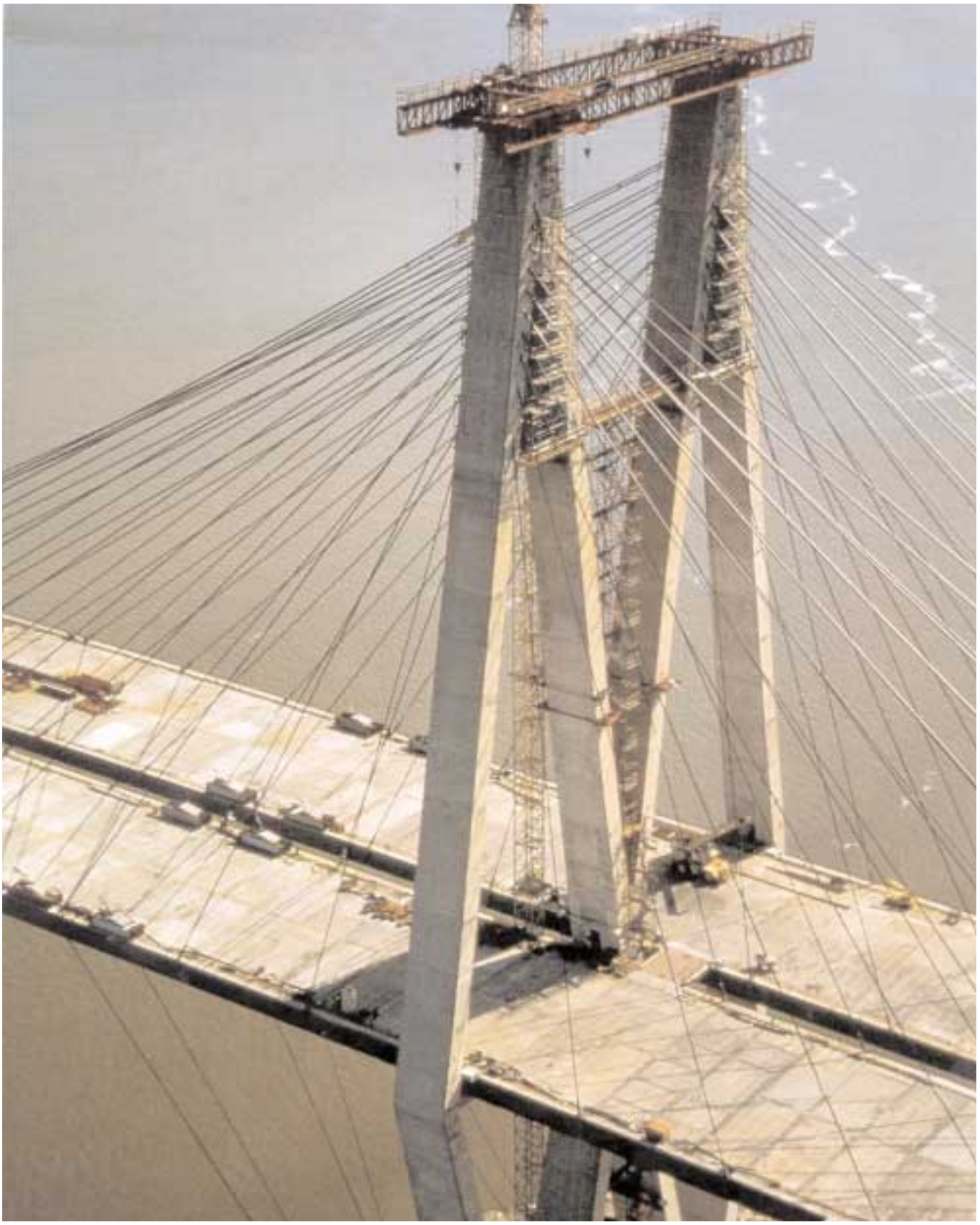
VSL NEWS

ISSUE TWO 1994



Editorial

Let Those who know best, do it

Post-tensioning or stay cables are essential parts of a structure. When you look at the front cover everyone will easily understand that this key activity must rely on people with know-how.

Prestressed structural solutions come to reality through the coordination of several clearly defined spheres of activity that require two basic types of contribution.
Firstly:

- to specify and design the structure needs competent Post-Tensioning Engineering
- to design and supply the means for it calls for a reliable Post-Tensioning System
- to install and supervise the works requires Post-Tensioning Skill
- to guarantee durability you need established Post-Tensioning Quality.

These requirements can only be brought by specialists, thus Post-Tensioning is the business of a **Specialist.**
Secondly:

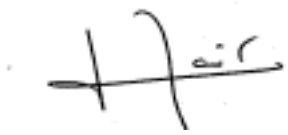
- Post-Tensioning is a critical part of a structure
- Post-Tensioning must be specifically detailed for each project
- Post-Tensioning sitework must be done at least in part by duly trained staff.

These features define the concept of subcontracting, thus Post-Tensioning is the business of a **Subcontractor.**

The VSL Group is structured as a service organization with personnel trained and experienced in engineering and site construction, qualified to perform as specialized Subcontractor, taking on the task and responsibility to supply and install our post-tensioning system. We strongly believe that this approach is very much to the benefit of you as our partner.

Our personnel are engaged exclusively with Post-Tensioning. They are totally familiar with the components and site work. Through regular training and know-how exchange our people continuously gain specific skills and so assure the required quality or identify and prevent problems prior to construction.

Today, VSL is already approaching our projects as a specialist. Today, VSL is already working as a subcontractor. VSL is striving to be even more your **Specialized Subcontracting Partner.**



Michel Maître
Chairman of the Board

Front Cover:

Houston Ship Channel Crossing, Baytown, Texas, USA.
192 VSL Stay Cables up to 61 strands support the 381 metre main span.

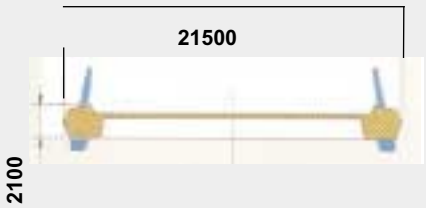
Photo: Greiner, Inc. / Leonhardt, Andrä and partners

Highlights of this Issue:

Stay Cable Bridges:

Batam-Tonton Bridge, Indonesia

Lapi-instute of Technology, Bandung



Stay cable bridges are always something special. Whether small or large they normally represent a landmark wherever they are built.

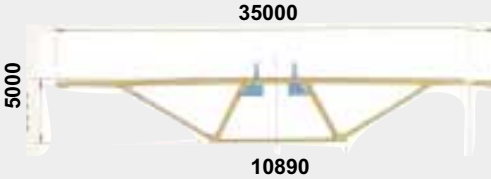
VSL's involvement in this type of construction can range from supply of stay cable material to a full subcontract. VSL's construction packages can include services like construction stage analysis including camber calculation, design of travellers, computation of temporary prestressing in case of a precast segmental construction method, detailing of the saddle at the top of a pylon, etc.

Lately VSL was awarded some extensive specialist work in connection with notable stay cable projects on which we will report in more detail when they are at an interestin construction phases.

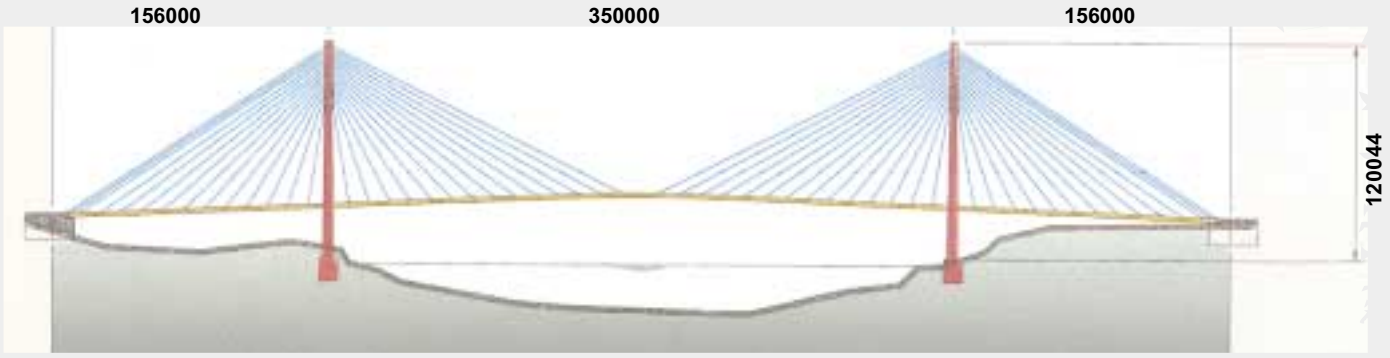
Franz Fischli VSL International Ltd. St-Quentin Yvelines, France

Wadi Leban Bridge, Saudi Arabia

Dar Al-Handasah Consultants (Shair & Partners) (UK) Ltd.

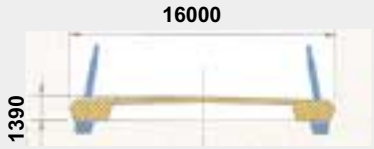


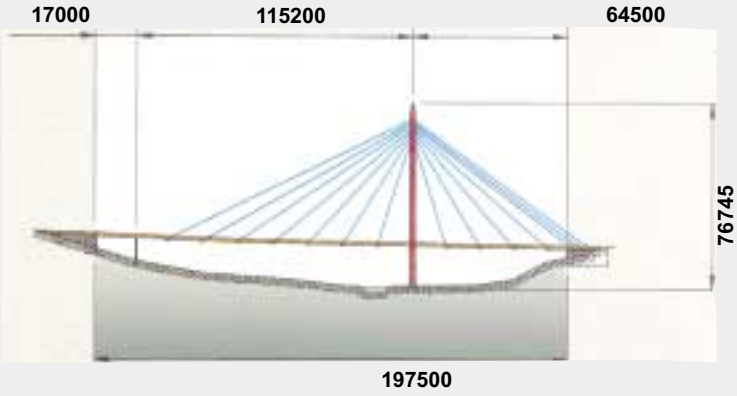
Success for VSL Technology and Partnership Approach



River Level bridge, Scotland

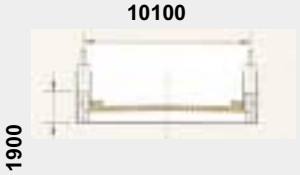
Babtie Shaw & morton

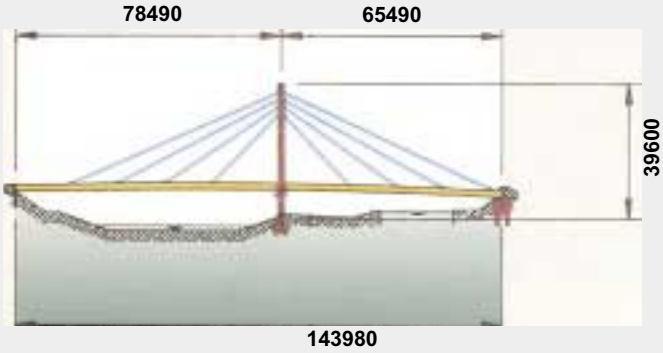


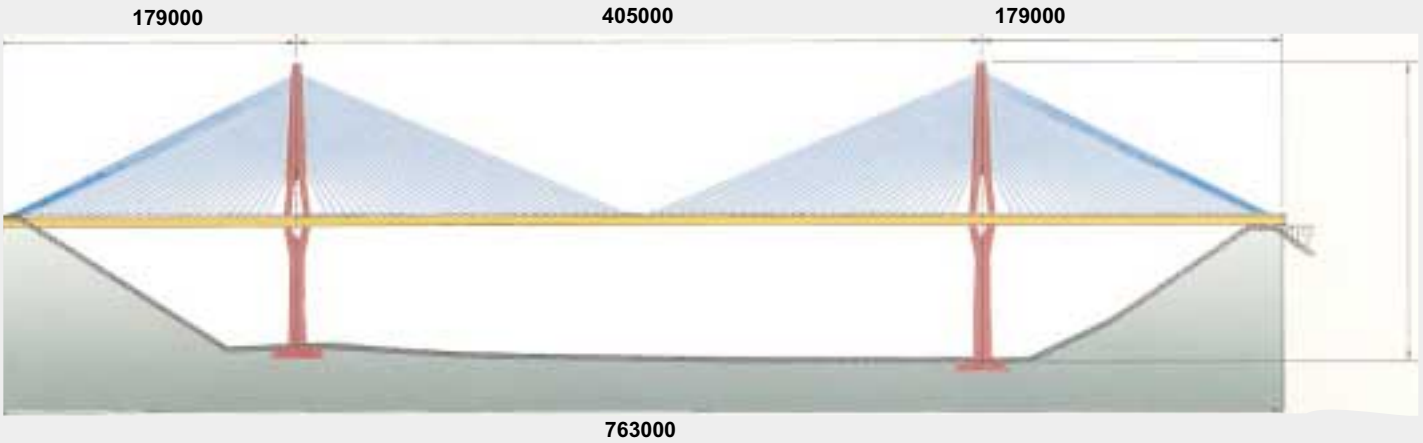


Allan Bridge, France

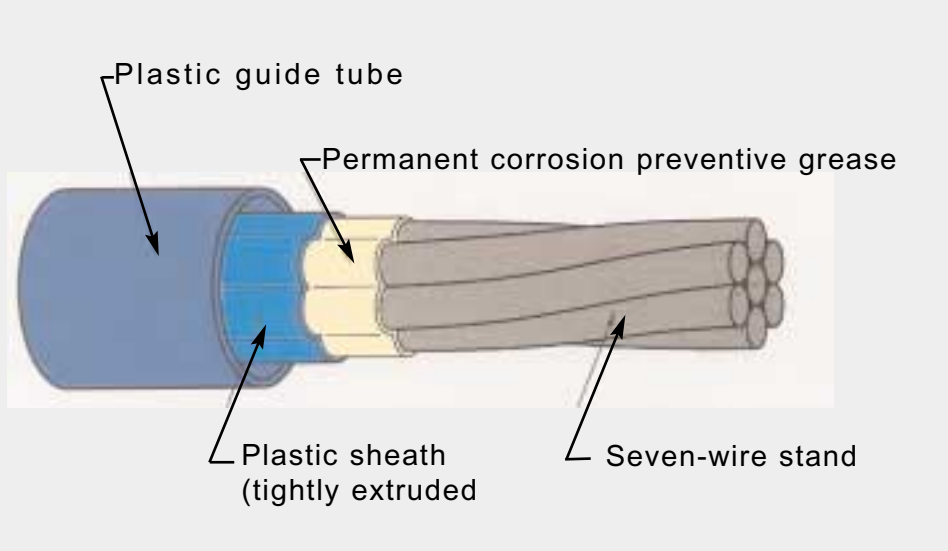
J.Tonello

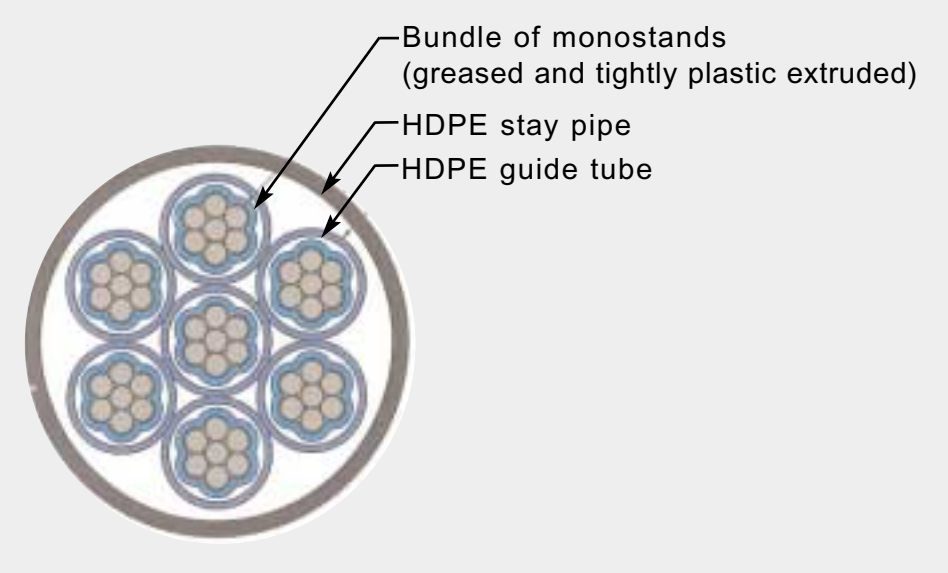






VSL Stay Cable System 200 SSI





Converting research into reality is synonymous with providing what the industry and the end user needs. VSL is dedicated to providing new solutions. Below we present the latest release of the VSL Stay Cable System referred to as SSI. Previous VSL Stay Cable systems have been well developed and quite simple in configuration. However, the method of stay construction had the potential for improvement. It was the main contractor and his construction programme that became the focus of the development team to evolve a stay that was more tuned to practical and quick construction. The result of that work is the SSI Stay Cable.

SSI is an acronym for **S**ingle **S**trand **I**nstallation. The main features of the SSI stay are an excellent anchorage efficiency, a very high fatigue strength, much easier construction, very durable with several layers of corrosion protection, desirable life time features permitting total inspectability and replaceability. SSI stays also allow the client's most desirable strand type and preferred stressing method to be used.

So now to the specifics.

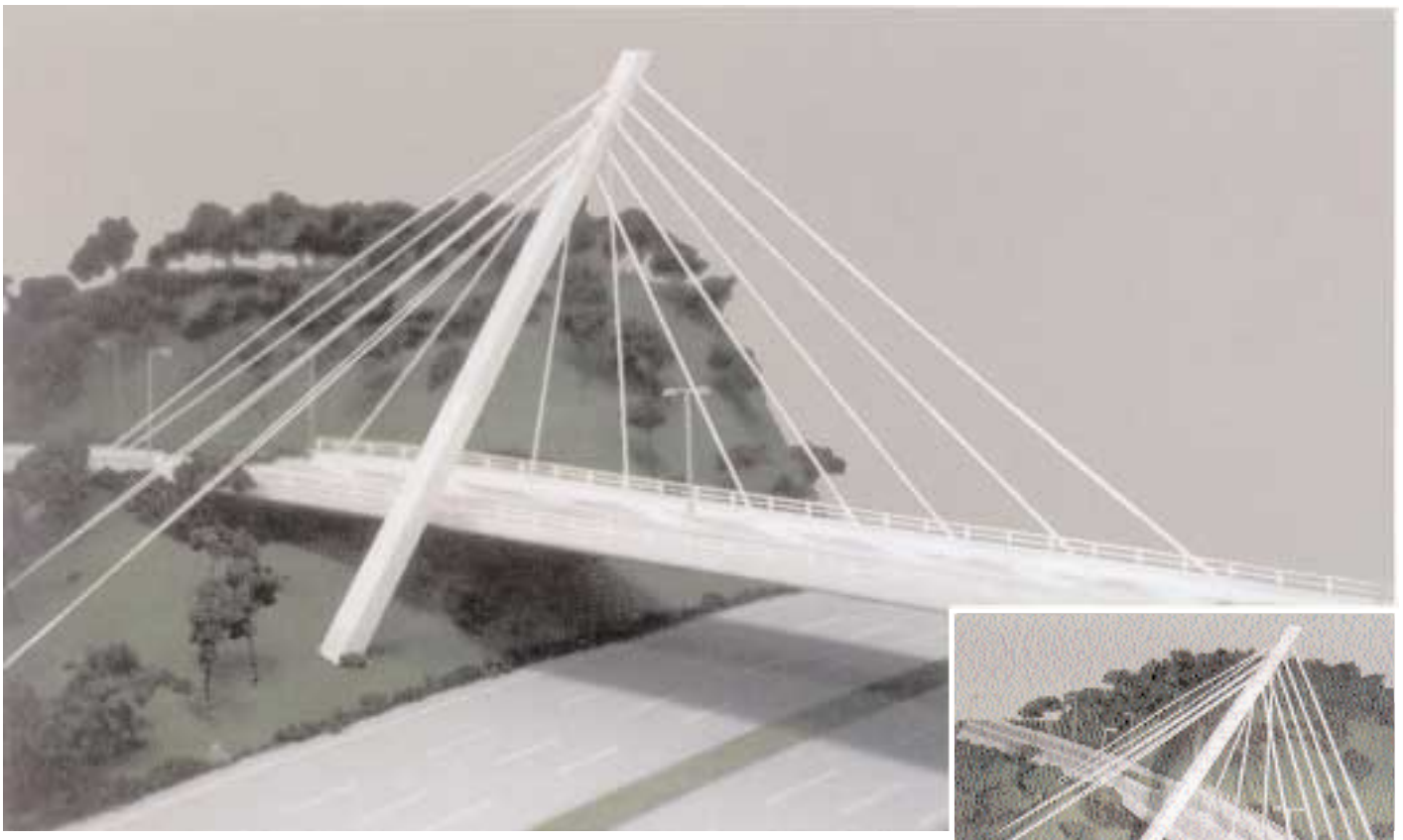
Anchorage: the SSI stay cable uses the well proven and very simple wedge and strand anchoring in the well known compact VSL hole pattern that allows small compact components.

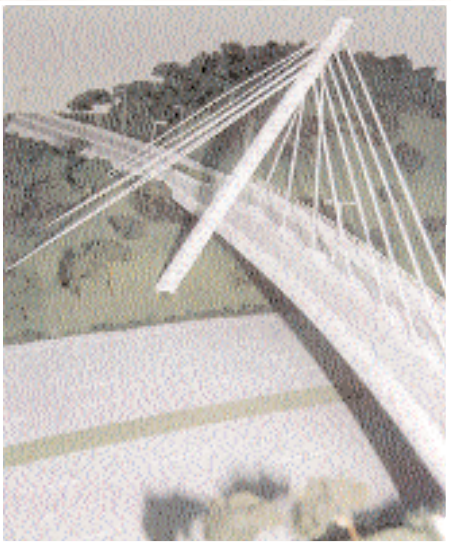
Free length: extending from anchorage to anchorage the free length is made up of an outer stay pipe, a compact assembly of guide tubes, strand, and spacers to maintain the relative position of the outer pipe to the guide tubes, but no grout.

Grouting: The SSI method eliminates almost all grouting, it only employs a small amount of grout in the stay's anchorage zone. This grouting is carried out prior to stay installation so it does not interfere or become a part of critical construction activities. This small amount of grout is used to maintain the position of each individual strand profile with separation and so avoid any concentrated angular changes as the strands deviate from the compact free length bundle to the anchor head hole pattern. The separation of the strands and the individual support provided by the grout totally avoids any lateral strand on strand forces.

Stay erection: The real asset of this stay system is the meaning behind the name: Single Strand Installation. The parallel guide tube bundle is inserted into the outer stay pipe but without strand. The end anchorage zones are profiled and grouted. With only a few strands inserted the essentially unstranded stay is ready to be erected. Without the weight of the steel strand this erection becomes a quick and easy process that does not require heavy construction equipment.

Single Strand Installation: Once the stay assembly is erected strand by strand installation can proceed by reeving one strand at a time. The strand may be a monostrand or a galvanized monostrand. Both these strands provide excellent site corrosion protection for the period prior to installation and during erection of the stay.





Model of the Safti Stay Cable Bridge, Singapore.
Design Engineer:
T.Y. Lin Souht-East Asia Pte. Ltd.

As each strand is installed it is stressed individually to a predetermited load.

Corrosion Protection: The SSI stay provides a multi-layer approach to corrosion protection: firstly, the monostrand grease layer and its cover of PE or the galvanizing of a galvanized strand, then the guide tube which runs totally unbroken from anchor head to anchor head. Finally the outer HDPE stay pipe provides full encapsulation with a thick walled robust pipe from anchor head to anchor head.

Outer Stay Pipe: The outer stay pipe has been maintained for the SSI stay system. Without it individually exposed strands are known to vibrate and impact against each other even in moderate wind. This may in time lead to splitting of the strand's PE sheathing. Full encapsulation with a robust pipe is an essential element for durability.

Inspection: By providing each strand with its own designated guide tube with pur pose made profiling in the anchorage zone, inspection of every single stand is easier than ever before. Linked with inspectability is replaceability. Replacement of individual strands is possible without any significant loss of tensile capacity of the stay in the process. The bridge can remain open to full service during any such quality control or maintenance.

Stressing: Multistrand stressing or if feasible strand by strand stressing can be used.

Other sections of this VSL NEWS highlight recently awarded projects some of which will be built using the SSI method. The award of these current projects is a fair reward for the effort to develop, test and bring to the world market user friendly and reliable systems. VSL's “Single Strand Installation” stay cable with its features of high fatigue strength, excellent anchorage efficiency, and easy construction with durability, are best linked with well trained and experienced site personnel; a service that VSL is ready to provide.

Brad Rathbone
VSL Intemational Ltd.
Lyssach, Switzerland

Two New Versions of VSL RETAINED EARTH

Welded mesh wall facing

Steel sheet facing

The Yarrie Iron Ore Mine is located approximately 2500 km north of Perth, Western Australia, on the edge of the Great Sandy Desert, in an almost uninhabited area of Australia.

It was for this open cut mine that Boulderstone Hornibrook Pty. Ltd. approached VSL to design and construct two Retained Earth walls, each significant in its own right and each a new application of VSL Retained Earth technology.

The first wall was 45 metres long and a maximum of 9 metres high with surcharge loads of 24 kPa applied due to heavy steel column loads. The wall facing used is a welded steel mesh which interlocks with the traditional VSL Retained Earth steel reinforcing mesh to form the complete wall.

The second wall, to service the iron ore crusher, and a more significant structure having a maximum height of 22 metres and 90 metres long, is designed to operate with vehicles of up to 230 tonnes each, working only 2 metres from the face of the wall.

This VSL Retained Earth structure uses a wall facing panel fabricated from processed 2.5 mm steel sheets and was remarkably easy to erect on site even in this remote and harsh area.

Mark Sinclair/Peter Tilley
VSL Prestressing (Aust.) Pty. Ltd.
Noble Park, Victoria

MACKAY Sugar Silo, Australia

PT-PLUST Duct Saves Times and Money

The construction of Mackay Refined Sugar's new 45,000 tonne storage silo located in Mackay, Queensland, was awarded to Concrete Constructions (Queensland). VSL Prestressing (Aust.) Pty. Ltd. was able to assist the contractor reduce labour in the silo slipform operation by redesigning the silo wall to make full use of VSL PT-PLUS ducting for all the horizontal hoop tendons. By designing with PT-PLUS duct, the total number of tendons was reduced by over fifteen percent.

The construction of the 45 m high 350 mm thick silo wall utilized over 6000 m of type 76 PT-PLUS duct with a maximum tendon

length of 65.8 m. Construction of the silo wall was completed in eight days.

VSL's scope of works included the material supply, placement of strand, stressing and grouting of the 19 x 12.7 mm tendons. Also included in VSL's work was the supply of mast climbing platforms which assisted with the construction period being maintained to six weeks.

Barry Story
VSL Prestressing (Aust.) Pty. Ltd.
Thornleigh, New South Wales

First use of PT-PLUS for a silo

VSL Climbform – Silom Precious Tower

Following the introduction of VSL Climbform into the Thailandconstruction market, VSL Thailand was awarded its second project; Silom Precious Tower. The first Climbform project, Baiyoke Tower II, is the tallest building in Bangkok.

Silom Precious Tower is a 67 storey highrise building with a height of 249 metres above ground level and a total floor area exceeding 325,OOO square metres.

The core wall area is approximately 73,000 square metres. Two VSL Climbforms were used in order to take the core's construction off the critical path.

An unusual feature of this project was the erection of the VSL Climbforms after approximately 15 floors of the building were constructed. This was due to the unique programme requirements of the project. The VSL Climbforms caught and passed floor construction well ahead of programme, to the delight of the main contractor, Samsung Development (Thailand) Co. Ltd.

This project commenced in 1993 and should be completed in1996, with the anticipated value of the overall project being US$ 167 million.

Narenn Jinruang
VSL (Thailand) Co., Ltd.
Bangkok, Thailand

Thailand's second climbform

Bridge Connection to Isolated Island

The Ministry of Construction in Korea intends to build several bridges to connect isolated islands in the southern part of the West Sea to improve the transportation system there.

The first such bridge connection named Bee-Do Bridge will employ in-situ Free Cantilever Method of construction. There are 5 main spans of 128 metres with 86 metre approach spans with a 8.2 metre wide deck.

Due to the difficult site conditions like heavy fog, typhoons, a high tidal range, and tremendous difficulties with site access, only 220 actual working days out of 365 days have been programmed for. This results in a cycle time for one segment of 15 calendar days to meet the target date of project completion which is the middle of 1995.

VSL Korea's scope of works includes the redesign of the superstructure, geometry control, post-tensioning works (approximately 430 tonnes of prestressing steel) and reinforcement fabrication and concrete casting.

M.S. Lee
VSL Korea Co., Ltd.
Seoul, Korea

VSL's PT at the Sukubo Bridge Enhances Agricultural Industry

Though being located close to a famous hot spring resort in Toyama prefecture, this bridge construction project is a major part of a programme to improve agricultural efficiency for a number of villages scattered over this mountainous area. The programme, planned by the prefectural government office, intends to improve the road system, to improve local industrial productivity, and to stabilize the regional community.

The bridge crosses a valley with two main spans of 140 metres. The height of the tallest pier is about 31 metres. The single cell box girders of prestressed concrete with an effective deck width of 7.8 metres were constructed by Free Cantilever Construction Method consuming a total of 244 tonnes of longitudinal VSL posttensioning cables.

Following the completion of the foundations, Kawada Construction Co. Ltd., one of the sublicensees of VSL Japan Corporation, started superstructure construction in September 1991, and will complete its work in March 1995.

When this bridge is opened to the public a total area of 6,000 hectares and 6 villages will be able to appreciate the benefit of this construction towards the future prosperity of the local region.

Shusuke Sakata
VSL Japan Corporation
Tokyo, Japan

VSL in Vietnam

An office opening ceremony presided over by Cris Dedigama, Regional CEO of VSL North East Asia, took place in Hanoi on July 18, 1994. The occasion marked the opening of two VSL Representative Offices in Vietnam: a main office in Hanoi and a branch office in Ho Chi Minh City. Delegates from VSL international and rom all VSL North East Asia regional offices (Hong Kong, Korea, Japan) participated in this unique opening.

The two offices will promote post-tensioning for large infrastructure works and private property developments, throughout the Vietnamese construction market and will become a trusted partner to local construction companies.

Bob Nguyen
VSL Vietnam
Hanoi, Vietnam

Tallest Residential Building South of New York City

Bristol Towers Condominium is located on the residential portion of prestigious Brickell Avenue in Downtown Miami, and with 40 stories it is the tallest condominium in the southern United States with an approximate area of 700,000 sq.ft. (65,000 sq.m). The General Contractor was McDevitt Street Bovis.

The structural frame for most of the floors has an irregular, round pattern of columns and consists of an 8 inch (200 mm) two-way post-tensioned flat plate, which used 500,000 lbs (230,000 kg) of post-tensioning material. Once again VSL's design expertise optimized the design resulting in a significant reduction in the post- tensioning and simplified an otherwise complicated layout of the cables to facilitate the construction of this unusually shaped structure for the benefit of all the parties involved in the project.

VSL's engineering and technical know how enabled the contractor to build this fast-track project in record time. Pouring one typical floor per week, which was 18,000 sq.ft. (1,700 sq.m.) helped cut two months off the scheduled completion date.

Rafael E. Puerta
VSL Corporation
Miami, Florida

VSL Turnkeys Large Openings in Buttonhead Wire Reinforced Slabs

When Borders Books and Music moved to their new location at 1801 K Street N.W., Washington, D.C., their build out design team was faced with a unique problem. They wanted to install a new escalator between two levels and a |new elevator between three levels in the store. This required three new openings to be created in the 7 1/2 inch two-way post-tensioned flat slab floor system. Normally a relatively routine demolition job, this particular slab system presented a more difficult problem. The building was originally constructed in the late 1 960's using a buttonhead wire post-tensioning system. Modifying such a slab system requires speciality equipment and expertise which VSL is uniquely qualified to supply.

VSL was awarded a subcontract to create the new slab openings on a turnkey basic.

VSL's work included developing the demolition procedure, detensioning and retensioning the PT tendons, and removal of concrete from the openings. The largest of the openings was 1 3'x70' (3.96 m x 21.3 m) in which there were a total of 50 tendons ranging in size from 4 each (1/4 inch wires) to 10 (1/4 inch wires). In the three openings more than 70 tendons were reanchored and 25 cubic yards of concrete were removed.

Don Kline
VSL Corporation
Washington, D.C.

Bridging the Canal

Delta Frame

The new Chesapeake & Delaware (C&D) Canal Bridge is scheduled to open in the fall of 1995. The 229 metre main span crosses the C&D Canal approximately 42 metres above the water. The canal allows ships to bypass ocean travel in favour of an easier and shorter route to some of the busiest ports on the East Coast of the United States. Recchi America, Inc. selected VSL Corporation to provide the stay cables, stay cable anchorages and permanent post-tensioning for this «gateway» between the canals.

The bridge consists of two single cell box girders with transverse and longitudinal post-tensioning. Each box girder has an 18 metre wide top deck, a bottom slab width of 5.5 metres and a total depth of 3.7 metres. Thirty-two central stays, ranging in size from 6-79 to 6-84, are used to support the main span. Each stay consists of two end anchorages, a central saddle, steel stay pipes, bare strand and grout.

The precast segmental main spans are erected using mobile cranes at the leading edge of the structure. «Delta Frames» placed in the 3 metre gap between the single cell boxes provide the anchorage for the stays. The approach spans are erected span-by-span using an overhead gantry. VSL external post-tensioning is used to provide continuity.

Keith Jacobson
VSL Corporation
Raleigh, North Carolina

World's First Catenary Moored Floating Platform

The Troll Oil Production Platform is a concrete hull based on the semi submerged concept. This Floating Production Unit is to be moored to the sea bed, at a depth in excess of 300 m in the Norwegian Trench, by chain/wire catenary lines. The semi-submerged concrete hull consists of four cylindrical columns, 29 m in diameter, standing 65 m high on rectangular pontoons with base measurements of 102x102m.

In March 1993, VSL (Switzerland) Ltd. was awarded the subcontract for the supply and installation of 3,100 tonnes of prestressing steel by the AF Troll Joint Venture. Construction of the structure started at the dry dock facilities of the main contractor, Kvaerner Concrete Construction a.s., at Hanoytangen in June 1993 with completion of the prestressing work scheduled for early September, 1994

Slipforming of the columns almost complete

An extremely tight construction schedule necessitated elaborate programming and scheduling of the prestressing works. For example at one point in the construction one hundred prefabricated vertical tendons in each of the four columns were installed in a record time of twenty-four hours.

Hans Hitz
VSL (Switzerland) Ltd.
Hauglandshella, Norway

Installing vertical tendons in a column

Duct placing in bottom slab

The first module support beam during launching

Launching of Two Module Support Beams in Norway

At Stavanger, Norway, the Heidrun tension leg platform (TLP)is presently in its final construction phase. Heidrun is the world's first TLP with a concrete hull. Norwegian Contractors (N C) the main contractor, simultaneously built the 2 components of the hull namely the bottom section with 4 platform legs and 2 module support beams (MSB).

In May 1994, the four huge platform legs, out at the deep water site in the Gandsfjord, were ready for mating with the 2 MSBs, having been stressed by VSL.

Norge, at their onshore construction site. The MSBs are 145 m long light weight concrete boxes with dimensions of 7.0 x 7.5 m, each weighing 9,000 tonnes. The mating operation of each MSB started with the load-out of the MSB onto 3 barges.

VSL was entrusted to play an important role in the load-out operation, being responsible for the launching of the MSBs onto the barges. VSL's contract with NC comprised consulting services with respect to skid tracks, skid shoes, lateral guiding as well as the provision and operation of the launching equipment.

An intensive planning phase preceded the operation, as it was the first time one rigid structure had to be launched onto 3 barges. It was very important to match the launching speed with the pumping capacity of the de-ballasting pumps.

The load of 9,000 tonnes was spread over 94 skid shoes, 47 per side, equipped with a teflon plate and sliding on polished stainless steel skid tracks. The 2 MSB load-out operations were carried out at the beginning of June 1994.

It proved to be a demanding and satisfying teamwork effort, for all parties involved: Norwegian Contractors, the barge ballasting crew, the surveying crew, the marine crew and the VSL launching crew.

Ferdi Trenkler
VSL (Switzerland) Ltd.
Lyssach, Switzerland

The Composite System Anchorage was the center piece of attraction

VSL Participates in World of Concrete Middle East 94

The Composite System Anchorage was the center piece of attraction
The Composite System Anchorage was the center piece of attraction
VSL Participates in world of Concrete Middle East 94 The concrete construction industry's leading exhibition took place between 23rd-26th January, 1994. The venue was Dubai, United Arab Emirates.VSL was among more than one hundred participating companies from over fiFteen different courtries. Almost three thousand professionals from the concrete construction industry: clients, contractors, engineers, designers visited the exhibition. VSL's highly specialized services attracted tremendous interest from the visitors who came from various countries from the entire region. VSL's presence reiterated our keen intention to activeiy participate in construction activities in the Middle East.

Isam Saad Sahawneh
VSL (Switzerland) Ltd.
Lyssach, Switzerland

Sliding Bridge Construction Method is User Friendly

A new freeway extension near Yvetot, Normandy, France, was required to cross under the existing railway line between Paris and Le Havre. The French National Railways, SNCF, decided to adopt the construction method AUTORIPAGE which is a registered construction method of JBM-Methods and so avoid a lengthy out of service period.

This construction method calls for the full construction of the complete bridge along side the railway embankment. With a limited period of track closure, the embankment is removed and the new underpass structure is pulled into position. The general contractor Spie-Citra/Quille entrusted VSL France with the operation of shifting the precast concrete bridge structure, complete with wingwalls and track, 36 metres from its casting point to the final alignement. The precast bridge weighed approximately 4,000 tonnes and had been constructed on a guiding

First Construction Phase of Paris Freeway Using VSL External Post-Tensioning Completed

concrete slab. Four stranded cables were used to pull the bridge into position The pulling cables were passed through bored holes made through the embank ment prior to excavation. The four 36 strand cables were anchored in piers on the far side of the embankment and connected to four 580 tonnes SLU jacks behind the structure. Shifting proceeded

at an average speed of 5 metres per hour. Precise control of the whole shifting process ensured that there were no delays and the precast bridge was in position 2 hours ahead of schedule.

Bernd Speck
VSL France S.A..
Egly, France

The viaduct Carrières sur Seine will permit the crossing of the two branches of the Seine River between Carrières sur Seine, the Chatou Island and Nanterre for the future freeway A14 which will connoct Orgeval and Nanterre.

The viaduct consists of two parallel structures and has a length of 820 m and a width of 12.5 m each. Its three main spans of 122 m are constructed by the Free Cantilever Method.

VSL France was entrusted to carry out all the post-tensioning work

- temporary stabilization of the cantilever structure during construction
- all cantilever cables (EC 6-19)
- all continuity cables (EC 6-19)
- exchangeable external cables within the box (up to 250 m long), in HDP ducts, 6-19

Francis Crozat
VSL France S.A.
Egly, France

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