Rehabilitation, Strengthening and Protection of concrete structures require thorough investigations, clearly defined procedures, expert execution and systematic quality control.

Through its wide range of construction and engineering services, VSL provides engineers, contractors, consultants and owners with the specialist advice they need.

Our experienced specialists inspect and assess civil engineering works, buildings, bridges, and industrial structures both to determine present condition and initiate measures found necessary for restoration to full-service condition.

In many cases, our team of experts will also undertake the project management for the rehabilitation work, in agreement with the contractor and/or owner.

VSL offers a wide range of specialist skills in each of the main areas of structural investigation, repair, strengthening and protection.
Structural remedial work demands thorough diagnosis of damage/ deterioration and full assessment of causes, risks and consequences involved. VSL employs state-of-the-art equipment and special inspection techniques to detect any defects in concrete, reinforced concrete, and prestressed concrete structures before any significant damage can occur. Close cooperation with material testing institutes, structural designers and the latest investigation techniques enables VSL to prepare precise and comprehensive reports such as:

- Inspection and surveyance of concrete structures
- Condition evaluation of concrete structures
- Root cause analysis
- Design of repair strategies
- Order-of-Magnitude Costing

**Deciding on a repair strategy**

Once the outward signs of a structural problem have been observed, the next step is critical: to identify the underlying cause. Any decision to repair and the repair strategy - should never be based solely on effect. It should always arise from any analysis of the cause. A solid understanding of the root cause will help determine whether the observable effect actually warrants a repair.

Many owner-related issues must also be assessed - safety, environmental effects, change of structural usage, new design loads, and risk level, to name just a few before a wise decision can be made to repair or not to repair.
VSL provides repair, strengthening and protection for concrete structures in bridges, office buildings, residences, factories and warehouses.

VSL has the expertise and technical competence needed to solve problems requiring surface repairs, strengthening, stabilization, waterproofing, and protection. Our toolbox offers solutions applicable to the repair of all structures including airports, bridges, buildings, high-rise structures, parking structures, plaza decks, tunnels and historic structures.

By applying new technologies to well-established repair principles, VSL partners with owners and designers to safely deliver cost effective solutions. Continual commitment to quality and building long-term solutions has earned VSL recognition as a leading repair and strengthening specialist contractor.

VSL has established stringent technical guidelines and quality standards for field procedures. These standards, along with our outstanding safety program and focused repair and strengthening experience, are key elements of the quality that VSL brings to every project.

**Non-Destructive Testing:**
- Prestressed Tendon Detection
- Re-bar Orientation Detection
- Concrete Defects Detection
- Prestressed Tendon Grout Void Detection

**Structural Repairs:**
- Concrete
- Reinforced Concrete
- Prestressed Concrete
- Reinforcement Repair
- Historic Restoration
- Re-Anchorining of Prestressing Tendons

**Rehabilitation & Protection:**
- Chemical/Epoxy Injection
- Rout/ Seal Cracks
- Expansion Joint Replacement
- Structural Bearing Replacement
- Cathodic Protection
Rehabilitation works under mid span of bridge

Full span vertical lifting of bridge

External post-tensioning of beams

External post-tensioning of piers

Full replacement of bridge beams

Replacement of bridge bearings
As a leading provider of specialty structural repair, strengthening and protection solutions for industrial facilities, VSL understands the unique challenges faced by industrial owners and operators.

Since repair work typically takes place in functioning facilities, VSL recognizes the need to ensure continuous plant operations. Executing repairs under these conditions requires an experienced industrial contractor that employs a team approach. With VSL, every project is carefully preplanned in close coordination with plant operations, maintenance and safety personnel.

Our work is carried out safely and with the least impact on critical manufacturing, processing, or production activities. Skilled teams develop safety-oriented solutions for challenging environments to provide turnkey project delivery.

In industrial facilities throughout the world, VSL can be relied on creativity, quality and dependability to deliver the project on time, within budget and with minimal disruption to operations.

**Design-Build Repair Service:**
- Inspection Services
- Condition Evaluation
- Repair Design
- Project Planning
- Project Management

**Repair & Maintenance Services:**
- Concrete & Structural Repairs
- Protective Coatings & Linings
- Concrete Fireproofing Repairs
- Structural Support & Shoring
- Heavy Lifting
- Turnaround and Shutdown Contracts
- Maintenance Contracts
- Strengthening & Upgrades
The need for strengthening may arise from deterioration, change in use, change in design code, structural defects and seismic conditions. VSL utilizes the latest technologies to develop innovative strategies to restore or add load-carrying capacity to bridges, buildings, parking facilities, silos, and other structures. Solutions for strengthening include fiber-reinforced polymer (FRP), Prestressed FRP, Hardwire® steel reinforced polymer (SRP), post-tensioning, supplemental steel framing, and section enlargement.

**Strengthening Systems & Services:**

- Preliminary Evaluation
- Composite Systems
  - Vwrap® CFRP Fabrics
  - Vplate® CFRP Plates
  - Vrod® CFRP Rods
  - Hardwire® SRP
  - Prestressed FRP
- External & Internal Post-Tensioning Systems
- Section Enlargement
- Span Shortening
- Vibration Dampening
- Load Isolation
Intrafor, the ground engineering and foundations specialist subsidiary of VSL, is able to provide a full package of design and construct solutions to any foundations enhancement, improvement or remedial works.

**Testing & Investigation**
- Sonic Logging
- Coring
- Sampling
- Video Inspection
- Material Analysis
- PDA/PIT/Capwap
- Radar
- Impact Echo Testing

**Design & Build Repair Service**
- Repair Design
- Project Management
- Construction

**Rehabilitation & Remedial**
- Remedial Piles
- Compensation & Structural Grouting
- Specific Waterproofing Grouting

From simple waterproofing grouting of earth-retaining structures to full scale foundation rehabilitation such as load transfer and replacement piles, Intrafor, having its own in house testing company and design department, can answer all technical challenges raised by the difficult task of underground structure diagnosis and repair.
VSL also offers materials for blast and impact resistance. Ductal® is a patented material consisting of cement, sand, silica fume, silica flour, admixture and water, with very fine high strength steel fibres. The use of Ductal® enables the development of new and innovative products for the protection of critical infrastructures and high-risk facilities. Ductal® may be applied for both new construction and retrofitting purposes.

Blast & Impact Resistance Systems using Ductal® or Hardwire® SRP:

- Blast walls
- Façade panels
- Explosives and hazardous materials storage
- Blast resistance walls in chemical, oil/gas and offshore facilities
- Blast and fire resistance coverings for parts of critical structures

- Defense applications
- Bullet proof and projectile resistant barriers
- Other applications that are subject to high impact loads can also be developed based on the results of the research.

5000kg of hexolite or 6000kg of TNT explosives tests.
MONITORING OF STRUCTURES

DeMon is a combination of services provided by VSL that brings the data from the monitoring (instrumentation and inspection) to the desk of the owner and the designer in the simplest way.

It is made of a back end and a front end: The back end Demon Site is a software installed on site that collects and filters the data from any type of sensor. The front end Demon Server is a secured Web server, in which data is processed, that allows authorised people to access to the data of their project in real time from anywhere.

Added services such as real time alarm and back analysis can also be included. Reports can be contained in the DeMon service for diffusion of electronic or printed documentation from and to Designer.

Screen shots of Demon system
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