



Robert L. Ehrlich, Jr., Governor  
Michael S. Steele, Lt. Governor

Robert L. Flanagan, Secretary  
Neil J. Pedersen, Administrator

MARYLAND DEPARTMENT OF TRANSPORTATION

March 2, 2004

Mr. Jitesh Parikh  
Project Manager, Maryland Federal-Aid Division  
Federal Highway Administration  
10 South Howard Street, Suite 2450  
Baltimore, MD 21201

**Subject: Woodrow Wilson Bridge Project**  
**Chemical Grouting of PT Ducts: Detection, Repair, and Verification**

Dear Jitesh:

In your recent request regarding chemical grouting of post tensioning ("PT") ducts, you asked that MSHA and VDOT provide more information regarding the methods and procedures used to address water intrusion into existing PT ducts. Our reply addresses the topics noted in your request:

**1. Detection Method**

- a. **Videoscopic Observations** - PCC first uses a video scope to investigate the existing condition of 100 percent of the PT ducts at all land and water pedestals. It entails inserting a detection camera into the duct to determine if there is water present in the ducts. The amount of water we have encountered using this method has ranged from negligible to significant. By correlating the geometry of the ducts with the distance between the water entry point and water exit point of the video scope, we have calculated the theoretical volume of water. PCC records its observations and tabulates its findings for evaluation by the project team. Although this calculation is admittedly imprecise, PCC captures this information for the record. This process categorizes ducts into either:
  - i. Dry ducts<sup>1</sup>; or
  - ii. Ducts containing water
- b. **Pressure Testing** - We agree that air pressure testing is one measurable way to identify with reasonable confidence which ducts are susceptible to infiltration. Pressure testing the ducts helps to (a) identify those ducts that may be susceptible to water infiltration so that we may respond accordingly, (b) show that the extent of the problem was investigated and documented, and (c) provide the contractor with a duct segment that satisfies the specification requirements for holding air pressure so that any future inability to hold pressure should not be attributed to loss of pressure through the reducers.

PCC developed the attached PT Duct Inspection Procedure (Attachment #1) that includes

<sup>1</sup> Because of the design configuration of the ducts, the low point grout vent is slightly higher than the true low point of the duct. Accordingly, once water enters a duct, it is not feasible to remove all of it. Although some ducts have no water in them at all, a "dry" duct is defined as having only a minimal volume of water.

an Air Test that is applied to all PT ducts. Air pressure is applied at increments of 10 psi, 20 psi and 30 psi<sup>2</sup> and held for five (5) minutes at each increment. The pressure is monitored over each time interval for pressure loss. To pass, the duct must hold each pressure increment within 10 percent of the test pressure for five (5) minutes. The acceptance criterion is less than 10 percent pressure loss over the test duration. If a duct is dry and it passes the Air Test, then we do not chemically grout it. If a duct either contains water or fails the Air Test, then we chemically grout the reducers using the repair method described in the next section of this letter.

On October 17 and October 31, 2003, we held conference calls that were attended by representatives from MSHA, FHWA, VDOT, PCC, and the designer of record. Before the conference calls, the group received tables containing all videoscopic observation data that the field team had gathered for the Bascule foundations. After discussing and evaluating the tables, the group agreed that PCC would make the determination regarding whether or not to chemically grout ducts as described above.

## 2. Repair Method

- a. **Background** – We documented the source of water infiltration as being the joint where the PT duct transitions from a 10-inch diameter galvanized steel section to a fiberglass 10-inch x 4-inch reducer to 4-inch polyethylene PT duct. To access this location, we needed a remedy that would adapt to the significant change in PT duct diameter.
  - i. **Insituform**<sup>®</sup> - We contacted vendors who provide and install Insituform<sup>®</sup> products. Insituform<sup>®</sup> is a proprietary product typically used to repair concrete and masonry storm water and wastewater underground pipe systems. The Insituform<sup>®</sup> system is a resin-impregnated fabric, woven into a tube shape that is inserted into the piping system with circulating water. Water pressure seats the material against the inside walls of the piping system. The circulating water is then heated, which activates the resin in the fabric to form an impervious, rigid liner. Representatives of Insituform<sup>®</sup> declined to support us, citing that the PT duct sizes of our system are far below the proven performance parameters of their product.
  - ii. **Bentonite** – Bentonite is fine particle clay commonly used to seal tunnels from ground water intrusion. We considered pumping the ducts full of Bentonite, with the strategy of pumping the material into the pathway that allowed water to enter the PT duct reducer joints. A major disadvantage of this approach would be the considerable volume of material required in both filling and removal. We realized that any solution involving grouting should address the volume problem. We concluded that we should explore a solution that would confine the grouting operation to the PT reducer joint area. A disadvantage of Bentonite is that it would be detrimental to the bonds needed to transfer loads from the tendons through the permanent cementitious grout to the duct walls. This meant that if we succeeded with a confined grouting technique, we would still need to thoroughly flush the ducts to remove trace Bentonite residue. This lead us to conclude that we should explore a solution that involved:

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<sup>2</sup> The bladders used to seal the ducts for the pressure test control the maximum test pressure. The bladders are rated for a maximum of 32 psi.

- A confined grouting operation
- A material that could penetrate small cracks
- A material that cleaned up readily
- A material that would not compromise the performance of the completed structure.

iii. **Chemical Grout** – In searching for alternate grouts, we made contact with Superior Grouting Services (“Superior Grout”), a firm specializing in unusual grouting applications. Superior Grout offered several products for consideration. The most promising product was a formulation of 95 percent Acrylamide and 5 percent N, N’ Methylenebisacrylamide, trade name “AV-100”, from Avanti International of Webster, Texas. The Material Safety Data Sheet for this product is attached as Attachment #2. This two-part grout mix has a precisely controllable, variable set time based on the proportions of its formulation, varying from minutes to hours. The material had the lowest viscosity – approaching the viscosity of water – of the grouts we considered, with the additional benefit of setting to a gel the consistency of Jell-O®. These characteristics made AV-100 the most promising formulation of available chemical grout types that we considered.

Before proceeding with this material, we met with FHWA, PCC and the designer of record and shared our findings. As a result of this meeting, we engaged Whitlock Dalrymple Poston & Associates, Inc. (“WDP”) to evaluate the compatibility and durability of the chemical grout for its proposed application. The product has been on the market for approximately 40 years, so it was not possible to conclusively address the product’s performance in the context of the bridge’s 75-year design life. However, WDP indicated that the chemical composition of the proposed grout appeared compatible with the concrete and PT strand used for the bridge foundations and pedestals. FHWA agreed with our decision to proceed with testing the chemical grout’s ability to seal the leaks.

iv. **Chemical Grout Testing**- PCC performed video inspections on every duct in the V1 and M1 foundations. Based on the video inspections that PCC performed and the follow-up evacuation of water from the ducts, it was determined by observing the return rate of the water that the worst leaks were located at V1L-SOUTH, front arch, ducts T3 and T4. The side-by-side configuration of T3 and T4 provided the opportunity to inspect T4 while grouting T3 on September 25, 2003. An integrated, double bladder configuration was used to facilitate the repair by allowing the grouting apparatus to be inserted from one side of the loop tendon duct.

While using a red dye to color the mix water, T3 was pressurized, and the dyed mix water could be observed leaking around the reducer in T4, indicating a transfer leak between ducts. In addition, air bubbles were observed in the water at the west face of the pedestal, indicating a leak at the pedestal-to-pier cap interface. While using a flow rate necessary to maintain a constant pressure on T3, the grout was added to the dyed mix water, to experiment with the set time necessary to stop both the transfer leak and the air bubbles in the water at the west face of the pedestal. Based on observations of a cessation of the leaking grout into T4, as well as no air bubbles in the water at the west face of the pedestal, a

five-minute set time was determined necessary to completely stop the transfer leak, while maintaining constant pressure in T3. A malfunctioning air compressor caused the bladders to deflate, and this terminated the operation. Attempts to remove the integrated double bladder apparatus resulted in the lower bladder being torn loose from the assembly.

On October 9, 2003, grouting was resumed at T4 using another integrated double bladder apparatus and the same methodology as was previously employed at T3. After starting the grouting operation at T4 with the initial grout mix, it was observed that pressure could be maintained with no further addition of grout. Video inspection below the lower bladder and above the upper bladder elements also revealed that there was no grout blow-by around the bladders. In addition, no air bubbles were observed in the water around the pedestal face. Lastly, inspection in the adjacent duct, T3, revealed that there was no grout transfer during the grouting operation. From these observations, it was determined that the leak in the T4 reducer was sealed, and grouting was terminated. Attempts to remove the integrated double bladder apparatus again resulted in the lower bladder being torn from the assembly.

Based on these results, it was decided that the integrated double bladders were failing because they were not strong enough to overcome the force required to pull them through the gelled grout. It was decided to use two single bladders, with each inserted from opposite sides of the loop tendon, to isolate the leaking reducers while grouting. This enabled us to remove single bladders after grouting, thus avoiding the high forces required to pull the integrated double bladder with its gelled grout plug.

The approximate set time (5 min.) and hold time (5 min.) values were determined from the initial repairs. The grout pressure upper limit of 29 psi was based on experience, and represented the highest pressure that could be maintained while grouting without blowing the bladders out of the duct.

- b. **Chemical Grout Repair Method**– Based on our test applications we concluded that we could successfully confine the grouting operation to the area of the PT duct reducers. Note that each PT duct has two reducers. After making the determination to repair a duct, we chemically grout both reducers by straddling the reducer joints with a pair of bladders that serve as inflatable plugs. We then chemically grout the area between the bladders, allow the chemical grout to set, flush out the chemical grout with pressurized water, use a pressurized air assist to vacuum the water and gel through the grout vent, and then pressure test the grouted joints. The detailed repair method is as follows:
  - i. Insert the lower bladder on the end of a flexible rod from the top of the 4-inch PT duct so that it travels through the bottom of the 10-inch duct and up to the reducer on the side opposite the insertion point. Position the lower bladder immediately beneath the 10-inch reducer joint that is opposite the insertion point, by observing the lower bladder from the high side (4-inch side) of the joint using the videoscope. Inflate and seal the lower bladder within the 10-inch duct.
  - ii. Insert the grout delivery bladder from the high side (4-inch PT duct). The grout delivery bladder has a grout delivery pipe running through it. The pipe is solid above the bladder and the pipe is perforated below the bladder. The length of the

- grout delivery pipe is such that it contacts the lower bladder and establishes the correct position of the grout delivery bladder relative to the reducer joint. Inflate and seal the grout delivery bladder within the 4-inch PT duct.
- iii. Formulate the Chemical Grout for a five-minute set time. Adjust the formulation to account for ambient and substrate temperature variations, in accordance with the manufacturer's recommendations.
  - iv. Mix and pump Chemical Grout through the grout delivery bladder into the confined zone created by the two bladders.
  - v. Hold the grout at 29 psi until five minutes or more have elapsed since the "youngest" grout was delivered to the reducer joint area and any pressure fluctuations have ceased, i.e., the gage reading has stabilized. At this point, the leading edge of the Chemical Grout has been at any void interface for longer than five minutes.
  - vi. Record the Volume of Grout (gallons), the Hold Pressure (psi), the Set Time (min.), the Hold Time (min.), and note any relevant observations.<sup>3</sup>
  - vii. Remove both bladders.
  - viii. Repeat the process for the reducer joints on the second PT duct reducer. This necessarily requires pushing a bladder through the chemical grout in the first reducer.
  - ix. Using high-pressure water, break up the set Chemical Grout that is within the PT duct at both reducer locations.
  - x. With pressurized air assist, vacuum the water/gel grout mixture out of the PT ducts through the grout vent.
  - xi. Verify by videoscope the cleanliness of joints at reducer, removal of water/gel grout mixture and arrestment of water infiltration.

To manage the effort in the field for contract BR-3A, we assigned PCC Assistant Resident Engineer, Cameron Lucas, the responsibility. Cameron's responsibilities included developing the inspection forms and records, maintaining a consistent and comprehensive inspection effort at all piers, and inspection documentation. Based upon the methods and lessons learned on BR-3A, Assistant Resident Engineer Kevin Wikar will have similar responsibilities on contract BR-3C and Assistant Resident Engineer Ronald Fletcher will lead the effort (to the extent work may be required) on contract BR-3B. Each will adapt the proven procedures to the minor configuration differences between the approach foundations and the bascule foundations. Cameron Lucas will be made available to assist Kevin Wikar and/or Ronald Fletcher as needed.

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<sup>3</sup> It is not possible to accurately establish the volume of grout that penetrates into the reducer joints. One of the factors that influences the volume of grout used is the variation in the location of the bladders relative to the reducer tapers. For example, if the lower bladder is set slightly low, the volume to fill will have slightly more 10-inch duct and slightly less 4-inch duct. Also, the bladder seals are not always leak free, so that chemical grout sometimes seeps around the bladder seals at the duct walls. Rather than relying on an estimate of the volume of grout that penetrates the duct joints, we verify that the grouted ducts pass an Air Pressure test and also conduct a follow-up video inspection to confirm that there are no observed leaks.

### 3. Verification Method

- a. **Air Test** – Air test verification of the success of Chemical Grouting repair is performed after all the repair steps described above have been completed. The equipment set-up for air testing is fundamentally the same as the set-up for pressurization during vacuuming, but is simplified because the vacuum truck and high-pressure water generator are not required. Accordingly, the air test is performed after the cleanout sequence is complete and the extraneous equipment has moved to another location. In accordance with the PT Duct Inspection Procedure, repaired ducts are air tested at increments of 10 psi, 20 psi and 30 psi and held for five (5) minutes at each increment. The pressure is monitored over each time interval for pressure loss. To pass, the duct must hold each pressure increment within 10 percent of the test pressure for five (5) minutes. The acceptance criterion is less than 10 percent pressure loss for each test increment.<sup>4</sup>
- b. **Follow Up Videoscopic Observations** – No sooner than three days after successfully passing the air test and often as long as two weeks later (depending on accessibility), PCC inspects the repaired ducts to verify that there is no increase in the volume of water in the ducts as compared with the baseline volume as established based on the last previous videoscopic observation after cleaning and air-testing. The comparison is made by observing and recording the linear index point at which the video scope first encounters and then exits a pool of residual water. Curing water or accumulated rainwater may enter a PT duct from above. The Verification Method comparison is made under conditions wherein water from such sources can be ruled out, and the expectation is to find that no water has entered the duct by leakage. To date, we have used the PT Duct Inspection Procedure to verify that the repairs completed at the VIOL-Center, Front and Rear arch were successful. Follow up video scope inspections confirmed that there was no water intrusion. To summarize, each PT duct repaired is examined by the video scope a *minimum* of four times:
  1. Initially, as part of the Detection Method, as described in 1.a above
  2. After cleanout, as described in 2.b.xi above. In practice, the video scope is used multiple times during the cleanout to ensure effective gel removal.
  3. As part of the Verification Method described in this paragraph
  4. Again immediately before PT tendons are inserted

4. **Summary of Repairs and Testing:** Attachment #3 provides the status of the chemical grout repairs and testing completed as of Jan. 21, 2004.

Analysis of the long-term durability of the Chemical Grout and impact of possible long-term degradation of Chemical Grout on the expected service life of the new bridge will be included in a separate "Risk Analysis" to be provided separately. Recognizing that there may be lingering concerns regarding risk to the structure, Parsons Transportation Group ("PTG", who is the

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<sup>4</sup> We have successfully completed this full procedure for all PT ducts installed in VI OL Center, Front and Rear pedestals and have confirmed the method to be reliable by pressure testing. Follow up video scope inspections confirmed that there was no water intrusion. It is important to note, however, that the VI OL South PT ducts are a special case. Because AB/EKS proceeded with cast-in-place concrete operations and PT duct installation on VI OL South, there were multiple grout fittings installed by AB/EKS that did not hold pressure. If we had insisted that AB/EKS address these fittings, it would have interfered with production work and created a significant delay. Accordingly, we did not conduct an air test at VIOLS tendons numbered T2R, T5R, and T7R. At these locations, we verified by video inspection that these ducts had no return of water prior to tendon installation.

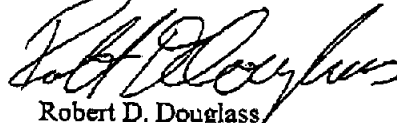
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designer of record) will provide its review of the potential implications of a failed PT strand and the remedies available should such an event occur. We will forward PTG's review by separate cover.

Similarly, we will separately request FHWA approval for the contracting method by which MSHA proposes to accomplish the Chemical Grouting. That letter will describe the project, the kind of work to be performed (referencing this letter), the estimated cost, the estimated Federal funds to be provided, and the reasons that a negotiated contract for the repair work is considered cost-effective.

Upon your review of this letter and the associated Risk Analysis and Contracting Strategy, your approval of the Chemical Grouting detection, repair and verification procedures described herein is requested.

Sincerely,



Robert D. Douglass

Director

Woodrow Wilson Bridge Project

**Attachments**

1. Post-Tensioning Duct Inspection Procedure
2. Material Safety Data Sheet for AV-100, from Avanti International of Webster, Texas
3. Status of the chemical grout repairs and testing completed as of Jan. 21, 2004.

**cc:**

Fawaz Saraf, VDOT  
Russ Fuhrman, PCC  
Greg Shafer, PTG  
Bob Healy

PAGE 05712

## Woodrow Wilson Bridge Project Post-Tensioning Duct Inspection Procedure

### General:

The following test procedure will be applied to all PT ducts on water or land. Whenever PT ducts fail the air test described in steps 1-3 below, or show evidence of water presence upon video inspection beyond the minimum residual amount, the ducts must be repaired with chemical grout. After chemical grouting, the repaired ducts must be cleaned and air tested again as described in steps 1-3 below to verify that the repair was successful.

### Air Testing:

1. Insert the test bladders in each end of the loop tendons to push air from both sides of the water column. Open the air supply valve and gradually increase the airflow with the regulator to maintain a 10 to 15-psi pressure. Using the air pressure, evacuate all of the water possible from the PT duct. Observe the grout tubes on the opposite face for water flow. Continue application of air pressure until clear air is observed blowing from the grout tubes. Close the air supply valve.
2. Apply Teflon<sup>®</sup> pipe dope on the 3/4" pipe nipples and the inside of the open ends of the grout tubes. Insert the pipe nipples into the grout tubes. Using two hose clamps around the ends of the grout tubes, tighten the clamps to seal the pipe nipples in the grout tubes. Attach 3/4" ball valves on the end of each nipple, leaving the valves open.
3. Open the air supply valve and gradually increase the airflow with the regulator to maintain a 10-psi pressure. Close the valves, and then check the grout tubes, valves and test bladders for any air leaks. Repair any leaks to the test set-up as necessary to maintain a constant 10-psi test pressure on the duct. After achieving a 10-psi test pressure, close the air supply valve and observe the pressure gauge for five (5) minutes for any pressure drop. At the end of the five (5) minute interval, open the air supply valve and adjust the regulator to increase the test pressure to 20 psi. Close the air supply valve and observe the pressure gauge for five (5) minutes for any pressure drop. At the end of the five (5) minute interval, open the air supply valve and adjust the regulator to increase the test pressure to 30 psi. Close the air supply valve and observe the pressure gauge for five (5) minutes for any pressure drop. Record the following information on the PT Duct Air Test sheet: date, duct location, test pressure (psi), test duration (minutes), pressure loss (psi), and whether each test passed or failed. Any pressure loss greater than 10 percent of the test pressure over any interval is a failing test.
4. For those ducts that fail the air test, apply the Chemical Grouting Repair Procedure. Upon completion of chemical grouting, and cleaning the duct of grout, repeat steps 1 through 3.

### Video Inspection:

Perform a video inspection on all ducts after completion of final clean up of grout gel and the evacuation of all water possible by means of vacuum-assisted air pressure.

Accurately record on the PT Duct Survey Worksheet the residual water remaining in the duct. This step is essential to establish a baseline for any subsequent visual inspections. See further discussion on p. 6 of basic letter.

**MATERIAL SAFETY DATA SHEET**

AVANTI INTERNATIONAL  
822 Bay Star Blvd.  
Webster, TX 77598

CHEMTREC Emergency Phone: 1-800-424-9300  
Product Data Information: (281) 486-5600

**IDENTIFICATION**

Trade Name: AV-100 Chemical Grout

Ingredient(s): Acrylamide

Percent: ≈ 95

CAS Number: 79-06-1

OSHA PEL: 0.3 mg/m<sup>3</sup>

ACGIH TLV: 0.03 mg/m<sup>3</sup>

N,N' Methylenebisacrylamide

Percent: ≈ 5

CAS Number: 110-26-9

OSHA PEL: N/D

ACGIH TWA: N/D

**HAZARD RATINGS**

NFPA: Health: 2

Fire: 2

Reactivity: 2

Special: None

**PHYSICAL/CHEMICAL CHARACTERISTICS**

Appearance and Odor: White, crystalline powder, odorless.

Boiling Point: N/L

Vapor Pressure(mm Hg.): 0.01 @ 68°F (20°C)

Vapor Density(Air=1): N/L

Specific Gravity(Water = 1): 1.150g/cm<sup>3</sup> @ 88°F (30°C)

Melting Point: 184°F (85°C)

Evaporation Rate(Butyl Acetate=1): N/L

Solubility in Water: 200g /100g @ 68°F (20°C)

**FIRE AND EXPLOSION HAZARD DATA**

Flash Point: N/A.

Flammable Limits: N/A

Extinguishing Media: Water spray, carbon dioxide, dry chemical, foam.

Special Fire Fighting Procedures: Avoid skin contamination and inhalation by wearing full protective clothing and positive pressure respirator. Approach fire from upwind to avoid hazardous vapors and toxic decomposition products.

Unusual Fire and Explosion Hazards: Thermal decomposition or combustion may generate toxic gases including carbon monoxide and ammonia. Closed containers may rupture violently when heated.

**REACTIVITY**

Stability: Stable under normal conditions.

Incompatibility(Materials to Avoid): Avoid acids, alkalis, peroxides, oxidizing and reducing agents, carbon steel or rust.

Decomposition: Thermal decomposition or combustion may generate toxic gases including carbon monoxide and ammonia.

Polymerization: May occur. Store below 104°F (40°C) with no exposure to direct sunlight.

N/A =Not Applicable

N/E =Not Established

N/D =Not Determined

N/L =Not Listed

ATTACHMENT 2

## STORAGE, DISPOSAL AND SPILL INFORMATION

**Storage and Handling:** Store in a cool, dry place and away from heat. Take measures not to raise dust, mist and vapor. Provide good ventilation. Wear protective clothing, gloves, boots, goggles and respirators, and clean them daily when contaminated.

**Disposal Method:** Incinerate or treat at a sewerage plant in accordance with governmental regulations.

**Steps to Be Taken in Case Material is Released or Spilled:** Collect into a closed container and dispose of in accordance with governmental regulations. Wash out the area with plenty of water. Do not create dust.

**Other Precautions:** Store below 104°F (40°C) with no exposure to direct sunlight. Do not leave open to the atmosphere. Store at a fixed place. Keep emptied bags or drums at a fixed place until proper disposal. Clean up the work area if contaminated. Wash thoroughly in case of skin or eye contact.

## PRECAUTIONARY MEASURES

**Respiratory Protection:** Wear a NIOSH approved full face-piece respirator for organic vapors and particulates. If airborne concentrations exceed permissible exposure limits, wear a NIOSH approved supplied air respirator or self-contained breathing apparatus.

**Ventilation:** Use local ventilation when possible. Mixing tanks should be vented to the outside of the truck.

**Protective Clothing:** Wear chemically resistant boots, gloves, and chemical suit (Tychem or equivalent).

**Eye Protection:** Use full face-piece respirator for mixing and cleaning operations, and chemical splash proof goggles when not wearing respirator.

**Other Protective Equipment:** Eyewash station and sink should be readily available.

**Work/Hygienic Practices:** Shower at the end of each shift. Clean and inspect PPE before reuse. Do not eat, drink, or smoke in work area.

## HEALTH RELATED DATA

**Primary Route(s) of Entry:** Skin absorption, inhalation and ingestion.

**Health Hazards:** Repeated exposure affects central nervous system

**Eye Contact:** Eye irritant.

**Skin Contact:** Skin irritant, causing peeling and redness. Penetrates skin easily.

**Inhalation:** Repeated inhalation affects nervous system.

**Ingestion:** Repeated ingestion affects nervous system.

**First Aid Procedures:**

**Eyes:** Flush with water for 15 minutes.

**Skin:** Wash thoroughly with soap and water.

**Inhalation:** Remove to fresh air.

**Ingestion:** Induce vomiting with water.

(Never give anything by mouth to an unconscious or convulsing person.)

## TOXICITY DATA

**Carcinogenicity:** This material is listed as a potential carcinogen by the IARC. In January 1992, American Cyanamid notified EPA that they had concluded that "acrylamide is not carcinogenic to mice" and "acrylamide is not carcinogenic in humans as shown by two epidemiological studies."

**LD<sub>50</sub>:** (Acrylamide Monomer)

Acute Oral(rat): 294 mg/kg

Acute Dermal(rabbit): 252 mg/kg

The information on this MSDS is accurate to the best of Avanti International's knowledge. Avanti International makes no express or implied warranty, and in no case shall be liable for consequential, special or indirect damages resulting from the use or handling of this product.

N/A =Not Applicable

N/E =Not Established

N/D =Not Determined

N/L =Not Listed

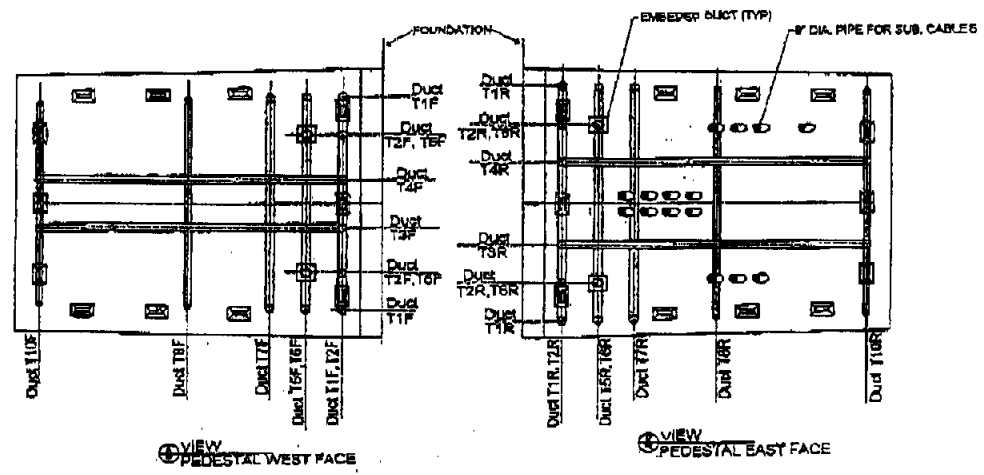
**WEEKLY STATUS REPORT 011**  
**BR-3A DUCT GROUTING**  
 PCC Resident Engineer : Srinivas Gunna

Construction Activities Summary Status thru January 21, 2004

Pier	TOTAL DUCTS	NO		* PRESSURE TEST		** PRESSURE TEST		*** RELEASED TO CONTRACTOR
		GRROUTING REQUIRED	GRROUTING REQUIRED	GRROUTING COMPLETE	REQUIRED	COMPLETE		
<b>Virginia Outer Loop (VI OL)</b>								
South Pedestal	18	4	14	14	18	18	6	0
Center Pedestal	18	12	6	6	18	18	3	0
North Pedestal	18	17	1	1	18	18	0	0
<b>Maryland Outer Loop (MI OL)</b>								
South Pedestal	18	10	8	8	18	0	0	0
Center Pedestal	18	10	8	8	18	9	0	0
North Pedestal	18	10	8	8	18	18	0	0
<b>Maryland Inner Loop (MI IL)</b>								
South Pedestal	18	9	9	9	18	0	0	0
Center Pedestal	18	13	5	5	18	0	0	0
North Pedestal	18	4	14	14	18	0	0	0
<b>Virginia Inner Loop (VIIL)</b>								
South Pedestal	18	4	14	14	18	16	0	0
Center Pedestal	18	11	7	7	18	18	0	0
North Pedestal	18	8	10	10	18	18	0	0
<b>TOTAL</b>	<b>216</b>	<b>112</b>	<b>104</b>	<b>104</b>	<b>216</b>	<b>133</b>	<b>9</b>	

**NOTES:**

- \* There are 30 ducts total, that have been grouted, but cannot be cleaned until warmer weather. These are the repaired ducts located at MIL, SOUTH, CENTER, and NORTH pedestals.
- \*\* There are 23 ducts total, that have been grouted, but cannot be air tested until warmer weather.
- \*\*\* The repaired ducts will not be released to the Contractor until follow-up inspections have been completed to confirm that the repairs are effective, and until just before the Contractor is ready to install the tendons.



# FAX

Maryland State Highway Administration  
Office of the Woodrow Wilson Bridge  
707 N. Calvert Street  
Baltimore MD 21202

*FWS*

**TO:** Paul Gudelski  
Jim Ruddell  
Tom Mohler  
Hazel Joseph  
Document Control  
*Bob Healy*  
Phone 301-686-0000  
Fax Phone 301-686-0001

DATE	March 9, 2004
NO. OF PAGES	incl. cover

*ELEVEN*

**FROM:** Linda A. Kuczinski  
Contract No:  
Project Woodrow Wilson Bridge  
Phone 410-545-8881  
Fax Phone 410-209-5052

**CC:**

**REMARKS:**  Urgent  For your review  Reply ASAP  Please Comment

For your information and file. Thanks, Linda Ski

*Another copy w/ attachments*  
*AK*