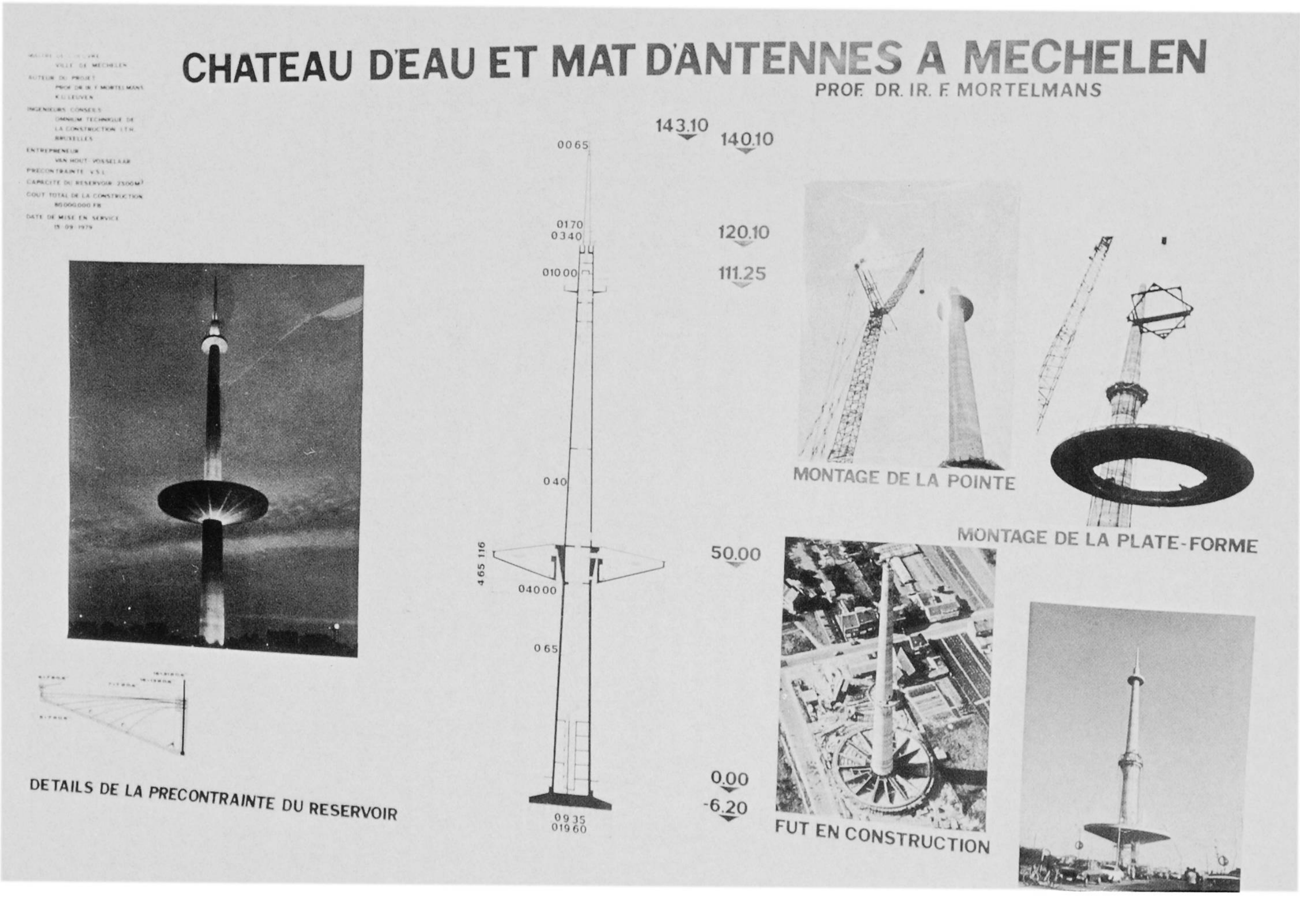
The structural frame of the residential buildings are shown in Fig. 4. The basic unit concerning the structure is four residential units per floor as shown in the figure. In the X direction (see Fig. 4) in order to create the free space for residential units, structural frame consist of two large rigid frames making the core with the stair column and the communal floors beams. In the Y direction (see Fig. 4), structural frame consists of four rigid joint truss frames situated at the both sides of the stairs.

2.2 The Structure of the Residential Unit

Fig. 5 shows the outline of the structure of the residential unit. The residential unit is composed of PCa panels (that is precast concrete panels), and the four stories residential units lie on the beam which is located on the upper floor of the communal floor, except the lowest part of the building. The PCa panels and the PCa wall panels bear the vertical load, and the load is transmitted from the PCa floor panels to the PCa wall panels, and the vertical load of the four stories is eventually supported by the beam of the upper floor of the communal floor. These PCa panels are not participated against wind or earthquake.

2.3 The Relationship between the Residential Unit and the Structural Framework

The walls and the floors of the residential unit are not only required to bear the vertical load but also to comply with deformation of the structural flamework when horizontal loads are exerted on the structural framework. Taking these requirements into consideration, the design has been made about each of the directions as shown by Fig. 6. For this purpose, tetrafluoroethylene resins are placed on top of the walls of every story to slide bearing materials.


CHATEAU D'EAU ET MAT D'ANTENNES A MECHELEN
PROF. DR. IR. F. MORTELMANS
VILLE DE MECHELEN
AUTEUR DU PROJET
ENTREPRENEUR
DATE DE MISE EN SERVICE
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DETAILS DE LA PRECONTRAINTE DU RESERVOIR
MONTAGE DE LA POINTE
MONTAGE DE LA PLATE-FORME
FUT EN CONSTRUCTION

CHÂTEAU D'EAU ET TOUR DE TELECOMMUNICATIONS EDIFIE A MECHELEN EN BELGIQUE

Fernand MORTELMANS
Professeur Ordinaire
à la Katholieke Universiteit Leuven
Leuven-Heverlee, Belgique

La construction est composée :

- d'un réservoir d'une capacité de 2.500 m^3 à un niveau d'eau maximum de + 50 m par rapport au sol,
- de l'emplacement de trois antennes paraboliques au niveau de la toiture du réservoir (+ 55 m),
- d'une plate-forme à + 110 m et sur laquelle sont montées les antennes réceptrices de la radio- et télédistribution de la ville,
- d'un mât en acier inoxydable de 20 m de hauteur et qui couronne la construction entière,
- d'un paratonnerre extensible de 4 m de hauteur au sommet du mât.

La gaine centrale en béton armé et de 120 m de hauteur fût réalisée par procédé de coffrage glissant. Le réservoir consiste d'un fond conique renforcé de 16 parois radiales en béton précontraint, une paroi intérieure, une paroi extérieure de 40 m de diamètre, également précontraintes. Le tout est couvert par une toiture en forme de coque mince conique reposant sur la paroi extérieure du réservoir. Après leur parachèvement sur le sol, le réservoir et la toiture ont été hissés vers une console de suspension et ancrés définitivement.

La plate-forme des antennes fût également construite sur le sol. Elle est composée de trois anneaux préfabriqués en béton léger, solidarisés par coulage d'une couche de béton après leur mise en place par une grue de 160 m de hauteur de levage. Le mât en acier inoxydable, mis en place par la même grue, n'a qu'une fonction purement esthétique.

Il était surtout la façon d'exécution de cet ouvrage d'art qui à suscité l'intérêt du public.
Apparamment les opinions sont unanimes sur le fait que les qualités esthétiques de cette construction peuvent être attribuées à l'élégance et la simplicité des lignes, le choix des matériaux et leur mise en oeuvre comme les combinaisons de béton lis et rugueux et l'acier inoxydable.
Finalement apparait la double dualité réservoir/plate-forme et gaine en béton/flêche en acier inoxydable.

Maître de l'ouvrage : La Ville de Mechelen
Auteur du projet : Prof.dr.ir. F. Mortelmans
Bureau d'Ingénieurs Conseils : I.T.H. Bruxelles
Systhème de précontrainte et de levage : V.S.L.
Pieux des fondations : Soc. Pieux Franck<s
Entrepreneur : Soc. Van Hout à Vosselaar (Belgique)
Coût des travaux : 80.000.000,- FB
Délai d'exécution des travaux : 200 jours ouvrables

6D-Bauverfahren · Doubrava KG · Attnang · Austria

Elementierter Stahl-Hochbau mit hohem industriellen Vorfertigungsgrad

In- und Auslandspatente

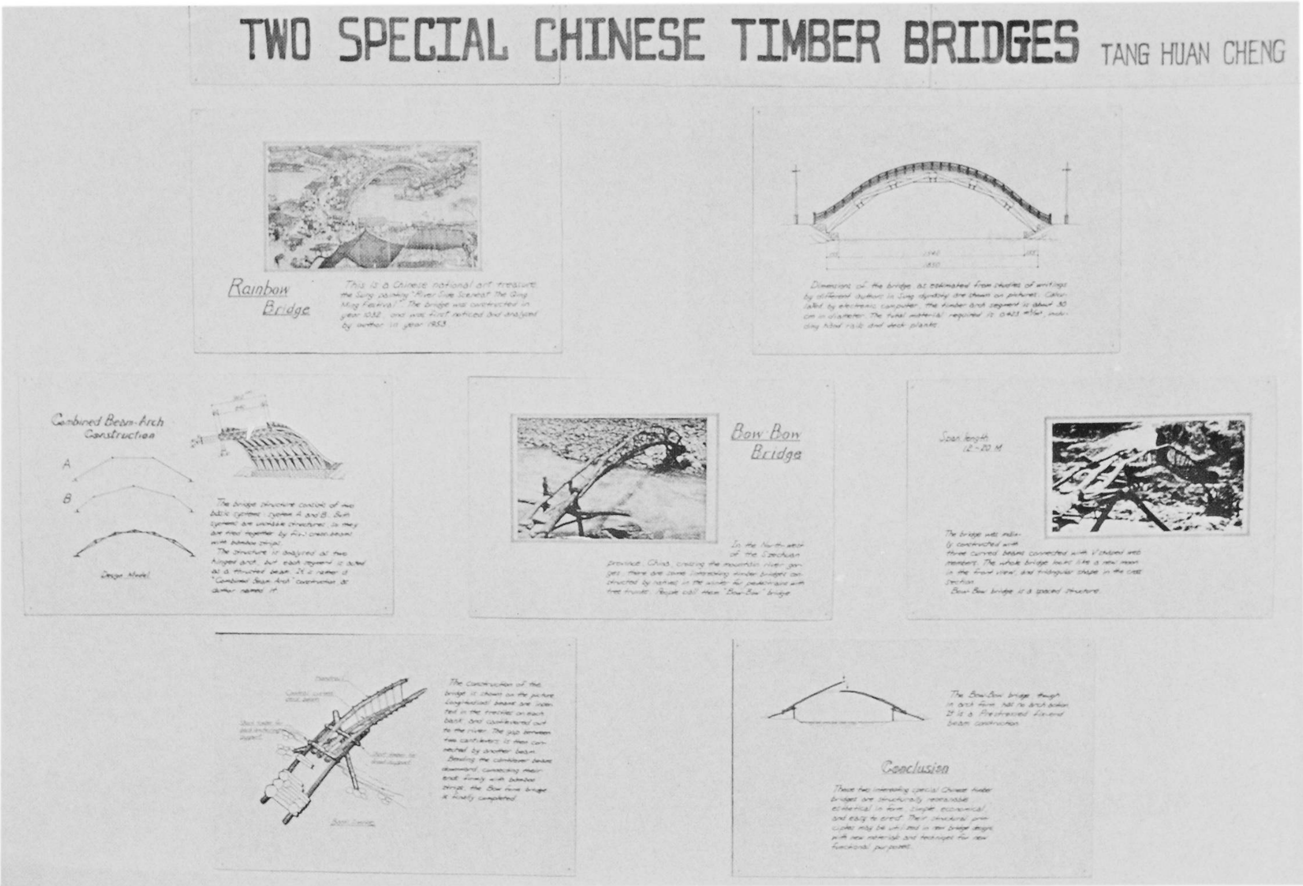
BAUEN OHNE GERÜST

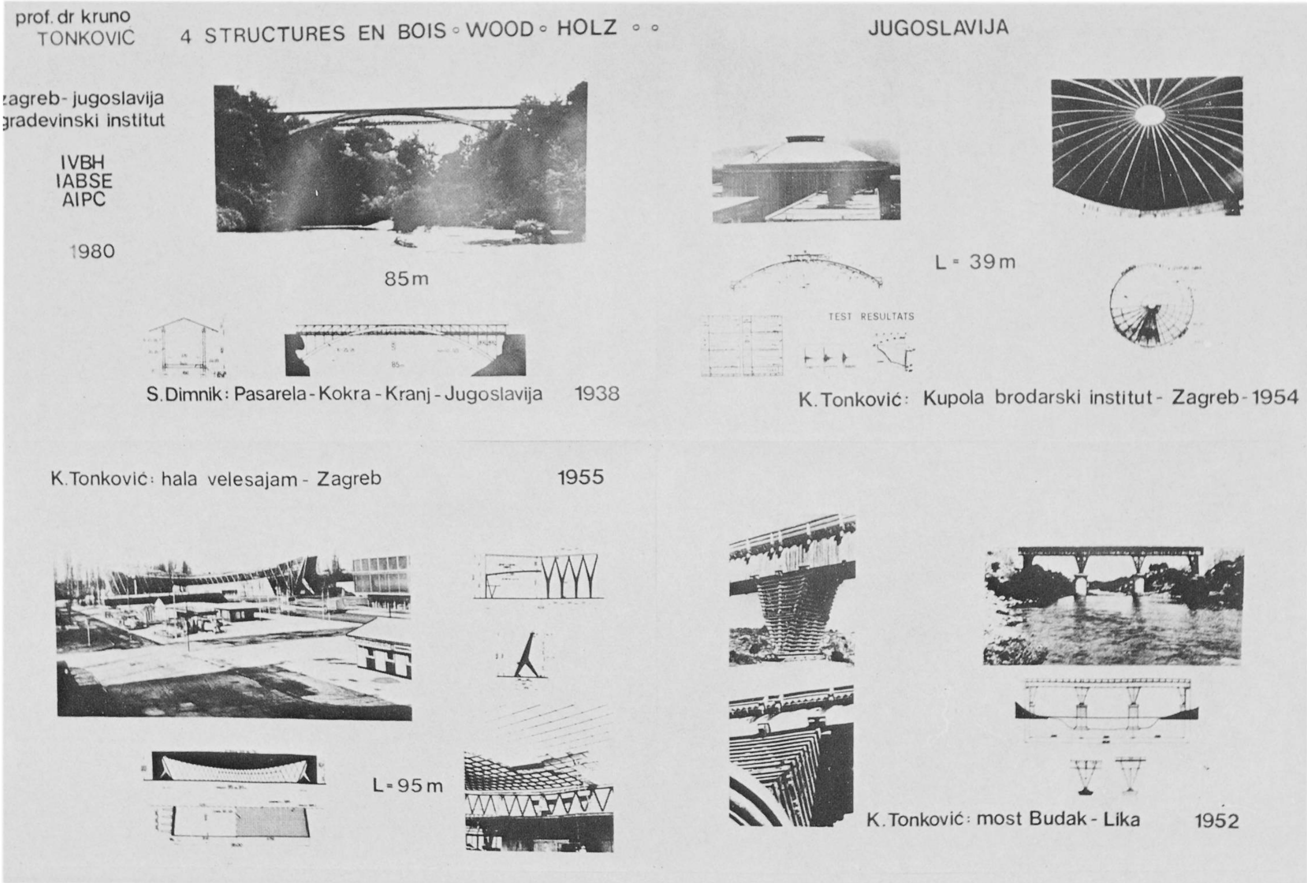
Die Entwicklung des 6D-Bauverfahrens stand unter dem Protektorat der Österr. Forschungs-Förderung und gründet auf der exakten Auswertung der Erkenntnisse weltweiter Bauforschung

6D-Charakteristik:

- Gestaltungsvielfalt durch freie Addierbarkeit der selbsttragenden 6D-Raumeinheiten in allen 3 Dimensionen (bis 21 Etagen).
- Bleibende Flexibilität gegenüber beliebigen Raumgrößenveränderungen (keine tragenden Wände!).
- Hohe Wärme- und Kälteschutzwerte durch optimale bauphysikalische Detaillösungen. Alle geforderten Brandschutz-, Wärme- und Schall-Dämmwerte sind erfüllbar.
- Keine Gerüstung, keine Materialverluste auf der Baustelle.
- Kurze Bauzeit und daher Fixpreis.
- Erdbebensicher. Ideal exportfähig.

150-BETTEN-HOTEL MIT RESTAURANT


TWO SPECIAL CHINESE TIMBER BRIDGES
TANG HUAN CHENG
Rainbow Bridge
Combined Beam-Arch Construction
Bow Bow Bridge
Conclusion


prof. dr kruno
TONKOVIĆ
4 STRUCTURES EN BOIS ◦ WOOD ◦ HOLZ ◦ ◦
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L = 39m
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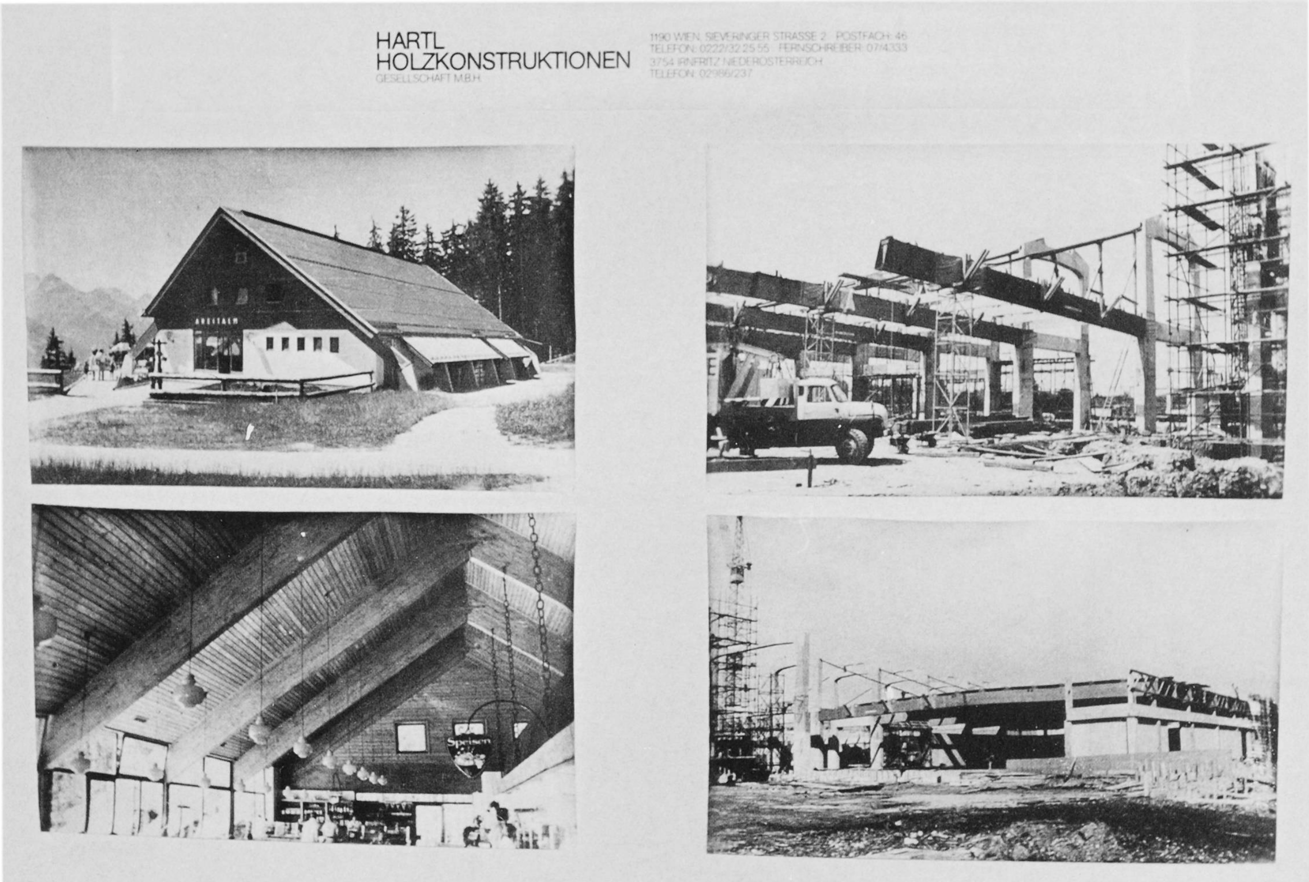
K. Tonković: hala velesajam - Zagreb 1955
L = 95m
K. Tonković: most Budak - Lika 1952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Speisen