VSL NEWS

ISSUE ONE 1999

Kisosansen bridge, Japan

Creating Solutions Together

EDITORIAL

Structural repairs, a new and developing market

In many industrialised countries, emphasis is shifting towards preserving or modifying structures rather than demolishing them and then rebuilding.

Far from being dictated by fashion, this approach is based on sound reasoning:

• Modern technologies and products now allow us to repair or modify structures at a reasonable cost. In the past, they would simply have been demolished.

• The construction of new infrastructures in densely populated areas is subject to a great many environmental and political constraints. It is now sometimes easier to upgrade existing structures than build new ones.

• Old structures and buildings are now perceived by the public as a valuable heritage that should be passed down to future generations in a good state of repair.

If one adds the maintenance of industrial buildings and installations to the above, it is clear that there is a vast potential market.

A Group like ours, with its understanding of and experience in sophisticated construction technologies - from design through to construction -, has a vital and increasing role to play in this field.

As only a small percentage of our turnover currently relates to this activity, we have a great margin for growth and our increasing involvement represents an excellent complement to the Group's current scope of works.

Alain Le Pivert
CEO and Chairman of the Board

HIGHLIGHTS

SPECIAL
HEAVY LIFTING

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- SWITZERLAND -

REPAIR TO THE SCHWARZWALDBRÜCKE

Overall view of Black Forest Bridge

The 27-year old Black Forest Highway Bridge (Schwarzwaldbrücke) over the river Rhine is one of the most important bridges in Basle, linking Switzerland, Germany and France. As the 233-m long and 48-m wide balanced cantilever bridge with 4 box girders had deflected beyond acceptable limits at its mid-span, the structure required major renovation works.
These works were based on a design by Schmidt & Partner.
The main contractor chose VSL to supply and install the external tendons. Each of the 24 cables consists of nineteen 0.6" strands with lengths varying from 218 m to 230 m, representing a total nominal breaking load of about 85,000 kN.
The 4 cables in 2 boxes were always stressed simultaneously. This resulted in a mid-span lift of between 100 mm and 110 mm, being very close to what had been predicted by the engineers.
Works began at the end of 1998 and were completed in spring 1999. ■

Franz Fischli
VSL Switzerland

Simultaneous post-tensioning in progress

- THAILAND -

COMPLETION OF THE BANGKOK MASS TRANSIT SYSTEM

BTS is a project awarded to the Siemens-ITD Consortium in 1995 to construct the elevated light rail transport system in Bangkok. ITD, a long-standing client of VSL Thailand, was awarded the contract for the civil works. It subsequently subcontracted the following works to VSL::
• design & equipment supply for overhead erection truss (designed by VSL Technical Center Europe);
• PT for spans, precast segments, piers & portals;
• equipment for underslung erection trusses;
• pier formwork design;
• overhead truss segment erection;
• underslung truss segment erection.
The total distance of the project is 25.5 km, representing 925 decks consisting of 8,052 precast segments. VSL was awarded the subcontract for 464 decks, representing 4,092 precast segments and 4,800 t of PT.

Segmental erection works by underslung truss, overhead truss, as well as longitudinal PT stressing were completed by the end of January 1999 and, by the end of February, VSL had completed approximately 98% of the overall works. The only remaining PT work on station E9 was completed in March.
The train's trial run took place at the end of October 1998, and has been successfully operating since then.
The ceremonial opening of the system is expected to take place on 5th December 1999, to celebrate His Majesty the King's 72nd birthday. ■

Narenn Jinruang
and Likhasit Kittisartra
VSL Thailand

- KINGDOM OF

Wadi Leban cab

The Wadi Leban bridge forms part of the section "B" works for the extension to the southern part of the Riyadh Ring road, and represents an overall length of 1.5 km.
Crossing the Wadi Leban valley, this 763-m long cable-stayed bridge is split into three spans (179 m – 405 m – 179 m). The bridge deck is 80 m above ground level and the towers rise 90 m over the deck level. The bridge has an overall width of 35.8 m and comprises two 13.95-m wide carriageways with a 5.4-m median strip that incorporates the stays.
With its towers rising to 167.5 m to the north and 175.5 m to the south, the Wadi Leban cable-stayed bridge is a particularly impressive sight, which can be seen from most of Riyadh. The original concrete design for the bridge was carried out by Dar al Handasah and the bridge was constructed by the Tanmia/Saudi Archirodon joint venture.

"With its towers rising to 167.5 m to the north and 175.5 m to the south, the Wadi Leban cable-stayed bridge is a particularly impressive sight, which can be seen from most of Riyadh"

The bridge deck is a three-cell box section, with a central trapezoid cell and two triangular side cells. The bridge deck is precast as a single section, with the exception of the mid-span closure and the end diaphragms.

View of the 763-m long cable-stayed bridge crossing the Wadi Leban valley

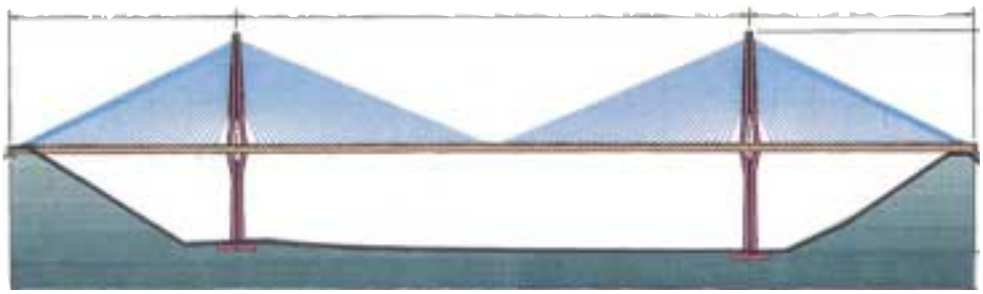
The precast segments (35 m wide and 3 m long; 185 t to 250 t) were match cast using the short line method and erected using the balanced cantilever method. All transversal and longitudinal PT was supplied by VSL. As the site is located in the Saudi Arabian desert, exceptional climatic conditions had to be taken into consideration during all construction stages. The thermal conditions ranged from –2°C up to +55°C over the year, and from +20°C to +55°C over 24 hours during summertime.

The scope of VSL CEME and VSL TCEU works included the design and supply of post-tensioning and stays,

Construction of bridge deck, located 80 m above ground level

construction engineering analysis, methods and work procedures, supervision during fabrication, erection, stressing and grouting of the stays.

The VSL 200 stay cables, varying in size from 6-19 to 6-52 and in length from 87 m to 435 m, were all fabricated on site. They were lifted and continuously installed from anchorage to anchorage and passed through the pylon inside saddle deviators, which were pre-grouted before the required load was introduced.



Overall drawing of the cable-stayed bridge

SAUDI ARABIA -

ble-stayed bridge

By using a tailor-made winch system, the stand-bundles were simultaneously pulled in pairs from the fabrication table at the bottom of the Wadi floor up to the edge of the main span segment. The stays were then deviated into the pre-installed stay-pipes on the main span side, pulled up through the HDPE pipe, then through the pylon inside the saddle pipes and down through the stay pipe on the side span side. The anchorage assembly was then carried out on the bridge deck after which the four stays were simultaneously pulled into the guide-pipe using four nos. of SLU-40. A novel feature of the saddle stays is the use of a flexible grout (soft rubber) at the saddle entrance with the remainder being filled, as usual, with rapid strength cement grout. Because of its flexibility, the grout is able to accept the cable sag variations during the stressing and grouting stages.

Grouting of the stays began mid-April and was completed by the first week of June 1999. ■

Pelle Gustafsson
VSL CEME

Wadi Leban normal cycle of construction:

- *erection of 2 concrete bridge segments, which were lifted from the bottom of the Wadi up to the bridge cantilever (+80 m), then glued and stressed to the previous segment;*
- *erection of 2 saddle stays (4 stays), average size 6-43 and with an average length of 305 m;*
- *initial stressing by four ZPE 1000;*
- *grouting of the saddle areas and allowing for curing;*
- *segment lifting cranes and jacking equipment moved forward on top of next segment;*
- *erection of 2 concrete bridge segments;*
- *re-stressing of the stays also carried out by four nos. of ZPE 1000;*
- *segment lifting cranes and jacking equipment moved forward on top of next segment.*

The last stay was installed in late November 1998 and the final tuning of the stays was completed by April 1999. Due to the use of a highly innovative jack manipulator, the final tuning of the 248 stays using 4 nos. of ZPE 1000, was carried out in a record 6 days, representing an average of 41 stays per day.
The construction method with erection of fully fabricated stays proved that, in some cases, it is possible to be fully competitive with a single strand installation. Regular 4-day cycles and two 3-day cycles were achieved during construction

The stays were prefabricated on site and pulled in pairs up to the edge of the main span.

- JAP

Kisosansen Bri

Located near Nagoya City, some 300 km south west of Tokyo, the Kisosansen Bridge project groups the construction of two viaducts: the Ibigawa Bridge (1,397 m), and the Kisogawa Bridge (1,145 m), which together form the world's longest composite steel and concrete cable-stayed superstructure. The project forms part of the new Meishin Expressway linking Nagoya to Kobe which has been commissioned by the Japan Highways Public Corporation and awarded to four separate joint ventures, each constructing half of the individual bridges.

Consrtucion of the world's longuest composite stay cable de bridge

Picture 1

In early 1997, VSL Japan, which has been active for over ten years, was contacted by one of the main contractors, the Taisei Corporation. VSL was asked to assist during tendering, particularly in view of developing original engineering solutions for this prestigious project.

As a result of the successful pretender co-operation and subsequent studies and proposals, VSL was awarded 3 significant subcontracts to design, supply and commission the following important special equipment:

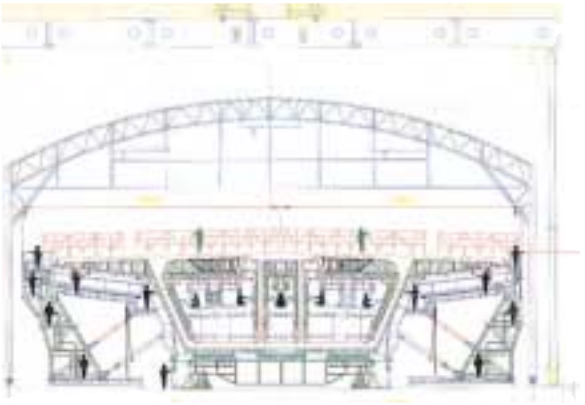
• The Pre-casting Formwork: capable of match-casting 5-m long segments weighing an average of 450 t and varying in height from 4 to 7.5 m and in width from 35 to 45 m; these pre-casting cells were designed to attain 3-day cycle rate and are now fully operational. (see Picture 1)
• The Segment Erection Equipment: capable of lifting and placing the 450-t Match Cast Segments. This equipment uses large strand based lifting jacks (SMU 440/550's) and a control system which were specifically manufactured in Switzerland for this project. The equipment was commissioned in April this year and is now fully operational (see Picture 2).
• The Side Span Launching Girder: capable of erecting and suspending

PAN -

dge project (K1)

General view of K1 project

the 13 side span segments, which collectively weigh 2,800 t, over an 85-m span. This twin truss cable-stayed launching girder (see sketch 3) is currently being designed and construction is expected to begin in October 1999. The girder is due to be erected on site in the early part of 2000.



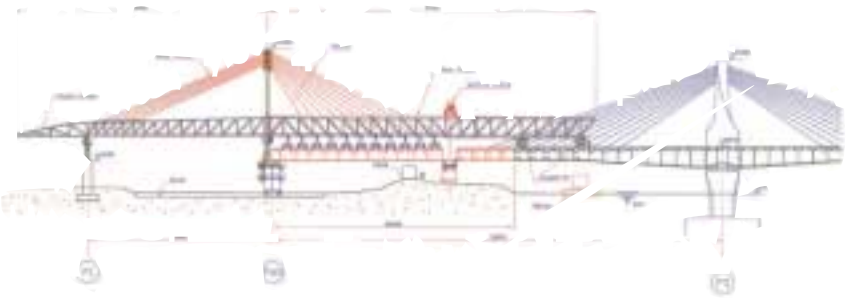
Cross-section of the pre-casting cells

Location

The VSL Group is extremely proud of its work on this technically challenging project which has involved collaborative design between the Technical Centres in Paris, Lyssach and Singapore, and fabrication in Southern China, all under the management of the Special Projects team in Hong Kong. It is the Group's sincere hope that this successful project and the good relationship built up with our customers in Japan will form the springboard for further fruitful projects ■

Philippe Casteleyn
and Dominique Droniou
VSL North East Asia

Picture 2



Sketch 3
Placing of side span segments with a twin-truss cable-stayed launching girder

- A R G E N T I N A -

Pilar Bayer Plant

VSL Argentina completed the post-tensioning design and construction of the slab-on-grade for the new Bayer Plant in Pilar, Argentina for Inelco S.A (Bilfinger Belger Group).
This 6,000-m² facility will contain a Production and a Packing Room (3,800 m²) and an automated Warehouse (2,200 m²).

The Production and Packing Room was poured in three sections without expansion joints. To prevent shrinkage cracks, partial stressing in both directions was performed 24 hours after concreting each sector. Full force was applied after the concrete developed 20 Mpa. Polyethylene sheeting reduced sub-grade friction and allowed for slab shortening.
In the Warehouse, a super-flat slab (F 100) was required to ensure the satisfactory operation of the automated storage equipment. This floor slab was poured in alternating strips. The strips were 4 to 5 m wide and 70 m long to obtain the required flatness. Partial longitudinal PT was applied to each strip and final stressing was applied in both directions once all the strips had been poured and the concrete had set at the specified resistance.

Bayer Plant PT ground slab under construction

Thanks to the use of PT on slab-on-grade, VSL was able to reduce the slab thickness and the amount of passive reinforcement, as well as avoid shrinkage effects.
VSL currently carrying out a second slab-on-ground contract for Inelco S.A. ■

Aldo Loguercio
VSL Argentina

- A R G E N T I N A -

Madero Este Complex

The Madero Este complex is located on the east side of Dock 3 at Puerto Madero, one of the most historically interesting places in the city of Buenos Aires. In the last century, these huge British designed docks stored all the merchandise arriving from overseas. Today Puerto Madero has been transformed into one of the finest areas of Buenos Aires, strategically located a few minutes away from the Government House, the Financial District, Plaza de Mayo Square and San Martin Square.
Madero Este is a Grupo González development, whose Chairman and CEO, Mr. Alberto L. González, is a well-known and respected professional in the mass media sector.
The project and development was designed by one of the most important architectural firms in Argentina: Mario Roberto Alvarez and Associates. The structural consultant is the highly reputed A - H. Fainstein y Asociados firm.

Post-tensioned slabs in progress

General view of the Madero Este Complex

Madero Este is a large complex totalling an approximate area of 200,000 m². It includes a Hilton Hotel, a Hilton Suites building, three office buildings, a shopping mall, twenty cinema theatres, a Sea Museum and a 2,420-car capacity underground carpark. The owner split the site in two separable packages. Ineco (Bilfinger-Berger) was awarded the first package including the Hilton Hotel, the Hilton Suites building, two office buildings and 16,000 m² of carpark. Lavallaz-Yentel y Asociados and Curuchet-Del Villar are Ineco's consultant structural engineers. Gualtieri was awarded the second package including the shopping mall, the theatres, the sea museum, an office building and 9,000 m² of carpark.
VSL successfully negotiated an unbonded PT proposal to cover all areas of this project. Our scope of works included the design, supply and installation of 125,000 m² of unbonded PT slab. We also supplied and installed EC5-12 tendons for the bonded PT beams. Likewise, VSL provided the final design and detailing of post-tensioning and reinforcing steel in the slabs, monostrand materials, installation and technical field service.
Construction began in November 1998 and the Hilton Hotel is scheduled to open in December 1999. ■

Vicente Jarque
VSL Argentina

- AUSTRALIA -

PRINCESS ALEXANDRA HOSPITAL, BRISBANE

The new high tech Princess Alexandra Hospital under construction

VSL has completed the post-tensioning works for one of Queensland's major hospital re-developments.
Princess Alexandra Hospital is an 850-bed tertiary teaching hospital, with nationally recognised expertise in spinal injury management, organ transplant and diagnostic radiography, servicing Brisbane's southern suburbs.
The new hospital structure is a major and distinctive part of the $300 million hospital re-development, and will replace an existing 50-year old, extensively modified cavity brick/reinforced concrete structure.

Flexibility was a key issue for the new structure to achieve the fit-out demands of the new "high tech" hospital and future refit as new technology and equipment are developed, and so avoid the expensive "cut and paste" renovation as evidenced in the old structure.
Flexibility was achieved over the 80,000 m^2 of suspended floors through the use of post-tensioned concrete, which provided:

- long sapans whith columm-free
- thin loor profile for service fit-out
- ease and speed of construction
- crack-free floors
- deflection control of slabs
- cost effectiveness

Two simple features were incorporated into the design to provide the flexibility for the extensive services fit-out and future modifications i.e.:
- line marking of all tendons to the top and bottom of slab;
- localised cable-free areas at columns for service penetrations (the slab was designed for reduced shear perimeter).

The structure follows a curvilinear shape forming a closed 'Y' with a central atrium. It was designed as either banded slab or drop panel slab as required by the loading or geometry. Shortening of the concrete structure was controlled at the contraction joints and with the use of split or double support columns.
VSL installed 460 t of PT over a 13-month period with up to 2 pours per week.

The success of this project can be attributed to the sound project management by the head contractor, John Holland Construction and Engineering, comprehensive documentation from Ove Arup and Partners, engineers, Quality Control of the post-tensioning installation process and commitment and sound communication from all trades.■

Bruce NEELS
VSL Australia

SPECIAL

HEAVY LIFTING

VSL's Heavy Lifting activities go back to 1968, when the Rod Lifting System was used for the first time by VSL. Soon afterwards, VSL developed the strand-lifting system to meet the industry's demand for larger equipment capacity and longer moving distances. Ever since, a team of dedicated engineers and specialists have met the challenges of this dynamic field of activity and contributed to strengthening VSL's reputation as a leading organisation in this speciality.

Öresund bridge – Denmark/Sweden

Placing of foundation caissons for the Öresund Bridge: catamaran for transport of two 20,000-t caissons from a dry-dock in Malmö (Sweden) to the main pylon location. Lifting and lowering was achieved by 40 VSL strand units.

In projects where cranes or other conventional handling equipment cannot be used because of excessive weight, dimensions or space limitations, VSL Heavy Lifting System will often provide the most effective solution.

Advantages

VSL will plan lifting, horizontal jacking, or lowering operations and design the necessary temporary structures and provide builders, engineers and owners with a broad range of advantages, including:

- economy and efficiency, through custom designed solutions
- the highest level of safety
- reliability, based on sound engineering and three decades of experience

Safety

The safety of your personnel and components is VSL's first priority. Our specialised hydraulic lifting equipment is designed for the highest level of reliability. VSL field services are also based upon a total commitment to safety. The extensive experience of our personnel and VSL's exceptional track record provide further assurance of reliable performance.

Chicago Beach Hotel, Dubai

Lifting and placing of 6 horizontal and 6 diagonal steel trusses for the exoskeleton

Glattviaduct, near St. Gallen, Switzerland

Lateral sliding of a concrete arch railway bridge (6,000 t) over the Glatt River

The VSL service package

VSL offers a complete range of services for the planning, engineering, equipment supply and execution of any heavy lifting project. Our approach is flexible, and the extent of our services is tailored to the specific project requirements. VSL Heavy Lifting services are provided throughout the world by the VSL Group and include:

- feasibility studies and preliminary consultation for lifting, horizontal jacking and lowering operations;
- project design and planning, equipment specification, scheduling, budgeting;
- design, manufacture, and supply of special equipment and temporary structures, if required;
- leasing and operation of VSL equipment and execution of work planned by VSL or others.

- ITALY AND SPAIN -

ERECTION OF CABLE SUPPORTED STADIUM ROOFS

View of the Turin stadium (Italy) built for the 1990 Soccer World Cup. The 56 strand units sit on top of the columns.

The sport stadiums in Turin (Italy) and Seville (Spain) both have roofs supported by a central tension ring and a system of radial cables. The actual roofing is a Teflon coated synthetic fabric membrane.
For erection, the tension ring and radial cables are laid out on the field and the terraces. The permanent radial roof cables are extended by temporary strand cables which run through heavy lifting units. The first pulling phase occurs with low forces: the slack is taken out of the cables and the tension ring is lifted off the ground. In the second phase, the ring and radial cables are pulled into their required shape. This loading with rapidly increasing forces in the final phase determines the size of the temporary cables and of the strand equipment.
In the past years, VSL has been involved in the cable net erection for stadiums in Riyadh, Turin, Stuttgart and Seville, to name but a few of the most important projects. Later this year, another similar project will be executed with the help of the VSL technique: the roof of the HSV Hamburg soccer stadium.■

Erich Möschler
VSL Switzerland

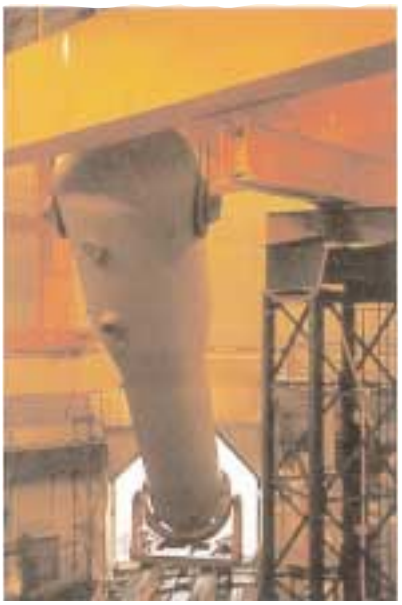
Olympic Stadium, Seville, for the 1999 world athletics championship.

For the roof erection, 44 VSL strand units were installed on the steel truss compression ring.

- SWITZERLAND -

EXCHANGE STEAM GENERATORS AT BEZNAU NUCLEAR POWER STATION

The Beznau Nuclear Power Plant in north-eastern Switzerland was commissioned at the end of 1969. The decision to replace the two steam generators for Unit 1 and later for Unit 2 was essential to ensure the reliability and economy of future plant operations.
The exchange was a complex undertaking, as neither the overhead polar crane nor the access locks were designed for handling a complete steam generator. The Siemens (Germany) and Sulzer (Switzerland) consortium entrusted VSL with the transport of the old and new steam generators between the transfer and containment areas, as well as the handling inside the containment area. Special lifting and transport equipment, along with a temporary opening in the containment wall, enabled the exchange of the massive steam generators. All vertical and horizontal movements were carried out using the VSL Strand Lifting System.
VSL's scope of works on the project included detailed planning of movements, design, supply, erection and dismantling of temporary steel structures such as sliding tracks with carriages, a temporary support to reinforce the polar crane and a temporary portal on the crane.
The exchange work on Unit 1 took place in April/May 1993. In August of 1999, VSL will be involved in the exchange of the steam generators for Unit 2.■



Exchange of steam generator

Ferdi Trenkler
VSL Switzerland

- CHILE -

Escondida Copper Mine

20,000-m² steel roof structure, weighing 4,200 t. For erection using the lifting method, the steel roof structure was divided into 8 sections.

VSL was engaged as the specialist contractor to lift over 4,200 t of steel roof structure and conveyor for the Escondida Copper Mine in northern Chile. VSL's contract for engineering and carrying out the lifting operations was critical to the success of this fast-paced project. VSL was selected by the owner, Minera Escondida Limitida, and the construction manager, Fluor Daniel, because of its technically superior solution, its ability to respond rapidly to the needs of the project, and to perform the work without interrupting ongoing mining operations. Through extensive engineering and close co-operation with all partners, the project was completed in less than a year, despite the difficult site conditions and several changes in the scope of the project.

The 20,000-m² steel roof structure was lifted in eight separate operations. The heaviest roof section and auxiliary lifting structures weighed over 620 t. The lifting system was designed for zone 4 earthquake loading (UBC) and to withstand the daily blasting at the open pit mine.

Close co-operation between VSL Chile and other entities of the VSL Group resulted in a successful project for the client.■

Andrès Avendaño
VSL Chile

- FRANCE -

Erection of the Main Span Segments for the Normandy Stay Cable Bridge

The 624-m central span of the world's largest cable-stayed bridge (main span: 856 m) was assembled from prefabricated steel segments. SDEM, the erection contractor, awarded VSL France the lifting work, because of its proven experience in the field of bridge segment lifting.

The 32 steel box girder segments are 20 m long and 21 m wide, and the streamlined profile has a depth of 3 m. Each of the 220-t segments was lifted with two strand lifting units at a rate of 30 m/h. Planning and equipment had to take account of a maximum wind speed of 50 km/h, a 0.5-m barge draught variation and a maximum lift induced deck deflection of 2.8 m. The cantilever construction method was used and required each new segment to be lifted clear of the navigation channel as rapidly as possible and be accurately aligned to the previous section and held in position until field welding and stay cable installation and stressing were completed.■

Lucien Boutonnet
VSL France

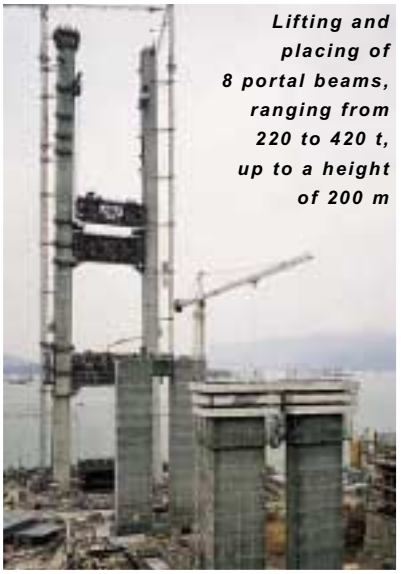
- HONG KONG -

TSING MA BRIDGE

Portal beams on main pylons

Within a larger scope of works awarded to VSL Hong Kong, VSL Singapore was responsible for the system engineering, temporary structure design, lifting system supply and supervision of the portal beam lifting and placing operation. The work was carried out with the close co-operation of VSL Switzerland. On-site works began in mid-1993 and took 6 months.
The four portal beams per pylon comprised prefabricated steel trusses, reinforcement and PT ducts, which were later encased in concrete in-situ.
The portal beams weighed from 400 to 200 t and were positioned at 50, 100, 150 and 200 m levels respectively. Four VSL strand-lifting units were used to lift each beam. The system included an automated strand coiling system which controlled the tailing strands and permitted the rapid lowering of strand bundles for hook up. The temporary lifting structures comprised cantilever corbels, sliding rails, C-frames and access platforms. Lifting speeds were around 20 to 35 m per hour and lifting was carried out in favourable weather conditions with wind speeds of under 50 km/h.
The lifting arrangements included straight vertical lifts, combined vertical lifts and horizontal movement, as well as the temporary "parking" of the portal beams on the pylons enabling the continuation of the slip forming process and the relocation of lifting structures. ■

David Trayner - VSL Singapore
Walter Althaus - VSL Switzerland



Lifting and placing of 8 portal beams, ranging from 220 to 420 t, up to a height of 200 m

- MALAYSIA -

PETRONAS TOWERS, KUALA LUMPUR

The Skybridge project consists of a two-storey glass sided walkway spanning between the world's two tallest buildings (450 m height). It links the twin towers at levels 41 and 42. The V-shaped legs supporting the bridge at its centre represent a distinctive feature of the skybridge project.
VSL's scope of works included the lifting of the skybridge using a piece-by-piece method. The operation was carried out by VSL Singapore in co-operation with VSL's Asia / Australasia Technical Centre for the temporary works design and with local support from VSL Malaysia.
Site conditions required that the four components be lifted from eccentric positions. The degree of manipulation required to move these components in plan, orientation and vertically involved an intricate sequence of controlled movements. In addition, there was a stringent tolerance on allowable deflections to protect the glass cladding.
With the invaluable assistance of VSL Switzerland and using a new laser levelling system, it was thus possible to monitor and fully control this lifting operation. The works proceeded successfully despite difficult weather conditions, including strong winds, torrential rain and electrical storms, including lightning strikes.
The VSL proposal provided the contractor, Samsung/Kukdong/Jasatera JV, and the owner, Kuala Lumpur City Centre Bhd, with a significant saving in cost, time and risk. ■

Lifting of the skybridge to link the two Petronas Towers on level 170 m

David Trayner, VSL Singapore
Walter Althaus, VSL Switzerland

- CHILE -

LIFTING OF 2 STOCKPILE ROOFS FOR MARIA ELENA MINE

The largest nitrate mining company in Chile, Soquimich Nitratos, decided to expand its facilities in Maria Elena, 1,000 km north of Santiago, to increase production capacity.

The main contractor, Fluor Daniel Chile S.A., awarded VSL the contract for the design and lifting of two new stockpile roofs forming part of the project for a new conveyor line. These roofs support the distribution equipment and the conveyor. Each weights approximately 160 t and covers approximately 40 x 15 m.
Both structures were lifted up to their final position, 30 m above the foundation level.

Maria Elena project first lift

Maria Elena project second lift

The structures were pre-assembled on the ground over temporary supports. The temporary towers and other equipment used for the lifting were simultaneously installed.
Two 40-m high lifting towers were required for this operation, each one equipped with an upper level 120-t capacity jack.

The stockpile roofs are 10 km away from each other, and as soon as the first lifting operation was completed, the equipment and towers were removed and re-assembled for the second roof.

Lifting was executed in three steps. After each step, new sections of the 4 supporting legs were connected to the already lifted structure prior to continuing with the next lift. When the roof had reached its final position, the main contractor connected the last portion of the legs to the 4 concrete foundations with the help of cranes. Our jacks could then be released and the towers dismantled. The average lifting speed was approximately 5 m per hour. Each roof required one month to be lifted.

Thanks to our previous experience in the Escondida Cooper Mine project, where Fluor Daniel was also involved, we were able to propose the use of our heavy lifting technology as a valid alternative for this type of structure. A solution using cranes was virtually impossible due to the number of large cranes required, the type of structure, and the client's tight schedule for the conveyor erection.

Once again, the close collaboration between VSL Corporation in USA and VSL Sistemas in Chile resulted in a successful project for the client.

Andrés Avendaño
VSL Chile

VSL in Mexico: a successful young subsidiary

Since its creation in December 1996, VSL Corporation Mexico has been awarded over 200,000 m² of post-tensioned floor slabs for offices, housing, hotels and other buildings.

The VSL Group has successfully penetrated the Mexican market through its young subsidiary, VSL Corporation Mexico. Its main references are Peninsula Residential, Unitec University Campus, Fiesta Inn Ciudad Juarez Hotel, the Franz Mayer Museum extension and Pan headquarters, as well as various office buildings for the architect and developer, Isaak Abadi. Both bonded and unbonded systems are used.

Unitec University Campus

UNITEC UNIVERSITY CAMPUS

The Unitec Atizapan project involves the construction of a new university campus, to the north of Mexico City. Earlier this year, the main contractors, Grupo M and Icisa, awarded VSL Corporation Mexico the design, supply and installation of the post-tensioned floor slabs for the University, representing over 40,000 m² in 8 different buildings.

The first slab was post-tensioned on 15 February and construction progressed according to schedule, with an average of 2,000 m² of post-tensioned slab cast every week. The final buildings were completed by mid-June.

PENINSULA RESIDENTIAL

Peninsula is a luxury residential programme located in Mexico City. It comprises four 15-level apartments towers and one 6-level carpark and general use structure (lobby, conference rooms, club house, gymnasium), respectively representing 40,000 m² and 20,000 m² of post-tensioned slabs.

Peninsula Residential

VSL Mexico has also penetrated the heavy lifting market, performing three major lifting operations for Pemex,

the State-owned petrochemical company. These operations also involved the American and European VSL technical and operation centres.

After 2 years activity in Mexico, VSL's working team has grown from just a handful of people to a staff of 50 (including technical, operations and administrative personnel). The next development phase will be the creation of a joint venture with a local partner. ■

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VSL Mexico

Your solution network

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