VSL NEWS

ISSUE TWO 1991

The Mission of the Future

„The Turning Point" - best-seller of the early 80's - forecasted a new age. The change to a holistic view of the universe, concerned with wholes rather than with parts, was predicted. “Small is beautiful" and “Quality instead of Quantity" were also some of the slogans. Many of these thoughts and ideas, based on idealism and utopism, lacked the sense of reality and proportion. No doubt, however, they have opened and broadened the mind of individuals and leaders.

What is our answer to the concern of many people who are afraid that the future evolution of life on earth is seriously endangered and may end in a disaster? It would be a cynical answer just-to tell them that they are pessimistic and even fainthearted. But, we have to tell them that going small is not the solution to overcome the crisis either. How could for instance the necessary quantity of energy be found and produced if not by accomplishing projects of a considerable size?

Nevertheless, there is one subject becoming more and more important in this connection. It is The *Principle of Quality* The VSL Group has always been keen on quality awareness. The *ISO Quality Standards*, instruments which we have adopted, establish dear guidelines and direction. Furthermore, *Hans Hitz*, the new Quality Assurance Manager at group level, will be guarantor for the right interpretation and application. The danger is, however, that in general QA matters are handled in a too formalistic and bureaucratic way. That will not be the case within The VSL Group ! For VSL staff, quality is a matter of company culture and personal responsibility in the day to day work of each individual. This new issue of the VSL News demonstrates again this highly regarded mission of our group.

Dear reader, do not hesitate to call on us if you need to implement solutions in the field of specialist engineering construction which combine innovative techniques with a systems-based approach and a ***high sense of quality!***

Reto Jenatsch
Chief Executive Officer

contents

Cover : VSL has a major subcontract for the post-tensioning of the 6.6 km long STOREBAELT West Bridge in Denmark. The background of the cover photograph shows "Svanen" the giant sea-going crane which installs the prefabricated bridge caissons, piers and girders, lifting up to 7000 tons.

Above: **Manufacturing of VSL PT-PLUS Plastic Duct. Right: PT-PLUS Plastic Duct will be installed in the TROLL North Sea offshore platform. TROLL is the tallest Condeep platform ever built.**

VSL introduces PT-PLUSTM: An advanced plastic duct system for bonded post-tensioning tendons

With the development and introduction of PT-PLUS Plastic Duct for bonded multistrand tendons, VSL has once again increased its leadership position in the post-tensioning industry. The new system furnishes a unique combination of advantages unmatched by any other commercially available product.

The watertight plastic duct greatly improves the corrosion protection of grouted tendons. This applies especially in configurations designed to completely encapsulate the steel.

Corrugated steel ducts can cause fretting fatigue due to high contact pressures and small relative movements of the prestressing steel and duct. VSL PT-PLUS eliminates fretting fatigue, and increases the fatigue strength of the tendons.

During tendon stressing, a PT-PLUS duct provides a lower and more reliable friction coefficient than a steel duct. This results in lower friction losses and more effective use of the post-tensioning steel for in-service conditions.

Moreover, testing has confirmed that PT-PLUS duct can be completely filled with grout, that bond characteristics allow full development of the steel's tensile strength, and that, due to the unique shape and wall thickness, wearing through of the duct during stressing does not occur even at minimum tendon radii typically applied. with steel duct.

The PT-PLUS Plastic Duct System will be available in four sizes to cover all practical tendon configurations: three circular ducts with internal diameters of 59, 76 and 100mm, and a flat duct measuring 21 by 72 mm internally. The system also includes special watertight couplers, grouting connections, vents, drains, anchorage transitions, and cable supports.

Dr Hans Rudolf Ganz
CTO of The VSL Group
Bern, Switzerland

The „dented bridge“ receives help

Excessive sagging of main span will be corrected by large-scale repair scheme.

Civielco B-V, the VSL licensee in Holland, has been commissioned to carry out renovations to the Ijsselbrug bridge. Built in 1970 by the free cantilever method the two double box girders with a main span of 150 m are the first and largest bridges in the Netherlands where large-scale prestress renovation is being applied.

The accumulative effects of shrinkage, creep and relaxation have led to excessive sagging of the bridge which has resulted in the nickname, the "dented bridge". Further, multilayer prestressing bar congestion and tightly fitting ducts made grouting difficult.

Based on examinations, approximately 40% of the bars were not adequately grouted raising concerns about corrosion of the prestressing bars.

Repairs involve correction of sagging, and drilling into the duct at regular intervals with the use of endoscopes to gauge the quality and completeness of grouting. High-viscosity synthetic resin and vacuum grouting methods, where appropriate, are being used to complete duct grouting.

Jacco Riem
Civielco B.V
At Leiden, Holland

VSL Stay Cables for Sapporo Munich Bridge

This cable-stayed bridge named after one of Sapporo's sister cities, Munich in Germany, will be completed in October 1991, after a construction period of three years.

The project employed a variety of new engineering and construction techniques including inverted T-type spread foundations using pneumatic caissons, prestressed concrete main girders erected by the free cantilever method, and concrete pylons constructed with a jumping stage.

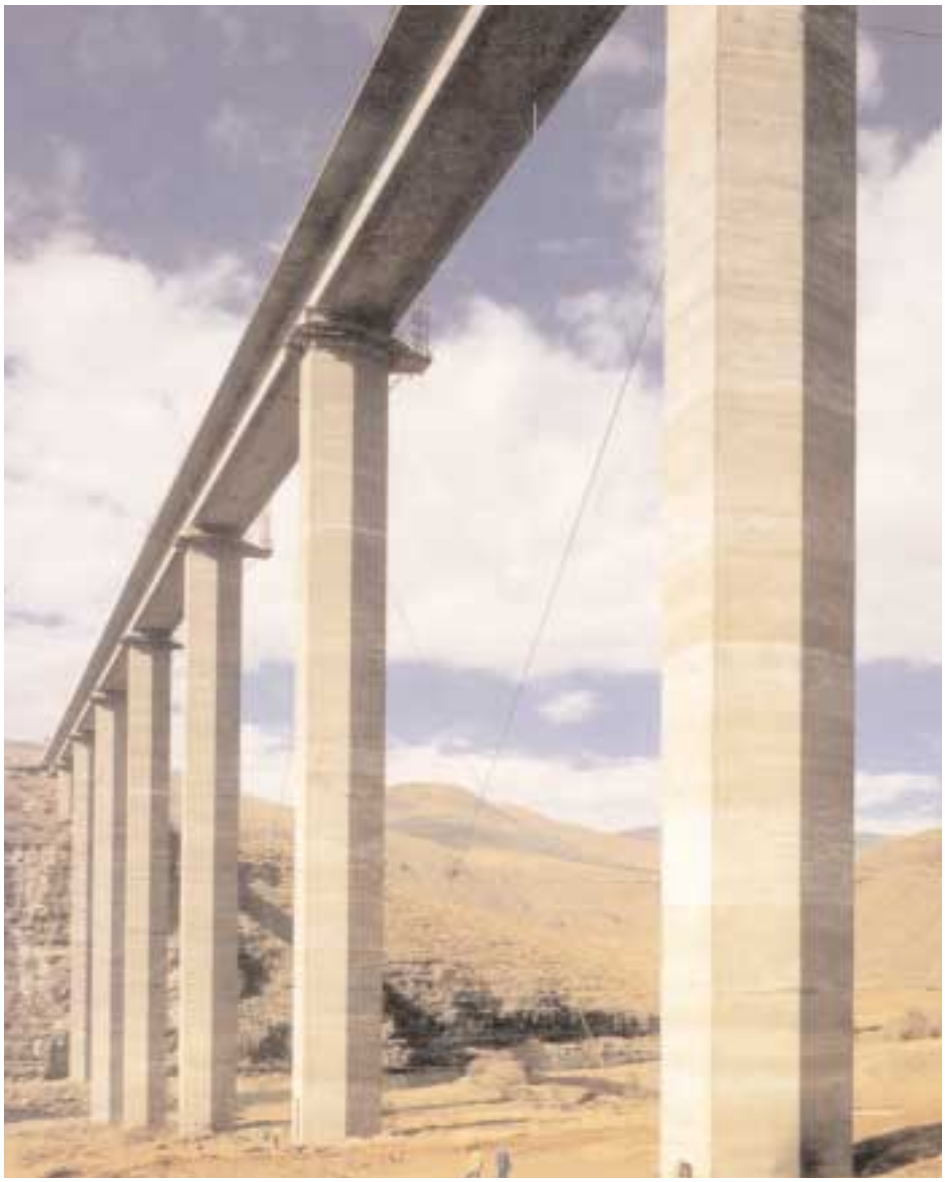
The VSL stay cables contained up to eighty 0.6" strands, in polyethylene pipes with cement grout for corrosion protection. Anchorage devices as well as 1500-ton jacks were tailored by VSL to cope with the magnitude of the forces and particular conditions of this project.

In order to minimize the cable eccentricities and temporary stresses in the pylon during construction, to avoid cable vibration due to wind, and to provide an aesthetically pleasing layout of cables, cables of one side of the pylons were bifurcated (split in half) with a Y-shaped anchorage. Development of the anchorage included static and fatigue tests.

This project is the first major application of bifurcated stay cables anywhere in the world.

Corrosion-protected VSL Stay Cable System provides reliable performance, long service life and low maintenance.

Shusuke Sakata
VSL Japan Corporation
Tokyo, Japan



The combination of pier slipforming and incremental launching of the dech proved the most effective construction method

VSL Incremental Launching and Post-Tensioning speed construction of South African bridge

The Malibamatso River Bridge spans the Pelaneng Valley, and crosses the Malibamatso River. A dam will cause the valley to be flooded to a depth of 80 m at the bridge site. Steep cliffs, tall piers, winter temperatures of -15° C and concrete aggregates with poor creep and shrinkage properties added to the challenge of this project.

To overcome the large creep and shrinkage properties of even the best available aggregates, 1200 t permanent hydraulic jacks were installed under most of the bridge bearings. The jacks allow for adjustments of up to 100 mm to compensate for differential shortening of the piers over the design life of the bridge.

The superstructure, which consisted of a 465 m box girder 10.9 m wide and 3.45 m deep, was incrementally launched to overcome problems with construction access. Casting the entire superstructure at one location in a 24.5 m long casting area improved working conditions, made cold weather concreting procedures easier and enhanced overall quality of the finished structure. The post-tension tendon layout was rationalized to suit the method of construction. The tallest piers were temporarily braced by lateral and longitudinal VSL stays during the launching of the superstructure.

Brian Cox
Steeledale Systems (Pty.) Ltd.
Johannesburg, South Africa

VSL Stressbars support two new Sydney bridges

VSL Stressbar-stayed bridges are now in service at University of Western Sydney and the Darling Harbour complex.

Two new cable stayed bridges recently completed in Sydney both used VSL Stressbars to form the cable stay supports. The use of VSL Stressbars for lightly loaded suspension structures such as these is bath economical and practical from the construction point of view.

The VSL Stressbars are preassembled on the deck prior to installation. Long stays are coupled on site for ease of transport and handling. The stays are coated with a white epoxy paint for both corrosion protection and aesthetics.

One bridge provides access to the new University of Western Sydney over the busy Great Western Highway at Werrington, while the other bridge provides a pedestrian access way linking the Power House Museum in Sydney, to an adjoining carpark and mono-rail station within the Darling Harbour redevelopment complex.

Mark Sinclair VSL Prestressing (Aust.) Pty Thornleigh, Australia

VSL Retained Earth tm System gaining ground in Australia

Precast facing panels are available in a variety of panel shapes, sizes and finishes.

VSL Australia introduced the Retained Earth Wall System to the Australian construction market in mid 1990. Since then, three major retaining wall projects have been awarded to VSL with a total surface area in excess of 7000 m .

The project shown here is the City West Link Road at Lilyfield, an inner suburb of Sydney. The project consists of a ramp structure which provides access for the City West Link Road to cross a busy rail yard via a prestressed concrete bridge.

The ramp structure has two adjacent VSL Retained Earth Walls over its full length of 195 m. The walls rise to a height of 7.5 meters where they come together to form an abutment for the rail overbridge.

For aesthetic reasons, a ribbed surface finish was chosen by the client, the Roads & Traffic Authority of New South Wales.

Neil Audsley
VSL Prestressing (Aust.) Pty Ltd.
Thornleigh, Australia

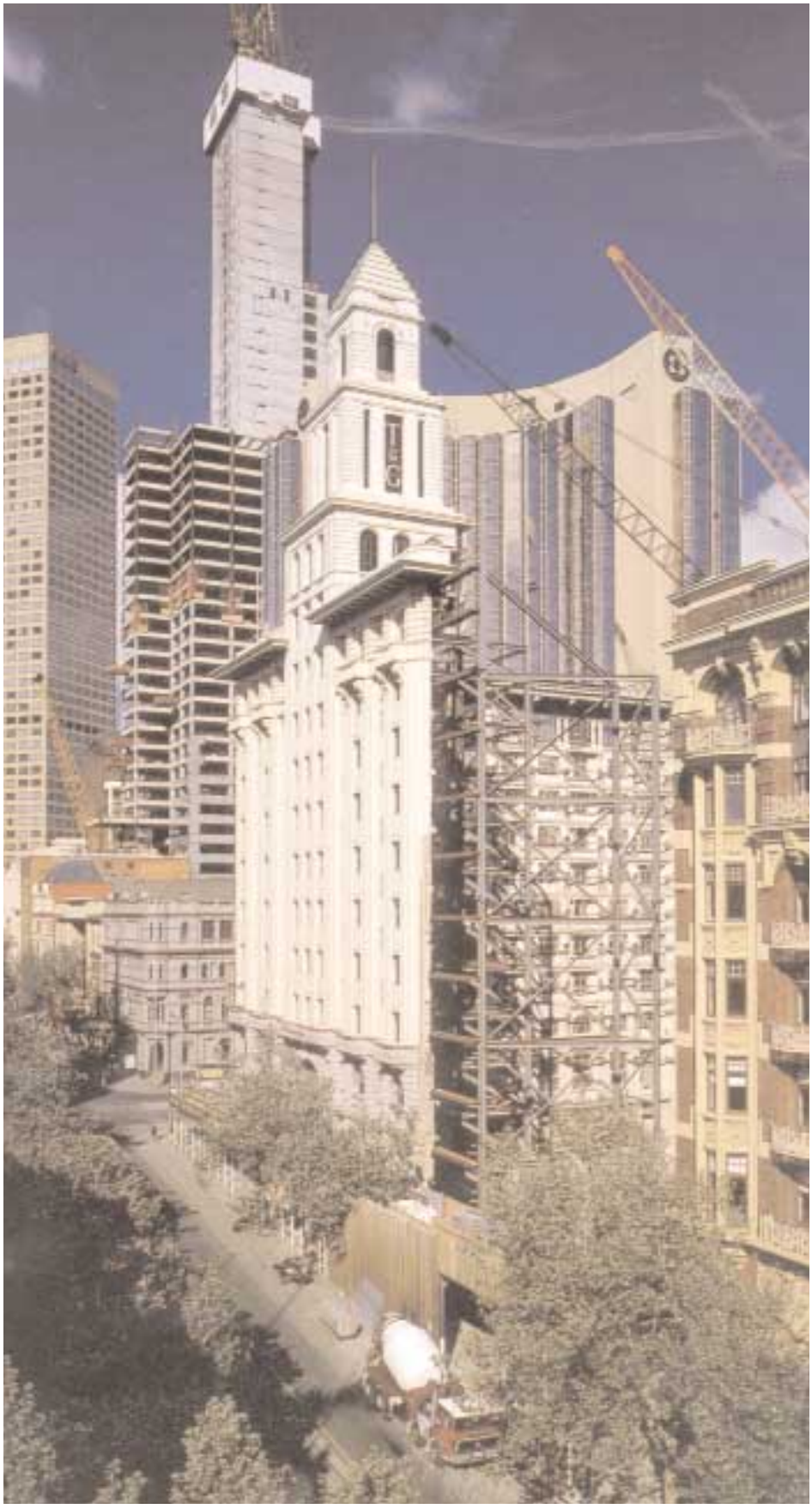
New building form Old

The redevelopment of the former T & G Building in Melbourne's famous Collins Street involves the preservation of a historic city street scape - and creation of a "new" building complex. The original internal structure was completely gutted leaving behind the fine ,,Art Deco" facade measuring over 150 meters in length on 3 sides and rising up to 45 meters above street level. The facade was temporarily supported by a steel bracing structure conceived and designed by the structural engineers, from The Meinhardt Group.

A new prestressed concrete structure was built behind the old facade. Post-tensioned flat slabs with drop panels was the chosen floor system on an 8.1 m x 8.1 m grid. The VSL based system was utilized as the permanent support for the facade when the temporary bracing was removed. A total area of approximately 44,000 m^2 of post-tensioned flooring was constructed in a little over ten weeks.

One of Australia's largest building companies, Grocon Pty. Ltd., who carried out this project, are justly proud of the speed of construction and the economic result for such a large complex project.

Reter Rlley
VSL Prestressing (Aust.) Pty Ltd.
Melbourne, Australia



New post-tensioned floor structure provides permanent support for old facade.

The VSL solution for aquatic tanks

The State of Washington's King County Aquatics Facility ranks third in size in the nation for a structure of this type according to the designers, TRA Architects/Engineers (Seattle).

Early in the planning stage, VSL was asked to take part in the feasibility study to determine the most economic solution for construction of the competition and diving tanks, the featured attractions of the facility.

Concerns regarding stress reversal (full tank/empty tank/buoyancy) and crack control were alleviated with the use of a post-tensioned concrete option. In addition, with post-tensioned concrete, reinforcing steel congestion was dramatically reduced and a saving in concrete of approximately 25 % was realized. Buoyancy during an empty tank condition was counteracted with auger cast friction piles anchored to the tank bases.

Walls and bases of both tanks were post-tensioned using the fully encapsulated VSL CP+ unbonded monostrand system.

Within one month of being awarded the post-tensioning subcontract, VSL produced placing drawings, fabricated tendons and delivered all material for the project !

Fred Robinson
VSL Corporation
Lynnwood, Washington

VSL CP + Post-Tensioning provided effective crack control, eliminated rebar congestion, and reduced concrete quantity by 25 %.

Mirrors attached to steel trusses at the rear of the rotating wall track the sun and reflect its light through the cut out names in the wall's granite.

Now complete and recognized as a U.S. National Monument, the Astronaut's Memorial stands at the entrance to Spaceport USA, Kennedy Space Center, Florida.

The Astronaut's Memorial: A challenge fulfilled

VSL has recently completed work on the Astronaut's Memorial at the Kennedy Space Center in Florida.

VSL designed the structural, mechanical, optical and control systems and acted as General Contractor for the construction of this unique project, which is now listed as a National Monument.

The Memorial includes a tilting steel frame mounted on a turntable. The frame supports a plane of black granite panels. Six panels had the names of the astronauts cut out by water jet.

The tilting mechanism combined with the rotating mechanism allows the Memorial to track the sun, while the granite panels face away from the sun and reflect the clouds and the sky. Mirrors on the back of the frame direct the sunlight through the names and thus create the impression of the names glowing in the sky.

Guida Schwager
VSL Western
Campbell, California

VSL frame design beats precast concrete by $450,000

Medical building frame is designed to accommodate two additional floors.

Keith Jacobson
VSL Eastern
Minneanolis Minnesota

When Iowa Methodist Medical Center decided to build a new medical office building on their campus in downtown Des Moines, Iowa, pre-cast concrete was the intended framing system. VSL worked with the owner and general contracter to provide an alternative post-tensioned concrete frame design which met their needs and provided considerable savings.

The six storey structure contains over 85,000 sq.ft. of elevated slab with live loads of up to 375 psf. The roof is designed to support the construction of two future floors without shoring and without encroaching on occupied tenant space.

VSL acted as Engineer-of-Record for the structural frame which consisted of post-tensioned beams and slabs. The VSL solution eliminated the need for shear walls and provided increased ceiling space and greater flexibility for mechanical and electrical services.

VSL serves as Engineer of Record for large tank complex

VSL Springfield recently completed a 3 tank complex with a total volume of 10.7 million gallons for Perdue Farms in Accomac, Virginia.

The project consisted of two similar 4.0 million gallon waste water treatment tanks and a 2.7 million gallon clarifier.

The VSL post-tensioned solution was chosen in a competition with a conventionally reinforced scheme for reasons of speed and economy. VSL performed as both the post-tensioning material supplier and the engineer of record. D.W. Burt Concrete Construction provided the balance of the concrete package to complete the tanks in place. The tanks were designed with 5 in. slab-on-grade with thickened edges utilizing the VSL CP+ mono-strand tendon. The larger tanks had a height of 30 ft., a 150 ft. diameter, and a wall thickness of 12 in. These tanks were designed with bonded horizontal tendons and unbonded CP+ vertical tendons. The clarifier had a height of 18 ft., a diameter of 160 ft. and a wall thickness of 10 in. The wall of this tank was designed with unbonded CP+ tendons both horizontally and vertically. All concrete construction was completed in a 6 month time frame.

Clarifier tank was designed with corrosion protected CP + monostrand tendons in vertical and horizontal directions.

Henry Cronin
VSL Eastern
Springfield Virginia

Vertical post-tensioning strengthens masonry walls and furnishes resistance to imposed deformations from lateral earth pressure.

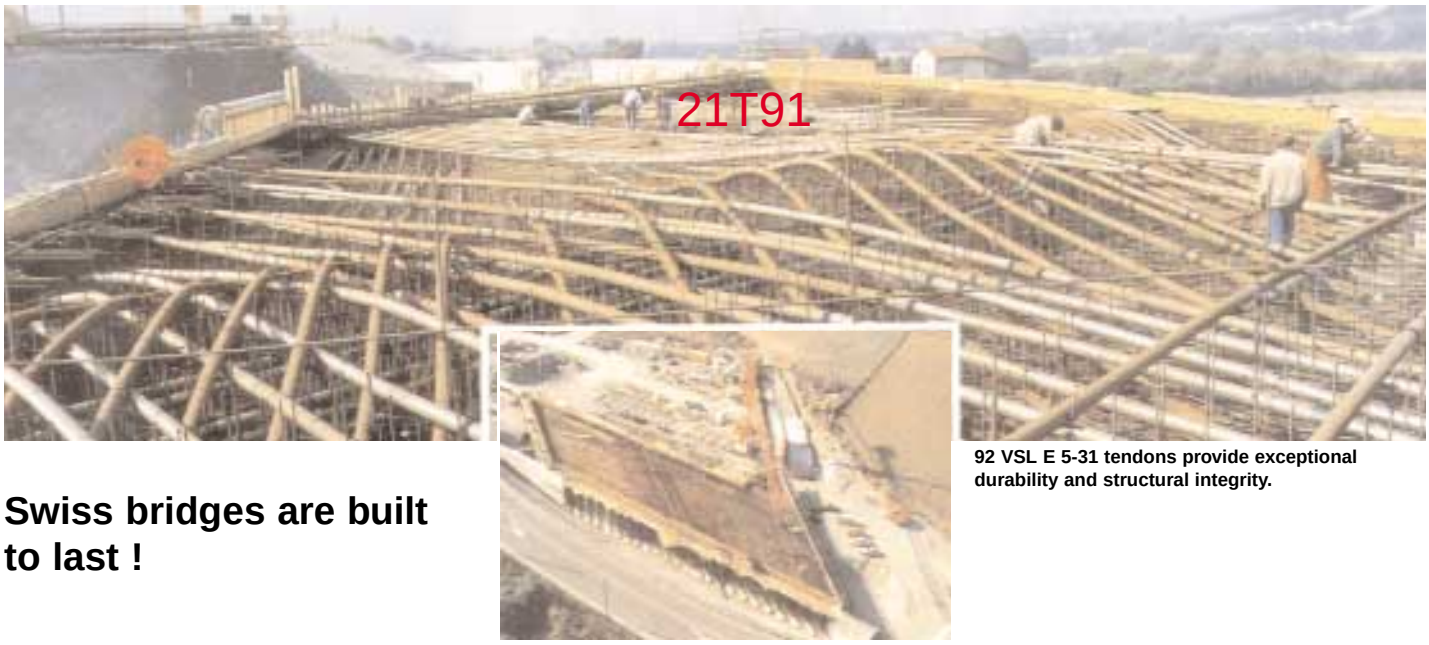
Home of the future built with post-tensioned masonry

Construction is currently underway on The National Concrete Masonry Association's INCMAI "Lifestyle 2000 Home". This project is located in the National Association of Home Builders' National Research Park in Bowie, Maryland. The NCMA along with VSL and others is sponsoring the construction of this very advanced 2300 square foot structure which features unique concrete masonry products including the VSL post-tensioned masonry system which is used to vertically prestress special masonry blocks in a foundation wall.

The prestressing system which was designed, furnished and installed by VSL features individual 1/2 in. diameter 270 K strands which were greased and coated with extruded polyethylene for maximum corrosion protection. The tendons are spaced 32 in. apart and are eccentrically located within the block cavities for maximum effectiveness in resisting lateral earth pressure. Special concrete blocks which were designed and fabricated by VSL contain the anchorages and bursting reinforcement. The lower block features a special self-activating monostrand anchorage while the upper block has a conventional CP+ monostrand anchorage. The self-activating lower anchorage allows for tendon installation after the wall masonry work is completed.

The completed house will serve as a preview of how masonry could be used in homes which will be built in the next century.

John Crigler
VSL Eastern
Springfield Virginia



92 VSL E 5-31 tendons provide exceptional durability and structural integrity.

Swiss bridges are built to last !

Located on the Geneva - St. Julien road, the East Bridge crosses the Plan des Ouates section of the Geneva ring road.

This bridge consists of a skew concrete prestressed slab. The two spans are supported by abutments at each end and by nine reinforced concrete columns of 1 m diameter in the middle. In plan, the bridge deck forms a parallelogram, approximately 85 m long, 25.1 m wide and varying in thickness from 1.1 to 2.1 m.

This project is of particular interest because of the unusual geometry, the dimensions and the large quantity of concrete (2600 m3) placed during one continuous shift of 24 hours with 180 men. 60 trucks supplied the concrete from 2 batching plants.

The 92 VSL tendons of type EC 5-31 were pushed in prier to concreting, had a total length of 4364 m and were stressed in 3 stages. Due to reduced block-out dimensions, special stressing chairs were required.

The consulting engineers were André Sumi and Georges Babel with the participation of Prof. R. Walther, EPFL; the contractors were a joint venture of Zschokke-Bariatti-Spinedi.

Pierre Alain Aigroz
VSL International Ltd.
Crissier, Switzerland

VSL heavy Lifting simplifies construction of Barcelona tower

The telecommunication tower on Mount Collserola, a Norman Foster design, is without any doubt one of Barcelona's new landmarks. A steel aerial of 83m towers above a 205m high concrete shaft. The 68 m high service building is suspended 84m above foundation level. The whole structure is stabilized by a system of steel strand stays, ground anchors and Kevlar cables.

12 storey service building assembled on ground, shown being lifted 85 meters to its final position.

In the construction procedure, main contractor Cubiertas y MZOV from Barcelona made extensive use of the rationalization and simplification heavy lifting technique can provide. In an early construction stage, the two sections of the steel aerial were placed by crane inside the shaft. The structural steel framing and the floor slabs of the 12 storey service building were erected standing on ground level. The 100 tons aerial and 2600 tons service building were brought to their final level by means of VSL Heavy Lifting. In addition, VSL Heavy Lifting was used for the telescopic pull out of the aerial to bring it to its final height.

Erich Môschler
VSL International Ltd.
Lyssach, Switzerland

Rehabilitation Works of the Sefid Rud Dam

The Sefid Rud Dam, completed in 1962, has a maximum height of 106 meters above foundation level and a total length of 417 meters at crest level. This concrete dam consists of 24 buttresses, 14 meters wide, a right bank abutment and a gravity structure on the left bank housing an intermediate level spillway.

During June 1990 an earthquake of magnitude 7.3 struck the region of the Sefid Rud Dam (approximately 200km north-west of Teheran).

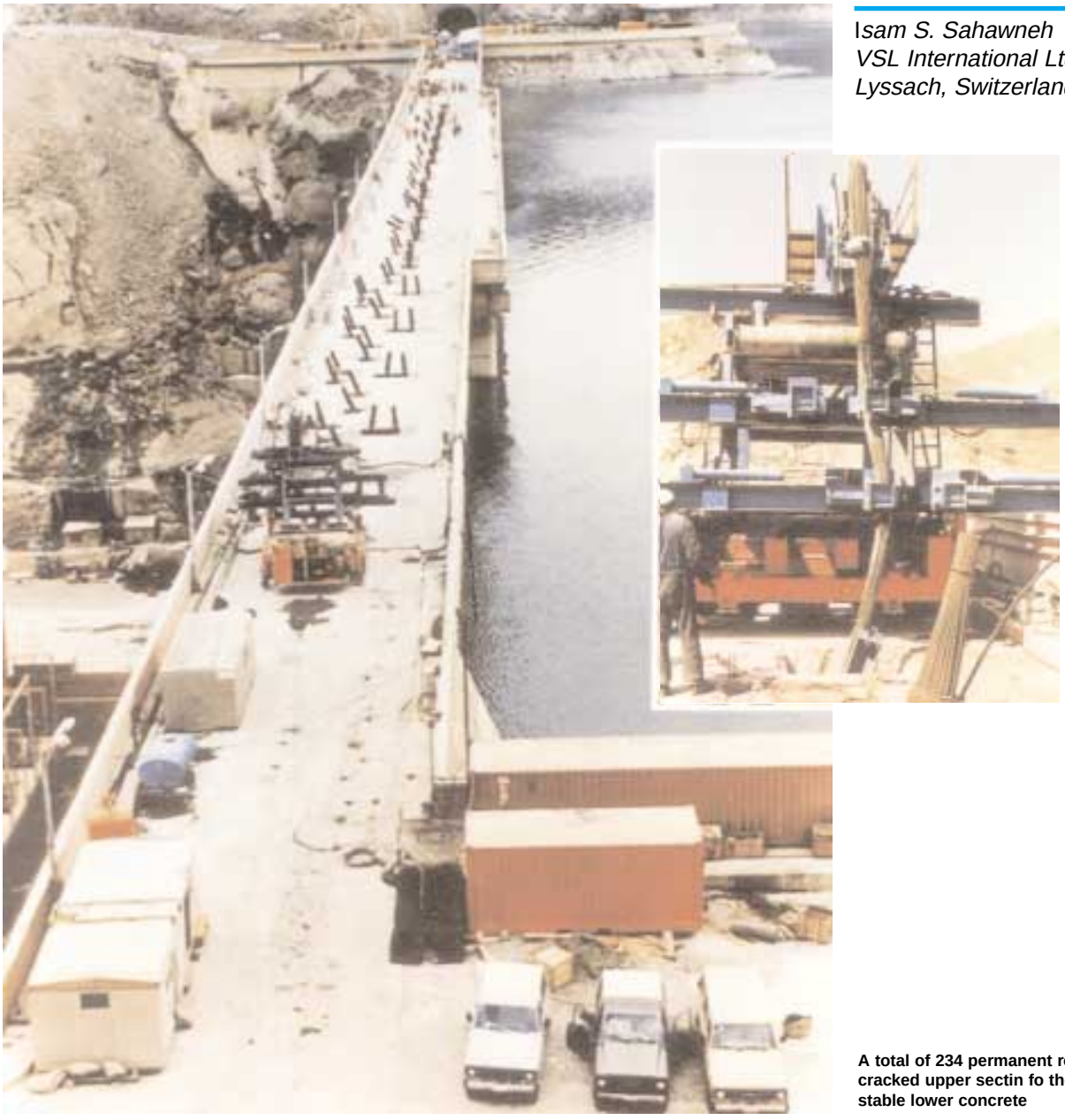
The dam suffered extensive cracking at several locations, with most horizontal cracks in a region 18 meters below the crest.

Rehabilitation works included anchoring the upper part of the dam to the concrete body below the cracks by applying prestress of approximately 100 MN to each buttress. To produce a total equivalent dead weight force would have required some 100,000 cubic meters of concrete!

234 VSL permanent rock anchors with 54 0.6 inch strands each, were installed within the dam buttresses at an inclination varying from 2° to 22°, using a specially designed VSL homing device. The average anchor length was 40 meters.

Strengthening the dam before the arrival of the seasonal floods gave the project an extreme sense of urgency. VSL installed the first anchor on March 3, 1991, with stressing of the last anchor on July 4, 1991!

Isam S. Sahawneh
VSL International Ltd.
Lyssach, Switzerland



A total of 234 permanent rock anchors tie the cracked upper sectin fo the dam to the stable lower concrete

VSL raises the roof if Indonesia

The 3,000 tonnes roof structure was lifted into position with a levelling accuracy during lifting of 2 mm.

Garuda Indonesia, the country's national airline, has had its third hangar roof lifted by VSL in February 1991. The completed steel roof structure along with its mechanical and electrical fixings weigh nearly 3,000 tons and cover an area of 25,725m^2 1210 x 122.5ml. VSL jacks were used in conjunction with an automated electronic sensing device to monitor and control the lifting with an accuracy of 2 mm. The hangar has six concrete piers, which were temporarily braced during lifting.

Johannes Himawan
PT VSL Indonesia
Jakarta, Indonesia

New North-South road link for Jakarta

The North-South Link is economically a vital road addition for Jakarta. Some 12 of the 16 kilometer length are elevated. This US$ 120 million project was opened for traffic in January 1991.

The elevated structure consisted of 4100 post-tensioned I-beams spanning 35m, supported on 318 piers. The post-tensioned pierheads which weighed 400 tons were rotated in place by 90 degrees to minimize disruption to traffic during construction.

PT VSL Indonesia was awarded the contract for post-tensioning and erection of these I-beams. Using a launching gantry, an average of 200 beams per month were erected!

The construction of the project was undertaken by a consortium consisting of PT Hutama Karya, PT Yala Perkasa International and PT Jaya Konstruksi, all of Indonesia.

Johannes Himawan
PT VSL Indonesia
Jakarta, Indonesia

VSL Launching Gantry placed a total of 4,100 I-beams, averaging 200 beams per month.

On the fast track with Hong Kong's first precast segmental project

Post-tensioned free cantilever segments provide rapid construction progress.

The Kwung Tong Bypass links the Eastern Harbour Crossing with the new Tates Cairn Tunnel. The Bypass consists of 3.7 kilometers of twin single cell boxes with spans ranging from 35 m to 48 m. Erection of the superstructure started in December 1989 and was completed in March 1991, one month ahead of schedule.

This was the first time the precast segmental free cantilever method has been adopted in a Hong Kong project. It has proven to be a major success ! The segments were produced by the match casting method on a short line system and transported along the previously erected bridge deck to the launching gantry. The elimination of falsework and scaffolding are significant advantages of this method in a densely populated urban environment.

VSL Engineers (HK) Ltd. supplied and installed all the post-tensioning cables. In total 2,100 tons of strand was installed with 11,500 anchorages ranging in size from EC 5-12 to EC 5-31. The erection work was carried out on a continuous twenty four hour basis with two shifts per day. Progress was rapid with the completion of one span of twin box girders every three days.

Mobashir A. Zia
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