

VSoL[®] - VSL RETAINED EARTH

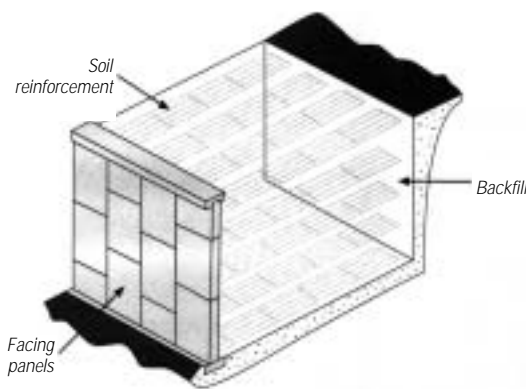


- DESIGN
- ENGINEERING
- SUPPLY
- INSTALLATION

The VSoL® System

A versatile solution for retaining wall construction

Throughout the World, VSoL® - VSL's Retained Earth wall system - has proved its performance as a cost effective construction technique in a variety of retaining walls applications. VSoL® is a reinforced soil wall system which combines advanced engineering, reliable performance, ease of construction and good aesthetics to provide a very economic wall solution.



Versatile system

Available using steel mesh reinforcement as the VSoL® Steel system, or with polyester straps as the VSoL® Polymeric system, the VSoL® technique uses a range of facing panel shapes, sizes and finishes, which connect to the soil reinforcement using simple, reliable connection details. When combined with compacted backfill these components form an internally stable reinforced soil block, suitable for bridge abutments, approach ramps and general retaining wall construction.

Pho Moi, Vietnam.

Penny's Bay, Hong Kong.



Chuquicamata mine, Chile.

Economic and rapid to construct

In addition to excellent structural performance, the VSoL® system is extremely quick to install, leading to significant savings in time and cost over conventional retaining wall solutions. Using proven components, construction methods and VSL's extensive company network, the VSoL® system provides an economical retaining wall system wherever your site location.



Nundah Bypass, Queensland, Australia.



Aesthetic

The use of precast panels permits a wide range of architectural finishes to be considered to meet the aesthetic requirements of a project.

Foundation solutions

VSoL® walls can be designed to accommodate significant foundation settlements and for particularly poor foundation conditions, where ground improvement is the only option, combined wall and foundation packages can be provided to suit project requirements.

Package Solutions

The VSoL® package is tailored to meet the specific project and customer's requirements with options including component supply, design and component supply through to design and construction of complete turnkey projects.

Himeem-Sahil Road, Abu Dhabi.

A system under continuous development

Since its development in California in 1981 the VSoL® Retained Earth system has been continuously improved. In its original form, VSoL® was developed using galvanised steel mesh reinforcement to withstand the forces generated within and applied to the reinforced soil mass. In the VSoL® Steel system, the soil reinforcing mesh connects to the facing panels using a simple pinned connection to galvanised clevis loops cast into in the facing panel. This enables a rapid, reliable connection.



San Joaquin Wall, California, USA.



Collahuasi mine, Chile.



Penny's Bay Access Road, Hong Kong.

**Steel system:
Superior interaction**

The reinforcing mesh ladders in the VSoL® Steel system develop the greatest soil to reinforcement interaction and pull out resistance of any reinforced soil wall system.

**Polymeric system:
Increased versatility**

In recent years the VSoL® system has developed to include the use of geosynthetic reinforcement in the VSoL® Polymeric system. This development increases the versatility of VSoL® as the use of polymeric friction ties extends the range of projects where the VSoL® system can provide an effective economic solution.

**Two-stage construction:
Time saving**

A further recent development to the VSoL® system for weak foundation soils is 2-Stage wall construction. With this technique

a mesh faced VSoL® wall is quickly erected to generate foundation consolidation settlement and permit adjacent construction activities to continue. Once foundation soil settlement is complete, concrete panels are installed and tied back to the mesh faced structure to create an aesthetically pleasing permanent wall facing.



Castle Peak Road, Hong Kong.

VSoL® construction

A simple and rapid process



Sainte-Foix-La-Grande,
France.



Penny's Bay Hong Kong.



Penny's Bay Hong Kong.

Simple cost effective installation

The simplicity of the installation method coupled with rapid reinforcement connections ensures cost effective wall installation. VSoL® walls are easily constructed using a simply proven method:

1. Casting of the mass concrete levelling pad.
2. Erection and alignment of the first row of half and full height panels.
3. Installation of joint and drainage materials.
4. Fill placement and compaction up to the level of the first layer of reinforcement.
5. Installation of soil reinforcement and connection to facing panels.
6. Placing and compaction of additional layers of fill up to top of the half height panels.
7. Installation of the second row of panels.
8. Repeat steps 3-7 until full wall height is achieved.
9. Installation of copings and crash barriers at the top of the wall to suit project requirements.

Rapid installation: 10-25m² per man per day

Depending on wall geometry and site conditions, wall construction is normally undertaken using a 4 man crew, a small crane or crane truck and conventional earthmoving/compaction plant. Installation is normally undertaken entirely from the back of the wall, thus permitting easy construction on restricted sites.



Ultrera, Spain.

KCRC 601, Hong Kong.



VSoL® Steel Engineered for performance

Proven system and components

The VSoL® Steel system uses laboratory and site proven materials. Key features of the system are the pinned reinforcement to panel connection and the ability of the reinforcing mesh to develop high pullout resistance in the soil at low strains. Extensive testing of the mesh with a variety of backfills has clearly demonstrated the superior interaction of VSoL® mesh with typical project fill.

Development and approval

When developing the VSoL® Steel system, extensive testing was carried out on the components and their interaction, leading to optimised designs for mesh, clevis connections and facing panels. This data was also used to assist the development of design standards for reinforced soil construction resulting in the approval of VSoL® design to all major design standards.

Quality Assurance

All VSoL® components are tested by suppliers and checked in accordance with VSL's quality assurance procedures. The use of standard components designed and manufactured in accordance with national standards minimises project specific testing requirements whilst offering the security of a tried and tested system.



Mesh-soil interaction test.



VSoL® pinned connection.



Clevis connector pullout test.



Applications VSoL® Steel

The VSoL® Steel system is suitable for a wide range of projects including: highway retaining walls, bridge abutments, and general landscaping walls. Modular and easy to install the system can be used for a range of backfill soils and foundation conditions. Straight, curved, tiered, superimposed or back to back walls can all be accommodated by the design flexibility of the VSoL® Steel system.

The VSoL® Steel system mesh comprises longitudinal and transverse bars with a connection loop at one end of each longitudinal wire. Wires of 8-12mm diameter are normally used with longitudinal wires at 150mm centres and transverse wire spacings varying from 150-900mm, depending on loading conditions.

During installation the mesh end loops interlock with similar loops in the panel clevis and the full strength joint is achieved using a connection pin. The simplicity of the pinned connection is a key feature of the system, enabling rapid installation on site.



Simple moment free pinned connection to panel clevis loops.



Galvanised steel mesh.



Pinned connection



Yarrie Mine, Australia.

Applications VSoL® Polymeric



Friction tie installation.

West Side Marina project with polymeric system, Dubai.

The VSoL® Polymeric system increases the versatility of VSoL® as the polymeric friction ties extend the range of projects where the VSoL® system can provide an effective economic solution.

Friction ties to reinforce the backfill

The VSoL® Polymeric system uses polyester friction ties to reinforce the backfill and create a stable soil mass. A simple high strength connection system attaches the reinforcement to the panel and soil forces are transferred by friction into the soil reinforcing straps.



Kralupy-Vranany project, Czech Republic.

Increased durability

One of the major advantages of using the VSoL® Polymeric system is that, through the use of the polymeric components, long term durability of the structure in all site conditions is assured. The VSoL® Polymeric system reinforcement is made from high strength polyester yarns encased in a durable polyethylene sheath which provides physical and chemical protection to the reinforcing yarns.



Kralupy-Vranany project, Czech Republic.



Truck Road project with polymeric system, Dubai.

Designing with VSoL®

VSoL® design and supply package

In support of the VSoL® system, VSL can provide full design calculations to suit local design standards. By the use of comprehensive software for wall design, drafting and project costing, VSL can provide rapid and cost effective design evaluations as part of its' VSoL® supply package.

Proven, standard components

VSoL® design solutions are tailored to individual project requirements. By using this approach with proven, standard components, a bespoke cost effective design is achieved for each project.

Foundation versatility

VSoL® walls, being internally stable reinforced soil structures are more accommodating to settlement than most other forms of wall construction. Through the use of flexible reinforcement connections and settlement tolerant facing details, VSoL® walls can accommodate larger construction and post construction settlements than conventional retaining wall methods. Hence VSoL® walls can be built on site with poorer foundation soils than conventional walls, without affecting the structural integrity and performance of the finished wall.

Design versatility

Due to the cost effectiveness of the system VSoL® walls are commonly used to replace other wall construction methods. Often proposed by VSL as design alternatives at time of tender, VSoL® walls are typically built as replacements for cantilever gabion and bored pile walls or viaduct structures. The design flexibility and structural performance of the VSoL® system also permits the removal of expensive foundation systems on many projects.



La Polvora, Chile.



Upper Bukit Timah Road, Singapore.

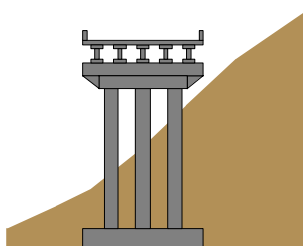
Truck Road, Contract No.2, Dubai.



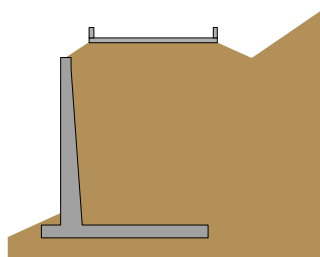
Frutillar, Chile.



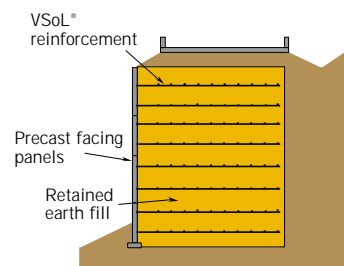
Voray Devecey, France .



Traditional Viaduct structure.



Traditional cantilever wall.



VSoL® wall solution.



VSoL® design software.



Mount Arthur, Australia.



Marga Marga, Chile.



Vatry, France.



Lantau Toll Plaza, Hong Kong.



Valentin, France.

DB 350, Hong Kong.



VSoL® Facings

Square or rectangular panels are most commonly used with the VSoL® system as they offer fabrication and construction benefits. However, many projects have been built using the traditional hexagonal panel design or T-shaped panels.

A 1.5m x 1.5m square panel is generally used as the standard panel size, although panels up to 2.5m x 2.5m are often used. Special panel sizes make it possible for VSoL® walls of almost any geometry to be built.



South East Transit,
Brisbane, Australia.



Nundah Bypass, Queensland, Australia.

VSL LOCATIONS

Americas

ARGENTINA

VSL Sistemas Especiales de Construcción Argentina S.A.
BUENOS AIRES
Phone: +54 11 4 393 28 07
Fax: +54 11 4 326 26 50

CHILE

VSL Especiales de Construcción S.A.
SANTIAGO
Phone: +56 2 233 10 81
Fax: +56 2 233 67 39

MEXICO

VSL Corporation Mexico S.A. de C.V.
MEXICO
Phone: +52 55 5 396 86 21
Fax: +52 55 5 396 84 88

UNITED STATES

VStructural LLC
HANOVER
Phone: +1 410 850 7000
Fax: +1 410 850 4111

Middle East

UNITED ARAB EMIRATES

VSL Middle East Office
DUBAI
Phone: +971 4 282 08 03
Fax: +971 4 282 94 41

Africa

SOUTH AFRICA

VSL Systems (South Africa) Pty Ltd
Kya Sand, RANDBURG
Phone: +27 11 708 2100
Fax: +27 11 708 2120

Asia

BRUNEI

VSL Systems (B) Sdn. Bhd.
BRUNEI DARUSSALAM
Phone: +673 2 380 153
/ 381 827
Fax: +673 2 381 954

HONG KONG

VSL Hong Kong Ltd.
WANCHAI
Phone: +852 2590 2288
Fax: +852 2590 0290

Intrafor (Hong Kong branch)
WANCHAI

Phone: +852 2836 31 12
Fax: +852 2591 61 39

INDIA

VSL India PVT Ltd.
CHENNAI
Phone: +91 44 5214 56 78
Fax: +91 44 2433 99 02

INDONESIA

PT VSL Indonesia
JAKARTA
Phone: +62 21 570 0786
Fax: +62 21 573 1217

JAPAN

VSL Japan Corporation
TOKYO
Phone: +81 3 3346 8913
Fax: +81 3 3345 9153

KOREA

VSL Korea Co. Ltd.
SEOUL
Phone: +82 2 553 82 00
Fax: +82 2 553 82 55

MAINLAND CHINA

VSL Engineering Corp. Ltd.
HEFEI
Phone: +86 551 557 6008
Fax: +86 551 557 6018

VSL Engineering Corporation Ltd.
Shanghai Branch Co.
SHANGHAI
Phone: +86 21 6475 4206
Fax: +86 21 6475 4255

MALAYSIA

VSL Engineers (M) Sdn. Bhd.
KUALA LUMPUR
Phone: +60 3 7981 4742
Fax: +60 3 7981 8422

PHILIPPINES

VSL Philippines Inc.
MADALUYONG CITY
Phone: +632 638 7686
Fax: +632 638 7691

SINGAPORE

VSL Singapore Pte. Ltd.
SINGAPORE
Phone: +65 6559 1222
Fax: +65 6257 7751

TAIWAN

VSL Taiwan Ltd.
TAPEI
phone: +886 2 2759 6819
Fax: +886 2 2759 6821

THAILAND

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

VIETNAM

VSL Vietnam Ltd.
HANOI
Phone: +844 8245 488
Fax: +844 8245 717

Ho Chi Minh City
Phone: +84 8 8258 144
Fax: +84 8 9102 596

Australia/Pacific

AUSTRALIA – Queensland

VSL Prestressing (Aust.) Pty. Ltd.
GEEBUNG
Phone: +61 7 3265 64 00
Fax: +61 7 3265 75 34

AUSTRALIA – New South Wales

VSL Prestressing (Aust.) Pty. Ltd.
THORNLEIGH
Phone: +61 2 9 484 59 44
Fax: +61 2 9 875 38 94

AUSTRALIA – Southern Division

VSL Prestressing (Aust.) Pty. Ltd.
NOBLE PARK
Phone: +61 3 979 503 66
Fax: +61 3 979 505 47

Europe

AUSTRIA

Grund- Pfahl- und Sonderbau GmbH
HIMBERG
Phone: +43 2235 8777 7
Fax: +43 2235 86 561

BELGIUM

N.V. Procedes VSL S.A.
BERCHEM
Phone: +32 3 230 3634
Fax: +32 3 230 89 65

CZECH REPUBLIC

VSL Systemy (CZ), s.r.o.
PRAGUE
Phone: +420 2 67 07 24 20
Fax: +420 2 67 07 24 06

FRANCE

VSL FRANCE S.A.
St-Quentin-en-Yvelines
Phone: +33 1 39 44 85 85
Fax: +33 1 39 44 85 86

GERMANY

Intrafor S.A.
St-Quentin-en-Yvelines
Phone: +33 1 39 44 85 85
Fax: +33 1 39 44 85 86

GERMANY

VSL Systems GmbH
BERLIN
Phone: +49 30 53 01 35 32
Fax: +49 30 53 01 35 34

GREAT BRITAIN

VSL SYSTEMS (UK) Ltd
ST. NEOTS, CAMBS
Phone: +44 1480 404 401
Fax: +44 1480 404 402

Intrafor (UK)
BRACKNELL
Phone: +44 1 344 742 115
Fax: +44 1 344 742 146

GREECE

VSL Systems S.A.
ATHENS
Phone: +30 1 0363 84 53
Fax: +30 1 0360 95 43

NETHERLANDS

VSL Benelux B.V.
AT LEIDEN
Phone: +31 71 576 89 00
Fax: +31 71 572 08 86

Intrafor (Netherlands)
AC LEIDERDORP
Phone: +31 71 581 70 22
Fax: +31 71 581 70 21

NORWAY

VSL Norge A/S
STAVANGER
Phone: +47 51 52 50 20
Fax: +47 51 56 27 21

POLAND

VSL Polska Sp.z.o.o.
WARSAW
Phone: +48 22 817 84 22
Fax: +48 22 817 83 59

PORTUGAL

VSL Sistemas Portugal
Pre-Esforço,
S. DOMINGOS DE RANA
Phone: +351 21 445 83 10
Fax: +351 21 444 63 77

SPAIN

CTT Stronghold
BARCELONA
Phone: +34 93 289 23 30
Fax: +34 93 289 23 31

VSL-SPAM, S.A.

BARCELONA
Phone: +34 93 289 23 30
Fax: +34 93 289 23 31

SWEDEN

Internordisk Spännarmring
AB
SOLNA
Phone: +46 8 504 37 200
Fax: +46 8 753 49 73

SWITZERLAND

VSL (Switzerland) Ltd.
SUBINGEN
Phone: +41 32 613 30 30
Fax: +41 32 613 30 15

VSL (Suisse) SA
VOUVRY
Phone: +41 24 48157 71
Fax: +41 24 48157 72

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HEADQUARTERS

VSL International Ltd.
Scheibenstrasse 70 – Bern – CH-3014 – Switzerland
Phone: +41 32 613 30 30 – Fax: +41 32 613 30 55