VSL NEWS

ISSUE ONE 1997

The Boulonnais Viaduct - France

EDITORIAL

A Global Approach to Post-Tensioning

Post-tensioning is now used in the most prestigious and technically complex structures : from the longest span bridges to the biggest dams, from the tallest buildings to the largest cryogenic tanks. In most of these cases, post-tensioning is the only technically acceptable solution. Post-tensioning is also chosen over traditional construction techniques for economical reasons.

Be it in innovative or traditional structures, post-tensioning remains a complex technology that can only be performed by a service oriented specialist backed by a long track record and a global approach including :

- The production of quality materials and specialised equipment,
- The ability to optimise the detailed design of a structure,
- The implementation of strict installation methods and procedures,
- The ability to work harmoniously on site with the contractor's teams,
- The capacity to quickly mobilise resources to provide optimum technical support.

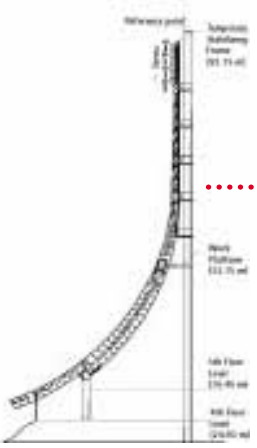
VSL is proud to offer this global approach :

- We design, manufacture, install and monitor the components used in our systems,
- We are specialised involved in post-tensioning,
- We can tailor our products to suit the particular requirements of a given construction,
- We can detail the design of a structure or part of it,
- We offer turnkey packages in which we build what we have designed,
- We can quickly mobilise human, technical and material resources that go beyond our client's capabilities.

We strongly believe that this approach is highly beneficial to our clients and our aim is to be the specialised contractor that you choose for your projects involving post-tensioning and related engineering works.

Alain Le Pivert
CEO and Chairman of the Board

HIGHLIGHTS



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- SOUTH AFRICA -
Grand Central Water Tower

This unusual cone-shaped structure is actually a 6.5 M l water pressure storage reservoir located between Johannesburg and Pretoria.

Only the top half of the 40-m high structure is filled with water and this section is post-tensioned with 32 horizontal rings in four buttresses. The bottom half remains hollow and will be used as a museum. A restaurant is proposed for the top section.

The Client is Midrand Town Council, the Engineer BKS Inc. and the Contractor Stocks Civils.

Casting the cone required special wedge-shaped formwork and it was constructed in horizontal segments. PT strand was pushed into the ducts after concreting and stressing was carried out by simultaneously using four ZPE 12ST jacks - i.e. one complete horizontal ring at a time.

Steedale Systems supplied the material and carried out the stressing and grouting works. l

Brian Cox
Steeledale Systems

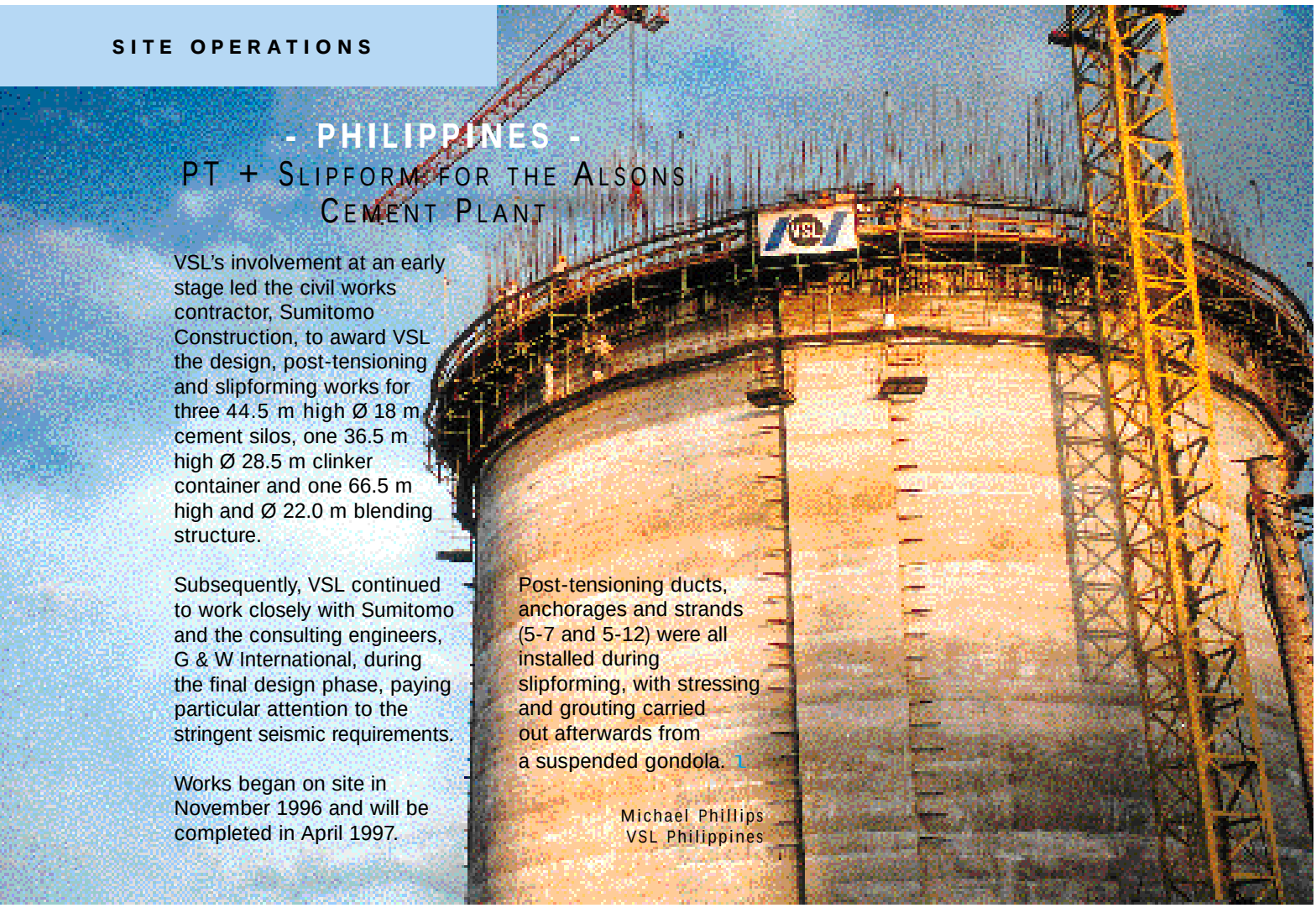
- PHILIPPINES -

PT + Slipform for the Alsons Cement Plant

VSL's involvement at an early stage led the civil works contractor, Sumitomo Construction, to award VSL the design, post-tensioning and slipforming works for three 44.5 m high Ø 18 m cement silos, one 36.5 m high Ø 28.5 m clinker container and one 66.5 m high and Ø 22.0 m blending structure.

Subsequently, VSL continued to work closely with Sumitomo and the consulting engineers, G & W International, during the final design phase, paying particular attention to the stringent seismic requirements.

Works began on site in November 1996 and will be completed in April 1997.



Post-tensioning ducts, anchorages and strands (5-7 and 5-12) were all installed during slipforming, with stressing and grouting carried out afterwards from a suspended gondola.

Michael Phillips
VSL Philippines

- SINGAPORE -

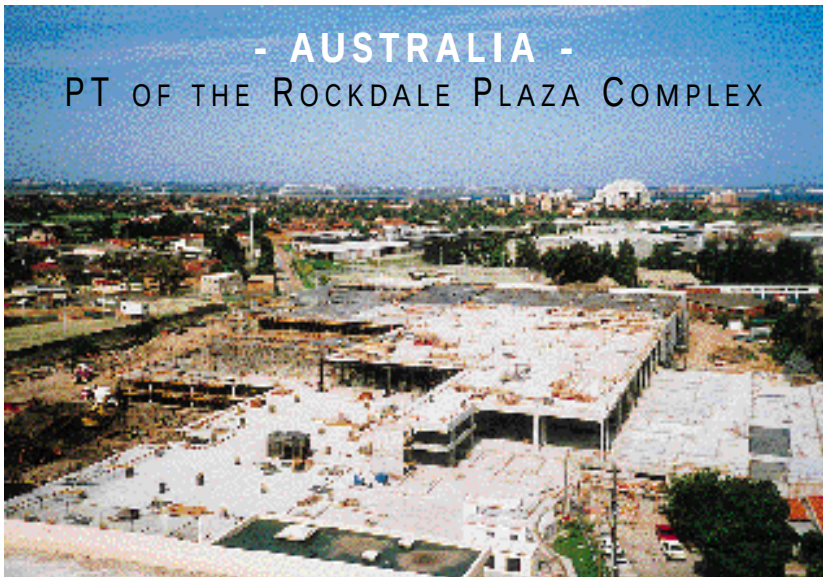
VSL PT is Used to Control Tight Deflection of Large-Span Floors

The automated stacking and retrieval systems (ASRS) used for high-density storage is part of Singapore's CWT Distripark. With racks extending to a height of 11.5 m and special trolleys mounted on tracks being used, controlling the deflection of the floor slab became an important design criteria in ensuring the stability of the ASRS system.

Recognising the need for a specialist, the consulting engineer, Meinhardt Singapore, and the main contractor, Koh Brothers Building & C.E. Contractor (Pte) Ltd awarded VSL the prestressing contract with the specification that PT Slab/PT Beam deflection remains under 1,000th of the span. With a typical floor grid of 13.1 m x 10.8 m and design loadings of 20 and 40 kPa, one-way band beam and two-way band beam systems respectively were used. The total post-tensioned floor area covers 66,000 m^2 and over 800 t of strands have been installed. A custom-made table form was also used for the construction of slabs to meet the needs of floor-to-floor heights of up to 13 m.

Gary Soon - VSL Singapore

- AUSTRALIA -
PT OF THE ROCKDALE PLAZA COMPLEX



Rockdale Plaza in Sydney's inner southern suburbs is a mixed residential and retail development that will eventually provide five residential apartment towers on top of a large shopping complex.

The Owner, Developer and Builder, City Freehold Constructions, awarded VSL the post-tensioning contract for two underground carpark levels and a retail level. A total slab area in excess of 60,000 m² is to be stressed comprising approximately 325 t of PT. Predominantly, the VSL slab system up to S5-5 has been specified by the Engineer, with multistrand tendons up to 5-27 being extensively used in the large transfer areas which support the apartment towers.

Construction is progressing according to schedule.

Neil Audsley and John Davie
VSL Prestressing (Aust.)

- HONG KONG -
RECORD TIMES FOR THE H.K.E BUILDING

The new Hong Kong Electric Co Ltd's building in Ap Lei Chau Hong Kong Island is now structurally completed.

VSL's scope of works included the design of floor slabs and the supply and installation of 800 t of post-tensioning.

The design was carried out twice because the zoning was changed from commercial to industrial which resulted in new design loads, changes to floor layouts and framing as well as alterations to building outline. These revisions saw the introduction of 2-way band beams and thicker flat slabs. A major challenge was the critical time frame as the final drawings were issued only days ahead of construction on a fast track schedule.

In overcoming these challenges, VSL as a construction partner demonstrated its ability to meet the changing needs of the client.

Andrew Rose - VSL Hong Kong

- AUSTRALIA -
A PT + Retained Earth Walls Package

The Inner North West Ring Road bridge forms the final link to Brisbane City Council's inner city ring road system. Concrete Constructions (Qld) were awarded the project and were required to maintain full traffic flow during construction which resulted in the four-span bridge being built in two stages.

VSL's contract involved installation of post-tensioning, stressing and grouting works of the 102-m four-span bridge.

The approach retained earth walls were also supplied by VSL and were finished in a rib face pattern to match the existing concrete pattern on previous stages of the project.

VSL provides post-tensioning and retained earth Walls for the project

Barry Story
VSL Australia, Queensland

- VIETNAM -
First Contract for VSL in Vietnam as a Foreign Licensed Sub-Contractor

General Construction Company Nº1 - a Vietnamese contractor, awarded VSL the supply, installation and supervision contract for the post-tensioning works of four silos (one raw meal blending, one clinker and two cement silos) as part of the Morning Star Cement Plant project.

This is the first contract for which VSL is working as a licensed foreign sub-contractor directly managing a local workforce. It will greatly increase VSL's experience of operating in Vietnam.

C.S. Siah
VSL Vietnam R.O.

- THAILAND -

TALINGCHAN PHUTHAMONTHON ROUTE 2

This project was initiated by the Thai Department of Highways, Ministry of Transport and Communications to reduce the serious traffic congestion in Southern Bangkok. This 9.1-km long highway will be entirely elevated 15 m above ground level and constructed using a precast girder and cast in-situ deck slab.

The project has been split into three sections and VSL was awarded the post-tensioning works for all three sections (3,040 t) by three contractors (Siam Concrete and Bricks Products Co. Ltd., P.P.D. Construction Co. Ltd. and Italian Thai Development Public Co. Ltd). In addition to PT, VSL is supplying labour for casting 803 girders on Section 2 and is responsible for their erection using a VSL Launching Truss. On Section 3, VSL is also supplying labour and supervising the erection of 875 girders using Italian Thai's Launching Truss. This Truss was originally designed by VSL and previously used on the Ramindra at Narong Expressway Project.

VSL's works commenced in September 1996 and completion is due in June 1997.

Gaysorn Lertmongkonnam
VSL Thailand

- USA -

WABASHA STREET BRIDGE REPLACEMENT

In February 1996, Lunda Construction Company of Black River Falls, Wisconsin, awarded VSL Corporation a contract for the supply and installation of 525 t of post-tensioning, and the lease of two sets of VSL Form Travellers (four headings) for the Wabasha Street Bridge Replacement in downtown Saint Paul, Minnesota. The new bridge (approximately 11,000 m^2 of deck area) consists of two parallel box girders (spans 72 m-119 m-119 m-72 m) built using the cast in-place balanced cantilever method. The structures replace an existing steel truss spanning over the Mississippi River.
Using VSL's Form Travellers and with a team effort from Lunda Construction, VSL Corporation and J & L Steel Erectors, a production rate of 8 pours (2 pours per heading) in a 6-day work has been achieved. Although the work has slowed during the winter months due to the extreme cold, the project is projected to be completed in October 1997, one year ahead of schedule !

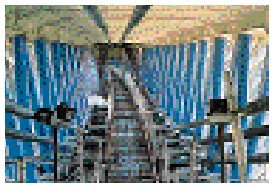
Bob Sward
VSL Corporation - Atlanta, GA

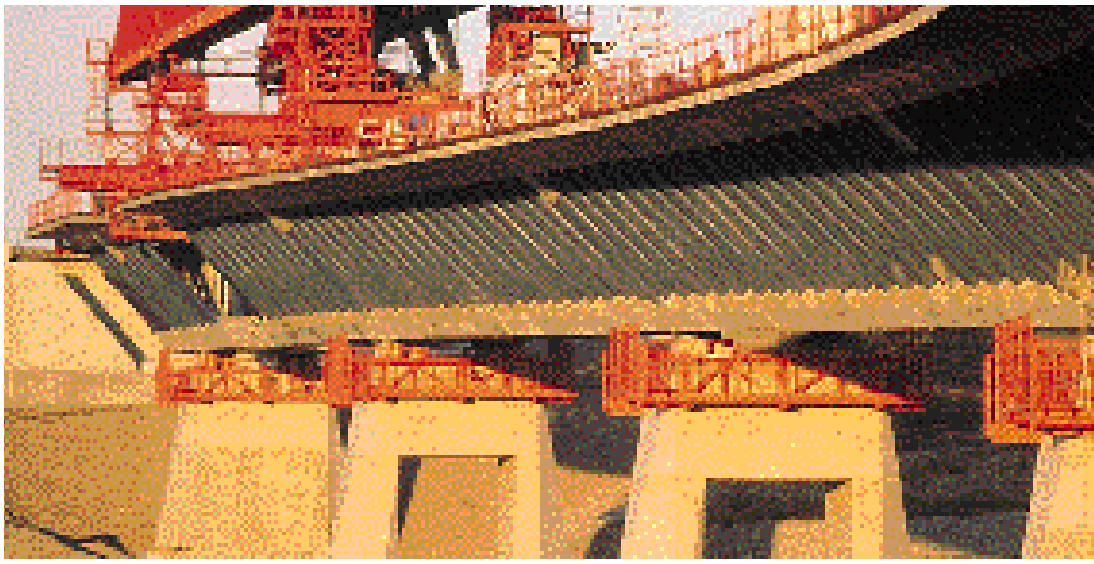
Batam Tonton Stay Cable Bridge

Nipah Sekoto Precast Segmental Bridge

- INDONESIA -

VSL Completes the Longest Balanced Cantilever Bridge in Indonesia





- USA -

Foss Waterway Stay Cable Bridge

The Foss Waterway Bridge opened in February 1997. Located in Tacoma, WA, it is part of the new SR-509 East-West Corridor project.

Washington State Department of Transportation, owner and engineer, designed the bridge in two units. The western portion is a two-span cast in-place post-tensioned box girder. The eastern portion is a two-span cable supported unit of cast in-situ post-tensioned concrete.

The cable stayed unit consists of a 107-m main-span and a 101-m back span. The bridge is supported by two planes of cables aligned with longitudinal edge girders along the roadway. There are a total of 44 stay cables which are comprised of individually greased and sheathed 15.2-mm strands. The stay cables range in size from 24 strands up to 63 strands. These were all supplied and installed by VSL Corporation.

Steve Ruel - VSL Corporation - San Jose, CA

Six bridges are being constructed as part of Batam Island development programme (South of Singapore) : one cable-stayed bridge (644 m), two cantilever bridges (420 m and 380 m), two precast segmental bridges (270 m and 180 m) and one arch bridge (365 m).

At the end of 1996, VSL had completed the superstructure of the two precast segmental bridges. It has now completed the 420-m long free cantilever bridge linking the islands of Tonton and Nipah. This bridge was initially an alternative design using a single box girder proposed to the Main Contractor by VSL to speed up construction. VSL supplied and installed the post-tensioning and was responsible for the design and operation of the two pairs of travellers used in the project.

Johannes Himawan
VSL Indonesia

- FRANCE -

Boulonnais Composite Steel/Concrete PT Bridges

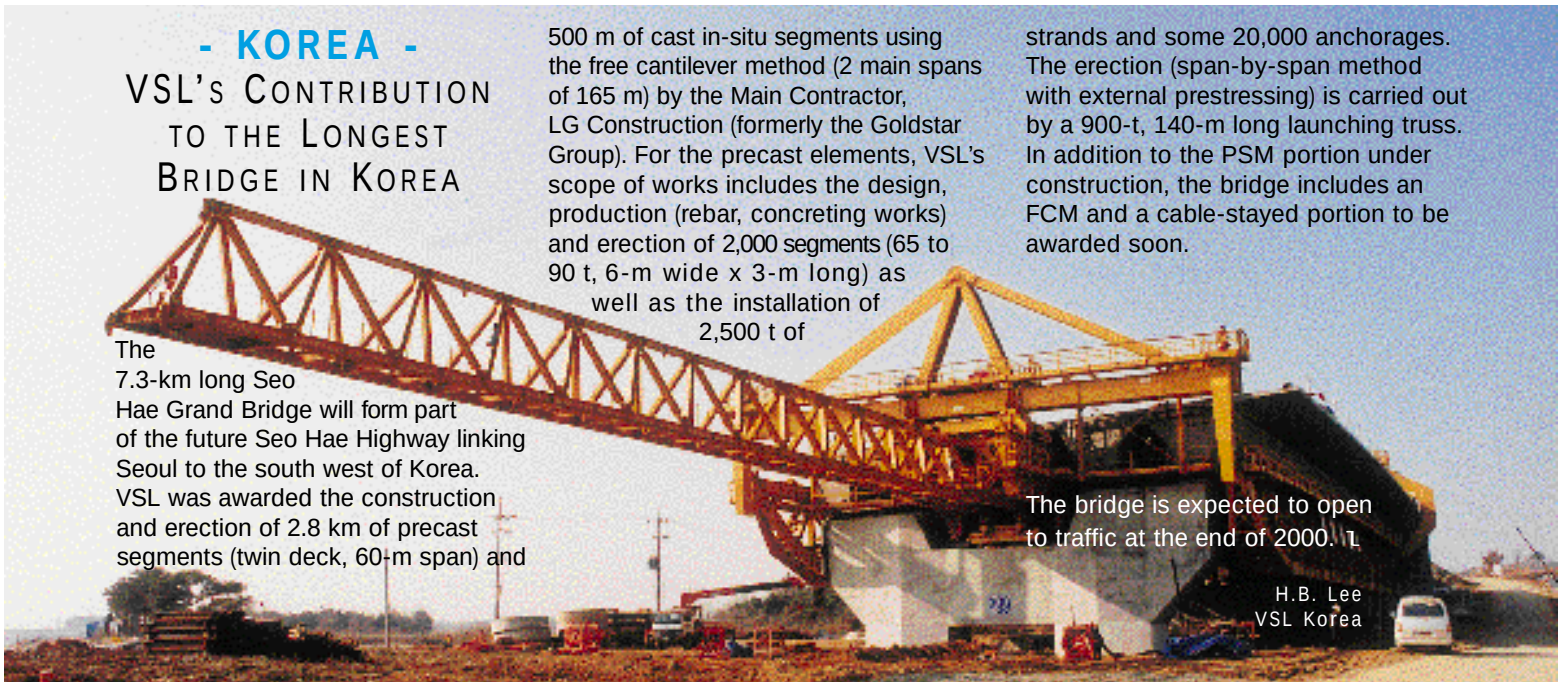
As part of the A16 motorway in Northern France, three similar composite bridges are being constructed by a Joint Venture led by Bouygues (Bouygues, Demathieu and Bard, Norpac). VSL intervenes as post-tensioning sub-contractor and its scope of works includes transversal, cantilever and continuity post-tensioning and the nailing of the piers.
The innovative nature of the design, with composite precast segments open on both sides, particularly complicates works during bad weather and demanded that VSL developed specific working procedures during the installation of external PT. Work on site is scheduled to be completed at the end of 1997 and the opening to traffic is scheduled for March 1998.

Pascal Helfer
VSL France

- KOREA -

VSL's Contribution to the Longest Bridge in Korea

The 7.3-km long Seo Hae Grand Bridge will form part of the future Seo Hae Highway linking Seoul to the south west of Korea. VSL was awarded the construction and erection of 2.8 km of precast segments (twin deck, 60-m span) and 500 m of cast in-situ segments using the free cantilever method (2 main spans of 165 m) by the Main Contractor, LG Construction (formerly the Goldstar Group). For the precast elements, VSL's scope of works includes the design, production (rebar, concreting works) and erection of 2,000 segments (65 to 90 t, 6-m wide x 3-m long) as well as the installation of 2,500 t of strands and some 20,000 anchorages. The erection (span-by-span method with external prestressing) is carried out by a 900-t, 140-m long launching truss. In addition to the PSM portion under construction, the bridge includes an FCM and a cable-stayed portion to be awarded soon.



The bridge is expected to open to traffic at the end of 2000.

H.B. Lee
VSL Korea

Deformed concrete walls

- PORTUGAL -

VSL Adapts Its Retained Earth System for a Concrete Wall Embankment

Poor soil conditions led the main contractor, Construçoes Aquino & Rodrigues SA, to halt the construction of an 8-m high concrete wall embankment for a Shell Petrol Station access ramp while the works had only reached 25% completion of the works.

After a careful analysis of soil conditions, static and seismic stability and impact of active earth pressure, VSL proposed adapting its Retained Earth steel meshes which are normally used for the 1.5 m x 1.5 m precast RE panels. This system led to the construction of the 300 m² wall in just three weeks and proved to be an extremely versatile and economical (design and construction) solution for remedial works to cast in-situ walls.

Zenobia Quadros Martins
VSL Prequipe

- USA -

Kendall Drive Interchange's Retained Earth Walls

The Kendall Drive Interchange on the Palmetto Expressway in Dade County, Florida is undergoing a renovation to handle an additional 25,000 vehicles per day.

VSL was awarded by general contractor - Odebrecht Contractors of Florida, Inc. - the installation of 10,200 m² of Retained Earth walls (total length 2,850 m) comprising 1.5 x 1.5 m panels with an Ashlar Stone form liner finish.

In addition, VSL is supplying some 2,500 m of precast concrete traffic barrier.

With new panels, reliable regional precasters, and local soil reinforcement suppliers, VSL is well positioned to continue its collaboration with the Florida Department of Transportation, one of the largest users of reinforced soil technology in the United States.

William Neely
VSL Corporation - Retained Earth

- SWITZERLAND -

Electrical Isolation Monitoring Provides a Simple Means of Checking Corrosion Protection of an Anchoring System

Electrical isolation and permanent monitoring provide many advantages :

- To achieve electrical isolation, VSL uses the best of its anchoring technology, encapsulation materials and fabrication methods.
- It practically eliminates worries concerning corrosion both during construction and the service life of the anchor.
- It enables the system integrity to be checked before corrosion develops.

Testing the anchoring system's electrical resistance provides a simple, economical and reliable way of checking the integrity of the encapsulation and the isolation of steel elements from chemical and stray current attacks. Electrical isolation has now become a standard requirement of the new Swiss Anchor Code.

One of the latest projects in which such a technology has been applied is the Bajikrachen Rock in the Canton of Valais, Switzerland, where twenty-seven of these 19-strand 40 to 50-m long high-tech anchors were installed.

Franz Fischli - VSL Switzerland

General view of a wall with three levels of ground anchors

- CHILE -

VSL Introduces Temporary Anchors Technology in Chile

The Sheraton hotel extension is currently one of the largest construction projects in Chile. The developer is Sheraton Hotel and the general contractor a consortium formed by Graña y Montero from Peru and two local contractors, Echeverrìa Izquierdo and Bravo Izquierdo. Bascuñan y Maccioni are the engineers. This extension includes a five-level basement car park, a convention centre floor level and a 16-storey tower for hotel accommodation.

VSL's scope of works covers the post-tensioning of the parking floor slabs and, in co-operation with Pilotes, a local underground works company, the installation of temporary ground anchors to the perimeter wall - a technique used for the first time in Chile.

Celso Villa
VSL Sistemas Especiales de Construccion

- HONG KONG -

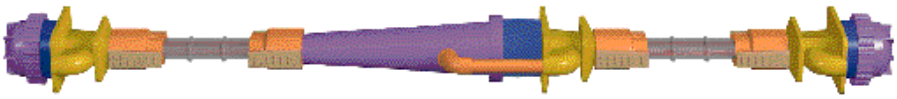
VSL Solution to Minimise the Effects of Stray Currents

The Mass Transit Railway Corporation (MTRC) appointed Babtie Oakervee Ltd. as the designer for the MTRC 509 project. The Main Contractor, GTM-Wan Hin-CFE Joint Venture, chose VSL as post-tensioning sub-contractor.

VSL's scope of works involves the supply and installation of post-tensioning for six railway viaducts (total length of approx. 1,060 m) and a twin-cell deck.

To solve the stray current problem on the structures, VSL designed an electrically isolated CS5-31 PT-Plus system including corrugated polyethylene ducts, epoxy coated EC castings, epoxy coated trumpets at coupling connections and bearings using surface-mounted cevolit plates. Better isolation was ensured by the use of vacuum-assisted grouting to optimise the quality of the tendon grouts.

Brian Lim - VSL Hong Kong



- USA -

VSLAB+™ was Ideally Suited for the Painters Mill Parking Garage

Painters Mill Parking Garage near Baltimore, Maryland was the first building using the innovative VSLAB+™ - a fully bonded encapsulated two-strand post-tensioning system.

Thanks to Schuster Concrete - the concrete frame contractor, who brought VSL into the early design phase, VSL provided a design that greatly enhances the durability of the parking deck in this climate, known to promote concrete deterioration. Designed for thin slabs (140 mm and larger), the VSLAB+™ with its completely bonded encapsulated system, plastic duct strand protection and high-performance silica grout was ideally suited to provide optimum long-term corrosion protection.

The frame was a one-way beam and slab scheme cast in-situ using bonded post-tensioning. The frame, covering 15,000 m^2, was completed in February 1997. VSL's scope of works included the design of beams and slabs, supplying and installing the post-tensioning, and installing the slab mild reinforcing.

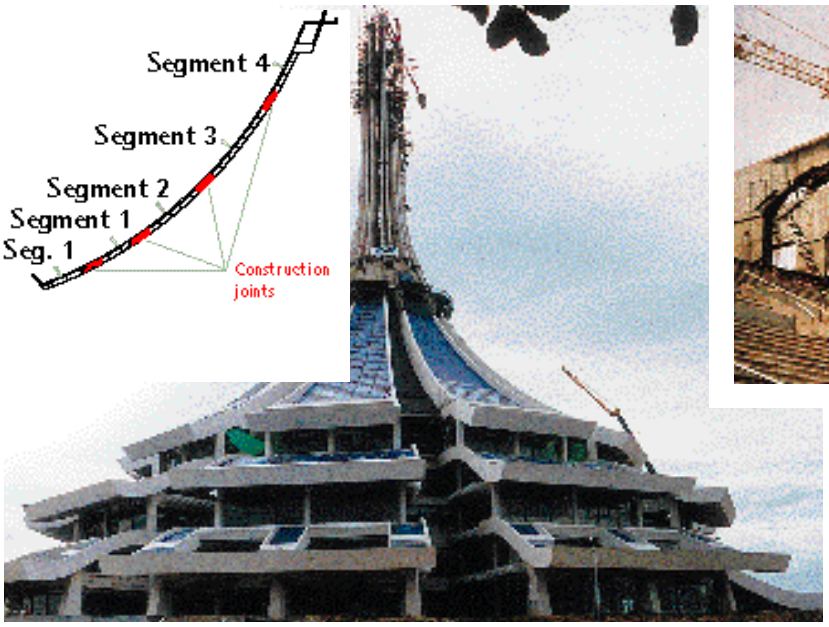
Painters Mill Parking Garage is another example of VSL's continued commitment to providing our project partners with the best value.

Hank Cronin
VSL Corporation - Washington DC

VSL Brings Bridge Pre-Cast Segmental Technology to the Building Industry

Everyone knows about the advantages of using pre-cast segments in the construction of bridges : cost savings, reduced construction time, increased work productivity, standardisation of methods, processes and materials, re-utilisation of equipment, control and quality of concrete. VSL has recently completed two projects in which pre-cast segmental construction was used for buildings : the roof of a 20,000-seat athletics stadium in Thailand and the roof of the Kuching City Hall in Kuching, Sarawak, East Malaysia. In these two projects, VSL demonstrated its ability to transfer precast segmental bridge technology into precast segmental building construction.

Max Meyer - VSL Singapore

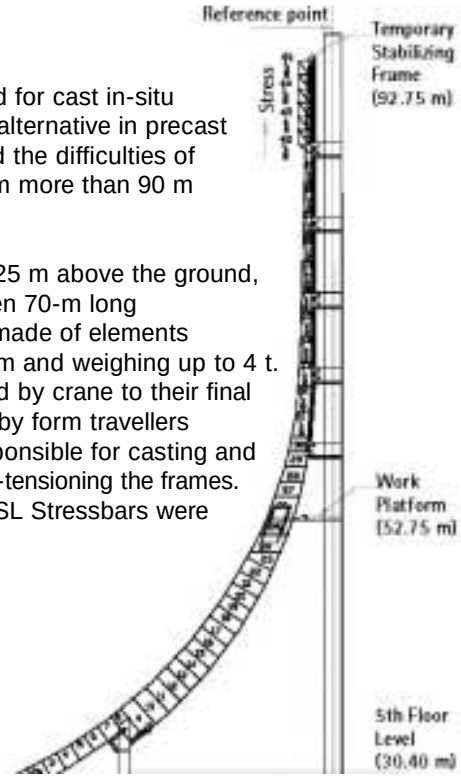


Kuching City Hall

Chiang Mai Sport Complex

The roof was originally designed for cast in-situ concrete but VSL proposed an alternative in precast segmental construction to avoid the difficulties of manipulating a formwork system more than 90 m above ground level.

Covering the main structure at 25 m above the ground, the roof is composed of eighteen 70-m long post-tensioned arched frames made of elements measuring between 1 m and 3 m and weighing up to 4 t. The precast elements were lifted by crane to their final position temporarily supported by form travellers designed by VSL. VSL was responsible for casting and placing the segments, and post-tensioning the frames. As in the Chiang Mai project, VSL Stressbars were used.



In this project, VSL convinced the consulting engineer to use precast concrete beams instead of steel to speed up construction and save on overall construction costs. The roof over the VIP seating area is 150-m long and supported by match-cast pre-cast post-tensioned frames with a maximum free cantilever of 27 m. The 26 frames are constructed from precast segments of 5 m maximum and weighing up to 8 t supporting the roof surface made of steel sheet on steel purlins. As a specialist contractor, VSL designed the frames and was responsible for precasting the beams, lifting them from ground level and placing into final position as well as the stressing of the segments. VSL Stressbars were used because they best suited the short tendons and progressive stressing construction techniques.

- JAPAN -
LIFTING A 4,130 T CONCRETE ROOF

Taisei Corporation, acting as a sublicensee of VSL Japan, lifted the 4,130 t roof of a 60 M-l LPG underground tank for Tokyo Gas Ogishima. The dome (Ø 43.8 m) was raised 36.3 m above the base slab where it was constructed.

The operation was completed in just three days and reduced construction time by 3 months when compared to the supporting traditional method. Sixteen 500 t jacks were necessary to place the roof into position at an average speed of 2 m/h. l

Shusuke Sakata
VSL Japan

This article has been prepared by the courtesy/cooperation of Messrs. M. Nakano, Tokyo Gas Corporation, Y. Tsubone, Taisei Corporation, and T. Toshimitsu, VSL Japan Corporation all of whom were very involved in the lifting.

- SWITZERLAND -
LIFTING THE 2,400 T STAUFFACHERSTRASSE BRIDGE

To provide headroom for new Intercity double-decker trains, VSL was awarded the contract to lift the deck of this 85-m long 2,400-t steel bridge by 0.60 m.

The works required an initial lifting of 0.75 m using 36 hydraulic jacks and steel packers, positioned in the 6 support axes. Lifting levels and forces were remotely controlled to comply with the stringent tolerances set by the consultant, Gonin, Zeerleder & Partner. The pier heads and abutments were then raised by 0.60 m by the main contractor, a joint venture led by Losinger Ltd. Four weeks after the lift, the bridge was carefully lowered 0.15 m onto the modified sub-structure. Subsequently, the access street to the bridge was raised to match the new profile. To the satisfaction of the Swiss Federal Railways, the bridge was reopened to traffic on the scheduled date. l

Six hydraulic jacks were required for each support axis

Erich Möschler
VSL Switzerland

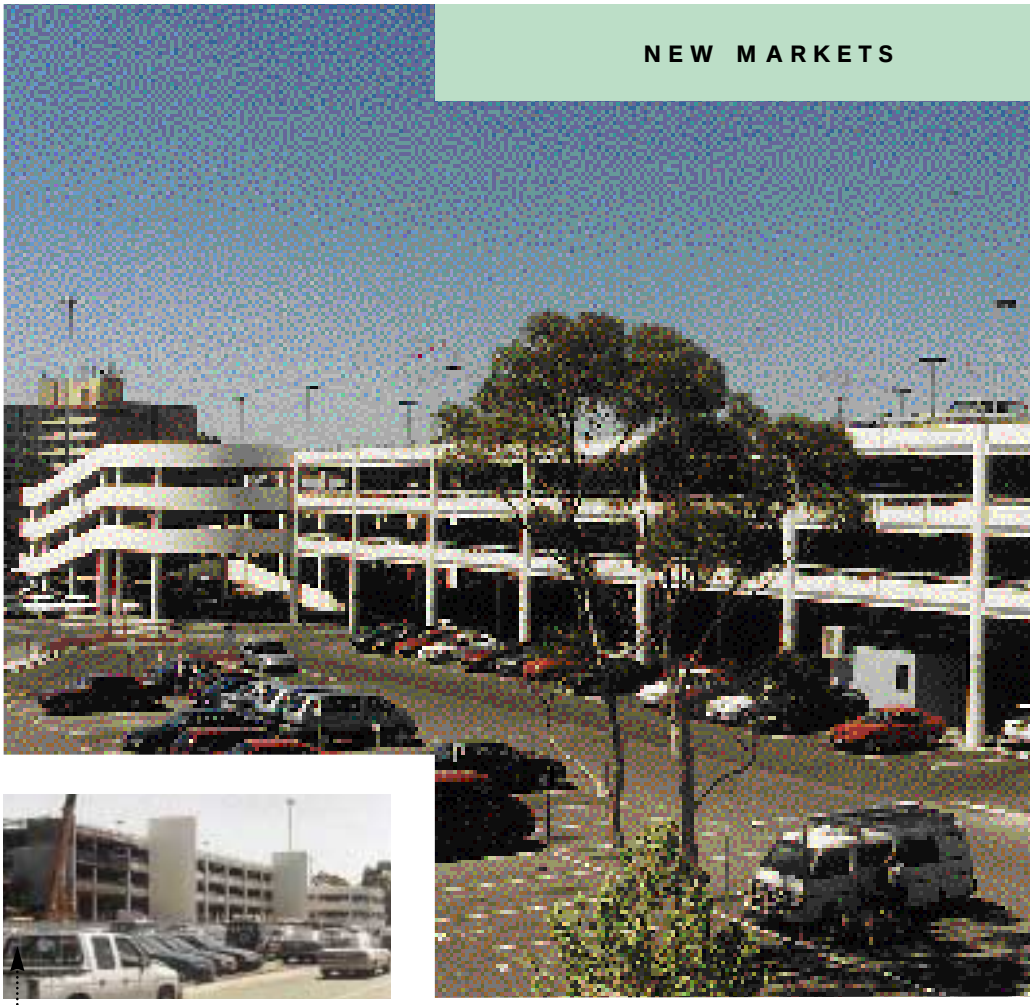
- AUSTRALIA -
More Carparks !

Carpark structures are an integral part of most commercial developments and ideally suited to in-situ post-tensioned construction.

VSL provided specialist PT services for the construction of several such structures using the classic bonded slab floor system.

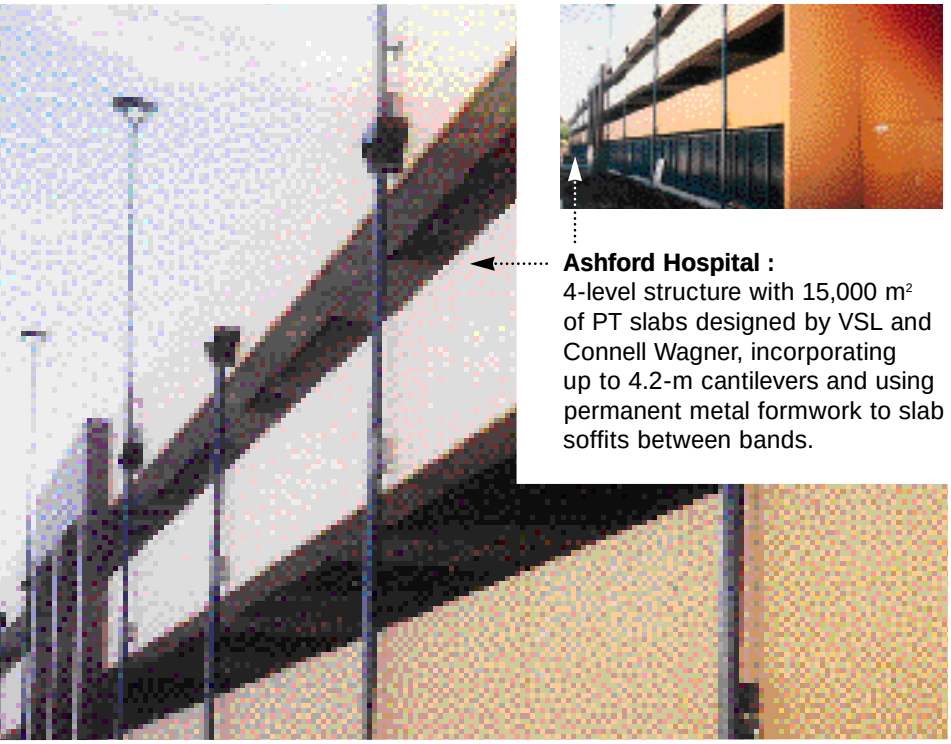
Greenwood Park Offices :
Two single deck carparks, 3,000 m^2 and 2,700 m^2 respectively, soon to be constructed to increase the existing parking capacity at this busy suburban office park at Burwood. PT was selected because of its economical and rapid construction rate.

Frank Filippone



Tullamarine Airport :
4 levels with a slab area of 58,000 m^2. Typical grid of 11 m x 8.4 m. Structural design by Meinhardts for construction in 2 stages to be completed by mid-1997.

Moonee Ponds Central Shopping mall : Single deck 5,000 m^2 with provision for a 2nd level, constructed in 4 weeks. VSL's scope of works included the full structural design.



Ashford Hospital :
4-level structure with 15,000 m^2 of PT slabs designed by VSL and Connell Wagner, incorporating up to 4.2-m cantilevers and using permanent metal formwork to slab soffits between bands.

RMIT Bundoora College :
4 levels, 12,000 m^2 total slab area designed by VSL. Floors constructed in nine weeks, which included a 2-week Christmas shutdown.

THE COMBINATION OF A WORLD-CLASS SPECIALIST CONTRACTOR
WITH THE RESPONSIVENESS OF A LOCALLY BASED PARTNER

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MALAYSIA
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KOREA
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PHILIPPINES
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VSL Corporation
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Fax: 1 - 305 - 592 - 5629

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Central and Eastern Europe, Middle East (Operating Unit 4)

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VSL Systemy (CZ) s. r. o.
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INDIA
Killick Prestressing Ltd.
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SWEDEN
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VSL (Switzerland) Ltd.
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Prestress VSL of Bolivia Jauregui Ltd
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VSL Sistemas
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VSL France S.A.
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GREAT BRITAIN
Balvac Whitley Moran Ltd.
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Stronghold Benelux B.V.
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Steeledale Systems (Pty) Ltd.
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