

# VSL NEWS

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**SPECIAL EDITION  
SYMPOSIUM 1992**



## The VSL Symposium – More Than a Family Affair


**N**ot only insiders know of the VSL Symposium tradition. Other international companies and organizations are envious of our Symposium and the spirit which it generates.

The organizing committee did a superb job and Montreux was another fine example of the 27 year old VSL Symposium tradition. The gathering, which takes place every four years, assembled representatives from all VSL subsidiaries, affiliated companies and licensees. A part of the Symposium was open for selected guests representing clients, consulting engineers, contractors and government agencies. The technical seminars related to post-tensioning brought leading speakers from around the world.

The theme for the Symposium was Value – Service – Leadership. These initials are not new to VSL, but Montreux showed again how really representative they are for us:

- Value** Based on a close working relationship and constant dialogue, VSL continues to tailor its offers to the client's own perception of value for money;
- Service** With supportive communication, entrepreneurial flair and highly trained and cooperative site experts VSL interacts and performs as a committed member of the construction team;
- Leadership** With international awareness of the global development process, VSL aims at consistently producing new products to remain at the leading edge of technology.

Tradition alone has not made us the world-wide leader in post-tensioning. Montreux became the birthplace of a new post-tensioning system – a revolutionary system which demonstrates VSL's continued leadership in the industry. The new VSL Composite System is developed to meet the new and ever increasing expectations of the construction world.

You may not have been one of the 250 Symposium delegates in Montreux, but we are sure that you will be among our clients to benefit from VSL's Value-Service-Leadership. 



*Franz Fischli*  
Chairman of the Organizing Committee

### Highlights of this Issue:

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### Cover:

"The VSL Toggel", a sculpture by De Es Schwertberger, wearing the VSL colours and emblems, the mascot of the Symposium 1992 and a symbol for the solid, reliable and powerful VSL.



## The VSL Symposium – More Than a Meeting




The VSL Symposium 1992 proved once again to be a memorable, technical and social event. Montreux on the Lake of Geneva, surrounded by vineyards, charming villages and beautiful mountains not only offered a splendid environment, it also allowed VSL to strengthen its well-known family spirit and good relations with business friends.

The technical programme started with an optional site visit at the Storebaelt Fixed Link in Denmark. VSL's involvement in the 6.6 km long West Bridge is substantial and includes 11'000 tonnes of post-tensioning material, the leasing of all associated equipment and provision of site management personnel for operations.

The sessions during the Montreux part of the Symposium were attractive and of high quality, and were attended by almost 300 delegates. Topics on current developments in bridge construction, trends and potentials in post-tensioned buildings and structural strengthening presented by experts like Professors Breen, Priestley, Falkner, Thürlimann and Marti have shown that The VSL Group is well prepared to

meet future challenges in the industry. Of particular interest was VSL's newly developed Composite Post-Tensioning System. Its numerous advantages in terms of quality, practicality, versatility and value were undisputed and well received by the delegates.

A large number of the participants continued their Symposium programme with a visit to Paris where they were guests at Bouygues' "Challenger". 

On July 1 and 2, the technical programme of the VSL Symposium included six main sessions on VSL System Developments, Bridges, Extraordinary Structures and Special Construction Methods, Structural Strengthening, Buildings, and the VSL Value Added Package. Invited speakers from both inside and outside The VSL Group gave a total of 28 individual presentations. This article summarizes selected technical highlights of this two day programme.

Hans Rudolf Ganz, Group Chief Technical Officer, and David Rogowsky, Head of Special Developments, reported on the most recent VSL System developments. The major focus was on the newly developed unique VSL Composite System which is presented in a separate article (see pages 8-10). However, other important developments included new applications of the VSL Monostrand System in stay cables, concrete pressure tunnel linings, and masonry construction as well as on recent improvements in the inspectability of permanent ground anchors.



**Professor John E. Breen** urged the audience for more innovative thinking and also for better acceptance of new innovations in bridge engineering. According to him construction innovation today still has a lag time of over 20 years – a technical generation. However, he sees substantial opportunities for innovations in mixed structures, i.e. combinations of precast and in-situ concrete, pretensioning and post-tensioning, internal and external post-tensioning, as well as steel and concrete. The keynote address was followed by reports on a series of outstanding bridge projects in the US, Europe and Asia.



**Dr. Bernt Jakobsen** started the session on extraordinary structures with a summary of design and construction experience gained in the last 20 years with Post-tensioned concrete offshore platforms. He then reviewed the Sleipner accident and its causes, and reconfirmed the inherent safety of this type of construction. Other offshore, heavy lifting, and climbform applications were also presented in this section.





Post-tensioned concrete is generally not permitted as an integral part of ductile seismic resistant structural systems. This is primarily based on isolated examples of poor performance in past earthquakes. **Professor Nigel Priestley** presented in his keynote lecture two specific situations where post-tensioning can result in enhanced seismic performance. The first involved retrofitting of existing bridges, and the second involved a new concept for seismic resistant ductile post-tensioned frames using partially debonded tendons. This produces structures with reduced damage in a severe earthquake.

**Professor Peter Marti** sees a huge potential for applications of post-tensioning in buildings all around the world. Current and future developments such as the use of lost concrete forms for composite post-tensioned slabs will, according to him, enhance constructability and efficiency of buildings considerably. Franz Zahn, Head of VSL Developments of The VSL Group, reinforced this statement by saying "There is more than in-situ slabs" for post-tensioning in buildings and illustrated this with examples of post-tensioned frames and cores. John Sindel, Manager of VSL Australia, identified major savings in post-tensioned ground slabs over conventional solutions if maintenance costs are considered.



It is the perception of our clients which determines the "Value" VSL adds to a project. This perception was discussed in a panel of highly recognized construction professionals headed by Graeme Pash, Chief Regional Executive Officer of VSL Far East South/Australia. This final session was closed with the conclusion that VSL will continue to apply strong product and service differentiation entailing specialist design skills and techniques.





Let me start my remarks with a basic question: ***What is the Future of Structural Concrete?***

The modern age of concrete started 1824 with the more or less accidental invention of Portland cement by Joseph Aspdin. Steel bars as reinforcement were introduced about 100 years ago. And Prestressed Concrete developed after the second world war, i.e. about 50 years ago.

In this rather short period structural concrete has become by far the most widely used structural material. The infrastructure for our civilisation including water supply, waste treatment, energy production and distribution, traffic systems as well as the structures for housing, industrial production, social and cultural affairs are unthinkable without structural concrete.

Since about fifteen years the introduction of superplasticizers has decisively improved the quality of structural concrete. With a low water/cement-ratio, combined with an excellent workability such that pumping is possible, a dense, homogeneous concrete can be produced with high strength, high resistance to chloride penetration and hence an excellent resistance against corrosion of the reinforcement.

In recent years ecological considerations in general and in the assessment of the use of building materials in particular have gained importance. Concrete as an inorganic readily available material is compatible with the environment, uses comparatively little

energy for its production and can be disposed without protective measures.

Steel in the form of bars, nets, wires, strands – due to its inherent technical qualities and its favourable price – will not be replaced by materials such as glass fibres, carbon fibres, synthetic materials except for very limited special applications.

Despite the fact that long range predictions in the scientific and technical field should rather be avoided, I feel quite sure that structural concrete as the main construction material will be irreplaceable within the next 50 years. However, continuous improvement of its qualities can be expected. Such a development could be for example the use of inorganic or organic corrosion inhibitors as admixtures.

How does Prestressing today fit into the field of structural concrete?

It has taken quite a long time to "demystify" prestressed concrete of its "magic" qualities and to demonstrate its full range of applications. Today we consider the total range from plain to reinforced, partially and fully prestressed concrete as one material: "Structural Concrete". The choice of prestressing is no longer arbitrarily mandated by experts or codes but is made by the designer. Performance requirements, questions of constructability and detailing lead the designer to make an appropriate choice. Especially new structural concepts, e.g. in the case of mixed structures for tall buildings, call for large tension members or beam-columns for which prestressing

offers decisive advantages such as high stiffness, no splices, high fatigue strength, ease of connecting, etc.

Furthermore, a hardly tapped field for prestressing is foundations. Since many years we have talked about this opportunity. We have made studies and even designed and constructed some foundation structures. I have come to the conclusion that we have to actively engage foundation specialists in these studies in order to convince them of the structural and economical advantages of prestressing. I still believe that foundations offer a wide new field to the application of prestressing.

Where now rests the role of VSL in the Prestressing industry?

VSL is a recognized leader in the International Prestressing Industry. It is important to maintain, preferably to strengthen this position.

I see three aspects to this endeavour:

- As a company VSL should offer a complete set of Prestressing Systems and Services.
- VSL should maintain a competent technical staff. In the R + D field an intensive collaboration with Universities, Research Establishments and Industry is necessary.
- Finally, a flexible organizational structure is necessary for a company active worldwide in an international market.

I believe that the VSL Symposium 1992 has offered an excellent review of the state-of-the-art as well as valuable information on technical and economical trends in the application of prestressing, and hence a sound basis for an evaluation of opportunities in this field. //

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*Dr Bruno Thürlimann  
Professor Emeritus ETH Zürich,  
Switzerland*



## The New VSL Composite System


The 1992 VSL Symposium brought with it the unveiling of the new VSL Composite System. Various internal and external papers described the technical and marketing features of the system. This article summarizes the background and main features of the system.

In the background presentation, it was explained that there is nothing wrong with the existing systems. On the contrary, VSL Post-Tensioning Systems enjoy an enviable reputation for quality and reliability. The need for a new system came from the need to anticipate and satisfy the ever increasing expectations of the construction industry for better value and reduced risk.

A technical presentation described the design and performance features of the VSL Composite System. The system capitalizes on recent developments in material and manufacturing technology. These include: the use of a high strength concrete, special heat treatment processes, and plastic in various system components.

An initial VSL marketing presentation described the competitive strategies required when introducing a new product. Without giving away any secrets, we will continue to build on our reputation as "VSL – The Market Leader with a Difference, Marketing Quality Products and Service".



There was animated discussion in the seminars and extreme interest in the exhibit of the new system. The following pages illustrate the new system. 

**Various VSL Patents Applicable**

Grout Connection

Threaded inserts permit  
bolting of bearing plate  
to formwork and attachment  
of grout caps

Compact Anchor Head  
offers reduced weight and  
simplified installation

Composite Bearing Plate  
(Metal - High Performance Concrete)  
with multiple bearing ledges offers  
reduced weight and improved handling



The VSL Composite System is engineered to meet FIP Recommendations, local codes, and state approve requirements throughout the world.



Vacuum grouting with PT-PLUS reduces the need for intermediate vents

PT-PLUS Plastic Duct and PT-PLUS Duct Couplers provide watertight tendon encapsulation

Plastic Trumpet provides continuity of encapsulation through the bearing plate

## The VSL Family of Solutions – different needs call for different solutions

The CS-STANDARD configuration, used for normal applications, combines the new CS stressing anchorage shown here but with conventional steel duct, and the complete family of existing VSL dead end anchorages. The compact CS stressing anchorage is lighter, easier to install, requires smaller and shallower block-outs, and permits closer anchorage spacing in certain applications. The CS-STANDARD configuration is a cost effective solution for ordinary applications.

The CS-PLUS configuration, used for applications requiring enhanced corrosion protection or improved fatigue resistance, combines the new CS stressing anchorage with the VSL PT-PLUS

plastic duct system. In addition to the advantages of the CS anchorages, the fully encapsulated system offers superb corrosion protection. The plastic duct eliminates fretting fatigue between the strand and duct. It also provides more reliable, and reduced duct friction. Integrity of the encapsulation can be confirmed prior to stressing by measuring the electrical resistance between the strand and the ordinary non-prestressed reinforcement. Vacuum testing of the duct is also possible. The VSL Vacuum Grouting Technique is recommended for use with the CS-PLUS configuration since it reduces the need for intermediate vents, and improves the overall quality and reliability of the completed structure. The CS-

PLUS configuration is the leading fully encapsulated multistrand post-tensioning system.

The CS-SUPER configuration combines the CS-PLUS configuration with special details and techniques to provide an electrically insulated tendon. This offers all of the advantages of the CS- PLUS configuration, plus the ability to electrically test the tendon after stressing, and electrically monitor the tendon at any time throughout the life of the structure. The CS-SUPER configuration is also the solution for structures plagued by stray currents.

## Pre-Symposium Tour

**B**eing currently the biggest combined road and rail construction project in Europe, the Storebaelt Fixed Link Project in Denmark was an easy choice for VSL's Pre-Symposium Tour.

VSL is part of the team building the West Bridge. VSL's site personnel were well acquainted with the project and conducted a detailed tour of the works, both off-shore and throughout the enormous prefabrication yard.

Over 70 delegates from 11 countries saw first hand the many steps that lead to the construction and erection of massive precast bridge segments that weigh up to 7400 tonnes. The heaviest components were the precast caissons which were up to 27 m high. The bridge girders span 110 m and were seen being constructed by the free cantilever method. It was easy to see the planned site co-ordination that allowed efficient assembly line construction. /




Approximately 3000 people are employed in this spectacular office complex.


## Post-Symposium Tour

**A**fter the Symposium many delegates accepted the invitation from VSL's majority shareholder Bouygues and visited "Challenger", their head office in Paris. /



We were delighted that so many participants were accompanied by their partner. We hope that our Social and Ladies' Programme provided them with lasting memories of the beautiful scenery around the Lake of Geneva and the cosmopolitan city of Geneva, including an interesting look at the diplomatic work of the United Nations, as well as the picturesque Castle of Chillon. 



The social side of the Symposium offered participants the chance to renew old friendships and to make new ones. The events included a welcome dinner on board a lake steamer and culminated in the social highlight of the Symposium: the Gala Dinner at the Montreux Palace Hotel on the last evening. 



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