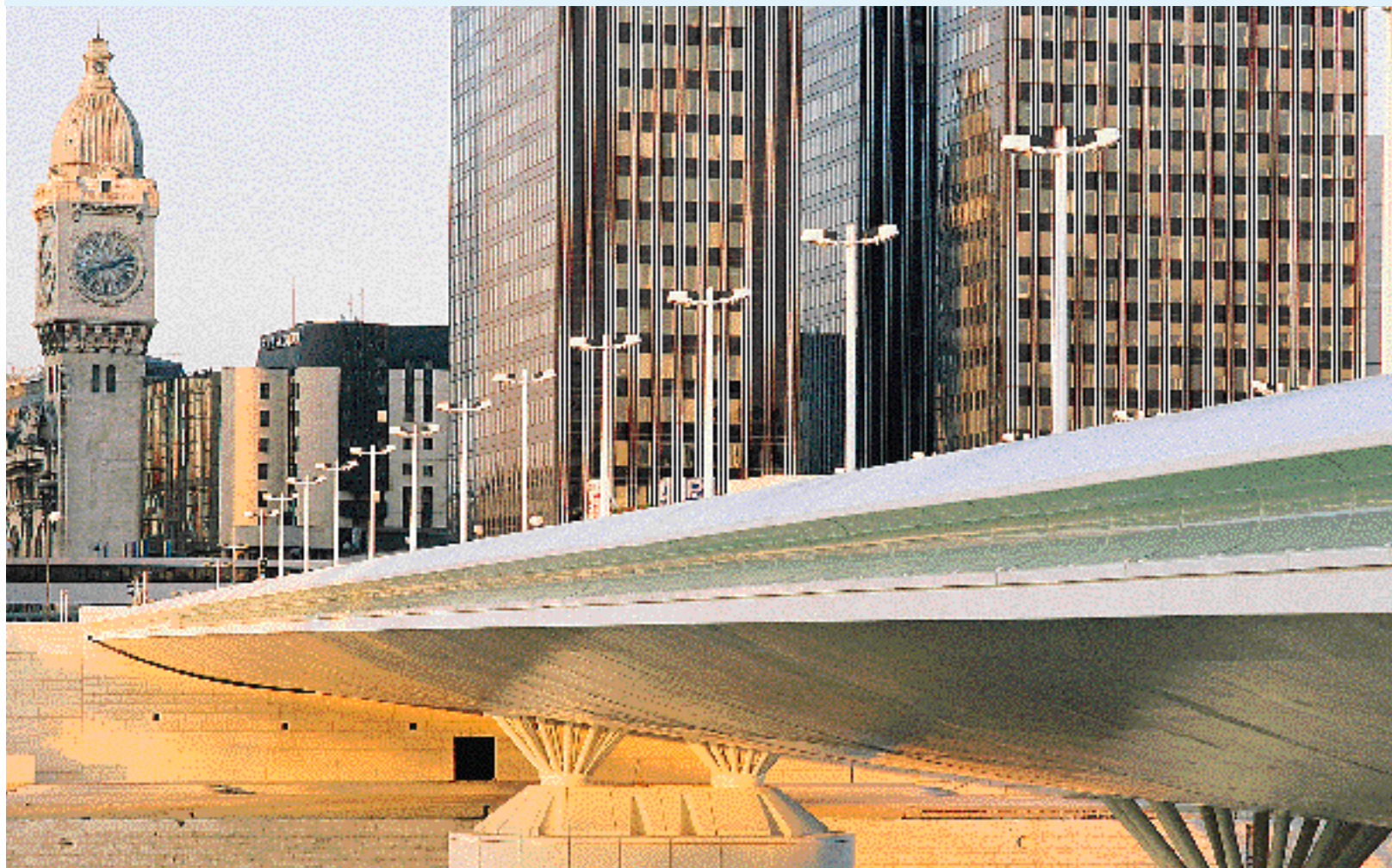


*The Charles De Gaulle Bridge - Paris, France*





### VSL Your Specialist Contractor

Prestressed concrete structures are making significant contributions to improving the overall effectiveness and quality to a growing and sensitive European infrastructure. VSL in co-operation with other partners has established "Convention Européenne de la Précontrainte" (C.E.P.) - an international non-profit organization with a view to :

- Promoting solutions using post-tensioning techniques and related structures in Europe.
- Improving construction effectiveness and the quality of concrete structures by providing complete post-tensioning services as a specialist contractor.
- Promoting post-tensioning in European codes and Approvals as a construction technique including research, development, production, installation, monitoring services and overall technical support - rather than product trading.
- Co-operating with National and European bodies together with other local and international associations having similar objectives particularly in relation to prestressed structures and technology.

VSL Clients and Partners will be able to assess our approach to post-tensioning capabilities by :

- measuring VSL's achievements in satisfying their needs
- meeting VSL staff and sharing innovative solutions for projects
- teaming with VSL's regional and technical specialists
- reviewing VSL's continuing development
- relying on VSL's research
- sharing VSL's confidence in the future of post-tensioned concrete and prestressed structure construction.

Michel Maitre  
CEO and Chairman of the Board



## HIGHLIGHTS

**3-5** *Special Hong Kong projects*

**8-9**

*Repair of the Koror-Babeldaub Bridge*



*The Autofonçage®  
Sliding Method*

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*Non-metallic tendons*



*VSL leads the Retained Earth market in South Eastern USA*

**15**



## P U B L I S H E D B Y

**VSL International Ltd.**  
Bernstrasse 9, 3421 Lyssach  
Switzerland  
and  
**VSL Management**  
41, avenue du Centre  
78067 St-Quentin-en-Yvelines  
France

Editor : M. MAÏTRE  
Tel : 33 1 30 12 09 30

Technical Editor : H. R. GANZ  
Tel : 33 1 30 12 09 30

### Regional Editors :

P. BRON - Western Europe,  
Africa and Middle East  
Tel : 33 1 69 19 43 00

G. PASH - South East Asia  
Tel : 61 2 484 59 44

A. PAYNE - North America  
Tel : 1 919 781 6272

J. SINDEL - Eastern Europe and  
Middle East - Tel : 33 1 69 19 43 19

J-P. TRIN - North East Asia  
Tel : 852 2590 22 22

### Coordination :

P. RENARD  
Tel : 33 1 30 12 09 41

Circulation :  
C. SICA  
Tel : 33 1 30 12 09 32

Conception :  
Red Line  
Tel : 33 1 41 14 01 80

Linguistic Consultant :  
N. HARGREAVES  
Tel : 33 1 43 66 88 05





## - HONG KONG - ROOF SLIDING FOR THE NEW AIRPORT

The roof structure for the terminal building consists of large barrel vaults, each spanning 36 m. For site erection the vaults have been divided into 36 m x 36 m modules of 80 t to 120 t. The layout of the terminal precludes the use of cranes to place the modules into the interior of the building.

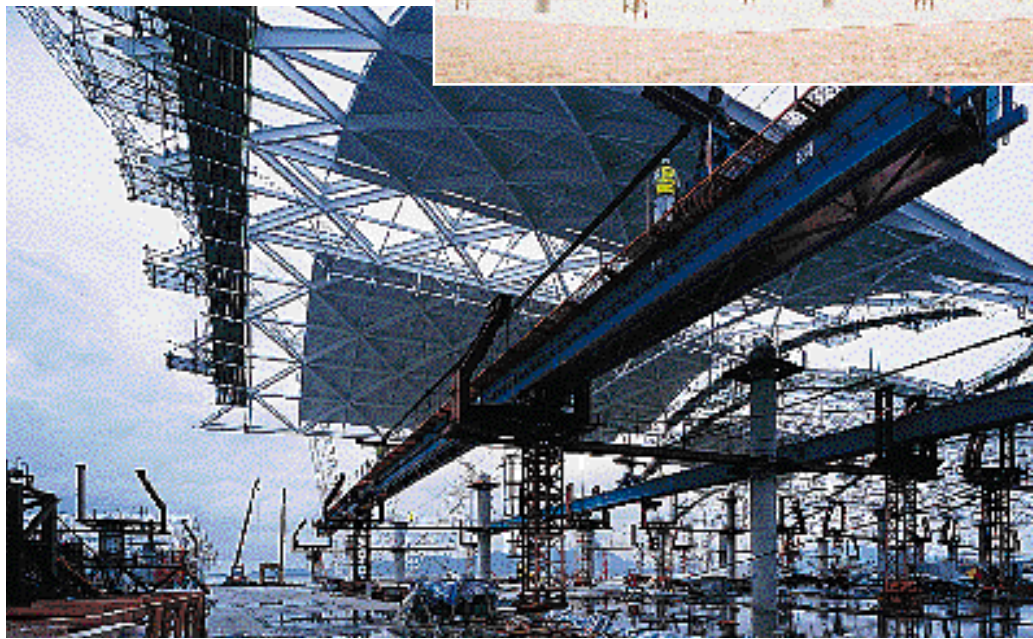
The launching system consists of two 80-m long self launching beams (SLBs) supported on electrically driven lower roller supports and temporary columns. Each SLB carries two motorized carriages which support, transport and lower the roof module into place. A cycle times of five days for transporting the modules over a distance of 360 m are now being achieved.

The design of the launching system was carried out by VSL Technical Centre Europe and site supervision

.....

is by VSL Hong Kong. Completion date is October 1996. [1](#)

Stephen Cardwell - VSL Hong Kong



### SITE OPERATIONS



## - HONG KONG - KAP SHUI MUN BRIDGE AND MAWAN VIADUCT



This project includes a cable stayed bridge with a 430-m main span and a 503-m long elevated viaduct. Both structures have two deck levels. The upper deck carries a dual three-lane carriageway and the lower deck carries the airport railway with two emergency lanes for vehicle transport.

The Main Contractor, Kumagai-Maeda-Yokogawa-Hitachi Joint Venture, awarded to VSL Hong Kong the supply and installation of 2,200 t of PT tendons and 20 t of VSL Stress Bar. VSL successfully proposed the VSL Type L anchorage as an alternative to the original vertical tendons for the 7-m high bridge web of the side spans. VSL also helped to optimise the tendon sizes for both the bridge deck and the viaduct. [1](#)





## - HONG KONG - FESTIVAL WALK MALL

Festival Walk includes 90,000 m<sup>2</sup> of landscaped - thumb mega mall covered by 23,000 m<sup>2</sup> of business complex. The exterior resembles a crystal embedded rock and incorporates extensive sky lighting with cavernous food courts and a 180-m deep shopping canyon.

PT was necessary in the general floor area where high span-to-depth ratios were desirable, in special structural elements such as the canyon boundary and the 4.5 m deep transfer beams and, in the office tower for the flooring system. [1](#)

Andrew Rose - VSL Hong Kong

PT has been utilised in four key areas:

- The general floor comprises PT primary beams with a precompressed ratio of 2.5 MPa.
- The suspended floors at the canyon extremities are supported on PT beams spanning up to 30 m.
- The adjacent floors and void perimeter of the secondary canyon are supported on PT beams with a continuous span of over 70 m.
- The flooring system of the office tower utilises PT ribs at 1 m centres spanning 12 m.



## - HONG KONG - MASS TRANSIT RAILWAY 509

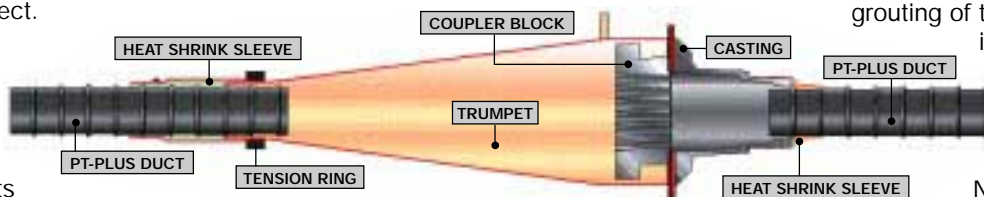
MTR Contract 509 includes six viaducts to be constructed using a standard stage-by-stage cast in-situ method. The difficult detailing for the stressing anchorage coupling zone led the Main Contractor to use VSL expertise for this project.

- 400 microns epoxy resin coating to all the exposed metallic anchorage components.
- 3 mm thick Cevolit isolating plates to be installed between the coupler block and the casting.

- Heat shrink sleeves to join the PT-PLUS duct and trumpet connection points.

Electrical insulation tests had been satisfactorily carried out on complete assembled PT anchorages in the VSL workshop. Full scale tests will be jointly conducted by the Engineer and VSL when vacuum assisted

To comply with the electrical insulation requirements specified by MTR's Engineer, VSL proposed to use EC and K type multistrand stressing anchorages with the following features:



- 3.5 mm thick PT-PLUS high density polyethylene ducts to be used for tendon sheathing.

grouting of the tendons is carried out which should occur in November 1996. [1](#)

C. T. Fung - VSL Hong Kong



## - HONG KONG - GATEWAY II

After the successful completion of Gateway I in Tsimshatsui, Kowloon, where VSL designed, supplied and installed 800 t of PT for the twin 36-storey towers with a ground floor area (GFA) of 115,000 m<sup>2</sup>. Gateway II will include three 36-storey towers and three storey podiums with GFAs of 210,000 and 36,000 m<sup>2</sup> respectively. Tower 1 and Tower 2 will be connected by a link bridge at the 15<sup>th</sup> floor to 19<sup>th</sup> floor.

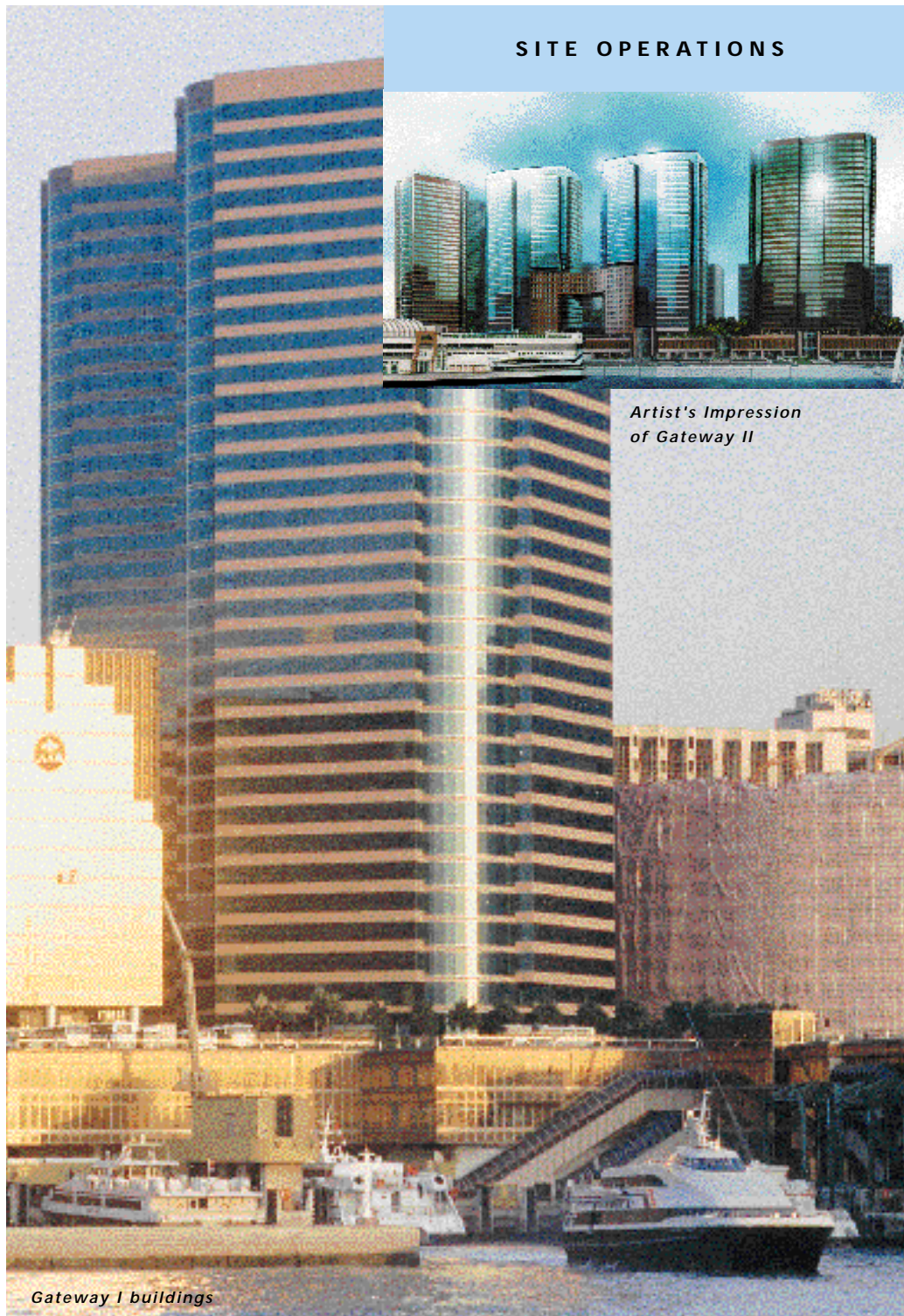
VSL's scope of works includes the design, supply and installation of post-tensioning tendons for all post-tensioned floors, from podium level 2 to the lower roof of all three towers. Design of the office towers and podium levels was carried out by VSL for Wong & Ouyang, the project Architects and Engineers, in 1995. To provide headroom for the installation of mechanical and electrical services in the ceiling, a PT flat slab scheme was selected. The PT floor slabs, spanning up to 12.0 m, are typically 260 mm thick with 4.0 x 4.0 m x 460 mm deep drop panels. This is similar to the structural floor scheme used for the twin-towers constructed in Phase I. [1](#)

Brian Lim  
VSL Hong Kong

## SITE OPERATIONS



*Artist's Impression  
of Gateway II*



*Gateway I buildings*



## - HONG KONG - ISO 9000 CERTIFICATION

In 1995, VSL Hong Kong decided to develop a quality assurance system to meet the growing demand from contractors and to maintain a leading position in its field. By the end of the year, structural bearings and movement joints were certified to ISO 9002 and

post-tensioning works to ISO 9001.

The results observed so far in 1996 have been highly positive, leading to a more systematic approach to works-in-hand and a greater awareness of the need for quality.

We intend to expand the quality assurance system to cover other activities, such as System Formwork, Retained Earth and Ground Anchors. [1](#)

Y. S. Li  
VSL Hong Kong







### - AUSTRALIA -

#### DEAGON DEVIATION BRIDGE, QUEENSLAND

The 140-m long three span box girder bridge forms a vital link for the Gateway Arterial Road in Deagon. The bridge, built by J. F. Hull, was constructed in three stages with each stage joined by a 2-m closure segment. Each closure segment allowed for the installation and stage stressing of multistrand coupling anchorages.

The triple box girder construction accommodated ten 31 x 15.2 mm multistrand anchorages in the four 2.2-m high vertical webs supporting an 11-m wide deck.

VSL carried out the material supply, installation of ducting and strands as well as all stressing and grouting works. [1](#)

Barry Story  
VSL Prestressing (Aust.)



### - SINGAPORE -

#### WOODLANDS INDUSTRIAL PARK D/2

VSL's scope of works includes the design of all structural elements except foundations and pilecaps and complete erection of the structural framework from 1<sup>st</sup> storey to 9<sup>th</sup> storey and roof. The total suspended floor area is 86,500 m<sup>2</sup>. Sembawang Construction Pte Ltd has been a VSL client for a long

time. The structural engineer is Chong & Lee Consultants

Due to the excellent layout and loading conditions of the building, a post-tensioned cast in-situ flat slab system was adopted. Large rolling table forms were used to improve the construction. Parapets and stairflights were also precast. The formwork for the core wall construction was modified so that the entire form assembly could be raised to the next pour level by VSL hydraulic jacks. When completed, this will be the largest project in Singapore fully designed and constructed by VSL. [1](#)



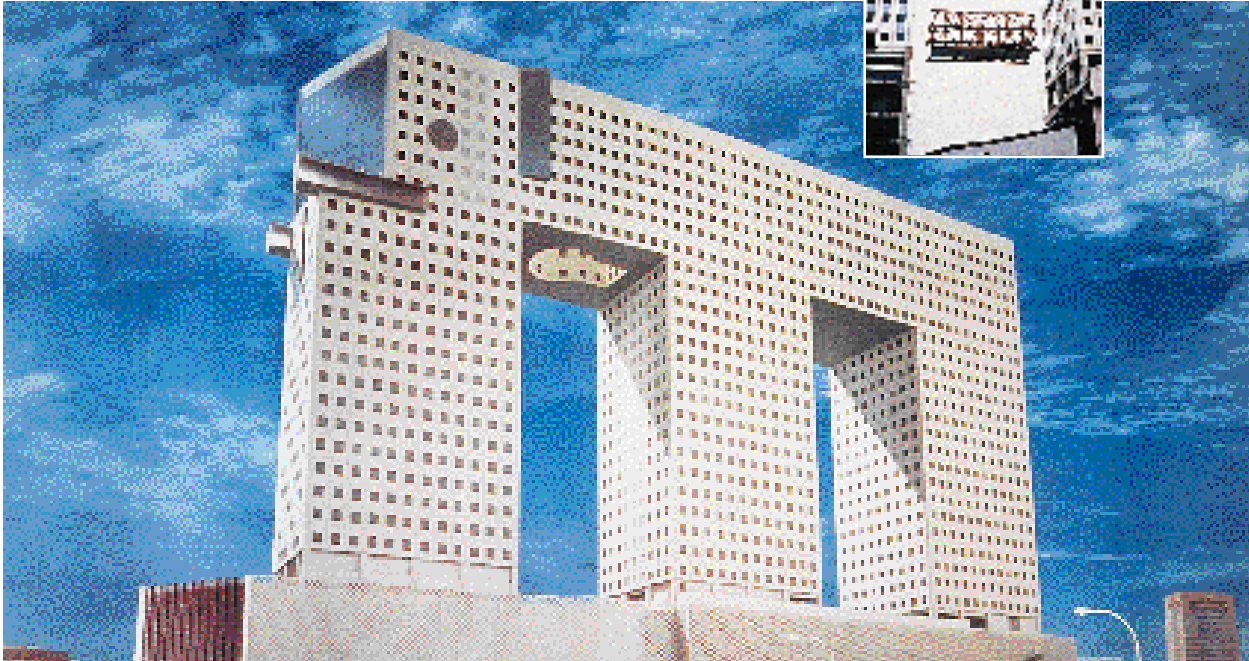
Gary Soon  
VSL Singapore





## - THAILAND -

### THE ELEPHANT TOWER, RATCHYOTHIN



As its name suggests, the Elephant Tower resembles an elephant. It is part of the new Ratchyothin business district in the north of Bangkok.

The 32-storey complex includes two office towers and a luxurious

residential condominium as well as a 1,200-car parking facility.

VSL was responsible for lifting four twin steel trusses approximately 100 m above ground level from a temporary fabrication platform on the 3<sup>rd</sup> floor level up to the 25<sup>th</sup> floor

transfer level. The trusses were lifted by four SLU 30 hydraulic jacks. Each pair of trusses span 32.7 m and has an approximate weight of 106 t. [1](#)

Gayson Lertmongkonnam  
VSL Thailand



## - AUSTRALIA -

### M2 TOLLWAY, SYDNEY

The M2 is a 23-km stretch of new road being built by the Abigroup Obayashi Joint Venture for the NSW State Government linking the North Western suburbs with Sydney City. The project is a build Own Operate Transfer toll scheme and is due to open mid 1997. VSL has been awarded the contract to supply and install 332 permanent rock anchors to retain the bored pier and shotcrete wall which stretches for over 0.5 km. Anchors range in size from 3 to 9 strands x 15.2 dia., and have a specified 100 year design life. The 'fast track' earthmoving schedule dictated that the

anchoring works be completed within nine weeks, with only one week for preparation. Anchors were prefabricated in a controlled yard environment and transported to site on extendable semi-trailers. To further streamline the installation, VSL designed a

special 'wrap around' bracket for the 30° angled bearing pads, thus avoiding the labour intensive and costly jack hammer preparation works to the concrete bored piers. [1](#)

Mick Holland  
VSL Prestressing (Aust.)





### - REPUBLIC OF PALAU - KOROR-BABELDAUB BRIDGE REPAIR

The Koror-Babeldaub Bridge is located in the Palau archipelago, approximately 1,000 km southwest of Guam. The single cell box girder bridge with shear hinges at mid-span was built in 1978 using the free cantilever construction method, providing a then record span of 240.8 m. Appreciable elastic and plastic deformation has taken place since the original construction, leading to a mid-span vertical deflection exceeding 0.9 m and considerable loss of riding comfort.

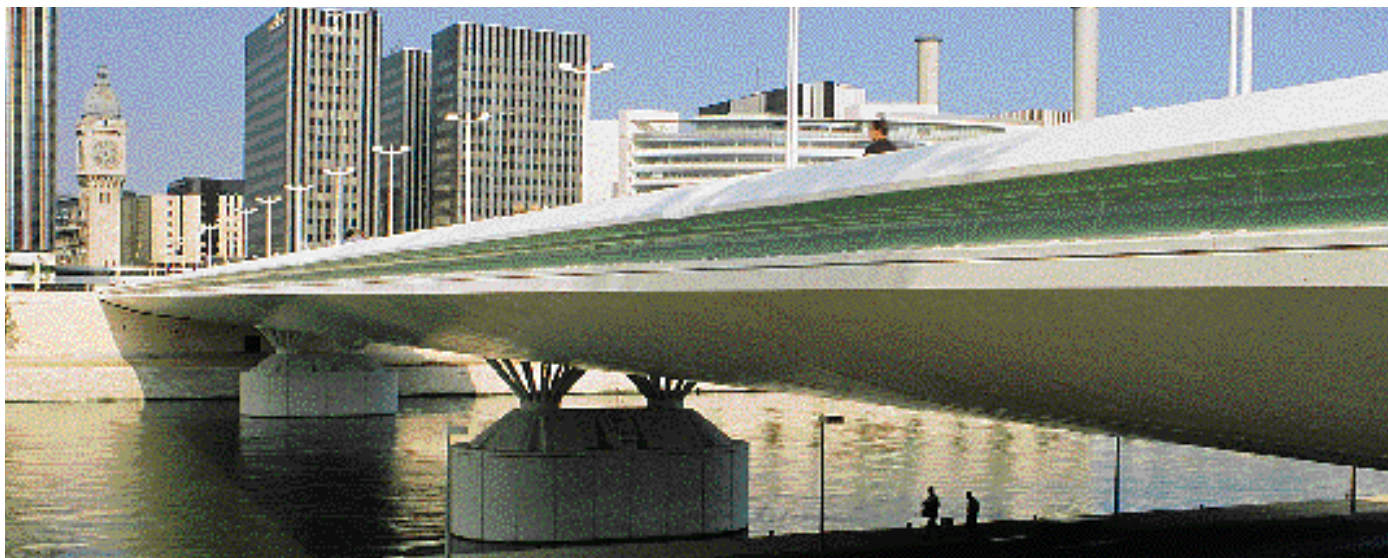
An alternative repair method proposed by VSL was accepted by the contractor, Black Micro Corp., and approved by the Engineer Berger/ABAM. This uses continuous external PT inside the girder cell over 310-m, with eight 12.7 mm tendons x 31 strands. All strands were uncoated, each tendon encapsulated in HDPE sheathing, and cement grouted. Large diameter flat jacks were used in a vertical arrangement at the mid-span hinge to assist the upward deflection and counteract



### - PORTUGAL - VASCO DA GAMA BRIDGE

The Vasco da Gama bridge is the second crossing over the River Tagus. With a length of 18 km, it is the longest bridge in Europe.

The scope of work of the JV ACE TEJO PRE-ESFORCO includes the supply and installation of 13,000 t of prestressing for the South (3.8 km), Central (6.5 km),







the effects of the new post-tensioning forces being redistributed into the pile foundation sub-structure. Intermediate support for the external tendons between anchor and deviator beams was achieved at a maximum length of 22.5 m. This was based on a computer model vibration analysis of the superstructure and PT tendons, as the American bridge code requires. [1](#)

Mark Geoghegan - VSL Guam



the Exposition (420 m) and the North (560 m) viaducts. For the four viaducts, four different



construction methods are used cast in-situ with form traveler, installing of 78-m long elements made of precast segments, symmetric installation of precast segments and cast in-situ on scaffolding.

The bridge should open to traffic in April 1998 and so far 250,000 m<sup>3</sup> out of 650,000 of concrete have been cast. [1](#)

Joaquim Rodrigues  
VSL Prequite

## - FRANCE -

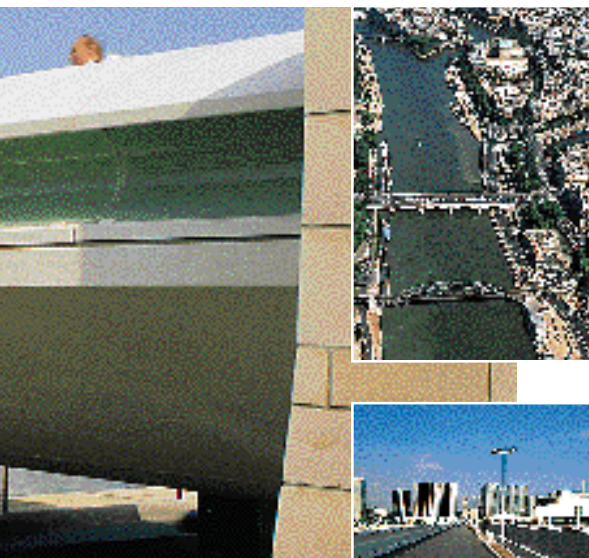
### THE CHARLES DE GAULLE BRIDGE, PARIS

This bridge, constructed by a Bouygues-led consortium, opened to traffic in August 1996.

VSL France was responsible for installing a variety of transverse post-

tensioning. T 13 and T 15 combined with EC 5-3 anchors and SO 6-4 anchors were used on the project. The SO anchors were connected to a flat PT-PLUS duct, a system which is ideally suited to thin decks with stringent corrosion and cable fatigue resistance requirements. [1](#)

A. Guillou  
VSL France





## - JAPAN -

### NATORIGAWA BRIDGE, SENDAI

The works for JR Eastern Japan involve replacing a steel railway bridge on a busy line linking Sendai and Tokyo.

The new bridge will sit alongside the existing structure and, on completion, the rails will be switched over.

This new post-tensioned concrete panel stayed bridge will be 512.2 m long. The main girders and stay panels are constructed from Prestressed Reinforced Concrete (PRC) utilising the VSL system.

The bridge design is economical and uses fewer anchorages.

Prestressed steel anchorages in the stay panels were placed on the girder side only. A "through-type" system was used on the pylon side - a first for cable stayed bridges in Japan. [1](#)

Shusuke SAKATA  
VSL Japan



*In the "New Central Gymnasium - Osaka" article (VSL News II 1995) the following information was omitted:  
Client: Osaka City, Board of Education  
Design, Supervision: Osaka City, Municipal Improvement Agency, Building and Repairs Dept.  
Entrusted Design, Supervision: Nikken Sekkei Ltd.  
We apologise for the omission.*



## - USA -

### MIAMI INTERNATIONAL AIRPORT PARKING GARAGE # 7

These two parking garages, each covering 55,800 m<sup>2</sup>, use standard cast in-situ reinforced concrete slabs and post-tensioned beams. There are 450 post-tensioned beams with 19.8 m (mostly single) spans. Early in the design stage and acting as the specialty consultant, VSL Miami presented the CS System with its reduced anchor sizes to Beachamps & Associates, Engineer of Record, as the solution to resolve reinforcing congestion at the beam-column joint and prevent the corrosion problems experienced on previous garages. This resulted in the column and

beam bar patterns being arranged around the CS system.

The system was endorsed by the Engineer for its technical superiority and labour saving characteristics. This led the contractor, Odebrecht Contractors of Florida, to award the contract to VSL.

The first of the two garages was topped out in May 1996 and the second should begin in mid-1997.

Several comprehensive value engineering alternatives were presented by VSL on behalf of the

Contractor which, although not finally used, demonstrated VSL's ability to work alongside the Contractor as a partner. [1](#)

Rafael Puerta/Raymond Bontz  
VSL Corporation - Miami, Florida





## - MALAYSIA - MALAYSIA/SINGAPORE SECOND CROSSING BRIDGE

The twin deck construction of this major crossing supports a dual three lane carriageway, each deck being 15 m wide. The overall length of the bridge is 1,919 m. The approach viaducts are being constructed using precast box girders, the first time this method has been used in Malaysia. The main navigational span consists of a variable depth cast in-situ box girder.

VSL's scope of works includes:

- Design, construction and commissioning of the erection gantry for the precast segments of the approach spans .
- All temporary props, temporary stressing, epoxy joints and permanent prestressing of the 840 segments for the approach spans.
- Erection of all precast segments for the approach spans.
- Construction of the superstructure for the main navigation spans including the design, fabrication and commissioning of eight sets of overhead formwork travellers.

There are approximately 2,650 t of VSL internal and external tendons. 1

Chong Chee Ken

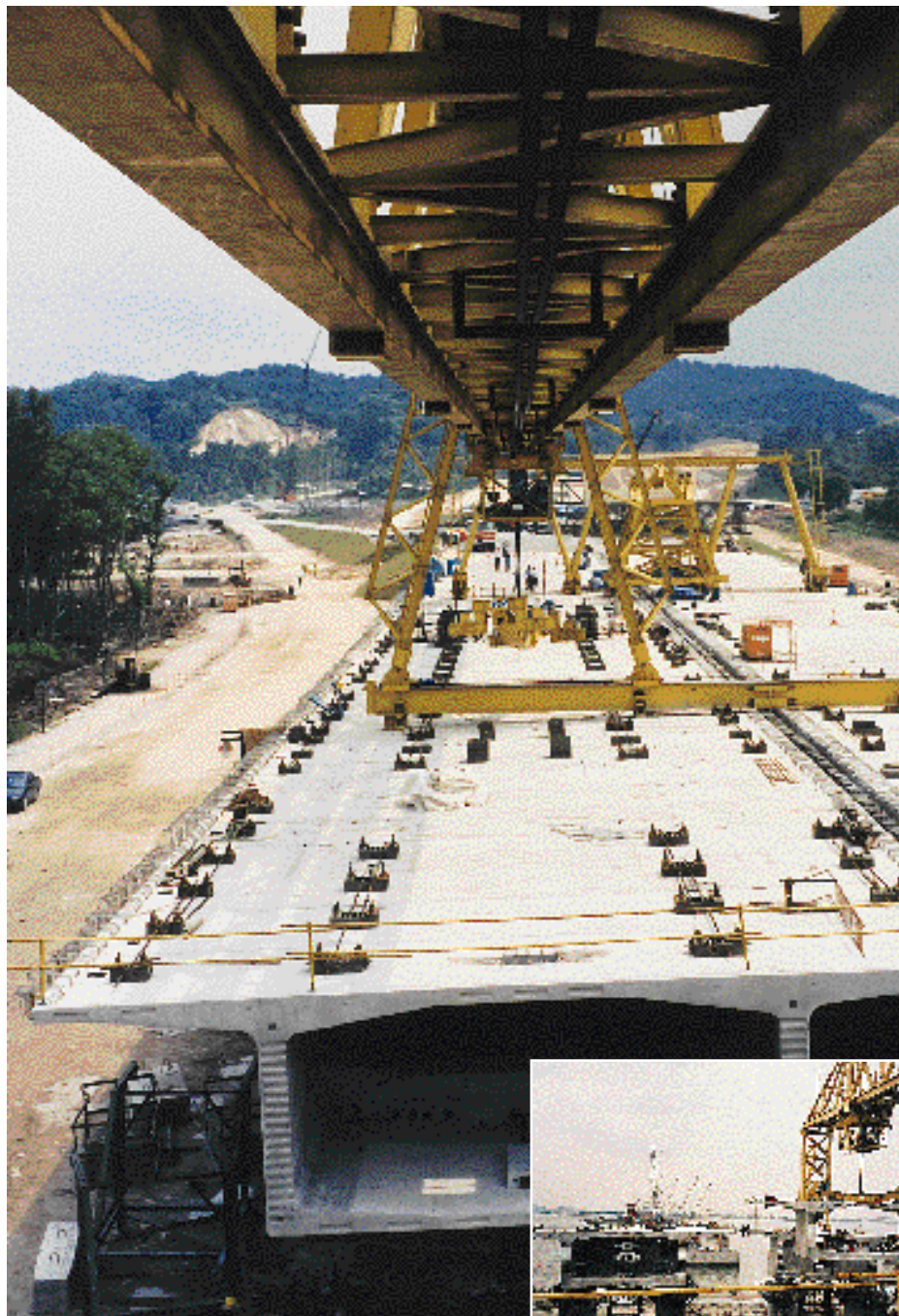
## - GERMANY - SLIDING OF THE SPREE VALLEY BRIDGE

Since the old steel bridge with a total weight of 400 t and a length of 120 m could not be dismantled and lifted by cranes, Hochtief AG - the General contractor - gave VSL Germany the responsibility of sliding out the old structure and putting in place the new concrete arch bridge.

This job also included the engineering of the sliding procedure and the replacement of the existing bearings with sliding bearings. One week after the job

award, VSL was on site and completed the job within the scheduled period of two weeks. 1

Johann Kollegger  
VSL Germany





## THE AUTOFONÇAGE® SLIDING LOUVRES UNDERPASS, FRANCE

Because of the unique feature of the AUTOFONÇAGE® sliding system which minimises traffic disruption, VSL France and JMB-Méthodes were awarded the construction of an underpass for the French Railway Authorities. The general contractor was LANG TP. The precast concrete elements are built alongside the railway line and then pulled into final position.

The underpass was created from four precast elements of 2,000 t which were prefabricated on a concrete slab. On completion of the embankment excavation the precast elements were slide into the final position.

The pulling system uses four cables with 37 x 0.6" strands that pass through bored holes in the embankment. These cables are anchored to the precast elements on opposite sides of the embankment. The elements are then pulled at an average speed of 4 m per hour using four VSL SLU 580 jacks, each with a 1,000 t capacity.

Less than three days were required for earthwork and the sliding of each element. [1](#)

Alain STAMM - VSL France



## INNOVATIVE APPROACH TO BRIDGE STRENGTHENING THE Z33 BRIDGE, SWITZERLAND

... bridge owner, the Canton of Solothurn, asked VSL Switzerland to produce a design able to strengthen the unsound bridge's load-carrying box.



VSL's solution was to introduce 0.6" single strand tendons, arranged in pairs, in individual steel tubes. These are looped around the webs and simultaneously stressed from the deck level. The strengthening of the box is completed by placing two horizontal single strand tendons, one below and one above the lower box slab, between the two web tendons. The two pairs of tendons are

joined together in a combined anchorage and deviation support element at the outer corners of the box.

The client found this solution to be technically and aesthetically satisfactory and awarded VSL the work. [1](#)

Mario BEVILACQUA  
VSL Switzerland

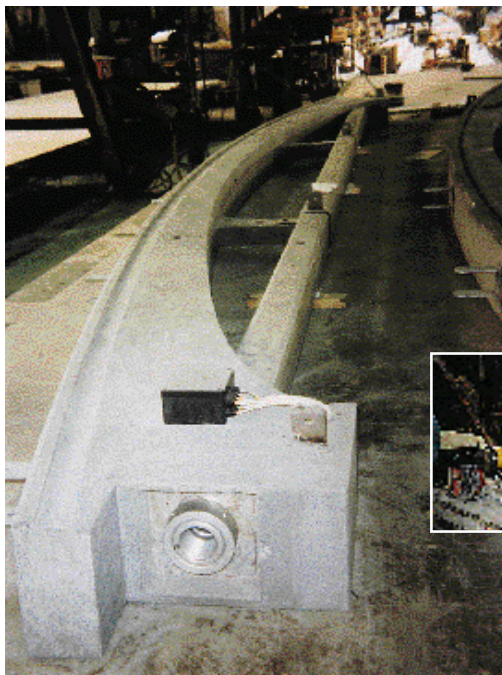






## NON-METALLIC TENDONS

### OPPEGAARD FOOTBRIDGE, OSLO NORWAY



As a part of EUROCRETE - a research programme on the use of Fibre Reinforced Plastics (FRP) in concrete structures - a pedestrian and light vehicle bridge exclusively using FRP has been built at the Oppegaard golf course.

This 9.5-m span bridge consists of two prefabricated concrete archformed edge girders carrying a wooden deck. Each girder is post-tensioned with a

VSL/Linear Composites Ltd (LCL) Parafil™ tendon (nominal ultimate load 900 kN) equipped with aluminium terminations.

## CONVERTING RESEARCH INTO REALITY



To ensure that all details were well specified and documented for the research programme, close co-operation was established between the engineer - Dr. Tech. Olav Olsen a.s., VSL Internordisk Spännarmering AB and LCL. [1](#)

Kalle NILSSON  
VSL Internordisk  
Spännarmering AB

### REDBANK CREEK PEDESTRIAN BRIDGE, NSW AUSTRALIA

This bridge consists of a single 33.4 m cable stayed span utilising VSL CT Stress Bars for the stays and transverse deck stressing. The deck is constructed of stress-laminated treated timber.

The Roads and Traffic Authority of NSW has included many new developments in the structure and is using this project to assess these new features.

VSL has incorporated a VSL Parafil™ non-metallic tendon in

the works as a transverse deck tendon. This tendon has been fitted with an electronic load cell which is regularly monitored. [1](#)

VSL  
Prestressing  
(Aust.)

Mark Sinclair





## THE FIRST B.O.T. PROJECT IN THE PHILIPPINES

### MANILA SKYWAY

This 35 km six lane elevated expressway is the first Build Operate Transfer (B.O.T) road project in the Philippines. Stage 1 is 9 km long and includes 2,900 precast post-tensioned I-beams spanning an average of 36.5 m with 10 beams per span.

Standard single column pierheads are 27.5 m wide and weigh 350 t. They are cast parallel to the road to minimise the space required for pierhead construction and then rotated 90 degree after post-tensioning using a special non-friction hydraulic device. U-tendons between the column and pierhead are stressed for the final connection of these two elements. VSL is supplying PT materials and carrying out the installation, stressing and grouting works for the columns, pierheads and precast I-beams.

The project client is the Citra Metro Manila Tollways Corp. and the Main Contractor is Hutama - RSEA Joint Operation. [1](#)

Michael Phillips - VSL Philippines



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## THE FIRST BONDED FLAT PLATE BUILDING IN THE PHILIPPINES

### FILSYSTEMS TOWER 1, MANILA

Manila being in an active seismic zone made earthquake loadings a prime design consideration for this 33-floor building. Indeed, under seismic loads the flat plate acts as a diaphragm connecting the earthquake load resisting elements i.e. the external frame and internal shear core.

A 200-mm flat plate spans from the perimeter framing beams to a central core, with a maximum span of 10 m.

The main contractor, Filsystems, chose VSL to design the post-tensioned slab, supply the materials and carry out the stressing and grouting works. The floors are currently being built on a 6-day cycle and the project will be completed by the end of 1996. [1](#)

Michael Phillips  
VSL Philippines

VSL was able to show the client the advantages of the bonded system over the more commonly used unbonded solution.







## VSL LEADS THE RETAINED EARTH MARKET IN SOUTH EASTERN UNITED STATES

The introduction of our 1.5 m square panel in Florida has met with considerable success because of ease of fabrication, increased flexibility of the facing - an important factor in Florida where most foundation soils are quite compressible - and speed of erection in the field.

These advantages were highlighted on the recently completed Midpoint Bridge project in Lee County, Florida. The project included some 5,000 m<sup>2</sup> of Retained Earth walls (REW) to limit right-of-way requirements for the approach

embankments; the walls also wrap around the pile-supported bridge abutments. The finish on the 1.5 m square panels is "fractured fin" with 20 mm relief.

The approach embankments and bridge were completed approximately three months ahead of schedule due, in large part, to

the speed of construction of the REWs. The success of this project was instrumental in our securing a further three Midpoint Corridor contracts totaling 8,000 m<sup>2</sup>. [1](#)

William Neely  
VSL Corporation - Raleigh, USA



## VSL MAKES A SUCCESSFUL ENTRY INTO THE POLISH MARKET VISTULA RIVER BRIDGE, POLAND



The Vistula River Bridge near Torun in Poland is 955.4-m long and includes three 130-m long main spans.

VSL provided the technology for the four form travelers, design assistance and the post-tensioning for the balanced cantilever main spans and the incrementally launched approaches. VSL's specialist on site is supervising the post-tensioning works and servicing VSL's equipment. The project includes 470 t of strand post-tensioning and stress bar. The contractual terms and conditions as well as the good relations between the General Contractor (ZBM Warsaw) and VSL have contributed to the project's fast progress this year remaining on schedule despite some initial delays and a tough winter. [1](#)

Miroslav Vejvoda





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



#### USA – North America (Operating Unit 3)

##### REGIONAL OFFICE

VSL Corporation  
Crosspointe II Plaza  
2840 Plaza Place - Suite 200  
RALEIGH, NC 27612 USA  
Tel 1 - 919 - 781 6272  
Fax 1 - 919 - 781 6892

##### WEST

VSL Corporation  
SAN JOSE, CA  
Tel 1 - 408 - 866 - 5000  
Fax 1 - 408 - 374 - 4113

##### NORTHEAST

VSL Corporation  
WASHINGTON, D.C.  
Tel 1 - 703 - 451 - 4300  
Fax 1 - 703 - 451 - 0862

##### SOUTHEAST

VSL Corporation  
MIAMI, FL  
Tel 1 - 305 - 592 - 5075  
Fax 1 - 305 - 592 - 5629

##### MIDWEST

VSL Corporation  
DALLAS, TX  
Tel 1 - 214 - 647 - 0200  
Fax 1 - 214 - 641 - 1192

#### Western Europe - South America and Africa (Operating Unit 5)

##### REGIONAL OFFICE

VSL France S.A.  
L'Odyssée - Bât. A  
2-12 Chemin des Femmes  
91886 MASSY Cedex - France  
Tel 33 - 1 - 69 19 43 00  
Fax 33 - 1 - 69 19 43 01

##### BOLIVIA

Prestress VSL of Bolivia Jauregui Ltd.  
LA PAZ  
Tel 591 - 2 - 321 874  
Fax 591 - 2 - 371 493

##### CHILE

VSL Sistemas - SANTIAGO  
Tel 56 - 2 - 233 10 81  
Fax 56 - 2 - 233 67 39

##### FRANCE

VSL France S.A. - EGLY  
Tel 33 - 1 - 69 26 14 00  
Fax 33 - 1 - 60 83 89 95

##### GREAT BRITAIN

Balvac Whitley Moran Ltd.  
DERBYSHIRE  
Tel 44 - 773 54 26 00  
Fax 44 - 773 54 27 00

##### ITALY

VSL Italia S. r. l. - MONTESE  
Tel 39 - 59 - 98 14 13  
Fax 39 - 59 - 98 14 12

##### PORTUGAL

VSL Prequite SA. - LISBON  
Tel 351 - 1 - 793 85 30  
Fax 351 - 1 - 793 09 01  
Stronghold Portugal - PORTO  
Tel 351 - 2 - 370 00 21  
Fax 351 - 2 - 379 39 73

##### SPAIN

CTT Stronghold  
BARCELONA  
Tel 34 - 3 - 200 87 11  
Fax 34 - 3 - 209 85 90

##### NETHERLANDS

Civielco B.V. - AT LEIDEN  
Tel 31 - 71 - 76 89 00  
Fax 31 - 71 - 72 08 86

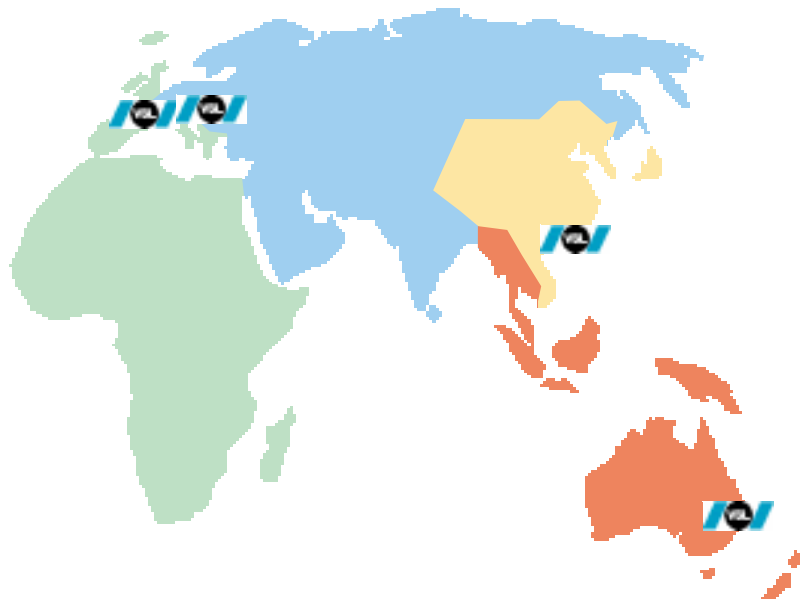
##### STRONGHOLD/BENELUX B.V.

Tel 31 - 70 - 511 51 45  
Fax 31 - 70 - 517 66 24

##### PERU

Pretensado VSL del Peru SA  
LIMA  
Tel 51 - 476 - 04 23/26  
Fax 51 - 476 - 04 77

##### SOUTH AFRICA



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

##### REGIONAL OFFICE

Representative Office  
L'Odyssée - Bât. A  
2-12 Chemin des Femmes  
91886 MASSY Cedex - France  
Tel 33 - 1 - 69 19 43 16  
Fax 33 - 1 - 69 19 43 17

##### AUSTRIA

Sonderbau GesmbH - VIENNA  
Tel 43 - 1 - 877 26 31  
Fax 43 - 1 - 877 26 31 762

##### CZECH REPUBLIC

VSL Systems (CZ) s. r. o.  
PRAGUE  
Tel 42 - 2 - 67 07 24 20  
Fax 42 - 2 - 67 07 24 06

##### GERMANY

VSL Vorspanntechnik (D) GmbH,  
ELSTAL  
Tel 49 - 33 234 - 8340  
Fax 49 - 33 234 - 83416

##### GREECE

VSL Systems A/E  
ATHENS  
Tel 30 - 1 - 363 84 53  
Fax 30 - 1 - 360 95 43

##### INDIA

Killick Prestressing Ltd.  
BOMBAY  
Tel 91 - 22 - 578 44 81  
Fax 91 - 22 - 578 47 19

##### NORWAY

VSL Norge A/S  
STAVANGER  
Tel 47 - 51 - 56 37 01  
Fax 47 - 51 - 56 27 21

##### SWEDEN

Internordisk Spännarmering  
AB, DANDERYD  
Tel 46 - 8 - 753 02 50  
Fax 46 - 8 - 753 49 73

##### SWITZERLAND

VSL (Switzerland) Ltd.  
LYSSACH  
Tel 41 - 34 - 47 99 11  
Fax 41 - 34 - 45 43 22

##### UNITED ARAB EMIRATES

Representative Office  
DUBAI  
Tel 971-4-555 220  
Fax 971-4-518 244

#### North East Asia (Operating Unit 2)

##### REGIONAL OFFICE

VSL North East Asia  
1508 Devon House  
979 King's Road  
Quarry Bay, HONG KONG  
Tel 852 - 2590 22 22  
Fax 852 - 2590 95 93

##### HONG KONG

VSL Hong Kong Ltd.  
QUARRY BAY  
Tel 852 - 2590 22 88  
Fax 852 - 2590 02 90

##### JAPAN

VSL Japan Corporation  
TOKYO  
Tel 81 - 33 - 346 89 13  
Fax 81 - 33 - 345 91 53

##### KOREA

VSL Korea Co. Ltd.  
SEOUL  
Tel 82 - 2 - 574 82 00  
Fax 82 - 2 - 577 00 98

##### PHILIPPINES

VSL Philippines  
Representative Office  
QUEZON CITY  
Tel 63 - 2 - 911 3269  
Fax 63 - 2 - 912 7380

##### VIETNAM

VSL Hanoi  
Representative Office  
HANOI  
Tel 84 - 4 - 8245 488  
Fax 84 - 4 - 8245 717

#### South East Asia / Australia (Operating Unit 1)

##### REGIONAL OFFICE

VSL Prestressing (Aust.) Pty. Ltd.  
6 Pioneer Avenue  
THORNLEIGH, NSW 2120  
Australia  
Tel 61 - 2 - 9484 59 44  
Fax 61 - 2 - 9875 38 94

##### AUSTRALIA - Queensland

VSL Prestressing (Aust.) Pty. Ltd.  
VIRGINIA  
Tel 61 - 7 - 326 564  
Fax 61 - 7 - 326 575

##### AUSTRALIA - New South Wales

VSL Prestressing (Aust.) Pty. Ltd.  
THORNLEIGH  
Tel 61 - 2 - 9484 59 44  
Fax 61 - 2 - 9875 38 94

##### AUSTRALIA - Southern Division

VSL Prestressing (Aust.) Pty. Ltd.  
NOBLE PARK  
Tel 61 - 3 - 9795 03 66  
Fax 61 - 3 - 9795 05 47

##### BRUNEI DARUSSALAM

VSL Systems (B) Sdn. Bhd.  
BANDAR SERI BEGAWAN  
Tel 673 - 2 - 380 153/2-38182  
Fax 673 - 2 - 381 954

##### GUAM

VSL Prestressing (Guam) Inc.  
TUMON  
Tel 67 - 646 80 61  
Fax 67 - 649 08 50

##### INDONESIA

PT VSL Indonesia - JAKARTA  
Tel 62 - 21 - 570 07 86  
Fax 62 - 21 - 573 68 49

##### MALAYSIA

VSL Engineers (M) Sdn. Bhd.  
KUALA LUMPUR  
Tel 60 - 3 - 242 47 11  
Fax 60 - 3 - 242 93 97

##### NEW ZEALAND

Precision Precasting (Wgtn.) Ltd.,  
OTAKI  
Tel 64 - 6 - 364 81 26  
Fax 64 - 6 - 364 83 44

##### SINGAPORE

VSL Singapore Pte. Ltd.  
SINGAPORE  
Tel 65 - 336 29 23  
Fax 65 - 337 64 61

##### THAILAND

VSL (Thailand) Co. Ltd. - BANGKOK  
Tel 66 - 2 - 237 32 88/89/90  
Fax 66 - 2 - 238 24 48