



CONCRETE RESTORATION & PROTECTION

A PORTFOLIO OF SOLUTIONS

We Save Structures™

INTRODUCTION



Concrete Preservation Alliance

Vector Construction, Vector Corrosion Technologies, Vector Corrosion Services and NDT Corporation are working together to extend the service life and preserve concrete structures.

Preservation of infrastructure is a sustainable activity that mitigates pollution, reduces solid waste and conserves natural resources.

Vector has a longstanding commitment to sustainable construction and providing solutions for durable concrete structures.

For more information visit WeSaveStructures.info



David W. Whitmore
President,
Vector Corrosion
Technologies



Robert G. Spriggs
Chief Executive Officer,
Vector Construction



Donald W. Whitmore
Founder and Chairman,
Vector Construction



Michelle Ball
President, Vector
Corrosion Services
& NDT Corporation

Vector is comprised of an extensive network of independent and geographically dispersed Concrete Solution Centres™ serving customers around the world. Collectively, these centers possess an unsurpassed level of expertise and experience to provide you with innovative, cost-effective concrete restoration and corrosion mitigation products and services to extend the service life of your concrete structures and facilities.

Today, concrete restoration and corrosion mitigation costs in North America are estimated to exceed \$40 billion per year. Worldwide, they are incalculable. There is no single solution to address a problem of this magnitude. But Vector has developed a portfolio of solutions to help you meet the specific challenges confronting the structures and facilities in your industry.

The hallmark of every Vector solution is the unsurpassed integrity, expertise and experience of our concrete team. We work with you to identify the root cause of the problem - not just the symptoms. Then we develop and implement the right solution for your specific situation. Then we do the right job, right!

That's the Vector philosophy. The result is innovative, cost-effective concrete restoration and corrosion mitigation techniques that have earned the long-standing trust and respect of customers around the globe for over 50 years.

The Vector portfolio of solutions is far more extensive than can be presented here. The problems and solutions summarized in this booklet are but a few of the ways Vector is helping customers successfully address their concrete and corrosion challenges. You are encouraged to contact any Concrete Solution Center™ in the Concrete Preservation Alliance network and see for yourself how we can help you.

Work Quality & Standards

Vector performs its work according to the applicable guidelines and standards of ICRI, ACI, NACE and PTI. Our focus on quality work and doing the right things right the first time minimizes punch list items and future call backs.

We stand by our work and are pleased to provide a free One Year Limited Warranty that our projects will be completed as specified and are free of defects in workmanship.

Contact Vector for more information on our limited warranty program.

Safety & Environment

Vector's safety, health and environmental protection policy initiatives demonstrate the integrity with which we embrace our ethical responsibilities to you. We strive to prevent workplace injury, property and equipment damage and to control risks to our customers, the public and the environment.

Vector adheres to a "least total cost" philosophy in all our endeavors replacing structures and facilities. This philosophy extends to consideration of sustainability, the environmental impact of projects and costs related to unnecessary consumption of materials and resources.

Our total commitment in this regard has allowed our customers to avoid unnecessary shutdowns and associated liability issues. Vector is proud of our high standards and the numerous safety and environmental awards we have received.

Industry Participation

Vector is committed to the advancement of industry standards, practices and new technologies. Vector's technical staff actively participate in the following industry organizations:

- American Association of State Highway Transportation Officials
- American Concrete Institute
- American Railway Engineering and Maintenance-of-Way Association
- American Society of Civil Engineers
- Building & Concrete Restoration Association of Ontario
- Canadian Construction Association
- Canadian Society of Civil Engineers
- Construction Safety Associations
- Grain Elevator & Processing Society
- International Concrete Repair Institute
- National Association of Corrosion Engineers
- Post-Tensioning Institute
- Structural Innovation and Monitoring Technologies Resource Centre
- Transportation Association of Canada
- Vancouver Construction Association



PROBLEM IDENTIFICATION

Vector's definition of integrity is not just doing the job right, but doing the right job, right!

Cost-effective solutions are always predicated on the correct identification of the underlying problem – not just the symptoms. For this reason, Vector recommends thorough evaluation to determine why the deterioration has occurred.

While each evaluation and inspection plan is unique, all are designed to provide you with the most cost-effective solution to keep facilities and structures in service with minimum 'down-time', future disruptions and maintenance.

- ▶ **Condition Surveys**
- ▶ **Concrete Investigation**
- ▶ **Corrosion Testing**
- ▶ **Corrosion Monitoring**
- ▶ **Corrosion Evaluations**
- ▶ **Structural Health Monitoring**
- ▶ **Locating Steel**
- ▶ **Void Detection**
- ▶ **Load Testing**
- ▶ **Post-Tension Evaluation**
- ▶ **Non-Destructive Testing**



CLIENT PROBLEM:

Concrete damage at the 12th street viaduct

VECTOR SOLUTION

Vector worked with the structural engineer to evaluate the presence of chlorides, delaminations and rebar corrosion. This information was used by the engineer to develop a corrosion management strategy and to determine the extent of repairs needed for each section of the bridge.



CLIENT PROBLEM:

Ruptured concrete and loss of structural capacity

VECTOR SOLUTION

Corrosion and failure of post-tension cables in this public parking garage lead to major structural problems.

Employing Vector's Post-Tech™ Corrosion Evaluation, cables were evaluated to determine the potential for corrosion. Based on the evaluation results, Post-Tech™ PT Drying and PT Grease Injection methods were used to mitigate corrosion activity and provide long-term protection.

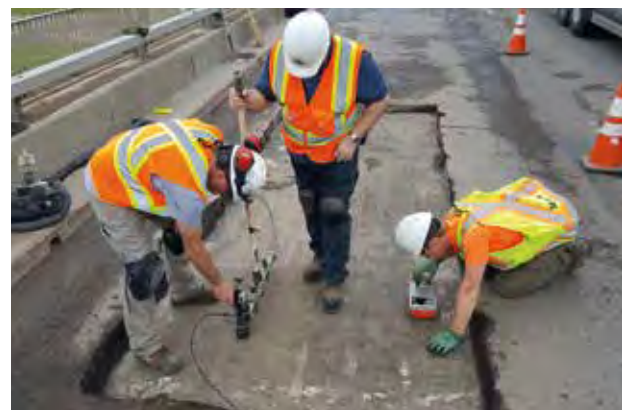


CLIENT PROBLEM:

Corrosion damage to grouted post-tensioned tendons

VECTOR SOLUTION

Vector performed extensive investigation which included the use of non-destructive testing such as sonic/ultrasonic and tomography to locate voids to evaluate and determine the probability of corrosion of post-tension cables throughout the structure. The evaluation provided the owner with confidence that the structure was still in good condition.



CONCRETE REPAIR & RESTORATION

Vector is a full service rehabilitation contractor – and more!

With over 50 years experience providing turn-key conventional and structural solutions for concrete repairs, Vector possesses unique capabilities to serve as your single-source restoration contractor.

In addition to proficiency in conventional repair methods, Vector has developed the expertise to employ innovative, proprietary processes and techniques that ensure timely, cost-effective solutions for all your concrete and corrosion challenges, everything from small concrete repairs to major restoration projects.



- ▶ **Conventional Concrete Repairs**
- ▶ **Structural Concrete Repairs**
- ▶ **Precast Concrete Repairs**
- ▶ **Epoxy Injection**
- ▶ **Chemical Grouting**
- ▶ **Cementitious Pressure Grouting**
- ▶ **Shotcrete**
- ▶ **Masonry Repairs**
- ▶ **Historic Preservation**
- ▶ **Post-Tension Repair**



CLIENT PROBLEM:

Freeze-thaw damage, corrosion and concerns about stability led the Federal Government to mandate a long-term solution.

VECTOR SOLUTION

Vector utilized multiple rehabilitation processes including concrete removal and replacement, overlays, anchoring, grouting, and additional reinforcement to provide a long-term solution to this seriously deteriorated structure.



CLIENT PROBLEM:

Leakage and unprotected concrete led to extensive corrosion and concrete deterioration at this underground parking garage.

VECTOR SOLUTION

Vector performed partial and through-slab replacement, installed new reinforcing steel, repaired joints and installed traffic deck membrane to protect the structure.



CLIENT PROBLEM:

Overseas nuclear reactor containment buildings exhibited structural cracks and were not air tight.

VECTOR SOLUTION

Specialized concrete repairs and structural crack injection techniques were utilized to cost-effectively repair the existing structures, bringing them into regulatory compliance.

PROTECTIVE SYSTEMS

Vector Protects your Concrete Structures.

If you are faced with the challenge of protecting or replacing your concrete floors, walls, tanks, and secondary containment structures from the devastating effects of salt, water, temperature, acid, other chemicals or abrasion, Vector has the experience and technical competence to help you.

No single product or system provides a universal, protective barrier against chemical, thermal and mechanical attack. Specially formulated coatings, linings, membranes, sealers, acid brick, tile and acid resistant concrete are but a few of the possible solutions in our portfolio from which to choose.

Vector's expertise is available to help you select the most cost-effective product solution and application technique. From precise problem definition to meticulous surface preparation, to proper application, let Vector's experience work for you.

- ▶ **Industrial Flooring**
- ▶ **Protective Coatings & Linings**
- ▶ **Traffic Bearing Membranes**
- ▶ **Waterproofing Systems**
- ▶ **Acid Resistant Concrete**
- ▶ **Concrete & Polymer Overlays**
- ▶ **Expansion Joints**
- ▶ **Refractory Linings**
- ▶ **Acid Brick & Tile Repair**
- ▶ **Geopolymer Overlays**

CLIENT PROBLEM:

Chemical and thermal attack in food plant caused a health and safety hazard.

VECTOR SOLUTION

Selection and application of a specialty flooring system provides a cleanable surface and withstands the thermal shock of daily steam cleaning.



CLIENT PROBLEM:

Reduced structural integrity due to chemical attack at an industrial plant effluent treatment facility.

VECTOR SOLUTION

Selection and application of a monolithic protective lining provided a durable barrier and long-term resistance to chemical attack while ensuring the job was completed within the short shutdown window mandated by customer requirements.



CLIENT PROBLEM:

Leakage and environmental contamination at a chemical plant were identified.

VECTOR SOLUTION

Vector implemented a 3-part solution comprised of repairing all concrete defects, sealing all cracks and joints and application of a chemical resistant lining to provide secondary containment.



STRUCTURAL STRENGTHENING

Vector is a recognized industry leader and award recipient for the development of innovative processes and techniques to strengthen and repair existing concrete structures. These innovative approaches provide cost-effective solutions to existing structural problems.

- ▶ **Advanced Composite Materials**
- ▶ **Rock Anchoring/Stabilization**
- ▶ **Supplemental Strengthening**
- ▶ **Post-Tension Repairs/Replacement**
- ▶ **FRP Rebar and FRP Mesh**
- ▶ **External Post-Tensioning**

CLIENT PROBLEM:

Structural deficiencies with a highway overpass caused safety and liability concerns to government officials.

VECTOR SOLUTION

Carbon fiber sheets were integrated into structurally deficient areas, resulting in significant cost and time savings.



CLIENT PROBLEM:

Significant cracking of timber bridge girders due to overloading.

VECTOR SOLUTION

Repair and strengthen, rather than replace. A combined approach of epoxy injection and installation of Fiber Reinforced Polymer (FRP) rebar strengthened the existing timbers to carry higher loads.



CLIENT PROBLEM:

Structural slabs at power plant needed to be strengthened to ensure safety and meet code requirements.

VECTOR SOLUTION

Carbon fiber strips and near surface mounted systems are cost-effective solutions to strengthen structurally deficient areas. All work can be completed without interfering with normal operations.



CLIENT PROBLEM:

Marine bridge required structural strengthening and relief from reinforcing steel corrosion.

VECTOR SOLUTION

Innovative structural strengthening system which included a galvanic distributed corrosion protection system was used to strengthen the beams and protect them from on-going corrosion.



CORROSION MITIGATION

Vector supplies and installs an extensive array of corrosion mitigation technologies to extend the service life of concrete and masonry structures. Vector solutions include galvanic protection systems, impressed current cathodic protection and electrochemical treatments.

In addition to innovative technologies, Vector has the greatest number of NACE trained and certified Cathodic Protection Specialists, Technicians and Testers in the concrete preservation industry. Let Vector's design and installation capability provide you with turn-key corrosion mitigation solutions for your corrosion problems.

- ▶ **Corrosion Investigation and Testing**
- ▶ **Galvanic Anodes for Concrete Repair**
- ▶ **Chloride Extraction and Re-Alkalization**
- ▶ **Impressed Current Cathodic Protection**
- ▶ **Activated Arc Spray Zinc**
- ▶ **Galvanic Jackets and Overlays**
- ▶ **Turnkey Design and Installation**



CLIENT PROBLEM:

Deteriorating pre-stressed concrete pier exposed to an aggressive marine environment.

VECTOR SOLUTION

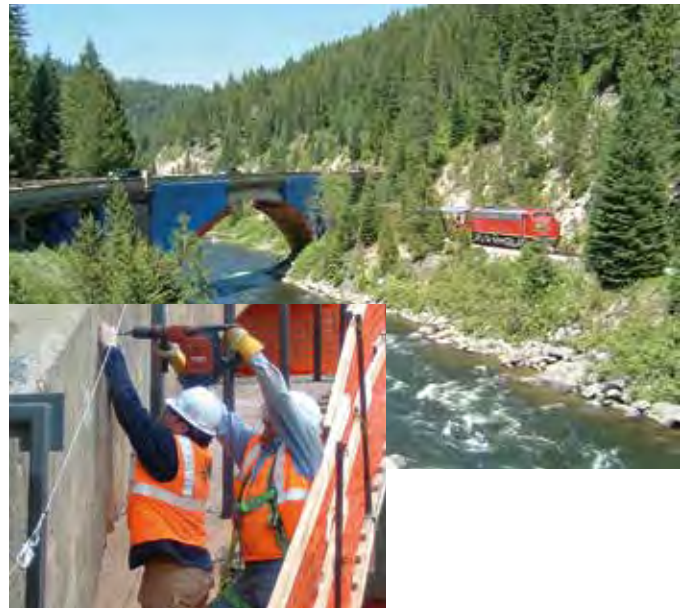
Vector applied a number of corrosion mitigation treatments to fortify the structure against the aggressive marine environment. For blanket corrosion protection, the Galvanode® ASZ+ humectant-activated arc sprayed zinc metalizing system was applied to the underside of the pier deck. On pile cap repairs, custom Galvanode® DAS distributed anode system was installed. Finally, concrete piles were outfitted with Galvashield® Jackets to provide long-term cathodic protection and durability.

CLIENT PROBLEM:

Chloride-contaminated historic bridge was nearing the end of its 75-year service life.

VECTOR SOLUTION

This ICRI award winning project used Norcure® Chloride Extraction as part of a comprehensive strategy to meet the DOT's design objective to extend the service life of this corroding structure by 50 years.



CLIENT PROBLEM:

Preventing reinforcing steel corrosion in bridge structures.

VECTOR SOLUTION

Vector designs and installs galvanic, impressed current and hybrid anode systems to mitigate ongoing corrosion.

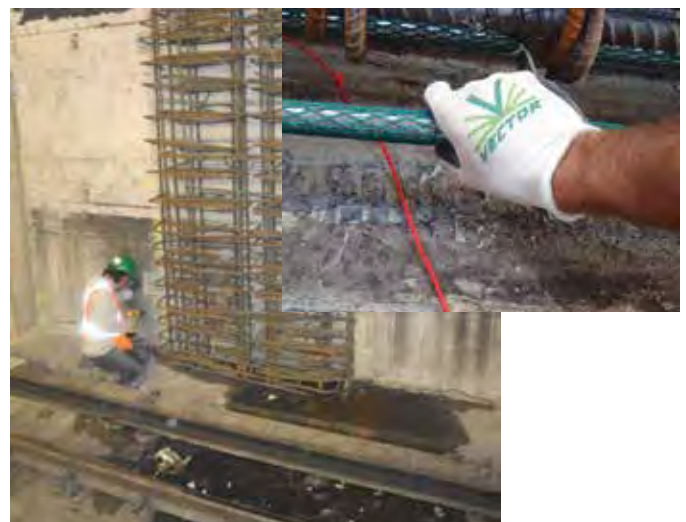


CLIENT PROBLEM:

Preventing corrosion of existing reinforcing steel in new concrete pilasters.

VECTOR SOLUTION

During a large subway expansion project, Galvanode® DAS distributed galvanic anode systems were installed into each pilaster to mitigate corrosion of the reinforcing steel.



POST-TENSIONED CONCRETE

Post-tensioned concrete is a unique structural system that is widely used to construct many types of structures such as bridges, parking structures, buildings and tanks. Our engineers and technicians have specialized knowledge and training in the deterioration and repair of post-tensioned concrete.

Vector is a recognized industry leader and award recipient for the development of innovative processes and techniques to evaluate, repair, replace and protect bonded and un-bonded post-tensioning in existing concrete structures. These innovative approaches provide cost-effective, turn-key solutions to all your post-tension problems.

- ▶ **Non-destructive Evaluation – Impact Echo, Pulse Velocity and GPR**
- ▶ **Post-Tech® PT Evaluation**
- ▶ **Post-Tech® Cable Drying**
- ▶ **Post-Tech® Grease Injection**
- ▶ **Post-Tech® PTI Impregnation System**
- ▶ **Post-Tension Tendon Repairs/Replacement**
- ▶ **Cable Grouting**
- ▶ **Concrete Repairs**
- ▶ **StructureView® and Acoustic Monitoring**



Inspection of grouted (bonded) post-tensioned tendon

Repair of paper wrapped, button headed wire post-tensioning system

CLIENT PROBLEM:

Corrosion of post-tensioned cables in a parking garage can result in ruptured concrete, loss of structural capacity and risk to public safety.

VECTOR SOLUTION

After completing Post-Tech® PT Corrosion Evaluation, Post-Tech® Cable Drying and Grease Injection were used throughout the parking garage to mitigate corrosion activity and provide long-term protection.



CLIENT PROBLEM:

Broken and water saturated post-tensioned tendons were discovered in the concrete roof slab of a large bank building.

VECTOR SOLUTION

Vector performed a thorough Post-Tech® Corrosion Evaluation to identify the affected strands. Broken strands were replaced and wet strands were dried using the Post-Tech® Cable Drying system to prevent these strands from prematurely failing. All work was completed at night so bank operations were not impacted.





Alternative Project Delivery

- ▶ **Structure and Facility Maintenance**
- ▶ **Design-Build**
- ▶ **Repair, Maintain and Finance**

In addition to repairing and protecting individual structures, Vector offers alternative project delivery solutions including maintenance contracts, design-build time and materials. We will fix your problems and take responsibility to maintain your structures in good, serviceable condition.

A few of our customers:

ADM	Dufferin Construction	Resolute Forest Products
AECOM	Domtar	Sherritt International
Areva Resources Canada Inc.	Erco Worldwide	Simpson & Brown, Inc.
Architecture 49 Inc.	Florida DOT	Simpson Gumpertz & Heger
Basin Electric	Great River Energy	Strata
Bentall Kennedy	Lorac Construction Ltd.	Stuart Olson Construction
BNSF	Manitoba Hydro	Tate & Lyle
Bot Ferrovia	Ministry of Transportation Ontario	Tom Jones Corporation
Burlington Northern Santa Fe	Mosaic Potash	Venshore Mechanical Ltd.
Caltrans	Moffitt & Nichol	West Frazer- Hinton Wood Prod
Cargill	Parsons	Williams Operating Corporation
City of Winnipeg	PCL Constructors Inc.	WSP
CP Rail	Read Jones Christofferson Ltd.	
Crosier Kilgour & Partners		
Dakota Gasification		

VECTOR CONSTRUCTION Vector-Construction.com

Winnipeg, MB 204-489-6300	Edmonton, AB 780-968-1544	Saskatoon, SK 306-934-3533	Thunder Bay, ON 807-346-4405	Fargo, ND 701-280-9697	Cedar Rapids, IA 319-364-5355	Decatur, IL 217-872-6780
-------------------------------------	-------------------------------------	--------------------------------------	--	----------------------------------	---	------------------------------------

VECTOR CORROSION TECHNOLOGIES Vector-Corrosion.com

Winnipeg, MB 204-489-9611	Vancouver, BC 604-540-8184	Toronto, ON 905-875-4030	Tampa, FL 813-830-7566	Michigan 720-236-5910	Frankfort, KY 502-403-2844	Melbourne, FL 813-421-1480	Minneapolis, MN 507-259-2481
Scranton, PA 570-412-5031	Birmingham, UK +44 (0)1384-671-400	Indonesia +62 878-640-75777					

VECTOR CORROSION SERVICES VCServices.com

Tampa, FL 813-501-0050	Kalamazoo, MI 269-743-4443
----------------------------------	--------------------------------------

NDT CORPORATION NTDCorporation.com

Sterling, MA 978-563-1327	Des Moines, IA 614-891-0349
-------------------------------------	---------------------------------------



Vector, Galvashield, Galvanode, Norcure, Post-tech and the Vector logo are registered trademarks. © 2019 Vector Printed in Canada.