



DYWIDAG-SYSTEMS INTERNATIONAL USA INC.
Business Unit
Repair and Strengthening

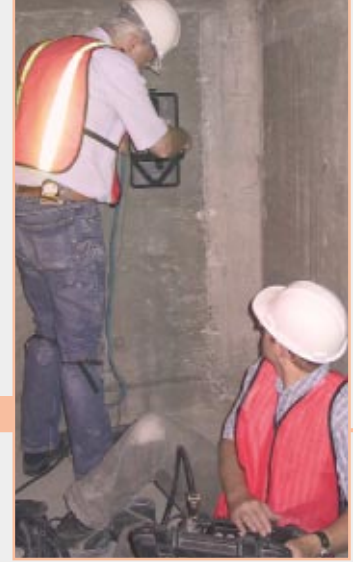


Inspection and Repair of Grouted Tendons

With over twenty years of experience in the field of inspection and repair of structures, DSI offers a complete service package that includes Non-Destructive Testing (NDT) for the non-invasive detection of flaws in structures, in particular, problems of voids in grouted post-tensioning tendons. DSI also offers special equipment such as metal sensitive drills and videoscopes for the limited invasive inspection at suspect locations in the structure, digital volumeters that measure the volume of any void inside the tendon and vacuum grouting equipment for subsequent filling of the void.

Non-Destructive Testing (NDT)

DSI's procedures for NDT include locating the ducts in the concrete using Ground Penetrating Radar (GPR), then using Impact Echo instrumentation to determine the location of any voids located inside the grouted tendons.



Using Impact Echo to locate voids in the tendon



Locating tendons using GPR

Vibration testing of external tendons



Vibration Testing

Vibration Testing is an economical and efficient procedure used to determine the amount of force existing in external tendons. The method consists of an external sensor located on the tendon to be tested and then generating a vibration in the tendon. The tendon response is recorded and analyzed with special software that will compute, based on the tendon characteristics, the remaining force in the tendon.

Invasive Inspections

The NDT inspection shall be followed by limited invasive inspection to verify the NDT findings. DSI offers special devices and techniques developed to minimally invade the structure in order to determine the actual conditions of the grouted tendons and protect the pre-stressing steel during the inspection.

Volume Measuring

DSI is able to determine the volume of the void through the use of a Digital Volumeter with leak compensating capabilities.



Digital Volumeter with leak compensating capabilities

Grout Remediation of PT Tendons

DSI uses vacuum grouting techniques & experienced personnel to fill any voids. As a necessary check, the volume of material injected in the void should be compared to the volume previously measured.

DSI uses only ASBI certified grout technicians cross trained in NDT inspection. All technicians have extensive experience in both pressure and vacuum grouting techniques employing thixotropic grout.



Result of void grouted with conventional methods



Result of void grouted with Vacuum Grouting



++++ DSI Services +++++
Inspection: NDT (GPR and Impact Echo), Special drills with shut-off capabilities when in contact with metal, Videoscope and Void volume measurement with air leak compensation capabilities /
Repair: Vacuum Grouting

Repair of the Trent Street Bridge, Spokane, WA

Washington Department of Transportation

DSI performed an NDT inspection using Ground Penetrating Radar to detect post-tensioning ducts and steel reinforcement as well as an Impact Echo Scanner to detect voids in the grouted ducts. Videoscope inspections were carried out to assess the condition of the post-tensioning strands. The volume of voids inside the ducts was measured with state-of-the-art equipment capable of compensating for air leaks. The grouting remediation of the post-tensioned tendons in web b was performed using vacuum grouting.

Mid Bay Bridge, Destin, FL

Mid Bay Bridge Authority

Inspection at anchorage areas of external tendons of the bridge and vacuum grouting of voids.

++++ DSI Services +++++
Inspection and Measurement of the Volume of Voids /
Repair: Vacuum injected more than 700 voids
Engineering: Assisted in preparing procedures for detensioning and replacement of 11 external tendons.



++++ DSI Services +++++
NDT inspection, by videoscope, of 18 cable stay guide pipes at the stays and NDT, limited invasive inspection and vacuum grouting of the anchorages of the external P.T. tendons in the bridge.



C & D Canal Bridge, SR1 over Chesapeake & Delaware Canal, St. Georges, New Castle Co., Delaware
 Delaware Department of Transportation

I-88 & I-355 Interchange, Downer Grove, IL
 The Illinois State Toll Highway Authority

Overall inspection of the post-tensioning tendons of 4 segmental ramps. Inspection included both, tendons in the superstructure as well as in the substructure. DSI planned and performed NDT and limited invasive inspection in a selected sample of the post-tensioning tendon population of these ramps and assessed the condition of those elements of the structure (i.e. condition of the prestressing steel and grout).



++++ DSI Services +++++
Preparation and implementation of the inspection plan. Inspection included the use of GPR, IE, vibration testing of external tendons, drillings, videoscope, volume measurement of the voids found inside the ducts and report preparation.

DYWIDAG-SYSTEMS INTERNATIONAL

Special Products

Dynashield

Half Pipe

Dynashield

Dynashield is a Viscoelastic gel of epoxy polymer that provides superior corrosion protection. Engineered to polymerize over a 72 hour period, Dynashield's viscosity allows it to penetrate into very small spaces such as the interstices of post-tensioning strands.

Dynashield can be applied at ambient temperatures and remains plastic after polymerization. A perfect protection solution for unbonded systems.

Half Pipe

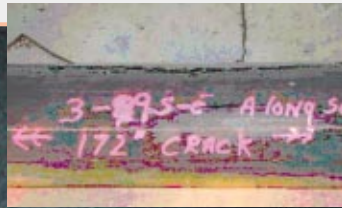
DSI's half pipe is the perfect solution for cracked or cracking HDPE external grouted ducts.

Developed to be installed in difficult access conditions, the Half Pipe snaps into place over an existing HDPE duct and has been engineered so that the annular spaces can be pressure grouted; restoring the tendon to its original corrosion protection specifications.

The DSI Half Pipe also allows for the complete removal of the existing HDPE pipe to assess the condition of the grout and strands, if required, prior to its installation.



Dynashield applied to prestressing strand



Cracked HDPE Duct



Simulated Repair of Cracked HDPE (White Pipe) duct using Half Pipe (Outer black Pipe). Annulus between pipes has been grouted.

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