LTPP Seasonal Monitoring Program

Site Installation Report for GPS Section 274040 (27D) Grand Rapids, Minnesota

Report No. FHWA- February 1996

LTPP Seasonal Monitoring Program

Site Installation Report for GPS Section 274040 (27D) Grand Rapids, Minnesota

---

Report No. FHWA-

Prepared by

Braun Intertec Corporation
6875 Washington Avenue South
P.O. Box 39108
Minneapolis, Minnesota 55439-0108

Prepared for

Federal Highway Administration
LTPP Division, HNR-40
Turner-Fairbanks Highway Research Center
6300 Georgetown Pike
McLean, Virginia 22101-2296

January 1996

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
FHWA-		

4. Title and Subtitle	5. Report Date
LTPP Seasonal Monitoring Program Site Installation Report for GPS Section 274040 (27D) Grand Rapids, Minnesota	January 1996
	6. Performing Organization Code
7. Author(s) Robert J. Van Sambeek and Ronald R. Urbach	8. Performing Organization Report No. DBNX92700-B6-27D
9. Performing Organization Name and Address Braun Intertec Corporation 6875 Washington Avenue South, P.O. Box 39108 Minneapolis, Minnesota 55439-0108	10. Work Unit No. (TRAIS)
	11. Contract or Grant No. DTFH61-92-C-00009
12. Sponsoring Agency Name and Address Federal Highway Administration LTPP-Division, HNR-40 Turner-Fairbanks Highway Research Center 6300 Georgetown Pike McLean, Virginia 22101-2296	13. Type of Report and Period Covered Final Report September 1993 - June 1995
	14. Sponsoring Agency Code

15. Supplementary Notes
Contracting Officer's Technical Representative - Aramis Lopez, HNR-40

16. Abstract

This report contains instrumentation installation details and data collection summaries for GPS test section 274040, which is a core section in the LTPP Seasonal Monitoring Program. This jointed reinforced concrete (JRC) pavement section on U.S. Highway 2 about nine miles west of Grand Rapids, Minnesota, was instrumented September 21, 1993. Instrumentation included time domain reflectometry (TDR) probes to estimate moisture content in unbound pavement layers, thermistor probes to measure pavement structure thermal gradients and air temperature, electrical resistivity probe to predict frost/thaw conditions, piezometer to measure water table depth below the pavement surface, snap rings to measure joint opening, and tipping-bucket rain gauge to measure precipitation.

Monitoring data was collected the day after instrument installation and roughly on a monthly basis from September 1993 to June 1995. In addition to temperature and precipitation data that were collected continuously by a datalogger at the site, monitoring data each month usually included Falling Weight Deflectometer data, joint faulting data, joint opening data, TDR probe readings, frost/thaw readings, and piezometer readings. On a less regular basis, longitudinal profile data, pavement surface elevation data, and manual distress data were collected as required by FHWA guidelines. A summary of data collected is included in the report.

17. Key Words	18. Distribution Statement
Long Term Pavement Performance, LTPP, Pavement Instrumentation, Seasonal Monitoring Program, SMP, Time Domain Reflectometry, TDR, Resistance, Frost, Thaw, Temperature, Thermistor, Water Table, Piezometer, Falling Weight Deflectometer, FWD, Joint Faulting, Joint Opening	

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price

Table of Contents

Page

I. **Introduction** 1

A. Test Site Location 1

B. General Test Section Information 1

C. SMP Test Section Information 1

II. **Instrumentation Installation** 3

A. Pre-Installation Activities 3

B. Installation Activities 5

III. **SMP Data Collection** 9

A. Initial SMP Data Collection 9

B. Routine SMP Data Collection 9

IV. **Summary, Conclusions, and Recommendations** 11

A. Instrumentation Installation Highlights 11

B. Recommendations for Improving Installations 11

Appendix A-1: Test Section Background Information

Appendix A-2: Pre-Installation Monitoring Data and FWDCHECK Results

Appendix B-1: Pre-Installation Site Recruitment and Coordination Information

Appendix B-2: Pre-Installation Equipment Checks/Calibration Information

Appendix C-1: Instrumentation Installation Information

Appendix D-1: Initial SMP Monitoring Data Collection

Appendix D-2: Routine SMP Monitoring Data Collection Summary

Appendix D-3: GPS Section 274040 Instrumentation Block Replacement

LTPP Seasonal Monitoring Program
Site Installation Report for GPS Section 274040 (27D)
Grand Rapids, Minnesota

I. Introduction

This report contains information specific to instrument installation and monitoring data collection for the Long Term Pavement Performance (LTPP) General Pavement Study (GPS) section 274040, which is part of the core Seasonal Monitoring Program (SMP) under the Federal Highway Administration (FHWA) LTPP Division. This pavement section was instrumented on September 21, 1993, and had regular data collection through June 16, 1995. The section will be monitored every other year under the LTPP Study for a ten-year period or until it is removed from the study.

A. Test Site Location

GPS section 274040 is located in northern Minnesota on the westbound driving lane of U.S. Highway 2 about nine miles west of Grand Rapids at milepost 173.1.

B. General Test Section Information

This four-lane divided highway had the original 206-mm thick jointed reinforced concrete (JRC) pavement placed in 1979. The rest of the pavement structure consists of a 150-mm granular base on a fine-grain subgrade. Additional background information about the section is located in Appendix A-1. This information includes, but is not limited to, the following items:

- SMP location map;
- Detailed section location map;
- SHRP Inventory Data Sheet - traffic, design factors, and layer information;
- SHRP Section Field Verification Form;
- IMS L05A and L05B tables - layer thickness and material type; and
- LTPP Form S04 - base and subgrade moisture data.

Relevant pre-installation monitoring data for the section located in Appendix A-2 includes the following:

- Pre-installation pavement distress data;
- Pre-installation FWD data (includes tests outside the section limits); and
- FWDCHECK program uniformity analysis results.

C. SMP Test Section Information

The geographic location and existing pavement structure place this section in Cell 28 of the SMP experiment, which is defined by the following parameters:

- JRC pavement;
- Fine-grain subgrade;
- Freezing environment; and
- Wet environment.

This was the fourth SMP installation in the LTPP North Central Region, and highlights of the installation are summarized in Section IV of this report. The people involved with the installation are listed on "Data Sheet SMP-I01: List of Installed Instrumentation," which is included in Appendix C-1 along with other SMP installation forms.

Data for this 1993 installation were transferred to forms from the LTPP Seasonal Monitoring Program: Instrumentation and Data Collection Guidelines, April 1994. The 1994 forms were used to keep all installation reports uniform and to facilitate data entry into the IMS database. Data transfer included conversion from English to metric units with some rounding error. On some forms, data are not available regarding procedure modifications adopted in 1994. On these forms the cells are usually blank, and a comment is included on the form to explain the missing data.

II. Instrumentation Installation

A. Pre-Installation Activities

The Minnesota Department of Transportation (MnDOT) routinely monitors seasonal changes on pavement structures, especially regarding frost/thaw conditions for posting spring load restrictions. In this respect, MnDOT was very willing to participate in the SMP, and GPS sections 271018, 271028, 274040, and 276251 were included in the core SMP study.

Mr. Fred Maurer of MnDOT was initially contacted regarding potential sections for the core experiment in Minnesota. Mr. Maurer worked with district offices to evaluate potential sections with the requirement to defer rehabilitation at least five years. This is the minimum period required to get three years of monitoring data that is collected every other year.

GPS section 274040 is the only Minnesota section in SMP Cell 28, and it was approved for the core SMP experiment. MnDOT agreed to defer any rehabilitation at least long enough to get the minimum number of monitoring cycles, as long as pavement conditions were not a safety concern.

On July 15, 1993, Regional Coordination Office (RCO) staff met with MnDOT staff at the Materials and Research facility in Maplewood, Minnesota. This meeting was held to coordinate support from MnDOT's Geotechnical and Foundations Division regarding a drill rig and various materials that the Materials and Research facility would supply for the four installations in Minnesota. At this meeting, tentative installation dates were discussed for all four installations to enable MnDOT staff to verify availability of equipment and materials. Also, the RCO was looking at a very tight schedule to complete seven SMP installations in the region before winter weather conditions would prevent any additional installations. At this meeting, an August 12, 1993 date was set for a group pre-installation meeting for all MnDOT and RCO staff involved with the four installations. The agenda and notes from the meeting in Maplewood are included in Appendix B-1.

On August 12, 1993, the group pre-installation meeting was held in Baxter, Minnesota. The meeting agenda, list of participants, and notes from the meeting are included in Appendix B-1.

On the way to the group pre-installation meeting in Baxter, RCO staff stopped at GPS section 271018 to identify any installation concerns with the site and to select which end of the section to monitor. After the group meeting, RCO staff visited GPS sections 271028, 276251, and 274040. Field notes from the site visit for section 274040 are included in Appendix B-1.

At the RCO, pre-installation activities included performing instrumentation checks/calibrations, and incorporating improvements to the installation process based on field notes from previous installations. Improvements to the installation process are listed in Section IV of this report, and results from instrumentation checks/calibration are included in Appendix B-2. The checks were performed according to 1993 guidelines, but the results are reported using 1994 forms, as discussed earlier. The forms include the following:

- Data Sheet SMP-C01: TDR Probe Check;
- Data Sheet SMP-C02: Thermistor and Air Temperature Probe Check;
- Data Sheet SMP-C03: Electrical Resistivity Probe Check;

- Data Sheet SMP-C04: Function Generator, Multi-meter, and Switch Box Checks; and
- Data Sheet SMP-C05: Tipping-Bucket Rain Gauge Calibration.

With respect to instrument checks on the resistivity probe, Data Sheet SMP-C03 requires "distance from top of probe" for each electrode. However, procedures in 1993 recorded "spacing between electrodes" on two separate lines about 180 degrees apart on the probe. As a consequence, cumulative errors from adding the 35 "spacings" had to be accounted for to transfer the data to the 1994 form. Adjustments were performed as described below to estimate "distance from top of probe" within ±5 mm:

1. Obtained average values for probes checked in 1994 and 1995 for the following:
   - Electrode No. 1 assigned 29 mm (±2 mm) if not measured;
   - Electrode No. 17 in the range 840 mm ± 3 mm as a check; and
   - Electrode No. 36 assigned at 1,805 mm from the top of the probe.
   - Average electrode spacing is (1805 - 29)/35, which is 50.74 mm.

2. Added the 35 "spacings" measured for the first line, divided the value by 35 to get the average, subtracted 50.74 mm to get adjustment value, and subtracted adjustment value from each "spacing."

3. Repeated Step 2 for the second line.

4. Added two adjusted "spacings" and divided by two to get "adjusted average spacing."

5. Recorded Electrode No. 1 at 29 mm and cumulated "adjusted average spacings" to get "distance from top of probe" for the remaining 35 electrodes.

6. Checked "distance from top of probe" for Electrode No. 17 in the range 840 mm ± 3 mm and Electrode No. 36 in the range 1,805 mm ± 2 mm.

For the air temperature probe, no readout device was available while the thermistor probe was checked. Therefore, the only check possible was to compare thermistor and air temperature probe readings obtained overnight with both probes connected to the datalogger. The air temperature probe was within ±1.0 °C of the average reading on the thermistor probe.

For the resistivity probe, loose electrode wraps were tightened by twisting the lead with a needle-nose pliers, and lead wires sticking out of the potting material for the probe were covered with silicon sealant for protection during installation. Excess potting material was scrapped off the electrodes for better contact with the soil.

Pre-installation activities also required selection of the instrumentation location. From field observations during the August 12, 1993 site visit and FWDCHECK program analysis for the section, the five panels from Station 3+85 to Station 5+22 were selected for monitoring, and instrumentation would be placed at Station 5+10, based on the following items:

- Safety concern with lane closure at Station 0+00 where a left turn lane exists; and
- Modulus of subgrade reaction was very uniform compared to the degree of variation for the five panels at Station 0+00.

B. Installation Activities

Instrumentation installation was completed on September 21, 1993, which was a cold day. Some final installation activities continued on the following day in spite of continued cold temperatures, fog, and light rain. The following installation forms are included in Appendix C-1 along with field notes for the installation:

- Data Sheet SMP-I01: List of Installed Instrumentation;
- Data Sheet SMP-I02: Instrumentation Locations;
- Data Sheet SMP-I03: Log of Piezometer Hole;
- Data Sheet SMP-I04: Log of Instrumentation Hole;
- Data Sheet SMP-I05: Field Gravimetric Moisture Contents;
- Data Sheet SMP-I05(A): Lab Gravimetric Moisture Contents;
- Data Sheet SMP-I05(B): Gravimetric Moisture Comparison;
- Data Sheet SMP-I06: TDR Moisture Content; and
- Data Sheet SMP-I07: Representative Dry Density.

Piezometer installation was done according to protocol. A 0.6-m long access tube was set in concrete just below the existing shoulder material to protect the top of the piezometer and provide easy access for measurements. A 3.0-m long grease sleeve was used on this piezometer to isolate the piezometer from frost heave. The grease sleeve extends about 0.2 m up into the access tube and the space between the two is filled with sand. Additional field notes on piezometer installation are included in Appendix C-1.

A 460-mm square for the instrumentation hole and a 100-mm wide trench for the conduit were marked on the pavement surface at Station 5+10 using the edge of the concrete as a transverse reference. Station 5+07 is the mid-point for the panel, but the instrumentation hole was shifted to Station 5+10 to avoid a 100-mm diameter core hole in the pavement surface. FWD testing was done prior to sawing the block and conduit trench, but only included midpanel tests and the test required over the instrumentation hole.

After the instrumentation hole and trench were sawed, the concrete surface was lifted out using anchors tapped into the pavement. The drill rig was moved into position over the hole and material was put into buckets as it was removed from the hole in 0.15-m lifts.

TDR probes were placed according to protocol with TDR probe 1 mid-depth in the granular base.

For installation reports from the LTPP North Central RCO, "Data Sheet SMP-I05(A): Lab Gravimetric Moisture Contents," is used to report DOT lab moisture results. Also, "Data Sheet SMP-I05(B): Gravimetric Moisture Comparison" was created to summarize moisture data obtained from field moisture tests, laboratory moisture tests, and interpretation of TDR probe data. These forms are included in Appendix C-1, and the following assumptions and conclusions were made regarding the moisture data:

- LTPP Directive Number: SM-13 "TDR Trace Interpretation Method for Calibration and Function Checks" dated August 17, 1995 was used to interpret the apparent length of each TDR trace obtained during installation for estimating moisture results. This method was specified for "calibration and function checks," but no other method

had been distributed by FHWA LTPP staff. The interpreted apparent lengths are reported on "Data Sheet SMP-I06: TDR Moisture Content" in Appendix C-1.

- Equations on pages II-2 and II-5 of the LTPP Seasonal Monitoring Program: Instrumentation Installation and Data Collection Guidelines, April 1994 were used to convert apparent lengths to gravimetric moisture estimates for the base and subgrade materials, and the results are included on "Data Sheet SMP-I05(B): Gravimetric Moisture Comparison," located in Appendix C-1.

- Water seeping from the granular base ran down the bore hole during placement of the instrumentation, and RCO staff tried to minimize seepage into materials placed directly on the TDR probes. However, for TDR probes 2 through 10, some moisture estimates may be high compared to field and laboratory results.

- Moisture estimates for the TDR probes in the fine-grain subgrade averaged 23.8 percent, which is 2.0 percentage points greater than the average obtained between field and laboratory data for all ten probes.

- Answers to the following questions could help explain the differences seen, but they are beyond the scope of this report:

  1. Are the equations used appropriate for fine-grain subgrade and granular base materials?
  2. How much influence does compaction have on the results?
  3. Does setting the noise filter on the cable reader to 8.0 instead of 1.0 influence apparent lengths interpreted from TDR traces obtained during installation?

"Data Sheet SMP-I07: Representative Dry Density," was not used in 1993, but it is included in Appendix C-1 to keep the report complete and uniform with other installation reports.

Several items were changed regarding installation of the datalogger cabinet and weather pole as follows:

- RCO staff were not able to get the 9.1-m offset from the lane edge specified on page II-23 and Figure II-12 of the LTPP Seasonal Monitoring Program: Instrumentation Installation and Data Collection Guidelines, April 1994 because the TDR cables provided were too short. The cabinet at this site is offset about 7.6 m and the weather pole is offset about 7.9 m. This places the obstructions inside the normal 9.15-m safety zone for highways. However, FHWA LTPP Division staff approved the two obstructions as break-away objects (page II-32 of manual) for placement inside the safety zone.

- The bottom of the front panel on the datalogger cabinet was notched about 0.1 m so the conduit buried about 0.3 m below the shoulder was easier to get into the cabinet, and it also slightly increased the distance the cabinet could be placed from the roadway.

- The conduit for the air temperature probe and tipping-bucket rain gauge signal wires was cut into the back of the cabinet above ground instead of running the conduit underground as shown in the guidelines. If the cables were run underground, the air temperature probe signal cable would have to be extended using special wire and resistors to compensate for increased lead resistance. Also, a union coupler was used on the weather pole about 0.3 m above ground to make pole installation easier.

For pavement repairs, MnDOT staff elected to patch the block and trench with quick-set concrete because of poor support from the soft subgrade soils. Quick-set concrete was also used to bond the pavement thermistor probe in place. Cold-mix asphalt patch was used on the asphalt shoulder. Saw cuts extending from the block were filled with Dow Corning 888 joint sealant the following day.

On September 22, 1993, final wiring of the datalogger in the cabinet was completed, and snap rings for monitoring joint openings were installed according to protocol. MnDOT staff installed a level-one benchmark at Station 5+16 and offset -7.92 m from the driving lane that has a stainless steel rod driven to refusal. This benchmark is expected to be more stable then the piezometer as a reference for monitoring pavement surface elevation changes. Also, RCO staff worked with Mr. Pat Houston of MnDOT to mark a location for the DOT to install a frost tube for comparing data to the resistivity probe. The frost tube was installed mid-lane at Station 5+35 on November 16, 1993.

Additional observations about the pavement repair at the instrumentation hole up to the completion of this installation report include the following:

- The quick-set concrete patch shrank and the block settled under the traffic loadings. The original concrete pavement also developed a crack extending from the saw cut at the corner of the block to the lane/shoulder joint. Attempts were made to keep cracks sealed, but the block/patch spalled, and the patch in the trench broke into several pieces that were moving under the traffic loadings. The RCO made arrangements with the MnDOT district bridge crew to replace the block.

- On August 25, 1994, RCO staff helped carefully remove material from the instrumentation hole and trench to prevent damage to the resistivity probe and thermistor probe, as well as, the teflon lead to the pavement thermistor probe. Both the quick-set patch and the concrete pavement that had cracked loose adjacent to the trench were removed, creating a hole roughly 0.42-m long by 1.0-m wide. After the material was removed, a reinforcement grid was installed and fiber-reinforced quick-set concrete was placed in the hole. The repair was covered with plastic because it started to rain, and the plastic caused the surface texture seen in the photographs in Appendix D-3.

- On September 30, 1994, saw cuts were re-sealed after the pavement repair done August 25, 1994 had cured one month.

- On January 12, 1995, the sealant was pulling loose, and a 0.2-m long spall on the patch was recorded.

- On March 31, 1995, old crack sealant and spalled patch material were removed, exposed surfaces were wire brushed, and all saw cuts and spalled areas were resealed.

The new sealant was covered with duct tape to prevent tracking from vehicle tires after the lane closure was removed.

- On May 11, 1995, intermittent hairline cracks were identified on the block. These cracks are above the reinforcement grid installed during the August 25, 1994 repair. Some of the duct tape used on March 31, 1995 was still on the pavement.

III. SMP Data Collection

A. Initial SMP Data Collection

On September 22, 1993, test locations were marked on the five monitoring panels according to protocol, and the first set of SMP data was collected.

Three cycles of FWD data were collected, as well as faulting, elevation, and piezometer data. The RCO had not received a switch box for manual readings on the resistivity probe, and manual readings were not taken until November 16, 1993. No joint opening data were taken until October 18, 1993, because the silicon on the snap rings had not cured. The October joint opening data and the November resistivity probe readings along with manual data collected September 22, 1993 are included in Appendix D-1 as follows:

- One set of contact resistance data;
- One set of four-point resistivity data;
- One ground water table measurement;
- One set of joint opening measurements;
- One set of joint faulting measurements; and
- One set of elevation data, which included shots on the MnDOT benchmark.

Computer data files obtained from automated data collection using the dataloggers included the following:

- Two sets of TDR traces and CRREL voltages; and
- Temperature and precipitation data collected from the datalogger to verify operation overnight.

Temperature data from the thermistor probe should not be entered into the IMS database because of heat given off by the quick-set concrete patching material used to repair the pavement and disturbance of material around the probe. In addition, temperature data up to several days after instrument installation will have to be reviewed to determine when the disturbed materials came back to thermal equilibrium. Data affected by the installation will have to be edited from the computer files.

B. Routine SMP Data Collection

Routine data collection was done on the site from September 22, 1993 through June 16, 1995, and MnDOT has continued to collect temperature and frost data from the site. LTPP's standard data tracking log, which summarizes the data collected on the site, is included in Appendix D-2.

Events that influenced the data collection and that will influence data interpretation for the site include the following:

- On November 16, 1993, a relay was added to the datalogger at the site, which included a change in the data format for subsequent files.

- On June 23, 1994, water was running out of the conduit in the datalogger cabinet. It is the authors' opinion that the conduit for the instrumentation cables, which runs from the outer wheel path of the driving lane to the datalogger cabinet, is functioning as a drainage channel for excess water in the granular base. This has the most potential to influence TDR probe 1 placed mid-depth in the base layer. A photograph included in Appendix D-2 shows stains on the conduit as evidence of water running from the conduit.

- On August 25, 1994, the block above the instrumentation was replaced because it had failed and could not be sealed to keep water from infiltrating the pavement structure. TDR data prior to August 1994 may have been affected. Correspondence relating to the block replacement is included in Appendix D-3 along with photographs of the repair.

Instrumentation and equipment problems at the site include the following:

- Cables for several TDR probes are slightly longer than supplied for other installations in 1993, and the second inflection point on these TDR probe traces is not always captured with the automated data collection equipment. This is especially a problem on the site, because the high moisture content in the fine-grain subgrade produces long apparent probe lengths. On several site visits, TDR probes failing the automated data collection had manual TDR probe traces collected to obtain both inflection points. Screen prints of the TDR data are included in Appendix D-2.

- Photographs in Appendix D-2 show rust on snap rings used to measure joint opening. Rusting of the snap rings on this section has probably been accelerated by de-icing chemicals used by MnDOT. If the rusting continues, it will need to be accounted for in joint opening measurements that are currently read to 0.01-mm accuracy.

- Elevation difference between piezometer and MnDOT benchmark changed about 4.0 mm during the first frost/thaw cycle after installation as shown on the plot in Appendix D-2. The benchmark movement will complicate elevation data analysis for estimating frost heave.

Other problems experienced at site include failures with switch boxes used to collect manual resistance and resistivity data and failures of the CRREL multiplexer for automated resistance data collection. Print screens showing the failure modes for the CRREL multiplexer are included in Appendix D-2.

IV. Summary, Conclusions, and Recommendations

A. Instrumentation Installation Highlights

The following items are identified by the authors as unique or particular items of interest regarding this section in the SMP.

- This was the first SMP installation in the LTPP North Central Region on a JRC pavement section, but experience gained on three previous installations helped keep the installation time reasonable.

- Mr. Larry Peirce of the Southern RCO was at the installation to observe installation procedures used by the North Central RCO, especially regarding changes incorporated by the RCO since the SMP pilot training. Photographs and video footage taken by Mr. Peirce to document the installation are available from the Southern RCO.

- Data for this 1993 installation were transferred to forms from the LTPP Seasonal Monitoring Program: Instrumentation and Data Collection Guidelines, April 1994.

B. Recommendations for Improving Installations

In addition to previous modifications from other installations, the following procedure and equipment changes from protocol were used during this installation:

- Changed saw cut pattern for the instrumentation hole and conduit trench. The trench was shifted to one side of the block to eliminate one of the cuts into the block.

- Built a metal lifting jig with handles to attach to the block. The jig permits two people to safely and precisely control removal/replacement of the block, especially for heavy blocks from thick pavement sections.

- Designed a drill guide for installing snap rings for joint opening measurements. The drill guide was custom built and was shared by the four RCOs for all SMP installations on concrete pavements. Design drawings and photograph of the drill guide are included in Appendix C-1.

- Added a shaft-locking collar to the MnDOT benchmark to get a 30-mm diameter surface to support the swivel foot used on the elevation rod. Collars were added to the MnDOT benchmarks at the other three Minnesota SMP installations as well.

Other recommendations resulting from the installation are as follows:

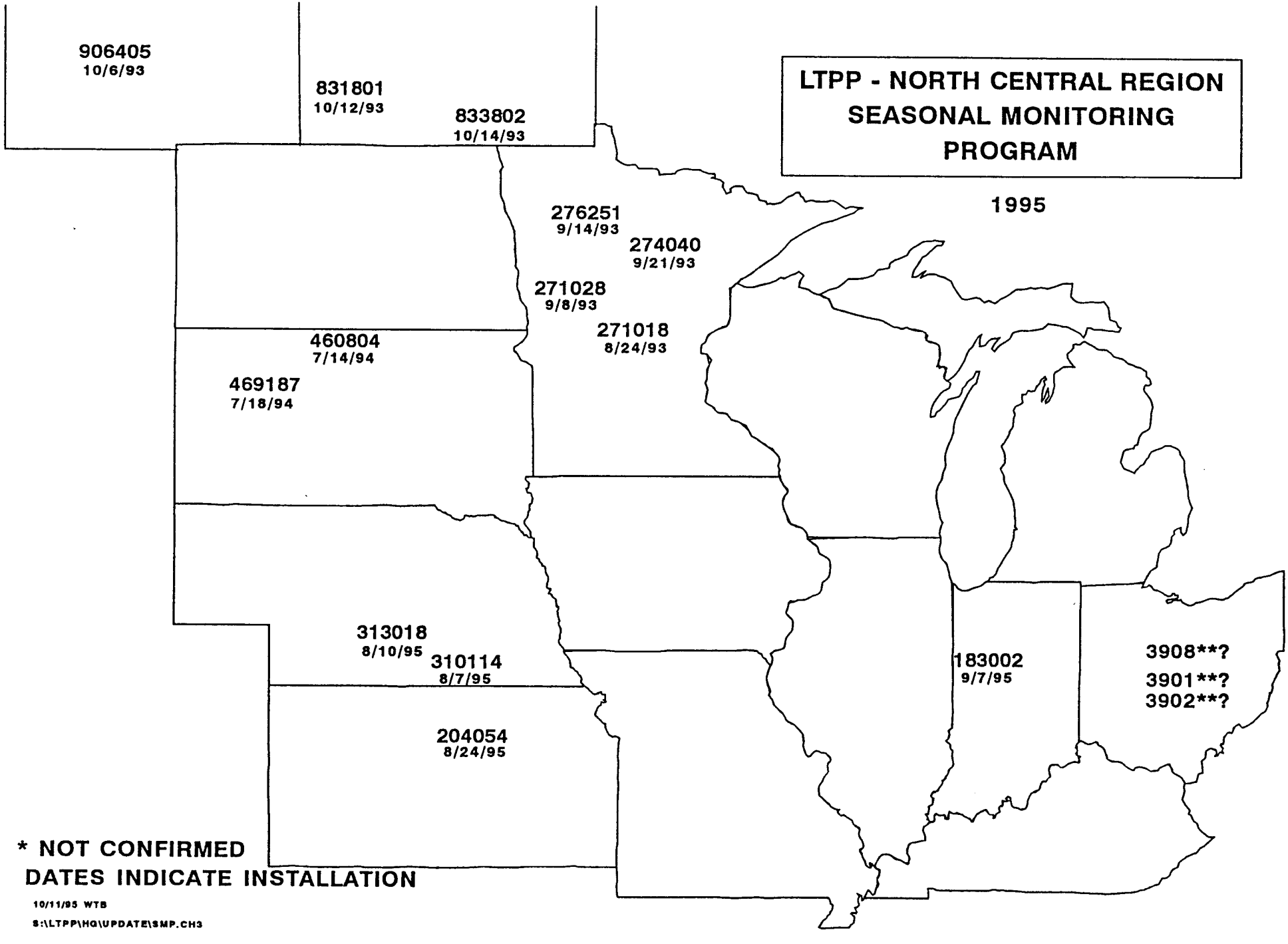
- Extend quick-set concrete patching material with aggregate to limit shrinkage; and

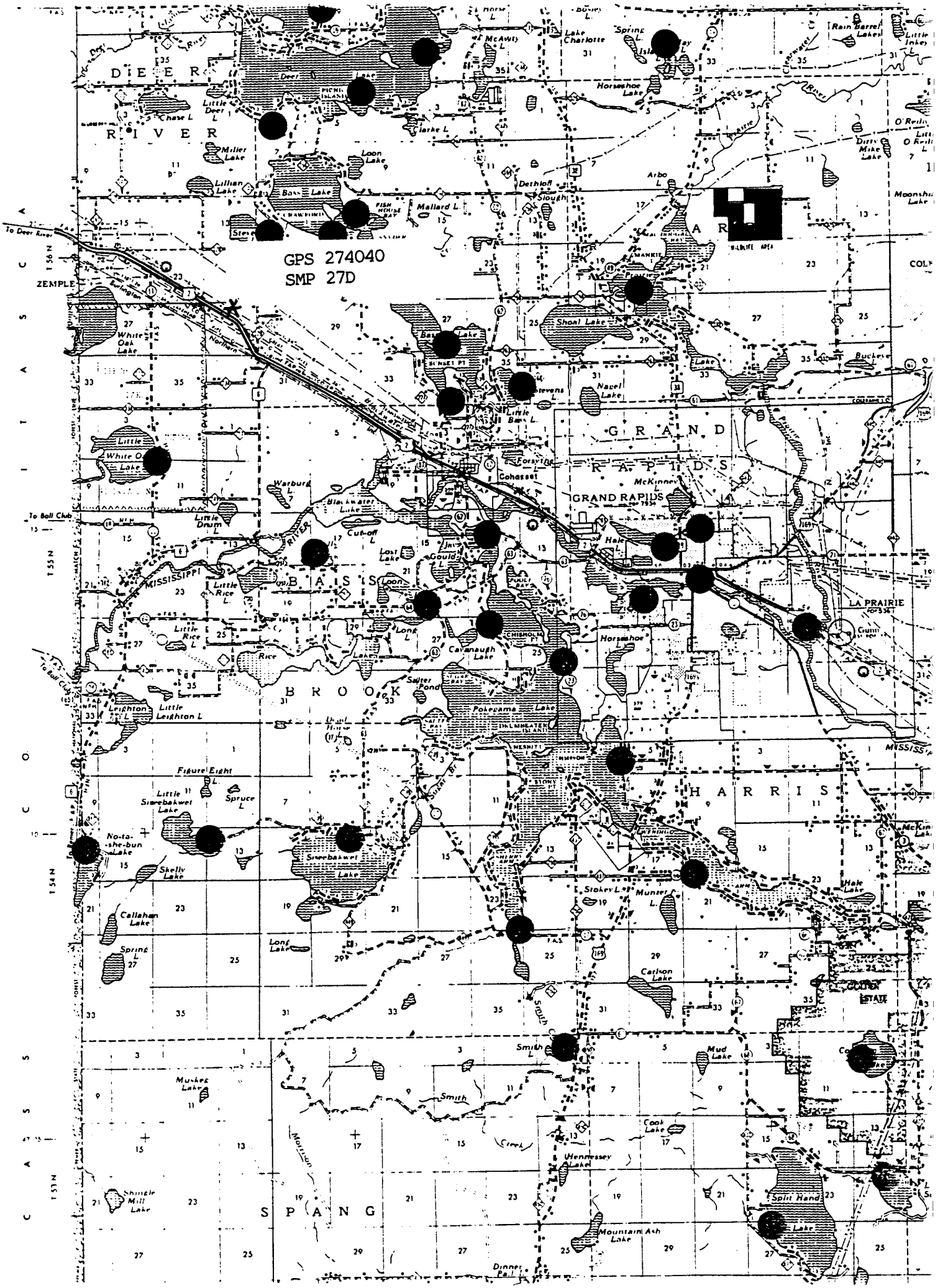
- Install metal reinforcement into the existing concrete to hold concrete repairs in place.

Appendix A-1: Test Section Background Information

Appendix A-1 contains the following test section background information:

- SMP location map;
- Detailed section location map;
- SHRP Inventory Data Sheet - traffic, design factors, and layer information;
- SHRP Section Field Verification Form;
- IMS L05A and L05B tables - layer thickness and material type; and
- LTPP Form S04 - base and subgrade moisture data.


LTPP - NORTH CENTRAL REGION
SEASONAL MONITORING
PROGRAM
1995
906405
10/6/93
831801
10/12/93
833802
10/14/93
276251
9/14/93
274040
9/21/93
271028
9/8/93
271018
8/24/93
460804
7/14/94
469187
7/18/94
313018
8/10/95
310114
8/7/95
204054
8/24/95
183002
9/7/95
3908**?
3901**?
3902**?
* NOT CONFIRMED
DATES INDICATE INSTALLATION
10/11/95 WTB
S:\LTPP\HQ\UPDATE\SMP.CH3


GPS 274040
SMP 27D
DEER RIVER
GRAND RAPIDS
BASS BROOK
HARRIS
SPANG
ZEMPLE
LA PRAIRIE
Cohasset
Horseshoe Lake
Shoal Lake
Nagel Lake
Little Bass L.
Forsythe
McKinney L.
Hale L.
Horseshoe L.
Cavanaugh Lake
Pokegama Lake
Sucker Br.
Smith L.
Mud Lake
Cook Lake
Hennessey Lake
Mountain Ash Lake
Split Hand Lake
Munzer L.
Stokey L.
Carlson Lake
Sweebakwet Lake
Little Sweebakwet Lake
Spruce L.
Figure Eight L.
Skelly Lake
Callahan Lake
Spring L.
Long Lake
Muskeg Lake
Shingle Mill Lake
Little Leighton L.
Leighton L.
Little Rice L.
Little Drum L.
Warburg L.
Blackwater Lake
Cut-off L.
Lost Lake
Gould L.
Long L.
Salter Pond
Little White Oak Lake
White Oak Lake
Miller Lake
Lillian Lake
Bass Lake
Loon Lake
Mallard L.
Dethloff Slough
Arbo L.
Horseshoe Lake
Lake Charlotte
Spring L.
Rain Barrel Lakes
Little Inkey L.
Dirty Mike Lake
Moonshine Lake
Buckeye
Little Deer L.
Chase L.
Clarke L.
Deer Lake
McAvity L.
Norfolk
Burlington
Northern
Blackwater
Mississippi River
To Deer River
To Boll Club
To Boll Club
Mississippi
Smith Creek
Morrison
Gulf State
Cass Co.
T 56 N
T 55 N
T 54 N
T 53 N

STRATEGIC HIGHWAY RESEARCH PROGRAM
GENERAL PAVEMENT STUDIES
Long-Term Pavement Performance Monitoring
Project Information Sheet
March, 1988

REGION: North Central
STATE: Minnesota

EXPERIMENT: Jointed Reinforced Concrete

SHRP Assigned ID:	274040	District:	1	Year Open:	1979
State Assigned ID:	4008	Highway:	U.S.- 2	Year Traffic:	1984
Expmnt Design Cell:	4- 1	Length:	5.5 miles	AADT:	4548
Status:	Selected	Lanes:	1	Trucks:	16.1 %

DESIGN FACTORS:

Moisture - Wet		
Temperature - Freeze		
Subgrade - 56 - Clayey Silt	Fine ok	
Traffic - 150 KESAL/Yr	Low ~~High~~	(200) ok
PCC Thickness - 8.0 in.	Low	(9.5) ok
Joint Spacing - 27.0 ft.	Low	(40) ok

LAYER CONFIGURATION

LAYER NO.	LAYER DESCRIPTION	LAYER THICKNESS	LAYER MATERIAL TYPE
3	3 - Orig Surface	8.0	5 - Portland Cement (JRCP)
2	5 - Base Layer	5.0	23 - Crushed Stone or Gravel or Slag ok
1	7 - Subgrade	.0	56 - Clayey Silt

PAVEMENT LAYER INFORMATION

PORTLAND CEMENT CONCRETE LAYERS

LAYER NO.	JOINT SPACING	DOWELS	REINFORCING	CRCP STEEL
3	27.0	Yes	Yes	0. %

SECTION FIELD VERIFICATION FORM

ate 9-8-88

Rater Marti

State Project Code 4 C C 5
State Code 2 7
SHRP Section I.D. 4 0 4 0

Project and Section Identification

State District No. 0 1

County or Parish Itasca

Route Signing (Numeric Code) 2
- Interstate 1
- Primary 2
- State 3
- Other 4

Route Number 0 2
LTPP Experiment Code 4
Number of Through Lanes (One Direction) 2
Direction of Travel 2
- Eastbound 1
- Westbound 2
- Northbound 3
- Southbound 4

Available Project Length (Without Discontinuities) 900

	Start Point	End Point
Test Section Milepoints	1 7 3 . 2 1	1 7 3 . 1 1

Additional Section Location Information*:
0' is 1087' E of MP 173
0' is 192.8' W. of STA 630+00 (∴ 0' is @ STA 628+07.2)
Located across from AAA trailer sales

* Include distances from two landmarks (refer to specific procedures outlined in the Initial State Visit Guidelines).

Location of monument: Both 1' South of North Bit. shoulder edges

Geometric Information

Lane Width (Feet) 1 2 .

Lane (By Number) Included in Monitoring Section 1
(Lane 1 is Outside Lane, Lane 2 is Next to Lane 1, etc.)

Shoulder Data:

	Outside Shoulder	Inside Shoulder
Total Width (Feet)	1 0 .	0 4 .
Paved Width (Feet)	1 0 .	0 4 .
Surface Type		3

- Turf 1
- Granular 2
- Asphalt Concrete ... 3
- Concrete 4
- Surface Treatment 5
- Other 6

Additional Data for PCC Shoulders:

Average Joint Spacing (Feet)	N/A	
Skewness of Joints (Feet)		
Joints Match Pavement Joints? (Yes - 1; No - 2)		

SHRP/LTPP LAYER THICKNESS

L05A - L05B TABLES

10-AUG-93

	L05A				STA 0		STA 5		L05 B REPRESENTATIVE					
	CON	LAYER	DESC	TYPE	THICK	MATL	THICK	MATL	LAYER	DESC	TYPE	THICK	MATL	INVENTORY
27 4040	1	1	7	SS		108		108	1	7	SS		108	1
	1	2	5	GB	6	302	5.9	302	2	5	GB	6	302	2
	1	3	3	PC	8.2	5	8.1	5	3	3	PC	8.1	5	3

MN

FIELD MATERIAL SAMPLING AND FIELD TESTING

SHRP ASSIGNED ID 274040

EXPERIMENT GPS 4 ROUTE/HIGHWAY US10 Lane 2 Direction W

MPLE/TEST: (a) Before Section _____ (b) After Section ✓ FIELD SET NO. 2

IN SITU DENSITY AND MOISTURE TESTS

DCG SHEET: 24

RATOR N Dawson NUCLEAR DENSITY GAUGE I.D. 573 SHEET NUMBER 15 OF 23

T DATE 8-28-89 LOCATION: STATION 5+62 TEST PIT NUMBER TP1

E OF LAST MAJOR CALIBRATION 4-1-89 OFFSET 3 feet from °/s

e: Use additional sheets if necessary

TH FROM SURFACE TO THE OF THE LAYER, FEET (SEE S03)								
ST PE	PAVEMENT SURFACE (AC) Test Pit O.W.P.	PAVEMENT SURFACE (AC) Between Wheelpath	BASE COURSE TOP Result, pcf Wet	BASE COURSE TOP Result, pcf Dry	SUBBASE TOP Result, pcf Wet	SUBBASE TOP Result, pcf Dry	SUBGRADE TOP Result, pcf Wet	SUBGRADE TOP Result, pcf Dry
SITU 1			140.4	129.7			134.4	113.0
SITU 2			140.9	130.3			134.8	114.2
SITY cf) 3			137.3	126.6			133.9	112.5
4			139.5	128.5			134.1	113.1
ERAGE			139.5	128.9			134.3	113.2
HTO T238-86 Method (A,B,C)								
Depth, inches			4				12	
IN SITU MOISTURE CONTENT, % 1			8.2				18.9	
2			8.2				18.1	
3			8.4				19.0	
4			8.6				18.6	
RAGE			8.4					
SHTO T239-86) RIAL TYPE: (Unbound-G, reated-AT, Other-T)								

RAL REMARKS: _____

IFIED

Chief, Contractor

liation: BCT

VERIFIED AND APPROVED

Ronald R Unbach

SHRP Representative

Affiliation: BPT

MONTH-DAY-YEAR

6-28-1989

Date

Form S04/Issued 23 February 1989

Appendix A-2: Pre-Installation Monitoring Data and FWDCHECK Results

Appendix A-2 contains the following pre-installation monitoring data and FWDCHECK analysis results:

- Pre-installation pavement distress data;
- Pre-installation FWD data; and
- FWDCHECK program uniformity analysis results.

Revised May 29, 1992

STATE ASSIGNED ID ____

SHEET 4

STATE CODE 27

DISTRESS SURVEY

SHRP SECTION ID 4040

LTPP PROGRAM

DISTRESS SURVEY FOR PAVEMENTS WITH JOINTED PORTLAND CEMENT CONCRETE SURFACES

DATE OF DISTRESS SURVEY (MONTH/DAY/YEAR) 07/28/93

SURVEYORS: BKN, ___, ___

PAVEMENT SURFACE TEMP - BEFORE 22°C; AFTER 29°C

PHOTOS, VIDEO, OR BOTH WITH SURVEY (P, V, B) B

DISTRESS TYPE	SEVERITY LEVEL LOW	MODERATE	HIGH
CRACKING			
1. CORNER BREAKS (Number)	0	0	0
2. DURABILITY "D" CRACKING (Number of Affected Slabs)	0	0	0
AREA AFFECTED (Square Meters)	0	0	0
3. LONGITUDINAL CRACKING (Meters)	0	0	0
Length Sealed (Meters)	0	0	0
4. TRANSVERSE CRACKING (Number of Cracks)	0	0	0
(Meters)	0	0	0
Length Sealed (Meters)	0	0	0
JOINT DEFICIENCIES			
5a. TRANSVERSE JOINT SEAL DAMAGE Well Sealed? (Y, N)			Y
If "Y" Number of Joints	3	10	6
5b. LONGITUDINAL JOINT SEAL DAMAGE Number of Longitudinal Joints that have been sealed (0, 1, or 2)			1
Length of Damaged Sealant (Meters)			0
6. SPALLING OF LONGITUDINAL JOINTS (Meters)	~~[illegible]~~ 1.0	0	0
7. SPALLING OF TRANSVERSE JOINTS Number of Affected Joints	0	0	0
Length Spalled (Meters)	0	0	0

Revised May 29, 1992

SHEET 5

DISTRESS SURVEY

LTPP PROGRAM

STATE ASSIGNED ID ____

STATE CODE 27

SHRP SECTION ID 4040

DISTRESS SURVEY FOR PAVEMENTS WITH JOINTED PORTLAND CEMENT CONCRETE SURFACES (CONTINUED)

DISTRESS TYPE	SEVERITY LEVEL LOW	MODERATE	HIGH
SURFACE DEFORMATION			
8a. MAP CRACKING (Number)			00
(Square Meters)			00
8b. SCALING (Number)			00
(Square Meters)			00
9. POLISHED AGGREGATE (Square Meters)			0
10. POPOUTS (Number)			9
MISCELLANEOUS DISTRESSES			
11. BLOWUPS (Number)			0
12. FAULTING OF TRANSVERSE JOINTS AND CRACKS - REFER TO SHEET 6			
13. LANE-TO-SHOULDER DROPOFF - REFER TO SHEET 7			
14. LANE-TO-SHOULDER SEPARATION - REFER TO SHEET 7			
15. PATCH/PATCH DETERIORATION			
Flexible (Number)	0	0	0
(Square Meters)	0	0	0
Rigid (Number)	0	0	0
(Square Meters)	0	0	0
16. WATER BLEEDING AND PUMPING (Number of Occurrences)			0
Length Affected (Meters)			0

17. ~~OTHER~~ COMMENTS (Describe) 0-50 + 5+50 SURVEY, NOT INCLUDED IN DISTRESS SUMMARY

Revised May 29, 1992

SHEET 6

DISTRESS SURVEY

LTPP PROGRAM

STATE ASSIGNED ID _ _ _ _

STATE CODE 27

SHRP SECTION ID 4 0 4 0

DISTRESS SURVEY FOR PAVEMENTS WITH JOINTED PORTLAND CEMENT CONCRETE SURFACES (CONTINUED)

12. FAULTING OF TRANSVERSE JOINTS AND CRACKS

	Point[1] Distance (Meters)	Joint or Crack (J/C)	Crack Length (Meters)	Well Sealed (Y/N)	Length of Spalling, m L	M	H	Faulting (mm)[2] 0.3m	0.75m
	14.8	J		N	0	0	0		
	6.6	J		N	0	0	0		
*	1.6	J		Y	0	0	0		
	9.8	J		Y	0	0	0		
	18.3	J		Y	0	0	0		
	26.6	J		Y	0	0	0		
	34.7	J		Y	0	0	0		
	43.1	J		N	0	0	0		
	51.4	J		N	0	0	0		
	59.7	J		N	0	0	0		
	67.8	J		N	0	0	0		
	76.2	J		N	0	0	0		
	84.7	J		Y	0	0	0		
	92.7	J		N	0	0	0		
	101.0	J		N	0	0	0		
	109.6	J		N	0	0	0		
	117.7	J		Y	0	0	0		
	125.9	J		Y	0	0	0		
	134.5	J		N	0	0	0		
	142.5	J		Y	0	0	0		
*	150.8	J		N	0	0	0		
	159.3	J		N	0	0	0		
	167.3	J		N	0	0	0		

Note 1. Point Distance is from the start of the test section to the measurement location.

Note 2. If the "approach" slab is higher than the "departure" slab, faulting is recorded as positive (+ or 0); if the "approach" slab is lower, record faulting as negative (-) and the minus sign must be used.

Revised May 29, 1992

STATE ASSIGNED ID ____

SHEET 7

DISTRESS SURVEY

LTPP PROGRAM

STATE CODE 27

SHRP SECTION ID 4040

DISTRESS SURVEY FOR PAVEMENTS WITH JOINTED PORTLAND CEMENT CONCRETE SURFACES (CONTINUED)

13. LANE-TO-SHOULDER DROPOFF

14. LANE-TO-SHOULDER SEPARATION

Point No.	Point[1] Distance (meters)	Lane-to-shoulder[2] Dropoff (mm)	Lane-to-shoulder Separation (mm)	Well Sealed (Y/N)
-1	-15.25	14	6	N
1.	0.	12.	5.	N
2.	15.25	15.	20.	N
3.	30.5	10.	2.	N
4.	45.75	7.	4.	N
5.	61.	17.	14.	N
6.	76.25	9.	16.	N
7.	91.5	8.	4.	N
8.	106.75	15.	8.	N
9.	122.	9.	7.	N
10.	137.25	12.	7.	N
11.	152.5	17.	4.	N
	167.8	17	10	N

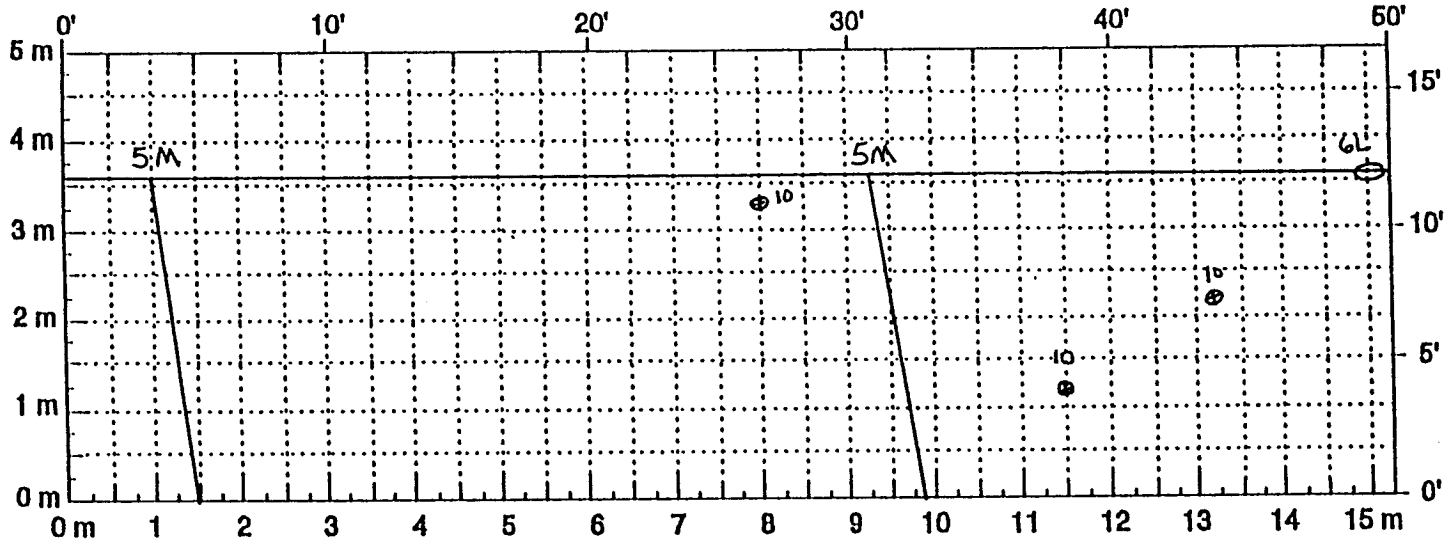
Note 1. Point Distance is from the start of the test section to the measurement location. The values shown are SI equivalents of the 50 feet spacing used in previous surveys.

Note 2. If heave of the shoulder occurs (upward movement), record as a negative (-) value. Do not record (+) signs, positive values are assumed.

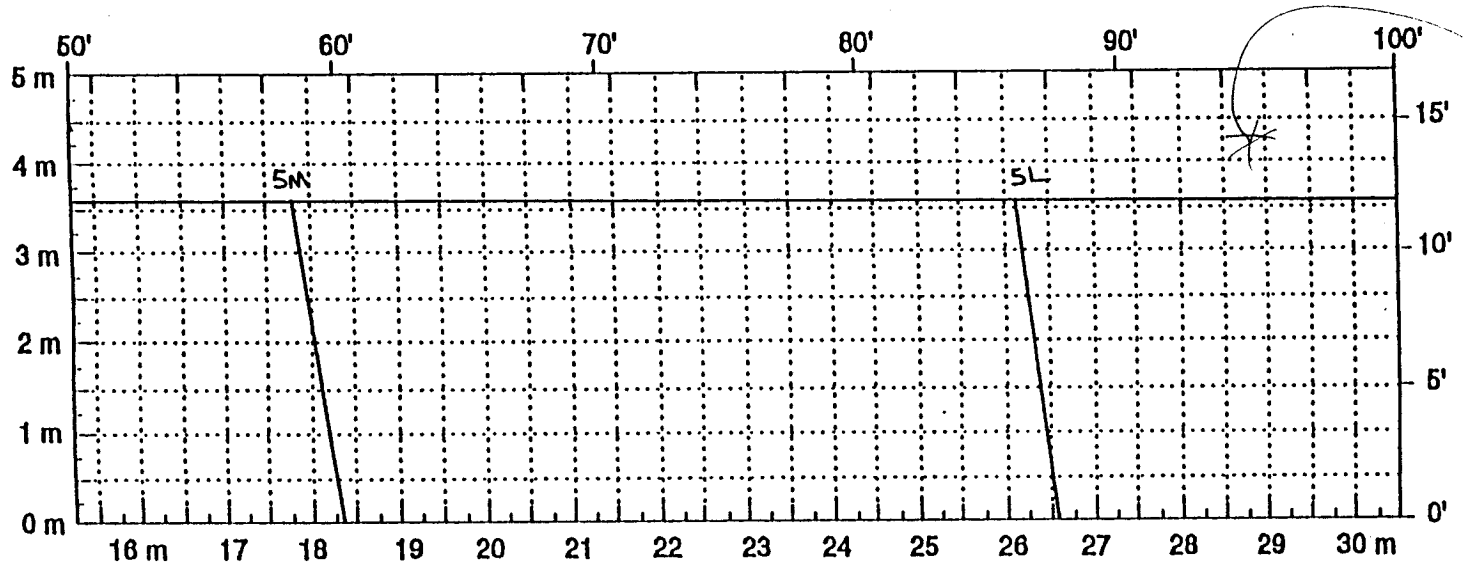
State Assigned ID _____

State Code 27

SHRP Section ID 4040



Comments: _____



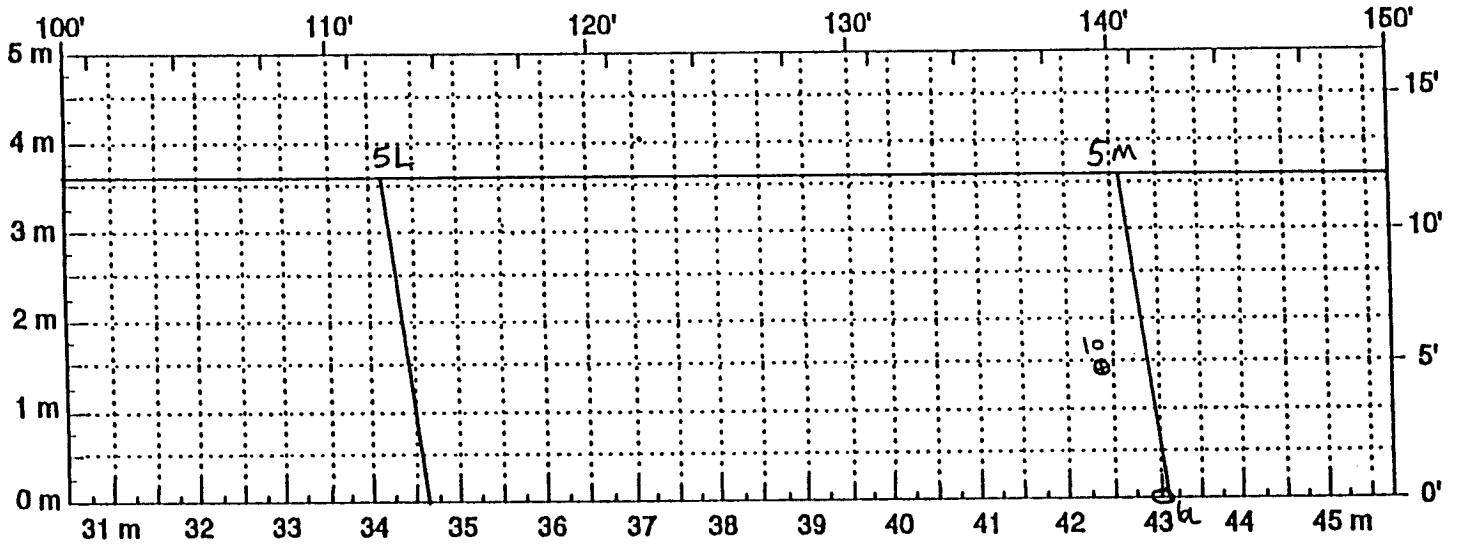
Panel on passing lane has T-crack

Comments: _____

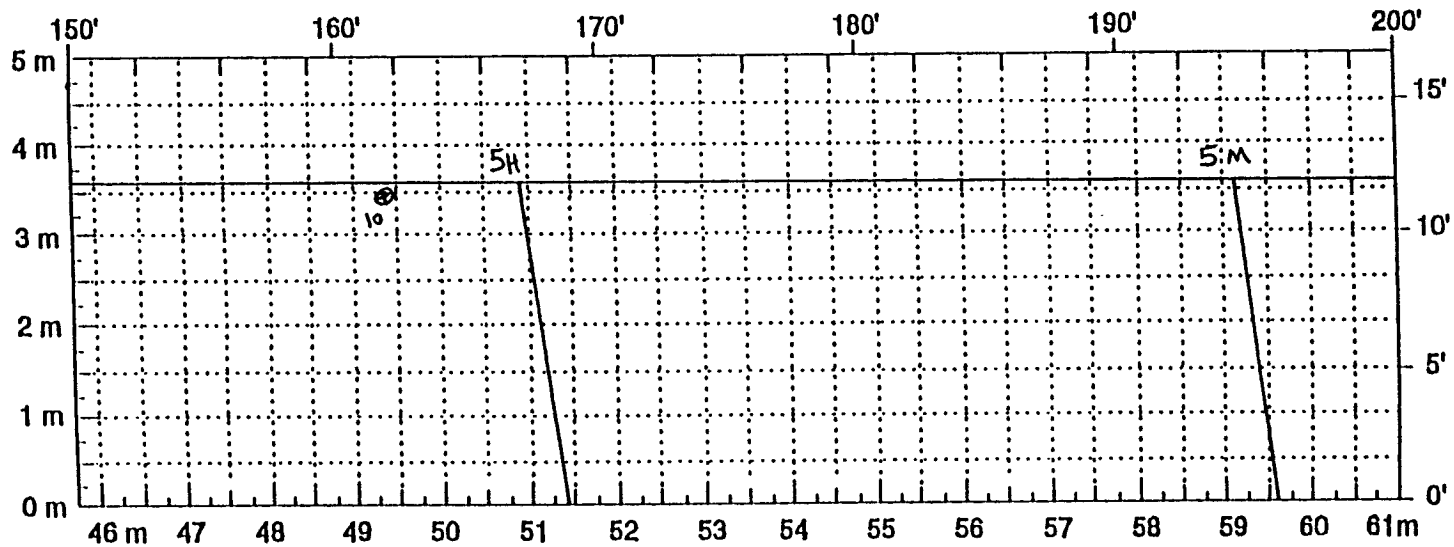
State Assigned ID _____

State Code 27

SHRP Section ID 4040



Comments: _____

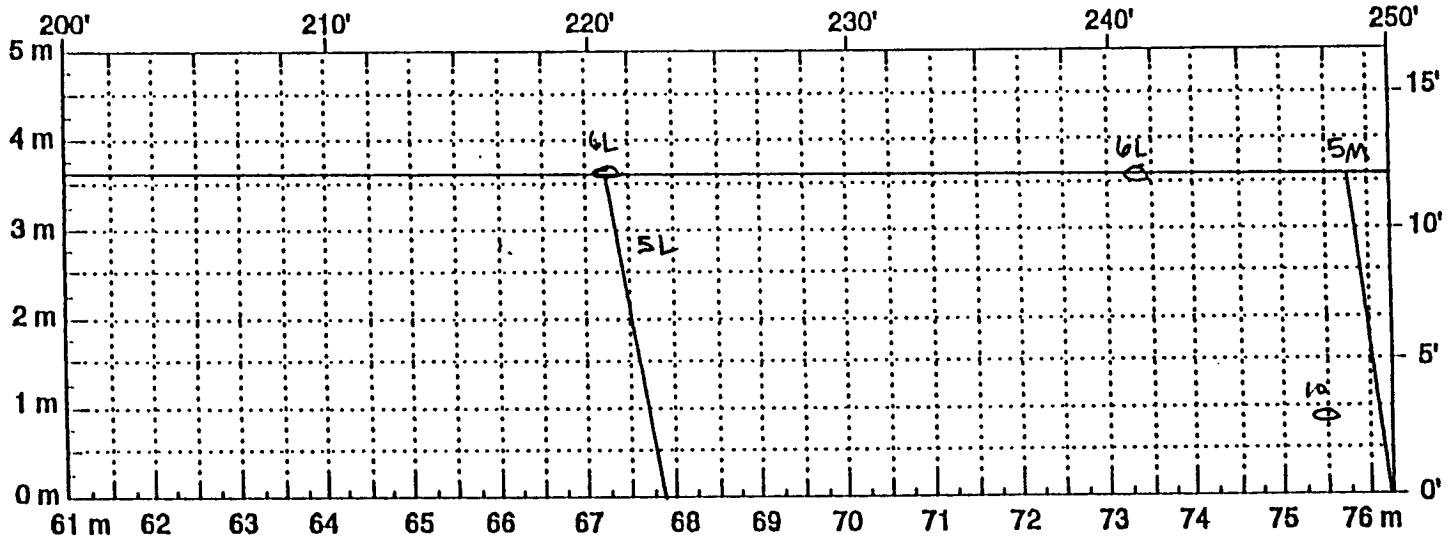


Comments: _____

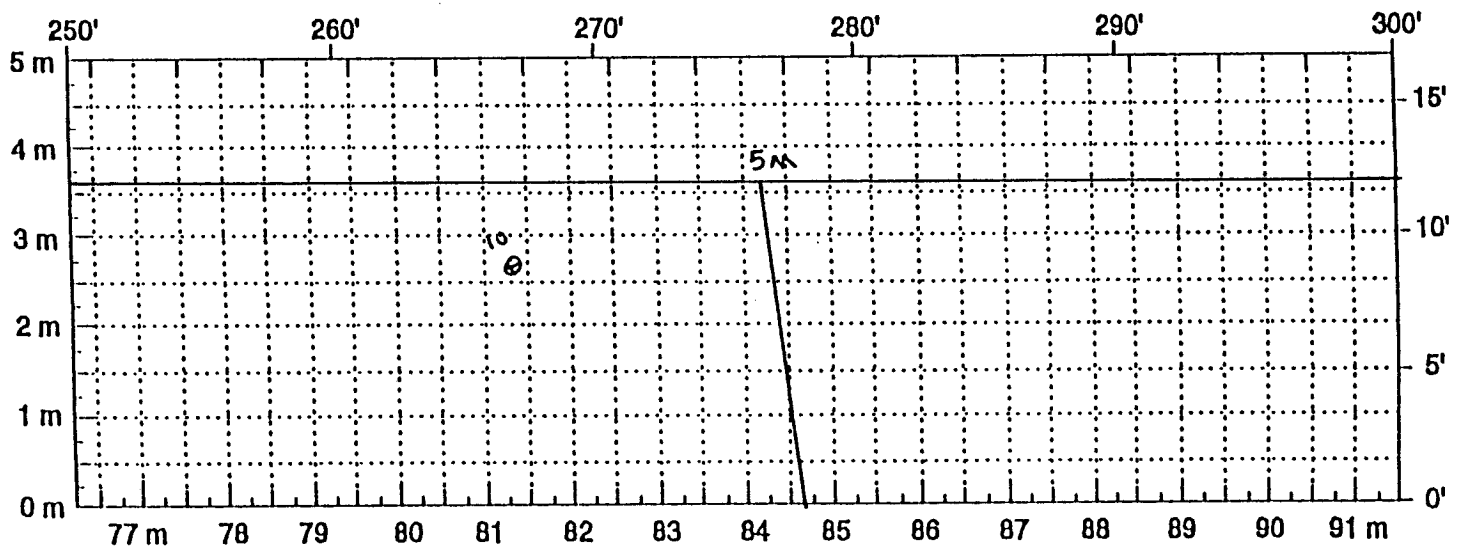
State Assigned ID _____

State Code 27

SHRP Section ID 4040



Comments: _____

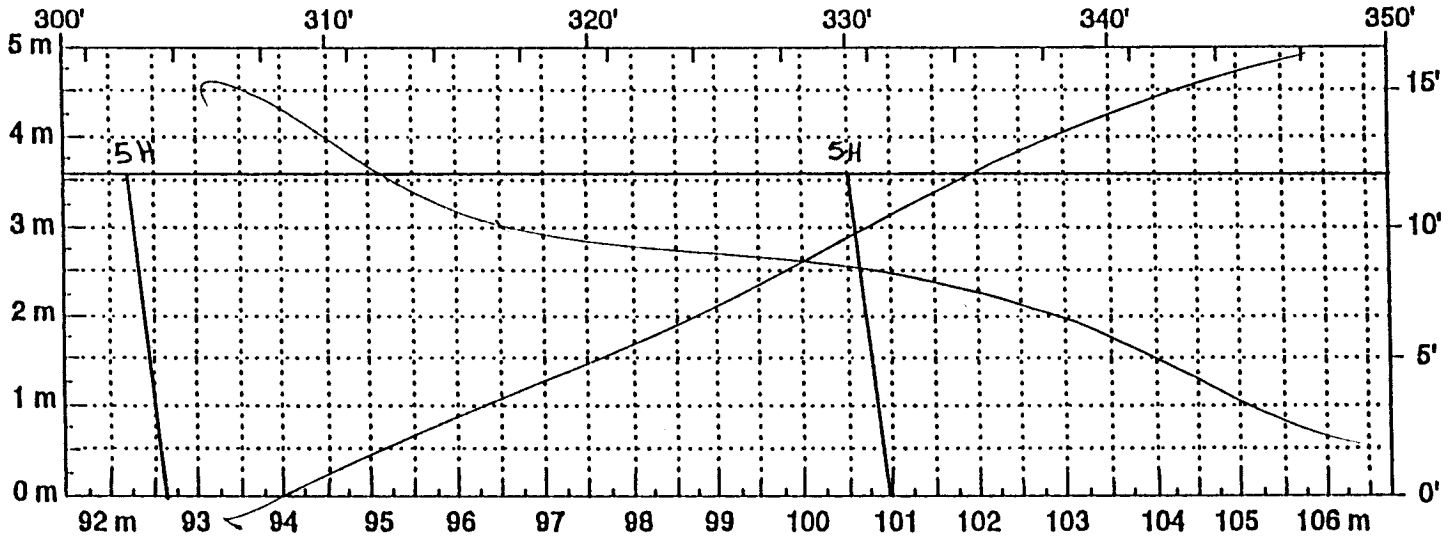


Comments: _____

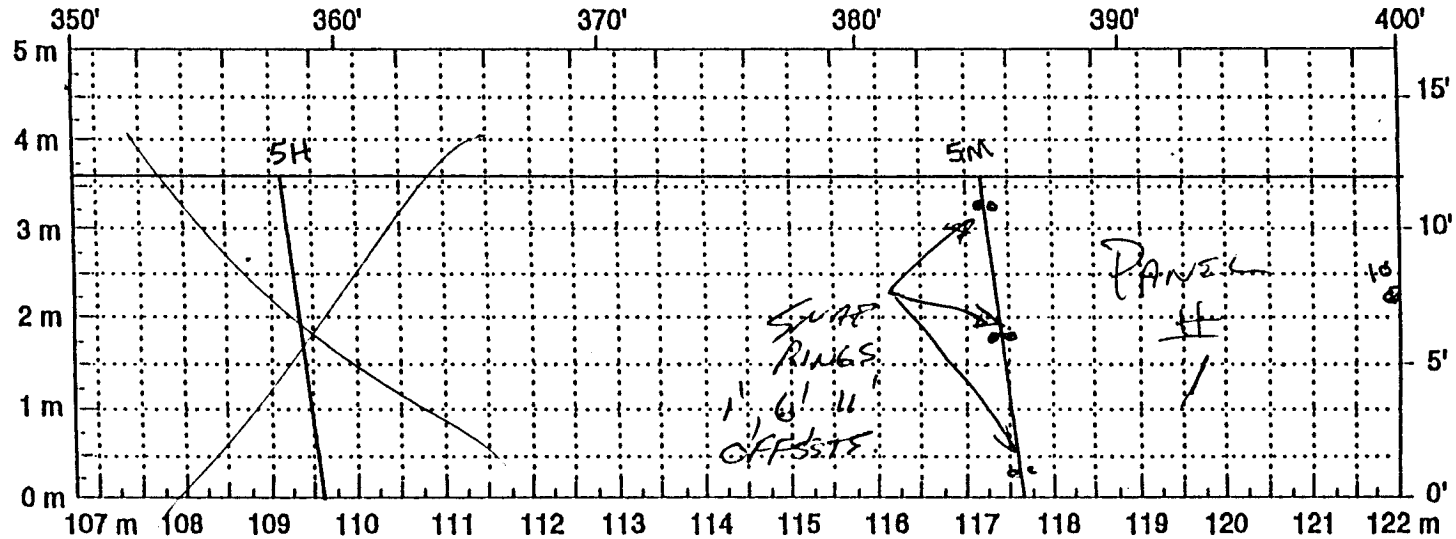
State Assigned ID _____

State Code 27

SHRP Section ID 4040



Comments: _____

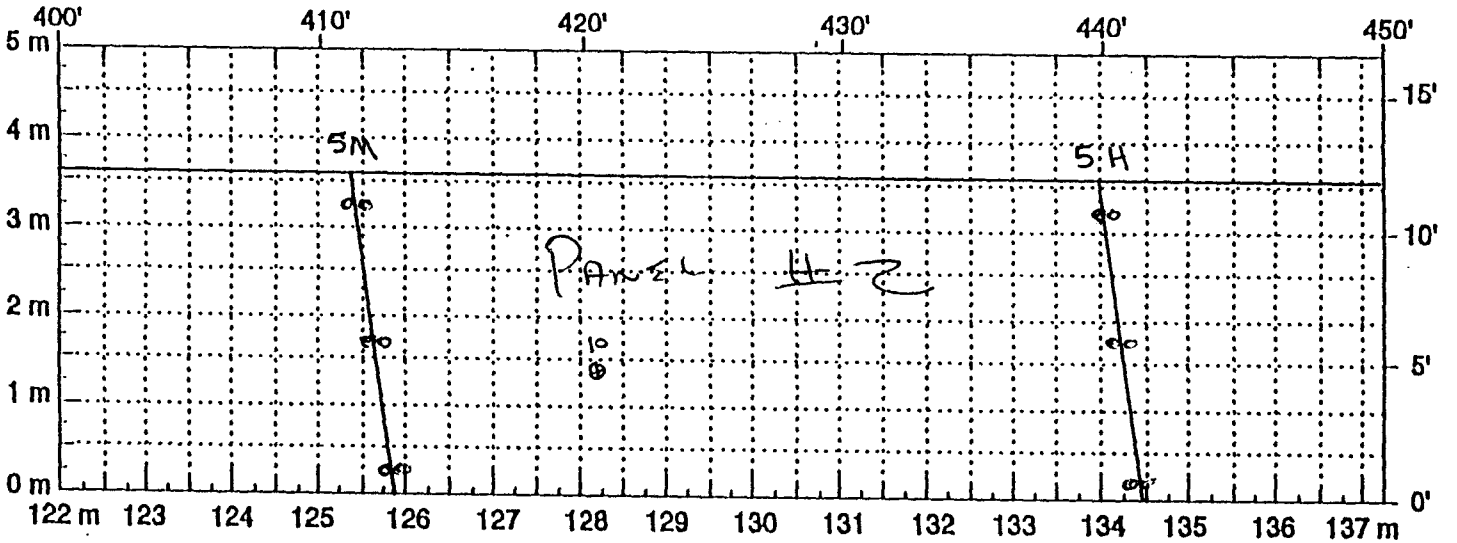


Comments: _____

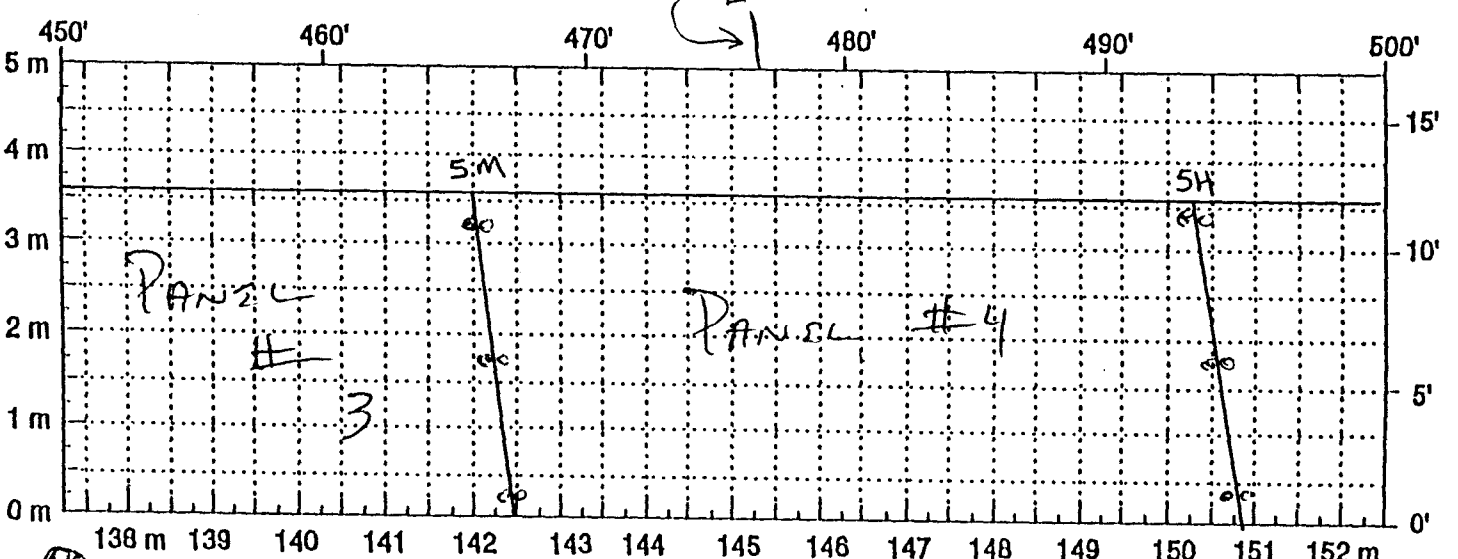
State Assigned ID _____

State Code 27

SHRP Section ID 4040



Comments: ℄ CROSSOVER



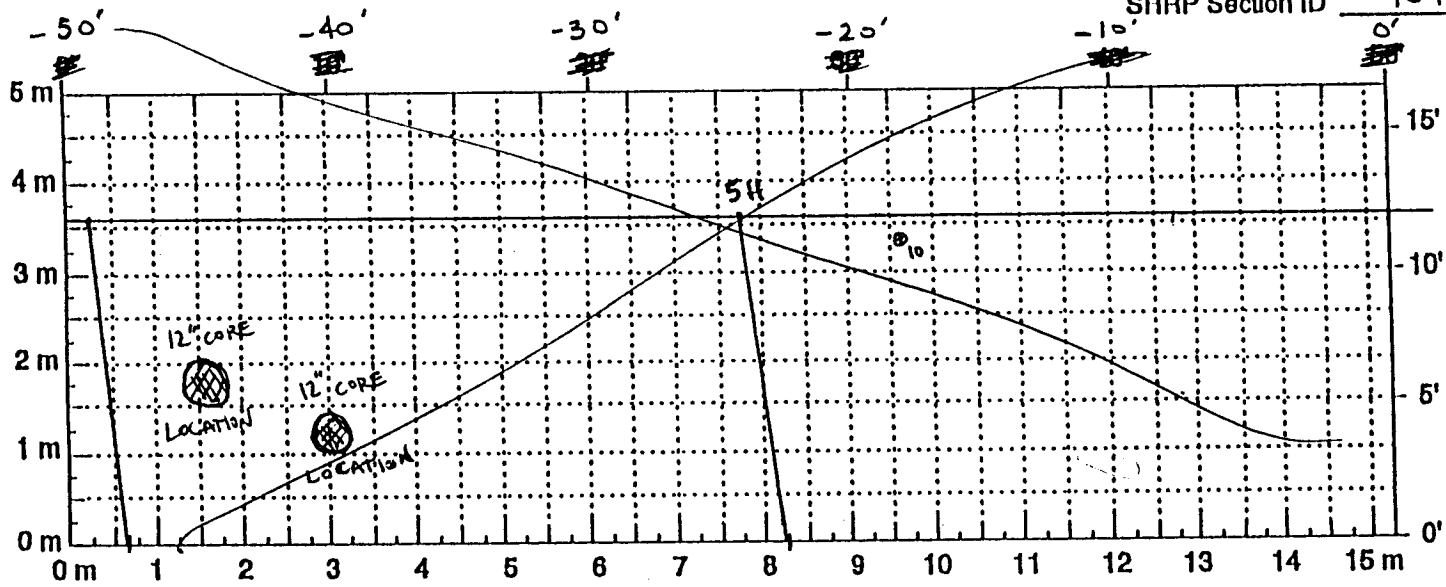
Comments: ℄ CROSSOVER IN MEDIAN @ Sta. 4+77

— PIEZOMETER @ Sta. 4+50

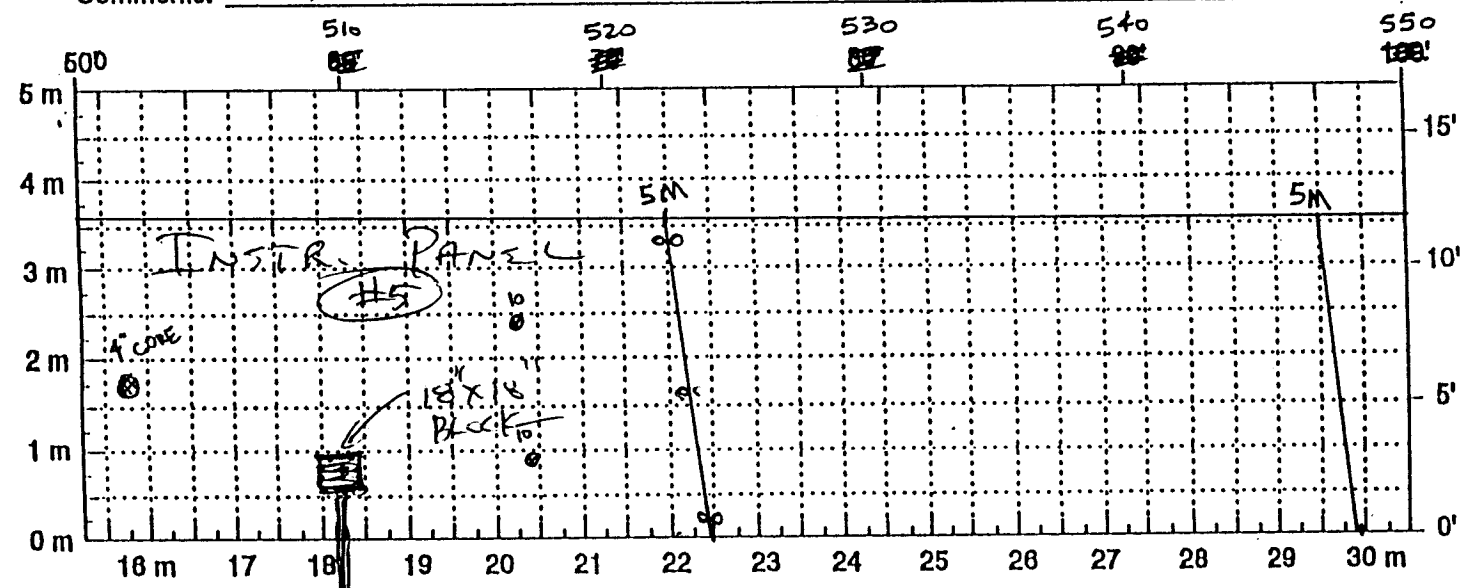
State Assigned ID _____

State Code 27

SHRP Section ID 4040



Comments: SEASONAL MONITORING INSTRUMENTATION LOCATIONS



Comments: Inst. Block @ 5+10 in OWP

FHWA/SHRP-LTPP GPS TEMPERATURE FORM

SHRP NORTH CENTRAL REGION

SHRP SECTION I.D. # 274040

AGENCY MINNESOTA

TESTING GPS

ROUTE/HIGHWAY # US-10

FIELD SET # B

TESTING DATE 7/28/93

SHEET # ____ OF ____

LOCATION 1 STATION 0-05

DEPTH MILTIME	D1 = 1.2	D2 = 4.0	D3 = 6.8	D4 = —	D5 = —	WEATHER CONDITIONS
0913	70.2	70.3	71.8			PC
1026	73.9	72.5	72.1			C
1125	74.8	73.9	72.8			C
1217	76.2	74.1	73.1			C
1322	77.4	75.5	74.1			C (MIST)
1416	75.9	76.0	74.2			C (MIST)
1515	78.6	76.2	73.3			C (MIST)

COMMENTS

LOCATION 2 STATION 5+03

DEPTH MILTIME	D1 = 1.1	D2 = 4.1	D3 = 7.5	D4 = —	D5 = —	WEATHER CONDITIONS
0945	72.8	70.7	71.5			PC
1045	75.2	72.8	72.0			C
1145	75.5	74.1	72.8			C
1250	75.3	74.2	72.9			C
1344	78.6	75.8	73.9			C (MIST)
1450	78.4	76.1	74.4			C (MIST)

COMMENTS

NOTE: USE ONLY THESE WEATHER TERMS; (S)SUNNY, (PC)PARTLY CLOUDY, (C)CLOUDY, (R)RAIN

TESTING COMPLETED BY:
BRAUN INTERTEC PAVEMENT INC.
FWD S/N 8002-063 (Braun FWD)

BJP
FWD OPERATOR

7/28/93
DATE

File: C:\FWD\DATA\274040B1.FWD
Road: US-2 WESTBOUND LANES 10 MILES WEST OF GRAND RAPIDS, MN.
Subsection: 274040

FWD S/N : 8002-063
Operator ID : PELKEY, BRUCE J.

EXTRA TEST FOR SMP

Stationing...: Feet

Diameter of Plate: 11.8
Deflector distances : 8 12 18 24 36 60

SHRP TESTING - RIGID/CRCP - BASIN AND EDGE TEST (J0/C0, J1/C1, J2/C2, J3/C3)
Sequence: CCC2222333344

Stn: 16 Lane:J1 Temp: J/C: Air: 73 PvT: 73 08:57

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	113.0	12400	8.13	7.89	7.63	7.09	6.58	5.59	3.64
	C	113.6	12464	8.17	7.93	7.67	7.22	6.67	5.72	3.77
	C	113.9	12488	8.13	7.89	7.63	7.13	6.58	5.63	3.69
*	2	86.1	9448	6.20	5.95	5.74	5.40	5.07	4.29	2.86
*	2	86.1	9440	6.16	5.90	5.74	5.40	5.02	4.25	2.78
*	2	85.7	9400	6.16	5.90	5.74	5.40	5.02	4.25	2.82
*	2	85.5	9376	6.20	5.90	5.70	5.40	5.02	4.29	2.82
*	3	113.5	12448	8.13	7.93	7.63	7.13	6.62	5.63	3.69
*	3	113.3	12424	8.13	7.84	7.58	7.13	6.62	5.63	3.69
*	3	113.5	12448	8.17	7.89	7.58	7.18	6.67	5.59	3.69
*	3	113.5	12448	8.21	7.93	7.63	7.22	6.67	5.68	3.73
*	4	144.8	15872	10.43	10.08	9.77	9.16	8.49	7.13	4.68
*	4	144.8	15872	10.52	10.13	9.81	9.20	8.58	7.28	4.73
*	4	144.5	15840	10.47	10.13	9.77	9.20	8.53	7.19	4.68
*	4	144.6	15856	10.47	10.13	9.81	9.20	8.53	7.28	4.73

TAKE OUT TEST

Stn: -35 Lane:J1 Temp: J/C: Air: 73 PvT: 72 09:02

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.8	12368	8.38	8.14	7.84	7.39	6.80	5.76	3.82
	C	113.2	12408	8.42	8.10	7.84	7.35	6.85	5.76	3.82
	C	113.3	12424	8.42	8.10	7.84	7.35	6.85	5.76	3.82
*	2	85.8	9408	6.33	6.12	5.87	5.57	5.16	4.38	2.95
*	2	85.2	9336	6.28	6.08	5.87	5.53	5.16	4.33	2.91
*	2	85.9	9432	6.33	6.12	5.91	5.57	5.16	4.38	2.95
*	2	85.9	9416	6.28	6.12	5.91	5.57	5.16	4.38	2.95
*	3	113.5	12448	8.42	8.14	7.88	7.39	6.89	5.85	3.90
*	3	113.3	12432	8.38	8.10	7.80	7.39	6.80	5.76	3.82
*	3	113.5	12448	8.38	8.10	7.84	7.39	6.80	5.76	3.77
*	3	113.8	12472	8.34	8.14	7.84	7.39	6.85	5.76	3.86
*	4	144.8	15872	10.85	10.43	10.07	9.50	8.80	7.41	4.90
*	4	144.3	15832	10.81	10.47	10.07	9.50	8.80	7.41	4.94
*	4	144.5	15840	10.81	10.43	10.07	9.50	8.80	7.41	4.94
*	4	144.6	15856	10.77	10.38	10.03	9.46	8.76	7.36	4.86

Stn: -12 Lane:J1 Temp: J/C: Air: 73 PvT: 74 09:05

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	113.5	12440	8.38	8.10	7.84	7.43	6.85	5.76	3.77
	C	114.1	12504	8.42	8.14	7.88	7.43	6.85	5.76	3.77
	C	114.1	12504	8.46	8.19	7.93	7.43	6.89	5.76	3.77
*	2	85.8	9408	6.37	6.08	5.91	5.57	5.16	4.38	2.86
*	2	86.2	9456	6.41	6.08	5.87	5.53	5.16	4.33	2.82
*	2	85.9	9424	6.45	6.12	5.91	5.61	5.20	4.38	2.86
*	2	85.9	9432	6.45	6.12	5.91	5.57	5.16	4.33	2.86
*	3	113.6	12456	8.46	8.14	7.88	7.43	6.85	5.76	3.77
*	3	113.8	12472	8.42	8.14	7.88	7.39	6.89	5.76	3.77
*	3	113.8	12472	8.42	8.14	7.84	7.39	6.85	5.72	3.73
*	3	114.1	12504	8.46	8.19	7.88	7.43	6.89	5.81	3.77
*	4	144.5	15832	10.81	10.47	10.11	9.54	8.80	7.36	4.86
*	4	144.6	15856	10.81	10.43	10.07	9.50	8.76	7.32	4.73
*	4	144.6	15864	10.77	10.43	10.03	9.50	8.80	7.41	4.77
*	4	145.1	15904	10.81	10.47	10.11	9.54	8.85	7.36	4.77

Stn: 16 Lane:J1 Temp: J/C: Air: 75 PvT: 74 09:08

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	113.6	12456	8.13	8.01	7.75	7.26	6.76	5.72	3.77
	C	113.9	12496	8.13	7.93	7.71	7.26	6.71	5.68	3.73

File: C:\FWD\DATA\274040B1.FWD
Road: US-2 WESTBOUND LANES 10 MILES WEST OF GRAND RAPIDS, MN.
Subsection: 274040

	C	113.9	12488	8.21	7.97	7.75	7.26	6.71	5.72	3.77
*	2	86.1	9440	6.24	6.08	5.83	5.45	5.07	4.33	2.86
*	2	86.1	9440	6.24	6.03	5.78	5.45	5.02	4.29	2.82
*	2	86.1	9440	6.28	6.08	5.83	5.45	5.07	4.33	2.86
*	2	85.8	9408	6.24	6.03	5.78	5.40	5.02	4.29	2.82
*	3	113.6	12456	8.17	7.97	7.71	7.26	6.76	5.72	3.77
*	3	113.8	12464	8.13	7.89	7.67	7.22	6.67	5.63	3.69
*	3	113.8	12464	8.13	7.93	7.71	7.26	6.76	5.76	3.77
*	3	113.8	12472	8.17	7.97	7.71	7.26	6.76	5.76	3.77
*	4	144.2	15816	10.56	10.17	9.85	9.29	8.62	7.32	4.77
*	4	144.5	15848	10.56	10.26	9.90	9.29	8.58	7.28	4.73
*	4	143.8	15760	10.52	10.26	9.85	9.24	8.58	7.28	4.73
*	4	144.5	15832	10.52	10.13	9.81	9.24	8.58	7.23	4.73

Stn: 46 Lane:J1 Temp: J/C: Air: 75 PvT: 73 09:11

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	114.6	12560	7.58	7.50	7.28	6.80	6.31	5.46	3.56
	C	114.9	12600	7.67	7.50	7.33	6.88	6.36	5.50	3.60
	C	115.1	12608	7.67	7.50	7.28	6.88	6.36	5.46	3.60
*	2	86.5	9480	5.82	5.60	5.44	5.15	4.76	4.12	2.73
*	2	86.5	9480	5.87	5.60	5.44	5.11	4.76	4.12	2.73
*	2	86.5	9488	5.95	5.69	5.53	5.19	4.84	4.20	2.82
*	2	86.4	9472	5.87	5.60	5.44	5.15	4.76	4.12	2.69
*	3	114.6	12560	7.62	7.45	7.24	6.84	6.36	5.37	3.56
*	3	114.8	12592	7.67	7.54	7.28	6.88	6.40	5.42	3.60
*	3	114.8	12592	7.71	7.50	7.28	6.88	6.36	5.46	3.56
*	3	114.5	12544	7.62	7.50	7.28	6.84	6.36	5.42	3.56
*	4	146.4	16048	10.05	9.65	9.34	8.82	8.18	6.93	4.55
*	4	146.2	16040	10.01	9.65	9.34	8.78	8.18	6.97	4.55
*	4	145.9	16000	10.01	9.65	9.34	8.82	8.18	6.93	4.60
*	4	146.2	16032	10.05	9.74	9.34	8.91	8.27	6.97	4.64

Stn: 75 Lane:J1 Temp: J/C: Air: 75 PvT: 74 09:13

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	113.9	12488	8.04	7.84	7.63	7.22	6.71	5.72	3.82
	C	114.3	12528	8.00	7.89	7.63	7.22	6.71	5.76	3.86
	C	114.2	12520	8.00	7.89	7.63	7.22	6.71	5.72	3.86
*	2	85.7	9392	6.12	5.86	5.74	5.45	5.11	4.33	2.91
*	2	86.1	9440	6.12	5.86	5.70	5.45	5.07	4.29	2.86
*	2	85.8	9408	6.16	5.90	5.74	5.40	5.07	4.33	2.91
*	2	86.1	9440	6.12	5.90	5.70	5.40	5.07	4.33	2.91
*	3	113.9	12488	8.09	7.93	7.63	7.26	6.71	5.76	3.86
*	3	114.1	12512	8.04	7.89	7.63	7.22	6.71	5.76	3.86
*	3	114.2	12520	8.04	7.89	7.63	7.22	6.71	5.76	3.86
*	3	113.8	12480	8.00	7.84	7.63	7.18	6.67	5.72	3.82
*	4	146.2	16024	10.52	10.13	9.85	9.33	8.67	7.41	4.94
*	4	145.7	15968	10.47	10.08	9.85	9.33	8.71	7.36	4.90
*	4	145.8	15992	10.52	10.13	9.90	9.37	8.76	7.41	4.94
*	4	145.8	15992	10.52	10.13	9.85	9.37	8.71	7.36	4.90

Stn: 101 Lane:J1 Temp: J/C: Air: 76 PvT: 74 09:16

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	114.1	12504	8.80	8.49	8.27	7.77	7.20	6.11	4.08
	C	114.3	12544	8.80	8.49	8.27	7.73	7.20	6.11	4.08
	C	114.1	12504	8.76	8.49	8.23	7.77	7.20	6.11	4.08
*	2	85.4	9360	6.62	6.42	6.21	5.91	5.42	4.64	3.12
*	2	85.8	9408	6.62	6.33	6.17	5.83	5.42	4.59	3.08
*	2	85.8	9408	6.66	6.42	6.17	5.83	5.42	4.64	3.12
*	2	85.4	9368	6.58	6.38	6.21	5.83	5.42	4.64	3.12
*	3	113.8	12480	8.76	8.49	8.27	7.77	7.20	6.11	4.08
*	3	113.9	12488	8.80	8.49	8.27	7.77	7.25	6.11	4.08
*	3	113.9	12496	8.80	8.49	8.27	7.81	7.25	6.15	4.12
*	3	114.3	12544	8.80	8.49	8.27	7.77	7.20	6.15	4.08
*	4	146.4	16048	11.44	11.03	10.67	10.05	9.29	7.88	5.25
*	4	146.1	16008	11.48	11.03	10.71	10.09	9.38	7.97	5.29
*	4	145.8	15992	11.40	10.99	10.71	10.00	9.29	7.88	5.25
*	4	146.2	16032	11.40	10.99	10.71	10.05	9.33	7.88	5.20

Stn: 128 Lane:J1 Temp: J/C: Air: 76 PvT: 75 09:18

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	114.1	12504	8.13	7.93	7.63	7.26	6.67	5.76	3.82

File: C:\FWD\DATA\274040B1.FWD
Road: US-2 WESTBOUND LANES 10 MILES WEST OF GRAND RAPIDS, MN.
Subsection: 274040

	C	114.2	12512	8.09	7.93	7.58	7.22	6.67	5.72	3.82
	C	114.1	12504	8.00	7.89	7.63	7.22	6.67	5.72	3.82
*	2	85.2	9344	6.28	5.95	5.74	5.45	5.07	4.38	2.95
*	2	85.1	9328	6.24	5.95	5.70	5.45	5.02	4.38	2.95
*	2	85.5	9376	6.12	5.90	5.66	5.36	4.98	4.29	2.86
*	2	84.9	9312	6.16	5.90	5.66	5.40	4.98	4.29	2.86
*	3	114.2	12512	8.00	7.84	7.58	7.22	6.62	5.72	3.77
*	3	114.3	12536	8.00	7.89	7.58	7.18	6.62	5.68	3.77
*	3	114.6	12568	8.00	7.89	7.58	7.22	6.67	5.72	3.82
*	3	114.1	12504	8.00	7.89	7.58	7.18	6.62	5.68	3.77
*	4	146.7	16072	10.56	10.21	9.85	9.37	8.67	7.41	4.90
*	4	146.8	16104	10.52	10.17	9.81	9.33	8.62	7.36	4.86
*	4	146.7	16072	10.56	10.17	9.77	9.33	8.58	7.36	4.81
*	4	147.0	16112	10.60	10.26	9.85	9.37	8.62	7.41	4.90

Stn: 155 Lane:J1 Temp: J/C: Air: 76 PvT: 75 09:21

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	113.8	12472	8.17	7.97	7.71	7.39	6.76	5.81	3.82
	C	114.2	12528	8.21	8.06	7.80	7.39	6.89	5.85	3.86
	C	113.9	12488	8.21	8.01	7.75	7.39	6.80	5.81	3.86
*	2	85.1	9336	6.24	6.03	5.78	5.53	5.11	4.38	2.91
*	2	85.4	9352	6.24	6.03	5.83	5.53	5.16	4.38	2.95
*	2	85.1	9336	6.16	5.95	5.74	5.49	5.07	4.29	2.86
*	2	85.2	9344	6.20	5.99	5.78	5.49	5.07	4.29	2.86
*	3	114.1	12496	8.13	7.97	7.71	7.26	6.80	5.76	3.77
*	3	113.9	12488	8.17	7.97	7.71	7.39	6.71	5.76	3.77
*	3	114.1	12504	8.17	7.97	7.75	7.35	6.80	5.81	3.82
*	3	114.1	12496	8.17	7.97	7.71	7.35	6.76	5.76	3.77
*	4	146.2	16032	10.68	10.34	10.03	9.46	8.85	7.45	4.90
*	4	146.4	16048	10.68	10.34	10.03	9.54	8.80	7.49	4.90
*	4	146.2	16040	10.68	10.34	10.03	9.50	8.80	7.45	4.86
*	4	146.2	16040	10.68	10.38	10.03	9.58	8.85	7.54	4.94

Stn: 182 Lane:J1 Temp: J/C: Air: 76 PvT: 75 09:26

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	113.9	12496	8.00	7.80	7.54	7.18	6.58	5.63	3.73
	C	113.8	12472	7.96	7.80	7.54	7.09	6.58	5.59	3.73
	C	113.9	12488	8.00	7.80	7.54	7.09	6.62	5.63	3.77
*	2	84.8	9288	5.99	5.82	5.61	5.32	4.84	4.20	2.82
*	2	84.9	9304	6.07	5.86	5.66	5.36	4.84	4.25	2.86
*	2	84.8	9296	6.03	5.86	5.66	5.36	4.89	4.25	2.86
*	2	84.5	9272	6.03	5.77	5.61	5.32	4.84	4.20	2.78
*	3	113.9	12496	8.00	7.80	7.54	7.13	6.58	5.63	3.73
*	3	113.9	12488	8.04	7.80	7.54	7.13	6.53	5.63	3.73
*	3	113.8	12472	8.09	7.80	7.54	7.13	6.58	5.63	3.73
*	3	113.8	12472	8.00	7.76	7.50	7.13	6.58	5.59	3.73
*	4	147.1	16128	10.43	10.13	9.77	9.20	8.53	7.28	4.81
*	4	147.0	16112	10.35	10.04	9.73	9.16	8.53	7.23	4.77
*	4	146.8	16096	10.35	10.08	9.77	9.24	8.40	7.23	4.77
*	4	146.5	16064	10.35	10.04	9.68	9.16	8.49	7.19	4.77

Stn: 211 Lane:J1 Temp: J/C: Air: 75 PvT: 75 09:29

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	113.0	12392	8.30	8.10	7.84	7.39	6.85	5.85	3.90
	C	113.2	12408	8.34	8.10	7.88	7.39	6.89	5.85	3.95
	C	113.2	12408	8.38	8.14	7.88	7.43	6.93	5.94	3.99
*	2	84.5	9264	6.33	6.08	5.91	5.53	5.20	4.46	2.99
*	2	84.2	9224	6.33	6.08	5.87	5.53	5.20	4.46	2.99
*	2	84.5	9264	6.37	6.16	5.96	5.61	5.24	4.46	3.04
*	2	84.3	9248	6.28	6.08	5.91	5.53	5.20	4.42	2.99
*	3	113.3	12424	8.34	8.19	7.93	7.47	6.98	5.94	4.03
*	3	113.5	12448	8.34	8.10	7.88	7.43	6.85	5.94	3.99
*	3	113.3	12424	8.30	8.10	7.84	7.39	6.89	5.89	3.95
*	3	113.3	12432	8.34	8.14	7.88	7.43	6.89	5.94	3.99
*	4	145.8	15992	10.93	10.56	10.20	9.58	9.02	7.49	5.07
*	4	145.4	15944	10.85	10.51	10.20	9.58	9.02	7.54	5.07
*	4	146.1	16016	10.93	10.60	10.28	9.62	9.11	7.54	5.07
*	4	145.7	15960	10.93	10.60	10.33	9.67	9.11	7.58	5.16

File: C:\FWD\DATA\274040B1.FWD
Road: US-2 WESTBOUND LANES 10 MILES WEST OF GRAND RAPIDS, MN.
Subsection: 274040

Stn: 238 Lane:J1 Temp: J/C: Air: 76 PvT: 75 09:32

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	113.0	12392	8.84	8.53	8.23	7.77	7.20	6.07	4.08
	C	113.2	12400	8.76	8.45	8.18	7.68	7.16	5.98	3.99
	C	113.2	12400	8.80	8.49	8.23	7.73	7.20	6.02	4.03
*	2	84.9	9320	6.58	6.33	6.13	5.78	5.38	4.59	3.12
*	2	84.8	9296	6.54	6.29	6.13	5.78	5.38	4.59	3.08
*	2	85.2	9336	6.54	6.29	6.13	5.74	5.33	4.59	3.04
*	2	84.9	9312	6.54	6.33	6.13	5.78	5.38	4.59	3.08
*	3	113.2	12400	8.80	8.53	8.18	7.77	7.16	6.11	4.08
*	3	113.0	12400	8.71	8.49	8.18	7.68	7.16	6.02	4.03
*	3	113.2	12416	8.71	8.40	8.14	7.68	7.16	6.02	3.99
*	3	113.0	12400	8.76	8.53	8.23	7.73	7.20	6.02	4.08
*	4	144.9	15888	11.52	11.03	10.67	10.00	9.29	7.84	5.20
*	4	144.6	15856	11.44	11.03	10.63	10.05	9.33	7.80	5.20
*	4	144.8	15880	11.44	10.99	10.67	10.00	9.33	7.84	5.16
*	4	145.1	15904	11.44	11.03	10.67	10.00	9.33	7.84	5.16

Stn: 264 Lane:J1 Temp: J/C: Air: 77 PvT: 76 09:34

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	113.2	12408	8.67	8.36	8.10	7.60	7.02	5.94	3.90
	C	113.6	12456	8.71	8.40	8.14	7.64	7.02	6.02	3.95
	C	113.6	12464	8.71	8.49	8.18	7.73	7.11	6.07	4.03
*	2	84.3	9248	6.66	6.29	6.08	5.74	5.29	4.55	3.08
*	2	84.3	9248	6.66	6.38	6.17	5.78	5.38	4.59	3.12
*	2	84.3	9256	6.66	6.33	6.13	5.74	5.33	4.55	3.04
*	2	84.3	9256	6.62	6.33	6.13	5.74	5.29	4.55	3.04
*	3	113.5	12448	8.67	8.45	8.14	7.64	7.07	6.02	4.03
*	3	113.8	12464	8.63	8.45	8.14	7.64	7.02	6.02	3.99
*	3	113.6	12464	8.67	8.40	8.14	7.64	7.02	6.02	3.95
*	3	113.5	12440	8.67	8.45	8.18	7.68	7.11	6.07	4.08
*	4	147.0	16104	11.44	10.94	10.54	9.92	9.11	7.75	5.12
*	4	147.1	16136	11.44	10.99	10.58	9.96	9.16	7.80	5.12
*	4	147.2	16152	11.48	10.99	10.63	9.96	9.16	7.80	5.12
*	4	147.1	16136	11.48	10.99	10.63	9.96	9.20	7.84	5.16

Stn: 291 Lane:J1 Temp: J/C: Air: 77 PvT: 76 09:38

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.8	12360	8.88	8.53	8.23	7.77	7.20	6.07	3.99
	C	112.5	12336	8.84	8.49	8.18	7.68	7.11	5.98	3.90
	C	112.6	12344	8.84	8.49	8.18	7.73	7.16	6.02	3.95
*	2	84.2	9224	6.66	6.33	6.08	5.74	5.33	4.51	2.95
*	2	84.2	9240	6.75	6.42	6.17	5.83	5.42	4.59	3.08
*	2	84.1	9208	6.66	6.33	6.13	5.74	5.33	4.51	2.99
*	2	84.1	9216	6.70	6.33	6.08	5.74	5.33	4.51	2.99
*	3	112.9	12376	8.84	8.49	8.18	7.68	7.11	6.02	3.90
*	3	112.9	12376	8.84	8.45	8.18	7.68	7.11	5.98	3.90
*	3	112.8	12368	8.84	8.49	8.23	7.73	7.16	6.02	3.95
*	3	112.6	12352	8.84	8.49	8.23	7.73	7.11	6.02	3.90
*	4	145.5	15952	11.56	11.03	10.67	10.00	9.20	7.75	5.07
*	4	145.1	15912	11.60	11.07	10.67	10.00	9.29	7.80	5.07
*	4	145.7	15976	11.60	11.07	10.67	10.05	9.29	7.80	5.07
*	4	145.5	15952	11.69	11.16	10.75	10.13	9.38	7.88	5.16

Stn: 320 Lane:J1 Temp: J/C: Air: 77 PvT: 78 09:42

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	113.8	12480	7.88	7.76	7.50	7.09	6.62	5.68	3.82
	C	113.9	12488	7.92	7.80	7.54	7.18	6.67	5.76	3.90
	C	114.2	12520	7.92	7.76	7.54	7.18	6.76	5.72	3.90
*	2	85.1	9328	6.03	5.82	5.66	5.36	5.07V	4.33	2.99
*	2	85.2	9352	6.03	5.77	5.61	5.32	4.84 -	4.29	2.91
*	2	85.1	9328	6.03	5.77	5.61	5.32	4.89	4.29	2.91
*	2	85.4	9360	6.03	5.82	5.66	5.36	4.93	4.33	2.95
*	3	113.9	12488	7.92	7.76	7.54	7.13	6.58	5.72	3.86
*	3	113.6	12464	7.92	7.80	7.54	7.13	6.62	5.76	3.90
*	3	114.1	12504	7.96	7.84	7.58	7.22	6.76	5.81	3.95
*	3	113.8	12480	7.92	7.76	7.54	7.13	6.71	5.72	3.90
*	4	146.2	16024	10.43	10.04	9.77	9.24	8.67	7.41	4.99
*	4	146.4	16056	10.43	10.08	9.81	9.29	8.71	7.41	5.03
*	4	146.2	16024	10.47	10.08	9.77	9.29	8.67	7.45	4.99
*	4	145.8	15984	10.47	10.13	9.85	9.37	8.76	7.49	5.07

File: C:\FWD\DATA\274040B1.FWD
Road: US-2 WESTBOUND LANES 10 MILES WEST OF GRAND RAPIDS, MN.
Subsection: 274040

'ACCEPTED TEST WITH VARATION

Stn: 346 Lane:J1 Temp: J/C: Air: 77 PvT: 77 09:44

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.6	12336	8.42	8.19	7.97	7.47	6.89	5.81	3.86
	C	112.8	12368	8.42	8.19	7.97	7.51	6.89	5.81	3.86
	C	112.8	12368	8.50	8.23	7.97	7.56	6.93	5.89	3.90
*	2	84.8	9304	6.45	6.20	6.00	5.66	5.29	4.51	3.04
*	2	84.6	9288	6.41	6.12	5.91	5.57	5.20	4.42	2.95
*	2	84.9	9312	6.49	6.20	6.00	5.66	5.29	4.51	3.08
*	2	84.5	9272	6.41	6.08	5.96	5.57	5.16	4.38	2.95
*	3	112.6	12336	8.50	8.23	7.97	7.56	6.98	5.98	3.99
*	3	113.2	12408	8.46	8.23	7.97	7.47	6.98	5.89	3.90
*	3	112.6	12352	8.42	8.19	7.97	7.51	6.93	5.89	3.90
*	3	112.8	12360	8.55	8.23	8.01	7.56	6.98	5.94	3.99
*	4	144.3	15832	11.06	10.64	10.28	9.71	9.07	7.67	5.07
*	4	144.2	15816	11.02	10.64	10.28	9.75	9.02	7.67	5.07
*	4	144.2	15808	11.02	10.60	10.24	9.67	9.02	7.62	5.03
*	4	144.3	15832	11.10	10.69	10.33	9.75	9.11	7.71	5.12

Stn: 376 Lane:J1 Temp: J/C: Air: 77 PvT: 78 09:47

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.6	12344	8.00	7.80	7.58	7.18	6.67	5.72	3.82
	C	112.6	12352	7.96	7.84	7.58	7.18	6.71	5.72	3.86
	C	113.0	12392	7.92	7.84	7.58	7.18	6.71	5.68	3.82
*	2	84.8	9304	6.16	5.90	5.74	5.40	5.11	4.33	2.99
*	2	84.9	9312	6.07	5.86	5.70	5.36	5.07	4.33	2.95
*	2	84.9	9312	6.03	5.86	5.66	5.36	5.07	4.29	2.91
*	2	84.2	9240	6.16	5.90	5.70	5.40	5.11	4.33	2.95
*	3	112.9	12376	8.00	7.84	7.63	7.18	6.76	5.76	3.90
*	3	112.9	12384	8.00	7.89	7.63	7.22	6.76	5.76	3.86
*	3	112.8	12360	8.00	7.89	7.63	7.22	6.76	5.72	3.90
*	3	112.9	12376	7.96	7.84	7.58	7.18	6.76	5.68	3.86
*	4	143.9	15776	10.52	10.13	9.85	9.29	8.71	7.41	4.99
*	4	143.8	15760	10.52	10.17	9.85	9.24	8.80	7.41	4.99
*	4	144.1	15792	10.56	10.21	9.94	9.29	8.85	7.36	5.03
*	4	143.6	15752	10.47	10.17	9.90	9.24	8.80	7.36	4.99

Stn: 402 Lane:J1 Temp: J/C: Air: 76 PvT: 77 09:50

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.6	12352	8.46	8.19	7.97	7.51	6.98	5.98	3.90
	C	112.8	12368	8.46	8.19	7.97	7.51	6.98	5.98	3.95
	C	112.8	12360	8.42	8.19	7.93	7.47	6.98	5.94	3.95
*	2	84.3	9248	6.45	6.16	5.96	5.66	5.29	4.51	2.99
*	2	84.2	9240	6.45	6.16	6.00	5.66	5.29	4.55	3.04
*	2	84.2	9240	6.45	6.20	6.00	5.66	5.33	4.55	3.04
*	2	84.3	9248	6.41	6.16	5.96	5.61	5.24	4.51	2.99
*	3	112.6	12352	8.42	8.19	7.93	7.47	6.98	5.98	3.95
*	3	112.8	12368	8.46	8.23	7.93	7.51	6.98	5.98	3.95
*	3	112.5	12328	8.46	8.23	7.97	7.56	7.07	6.02	3.99
*	3	112.8	12368	8.46	8.14	7.93	7.47	6.98	5.98	3.90
*	4	145.1	15904	10.98	10.60	10.28	9.67	9.02	7.71	5.07
*	4	145.1	15904	11.02	10.60	10.33	9.75	9.11	7.75	5.12
*	4	144.9	15896	10.98	10.64	10.28	9.71	9.07	7.75	5.12
*	4	144.9	15888	11.06	10.69	10.33	9.79	9.16	7.75	5.16

Stn: 427 Lane:J1 Temp: J/C: Air: 77 PvT: 78 09:54

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	113.2	12408	8.55	8.32	8.05	7.64	7.07	6.02	4.08
	C	113.3	12424	8.55	8.32	8.01	7.60	7.07	6.02	4.03
	C	113.5	12440	8.55	8.27	8.01	7.60	7.07	6.02	4.03
*	2	84.3	9248	6.41	6.20	6.00	5.74	5.33	4.55	3.08
*	2	84.5	9272	6.54	6.25	6.04	5.74	5.33	4.59	3.12
*	2	84.6	9280	6.49	6.25	6.04	5.78	5.38	4.59	3.08
*	2	84.5	9264	6.54	6.29	6.04	5.74	5.33	4.59	3.17
*	3	113.5	12448	8.59	8.32	8.05	7.64	7.07	6.07	4.08
*	3	113.8	12472	8.63	8.40	8.10	7.68	7.11	6.07	4.12
*	3	113.3	12432	8.59	8.32	8.01	7.60	7.07	6.02	4.08
*	3	113.6	12456	8.55	8.32	8.01	7.60	7.07	6.02	4.08

File: C:\FWD\DATA\274040B1.FWD
Road: US-2 WESTBOUND LANES 10 MILES WEST OF GRAND RAPIDS, MN.
Subsection: 274040

*	4	146.2	16024	11.14	10.82	10.45	9.88	9.25	7.80	5.25
*	4	146.2	16024	11.19	10.82	10.50	9.88	9.25	7.80	5.20
*	4	146.1	16024	11.19	10.82	10.45	9.92	9.25	7.84	5.25
*	4	146.2	16024	11.14	10.82	10.45	9.88	9.16	7.80	5.25

Stn: 455 Lane:J1 Temp: J/C: Air: 77 PvT: 78 09:57

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	113.0	12392	8.50	8.27	8.05	7.60	7.11	5.98	4.03
	C	113.3	12424	8.50	8.32	8.05	7.60	7.07	6.02	4.08
	C	113.2	12408	8.50	8.27	8.01	7.60	7.07	6.02	4.03
*	2	84.9	9304	6.49	6.20	6.00	5.70	5.29	4.55	3.08
*	2	84.9	9312	6.49	6.20	6.00	5.70	5.33	4.55	3.08
*	2	85.2	9336	6.49	6.16	6.00	5.70	5.29	4.51	3.04
*	2	85.1	9328	6.41	6.20	6.00	5.66	5.29	4.51	3.04
*	3	112.9	12376	8.50	8.27	8.01	7.56	7.11	5.98	4.03
*	3	113.3	12432	8.55	8.27	8.01	7.60	7.07	5.98	4.03
*	3	112.8	12368	8.50	8.27	8.01	7.56	7.07	5.98	4.03
*	3	113.2	12408	8.59	8.32	8.05	7.64	7.16	6.07	4.08
*	4	144.2	15800	11.02	10.64	10.33	9.75	9.11	7.71	5.16
*	4	144.2	15816	10.98	10.69	10.33	9.79	9.16	7.75	5.16
*	4	144.2	15816	11.02	10.73	10.37	9.84	9.16	7.75	5.20
*	4	144.2	15800	10.98	10.73	10.41	9.84	9.16	7.80	5.20

Stn: 484 Lane:J1 Temp: J/C: Air: 77 PvT: 79 10:01

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.6	12352	8.63	8.36	8.10	7.68	7.11	6.07	4.03
	C	112.8	12360	8.67	8.40	8.14	7.68	7.11	6.07	4.03
	C	112.9	12376	8.71	8.40	8.14	7.68	7.16	6.11	4.03
*	2	84.3	9256	6.49	6.29	6.08	5.70	5.33	4.55	2.99
*	2	84.2	9224	6.54	6.25	6.08	5.74	5.33	4.55	3.04
*	2	84.1	9208	6.49	6.25	6.04	5.70	5.29	4.55	2.99
*	2	83.9	9200	6.45	6.25	6.04	5.74	5.33	4.51	2.99
*	3	112.6	12336	8.67	8.36	8.10	7.64	7.11	6.02	4.03
*	3	112.6	12344	8.71	8.40	8.14	7.68	7.16	6.07	4.03
*	3	112.8	12360	8.67	8.45	8.14	7.68	7.11	6.07	4.03
*	3	112.9	12376	8.67	8.40	8.14	7.68	7.16	6.11	4.03
*	4	144.9	15896	11.31	10.90	10.54	9.92	9.25	7.80	5.16
*	4	145.1	15912	11.35	10.86	10.50	9.92	9.25	7.88	5.16
*	4	144.8	15880	11.27	10.90	10.54	9.96	9.25	7.84	5.20
*	4	145.1	15912	11.35	10.86	10.54	9.92	9.25	7.84	5.16

Stn: 510 Lane:J1 Temp: J/C: Air: 78 PvT: 80 10:07

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.8	12368	8.80	8.45	8.14	7.64	7.11	6.02	3.99
	C	112.8	12368	8.71	8.32	8.10	7.56	7.07	5.98	3.95
	C	112.8	12368	8.76	8.40	8.10	7.64	7.11	6.02	3.99
*	2	84.5	9264	6.49	6.25	6.04	5.70	5.29	4.46	2.99
*	2	84.5	9272	6.54	6.20	6.08	5.70	5.29	4.51	2.99
*	2	84.5	9264	6.54	6.20	6.04	5.66	5.29	4.46	2.95
*	2	84.3	9240	6.49	6.25	6.04	5.66	5.29	4.51	2.99
*	3	112.9	12376	8.76	8.40	8.10	7.60	7.11	6.02	3.99
*	3	112.5	12336	8.76	8.40	8.10	7.64	7.07	5.98	3.99
*	3	112.9	12376	8.80	8.40	8.14	7.68	7.11	6.02	3.99
*	3	112.8	12368	8.80	8.45	8.14	7.64	7.16	6.02	4.03
*	4	144.6	15856	11.40	10.86	10.54	9.88	9.20	7.75	5.12
*	4	144.6	15856	11.35	10.86	10.54	9.92	9.25	7.80	5.16
*	4	144.3	15824	11.31	10.82	10.50	9.84	9.16	7.75	5.07
*	4	144.3	15832	11.40	10.86	10.50	9.88	9.20	7.80	5.12

Stn: 535 Lane:J1 Temp: J/C: Air: 77 PvT: 80 10:10

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	113.5	12440	8.34	8.01	7.71	7.35	6.76	5.81	3.86
	C	113.2	12408	8.30	8.06	7.75	7.35	6.85	5.85	3.90
	C	113.5	12448	8.30	8.01	7.71	7.30	6.80	5.81	3.82
*	2	84.1	9208	6.41	6.08	5.87	5.57	5.16	4.42	2.95
*	2	84.1	9208	6.33	6.03	5.78	5.53	5.11	4.42	2.95
*	2	84.1	9224	6.37	6.03	5.78	5.53	5.11	4.38	2.95
*	2	84.6	9272	6.37	6.03	5.74	5.49	5.11	4.38	2.95
*	3	113.6	12456	8.30	8.01	7.67	7.35	6.76	5.81	3.86

File: C:\FWD\DATA\274040B1.FWD
Road: US-2 WESTBOUND LANES 10 MILES WEST OF GRAND RAPIDS, MN.
Subsection: 274040

*	3	113.3	12424	8.30	8.06	7.71	7.35	6.76	5.81	3.90
*	3	113.3	12424	8.30	8.01	7.71	7.35	6.80	5.81	3.82
*	3	113.0	12400	8.34	8.06	7.71	7.35	6.80	5.81	3.86
*	4	147.4	16160	10.93	10.43	10.07	9.54	8.89	7.58	4.99
*	4	146.7	16088	10.85	10.38	10.03	9.54	8.85	7.49	4.99
*	4	147.0	16112	10.93	10.51	10.15	9.58	8.93	7.62	5.07
*	4	147.0	16112	10.85	10.47	10.15	9.58	8.89	7.58	5.03

Mileage:-.007 -> .101

File: C:\FWD\DATA\274040B2.FWD
Road: US-2 WESTBOUND LANES 10 MILES WEST OF GRAND RAPIDS, MN.
Subsection: 274040

FWD S/N : 8002-063
Operator ID : PELKEY, BRUCE J.

EXTRA TESTS FOR SMP

Stationing...: Feet

Diameter of Plate: 11.8
Deflector distances : 8 12 18 24 36 60

SHRP TESTING - RIGID/CRCP - BASIN AND EDGE TEST (J0/C0, J1/C1, J2/C2, J3/C3)
Sequence: CCC222233334444

Error: 558

Stn: -48 Lane:J2 Temp: J/C: Air: 77 PvT: 76 10:20

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.1	12080	24.47	21.98	20.61	18.70	16.76	13.39	7.89
	C	110.3	12096	24.51	22.02	20.65	18.74	16.71	13.34	7.81
	C	110.4	12112	24.76	22.32	20.87	18.91	16.93	13.47	7.89
*	2	81.9	8976	19.10	17.11	16.02	14.56	12.93	10.35	6.03
*	2	82.0	8992	19.23	17.19	16.15	14.69	13.07	10.44	6.12
*	2	81.6	8952	19.27	17.24	16.15	14.69	13.07	10.44	6.12
*	2	82.0	8984	19.40	17.28	16.24	14.77	13.11	10.53	6.16
*	3	110.3	12088	25.14	22.54	21.12	19.16	17.16	13.60	7.94
*	3	110.3	12088	25.35	22.71	21.25	19.29	17.25	13.73	8.02
*	3	110.0	12064	25.30	22.75	21.34	19.33	17.29	13.78	8.02
*	3	110.3	12096	25.51	22.92	21.42	19.42	17.38	13.86	8.07
*	4	142.6	15632	32.68	29.21	27.33	24.82	22.22	17.68	10.32
*	4	142.3	15600	33.10	29.34	27.38	24.86	22.27	17.72	10.37
*	4	142.3	15600	33.05	29.60	27.68	25.16	22.58	17.94	10.50
*	4	142.2	15592	33.22	29.69	27.81	25.20	22.58	18.02	10.54

Error: 558

Stn: -35 Lane:J3 Temp: J/C: Air: 78 PvT: 79 10:24

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.0	12280	17.09	16.76	16.24	15.41	14.31	12.17	7.98
	C	112.2	12296	16.84	16.46	16.02	15.11	14.00	11.87	7.72
	C	112.5	12328	17.01	16.63	16.20	15.24	14.18	12.00	7.81
*	2	84.1	9208	12.78	12.41	12.08	11.40	10.58	8.92	5.81
*	2	83.9	9200	12.90	12.41	12.08	11.44	10.58	8.97	5.81
*	2	84.1	9216	12.74	12.41	12.04	11.40	10.58	8.92	5.81
*	2	83.9	9200	12.82	12.45	12.17	11.44	10.62	9.01	5.86
*	3	112.2	12304	16.97	16.55	16.15	15.20	14.09	11.96	7.76
*	3	112.6	12336	17.05	16.63	16.20	15.24	14.13	11.96	7.76
*	3	112.3	12312	17.09	16.72	16.24	15.37	14.18	12.04	7.85
*	3	112.6	12344	17.09	16.72	16.28	15.37	14.22	12.09	7.85
*	4	144.6	15856	22.16	21.59	20.99	19.84	18.31	15.60	10.15
*	4	144.9	15888	22.33	21.72	21.12	19.92	18.45	15.64	10.19
*	4	144.8	15872	22.33	21.72	21.12	19.92	18.45	15.68	10.19
*	4	145.2	15920	22.37	21.80	21.17	19.97	18.53	15.73	10.19

Stn: -22 Lane:J2 Temp: J/C: Air: 78 PvT: 78 10:31

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.7	12032	28.53	25.59	23.91	21.74	19.38	15.38	8.85
	C	109.6	12016	28.53	25.59	23.91	21.70	19.38	15.42	8.94
	C	109.9	12040	28.49	25.55	23.86	21.66	19.29	15.38	8.85
*	2	81.3	8920	21.53	19.22	17.99	16.38	14.58	11.61	6.72
*	2	81.2	8904	21.58	19.22	17.99	16.38	14.58	11.61	6.72
*	2	81.4	8936	21.58	19.26	18.04	16.42	14.62	11.65	6.77
*	2	81.4	8936	21.62	19.26	18.04	16.38	14.58	11.61	6.68
*	3	109.3	11984	28.32	25.38	23.74	21.53	19.20	15.25	8.80
*	3	109.7	12024	28.40	25.51	23.78	21.57	19.29	15.29	8.80
*	3	109.7	12032	28.57	25.55	23.91	21.70	19.29	15.38	8.89
*	3	110.0	12056	28.61	25.55	23.91	21.74	19.33	15.38	8.85
*	4	141.6	15520	36.45	32.62	30.46	27.65	24.62	19.58	11.28
*	4	141.3	15496	36.78	32.92	30.72	27.90	24.85	19.80	11.41
*	4	140.7	15432	36.83	32.92	30.76	27.95	24.89	19.84	11.45
*	4	141.7	15536	36.83	33.01	30.81	27.95	24.94	19.80	11.41

File: C:\FWD\DATA\274040B2.FWD
Road: US-2 WESTBOUND LANES 10 MILES WEST OF GRAND RAPIDS, MN.
Subsection: 274040

Stn: -12 Lane:J3 Temp: J/C: Air: 78 PvT: 79 10:34

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	111.0	12168	20.07	19.43	18.77	17.60	16.27	13.65	8.72
	C	111.2	12184	19.94	19.26	18.59	17.48	16.13	13.47	8.50
	C	111.3	12208	20.11	19.39	18.77	17.60	16.27	13.60	8.63
*	2	82.6	9064	15.21	14.61	14.10	13.25	12.22	10.27	6.51
*	2	82.8	9072	15.21	14.65	14.14	13.30	12.31	10.27	6.59
*	2	82.9	9088	15.21	14.65	14.18	13.30	12.31	10.27	6.55
*	2	82.6	9056	15.21	14.65	14.18	13.30	12.27	10.31	6.55
*	3	110.9	12160	20.15	19.39	18.72	17.60	16.22	13.60	8.54
*	3	111.3	12208	20.19	19.48	18.85	17.69	16.36	13.69	8.67
*	3	111.0	12176	20.15	19.48	18.81	17.69	16.31	13.65	8.63
*	3	110.9	12160	20.28	19.52	18.89	17.77	16.36	13.73	8.72
*	4	142.9	15664	26.10	25.16	24.34	22.84	21.07	17.68	11.19
*	4	143.0	15688	26.35	25.42	24.55	23.01	21.29	17.81	11.28
*	4	143.0	15680	26.35	25.38	24.55	23.05	21.25	17.85	11.28
*	4	143.0	15680	26.48	25.55	24.64	23.22	21.38	17.94	11.36

Stn: 5 Lane:J2 Temp: J/C: Air: 79 PvT: 74 10:39

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.1	12080	23.75	21.24	19.97	18.03	16.05	12.82	7.50
	C	110.4	12112	23.54	21.16	19.84	17.90	15.96	12.69	7.46
	C	110.1	12080	23.71	21.29	19.97	18.03	16.05	12.82	7.55
*	2	82.2	9016	18.39	16.24	15.25	13.80	12.27	9.79	5.77
*	2	82.3	9024	18.22	16.20	15.21	13.72	12.22	9.75	5.73
*	2	82.6	9056	18.27	16.24	15.30	13.80	12.27	9.79	5.77
*	2	82.5	9032	18.22	16.24	15.21	13.76	12.27	9.79	5.73
*	3	110.3	12096	23.84	21.37	20.05	18.11	16.13	12.82	7.50
*	3	110.6	12128	23.92	21.41	20.14	18.15	16.13	12.91	7.55
*	3	110.3	12096	23.88	21.50	20.18	18.24	16.27	13.00	7.59
*	3	110.3	12088	23.96	21.54	20.22	18.24	16.22	12.95	7.59
*	4	141.7	15536	30.79	27.40	25.71	23.22	20.67	16.51	9.67
*	4	141.2	15480	30.92	27.58	25.88	23.34	20.80	16.59	9.76
*	4	141.0	15472	31.04	27.66	25.96	23.43	20.85	16.68	9.80
*	4	141.0	15472	31.13	27.75	26.05	23.51	20.94	16.72	9.85

Stn: 16 Lane:J3 Temp: J/C: Air: 79 PvT: 77 10:42

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	111.4	12224	16.34	15.94	15.38	14.52	13.38	11.26	7.11
	C	111.4	12224	16.21	15.77	15.25	14.35	13.25	11.09	6.94
	C	111.7	12248	16.30	15.81	15.34	14.44	13.33	11.18	6.98
*	2	83.3	9128	12.48	11.94	11.57	10.93	10.09	8.45	5.34
*	2	83.2	9128	12.44	11.89	11.57	10.89	10.05	8.45	5.34
*	2	83.0	9112	12.48	11.94	11.57	10.89	10.05	8.45	5.38
*	2	83.2	9128	12.44	11.94	11.57	10.93	10.09	8.45	5.34
*	3	111.4	12216	16.30	15.86	15.30	14.39	13.29	11.18	6.98
*	3	111.6	12240	16.42	15.94	15.38	14.52	13.38	11.26	7.16
*	3	111.4	12216	16.42	15.90	15.38	14.48	13.33	11.22	7.07
*	3	111.4	12216	16.51	15.99	15.47	14.56	13.42	11.26	7.11
*	4	143.8	15768	21.16	20.47	19.84	18.74	17.25	14.51	9.15
*	4	143.5	15736	21.20	20.64	19.92	18.78	17.29	14.56	9.24
*	4	143.0	15688	21.20	20.60	19.92	18.78	17.33	14.56	9.20
*	4	143.5	15728	21.28	20.68	20.01	18.87	17.42	14.60	9.24

Stn: 32 Lane:J2 Temp: J/C: Air: 79 PvT: 78 10:45

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.7	12144	20.61	18.66	17.57	16.04	14.36	11.48	6.94
	C	111.0	12168	20.24	18.31	17.22	15.70	14.09	11.22	6.68
	C	111.0	12176	20.36	18.40	17.31	15.79	14.09	11.31	6.77
*	2	82.3	9024	15.46	13.83	13.07	11.86	10.62	8.58	5.16
*	2	82.3	9024	15.54	13.83	13.02	11.90	10.67	8.58	5.20
*	2	83.0	9112	15.42	13.87	13.07	11.95	10.67	8.58	5.16
*	2	82.9	9088	15.38	13.83	13.02	11.90	10.67	8.53	5.16
*	3	110.7	12144	20.32	18.36	17.31	15.79	14.09	11.26	6.77
*	3	110.9	12160	20.40	18.40	17.31	15.79	14.13	11.35	6.77
*	3	110.7	12144	20.36	18.36	17.27	15.83	14.13	11.26	6.72
*	3	111.0	12176	20.44	18.53	17.44	15.87	14.18	11.39	6.81
*	4	142.8	15648	26.31	23.78	22.41	20.47	18.31	14.69	8.76
*	4	142.0	15576	26.23	23.78	22.32	20.47	18.31	14.64	8.76
*	4	142.2	15584	26.27	23.83	22.45	20.52	18.36	14.73	8.80

File: C:\FWD\DATA\274040B2.FWD
Road: US-2 WESTBOUND LANES 10 MILES WEST OF GRAND RAPIDS, MN.
Subsection: 274040

*	4	142.3	15600	26.35	23.91	22.49	20.60	18.40	14.77	8.89

Stn: 46 Lane:J3 Temp: J/C: Air: 79 PvT: 79 10:47

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.6	12344	16.59	16.12	15.64	14.77	13.69	11.61	7.50
	C	111.7	12248	16.30	15.86	15.38	14.48	13.42	11.39	7.29
	C	111.6	12240	16.42	15.99	15.42	14.61	13.51	11.48	7.42
*	2	82.9	9080	12.36	12.02	11.65	10.98	10.22	8.66	5.64
*	2	82.6	9064	12.28	11.94	11.57	10.93	10.13	8.58	5.55
*	2	82.9	9080	12.40	12.02	11.61	11.02	10.18	8.62	5.64
*	2	83.2	9120	12.36	11.98	11.61	10.98	10.18	8.62	5.60
*	3	111.9	12272	16.38	15.99	15.47	14.61	13.51	11.44	7.37
*	3	111.7	12248	16.42	15.99	15.51	14.65	13.56	11.48	7.42
*	3	111.7	12256	16.42	15.99	15.51	14.61	13.56	11.48	7.42
*	3	111.7	12248	16.46	16.07	15.55	14.65	13.60	11.52	7.46
*	4	144.8	15880	21.32	20.73	20.09	19.00	17.56	14.90	9.63
*	4	144.1	15792	21.37	20.77	20.18	19.04	17.60	14.99	9.63
*	4	144.2	15816	21.41	20.81	20.18	19.04	17.60	14.95	9.67
*	4	144.1	15800	21.45	20.94	20.27	19.16	17.73	15.03	9.72

Stn: 61 Lane:J2 Temp: J/C: Air: 79 PvT: 80 10:50

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.4	12112	23.38	21.24	20.01	18.28	16.36	13.21	7.89
	C	110.6	12128	23.46	21.33	20.09	18.36	16.45	13.30	7.94
	C	110.4	12104	23.50	21.37	20.18	18.40	16.53	13.34	7.98
*	2	82.0	9000	17.76	16.07	15.21	13.89	12.49	10.05	6.07
*	2	81.9	8984	17.72	15.99	15.08	13.80	12.40	10.01	5.99
*	2	82.2	9016	17.76	16.07	15.17	13.85	12.45	10.05	6.03
*	2	82.2	9016	17.81	16.07	15.17	13.85	12.45	10.05	6.03
*	3	110.6	12128	23.50	21.41	20.18	18.40	16.49	13.34	7.98
*	3	110.1	12080	23.50	21.33	20.14	18.36	16.49	13.30	7.94
*	3	110.1	12080	23.59	21.50	20.31	18.53	16.58	13.47	8.07
*	3	110.6	12128	23.54	21.46	20.22	18.45	16.58	13.43	7.98
*	4	142.8	15648	30.67	27.88	26.26	23.93	21.51	17.42	10.41
*	4	141.9	15560	30.62	27.79	26.22	23.98	21.60	17.42	10.45
*	4	142.0	15576	30.71	27.88	26.26	24.02	21.56	17.42	10.41
*	4	142.0	15576	30.79	27.96	26.39	24.06	21.69	17.50	10.45

Stn: 75 Lane:J3 Temp: J/C: Air: 80 PvT: 80 10:53

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.9	12152	18.94	18.36	17.87	16.76	15.51	13.04	8.41
	C	111.0	12168	18.73	18.18	17.74	16.59	15.33	12.87	8.20
	C	111.0	12168	18.81	18.23	17.69	16.67	15.38	12.91	8.28
*	2	82.0	8992	14.20	13.70	13.37	12.54	11.60	9.70	6.20
*	2	81.9	8984	14.20	13.70	13.37	12.54	11.60	9.70	6.20
*	2	81.9	8968	14.20	13.75	13.37	12.58	11.65	9.79	6.25
*	2	82.2	9016	14.24	13.79	13.41	12.62	11.69	9.83	6.29
*	3	110.9	12152	18.98	18.27	17.78	16.67	15.42	12.95	8.24
*	3	110.7	12144	19.10	18.40	17.87	16.80	15.47	13.04	8.33
*	3	110.7	12136	19.15	18.44	17.82	16.80	15.47	13.00	8.37
*	3	110.9	12152	19.10	18.40	17.87	16.80	15.51	13.04	8.37
*	4	143.5	15736	24.76	23.87	23.18	21.74	20.09	16.85	10.76
*	4	142.6	15640	24.76	23.87	23.18	21.78	20.09	16.85	10.80
*	4	142.6	15640	24.80	23.96	23.26	21.82	20.18	16.98	10.84
*	4	142.6	15640	24.93	24.00	23.31	21.91	20.22	17.03	10.89

Stn: 89 Lane:J2 Temp: J/C: Air: 79 PvT: 81 10:56

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.6	12016	25.35	22.75	21.29	19.42	17.38	13.82	8.15
	C	109.6	12016	24.84	22.36	20.91	19.04	17.02	13.56	7.85
	C	110.0	12064	25.01	22.49	21.08	19.21	17.16	13.65	7.98
*	2	81.2	8904	18.98	17.11	16.07	14.61	13.07	10.44	6.12
*	2	81.3	8920	18.98	17.02	15.98	14.56	12.98	10.40	6.07
*	2	81.6	8952	19.10	17.15	16.07	14.69	13.16	10.44	6.12
*	2	81.6	8944	19.06	17.15	16.07	14.65	13.11	10.44	6.07
*	3	110.1	12072	25.01	22.66	21.25	19.38	17.33	13.78	8.02
*	3	109.6	12016	25.01	22.58	21.17	19.25	17.16	13.69	8.02
*	3	109.9	12048	25.14	22.75	21.29	19.38	17.25	13.82	8.11
*	3	109.7	12024	25.22	22.75	21.34	19.42	17.33	13.82	8.07

File: C:\FWD\DATA\274040B2.FWD
Road: US-2 WESTBOUND LANES 10 MILES WEST OF GRAND RAPIDS, MN.
Subsection: 274040

*	4	141.9	15552	32.55	29.34	27.51	25.07	22.40	17.89	10.41
*	4	141.6	15520	32.51	29.43	27.59	25.03	22.49	17.89	10.45
*	4	141.6	15528	32.64	29.56	27.59	25.16	22.54	17.94	10.45
*	4	141.3	15496	32.76	29.56	27.68	25.24	22.58	18.02	10.50

Stn: 101 Lane:J3 Temp: J/C: Air: 79 PvT: 81 10:59

	Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
		C	110.3	12096	18.85	18.36	17.74	16.76	15.42	13.00	8.24
		C	110.6	12120	18.73	18.23	17.69	16.67	15.38	12.82	8.15
		C	110.4	12112	18.85	18.36	17.74	16.72	15.42	12.91	8.20
*		2	82.8	9080	14.20	13.75	13.28	12.54	11.56	9.70	6.20
*		2	82.6	9056	14.20	13.75	13.28	12.54	11.56	9.66	6.16
*		2	82.6	9048	14.16	13.66	13.24	12.50	11.56	9.66	6.20
*		2	82.5	9040	14.24	13.79	13.37	12.54	11.60	9.75	6.20
*		3	111.0	12168	18.85	18.40	17.78	16.80	15.51	13.04	8.24
*		3	110.6	12128	18.94	18.44	17.82	16.80	15.51	13.00	8.24
*		3	110.6	12128	18.98	18.44	17.82	16.80	15.51	12.95	8.24
*		3	110.7	12136	19.02	18.48	17.87	16.89	15.56	13.04	8.28
*		4	142.3	15608	24.63	23.91	23.09	21.78	20.09	16.90	10.71
*		4	142.2	15592	24.80	24.09	23.31	21.99	20.27	16.98	10.80
*		4	141.7	15544	24.80	24.13	23.35	22.04	20.36	17.07	10.84
*		4	141.9	15560	24.84	24.13	23.35	22.04	20.36	17.07	10.80

Stn: 115 Lane:J2 Temp: J/C: Air: 78 PvT: 79 11:02

	Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
		C	109.1	11968	27.23	24.34	22.75	20.60	18.40	14.51	8.33
		C	109.4	12000	27.02	24.17	22.62	20.39	18.22	14.34	8.20
		C	109.3	11976	27.11	24.22	22.71	20.47	18.31	14.43	8.20
*		2	81.2	8896	20.49	18.18	17.01	15.41	13.73	10.79	6.16
*		2	81.0	8888	20.61	18.18	17.09	15.41	13.73	10.83	6.12
*		2	81.0	8880	20.49	18.23	17.14	15.45	13.82	10.87	6.16
*		2	80.7	8848	20.65	18.36	17.18	15.53	13.87	10.92	6.25
*		3	109.7	12024	27.36	24.47	22.84	20.64	18.45	14.56	8.33
*		3	109.4	11992	27.27	24.43	22.84	20.64	18.36	14.51	8.24
*		3	109.1	11968	27.36	24.43	22.88	20.60	18.45	14.47	8.28
*		3	109.1	11968	27.44	24.47	22.92	20.68	18.49	14.51	8.33
*		4	141.2	15472	35.32	31.63	29.61	26.68	23.87	18.80	10.76
*		4	140.6	15416	35.36	31.76	29.69	26.85	23.96	18.89	10.80
*		4	140.6	15408	35.40	31.76	29.73	26.85	24.00	18.89	10.76
*		4	140.7	15432	35.61	31.93	29.91	26.97	24.14	19.02	10.89

Stn: 128 Lane:J3 Temp: J/C: Air: 78 PvT: 78 11:08

	Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
		C	111.3	12208	17.18	16.59	16.02	15.11	13.91	11.74	7.55
		C	111.6	12240	16.97	16.46	15.90	15.03	13.78	11.61	7.46
		C	111.4	12216	16.97	16.50	15.98	15.03	13.82	11.65	7.37
*		2	82.6	9064	12.90	12.37	11.95	11.31	10.36	8.71	5.60
*		2	82.3	9032	12.90	12.37	11.91	11.23	10.36	8.66	5.55
*		2	82.3	9032	12.74	12.37	11.95	11.23	10.40	8.71	5.55
*		2	82.3	9016	12.78	12.37	11.91	11.31	10.36	8.71	5.64
*		3	111.7	12256	17.13	16.59	16.07	15.11	13.91	11.70	7.46
*		3	111.9	12264	17.18	16.68	16.11	15.15	14.00	11.74	7.46
*		3	112.0	12288	17.22	16.72	16.15	15.15	14.00	11.74	7.50
*		3	111.7	12256	17.26	16.68	16.11	15.20	14.05	11.78	7.46
*		4	144.9	15888	22.46	21.76	21.04	19.71	18.36	15.34	9.72
*		4	144.2	15816	22.54	21.80	21.08	19.84	18.36	15.38	9.76
*		4	144.8	15872	22.66	21.93	21.25	19.92	18.53	15.51	9.80
*		4	144.2	15816	22.58	21.93	21.17	19.84	18.49	15.42	9.72

Stn: 142 Lane:J2 Temp: J/C: Air: 77 PvT: 79 11:11

	Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
		C	110.4	12112	22.96	20.77	19.58	17.86	15.96	12.87	7.55
		C	110.3	12096	22.92	20.77	19.58	17.81	15.91	12.87	7.55
		C	110.6	12120	22.92	20.77	19.54	17.86	15.96	12.87	7.50
*		2	82.0	9000	17.05	15.43	14.52	13.30	11.91	9.62	5.68
*		2	81.9	8976	17.05	15.47	14.57	13.34	11.96	9.66	5.73
*		2	81.7	8968	17.01	15.43	14.57	13.30	11.91	9.62	5.68
*		2	82.3	9024	17.01	15.43	14.52	13.30	11.91	9.62	5.64
*		3	110.6	12128	22.92	20.77	19.58	17.86	15.96	12.87	7.55
*		3	110.7	12136	22.96	20.81	19.58	17.86	16.00	12.87	7.55

File: C:\FWD\DATA\274040B2.FWD
Road: US-2 WESTBOUND LANES 10 MILES WEST OF GRAND RAPIDS, MN.
Subsection: 274040

*	3	111.0	12176	23.00	20.85	19.62	17.90	16.05	12.87	7.50
*	3	110.4	12112	23.00	20.85	19.62	17.90	16.05	12.91	7.55
*	4	142.9	15672	29.95	27.10	25.49	23.30	20.80	16.77	9.85
*	4	142.6	15640	29.95	27.19	25.62	23.30	20.85	16.77	9.85
*	4	142.9	15664	30.08	27.27	25.66	23.39	20.94	16.90	9.93
*	4	142.8	15656	30.12	27.32	25.66	23.43	20.94	16.90	9.93

Stn: 155 Lane:J3 Temp: J/C: Air: 77 PvT: 80 11:15

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	111.6	12240	18.14	17.80	17.22	16.25	14.98	12.65	8.07
	C	112.0	12280	18.06	17.71	17.09	16.17	14.89	12.52	7.98
	C	112.2	12304	18.10	17.67	17.09	16.17	14.93	12.52	7.94
*	2	82.6	9056	13.66	13.19	12.77	12.07	11.11	9.40	6.03
*	2	82.9	9080	13.66	13.19	12.77	12.03	11.11	9.36	5.99
*	2	83.2	9120	13.74	13.19	12.81	12.07	11.16	9.36	5.94
*	2	82.9	9096	13.74	13.23	12.81	12.12	11.16	9.40	5.99
*	3	112.2	12304	18.18	17.75	17.18	16.25	14.98	12.56	8.02
*	3	111.9	12272	18.14	17.80	17.22	16.25	14.98	12.61	8.02
*	3	111.7	12256	18.18	17.80	17.22	16.29	15.02	12.65	8.07
*	3	111.9	12264	18.18	17.84	17.27	16.25	15.02	12.65	8.07
*	4	144.6	15856	24.05	23.27	22.49	21.32	19.65	16.55	10.54
*	4	144.2	15808	24.05	23.31	22.54	21.32	19.65	16.55	10.50
*	4	144.3	15832	24.13	23.44	22.62	21.44	19.78	16.68	10.67
*	4	144.5	15840	24.22	23.48	22.66	21.44	19.78	16.64	10.58

Stn: 168 Lane:J2 Temp: J/C: Air: 77 PvT: 79 11:17

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.6	12008	27.19	24.30	22.75	20.64	18.45	14.64	8.50
	C	109.7	12024	27.61	24.65	23.05	20.85	18.62	14.73	8.54
	C	109.4	11992	28.03	25.03	23.39	21.23	18.93	14.99	8.72
*	2	81.2	8896	21.53	19.22	17.99	16.38	14.58	11.57	6.72
*	2	80.9	8872	21.58	19.30	18.04	16.42	14.67	11.61	6.77
*	2	81.0	8888	21.58	19.30	18.08	16.38	14.62	11.57	6.77
*	2	81.3	8920	21.70	19.39	18.17	16.51	14.71	11.65	6.81
*	3	109.7	12024	28.61	25.59	23.91	21.70	19.33	15.34	8.94
*	3	109.1	11968	28.78	25.64	24.04	21.82	19.42	15.47	8.98
*	3	109.3	11976	28.91	25.85	24.21	21.91	19.51	15.51	9.02
*	3	109.3	11984	29.07	25.98	24.34	22.04	19.69	15.64	9.07
*	4	141.2	15488	37.24	33.26	31.15V	28.24V	25.20	20.06	11.67
*	4	140.7	15432	37.45	33.52	31.40	28.45	25.42	20.19	11.75
*	4	140.6	15424	37.75	33.74	31.58	28.70	25.56	20.41	11.88
*	4	140.6	15416	37.79	33.82	31.66	28.75	25.60	20.41	11.84

'ACCEPTED TEST WITH VARATION

Stn: 182 Lane:J3 Temp: J/C: Air: 77 PvT: 78 11:20

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.7	12144	16.88	16.33	15.77	14.90	13.69	11.44	7.29
	C	111.0	12176	16.80	16.33	15.72	14.90	13.73	11.35	7.20
	C	111.4	12224	16.84	16.42	15.81	14.94	13.82	11.44	7.24
*	2	82.5	9032	12.90	12.28	11.87	11.27	10.40	8.62	5.51
*	2	82.9	9096	12.90	12.28	11.87	11.23	10.36	8.62	5.47
*	2	82.8	9072	12.90	12.32	11.91	11.27	10.40	8.66	5.51
*	2	82.8	9080	12.95	12.37	11.91	11.31	10.40	8.66	5.55
*	3	111.4	12224	16.93	16.42	15.85	14.99	13.82	11.44	7.24
*	3	111.2	12192	16.88	16.46	15.85	14.99	13.78	11.48	7.24
*	3	111.4	12216	16.93	16.50	15.94	15.07	13.91	11.48	7.29
*	3	111.2	12184	16.93	16.46	15.90	15.03	13.91	11.48	7.24
*	4	143.6	15744	22.37	21.50	20.74	19.63	18.05	15.08	9.54
*	4	143.8	15760	22.37	21.54	20.78	19.67	18.13	15.03	9.46
*	4	143.5	15736	22.46	21.63	20.82	19.76	18.22	15.12	9.59
*	4	144.1	15800	22.58	21.72	20.91	19.80	18.27	15.16	9.54

Stn: 196 Lane:J2 Temp: J/C: Air: 77 PvT: 75 11:23

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.0	11960	25.09	22.54	21.08	19.12	17.11	13.56	7.98
	C	109.3	11984	24.89	22.32	20.87	18.91	16.93	13.34	7.81
	C	109.0	11944	24.93	22.36	20.91	18.95	16.93	13.43	7.81
*	2	81.3	8920	19.02	16.93	15.85	14.39	12.89	10.22	5.99
*	2	81.4	8928	19.02	16.89	15.81	14.31	12.85	10.14	5.94

File: C:\FWD\DATA\274040B2.FWD
Road: US-2 WESTBOUND LANES 10 MILES WEST OF GRAND RAPIDS, MN.
Subsection: 274040

*	2	81.0	8880	16.94	16.85	15.77	14.27	12.76	10.09	5.90
*	2	81.3	8920	19.02	16.89	15.81	14.35	12.85	10.18	5.94
*	3	109.4	12000	25.26	22.66	21.17	19.16	17.20	13.60	7.98
*	3	109.4	12000	25.43	22.79	21.25	19.29	17.33	13.69	8.02
*	3	109.4	11992	25.43	22.79	21.29	19.29	17.29	13.69	7.94
*	3	109.4	12000	25.56	22.92	21.42	19.46	17.33	13.82	8.07
*	4	141.0	15464	33.22	29.56	27.68	25.03	22.49	17.81	10.41
*	4	141.2	15480	33.39	29.73	27.85	25.24	22.58	17.98	10.50
*	4	141.0	15464	33.56	29.86	27.93	25.29	22.71	18.07	10.58
*	4	140.6	15408	33.56	29.90	27.98	25.37	22.71	18.11	10.58

Stn: 211 Lane:J3 Temp: J/C: Air: 77 PvT: 76 11:28

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	111.9	12264	16.46	15.99	15.47	14.52	13.51	11.35	7.46
	C	111.4	12216	16.42	15.94	15.42	14.52	13.47	11.35	7.42
	C	111.6	12240	16.51	16.07	15.60	14.61	13.60	11.44	7.55
*	2	82.9	9088	12.36	11.98	11.57	10.93	10.13	8.53	5.64
*	2	83.0	9112	12.36	11.98	11.61	10.93	10.13	8.58	5.64
*	2	83.2	9120	12.40	12.02	11.65	11.02	10.22	8.62	5.68
*	2	83.2	9120	12.36	11.98	11.57	10.93	10.09	8.58	5.60
*	3	111.4	12224	16.46	15.99	15.47	14.56	13.51	11.39	7.46
*	3	112.0	12272	16.46	15.99	15.51	14.56	13.51	11.35	7.46
*	3	111.4	12208	16.42	15.86	15.47	14.52	13.47	11.31	7.46
*	3	111.4	12224	16.42	15.94	15.51	14.52	13.51	11.31	7.46
*	4	144.2	15808	21.32	20.68	20.05	18.83	17.42	14.69	9.59
*	4	144.1	15784	21.37	20.73	20.14	18.87	17.56	14.69	9.63
*	4	144.2	15808	21.37	20.73	20.09	18.91	17.56	14.73	9.67
*	4	144.1	15800	21.45	20.81	20.22	18.95	17.65	14.77	9.67

Stn: 223 Lane:J2 Temp: J/C: Air: 78 PvT: 76 11:33

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.8	11928	28.95	25.38	23.61	21.15	18.67	14.64	8.41
	C	108.3	11872	29.03	25.34	23.56	21.15	18.62	14.64	8.41
	C	108.4	11880	28.91	25.29	23.52	21.11	18.62	14.56	8.37
*	2	80.0	8776	22.54	19.48	18.17	16.38	14.36	11.26	6.51
*	2	80.1	8792	22.58	19.43	18.12	16.25	14.31	11.22	6.46
*	2	80.1	8792	22.46	19.43	18.04	16.21	14.27	11.22	6.42
*	2	80.0	8776	22.50	19.35	17.95	16.17	14.22	11.13	6.38
*	3	108.8	11928	28.99	25.34	23.56	21.19	18.67	14.64	8.41
*	3	108.3	11872	28.95	25.38	23.61	21.19	18.71	14.64	8.41
*	3	108.3	11872	28.87	25.34	23.61	21.23	18.71	14.64	8.41
*	3	108.1	11848	28.91	25.38	23.61	21.19	18.71	14.69	8.41
*	4	139.7	15328	36.70V	32.06	29.86	26.85	23.65	18.59	10.67
*	4	139.0	15248	36.95	32.23	29.95	26.89	23.74	18.67	10.71
*	4	138.8	15216	37.41	32.49	30.12	27.02	23.91	18.85	10.80
*	4	138.6	15192	37.71V	32.36	30.25	27.23	24.05	18.80	10.84

'ACCEPTED TEST WITH VARATION

Stn: 238 Lane:J3 Temp: J/C: Air: 78 PvT: 79 11:36

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	111.9	12264	17.68	17.28	16.79	15.87	14.71	12.48	8.24
	C	112.0	12288	17.51	17.15	16.67	15.70	14.53	12.26	8.02
	C	112.2	12296	17.55	17.24	16.71	15.79	14.62	12.35	8.07
*	2	83.3	9128	13.32	12.93	12.60	11.86	11.02	9.31	6.12
*	2	83.3	9136	13.32	12.97	12.60	11.86	11.02	9.36	6.12
*	2	83.3	9128	13.32	12.97	12.60	11.90	11.02	9.36	6.12
*	2	83.2	9120	13.28	12.97	12.55	11.86	10.98	9.31	6.12
*	3	112.2	12304	17.64	17.28	16.79	15.83	14.71	12.30	8.07
*	3	111.9	12272	17.68	17.28	16.84	15.87	14.71	12.43	8.15
*	3	112.0	12280	17.76	17.41	16.88	15.96	14.76	12.48	8.15
*	3	111.9	12272	17.72	17.36	16.88	15.91	14.76	12.43	8.15
*	4	145.2	15928	23.21	22.62	22.02	20.73	19.25	16.16	10.54
*	4	144.9	15888	23.21	22.75	22.06	20.85	19.33	16.29	10.63
*	4	144.9	15888	23.29	22.84	22.19	20.94	19.38	16.38	10.71
*	4	144.8	15872	23.34	22.88	22.19	20.98	19.42	16.38	10.71

Stn: 251 Lane:J2 Temp: J/C: Air: 79 PvT: 79 11:39

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7

File: C:\FWD\DATA\274040B2.FWD
Road: US-2 WESTBOUND LANES 10 MILES WEST OF GRAND RAPIDS, MN.
Subsection: 274040

	C	108.8	11928	29.45	26.37	24.72	22.37	20.05	15.90	9.28
	C	109.1	11968	29.37	26.20	24.59	22.16	19.82	15.64	8.94
	C	109.0	11944	29.83	26.71	25.02	22.58	20.27	16.03	9.28
*	2	80.7	8848	22.66	20.34	19.07	17.27	15.42	12.22	7.07
*	2	80.7	8848	22.71	20.38	19.11	17.27	15.47	12.22	7.11
*	2	80.6	8832	22.75	20.34	19.15	17.27	15.51	12.26	7.11
*	2	80.9	8864	22.71	20.38	19.11	17.31	15.47	12.26	7.11
*	3	109.3	11984	30.12	26.97	25.28	22.84	20.49	16.16	9.37
*	3	109.0	11944	30.25	27.15	25.36	22.92	20.58	16.25	9.41
*	3	109.1	11968	30.29	27.23	25.49	23.05	20.67	16.38	9.46
*	3	109.1	11968	30.46	27.40	25.71	23.18	20.80	16.46	9.54
*	4	141.7	15536	39.26	35.29	33.08	29.89	26.80	21.18	12.27
*	4	141.0	15464	39.38	35.46	33.20	29.93	26.94	21.27	12.32
*	4	140.9	15440	39.55	35.63	33.38	30.14	26.98	21.44	12.40
*	4	141.0	15464	39.84	35.85	33.55	30.31	27.25	21.62	12.54

Stn: 264 Lane:J3 Temp: J/C: Air: 78 PvT: 79 11:42

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.7	12144	19.65	19.05	18.38	17.35	16.00	13.47	8.59
	C	110.6	12120	19.56	18.96	18.29	17.22	15.82	13.26	8.41
	C	110.7	12136	19.69	19.05	18.38	17.31	15.96	13.39	8.46
*	2	82.0	8984	14.87	14.35	13.84	13.04	12.05	10.14	6.38
*	2	81.9	8976	14.83	14.35	13.84	13.04	12.00	10.14	6.42
*	2	82.2	9016	14.91	14.39	13.88	13.13	12.09	10.18	6.46
*	2	82.0	8984	14.87	14.35	13.84	13.04	12.00	10.09	6.38
*	3	110.9	12152	19.82	19.17	18.55	17.43	16.05	13.47	8.54
*	3	111.0	12176	19.86	19.22	18.55	17.48	16.09	13.47	8.50
*	3	111.0	12176	19.90	19.26	18.59	17.52	16.13	13.56	8.54
*	3	110.9	12152	19.94	19.30	18.59	17.52	16.13	13.52	8.54
*	4	143.6	15744	25.97	25.03	24.21	22.71	21.07	17.63	11.10
*	4	143.6	15744	26.10	25.16	24.34	22.88	21.25	17.72	11.15
*	4	143.6	15744	26.18	25.21	24.34	22.92	21.38	17.68	11.15
*	4	143.5	15728	26.23	25.16	24.38	22.92	21.42	17.63	11.15

Stn: 279 Lane:J2 Temp: J/C: Air: 77 PvT: 79 11:45

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.9	12048	28.91	25.98	24.42	22.16	19.78	15.77	9.28
	C	109.7	12024	29.33	26.28	24.68	22.37	19.96	15.77	9.33
	C	109.7	12032	29.66	26.59	24.94	22.58	20.14	15.99	9.41
*	2	81.0	8880	22.46	20.25	18.98	17.27	15.33	12.22	7.11
*	2	80.9	8864	22.54	20.34	19.07	17.31	15.42	12.30	7.20
*	2	80.9	8864	22.46	20.25	19.02	17.27	15.38	12.22	7.16
*	2	81.0	8880	22.46	20.25	19.02	17.27	15.33	12.26	7.16
*	3	109.6	12024	30.00	26.84	25.19	22.80	20.27	16.16	9.46
*	3	109.9	12048	30.16	27.02	25.32	23.01	20.49	16.29	9.54
*	3	109.7	12024	30.29	27.15	25.41	23.09	20.58	16.38	9.59
*	3	109.9	12040	30.37	27.23	25.45	23.18	20.62	16.42	9.59
*	4	142.3	15600	38.79	34.90	32.73	29.72	26.40	21.05	12.36
*	4	142.6	15632	39.13	35.16	32.99	29.97	26.67	21.18	12.49
*	4	142.3	15600	39.26	35.29	33.12	30.10	26.76	21.27	12.49
*	4	142.5	15616	39.42	35.46	33.20	30.22	26.85	21.36	12.58

Stn: 291 Lane:J3 Temp: J/C: Air: 76 PvT: 78 11:47

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	111.3	12208	19.65	19.13	18.59	17.52	16.18	13.65	8.80
	C	111.4	12216	19.65	19.13	18.55	17.48	16.13	13.60	8.76
	C	111.3	12200	19.69	19.13	18.59	17.52	16.13	13.60	8.76
*	2	82.3	9032	14.91	14.48	13.97	13.21	12.13	10.31	6.64
*	2	82.2	9016	14.83	14.35	13.92	13.13	12.09	10.22	6.59
*	2	82.3	9024	14.79	14.26	13.84	13.04	12.00	10.14	6.46
*	2	82.8	9072	15.08	14.52	14.10	13.30	12.27	10.35	6.68
*	3	111.3	12200	19.77	19.26	18.64	17.60	16.22	13.65	8.76
*	3	111.3	12200	19.82	19.30	18.72	17.65	16.31	13.78	8.85
*	3	111.3	12200	19.94	19.43	18.85	17.77	16.40	13.82	8.94
*	3	111.2	12192	19.90	19.43	18.85	17.81	16.40	13.86	8.94
*	4	143.9	15784	25.85	25.08	24.34	22.92	21.16	17.85	11.49
*	4	143.9	15784	25.97	25.21	24.46	23.09	21.29	17.98	11.54
*	4	144.1	15800	26.14	25.34	24.59	23.18	21.38	18.07	11.62
*	4	143.9	15784	26.18	25.38	24.64	23.26	21.47	18.15	11.71

File: C:\FWD\DATA\274040B2.FWD
Road: US-2 WESTBOUND LANES 10 MILES WEST OF GRAND RAPIDS, MN.
Subsection: 274040

Stn: 304 Lane:J2 Temp: J/C: Air: 75 PvT: 79 11:50

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.6	11904	28.20	25.34	23.69	21.53	19.07	15.21	8.89
	C	108.6	11912	28.24	25.34	23.74	21.57	19.11	15.25	8.89
	C	108.7	11920	28.32	25.42	23.82	21.66	19.25	15.34	8.89
*	2	80.9	8872	21.45	19.13	17.91	16.29	14.45	11.57	6.72
*	2	80.9	8864	21.41	19.13	17.95	16.29	14.49	11.57	6.72
*	2	80.9	8864	21.53	19.13	17.91	16.29	14.45	11.57	6.77
*	2	81.0	8880	21.49	19.13	17.95	16.25	14.49	11.57	6.72
*	3	108.6	11904	28.32	25.47	23.86	21.66	19.25	15.34	8.94
*	3	108.8	11928	28.49	25.59	23.99	21.82	19.38	15.51	9.02
*	3	108.7	11920	28.40	25.64	23.99	21.78	19.33	15.47	9.02
*	3	108.7	11920	28.49	25.64	23.99	21.78	19.38	15.47	9.07
*	4	139.3	15264	36.87	32.96	30.81	27.99	24.89	19.89	11.58
*	4	138.8	15224	37.12	33.22	31.10	28.24	25.02	20.06	11.71
*	4	139.3	15264	37.20	33.18	31.06	28.28	25.11	20.10	11.71
*	4	139.7	15320	37.29	33.35	31.23	28.41	25.25	20.19	11.75

Stn: 320 Lane:J3 Temp: J/C: Air: 74 PvT: 77 11:54

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.9	12048	19.90	19.39	18.81	17.86	16.62	14.21	9.37
	C	110.0	12064	19.90	19.39	18.81	17.81	16.58	14.17	9.28
	C	110.1	12072	20.15	19.56	18.98	17.94	16.76	14.30	9.37
*	2	81.3	8912	15.46	14.82	14.35	13.63	12.67	10.83	7.11
*	2	81.4	8928	15.25	14.82	14.35	13.63	12.67	10.83	7.11
*	2	81.4	8936	15.21	14.82	14.40	13.68	12.71	10.87	7.16
*	2	81.3	8904	15.50	14.78	14.35	13.59	12.67	10.79	7.11
*	3	109.9	12040	20.15	19.56	18.98	18.03	16.76	14.30	9.41
*	3	110.1	12080	20.24	19.69	19.07	18.07	16.85	14.38	9.41
*	3	109.9	12048	20.36	19.73	19.19	18.15	16.93	14.47	9.50
*	3	109.9	12048	20.36	19.82	19.24	18.24	16.98	14.51	9.54
*	4	142.5	15624	26.18	25.38	24.72	23.34	21.82	18.59	12.19
*	4	142.5	15624	26.31	25.59	24.89	23.55	21.96	18.76	12.36
*	4	142.6	15640	26.35	25.68	24.94	23.60	22.05	18.85	12.36
*	4	142.6	15640	26.52	25.81	25.06	23.72	22.14	18.98	12.45

Stn: 332 Lane:J2 Temp: J/C: Air: 73 PvT: 74 11:57

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.0	12056	25.51	23.10	21.64	19.67	17.60	14.12	8.37
	C	110.1	12080	25.22	22.75	21.29	19.38	17.33	13.91	8.24
	C	110.1	12080	25.30	22.79	21.34	19.42	17.38	13.95	8.28
*	2	81.7	8960	19.02	17.06	16.02	14.56	13.07	10.48	6.20
*	2	81.7	8960	19.10	17.15	16.11	14.65	13.11	10.53	6.29
*	2	81.9	8976	19.02	17.11	16.07	14.65	13.11	10.53	6.20
*	2	81.9	8976	19.02	17.11	16.02	14.61	13.07	10.48	6.16
*	3	110.1	12072	25.35	22.84	21.38	19.42	17.42	13.95	8.28
*	3	110.0	12056	25.35	22.92	21.42	19.54	17.47	14.04	8.37
*	3	109.9	12048	25.43	22.92	21.51	19.54	17.47	14.04	8.28
*	3	109.9	12048	25.39	22.97	21.51	19.59	17.51	14.08	8.33
*	4	141.9	15552	32.93	29.82	27.89	25.37	22.71	18.20	10.76
*	4	141.9	15560	33.10	29.86	27.98	25.41	22.76	18.24	10.76
*	4	141.9	15552	33.18	29.99	28.06	25.50	22.85	18.37	10.80
*	4	141.7	15536	33.22	30.03	28.11	25.58	22.89	18.46	10.89

Stn: 346 Lane:J2 Temp: J/C: Air: 73 PvT: 73 12:00

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	111.3	12208	19.15	18.66	17.99	17.01	15.78	13.30	8.59
	C	111.4	12224	19.10	18.66	18.04	17.01	15.69	13.30	8.46
	C	111.3	12200	19.15	18.70	18.08	17.05	15.78	13.34	8.50
*	2	82.6	9056	14.54	14.09	13.62	12.92	11.91	10.09	6.46
*	2	82.6	9048	14.58	14.18	13.71	12.92	11.91	10.14	6.51
*	2	82.6	9048	14.62	14.18	13.67	12.96	11.96	10.09	6.55
*	2	82.5	9040	14.62	14.13	13.62	12.92	11.91	10.09	6.51
*	3	111.0	12176	19.27	18.79	18.17	17.14	15.82	13.39	8.59
*	3	111.3	12208	19.27	18.83	18.17	17.14	15.91	13.39	8.54
*	3	111.3	12200	19.27	18.83	18.25	17.18	15.96	13.39	8.59
*	3	111.2	12184	19.31	18.87	18.21	17.22	15.96	13.39	8.63
*	4	143.8	15768	24.93	24.34	23.52	22.20	20.58	17.29	11.10
*	4	143.9	15784	25.09	24.52	23.69	22.33	20.71	17.42	11.19
*	4	144.1	15800	25.22	24.58	23.78	22.42	20.80	17.50	11.23

File: C:\FWD\DATA\274040B2.FWD
Road: US-2 WESTBOUND LANES 10 MILES WEST OF GRAND RAPIDS, MN.
Subsection: 274040

*	4	143.8	15760	25.18	24.60	23.82	22.42	20.80	17.50	11.23

Stn: 360 Lane:J2 Temp: J/C: Air: 77 PvT: 72 12:05

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.3	11864	32.13	28.87	27.08	24.48	21.96	17.42	10.32
	C	108.8	11928	32.18	28.87	27.12	24.44	21.96	17.46	10.32
	C	108.6	11896	32.26	28.87	27.16	24.53	22.00	17.46	10.28
*	2	80.0	8776	25.05	22.23	20.91	18.95	16.98	13.56	8.02
*	2	80.3	8808	24.76	22.15	20.87	18.87	16.93	13.47	7.94
*	2	80.0	8776	24.68	22.10	20.82	18.83	16.89	13.47	7.98
*	2	80.1	8784	24.72	22.10	20.82	18.83	16.89	13.43	7.98
*	3	108.4	11880	32.01	28.61	26.91	24.31	21.82	17.29	10.24
*	3	108.3	11872	32.13	28.83	27.08	24.44	21.96	17.46	10.32
*	3	108.6	11904	32.18	28.78	27.12	24.44	21.96	17.46	10.28
*	3	108.6	11896	32.26	28.83	27.12	24.48	22.00	17.46	10.28
*	4	140.0	15352	40.39	36.19	34.02	30.69	27.56	21.88	12.88
*	4	139.9	15328	40.68	36.45	34.32	30.94	27.82	22.05	13.01
*	4	139.9	15328	40.76	36.58	34.36	31.07	27.91	22.14	13.10
*	4	139.9	15328	40.85	36.63	34.45	31.15	27.87	22.18	13.06

Stn: 373 Lane:J3 Temp: J/C: Air: 79 PvT: 74 12:08

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	111.2	12192	18.06	17.49	16.88	15.91	14.71	12.35	7.89
	C	111.2	12184	18.14	17.54	16.97	15.96	14.76	12.39	7.94
	C	111.2	12192	18.14	17.54	16.92	15.96	14.76	12.39	7.89
*	2	82.2	9008	13.70	13.19	12.72	12.07	11.11	9.36	5.99
*	2	82.2	9008	13.70	13.19	12.77	12.07	11.11	9.40	5.99
*	2	81.9	8976	13.74	13.23	12.81	12.07	11.16	9.40	5.99
*	2	82.0	8992	13.70	13.19	12.77	12.03	11.11	9.36	5.94
*	3	111.2	12184	18.22	17.62	17.01	16.00	14.85	12.43	7.94
*	3	111.2	12184	18.22	17.62	17.05	16.04	14.89	12.43	7.94
*	3	111.3	12208	18.27	17.67	17.05	16.08	14.89	12.43	7.94
*	3	111.3	12200	18.35	17.75	17.14	16.17	14.98	12.52	8.02
*	4	144.3	15832	23.75	22.92	22.15	20.81	19.29	16.12	10.32
*	4	144.3	15832	23.92	23.05	22.28	20.94	19.42	16.25	10.41
*	4	144.1	15792	24.01	23.10	22.32	20.98	19.47	16.29	10.41
*	4	144.2	15800	24.05	23.10	22.36	21.02	19.51	16.33	10.45

Stn: 386 Lane:J2 Temp: J/C: Air: 80 PvT: 75 12:11

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.9	12040	24.09	21.37	20.01	18.11	16.18	12.82	7.55
	C	110.0	12056	23.80	21.20	19.84	17.98	16.05	12.69	7.42
	C	109.7	12032	24.09	21.50	20.14	18.24	16.27	12.95	7.59
*	2	81.6	8944	18.22	16.12	15.08	13.68	12.13	9.66	5.68
*	2	81.6	8944	18.18	16.16	15.12	13.72	12.18	9.66	5.68
*	2	81.3	8920	18.43	16.16	15.17	13.72	12.22	9.70	5.68
*	2	81.6	8944	18.35	16.24	15.21	13.80	12.31	9.79	5.81
*	3	109.7	12032	24.17	21.46	20.09	18.19	16.18	12.91	7.59
*	3	110.0	12064	24.26	21.54	20.14	18.28	16.22	12.95	7.59
*	3	109.7	12032	24.17	21.54	20.18	18.28	16.27	12.95	7.59
*	3	109.9	12048	24.30	21.63	20.22	18.32	16.31	13.00	7.59
*	4	141.7	15536	31.25	27.79	26.01	23.51	21.02	16.72	9.80
*	4	141.3	15488	31.34	27.92	26.13	23.64	21.16	16.77	9.89
*	4	141.6	15520	31.50	28.05	26.26	23.77	21.25	16.90	9.93
*	4	141.3	15488	31.55	28.05	26.31	23.81	21.29	16.90	9.98

Stn: 402 Lane:J3 Temp: J/C: Air: 81 PvT: 77 12:16

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	111.2	12192	17.97	17.67	17.14	16.21	15.07	12.91	8.50
	C	111.2	12184	18.18	17.75	17.22	16.34	15.16	12.95	8.54
	C	111.0	12176	18.31	17.84	17.27	16.38	15.20	13.04	8.63
*	2	82.5	9032	13.91	13.62	13.15	12.54	11.60	9.96	6.64
*	2	82.5	9040	13.95	13.53	13.11	12.45	11.51	9.88	6.59
*	2	82.0	9000	13.99	13.44	13.07	12.41	11.51	9.88	6.55
*	2	81.9	8976	13.74	13.49	13.07	12.41	11.47	9.83	6.55
*	3	111.0	12168	18.31	17.84	17.27	16.38	15.25	13.08	8.67
*	3	111.4	12224	18.31	17.92	17.31	16.46	15.33	13.13	8.67
*	3	111.2	12184	18.35	17.97	17.39	16.51	15.33	13.13	8.72
*	3	110.9	12160	18.31	17.88	17.35	16.46	15.25	13.08	8.67

File: C:\FWD\DATA\274040B2.FWD
Road: US-2 WESTBOUND LANES 10 MILES WEST OF GRAND RAPIDS, MN.
Subsection: 274040

*	4	143.6	15744	23.67	22.97	22.28	21.06	19.65	16.85	11.10
*	4	143.3	15712	23.71	23.05	22.32	21.15	19.74	16.98	11.23
*	4	143.5	15728	23.80	23.14	22.41	21.19	19.82	16.98	11.23
*	4	143.0	15688	23.84	23.18	22.45	21.23	19.82	16.98	11.28

Stn: 415 Lane:J2 Temp: J/C: Air: 80 PvT: 79 12:21

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.8	11944	28.57	25.68	24.16	22.08	19.87	16.07	9.59
	C	109.0	11944	28.53	25.68	24.16	22.08	19.91	16.12	9.63
	C	109.0	11952	28.57	25.77	24.25	22.16	19.96	16.12	9.63
*	2	80.6	8832	21.95	19.65	18.51	16.93	15.29	12.35	7.46
*	2	80.4	8816	21.99	19.61	18.51	16.89	15.20	12.30	7.42
*	2	80.6	8832	21.95	19.65	18.51	16.93	15.20	12.35	7.46
*	2	80.4	8816	21.91	19.61	18.51	16.93	15.20	12.35	7.42
*	3	109.0	11952	28.53	25.68	24.12	22.04	19.87	16.03	9.59
*	3	109.1	11968	28.66	25.81	24.25	22.20	20.00	16.20	9.72
*	3	109.1	11968	28.78	25.81	24.38	22.20	20.09	16.20	9.72
*	3	109.0	11952	28.74	25.85	24.38	22.20	20.09	16.20	9.76
*	4	141.4	15512	36.41	32.70	30.76	28.03	25.34	20.36	12.19
*	4	140.6	15416	36.53	32.79	30.89	28.16	25.38	20.53	12.32
*	4	140.7	15424	36.62	32.88	30.93	28.24	25.42	20.53	12.32
*	4	140.7	15424	36.74	33.05	31.10	28.41	25.56	20.66	12.40

Stn: 427 Lane:J2 Temp: J/C: Air: 79 PvT: 78 12:23

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.7	12136	18.94	18.23	17.65	16.72	15.42	13.00	8.37
	C	110.9	12152	18.94	18.27	17.69	16.76	15.51	13.04	8.37
	C	110.6	12120	19.02	18.36	17.74	16.80	15.56	13.13	8.41
*	2	81.7	8968	14.37	13.75	13.32	12.62	11.65	9.83	6.25
*	2	81.9	8976	14.41	13.79	13.37	12.66	11.69	9.88	6.38
*	2	81.9	8976	14.37	13.79	13.37	12.66	11.69	9.83	6.29
*	2	81.9	8976	14.41	13.79	13.41	12.66	11.69	9.92	6.33
*	3	110.6	12120	19.06	18.36	17.82	16.80	15.51	13.13	8.41
*	3	110.9	12152	19.15	18.48	17.87	16.93	15.65	13.21	8.41
*	3	110.7	12144	19.19	18.48	17.87	16.93	15.65	13.21	8.41
*	3	110.7	12136	19.19	18.53	17.91	16.93	15.65	13.21	8.41
*	4	143.2	15696	24.84	23.91	23.16	21.91	20.27	17.11	10.97
*	4	143.0	15680	24.89	24.00	23.22	21.99	20.36	17.16	11.02
*	4	142.6	15640	24.93	24.00	23.18	21.99	20.27	17.16	10.97
*	4	142.9	15664	24.97	24.04	23.26	22.04	20.36	17.20	10.97

Stn: 443 Lane:J2 Temp: J/C: Air: 79 PvT: 77 12:27

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.1	11968	29.41	26.46	24.89	22.54	20.31	16.25	9.63
	C	109.1	11968	28.99	26.07	24.55	22.16	20.00	15.94	9.37
	C	109.0	11952	29.03	26.15	24.55	22.25	19.87	15.81	9.07
*	2	80.3	8800	23.00	20.80	19.32	17.52	15.78	12.56	7.33
*	2	80.3	8800	23.13	20.64	19.32	17.52	15.78	12.52	7.33
*	2	80.0	8776	23.13	20.68	19.41	17.60	15.82	12.61	7.42
*	2	80.1	8792	23.21	20.73	19.45	17.60	15.87	12.61	7.42
*	3	109.1	11968	29.33	26.41	24.76	22.46	20.27	16.16	9.46
*	3	109.3	11984	29.49	26.63	24.98	22.63	20.40	16.29	9.54
*	3	109.1	11968	29.45	26.67	25.02	22.67	20.45	16.29	9.59
*	3	109.3	11984	29.49	26.67	25.06	22.71	20.45	16.38	9.59
*	4	140.9	15448	36.87	33.26	31.19	28.24	25.56	20.41	11.97
*	4	140.3	15392	37.12	33.48	31.40	28.49	25.74	20.58	12.14
*	4	140.0	15344	37.20	33.48	31.40	28.49	25.78	20.58	12.10
*	4	140.1	15360	37.29	33.52	31.49	28.62	25.82	20.62	12.19

Stn: 455 Lane:J3 Temp: J/C: Air: 81 PvT: 79 12:30

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.9	12160	19.31	18.74	18.21	17.22	16.00	13.47	8.76
	C	111.2	12192	19.44	18.83	18.29	17.27	16.09	13.43	8.72
	C	111.3	12208	19.52	18.92	18.38	17.35	16.22	13.56	8.76
*	2	82.0	9000	14.70	14.13	13.80	13.04	12.09	10.14	6.55
*	2	81.9	8976	14.75	14.13	13.75	13.00	12.09	10.18	6.51
*	2	81.9	8984	14.83	14.22	13.84	13.09	12.13	10.22	6.64
*	2	82.0	8984	14.79	14.22	13.84	13.09	12.18	10.22	6.64

File: C:\FWD\DATA\274040B2.FWD
Road: US-2 WESTBOUND LANES 10 MILES WEST OF GRAND RAPIDS, MN.
Subsection: 274040

*	3	111.3	12208	19.61	18.92	18.42	17.31	16.27	13.52	8.76
*	3	111.4	12216	19.65	18.96	18.51	17.39	16.36	13.60	8.80
*	3	111.4	12224	19.65	19.00	18.51	17.43	16.40	13.65	8.85
*	3	111.3	12208	19.65	19.05	18.51	17.48	16.31	13.65	8.85
*	4	144.6	15856	25.47	24.60	23.95	22.58	21.11	17.63	11.41
*	4	144.3	15824	25.60	24.69	23.99	22.63	21.20	17.68	11.41
*	4	144.5	15840	25.68	24.73	24.04	22.71	21.25	17.72	11.45
*	4	144.6	15864	25.77	24.82	24.16	22.80	21.34	17.85	11.54

Stn: 470 Lane:J2 Temp: J/C: Air: 81 PvT: 80 12:33

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.9	12040	28.11	25.29	23.69	21.61	19.38	15.55	9.20
	C	109.4	12000	28.03	25.25	23.61	21.61	19.42	15.55	9.20
	C	109.9	12040	28.15	25.42	23.78	21.78	19.56	15.68	9.24
*	2	80.9	8856	21.45	19.26	18.08	16.55	14.80	11.87	7.03
*	2	80.9	8856	21.37	19.22	18.04	16.46	14.76	11.83	6.94
*	2	80.9	8856	21.49	19.30	18.12	16.59	14.85	11.91	7.07
*	2	80.9	8856	21.53	19.30	18.12	16.59	14.85	11.91	7.07
*	3	109.4	12000	28.32	25.55	23.91	21.91	19.65	15.68	9.33
*	3	109.7	12032	28.49	25.68	24.08	21.99	19.74	15.73	9.37
*	3	109.7	12024	28.57	25.72	24.08	22.04	19.78	15.77	9.37
*	3	109.9	12048	28.57	25.72	24.08	22.08	19.82	15.73	9.37
*	4	141.4	15512	36.32	32.83	30.76	28.11	25.20	20.02	11.93
*	4	141.4	15512	36.53	32.92	30.89	28.24	25.38	20.10	12.01
*	4	141.3	15488	36.62	32.92	30.98	28.33	25.47	20.19	12.06
*	4	141.3	15496	36.70	32.92	31.06	28.28	25.51	20.28	12.10

Stn: 484 Lane:J3 Temp: J/C: Air: 81 PvT: 82 12:36

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	111.7	12256	19.31	18.79	18.17	17.10	15.91	13.47	8.80
	C	111.7	12256	19.31	18.79	18.17	17.14	16.00	13.43	8.80
	C	111.7	12256	19.44	18.87	18.25	17.22	16.00	13.52	8.85
*	2	82.6	9056	14.66	14.09	13.62	12.92	11.96	10.05	6.59
*	2	82.8	9080	14.70	14.18	13.71	12.96	12.00	10.09	6.64
*	2	82.8	9080	14.66	14.13	13.62	12.92	12.00	10.05	6.64
*	2	82.2	9016	14.66	14.13	13.67	12.92	12.00	10.09	6.64
*	3	111.9	12264	19.44	18.87	18.21	17.22	16.00	13.43	8.80
*	3	111.9	12272	19.52	18.96	18.34	17.31	16.05	13.52	8.85
*	3	111.9	12264	19.65	19.05	18.42	17.43	16.16	13.60	8.98
*	3	111.7	12256	19.61	19.00	18.38	17.39	16.13	13.56	8.89
*	4	145.1	15904	25.47	24.60	23.82	22.50	20.89	17.59	11.49
*	4	144.9	15896	25.64	24.73	23.95	22.63	21.02	17.72	11.62
*	4	144.1	15800	25.51	24.65	23.91	22.58	20.94	17.68	11.58
*	4	144.1	15800	25.60	24.73	23.99	22.67	20.98	17.72	11.62

Stn: 496 Lane:J2 Temp: J/C: Air: 80 PvT: 79 12:38

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.3	11984	25.68	23.05	21.64	19.67	17.60	14.08	8.33
	C	109.6	12008	25.47	22.92	21.46	19.46	17.42	13.95	8.20
	C	109.6	12008	25.77	23.14	21.72	19.71	17.65	14.12	8.28
*	2	81.0	8888	19.69	17.54	16.50	14.99	13.42	10.74	6.33
*	2	80.9	8856	19.73	17.54	16.54	15.03	13.42	10.74	6.33
*	2	81.0	8880	19.73	17.54	16.54	14.99	13.42	10.74	6.25
*	2	81.2	8904	19.82	17.62	16.58	15.07	13.47	10.79	6.33
*	3	109.6	12008	26.10	23.40	21.94	19.92	17.82	14.30	8.41
*	3	109.4	12000	26.23	23.53	22.11	20.05	18.00	14.43	8.50
*	3	109.7	12024	26.31	23.61	22.19	20.09	18.00	14.43	8.46
*	3	109.4	12000	26.39	23.66	22.24	20.22	18.09	14.47	8.50
*	4	141.6	15528	34.10	30.46	28.62	25.92	23.25	18.59	10.93
*	4	141.2	15472	34.23	30.68	28.79	26.05	23.38	18.72	11.02
*	4	141.2	15472	34.48	30.81	28.96	26.21	23.56	18.85	11.10
*	4	141.2	15472	34.56	30.98	29.09	26.30	23.65	18.93	11.15

Stn: 510 Lane:J3 Temp: J/C: Air: 76 PvT: 80 12:43

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.7	12136	18.81	18.31	17.74	16.80	15.65	13.30	8.76
	C	111.2	12184	18.89	18.48	17.91	16.93	15.78	13.43	8.85
	C	111.4	12216	18.94	18.44	17.91	16.93	15.78	13.39	8.80
*	2	81.4	8936	14.41	13.87	13.54	12.79	11.96	10.14	6.68
*	2	81.4	8928	14.37	13.92	13.50	12.79	11.91	10.14	6.68

File: C:\FWD\DATA\274040B2.FWD
Road: US-2 WESTBOUND LANES 10 MILES WEST OF GRAND RAPIDS, MN.
Subsection: 274040

*	2	81.4	8928	14.37	13.92	13.54	12.83	11.91	10.14	6.68
*	2	81.7	8968	14.37	13.92	13.54	12.79	11.96	10.14	6.68
*	3	111.0	12168	18.94	18.44	17.95	16.93	15.78	13.39	8.85
*	3	111.2	12184	18.98	18.48	17.95	17.01	15.82	13.47	8.89
*	3	111.2	12192	19.02	18.61	18.08	17.14	15.91	13.52	8.98
*	3	111.3	12208	19.02	18.57	18.04	17.10	15.91	13.52	8.89
*	4	144.9	15880	24.63	23.96	23.22	21.99	20.45	17.42	11.41
*	4	143.9	15784	24.68	23.96	23.26	21.99	20.54	17.37	11.45
*	4	143.9	15784	24.72	24.04	23.35	22.04	20.58	17.46	11.45
*	4	143.8	15760	24.76	24.09	23.35	22.04	20.62	17.46	11.49

Stn: 522 Lane:J2 Temp: J/C: Air: 76 PvT: 79 12:47

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.0	11944	28.28	25.64	23.99	21.87	19.56	15.73	9.37
	C	109.0	11952	28.32	25.59	24.04	21.87	19.56	15.73	9.37
	C	108.8	11936	28.36	25.64	23.99	21.87	19.51	15.73	9.37
*	2	80.7	8856	21.83	19.61	18.38	16.72	15.02	12.09	7.24
*	2	80.9	8864	21.70	19.52	18.34	16.67	14.98	12.00	7.20
*	2	80.7	8856	21.66	19.48	18.29	16.67	14.93	12.00	7.20
*	2	80.7	8856	21.62	19.43	18.25	16.67	14.93	12.00	7.20
*	3	109.0	11952	28.28	25.51	23.95	21.74	19.51	15.68	9.37
*	3	108.8	11928	28.28	25.51	23.91	21.74	19.47	15.64	9.33
*	3	108.7	11912	28.40	25.64	24.04	21.87	19.60	15.77	9.41
*	3	109.0	11944	28.28	25.55	23.95	21.74	19.51	15.68	9.33
*	4	140.4	15400	36.03	32.57	30.55	27.82	24.85	20.02	11.88
*	4	140.1	15368	36.15	32.75	30.63	27.86	24.94	20.06	11.93
*	4	139.9	15344	36.20	32.75	30.68	27.95	25.02	20.10	11.93
*	4	140.0	15352	36.32	32.88	30.81	28.03	25.11	20.23	12.01

Stn: 535 Lane:J3 Temp: J/C: Air: 77 PvT: 76 12:51

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.6	12128	19.61	18.92	18.42	17.39	16.00	13.52	8.63
	C	110.7	12136	19.69	19.00	18.51	17.48	16.09	13.56	8.63
	C	110.7	12136	19.82	19.09	18.59	17.56	16.13	13.60	8.67
*	2	82.2	9016	15.12	14.52	14.22	13.38	12.31	10.40	6.64
*	2	82.2	9008	15.17	14.56	14.22	13.42	12.36	10.44	6.64
*	2	82.2	9016	15.12	14.48	14.18	13.38	12.27	10.35	6.64
*	2	82.9	9088	15.17	14.56	14.22	13.42	12.36	10.40	6.64
*	3	110.9	12152	19.94	19.22	18.72	17.65	16.22	13.73	8.76
*	3	110.7	12144	19.90	19.17	18.77	17.65	16.22	13.65	8.72
*	3	110.9	12160	20.03	19.26	18.85	17.77	16.36	13.78	8.80
*	3	110.7	12136	19.98	19.26	18.85	17.77	16.31	13.73	8.80
*	4	143.0	15688	25.77	24.78	24.25	22.88	20.98	17.72	11.28
*	4	142.6	15640	25.85	24.86	24.38	23.01	21.07	17.81	11.41
*	4	142.6	15640	25.93	24.95	24.42	23.01	21.16	17.85	11.45
*	4	142.6	15640	25.97	25.03	24.38	23.05	21.20	17.94	11.49

Mileage:-.009 -> .101

12:58 930728

√ Loc of Test with Distress Survey OFF 10' AT 001

File: C:\FWD\DATA\274040B3.FWD
Road: US-2 WESTBOUND LANES 10 MILES WEST OF GRAND RAPIDS, MN.
Subsection: 274040

FWD S/N : 8002-063
Operator ID : PELKEY, BRUCE J.

Extra Tests for SMP

Stationing...: Feet

Diameter of Plate: 11.8
Deflector distances : 12 12 18 24 36 60

SHRP TESTING - RIGID/CRCP - JOINT AND CRACK TEST (J4/C4, J5/C5)
Sequence: CCC222233334444

Stn: -49 Lane:J4 Temp: J/C: 51 Air: 81 PvT: 82 13:01

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.0	12280	13.83	11.38	11.78	10.64	9.38	7.54	4.51
	C	112.5	12328	13.66	11.25	11.74	10.55	9.38	7.49	4.51
	C	112.5	12336	13.83	11.42	11.83	10.64	9.51	7.58	4.64
*	2	83.3	9144	10.47	8.49	8.78	7.94	7.02	5.63	3.43
*	2	83.8	9184	10.52	8.53	8.78	7.94	7.07	5.63	3.47
*	2	83.6	9168	10.43	8.49	8.78	7.89	7.02	5.63	3.43
*	2	83.5	9160	10.43	8.49	8.74	7.94	6.93	5.63	3.43
*	3	112.2	12296	13.74	11.33	11.65	10.55	9.33	7.45	4.55
*	3	112.2	12296	13.74	11.33	11.65	10.51	9.33	7.45	4.51
*	3	112.3	12312	13.74	11.33	11.61	10.51	9.29	7.41	4.51
*	3	112.3	12320	13.83	11.42	11.70	10.55	9.33	7.49	4.55
*	4	144.9	15888	18.10	14.69	15.12	13.63	12.09	9.66	5.81
*	4	145.1	15912	18.18	14.78	15.21	13.68	12.13	9.66	5.81
*	4	145.1	15912	18.22	14.74	15.12	13.68	12.09	9.66	5.81
*	4	144.8	15880	18.22	14.74	15.12	13.63	12.00	9.66	5.77

Stn: -47 Lane:J5 Temp: J/C: 51 Air: 82 PvT: 81 13:03

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	111.7	12248	15.75	11.55	12.68	11.36	10.00	7.88	4.73
	C	111.7	12248	15.75	11.76	12.77	11.44	10.13	7.93	4.81
	C	111.6	12232	15.84	11.72	12.77	11.48	10.18	7.97	4.86
*	2	83.0	9104	11.98	8.66	9.64	8.65	7.65	6.02	3.64
*	2	83.5	9152	11.98	8.79	9.73	8.74	7.73	6.11	3.69
*	2	83.3	9144	11.98	8.79	9.73	8.74	7.73	6.11	3.73
*	2	83.3	9144	11.94	8.75	9.73	8.74	7.78	6.11	3.73
*	3	111.7	12256	15.75	11.63	12.77	11.44	10.13	7.93	4.77
*	3	111.9	12264	15.84	11.76	12.85	11.48	10.13	7.93	4.64V
*	3	111.9	12272	15.96	11.76	12.90	11.57	10.22	8.06	4.90
*	3	111.0	12176	15.88	11.72	12.85	11.52	10.16	8.01	4.90
*	4	143.9	15784	20.57	15.34	16.75	15.03	13.38	10.44	6.29
*	4	143.5	15736	20.44	15.21	16.58	14.86	13.16	10.27	6.16
*	4	143.9	15784	20.53	15.25	16.62	14.90	13.20	10.31	6.20
*	4	144.2	15808	20.57	15.21	16.71	14.99	13.20	10.40	6.25

'ACCEPTED TEST WITH VARATION

Stn: -22 Lane:J4 Temp: J/C: 61 Air: 83 PvT: 83 13:09

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	111.9	12264	13.11	10.86	12.30	11.02	9.65	7.62	4.64
	C	112.3	12320	12.99	10.86	12.30	11.02	9.78	7.62	4.64
	C	112.8	12360	13.07	10.90	12.38	11.10	9.82	7.71	4.73
*	2	84.1	9216	9.64	8.06	9.21	8.27	7.29	5.81	3.51
*	2	83.9	9200	9.72	8.14	9.30	8.32	7.29	5.89	3.60
*	2	83.9	9200	9.76	8.14	9.30	8.32	7.38	5.85	3.60
*	2	84.5	9272	9.76	8.10	9.25	8.27	7.29	5.76	3.51
*	3	112.2	12296	12.99	10.86	12.30	11.02	9.78	7.67	4.64
*	3	112.6	12352	13.07	10.82	12.34	11.06	9.73	7.67	4.68
*	3	112.8	12352	13.11	10.94	12.42	11.14	9.82	7.75	4.73
*	3	112.6	12344	13.03	10.86	12.34	11.06	9.78	7.67	4.64
*	4	144.3	15824	17.09	14.13	15.94	14.27	12.62	9.88	5.90
*	4	144.3	15824	17.22	14.26	16.15	14.44	12.89	10.01	6.03
*	4	144.3	15824	17.18	14.31	16.11	14.44	12.80	10.01	6.07
*	4	143.9	15784	17.13	14.26	16.07	14.39	12.85	9.92	5.99

Stn: 21 Lane:J5 Temp: J/C: 61 Air: 82 PvT: 83 13:11

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.9	12152	14.16	12.41	11.61	10.47	9.20	7.32	4.47

File: C:\FWD\DATA\274040B3.FWD
Road: US-2 WESTBOUND LANES 10 MILES WEST OF GRAND RAPIDS, MN.
Subsection: 274040

	C	111.6	12232	14.12	12.58	11.57	10.43	9.33	7.36	4.55
	C	111.7	12248	14.12	12.58	11.57	10.43	9.29	7.32	4.51
*	2	83.0	9096	10.56	9.35	8.65	7.85	6.89	5.55	3.38
*	2	83.2	9112	10.64	9.39	8.74	7.94	6.98	5.59	3.47
*	2	82.9	9088	10.60	9.48	8.74	7.94	7.02	5.63	3.47
*	2	83.0	9096	10.64	9.39	8.74	7.94	6.93	5.59	3.43
*	3	111.2	12184	14.12	12.58	11.61	10.51	9.29	7.41	4.55
*	3	111.3	12208	14.16	12.58	11.65	10.55	9.25	7.41	4.55
*	3	111.4	12216	14.24	12.58	11.61	10.47	9.29	7.36	4.47
*	3	111.2	12192	14.20	12.58	11.70	10.60	9.29	7.45	4.55
*	4	144.3	15824	18.56	16.33	15.08	13.51	12.00	9.40	5.77
*	4	144.1	15800	18.52	16.33	15.08	13.51	12.00	9.40	5.73
*	4	144.2	15808	18.56	16.33	15.12	13.55	12.00	9.44	5.73
*	4	143.8	15752	18.60	16.33	15.12	13.55	12.05	9.49	5.81

Stn: 4 Lane:J4 Temp: J/C: 52 Air: 80 PvT: 84 13:14

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	111.4	12216	13.41	10.94	11.27	10.13	8.98	7.06	4.25
	C	111.7	12248	13.36	10.90	11.23	10.13	8.98	7.10	4.29
	C	111.6	12240	13.36	10.90	11.27	10.13	8.98	7.10	4.29
*	2	83.3	9136	10.18	8.23	8.48	7.68	6.76	5.42	3.34
*	2	83.5	9144	10.26	8.27	8.53	7.73	6.80	5.46	3.34
*	2	83.5	9144	10.10	8.23	8.48	7.68	6.71	5.37	3.30
*	2	83.5	9152	10.10	8.23	8.48	7.73	6.80	5.42	3.34
*	3	111.3	12208	13.45	10.94	11.31	10.17	9.02	7.15	4.38
*	3	111.9	12264	13.41	10.90	11.27	10.13	8.98	7.10	4.34
*	3	111.7	12248	13.36	10.90	11.23	10.13	8.98	7.10	4.34
*	3	111.7	12248	13.41	10.94	11.23	10.13	9.02	7.10	4.29
*	4	143.9	15776	17.51	14.18	14.61	13.13	11.65	9.18	5.55
*	4	143.6	15752	17.47	14.13	14.57	13.09	11.60	9.14	5.51
*	4	143.9	15784	17.51	14.18	14.61	13.21	11.65	9.23	5.55
*	4	143.6	15752	17.55	14.13	14.52	13.09	11.60	9.14	5.51

Stn: 5 Lane:J5 Temp: J/C: 52 Air: 79 PvT: 83 13:17

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	111.3	12208	14.37	11.33	11.57	10.43	9.20	7.23	4.38
	C	112.2	12288	14.37	11.42	11.61	10.47	9.25	7.32	4.42
	C	111.9	12272	14.33	11.42	11.57	10.38	9.20	7.23	4.38
*	2	82.5	9048	10.85	8.53	8.70	7.89	6.98	5.50	3.34
*	2	82.9	9088	10.85	8.57	8.74	7.94	7.02	5.55	3.43
*	2	83.0	9104	10.85	8.49	8.70	7.89	6.93	5.50	3.38
*	2	82.8	9080	10.85	8.53	8.70	7.89	6.98	5.55	3.38
*	3	111.9	12272	14.37	11.33	11.57	10.43	9.25	7.23	4.42
*	3	112.3	12312	14.45	11.42	11.61	10.47	9.25	7.23	4.34
*	3	112.2	12296	14.41	11.38	11.61	10.51	9.29	7.28	4.42
*	3	111.9	12264	14.45	11.38	11.61	10.47	9.25	7.28	4.42
*	4	145.1	15912	18.73	14.74	15.04	13.42	11.87	9.31	5.60
*	4	144.6	15864	18.73	14.74	15.04	13.51	11.87	9.31	5.60
*	4	144.6	15864	18.77	14.74	15.04	13.51	11.91	9.36	5.64
*	4	144.1	15800	18.68	14.69	15.04	13.51	11.87	9.31	5.60

Stn: 31 Lane:J4 Temp: J/C: 50 Air: 77 PvT: 83 13:20

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	113.5	12440	11.69	9.87	11.18	10.13	8.98	7.19	4.42
	C	113.5	12448	11.60	9.78	11.05	10.00	8.93	7.19	4.47
	C	113.5	12440	11.60	9.78	11.10	10.09	8.93	7.19	4.47
*	2	84.3	9240	8.80	7.37	8.27	7.56	6.76	5.46	3.43
*	2	84.3	9256	8.76	7.41	8.35	7.60	6.80	5.50	3.47
*	2	84.6	9280	8.71	7.33	8.31	7.56	6.76	5.46	3.38
*	2	84.5	9264	8.76	7.41	8.35	7.60	6.76	5.46	3.43
*	3	113.3	12424	11.56	9.69	11.05	10.00	8.89	7.19	4.42
*	3	113.2	12416	11.65	9.87	11.10	10.09	9.02	7.23	4.51
*	3	113.3	12424	11.65	9.78	11.10	10.05	8.93	7.19	4.47
*	3	113.6	12464	11.69	9.82	11.18	10.13	9.02	7.28	4.51
*	4	146.2	16040	15.17	12.80	14.31	12.96	11.56	9.27	5.68
*	4	146.2	16040	15.25	12.84	14.35	13.00	11.56	9.27	5.73
*	4	146.1	16024	15.21	12.80	14.40	13.00	11.60	9.27	5.73
*	4	146.5	16064	15.25	12.84	14.40	13.04	11.60	9.31	5.73

Stn: 33 Lane:J5 Temp: J/C: 50 Air: 77 PvT: 83 13:23

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7

File: C:\FWD\DATA\274040B3.FWD
Road: US-2 WESTBOUND LANES 10 MILES WEST OF GRAND RAPIDS, MN.
Subsection: 274040

	C	112.9	12384	12.19	11.20	10.37	9.50	8.53	6.93	4.38
	C	113.3	12424	12.32	11.25	10.37	9.54	8.53	6.84	4.38
	C	113.2	12408	12.32	11.25	10.37	9.50	8.58	6.84	4.42
*	2	83.9	9200	9.30	8.40	7.84	7.13	6.44	5.24	3.34
*	2	84.2	9232	9.30	8.45	7.80	7.13	6.44	5.20	3.30
*	2	84.2	9240	9.26	8.32	7.71	7.05	6.36	5.24	3.30
*	2	83.9	9200	9.30	8.40	7.75	7.13	6.44	5.24	3.30
*	3	113.0	12400	12.23	11.20	10.37	9.50	8.53	6.84	4.38
*	3	113.0	12400	12.28	11.25	10.37	9.50	8.53	6.89	4.42
*	3	113.2	12408	12.28	11.20	10.41	9.46	8.53	6.93	4.38
*	3	113.2	12408	12.15	11.20	10.33	9.46	8.53	6.89	4.34
*	4	146.2	16032	15.88	14.52	13.37	12.20	10.93	8.75	5.51
*	4	146.7	16088	15.92	14.56	13.37	12.24	10.98	8.75	5.51
*	4	146.2	16032	15.88	14.43	13.45	12.20	11.02	8.84	5.55
*	4	147.0	16112	15.96	14.56	13.41	12.28	11.02	8.84	5.60

Stn: 60 Lane:J4 Temp: J/C: 51 Air: 76 PvT: 83 13:26

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.6	12344	12.28	10.43	11.95	10.81	9.69	7.62	4.60
	C	113.2	12408	12.02	10.26	11.65	10.55	9.47	7.58	4.60
	C	113.2	12408	12.07	10.34	11.65	10.64	9.47	7.62	4.68
*	2	84.1	9216	9.17	7.76	8.74	7.94	7.07	5.68	3.47
*	2	84.1	9216	9.05	7.58	8.65	7.85	7.02	5.63	3.43
*	2	83.9	9200	9.13	7.67	8.70	7.94	7.11	5.72	3.51
*	2	83.9	9200	9.34	7.80	8.87	8.10	7.25	5.89V	3.69V
*	3	113.0	12392	12.07	10.38	11.70	10.55	9.56	7.58	4.64
*	3	113.3	12424	12.11	10.30	11.70	10.64	9.51	7.58	4.68
*	3	112.9	12376	12.02	10.26	11.57	10.51	9.47	7.49	4.55
*	3	113.2	12408	12.07	10.26	11.65	10.60	9.47	7.54	4.60
*	4	145.8	15984	15.75	13.44	15.30	13.72	12.40	9.79	5.94
*	4	146.2	16032	15.84	13.44	15.25	13.80	12.40	9.83	5.94
*	4	146.2	16040	15.88	13.53	15.34	13.85	12.49	9.88	6.03
*	4	146.1	16024	15.92	13.53	15.38	13.89	12.49	9.96	6.07

Stn: 61 Lane:J5 Temp: J/C: 51 Air: 75 PvT: 83 13:28

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	113.2	12408	12.65	11.81	10.84	9.88	8.98	7.10	4.51
	C	113.5	12440	12.69	11.89	10.93	9.96	9.07	7.19	4.55
	C	113.3	12424	12.74	11.94	10.93	9.96	9.07	7.23	4.55
*	2	84.3	9240	9.59	8.92	8.23	7.51	6.85	5.50	3.47
*	2	83.9	9200	9.47	8.83	8.14	7.43	6.76	5.42	3.43
*	2	84.5	9264	9.51	8.88	8.14	7.43	6.76	5.42	3.38
*	2	84.3	9240	9.51	8.92	8.23	7.51	6.80	5.46	3.43
*	3	113.3	12432	12.69	11.89	10.93	9.92	9.02	7.15	4.51
*	3	113.6	12464	12.74	11.89	10.88	9.92	8.98	7.19	4.51
*	3	113.5	12448	12.74	11.89	10.88	9.92	9.02	7.19	4.51
*	3	113.5	12448	12.74	11.89	10.93	9.96	9.02	7.19	4.51
*	4	146.7	16088	16.55	15.43	14.10	12.83	11.60	9.27	5.77
*	4	146.5	16064	16.59	15.51	14.18	12.88	11.69	9.31	5.77
*	4	146.5	16064	16.51	15.47	14.14	12.88	11.65	9.31	5.81
*	4	146.4	16056	16.55	15.47	14.14	12.88	11.69	9.27	5.77

Stn: 88 Lane:J4 Temp: J/C: 42 Air: 75 PvT: 80 13:31

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.9	12376	13.83	11.63	12.94	11.61	10.36	8.19	4.86
	C	113.2	12408	13.66	11.46	12.77	11.44	10.22	8.06	4.73
	C	112.9	12376	13.70	11.46	12.77	11.48	10.22	8.10	4.81
*	2	84.6	9280	10.35	8.62	9.60	8.65	7.69	6.11	3.64
*	2	84.5	9272	10.35	8.57	9.60	8.61	7.65	6.15	3.64
*	2	84.5	9256	10.31	8.57	9.55	8.61	7.65	6.07	3.60
*	2	84.3	9240	10.35	8.53	9.60	8.65	7.65	6.11	3.69
*	3	112.9	12376	13.66	11.55	12.77	11.46	10.22	8.10	4.77
*	3	112.8	12368	13.74	11.42	12.85	11.57	10.22	8.14	4.81
*	3	112.8	12368	13.74	11.63	12.85	11.52	10.27	8.14	4.90
*	3	112.9	12384	13.78	11.55	12.90	11.61	10.31	8.19	4.86
*	4	144.9	15880	18.01	14.99	16.67	14.94	13.29	10.48	6.20
*	4	145.1	15912	18.06	15.04	16.71	15.03	13.33	10.57	6.25
*	4	144.8	15872	18.01	14.99	16.71	14.99	13.33	10.53	6.25
*	4	144.8	15872	18.06	15.04	16.71	15.03	13.33	10.53	6.25

File: C:\FWD\DATA\274040B3.FWD
Road: US-2 WESTBOUND LANES 10 MILES WEST OF GRAND RAPIDS, MN.
Subsection: 274040

Stn: 89 Lane:J5 Temp: J/C: 42 Air: 75 PvT: 80 13:34

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	113.0	12392	14.20	12.75	11.95	10.85	9.69	7.75	4.77
	C	112.9	12376	14.24	12.93	12.00	10.89	9.69	7.80	4.77
	C	112.9	12384	14.20	12.93	11.95	10.89	9.69	7.75	4.77
*	2	83.8	9184	10.81	9.65	9.00	8.19	7.29	5.89	3.69
*	2	84.1	9216	10.64	9.61	8.95	8.15	7.25	5.81	3.60
*	2	83.8	9184	10.68	9.61	8.95	8.15	7.25	5.85	3.64
*	2	83.9	9200	10.68	9.57	8.91	8.10	7.20	5.81	3.60
*	3	112.9	12384	14.20	12.88	11.95	10.85	9.65	7.71	4.73
*	3	113.2	12400	14.24	12.93	12.00	10.89	9.69	7.75	4.77
*	3	113.2	12408	14.24	12.93	12.00	10.93	9.73	7.80	4.81
*	3	112.9	12384	14.24	12.93	12.00	10.93	9.69	7.80	4.81
*	4	145.4	15936	18.56	16.68	15.47	14.06	12.49	10.01	6.16
*	4	145.5	15960	18.64	16.76	15.55	14.14	12.58	10.09	6.20
*	4	145.5	15960	18.64	16.76	15.55	14.14	12.58	10.05	6.16
*	4	145.5	15960	18.73	16.80	15.64	14.18	12.67	10.14	6.20

Stn: 115 Lane:J4 Temp: J/C: 50 Air: 75 PvT: 80 13:36

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.0	12288	14.37	12.06	13.15	11.86	10.45	8.23	4.81
	C	112.2	12304	14.12	11.94	12.94	11.65	10.31	8.14	4.77
	C	112.0	12288	14.12	11.94	12.98	11.65	10.36	8.19	4.86
*	2	84.2	9240	10.73	8.92	9.64	8.78	7.78	6.15	3.69
*	2	84.5	9264	10.64	8.88	9.60	8.70	7.73	6.11	3.64
*	2	84.3	9248	10.64	8.88	9.64	8.70	7.69	6.11	3.64
*	2	84.2	9240	10.64	8.92	9.68	8.78	7.78	6.15	3.73
*	3	112.2	12288	14.20	11.98	12.98	11.65	10.40	8.19	4.86
*	3	112.2	12288	14.20	11.89	12.94	11.65	10.36	8.14	4.81
*	3	111.9	12272	14.16	11.89	12.90	11.61	10.36	8.14	4.77
*	3	112.2	12288	14.24	12.02	13.02	11.74	10.45	8.23	4.90
*	4	143.3	15712	18.56	15.60	16.88	15.15	13.47	10.61	6.25
*	4	142.9	15672	18.56	15.55	16.84	15.15	13.47	10.61	6.20
*	4	143.0	15680	18.60	15.60	16.92	15.20	13.51	10.66	6.29
*	4	142.9	15664	18.56	15.51	16.88	15.15	13.47	10.61	6.20

Stn: 116 Lane:J5 Temp: J/C: 50 Air: 76 PvT: 81 13:39

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.0	12280	15.25	13.06	12.47	11.23	9.91	7.88	4.64
	C	112.5	12328	15.21	13.10	12.42	11.23	10.00	7.84	4.68
	C	112.3	12312	15.25	13.14	12.47	11.27	10.00	7.97	4.73
*	2	84.1	9216	11.52	9.69	9.30	8.40	7.51	5.94	3.56
*	2	84.5	9272	11.56	9.69	9.30	8.40	7.47	5.94	3.51
*	2	84.3	9240	11.56	9.69	9.30	8.40	7.47	5.94	3.51
*	2	84.5	9256	11.48	9.65	9.25	8.36	7.47	5.89	3.51
*	3	112.2	12296	15.12	13.06	12.38	11.19	9.96	7.84	4.68
*	3	112.2	12296	15.08	13.01	12.38	11.19	9.91	7.84	4.68
*	3	112.5	12328	15.17	13.10	12.42	11.23	9.96	7.93	4.68
*	3	112.3	12320	15.17	13.10	12.42	11.19	9.96	7.84	4.68
*	4	144.1	15792	19.73	17.02	16.02	14.48	12.93	10.09	5.99
*	4	144.1	15784	19.73	17.02	16.07	14.52	12.98	10.14	6.03
*	4	143.8	15760	19.65	17.02	16.07	14.48	12.89	10.14	6.03
*	4	143.8	15768	19.65	17.02	16.07	14.48	12.89	10.14	5.99

Stn: 142 Lane:J4 Temp: J/C: 50 Air: 78 PvT: 83 13:42

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.9	12376	12.78	10.77	12.34	11.19	9.87	7.88	4.68
	C	113.0	12392	12.57	10.73	12.12	11.02	9.82	7.80	4.68
	C	113.2	12408	12.57	10.69	12.17	11.02	9.82	7.80	4.73
*	2	83.8	9184	9.47	7.97	9.04	8.23	7.33	5.89	3.60
*	2	84.3	9240	9.47	7.97	9.08	8.23	7.33	5.89	3.60
*	2	84.3	9240	9.43	7.93	9.08	8.23	7.25	5.81	3.51
*	2	84.3	9240	9.47	7.93	9.13	8.27	7.33	5.89	3.64
*	3	112.6	12352	12.61	10.64	12.12	11.02	9.82	7.84	4.73
*	3	112.9	12376	12.61	10.69	12.12	11.02	9.82	7.80	4.68
*	3	112.8	12368	12.65	10.69	12.17	11.06	9.82	7.84	4.73
*	3	112.9	12376	12.61	10.73	12.17	11.02	9.87	7.84	4.73
*	4	145.4	15936	16.46	13.87	15.85	14.35	12.80	10.18	6.07
*	4	145.2	15920	16.51	13.96	15.90	14.44	12.93	10.22	6.07
*	4	145.2	15920	16.55	14.00	15.94	14.44	12.98	10.27	6.12

File: C:\FWD\DATA\274040B3.FWD
Road: US-2 WESTBOUND LANES 10 MILES WEST OF GRAND RAPIDS, MN.
Subsection: 274040

*	4	145.2	15920	16.55	13.92	15.90	14.44	12.89	10.22	6.12

2 Stn: 144 Lane:J5 Temp: J/C: 50 Air: 79 PvT: 84 13:45

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.6	12352	13.41	12.15	11.31	10.26	9.16	7.36	4.51
	C	112.5	12336	13.49	12.24	11.31	10.30	9.20	7.41	4.55
	C	113.0	12384	13.57	12.28	11.35	10.30	9.20	7.36	4.51
*	2	83.8	9184	10.05	9.18	8.48	7.73	6.93	5.59	3.47
*	2	83.9	9200	10.14	9.05	8.40	7.68	6.85	5.50	3.38
*	2	83.9	9200	10.05	9.13	8.48	7.73	6.93	5.59	3.47
*	2	84.1	9216	10.01	9.05	8.44	7.73	6.85	5.55	3.43
*	3	112.6	12352	13.45	12.19	11.27	10.26	9.20	7.36	4.51
*	3	112.6	12352	13.53	12.28	11.35	10.30	9.25	7.41	4.55
*	3	112.9	12376	13.49	12.28	11.35	10.30	9.29	7.41	4.55
*	3	112.8	12360	13.49	12.24	11.31	10.30	9.20	7.36	4.51
*	4	145.1	15904	17.60	15.99	14.74	13.38	12.00	9.53	5.81
*	4	145.4	15944	17.60	15.99	14.74	13.34	12.00	9.53	5.81
*	4	145.1	15896	17.64	16.07	14.78	13.38	12.05	9.57	5.90
*	4	145.1	15912	17.60	16.07	14.78	13.38	12.05	9.53	5.81

3 Stn: 170 Lane:J4 Temp: J/C: 52 Air: 79 PvT: 84 13:47

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	111.2	12184	15.21	12.32	12.72	11.48	10.22	8.10	4.90
	C	111.0	12176	14.96	12.06	12.55	11.31	10.09	7.93	4.77
	C	111.9	12264	14.96	12.15	12.51	11.31	10.05	7.93	4.77
*	2	82.9	9088	11.40	9.22	9.34	8.48	7.60	5.98	3.69
*	2	82.6	9064	11.31	9.18	9.34	8.48	7.56	5.98	3.64
*	2	82.9	9088	11.31	9.18	9.34	8.44	7.56	5.94	3.60
*	2	82.5	9040	11.35	9.13	9.30	8.40	7.51	5.89	3.60
*	3	111.0	12176	15.08	12.19	12.47	11.27	10.05	7.88	4.73
*	3	111.0	12168	15.21	12.24	12.51	11.31	10.09	7.97	4.81
*	3	110.9	12152	15.21	12.32	12.51	11.36	10.09	7.97	4.77
*	3	111.0	12176	15.17	12.28	12.51	11.27	10.09	7.93	4.77
*	4	143.0	15688	19.73	15.90	16.28	14.69	13.07	10.27	6.16
*	4	142.5	15616	19.82	16.07	16.32	14.73	13.11	10.35	6.25
*	4	142.8	15648	19.90	15.99	16.37	14.77	13.20	10.35	6.20
*	4	142.6	15640	19.94	16.07	16.32	14.73	13.16	10.40	6.25

9 Stn: 171 Lane:J4 Temp: J/C: 52 Air: 78 PvT: 84 13:50

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.9	12152	16.13	12.75	13.11	11.82	10.49	8.23	4.99
	C	111.2	12184	16.17	12.71	13.20	11.82	10.49	8.32	5.03
	C	111.2	12192	16.26	12.62	13.24	11.90	10.53	8.36	5.03
*	2	82.8	9072	12.48	9.39	10.03	9.08	7.96	6.37	3.82
*	2	82.8	9080	12.32	9.26	10.03	9.03	7.96	6.37	3.82
*	2	82.8	9072	12.36	9.31	10.03	9.03	7.91	6.37	3.82
*	2	82.8	9072	12.36	9.22	9.98	8.99	7.91	6.33	3.82
*	3	110.9	12160	16.30	12.45	13.24	11.90	10.49	8.32	4.99
*	3	110.9	12152	16.42	12.54	13.28	11.95	10.62	8.36	5.03
*	3	110.9	12160	16.30	12.50	13.24	11.90	10.58	8.27	4.90
*	3	110.9	12152	16.30	12.45	13.24	11.90	10.53	8.27	4.94
*	4	142.9	15672	21.11	16.42	17.09	15.32	13.73	10.66	6.33
*	4	142.8	15656	21.28	16.29	17.18	15.45	13.69	10.74	6.42
*	4	142.6	15640	21.24	16.20	17.18	15.45	13.69	10.74	6.38
*	4	142.6	15640	21.32	16.20	17.18	15.41	13.73	10.66	6.29

5 Stn: 197 Lane:J4 Temp: J/C: 51 Air: 77 PvT: 84 13:53

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	111.4	12216	13.70	11.46	12.85	11.57	10.22	8.10	4.77
	C	111.4	12224	13.66	11.33	12.85	11.57	10.18	8.14	4.77
	C	111.3	12208	13.70	11.38	12.90	11.57	10.22	8.10	4.81
*	2	83.2	9128	10.26	8.53	9.60	8.70	7.69	6.11	3.69
*	2	83.2	9128	10.22	8.49	9.55	8.61	7.65	6.07	3.60
*	2	83.6	9160	10.31	8.45	9.60	8.65	7.65	6.07	3.60
*	2	83.3	9144	10.35	8.57	9.64	8.70	7.69	6.15	3.69
*	3	111.7	12248	13.86	11.42	12.90	11.61	10.31	8.10	4.81
*	3	111.7	12256	13.78	11.42	12.94	11.65	10.27	8.14	4.86
*	3	111.6	12232	13.74	11.46	12.94	11.61	10.31	8.10	4.86
*	3	111.6	12232	13.74	11.46	12.94	11.61	10.27	8.14	4.81
*	4	143.0	15680	17.97	14.91	16.79	15.07	13.38	10.53	6.20
*	4	142.6	15632	17.97	14.95	16.84	15.11	13.38	10.57	6.25

File: C:\FWD\DATA\274040B3.FWD
Road: US-2 WESTBOUND LANES 10 MILES WEST OF GRAND RAPIDS, MN.
Subsection: 274040

*	4	142.8	15656	18.06	14.95	16.92	15.15	13.47	10.57	6.29
*	4	142.8	15656	18.06	14.99	16.88	15.20	13.47	10.61	6.29

6 Stn: 199 Lane:J5 Temp: J/C: 51 Air: 77 PvT: 84 13:55

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.7	12144	14.79	12.93	12.17	11.06	9.73	7.84	4.68
	C	110.7	12136	14.75	13.14	12.25	11.06	9.82	7.88	4.77
	C	111.0	12176	14.70	13.10	12.21	11.02	9.73	7.84	4.68
*	2	83.2	9128	11.02	9.78	9.13	8.27	7.29	5.89	3.56
*	2	83.2	9128	11.02	9.74	9.08	8.27	7.29	5.89	3.56
*	2	83.2	9128	11.02	9.74	9.08	8.23	7.29	5.89	3.56
*	2	83.2	9128	11.06	9.82	9.13	8.32	7.33	5.98	3.60
*	3	111.2	12184	14.79	13.14	12.25	11.10	9.82	7.93	4.77
*	3	111.2	12184	14.75	13.14	12.21	11.06	9.82	7.88	4.73
*	3	111.2	12184	14.70	13.10	12.21	11.02	9.78	7.84	4.68
*	3	111.2	12184	14.79	13.14	12.25	11.10	9.82	7.93	4.77
*	4	142.3	15600	19.36	16.93	15.90	14.31	12.67	10.18	6.07
*	4	141.7	15544	19.27	16.93	15.81	14.31	12.62	10.14	6.03
*	4	142.0	15568	19.36	16.98	15.90	14.39	12.71	10.22	6.07
*	4	142.0	15568	19.44	17.06	15.94	14.48	12.71	10.27	6.16

2 Stn: 226 Lane:J4 Temp: J/C: 51 Air: 75 PvT: 81 13:58

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	111.3	12200	16.88	13.27	11.61	10.47	9.25	7.36	4.55
	C	111.3	12208	16.67	13.10	11.44	10.30	9.16	7.23	4.47
	C	111.4	12224	16.72	13.10	11.35	10.22	9.07	7.15	4.38
*	2	82.9	9088	12.61	9.87	8.57	7.77	6.85	5.50	3.47
*	2	83.0	9104	12.57	9.82	8.53	7.68	6.76	5.42	3.38
*	2	83.2	9128	12.57	9.87	8.57	7.73	6.85	5.46	3.43
*	2	83.2	9128	12.61	9.87	8.57	7.73	6.85	5.50	3.43
*	3	111.3	12208	16.84	13.19	11.44	10.34	9.11	7.28	4.51
*	3	111.4	12216	16.80	13.23	11.44	10.30	9.16	7.23	4.47
*	3	111.0	12176	16.84	13.14	11.44	10.34	9.16	7.28	4.55
*	3	111.0	12176	16.84	13.31	11.48	10.38	9.20	7.28	4.55
*	4	143.0	15680	21.87	17.19	14.87	13.38	11.82	9.36	5.73
*	4	142.6	15640	22.04	17.32	14.95	13.51	12.05	9.53	5.86
*	4	142.6	15640	21.99	17.32	14.91	13.47	11.96	9.44	5.77
*	4	142.5	15616	21.99	17.28	14.87	13.38	11.96	9.40	5.73

3 Stn: 227 Lane:J5 Temp: J/C: 51 Air: 75 PvT: 81 14:00

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.7	12136	18.60	12.06	14.61	12.92	11.33	8.79	5.20
	C	111.0	12168	18.60	12.11	14.70	13.00	11.42	8.84	5.25
	C	110.9	12160	18.73	11.98	14.74	13.00	11.38	8.84	5.20
*	2	83.2	9112	14.33	8.83	11.27	9.92	8.71	6.76	3.95
*	2	83.2	9120	14.41	8.83	11.31	9.96	8.76	6.80	4.03
*	2	82.8	9072	14.37	8.83	11.31	10.00	8.76	6.84	4.08
*	2	83.0	9104	14.33	8.75	11.23	9.92	8.67	6.76	3.95
*	3	110.7	12144	18.81	11.94	14.87	13.13	11.51	8.92	5.29
*	3	111.0	12176	18.81	11.89	14.91	13.13	11.51	8.92	5.25
*	3	111.0	12168	18.89	11.89	14.95	13.21	11.56	8.97	5.29
*	3	111.2	12184	18.94	11.85	14.95	13.17	11.56	8.92	5.25
*	4	142.6	15640	24.38	15.51	19.07	16.89	14.76	11.44	6.68
*	4	142.8	15648	24.51	15.51	19.19	16.93	14.80	11.44	6.68
*	4	142.6	15640	24.51	15.47	19.15	16.97	14.80	11.44	6.68
*	4	142.6	15640	24.55	15.47	19.24	17.01	14.85	11.48	6.68

0 Stn: 254 Lane:J4 Temp: J/C: 51 Air: 75 PvT: 81 14:03

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	111.2	12192	15.63	12.62	13.24	11.95	10.53	8.32	4.99
	C	111.2	12192	15.58	12.62	13.28	11.95	10.53	8.36	5.07
	C	111.3	12200	15.42	12.45	13.07	11.74	10.36	8.10	4.73
*	2	82.8	9072	11.81	9.57	10.07	9.08	8.09	6.37	3.86
*	2	82.9	9088	11.65	9.39	9.94	8.95	7.91	6.24	3.77
*	2	82.6	9064	11.65	9.39	9.90	8.91	7.91	6.20	3.73
*	2	82.8	9080	11.73	9.44	9.94	8.95	7.96	6.24	3.77
*	3	111.0	12176	15.58	12.62	13.24	11.95	10.53	8.32	5.03
*	3	111.2	12192	15.58	12.62	13.24	11.95	10.53	8.27	4.99
*	3	111.3	12208	15.67	12.71	13.32	11.95	10.62	8.36	5.03
*	3	111.0	12176	15.75	12.71	13.37	11.99	10.62	8.36	5.03
*	4	143.5	15728	20.40	16.50	17.27	15.45	13.73	10.70	6.38

File: C:\FWD\DATA\274040B3.FWD
Road: US-2 WESTBOUND LANES 10 MILES WEST OF GRAND RAPIDS, MN.
Subsection: 274040

*	4	143.6	15736	20.49	16.50	17.27	15.49	13.69	10.79	6.46
*	4	143.2	15704	20.49	16.55	17.31	15.53	13.73	10.79	6.46
*	4	143.3	15712	20.49	16.55	17.31	15.53	13.73	10.79	6.46

Stn: 255 Lane:J5 Temp: J/C: 51 Air: 74 PvT: 80 14:05

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.7	12144	16.84	13.57	13.62	12.28	10.80	8.58	5.16
	C	110.7	12136	16.80	13.62	13.62	12.24	10.76	8.49	5.16
	C	110.7	12144	16.93	13.62	13.71	12.37	10.89	8.62	5.25
*	2	82.5	9032	12.95	10.13	10.33	9.33	8.18	6.50	3.90
*	2	82.5	9048	12.86	10.13	10.37	9.33	8.22	6.50	3.95
*	2	82.5	9040	12.95	10.17	10.37	9.37	8.22	6.54	3.95
*	2	82.5	9040	13.03	10.17	10.41	9.41	8.22	6.54	4.03
*	3	110.9	12160	17.01	13.62	13.80	12.41	10.93	8.66	5.25
*	3	110.9	12152	16.97	13.49	13.71	12.37	10.89	8.58	5.16
*	3	110.7	12144	17.01	13.49	13.75	12.37	10.89	8.62	5.16
*	3	110.7	12136	17.09	13.53	13.84	12.45	10.98	8.66	5.25
*	4	143.2	15696	22.20	17.58	17.82	15.96	14.13	11.09	6.64
*	4	143.0	15680	22.20	17.54	17.82	16.00	14.09	11.09	6.59
*	4	142.8	15656	22.25	17.49	17.87	16.00	14.09	11.09	6.59
*	4	143.0	15680	22.37	17.49	17.95	16.13	14.13	11.16	6.64

Stn: 281 Lane:J4 Temp: J/C: 49 Air: 73 PvT: 80 14:08

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.5	12320	15.96	12.84	12.85	11.61	10.18	8.10	4.90
	C	112.2	12296	15.96	12.88	12.94	11.65	10.27	8.10	4.90
	C	111.9	12256	15.96	12.84	12.90	11.61	10.22	8.10	4.90
*	2	82.9	9096	12.02	9.65	9.60	8.70	7.65	6.07	3.73
*	2	82.9	9088	12.07	9.69	9.60	8.70	7.69	6.11	3.73
*	2	82.8	9072	12.02	9.65	9.64	8.70	7.69	6.11	3.73
*	2	82.9	9096	12.07	9.69	9.64	8.70	7.65	6.11	3.73
*	3	112.0	12280	16.05	12.93	12.94	11.61	10.22	8.10	4.90
*	3	112.0	12280	16.13	12.97	12.94	11.65	10.27	8.14	4.94
*	3	112.2	12296	16.21	13.01	12.98	11.69	10.31	8.19	5.03
*	3	112.2	12304	16.21	13.01	12.98	11.69	10.31	8.14	4.94
*	4	144.8	15872	21.03	16.85	16.75	15.11	13.25	10.48	6.29
*	4	144.2	15816	21.03	16.85	16.79	15.07	13.29	10.44	6.29
*	4	144.8	15872	21.11	16.93	16.84	15.11	13.33	10.48	6.29
*	4	144.6	15856	21.20	16.98	16.88	15.15	13.38	10.48	6.29

Stn: 283 Lane:J5 Temp: J/C: 49 Air: 74 PvT: 79 14:11

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	111.9	12264	17.51	12.97	14.10	12.58	11.07	8.66	5.20
	C	112.0	12280	17.51	12.97	14.10	12.58	11.07	8.66	5.20
	C	111.4	12224	17.51	12.88	14.14	12.62	11.11	8.66	5.20
*	2	82.6	9056	13.41	9.61	10.67	9.54	8.40	6.59	4.03
*	2	82.8	9072	13.36	9.57	10.67	9.54	8.40	6.59	3.95
*	2	82.5	9040	13.28	9.57	10.67	9.54	8.40	6.59	3.99
*	2	82.9	9088	13.41	9.65	10.75	9.62	8.49	6.67	4.03
*	3	111.7	12256	17.64	12.80	14.22	12.66	11.11	8.71	5.25
*	3	111.6	12240	17.64	12.84	14.22	12.71	11.16	8.75	5.25
*	3	111.4	12216	17.76	12.88	14.35	12.83	11.25	8.84	5.38
*	3	111.9	12264	17.72	12.80	14.27	12.75	11.20	8.75	5.25
*	4	143.9	15784	22.96	16.63	18.38	16.42	14.40	11.22	6.72
*	4	144.3	15824	23.04	16.68	18.47	16.46	14.45	11.26	6.72
*	4	144.6	15856	23.17	16.68	18.51	16.46	14.49	11.31	6.72
*	4	144.2	15808	23.17	16.72	18.55	16.55	14.53	11.39	6.81

Stn: 308 Lane:J4 Temp: J/C: 51 Air: 74 PvT: 78 14:15

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.7	12136	13.57	11.20	12.64	11.31	9.96	7.84	4.73
	C	111.4	12216	13.70	11.33	12.68	11.40	10.09	7.93	4.81
	C	111.4	12216	13.74	11.38	12.77	11.44	10.13	7.97	4.86
*	2	82.8	9072	10.26	8.45	9.51	8.53	7.51	5.94	3.64
*	2	82.5	9048	10.26	8.45	9.51	8.53	7.56	5.94	3.64
*	2	82.6	9056	10.31	8.49	9.55	8.57	7.60	5.98	3.69
*	2	82.5	9048	10.26	8.40	9.51	8.53	7.51	5.94	3.64
*	3	111.6	12240	13.66	11.29	12.72	11.40	10.05	7.88	4.77
*	3	111.4	12216	13.74	11.33	12.72	11.40	10.13	7.93	4.77
*	3	111.6	12240	13.74	11.42	12.81	11.48	10.18	7.97	4.86

File: C:\FWD\DATA\274040B3.FWD
Road: US-2 WESTBOUND LANES 10 MILES WEST OF GRAND RAPIDS, MN.
Subsection: 274040

*	3	111.3	12208	13.74	11.38	12.72	11.40	10.09	7.93	4.77
*	4	144.1	15800	18.01	14.82	16.50	14.77	13.16	10.22	6.07
*	4	144.1	15800	18.06	14.87	16.54	14.77	13.16	10.27	6.12
*	4	143.9	15784	18.06	14.87	16.58	14.86	13.16	10.27	6.16
*	4	143.6	15744	18.06	14.87	16.54	14.82	13.16	10.27	6.12

Stn: 309 Lane:J5 Temp: J/C: 51 Air: 75 PvT: 79 14:17

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.7	12136	15.21	12.67	12.34	11.06	9.82	7.75	4.73
	C	110.9	12152	15.04	12.80	12.21	11.02	9.69	7.71	4.68
	C	111.2	12192	15.00	12.80	12.21	10.98	9.69	7.62	4.64
*	2	82.5	9048	11.23	9.57	9.13	8.23	7.33	5.81	3.56
*	2	82.5	9048	11.23	9.57	9.17	8.23	7.33	5.81	3.56
*	2	82.6	9048	11.27	9.57	9.17	8.23	7.29	5.76	3.56
*	2	82.5	9048	11.23	9.57	9.17	8.23	7.29	5.76	3.56
*	3	111.0	12168	15.00	12.84	12.21	10.98	9.69	7.67	4.64
*	3	111.2	12192	15.04	12.84	12.25	10.98	9.73	7.67	4.68
*	3	111.0	12176	15.04	12.84	12.30	11.02	9.73	7.67	4.73
*	3	110.9	12160	15.04	12.84	12.25	10.98	9.73	7.67	4.68
*	4	143.6	15744	19.82	16.59	15.98	14.31	12.62	9.96	5.99
*	4	143.5	15728	19.73	16.63	15.94	14.31	12.62	9.92	5.99
*	4	143.3	15712	19.77	16.68	15.98	14.31	12.67	9.96	6.03
*	4	143.3	15712	19.77	16.68	15.98	14.31	12.67	9.92	5.99

Stn: 335 Lane:J4 Temp: J/C: 50 Air: 75 PvT: 79 14:20

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.3	12312	12.40	10.56	12.00	10.93	9.73	7.80	4.81
	C	112.5	12320	12.40	10.51	12.04	10.93	9.73	7.80	4.81
	C	112.5	12320	12.44	10.56	12.04	10.98	9.78	7.84	4.81
*	2	83.3	9128	9.34	7.93	9.04	8.19	7.29	5.89	3.64
*	2	83.3	9144	9.26	7.84	8.91	8.10	7.29	5.85	3.64
*	2	83.5	9152	9.30	7.89	9.00	8.15	7.29	5.85	3.60
*	2	83.3	9136	9.26	7.89	9.00	8.19	7.29	5.85	3.60
*	3	112.0	12280	12.40	10.56	12.00	10.89	9.73	7.80	4.77
*	3	112.3	12320	12.44	10.60	12.04	10.98	9.78	7.80	4.81
*	3	112.5	12320	12.40	10.56	12.04	10.89	9.73	7.75	4.77
*	3	112.3	12312	12.44	10.56	12.08	10.98	9.78	7.84	4.81
*	4	144.9	15888	16.30	13.79	15.64	14.14	12.62	10.05	6.12
*	4	144.6	15856	16.38	13.75	15.72	14.23	12.71	10.14	6.20
*	4	144.6	15856	16.34	13.79	15.68	14.18	12.67	10.09	6.16
*	4	144.3	15832	16.38	13.79	15.72	14.27	12.71	10.14	6.20

Stn: 337 Lane:J5 Temp: J/C: 50 Air: 75 PvT: 80 14:23

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	111.7	12256	13.15	12.06	11.10	10.09	9.02	7.28	4.55
	C	111.7	12256	13.15	12.15	11.14	10.17	9.11	7.32	4.60
	C	111.6	12232	13.15	12.19	11.18	10.13	9.11	7.32	4.60
*	2	83.0	9104	9.97	9.05	8.35	7.60	6.85	5.55	3.47
*	2	83.3	9136	9.93	9.01	8.31	7.56	6.80	5.50	3.43
*	2	83.3	9136	9.89	9.01	8.27	7.56	6.80	5.50	3.43
*	2	83.2	9128	9.93	9.09	8.35	7.64	6.80	5.59	3.51
*	3	111.7	12248	13.11	12.15	11.14	10.13	9.11	7.32	4.55
*	3	111.7	12256	13.20	12.19	11.14	10.17	9.11	7.32	4.60
*	3	111.7	12248	13.24	12.19	11.18	10.22	9.16	7.41	4.64
*	3	111.7	12256	13.15	12.19	11.14	10.17	9.11	7.36	4.60
*	4	143.6	15752	17.39	15.81	14.44	13.13	11.78	9.40	5.77
*	4	143.8	15760	17.39	15.86	14.48	13.17	11.82	9.36	5.81
*	4	143.5	15728	17.34	15.81	14.44	13.13	11.82	9.44	5.81
*	4	143.6	15736	17.43	15.86	14.52	13.21	11.82	9.44	5.86

Stn: 364 Lane:J4 Temp: J/C: 50 Air: 75 PvT: 79 14:25

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.7	12144	16.09	12.97	12.90	11.69	10.36	8.23	4.99
	C	110.9	12152	16.21	13.14	12.98	11.74	10.45	8.27	5.03
	C	110.7	12144	16.26	13.14	12.94	11.69	10.40	8.23	4.94
*	2	82.5	9048	12.36	9.82	9.73	8.82	7.91	6.37V	4.03V
*	2	82.6	9056	12.19	9.82	9.60	8.70	7.73	6.15	3.77
*	2	83.2	9120	12.28	9.87	9.64	8.74	7.78	6.24	3.86
*	2	82.8	9072	12.23	9.82	9.60	8.74	7.73	6.20	3.82
*	3	110.7	12144	16.21	13.10	12.81	11.57	10.36	8.19	4.99
*	3	110.9	12152	16.34	13.14	12.90	11.65	10.40	8.27	5.07

File: C:\FWD\DATA\274040B3.FWD
Road: US-2 WESTBOUND LANES 10 MILES WEST OF GRAND RAPIDS, MN.
Subsection: 274040

*	3	111.2	12184	16.34	13.19	12.90	11.69	10.40	8.27	5.07
*	3	111.0	12168	16.42	13.23	12.94	11.69	10.40	8.27	5.03
*	4	142.8	15648	21.24	17.11	16.71	15.07	13.47	10.66	6.46
*	4	142.5	15616	21.28	17.11	16.71	15.07	13.47	10.66	6.46
*	4	142.3	15608	21.37	17.15	16.71	15.11	13.47	10.70	6.55
*	4	142.8	15656	21.37	17.19	16.71	15.11	13.47	10.66	6.46

'ACCEPTED TEST WITH VARATION

Stn: 365 Lane:J5 Temp: J/C: 50 Air: 75 PvT: 78 14:28

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.7	12136	18.27	13.10	14.74	13.21	11.69	9.18	5.55
	C	110.4	12112	18.27	13.06	14.74	13.17	11.65	9.10	5.47
	C	110.6	12120	18.39	13.06	14.82	13.25	11.69	9.18	5.55
*	2	82.5	9048	13.95	9.65	11.23	10.09	8.93	6.97	4.25
*	2	82.8	9072	13.95	9.69	11.27	10.09	8.89	6.97	4.25
*	2	81.9	8968	13.99	9.69	11.31	10.13	8.93	7.02	4.29
*	2	82.6	9056	13.95	9.69	11.27	10.09	8.89	6.97	4.25
*	3	110.6	12120	18.48	12.97	14.87	13.30	11.73	9.27	5.55
*	3	110.7	12136	18.52	12.93	14.87	13.25	11.73	9.23	5.51
*	3	110.7	12136	18.52	12.97	14.95	13.34	11.78	9.27	5.55
*	3	110.6	12120	18.56	12.97	14.91	13.34	11.78	9.27	5.55
*	4	142.5	15624	23.75	16.85	19.11	17.01	15.07	11.78	7.03
*	4	142.5	15616	23.80	16.80	19.15	17.01	15.07	11.78	7.03
*	4	142.3	15600	23.88	16.76	19.19	17.10	15.11	11.83	7.07
*	4	142.0	15568	23.92	16.80	19.28	17.14	15.16	11.87	7.11

Stn: ~~391~~ Lane:J4 Temp: J/C: 52 Air: 75 PvT: 80 14:30

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	111.9	12264	14.70	12.02	12.68	11.44	10.18	8.06	4.90
	C	111.9	12264	14.50	11.85	12.60	11.31	10.05	7.93	4.77
	C	111.9	12264	14.50	11.89	12.55	11.31	10.09	7.93	4.77
*	2	83.3	9136	10.93	8.96	9.38	8.48	7.56	5.98	3.64
*	2	82.9	9088	11.02	8.96	9.43	8.53	7.60	6.02	3.69
*	2	83.3	9128	11.02	9.01	9.43	8.53	7.60	6.02	3.69
*	2	83.3	9144	10.93	8.96	9.43	8.48	7.51	5.98	3.60
*	3	111.4	12224	14.54	11.98	12.55	11.36	10.09	7.97	4.86
*	3	111.9	12264	14.54	11.94	12.55	11.31	10.05	7.93	4.77
*	3	111.6	12240	14.58	11.98	12.55	11.31	10.05	7.93	4.77
*	3	111.6	12240	14.58	12.02	12.55	11.36	10.09	7.93	4.81
*	4	144.1	15800	19.15	15.60	16.37	14.73	13.07	10.31	6.20
*	4	143.8	15760	19.19	15.64	16.37	14.77	13.16	10.35	6.20
*	4	144.1	15800	19.15	15.60	16.32	14.73	13.11	10.31	6.16
*	4	143.8	15760	19.27	15.64	16.41	14.82	13.16	10.35	6.25

Stn: ~~392~~ Lane:J5 Temp: J/C: 52 Air: 75 PvT: 79 14:33

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	111.4	12208	15.63	12.58	12.81	11.52	10.31	8.10	4.90
	C	111.4	12224	15.58	12.62	12.81	11.52	10.31	8.06	4.90
	C	111.2	12184	15.58	12.58	12.77	11.48	10.27	8.06	4.86
*	2	83.2	9120	11.81	9.35	9.60	8.65	7.78	6.07	3.69
*	2	82.9	9088	11.81	9.35	9.64	8.70	7.78	6.11	3.73
*	2	83.2	9120	11.81	9.39	9.64	8.70	7.87	6.07	3.73
*	2	82.9	9088	11.81	9.39	9.64	8.65	7.82	6.11	3.73
*	3	111.2	12184	15.63	12.58	12.85	11.52	10.31	8.10	4.90
*	3	111.2	12192	15.63	12.58	12.85	11.52	10.31	8.06	4.86
*	3	111.0	12176	15.63	12.54	12.81	11.48	10.27	8.06	4.90
*	3	111.4	12208	15.67	12.58	12.85	11.52	10.27	8.14	4.90
*	4	143.3	15720	20.36	16.33	16.58	14.90	13.29	10.44	6.29
*	4	142.9	15672	20.32	16.33	16.58	14.94	13.29	10.48	6.33
*	4	142.9	15672	20.32	16.33	16.58	14.90	13.25	10.48	6.29
*	4	143.0	15688	20.36	16.33	16.62	14.94	13.29	10.57	6.33

Stn: ~~418~~ Lane:J4 Temp: J/C: 50 Air: 77 PvT: 81 14:36

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	111.0	12168	15.21	12.75	13.92	12.54	11.16	8.84	5.34
	C	111.3	12200	15.21	12.75	13.88	12.58	11.20	8.88	5.38
	C	111.2	12192	15.25	12.75	13.92	12.58	11.25	8.88	5.38
*	2	82.9	9088	11.52	9.57	10.41	9.41	8.40	6.67	4.03
*	2	82.9	9096	11.56	9.61	10.45	9.46	8.45	6.72	4.08

File: C:\FWD\DATA\274040B3.FWD
Road: US-2 WESTBOUND LANES 10 MILES WEST OF GRAND RAPIDS, MN.
Subsection: 274040

*	2	82.8	9072	11.56	9.61	10.45	9.46	8.45	6.72	4.08
*	2	83.0	9096	11.56	9.61	10.41	9.41	8.40	6.67	4.03
*	3	111.0	12176	15.17	12.71	13.84	12.54	11.16	8.88	5.38
*	3	111.0	12168	15.29	12.84	13.97	12.62	11.20	8.92	5.42
*	3	111.0	12176	15.25	12.75	13.88	12.58	11.20	8.84	5.34
*	3	111.0	12168	15.29	12.80	13.92	12.62	11.20	8.92	5.42
*	4	143.5	15728	19.98	16.55	18.04	16.34	14.53	11.48	6.90
*	4	143.0	15688	19.98	16.50	18.04	16.29	14.49	11.48	6.90
*	4	143.0	15680	20.03	16.63	18.08	16.34	14.58	11.52	6.94
*	4	142.5	15624	20.03	16.59	18.04	16.34	14.53	11.52	6.94

Stn: ~~419~~ Lane:J5 Temp: J/C: 50 Air: 77 PvT: 81 14:39

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.7	12136	16.13	14.22	13.50	12.20	10.89	8.71	5.34
	C	110.9	12152	16.05	14.22	13.41	12.16	10.85	8.66	5.29
	C	110.7	12136	15.96	14.13	13.41	12.12	10.80	8.62	5.25
*	2	82.8	9072	12.23	10.60	10.11	9.16	8.13	6.54	4.08
*	2	83.0	9104	12.19	10.60	10.11	9.12	8.18	6.50	3.99
*	2	82.2	9016	12.23	10.64	10.15	9.20	8.18	6.59	4.08
*	2	83.3	9128	12.19	10.69	10.15	9.20	8.22	6.63	4.08
*	3	110.7	12136	15.96	14.09	13.37	12.12	10.80	8.62	5.25
*	3	110.7	12136	15.96	14.13	13.41	12.12	10.80	8.62	5.25
*	3	110.7	12136	16.05	14.13	13.45	12.16	10.80	8.66	5.29
*	3	110.7	12144	16.05	14.13	13.41	12.16	10.85	8.62	5.34
*	4	141.9	15560	20.86	18.27	17.22	15.66	14.00	11.13	6.77
*	4	141.4	15504	20.61	18.18	17.27	15.58	13.87	11.09	6.77
*	4	141.4	15520	20.78	18.23	17.31	15.66	13.91	11.13	6.85
*	4	141.4	15520	20.82	18.23	17.27	15.66	13.91	11.13	6.77

Stn: ~~445~~ Lane:J4 Temp: J/C: 50 Air: 79 PvT: 83 14:42

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.9	12048	17.43	14.05	10.80	9.79	8.80	7.06	4.42
	C	109.7	12024	17.39	13.96	10.80	9.88	8.85	7.15	4.51
	C	110.0	12056	17.51	14.09	10.71	9.79	8.80	7.10	4.51
*	2	81.3	8912	13.24	10.60	8.01	7.35	6.62	5.37	3.43
*	2	81.3	8920	13.32	10.64	7.97	7.30	6.58	5.33	3.38
*	2	81.2	8904	13.28	10.64	7.93	7.26	6.53	5.24	3.38
*	2	81.2	8896	13.36	10.69	7.93	7.26	6.53	5.29	3.38
*	3	110.1	12088	17.81	14.31	10.54	9.62	8.67	7.02	4.47
*	3	110.1	12072	17.93	14.39	10.54	9.62	8.71	7.02	4.55
*	3	110.1	12080	17.97	14.43	10.50	9.58	8.67	6.97	4.51
*	3	110.0	12056	17.97	14.39	10.41	9.54	8.62	6.97	4.47
*	4	142.8	15648	23.42	18.66	13.32	12.16	10.93	8.84	5.64
*	4	142.6	15632	23.46	18.79	13.28	12.12	10.89	8.84	5.64
*	4	142.5	15616	23.63	18.96	13.28	12.16	10.93	8.88	5.73
*	4	142.5	15616	23.63	18.92	13.20	12.03	10.85	8.79	5.64

Stn: ~~447~~ Lane:J5 Temp: J/C: 50 Air: 79 PvT: 83 14:44

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.6	12128	18.73	11.38	15.25	13.59	11.96	9.36	5.51
	C	110.9	12152	18.31	11.85	14.87	13.25	11.78	9.14	5.42
	C	111.0	12168	18.27	11.98	14.82	13.25	11.82	9.10	5.42
*	2	82.3	9032	14.29	8.53	11.48	10.30	9.11	7.02	4.16
*	2	82.3	9032	14.29	8.53	11.53	10.34	9.11	7.10	4.21
*	2	82.5	9048	14.24	8.49	11.48	10.26	9.02	7.02	4.12
*	2	82.8	9072	14.24	8.49	11.53	10.30	9.07	7.06	4.12
*	3	111.2	12184	18.10	11.94	14.74	13.17	11.60	9.05	5.29
*	3	110.7	12144	18.14	12.02	14.82	13.21	11.65	9.10	5.38
*	3	110.9	12152	18.18	12.06	14.87	13.25	11.69	9.14	5.42
*	3	110.9	12152	18.10	12.02	14.78	13.21	11.65	9.05	5.38
*	4	142.8	15656	22.79	16.20	18.51	16.59	14.62	11.39	6.72
*	4	142.6	15640	22.71	16.20	18.51	16.55	14.62	11.39	6.72
*	4	142.3	15600	22.66	16.20	18.51	16.55	14.62	11.39	6.68
*	4	142.2	15592	22.66	16.20	18.51	16.55	14.58	11.39	6.68

Stn: ~~473~~ Lane:J4 Temp: J/C: 50 Air: 80 PvT: 83 14:47

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	111.7	12248	14.54	11.94	13.11	11.82	10.45	8.23	4.94
	C	111.9	12264	14.45	11.89	13.11	11.82	10.49	8.32	5.03
	C	112.0	12280	14.50	11.94	13.15	11.90	10.53	8.36	5.07
*	2	83.8	9192	10.81	8.88	9.81	8.86	7.82	6.24	3.77

File: C:\FWD\DATA\274040B3.FWD
Road: US-2 WESTBOUND LANES 10 MILES WEST OF GRAND RAPIDS, MN.
Subsection: 274040

*	2	84.1	9216	10.81	8.88	9.77	8.86	7.82	6.20	3.73
*	2	83.8	9184	10.77	8.88	9.77	8.82	7.82	6.20	3.73
*	2	83.8	9184	10.77	8.83	9.77	8.86	7.82	6.20	3.73
*	3	111.7	12248	14.45	11.94	13.11	11.82	10.49	8.32	5.03
*	3	111.7	12248	14.45	11.89	13.11	11.82	10.49	8.27	4.99
*	3	112.0	12280	14.50	11.94	13.11	11.82	10.45	8.27	4.99
*	3	111.9	12272	14.50	11.94	13.11	11.82	10.49	8.27	4.99
*	4	143.5	15728	18.89	15.43	16.97	15.28	13.51	10.66	6.38
*	4	143.3	15712	18.89	15.47	16.97	15.28	13.56	10.70	6.42
*	4	143.0	15688	18.89	15.51	17.01	15.32	13.56	10.70	6.42
*	4	143.0	15688	18.94	15.55	17.01	15.32	13.60	10.74	6.46

Stn: 474 Lane:J5 Temp: J/C: 50 Air: 79 PvT: 84 14:50

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	111.9	12264	15.17	13.23	12.64	11.40	10.18	8.06	4.90
	C	111.7	12256	15.08	13.27	12.55	11.40	10.09	8.01	4.86
	C	111.7	12256	15.08	13.23	12.55	11.36	10.09	8.01	4.86
*	2	83.3	9136	11.44	9.95	9.43	8.57	7.56	6.02	3.69
*	2	83.3	9128	11.52	10.00	9.47	8.61	7.65	6.11	3.73
*	2	83.3	9128	11.48	9.91	9.43	8.57	7.56	6.02	3.64
*	2	83.3	9128	11.48	9.87	9.38	8.48	7.51	5.98	3.60
*	3	111.7	12256	15.12	13.31	12.60	11.44	10.18	8.06	4.94
*	3	111.9	12272	15.17	13.31	12.64	11.44	10.18	8.10	4.94
*	3	111.7	12256	15.08	13.36	12.64	11.40	10.18	8.06	4.90
*	3	112.2	12296	15.04	13.27	12.55	11.36	10.13	8.01	4.90
*	4	144.9	15880	19.86	17.19	16.32	14.73	13.07	10.31	6.25
*	4	144.3	15824	19.77	17.19	16.28	14.69	13.02	10.35	6.25
*	4	144.2	15816	19.77	17.24	16.32	14.69	13.11	10.35	6.29
*	4	144.3	15824	19.77	17.19	16.28	14.65	13.07	10.35	6.25

Stn: 490 Lane:J4 Temp: J/C: 50 Air: 79 PvT: 84 14:54

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.2	12304	13.91	11.63	13.02	11.78	10.45	8.27	4.99
	C	112.3	12320	13.95	11.68	13.07	11.78	10.45	8.27	4.99
	C	112.2	12296	13.91	11.63	13.02	11.69	10.40	8.23	4.90
*	2	83.3	9144	10.43	8.70	9.73	8.78	7.78	6.20	3.73
*	2	83.3	9144	10.47	8.70	9.77	8.78	7.78	6.20	3.73
*	2	82.9	9088	10.43	8.66	9.73	8.74	7.82	6.15	3.69
*	2	83.2	9128	10.47	8.66	9.73	8.78	7.78	6.15	3.73
*	3	112.3	12312	13.99	11.68	13.02	11.78	10.45	8.23	4.94
*	3	112.6	12344	13.95	11.72	13.07	11.78	10.45	8.23	4.94
*	3	112.2	12296	13.95	11.72	13.02	11.78	10.45	8.23	4.94
*	3	112.2	12296	13.99	11.68	13.07	11.74	10.45	8.27	4.94
*	4	145.1	15912	18.39	15.30	17.05	15.37	13.60	10.74	6.46
*	4	145.1	15912	18.39	15.25	17.01	15.32	13.60	10.70	6.33
*	4	144.5	15840	18.43	15.34	17.05	15.37	13.60	10.74	6.46
*	4	144.6	15856	18.22	15.17	16.88	15.15	13.47	10.57	6.25

Stn: 495 OK Lane:J5 Temp: J/C: 50 Air: 78 PvT: 83 14:57

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	111.6	12224	15.46	13.31	12.68	11.48	10.27	8.14	4.94
	C	111.6	12232	15.42	13.36	12.64	11.40	10.22	8.06	4.90
	C	111.7	12248	15.38	13.36	12.64	11.44	10.18	8.10	4.90
*	2	83.0	9104	11.56	9.91	9.47	8.57	7.65	6.07	3.69
*	2	83.0	9112	11.60	9.91	9.47	8.57	7.65	6.07	3.69
*	2	83.0	9104	11.48	9.91	9.43	8.53	7.65	6.02	3.69
*	2	83.2	9128	11.56	9.91	9.43	8.53	7.65	6.02	3.64
*	3	111.7	12248	15.42	13.36	12.68	11.48	10.22	8.10	4.94
*	3	111.7	12248	15.42	13.40	12.68	11.48	10.18	8.19	4.94
*	3	111.6	12232	15.42	13.40	12.68	11.48	10.27	8.10	4.94
*	3	111.6	12240	15.42	13.40	12.72	11.52	10.27	8.14	4.94
*	4	144.1	15792	20.07	17.45	16.45	14.86	13.20	10.44	6.33
*	4	144.5	15840	20.07	17.36	16.41	14.82	13.16	10.44	6.25
*	4	144.2	15808	20.07	17.41	16.45	14.82	13.20	10.44	6.29
*	4	144.3	15824	20.15	17.41	16.50	14.86	13.25	10.44	6.29

Stn: 521 Lane:J4 Temp: J/C: 54 Air: 77 PvT: 84 15:00

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.6	12344	14.79	12.28	13.54	12.16	10.80	8.49	5.16
	C	112.5	12336	14.58	12.15	13.32	11.99	10.62	8.36	5.07

File: C:\FWD\DATA\274040B3.FWD
Road: US-2 WESTBOUND LANES 10 MILES WEST OF GRAND RAPIDS, MN.
Subsection: 274040

	C	112.2	12288	14.50	12.06	13.28	11.95	10.56	8.40	5.03
*	2	83.8	9184	10.85	9.01	9.85	8.86	7.91	6.24	3.82
*	2	83.3	9144	10.93	9.09	9.90	8.91	7.91	6.28	3.82
*	2	83.5	9152	11.02	9.18	9.98	9.03	8.00	6.33	3.90
*	2	83.9	9200	10.93	9.05	9.90	8.95	7.91	6.24	3.77
*	3	112.2	12288	14.62	12.15	13.32	11.99	10.62	8.45	5.12
*	3	112.2	12304	14.62	12.15	13.28	11.99	10.58	8.36	5.07
*	3	112.3	12320	14.66	12.19	13.32	11.99	10.67	8.45	5.12
*	3	112.6	12344	14.66	12.15	13.32	11.99	10.62	8.36	5.03
*	4	145.5	15952	19.06	15.77	17.31	15.58	13.78	10.83	6.51
*	4	144.6	15864	19.10	15.86	17.35	15.58	13.82	10.79	6.46
*	4	144.6	15864	19.10	15.81	17.35	15.62	13.82	10.87	6.55
*	4	144.8	15880	19.10	15.86	17.31	15.62	13.82	10.83	6.55

Stn: 522 Lane:J5 Temp: J/C: 54 Air: 77 PvT: 84 15:02

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	111.3	12208	15.75	13.40	13.02	11.74	10.45	8.32	4.94
	C	111.9	12272	15.84	13.53	13.11	11.86	10.53	8.32	5.07
	C	111.7	12248	15.79	13.44	13.07	11.78	10.49	8.27	4.99
*	2	83.3	9144	11.90	10.00	9.81	8.82	7.87	6.28	3.77
*	2	83.5	9160	11.98	10.13	9.85	8.91	7.91	6.33	3.82
*	2	83.5	9152	11.90	10.00	9.81	8.86	7.87	6.24	3.77
*	2	83.8	9184	11.94	10.04	9.81	8.86	7.87	6.28	3.77
*	3	111.7	12248	15.75	13.44	13.07	11.78	10.45	8.23	4.99
*	3	111.7	12256	15.84	13.44	13.11	11.82	10.53	8.32	5.03
*	3	111.7	12248	15.79	13.44	13.11	11.86	10.49	8.27	4.99
*	3	111.6	12240	15.92	13.57	13.20	11.90	10.62	8.40	5.07
*	4	143.9	15784	20.65	17.45	16.97	15.28	13.56	10.79	6.46
*	4	143.8	15760	20.65	17.45	17.01	15.32	13.56	10.79	6.51
*	4	144.1	15800	20.70	17.49	17.01	15.37	13.60	10.83	6.51
*	4	144.1	15800	20.65	17.45	17.01	15.32	13.56	10.79	6.46

Mileage:-.009 -> .099

Summary of Data for section 274040B
Analyzed by: JOEL RECTOR on 08-11-1993

UNCORRECTED Overall Deflection Statistics

Mean Values (mils/kip)

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	2	0.6811	0.6535	0.6321	0.5973	0.5551	0.4746	0.3180
	3	0.6723	0.6534	0.6319	0.5969	0.5538	0.4714	0.3136
	4	0.6837	0.6594	0.6381	0.6020	0.5601	0.4740	0.3139

Standard Deviations

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	2	0.0268	0.0246	0.0238	0.0218	0.0212	0.0164	0.0120
	3	0.0287	0.0243	0.0235	0.0211	0.0201	0.0159	0.0118
	4	0.0275	0.0249	0.0241	0.0214	0.0203	0.0163	0.0115

Coefficient of Variation

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	2	3.94%	3.77%	3.76%	3.65%	3.81%	3.46%	3.77%
	3	4.26%	3.71%	3.72%	3.53%	3.62%	3.37%	3.75%
	4	4.03%	3.78%	3.77%	3.56%	3.62%	3.45%	3.66%

Rigid Pavement Deflection Statistics - 274040B

Mean Values (mils/kip)

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	2	0.6811	0.6535	0.6321	0.5973	0.5551	0.4746	0.3180
	3	0.6723	0.6534	0.6319	0.5969	0.5538	0.4714	0.3136
	4	0.6837	0.6594	0.6381	0.6020	0.5601	0.4740	0.3139

Standard Deviations

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	2	0.0268	0.0246	0.0238	0.0218	0.0212	0.0164	0.0120
	3	0.0287	0.0243	0.0235	0.0211	0.0201	0.0159	0.0118
	4	0.0275	0.0249	0.0241	0.0214	0.0203	0.0163	0.0115

Coefficient of Variation

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	2	3.94%	3.77%	3.76%	3.65%	3.81%	3.46%	3.77%
	3	4.26%	3.71%	3.72%	3.53%	3.62%	3.37%	3.75%
	4	4.03%	3.78%	3.77%	3.56%	3.62%	3.45%	3.66%

Outlier Statistics - 274040B

Station	Height	Sensor	Number of Std. Dev.
46	2	1	-2.28
46	2	2	-2.45
46	2	3	-2.35
46	2	4	-2.48
46	2	5	-2.41
46	2	6	-2.31
46	2	7	-2.39
46	3	1	-2.21
46	3	2	-2.35
46	3	3	-2.28
46	3	4	-2.43
46	3	5	-2.35
46	3	6	-2.55
46	3	7	-2.51
46	4	1	-2.11
46	4	2	-2.25
46	4	3	-2.30
46	4	4	-2.38
46	4	5	-2.39
46	4	6	-2.47
46	4	7	-2.43

Pavement Construction Information - 274040B

Material Code	Material Name	Layer Thickness
730	Portland Cement Concrete	8.1
302	Uncrushed Gravel	6.0

RIGID Pavement Thickness Data - 274040B
(comparison of each calculation to the expected value)

Minimum expected thickness: 5.26
Maximum expected thickness: 9.31

Height	Station	Effective Thickness

No predicted thickness values fall outside the expected range...

RIGID Pavement Thickness Statistics - 274040B

Drop height 2

Subsection	Station	Volumetric k	Effective Thickness
No test pit data found, therefore no results exist...			
1	-35	162	7.81
	-12	165	7.81
	16	167	7.81
	46	175	8.09
	75	165	8.00
	101	153	7.81
	128	164	7.91
	155	163	7.91
	182	167	8.00
	211	157	7.81
	238	154	7.81
	264	153	7.63
	291	154	7.63
	320	164	8.00
	346	158	7.81
	373	162	8.00
	402	155	7.81
	427	153	7.81
	455	155	7.81
	484	155	7.81
	510	157	7.72
	535	159	7.81
Subsection 1 Overall Mean:		160	7.85
Standard Deviation:		6	0.12
Coeff Of Variation:		3.67%	1.50%

RIGID Pavement Thickness Statistics - 274040B

Drop height 3

Subsection	Station	Volumetric k	Effective Thickness
No test pit data found, therefore no results exist...			
1	-35	163	7.81
	-12	165	7.81
	16	166	8.00
	46	177	8.19
	75	165	8.00
	101	154	7.81
	128	167	8.00
	155	165	8.00
	182	169	8.00
	211	159	8.00
	238	155	7.72
	264	157	7.81
	291	157	7.63
	320	164	8.19
	346	158	7.81
	373	163	8.00
	402	157	7.81
	427	155	7.81
	455	156	7.81
	484	155	7.81
	510	156	7.63
	535	163	7.81
Subsection 1 Overall Mean:		161	7.88
Standard Deviation:		6	0.15
Coeff Of Variation:		3.60%	1.94%

RIGID Pavement Thickness Statistics - 274040B

Drop height 4

Subsection	Station	Volumetric k	Effective Thickness
No test pit data found, therefore no results exist...			
1	-35	162	7.81
	-12	164	7.81
	16	166	7.81
	46	175	8.00
	75	164	8.00
	101	154	7.63
	128	166	8.00
	155	164	7.81
	182	169	8.00
	211	159	7.81
	238	154	7.63
	264	157	7.63
	291	155	7.53
	320	163	8.00
	346	157	7.81
	373	161	8.00
	402	156	7.81
	427	155	7.81
	455	154	7.81
	484	154	7.63
	510	155	7.63
	535	162	7.81
Subsection 1 Overall Mean:		160	7.81
Standard Deviation:		6	0.15
Coeff Of Variation:		3.60%	1.91%

Summary of Results

Section uniformity:
NO Subsections were identified within the section.

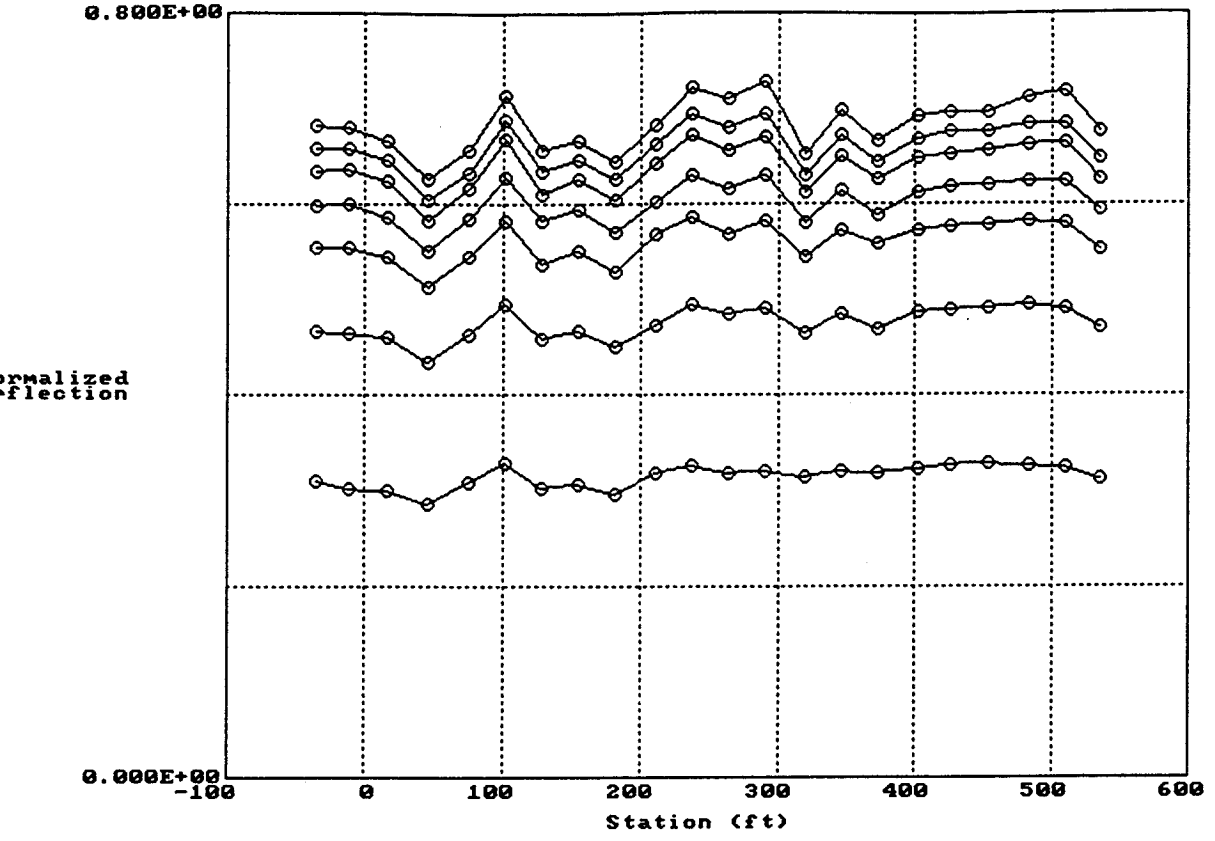
ıtliers - Test pits: 21 combinations at each test pit
NO Test pit data was present.

Outliers - Section data: 462 total combinations within the section
21 height/sensor/station combinations are data outliers in subsection 1.

Structural capacity - Test pits: 3 combinations at each test pit
All results for TP 1 are within the range of expected values.
All results for TP 2 are within the range of expected values.

Structural capacity - Section data: 66 total combinations within the section
All results are within the range of expected values.

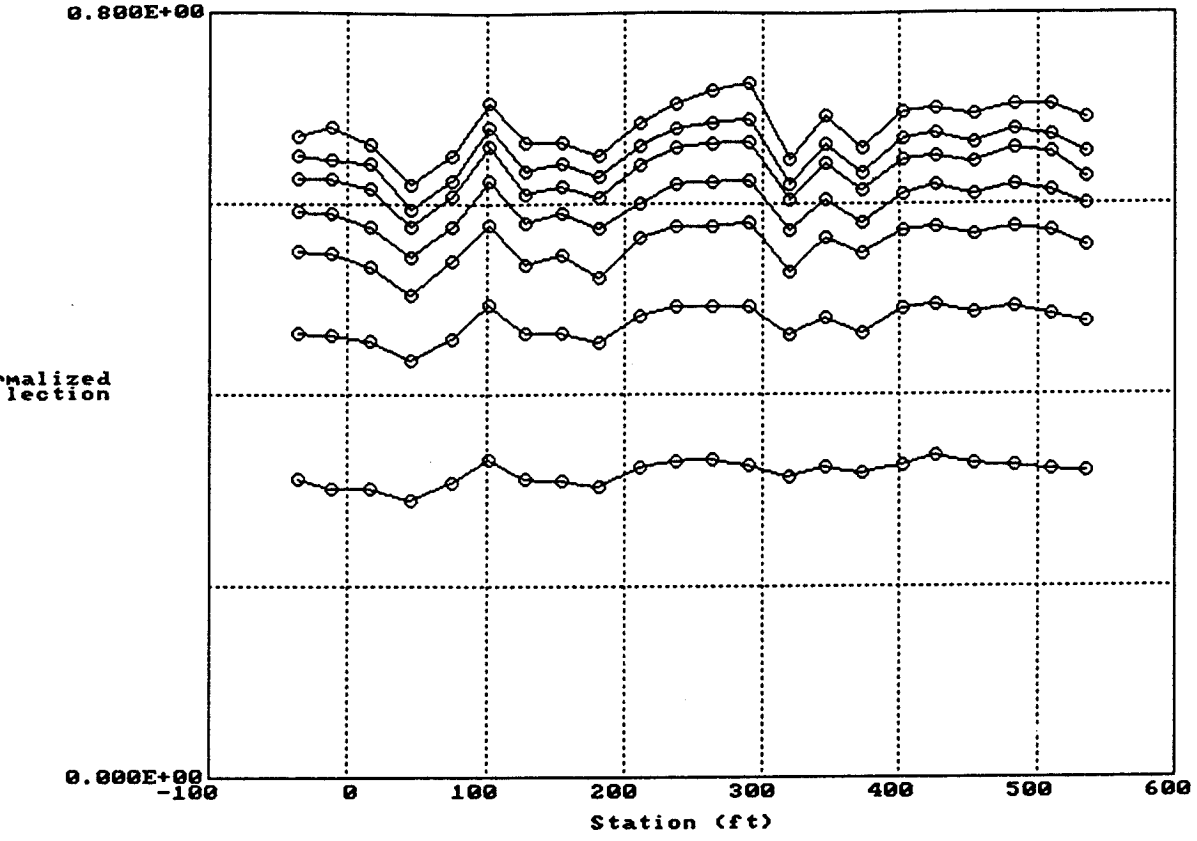
Deflection Data for Section: 274040B



Location 1 Drop Height 4 Sensors 1, 2, 3, 4, 5, 6, 7

F2:ScrnDump F10:Exit ↓↑:Prv/Nxt Ht PgUp/PgDn:Prv/Nxt Loc

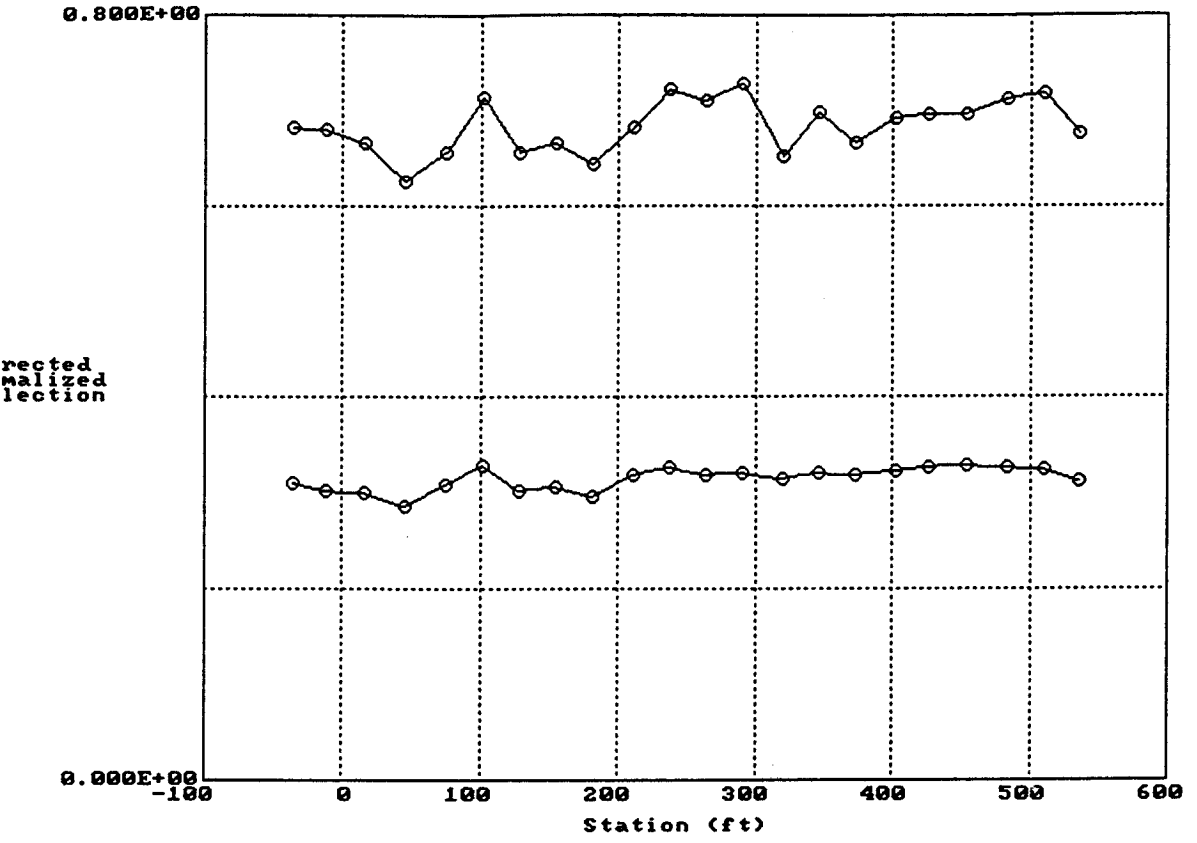
Deflection Data for Section: 274040B



Location 1 Drop Height 2 Sensors 1, 2, 3, 4, 5, 6, 7

F2:ScrnDump F10:Exit ↓↑:Prv/Nxt Ht PgUp/PgDn:Prv/Nxt Loc

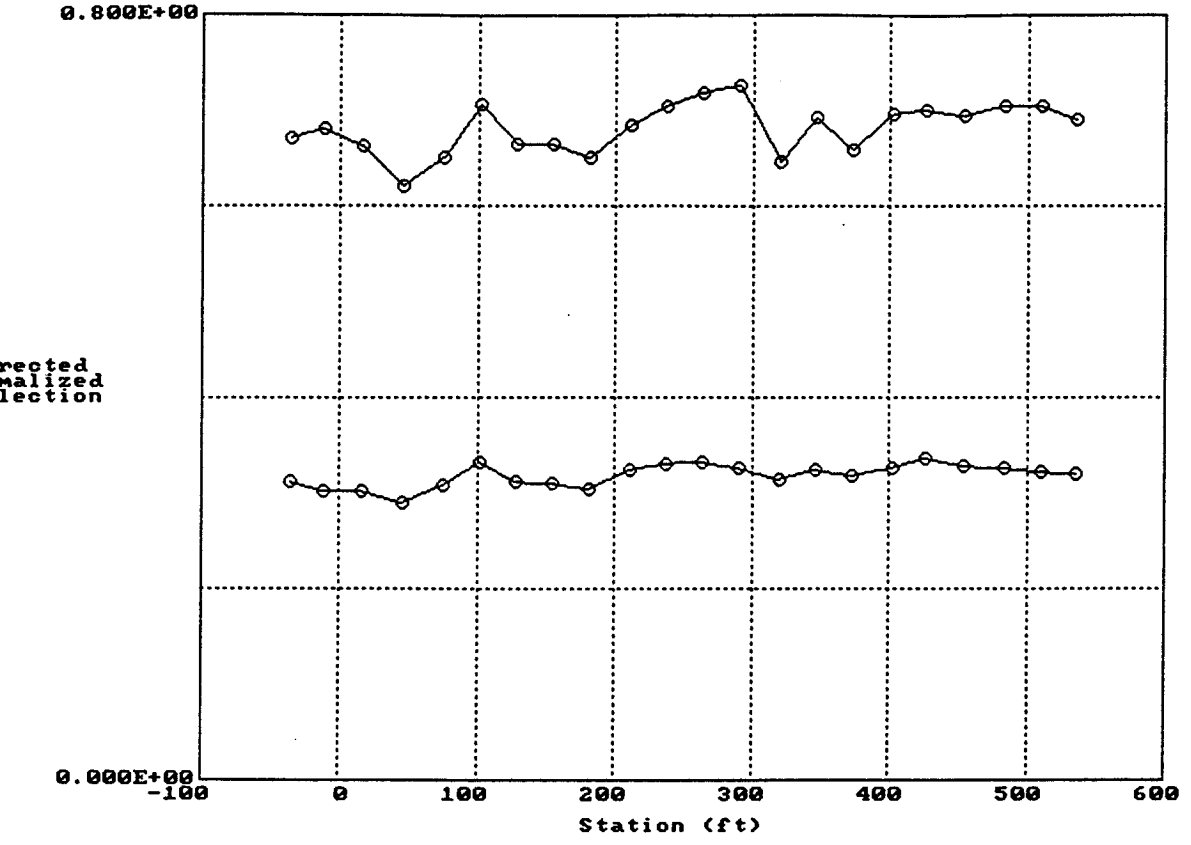
Corrected Deflection Data for Section: 274040B



Location 1 Drop Height 4 Sensors 1, 7

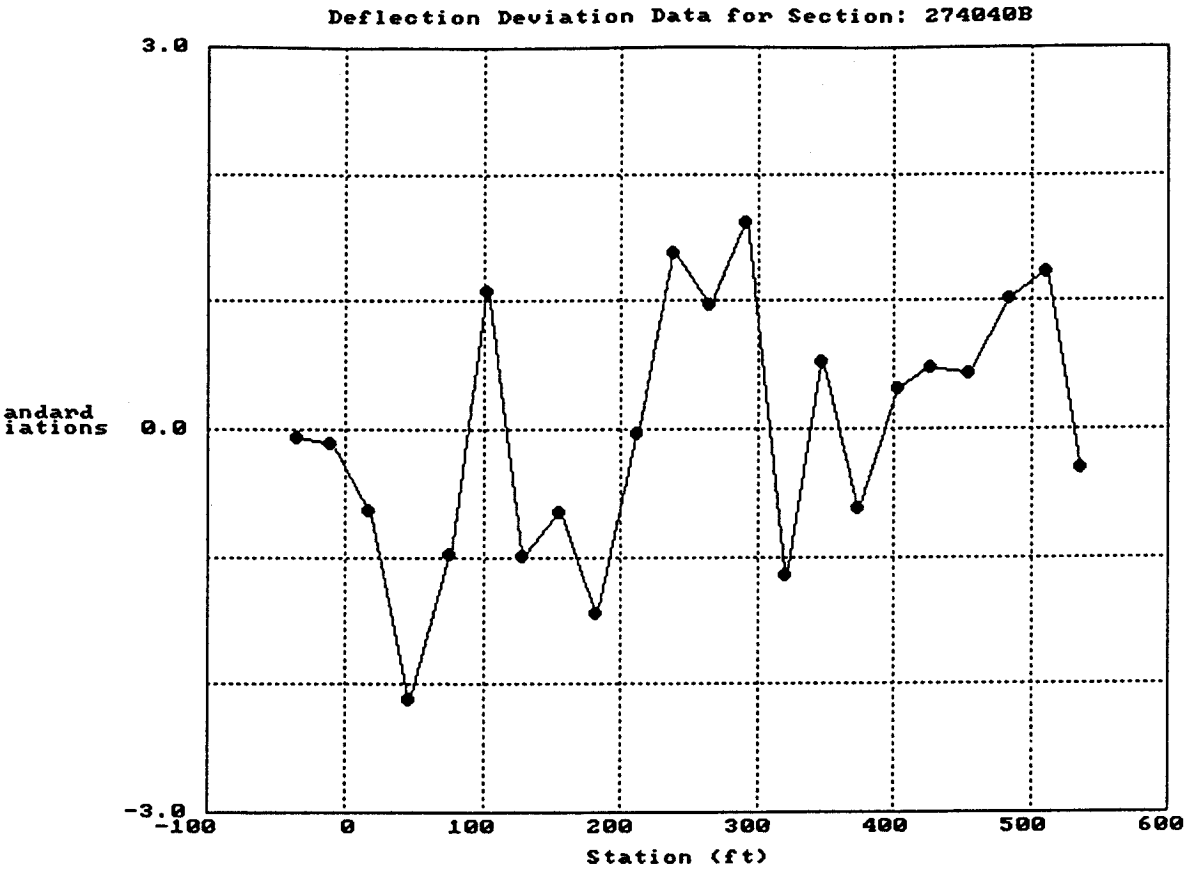
F2:ScrnDump F10:Exit ↓↑:Prv/Nxt Ht PgUp/PgDn:Prv/Nxt Loc

Corrected Deflection Data for Section: 274040B



Location 1 Drop Height 2 Sensors 1, 7

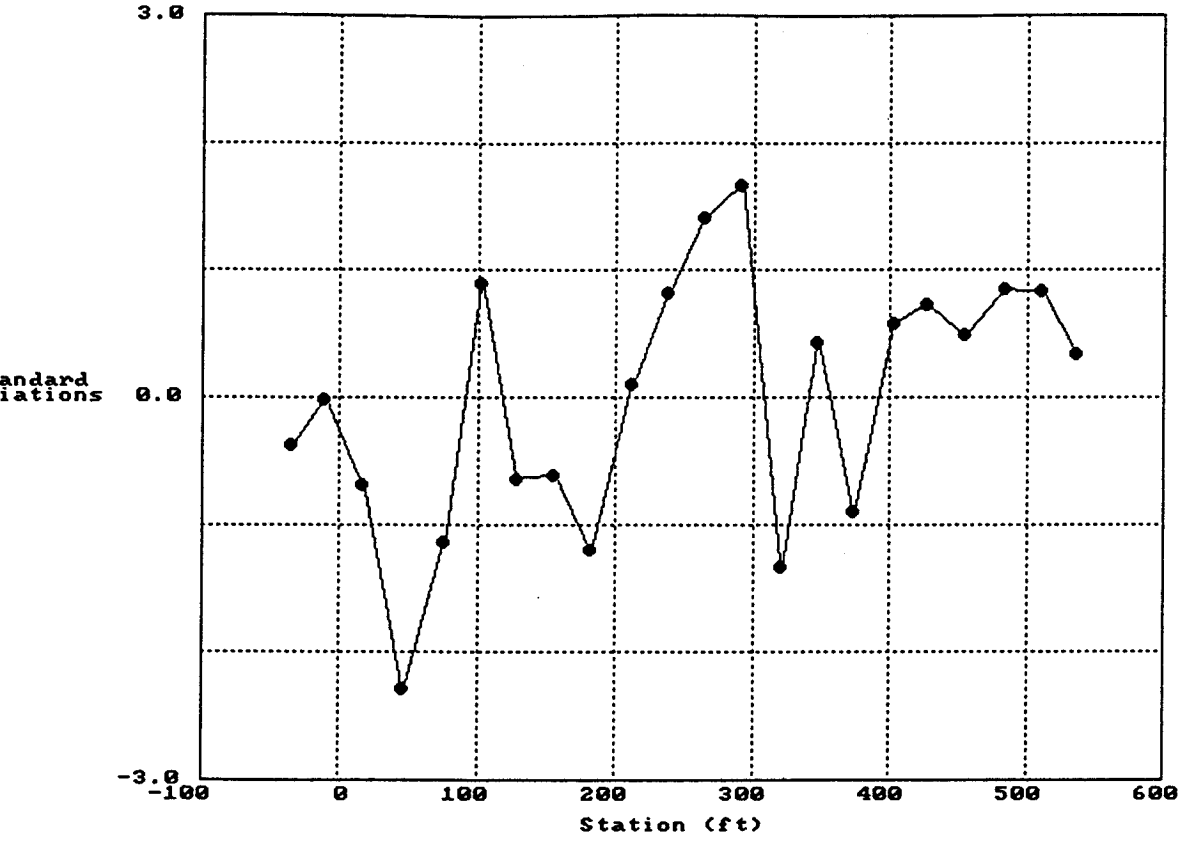
F2:ScrnDump F10:Exit ↓↑:Prv/Nxt Ht PgUp/PgDn:Prv/Nxt Loc



Location 1 Drop Height 4 Sensor 1

F2:ScrnDump F10:Exit ↓↑:Prv/Nxt Ht ←→:Prv/Nxt Defl PgUp/PgDn:Prv/Nxt Loc

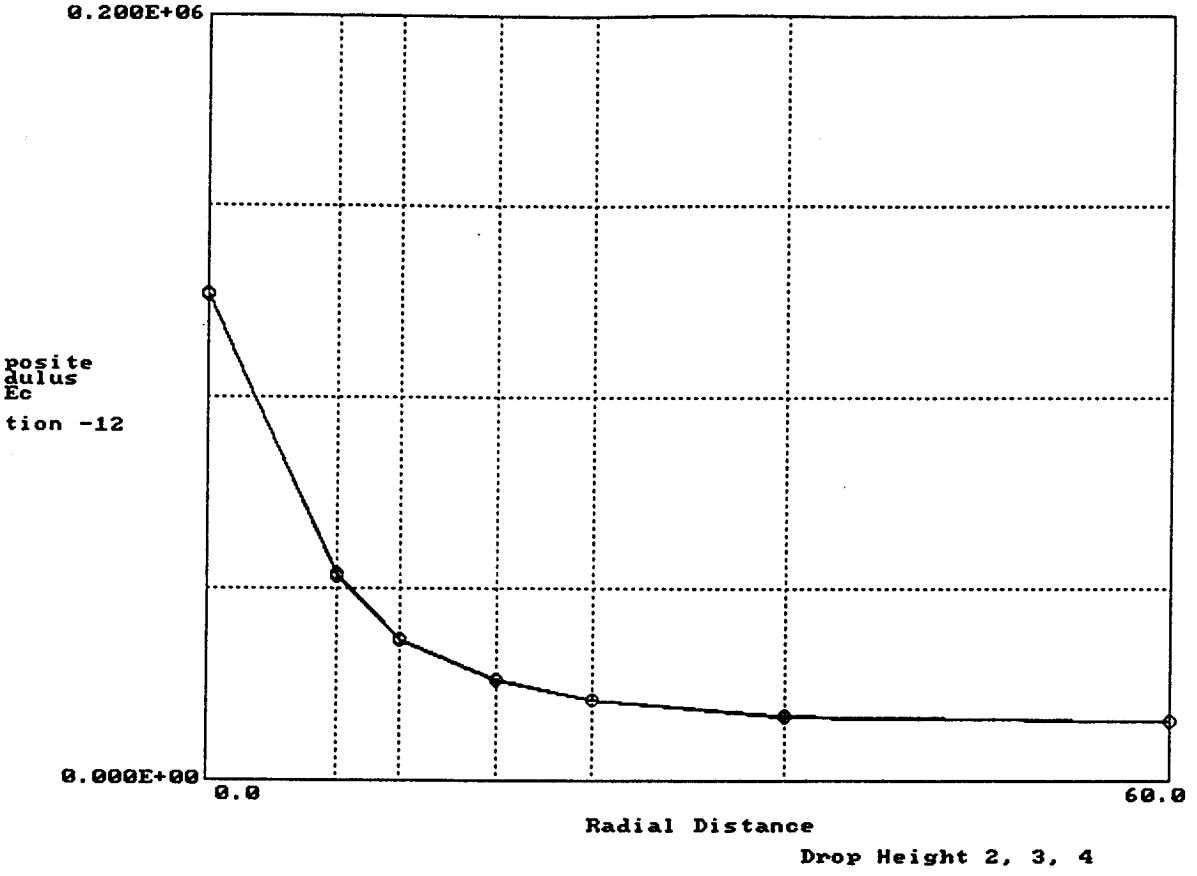
Deflection Deviation Data for Section: 274040B



Location 1 Drop Height 2 Sensor 1

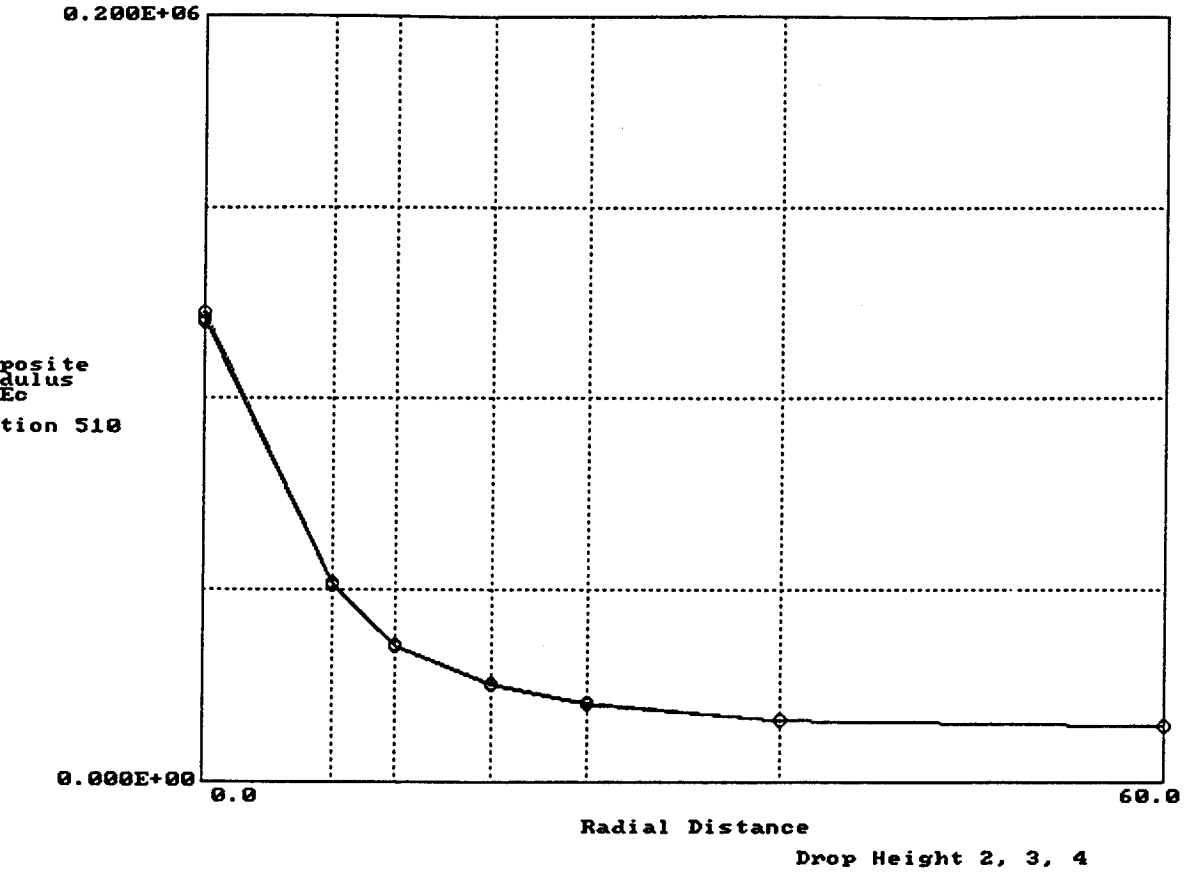
F2:ScrnDump F10:Exit ↓↑:Prv/Nxt Ht ←→:Prv/Nxt Defl PgUp/PgDn:Prv/Nxt Loc

Composite Modulus vs Deflector for Section: 274040B



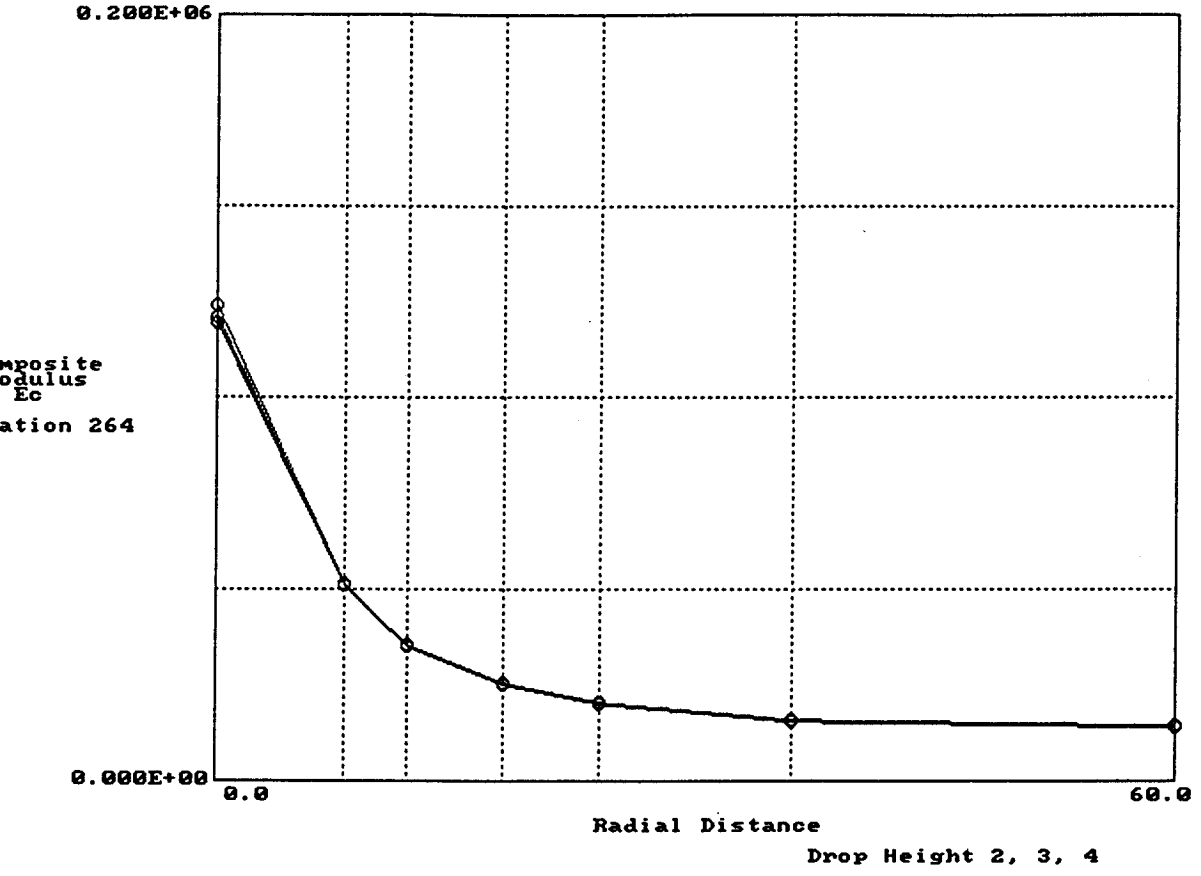
F10:ExitPlots Home End PgUp PgDn

Composite Modulus vs Deflector for Section: 274040B



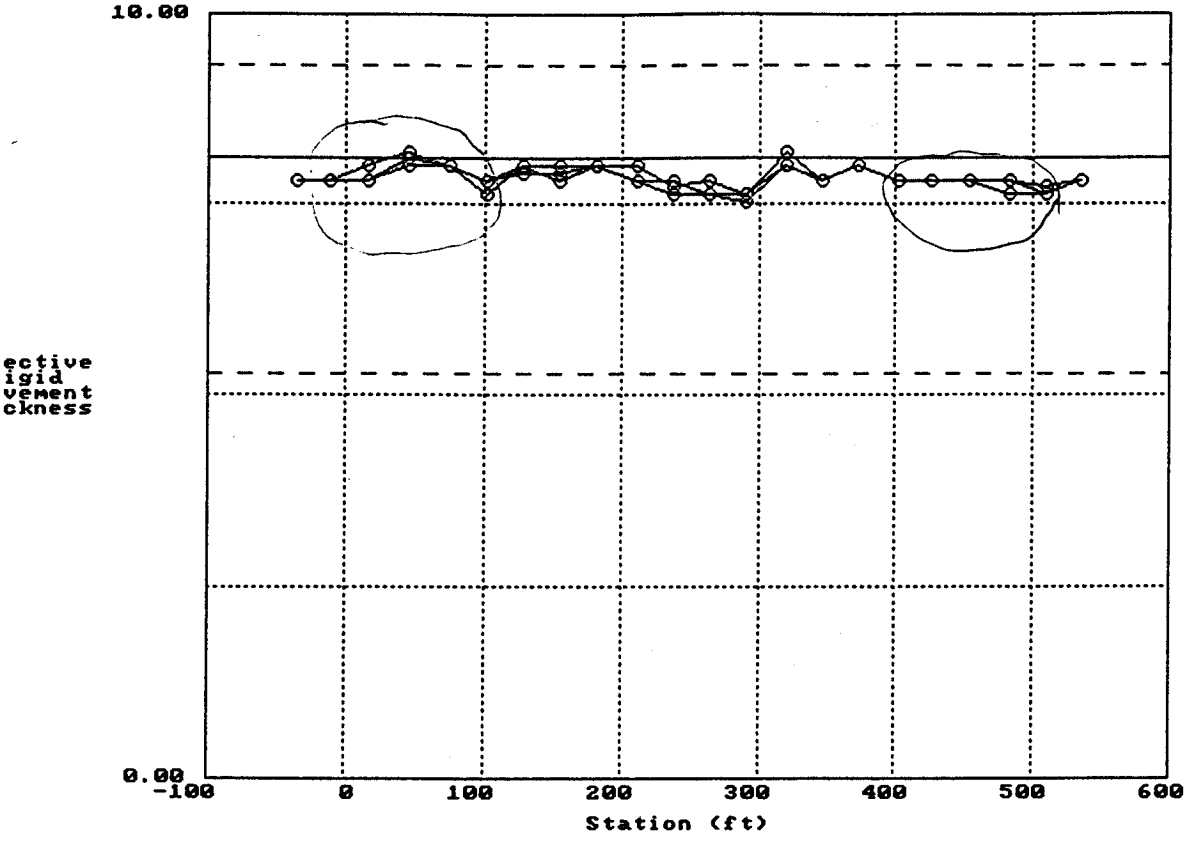
F10:ExitPlots Home End PgUp PgDn

Composite Modulus vs Deflector for Section: 274040B



F10:ExitPlots Home End PgUp PgDn

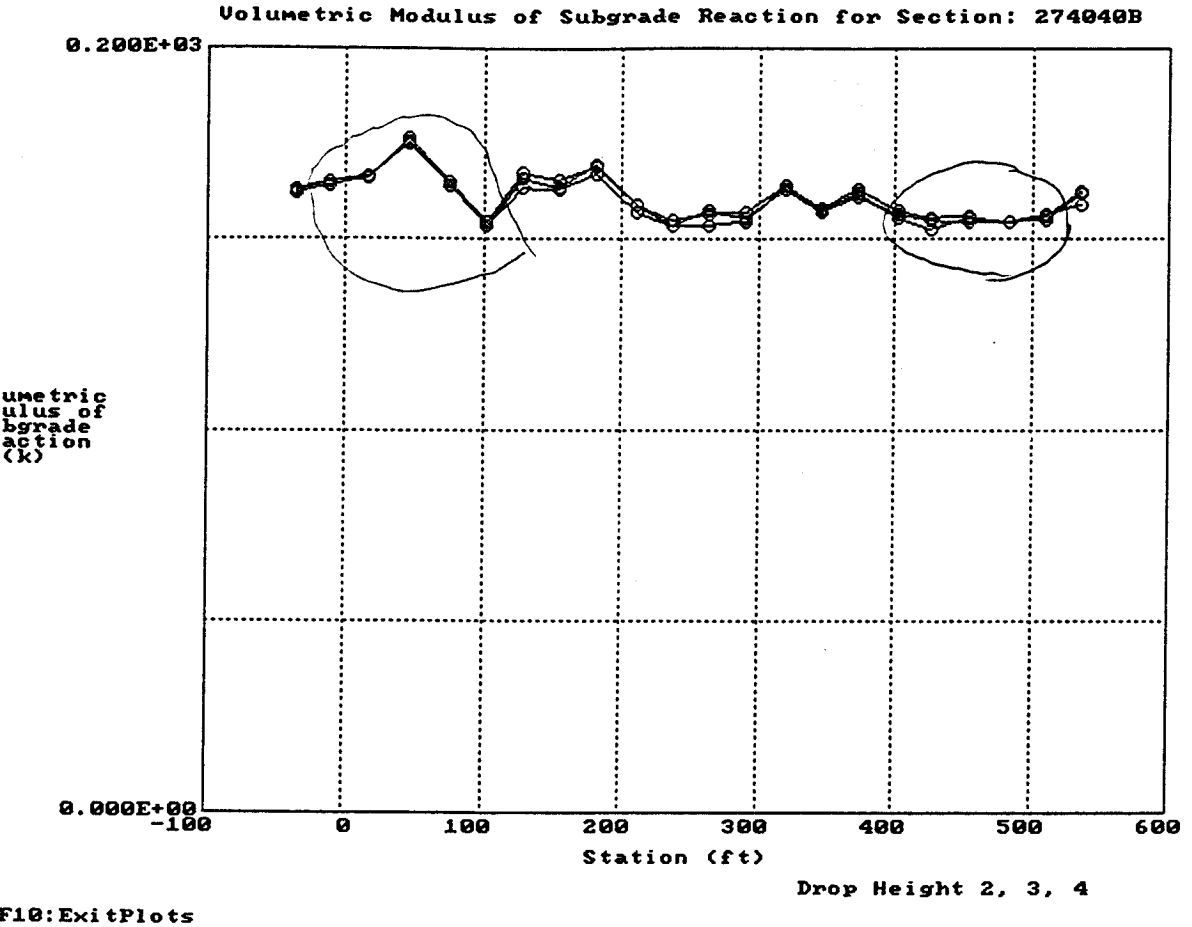
Westergaard based Rigid Thickness for Section: 274040B



Drop Height 2, 3, 4

F10:ExitPlots

Last 4 panels more uniform
however, have crossover
w/ ℄ @ Sta. 4+77



F10:ExitPlots

Appendix B-1: Pre-Installation Site Recruitment and Coordination Information

Appendix B-1 contains the following pre-installation site recruitment and coordination information:

- SMP site recruitment notes;
- MnDOT Materials and Research meeting agenda and notes;
- Site visit field notes; and
- Pre-installation meeting agenda and notes.

MN SM

BRAUN℠ INTERTEC

Description: SEASONAL – MN 274040

Project No: DBNX 92700

Date: 3/4/93 By: RV

FRED MAURER – 779-5568

PCC – 274040 → Dist-1 (*) okay with this section for traffic control and no scheduled maintenance
US-2 – Grand Rapids

AC – 271028 → (*) Fergus Falls (Detroit lakes) Dist. is willing to delay any work on the section as long as condition is not a safety concern.
US-10

AC – 271018 → (*) Little Falls/RANDALL – Dist. going to look @ section on 3/17/93
– 7/24/93 – Can use section – maybe repairing trans. cracks.
– Engineer indicated two sections laid out?

) – 273003 → (*) still checking on – Steve O.
ST15
~2147 AADT – one lane
okay, very interested in participating!

– 276251 → (*) – Dist. is willing to make exception to defer any rehab.
US2 (WB)

Craig Gilberson 218/755-3807

– 271016 → (*) already delayed work on section in 92 – tough shape
US-71 SB

– out
– will look @ overlay when SP-3 ends.

(1/2)

BRAUN℠
INTERTEC

Braun Intertec Pavement, Inc.
1983 Sloan Place
St. Paul, Minnesota 55117-2004
612-776-7522 Fax: 776-7201

Engineers and Scientists Serving the Built and Natural Environments

Memorandum

Date: July 15, 1993

To: Fred Maurer

From: Robert J. Van Sambeek RV

Re: Discussion Topics for July 15, 1993 Meeting

Drill Rig

The specific sites in Minnesota for the Seasonal Monitoring Program sponsored by FHWA-LTPP Division are listed below along with tentative dates for the installations.

- AGG. + 4.4" AC ▷ GPS 271018 on US-10 two miles northwest of Little Falls, AC, 8/24 and 8/25 — ~~Ken Wasmie~~ — Dist. 3 mdl.
- AGG. + 9.6" AC ▷ GPS 271028 on US-10 ten miles east of Detroit Lakes, AC, 9/8 and 9/9 — Bud Wyborny — 218-847-156
- AGG. + 7.1" AC ▷ GPS 276251 on US-2 bypass in Bemidji, AC, 9/14 and 9/15 — ~~Craig Gilbertson~~
- 6" AGG. + 8.1" PC ▷ GPS 274040 on US-2 five miles west of Grand Rapids, PCC, 9/21 and 9/22 — Equip — 218-755-3807

The dates listed above are dependant on FHWA-LTPP Division office having someone available for each installation, and Mn D.O.T. having personnel and equipment available.

Items that need to be addressed prior to installation activities are listed on the attached sheet. For some of the items only a contact name and phone number is needed at this time. For other items, several people will need to be involved regarding schedules and equipment availability.

Phone # list.

Dick Rudd 779-1110 — Dist. 9

— FRED MAURER 612-779-5568 — LTPP CONTACT

— ~~KELVIN HOWITSON 218-828-2240~~ (Dist. 3 Soils Eng.)

— ~~Jerry Dempsey 612-779-5560~~

—

~~MIKE~~ BLAKE NELSON 612-~~779~~-5599 → ~~JERRY DEMPSEY — 5565~~

Remains in charge

Meet w/ BLAKE + JERRY 7/23/93

(MN/DOT BILLING CODE) WORK TYPE #
00310 ___
ACT. #

(2/2

ITEMS TO ADDRESS PRIOR TO SITE INSTALLATIONS

- Set date for meeting centrally located for all people involved in the four installations.
  - Brainard area? Ask KEN WASNIE ~~218-828-2981 Matl. Eng.~~
    - Kelvin ~~Howieson (Soils~~ Engineer with District 3) help organize?
  - August ~~10th or 11th?~~ Thurs Better
    - Maybe visit four sites after meeting? 8/12
  - Include following personnel?
    - LTPP contact? → FRED
    - Maintenance supervisor? — person in charge of traffic control
    - Drill rig operator? Matl. Eng. from Each Dist.
    - FHWA Division personnel?
    - Other?
      ~~JOE KORZILIUS — MFR 612 779-5565~~
      BLAKE NELSON — AND JERRY DEMPSEY.

3/12

- Option for highway agency to establish permanent bench mark at each site. — if hit peat

- Equipment requirements.
  - Drill rig
    - 12 inch core? — See if Eng. still has 12" auger
    - 10 inch minimum diameter hole required (solid stem auger?).
    - 6 inch diameter hole located about 30 feet off roadway. —
    -
    -
  - Pavement saw.
    - 10 inch cut depth maximum required for all four sites.
    -

- Supplies
  - See listings from installation guide.
  -

- SHIFT SITES #3 AND #4 TO MONDAY? — Jerry decide

-

-

-

s:\wp\bop_v\sm_pre.mn

FRED MAURER - 612-779-5568 MN CONTACTS
JOE KORZILIUS - 779-5565 (INSTR.)
DAVE BULLOCK - 779-5542

— DRILL RIG

WARREN O. PLADSEN, P.E.
Aggregate Engineer
Geotechnical Engineering Sect.

Materials & Research Laboratory
1400 Gervais Avenue
Maplewood, MN 55109

612-779-5612
FAX 612-779-5616

JERRY L. DEMPSEY
Field Operations Supervisor
Foundation Unit
Blake Nelson - 5599

Materials & Research Laboratory
1400 Gervais Avenue
Maplewood, MN 55109

612-779-5600
FAX 612-779-5616

— Filter Sand
— Piezometer caps
— Bentonite pellets

Quality Service Through Individual Commitment

KELVIN D. HOWIESON, P.E.
District Soils Engineer

For District Three
1991 Industrial Pk. Rd.
Baxter, MN 56401

(218) 828-2240
Fax (218) 828-2210

SURVEY IN BM? — DAVE GORG..
DICK RUDD - DIST 9 - 779-1110

BRAUN™
INTERTEC

BOB V

7-22-93 2.50 PM

KEN WASNIE SAID OK FOR THE MEETING ON AUG 12 FOR SEASONAL.

IT WILL IN THE DOT BLDG.

LIBRARY CONFERENCE ROOM
1991 INDUSTRIAL PARK RR. ROAD
BAXTER MN 56401

SUBURB OF BRAINERD

ABOUT 1/4 MILE South OF PAUL BUNYAN

WILL HAVE TO SET TIME FOR MEETING.

ROOM CAN HANDLE 20+

RRG

9/27/93
- set time for 9:30 to ≈ 12:00
- can check into availability of coffee.
- maybe bring rolls?
AV

BRAUN℠
INTERTEC

Braun Intertec Pavement, Inc.
1983 Sloan Place
St. Paul, Minnesota 55117-2004
612-776-7522 Fax: 776-7201

Engineers and Scientists Serving the Built and Natural Environments

July 29, 1993

Mr. Fred Maurer
Mn/DOT Materials and Research Laboratory
1400 Gervais Avenue
Maplewood, MN 55109

Dear Mr. Maurer:

Re: Group Meeting Announcement for Activities in FHWA's Seasonal Monitoring Program in Minnesota

A tentative meeting agenda and list of who should attend the meeting is attached. The same information, along with a cover letter, was sent to the four District Materials Engineers involved. The meeting objectives as stated in the cover letter include;

* Inform involved parties about the Seasonal Monitoring Program
* Assign and coordinate responsibilities for installation and monitoring
* Finalize schedules for equipment and traffic control requirements, and
* Address any questions or concerns about the Seasonal Monitoring Program.

Please make arrangements for people from the Materials & Research Laboratory to attend. Some names, other than yourself, that have come up in previous meetings include;

Richard Sullivan - SHRP Representative
Warren Pladsen - in charge of drilling operations on the four sections,
Blake Nelson - initial planning of installations,
Joe Korzilius - involvement with instrumentation, and
Dave Bullock - involvement with instrumentation and FWD Spring Recovery testing.

Please give copies of the meeting announcement and agenda to the people you think need to attend. It is very important that someone in charge of drilling operations attend the meeting. If you have any questions or need additional information, please call me or Ron Urbach at 800-344-7477 or 612-776-7522.

Sincerely,

Robert Van Sambeek
Project Engineer
s:\wp\bob_v\mnmtg1.sm

What: Meeting Announcement for Activities in LTPP's Seasonal Monitoring Program in Minnesota

When: August 12, 1993 from 9:30 AM to 12:00 Noon

Where: Mn/DOT Library Conference Room
1991 Industrial Park Road
Baxter, MN

(0.25 miles south of Paul Bunyan in Brainerd)

Who: State Level

SHRP Representative
LTPP Contact

District Level

Materials Engineer and/or Soils Engineer

Maintenance Superintendent or Maintenance Sub Area Supervisor

Other Interested Parties

DOT staff involved with instrumentation or spring recovery study

University students

Agenda: See next page

FHWA-LTPP SEASONAL MONITORING PROGRAM IN MINNESOTA

MEETING AGENDA

Introduction
- Review of LTPP Program and Activities
- Objectives of the Seasonal Monitoring Program
- Overview of Sensor Installation and Monitoring Activities

Test Sections
- Section Location
- Allowable Maintenance

Sensors, Sensor Layout, and Installation
- TDR Probes
- Thermistor Probe
- Resistivity Instrumentation
- Air Temperature
- Rain Gauge
- Equipment Cabinet and On-Site Instrumentation
- Observation Piezometer

Schedule
- Installation
- Monitoring

Responsibilities
- Mn/DOT State Level
  - Project contacts
- Mn/DOT District Level
  - Traffic control
  - Utility clearance
  - Pavement saw and operator
  - Filter sand
  - Bentonite pellets
  - Sac-crete
  - Pavement repairs
- Mn/DOT Materials and Research Laboratory
  - Drill rig and operator
  - Access cover for piezometer
- NCRCO and FHWA Staff
  - Instrumentation
  - Monitoring activities

Closing Comments

274040

BRAUN[SM]
INTERTEC

Braun Intertec Pavement, Inc.
1983 Sloan Place
St. Paul, Minnesota 55117-2004
612-776-7522 Fax: 776-7201

Engineers and Scientists Serving the Built and Natural Environments

July 29, 1993

Mr. Rod Garver
Minnesota Department of Transportation
1123 Mesaba Avenue
Duluth, MN 55811

Dear Mr. Garver:

Re: Group Meeting Announcement for Activities in FHWA's Seasonal Monitoring Program in Minnesota

Braun Intertec, under contract with FHWA LTPP Division, has responsibility for the Seasonal Monitoring Program initiated by SHRP. Earlier this year, we worked together with Fred Maurer to contact the Districts regarding sections to include in the program, and GPS section 274040 on US TH-2 west of Grand Rapids in District 1 was approved for use in the program. In addition, sections by Bemidji, Detroit Lakes, and Little Falls were approved.

With the four sites in Minnesota relatively close together, only one group meeting is planned for the Districts involved. A tentative meeting agenda and who should attend the meeting is attached. The meeting objectives include;

* Inform involved parties about the Seasonal Monitoring Program
* Assign and coordinate responsibilities for installation and monitoring
* Finalize schedules for equipment and traffic control requirements, and
* Address any questions or concerns about the Seasonal Monitoring Program.

Please make arrangements for appropriate district people to participate in the meeting. It is very important someone in charge of traffic control and maintenance attend the meeting. If you have any questions or need additional information, please call me or Ron Urbach at 800-344-7477 or 612-776-7522.

Sincerely,

Robert Van Sambeek
Project Engineer

s:\wp\bob_v\mnmtg1.sm

BRAUN℠
INTERTEC

274040
SITE VISIT
8/12/93

NCERNS

PCC CROSSOVER w/ ℄ @ sta. 4+77

Cones @ sta. 0 and may cause problems w/ left turn lane at this location

- H_2O in ditch

OMMENTS

Drill rig able to back into intr. pipe location

- 10' AC SHOULDER

- Section markers ~ 24' from edge stripe
  - place cabinet in line w/ markers

ONCLUSIONS

- depend on Crossover (PCS/LAW, FHWA - decide?)
- sta. 5+00 end more uniform for FWDCHECK

Motel in Deer River _ Bahrs 246-8271

~~Sign up sheet?~~

S:\WP\BOB_V\MNMTS.SM? BOB V.

NOTES

FHWA-LTPP SEASONAL MONITORING PROGRAM IN MINNESOTA
MEETING AGENDA

Send letter to each dist. as follow of revised responsibilities locations for utility clearance
- sketch of area?
- MP's
cc - Matl + Maint.

August 12, 1993 from 9:30 AM to 12:00 Noon
Mn/DOT Library Conference Room
1991 Industrial Park Road, Baxter, MN

Introduction
- Review of LTPP Program and Activities
- Objectives of the Seasonal Monitoring Program
- Overview of Sensor Installation and Monitoring Activities

Test Sections
- Section Location
- Allowable Maintenance

Sensors, Sensor Layout, and Installation
- TDR Probes
- Thermistor Probe
- Resistivity Instrumentation
- Air Temperature
- Rain Gauge
- Equipment Cabinet and Instrument Pole
- Interface/Communications Equipment
- Observation Piezometer

Schedule
- Instrumentation Installation and Initial Monitoring
- Long Term Monitoring

Responsibilities
- Mn/DOT State Level
  - Project contacts — PR? —
- Mn/DOT District Level
  - Traffic control
  - Equipment
  - Materials
  - Pavement repairs — Mow GRASS? — utility clearance
- Mn/DOT Materials and Research Laboratory
  - Drill rig and operator
  - Materials
- NCRCO and FHWA Staff — PR?
  - Instrumentation
  - Monitoring activities

Closing Comments

SAFETY

? s for Dist/Agency

Cabinet location - not 30'
- any problem

Piezometer location
- outside paved sho

Maintenance activities
- before install?

Snow plow concerns?

BM install or not?

Safety requirements
- clothes

SITE VISIT

BM - 2nd alt.

Utilities - Power-lines, Culver

Drill rig in ditch.

Any Rock

Distress @ instr. hole

Required maintenance

Trees, wind consistant

Introduction

Review of LTPP Program and Activities

- see handout

Objectives of the Seasonal Monitoring Program

- Collect and analyze data to better understand the short and long term impacts of environmental factors including temperature, moisture, and frost/thaw depth on a pavement structure for improving pavement design.

- Factors defined in the core experiment monitored by FHWA-LTPP include
    - wet or dry climate
    - freeze or no freeze climate
    - pavement surface type (AC or PCC)
    - pavement surface thickness

- Factors not defined in the core experiment include
    - pavement edge drains
    - recycled materials
    - CRCP
    - shallow water table
    - shallow bedrock
    - etc.

- Agencies are encouraged to monitor supplemental sections to study factors not included in the core experiment.
    - reduced monitoring requirements
    - use existing GPS or SPS sections

Overview of Sensor Installation and Monitoring Activities

- Two days for initial instrumentation installation and monitoring

- About $10,000 of equipment installed at each site

- Monitor sections every other year (70 days over a 10 year period)

- Relate environmental variations to changes in
    - pavement, base and subgrade strength
        - deflection data collected 14 times per year
            - monthly most of year, and bi-weekly in the spring
    - ride quality
        - profile data collected five times per year
    - pavement distress
        - detailed pavement distress surveys two times per year
    - frost heave/swelling soil
        - elevation data collected five times in first year
        - elevations two times per year after the first year

Test Sections

Section Location

- 64 sections in the Core Experiment monitored under FHWA-LTPP contract

- 16 sections in the North Central Region
  - four core sections in Minnesota
    - 271018, EB US-10, MP 140, North of Little Falls
    - 271028, EB US-10, MP 58, East of Detroit Lakes
    - 274040, WB US-2, MP 173, West of Grand Rapids
    - 276251, WB US-2, MP 113, By pass in Bemidji

  - supplemental sections in Minnesota
    - none identified at this time

Allowable Maintenance

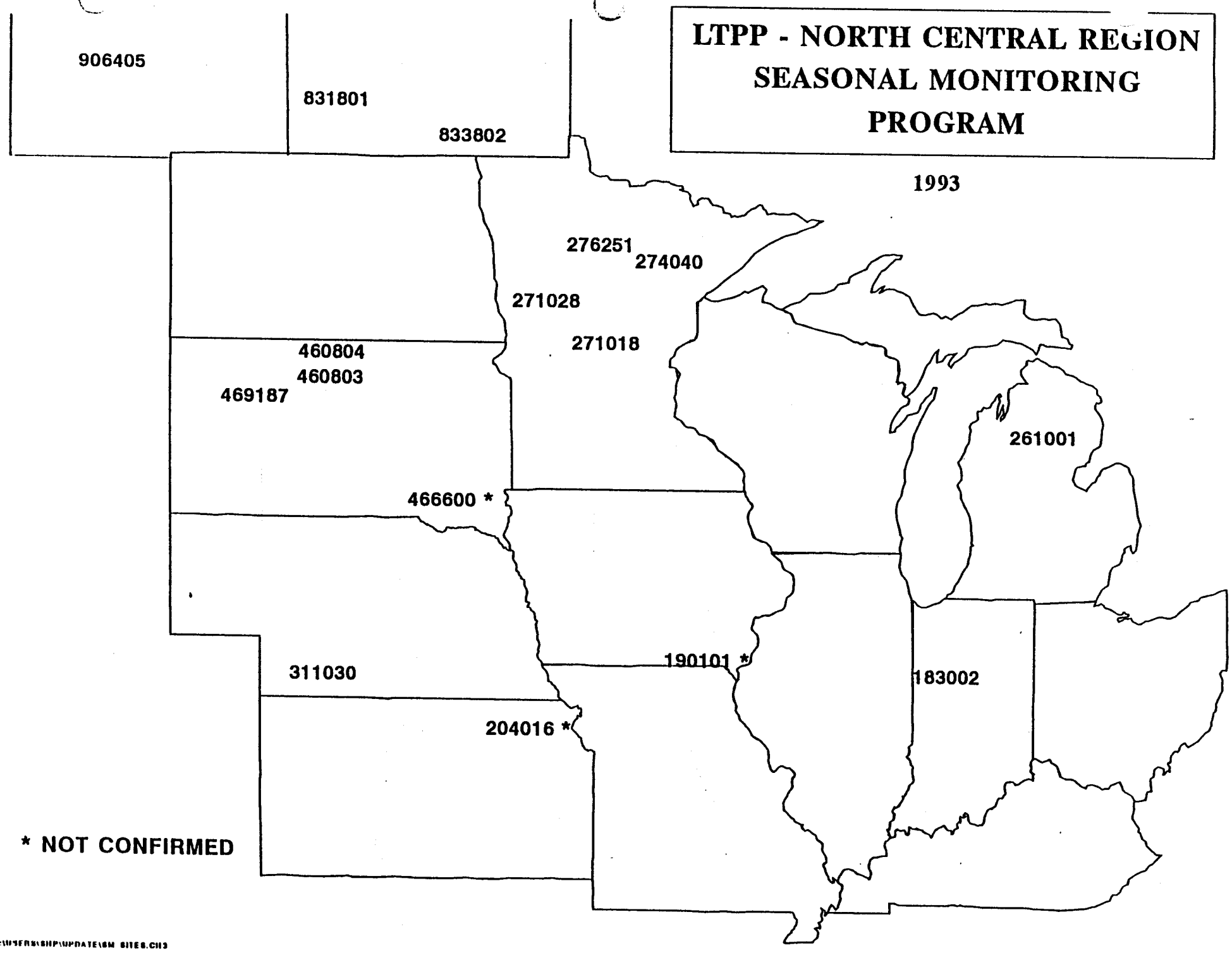
- routine maintenance

- no structural rehab preferred for ten years

- safety is primary concern

LTPP - NORTH CENTRAL REGION SEASONAL MONITORING PROGRAM

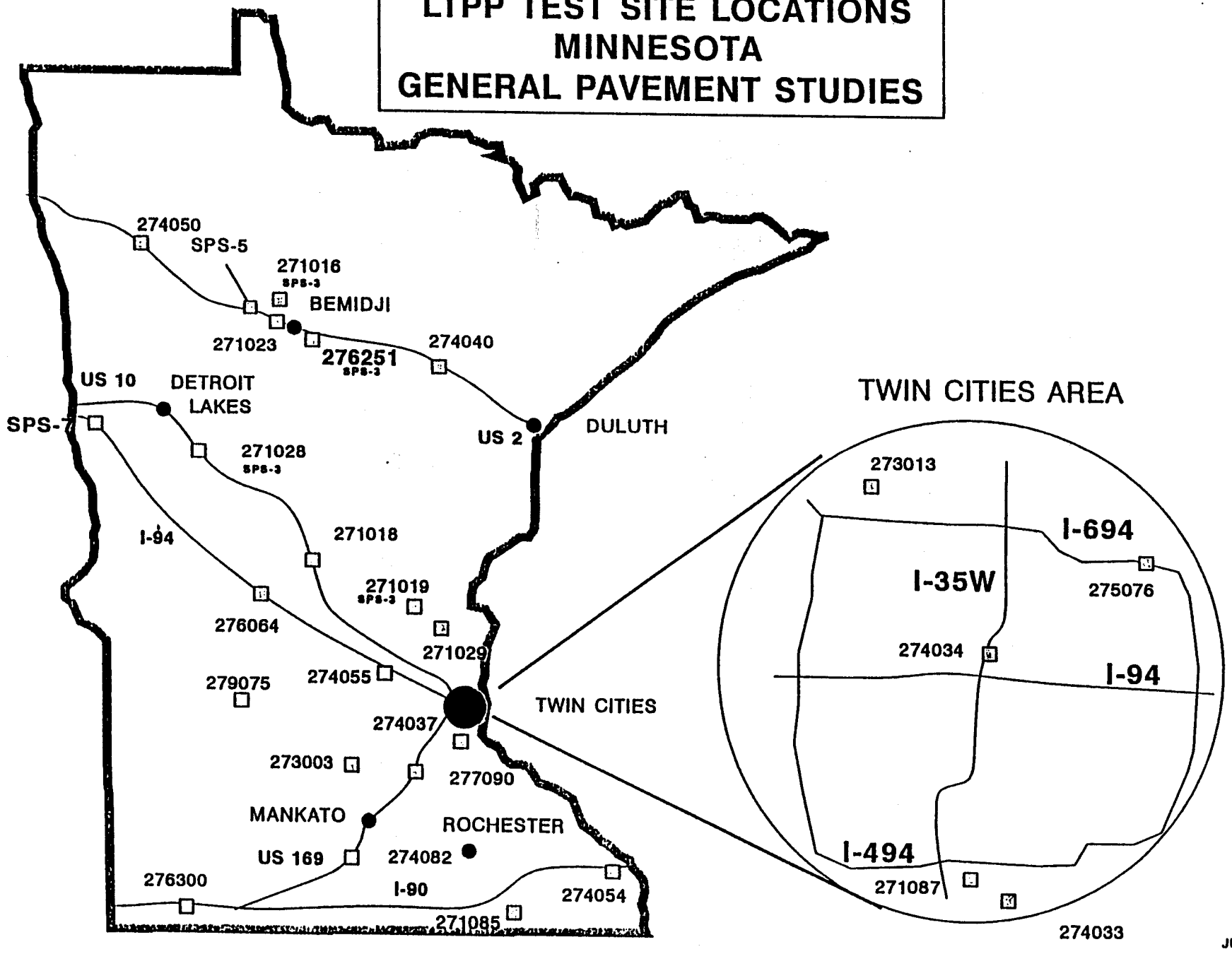
1993



* NOT CONFIRMED

F:\USERS\SHP\UPDATE\GM SITES.CH3

LTPP TEST SITE LOCATIONS
MINNESOTA
GENERAL PAVEMENT STUDIES



JUNE 1992

Sensors, Sensor Layout, and Installation

TDR (Time Domain Reflectometry) Probes

- FHWA design and manufacture
  - three prong
  - $60.00 each

- measure dielectric of material between probes and relate to moisture content
  - air = 1.0
  - dry soil = 3 to 4
  - water = 80

- calibration
  - laboratory in air and water
  - field moisture test on material placed on probes
  - retain soil samples for additional laboratory calibration

- 10 probes per installation
  - one mid-depth in the base
  - seven at six inch intervals in the top of the subgrade
  - two at 12 inch intervals approximately seven feet below the surface

- cable reader
  - generate signal for cable
  - monitor return signal
  - $8000.00

Thermistor Probe

- Measurement Research Corporation (MRC)
  - $1000.00 each

- thermistors change resistance with change in temperature

- built in multiplexer for automated readings

- two part
  - stainless steel section
    - monitor temperature gradient through the pavement surface
      - one inch deep
      - mid depth
      - one inch from bottom of pavement

  - plexiglass section
    - monitor 15 temperatures at six inch intervals

- laboratory calibration at three temperatures

Resistivity Instrumentation

- CRREL design
  - PVC probe with 36 electrodes at two inch intervals
  - $800.00 each

- large increase in resistance when moisture in the soil freezes
  - determine both frost and thaw depth

- require signal generator and multimeters
  - compute AC resistance between electrodes

- both manual measurement and automated

Air Temperature

- Campbell Scientific
  - $150.00 each

- Air probe and radiation shield

- mount on instrument pole

Rain Gauge/Tipping Bucket

- Texas Electronics
  - $255.00 each

- 0.1 mm (0.004 inches) precipitation per tip
  - liquid precipitation only

- mount on instrument pole

Equipment Cabinet and Instrument Pole

- telephone pedestal
  - break away classification
  - contain power supply, CR10 data logger, terminal strip for sensor connections, and cables for mobile reader
  - conduit runs into cabinet from instrumentation hole
  - pea rock inside base to prevent condensation

- instrument pole
  - break away classification
  - extend below frost line
  - holds rain gauge and air temperature probe

Interface/Communications Equipment

- mobile unit
  - used on site to read TDR probes and resistivity probe
  - multiplexers for automated readings

- cable reader
  - Tectronics model 1502
  - required for reading TDR probes

- computer and software
  - "onsite" used to record data everyday
  - "mobile" used to record data monthly

Observation Piezometer

- monitor depth to ground water table

- designed to act as frost free bench mark
  - Dave Esch design
  - anchor at 14 foot depth
  - sliding section extends six feet below the surface
    - filled with water proof grease

Schedule

Instrumentation Installation and Initial Monitoring

- two days required with third day as contingency
  - first day complete instrument installation
  - second day collect data

- tentative schedule
  - Aug. ~~23~~ 24 & ~~24~~ 25 - 271018, EB US-10, MP 140, North of Little Falls
  - Sept. 8 & 9 - 271028, EB US-10, MP 58, East of Detroit Lakes
  - Sept. 21 & 22 - 274040, WB US-2, MP 173, West of Grand Rapids
  - Sept. 14 & 15 - 276251, WB US-2, MP 113, By pass in Bemidji

Long Term Monitoring

- one day every month

- every other year for 10 years

Responsibilities

Mn/DOT State Level

- project contacts for maintenance activities and traffic control

Mn/DOT District Level

- traffic control for full lane closure
  - two days for initial installation and monitoring
  - lane closure for 500 foot section
    - signs, cones, and arrow board

Utility Clearance

- equipment
  - pavement saw and operator
    - if drill rig not able to core 12 inch diameter, then saw 14 inch square block out of the pavement
      - located in the outer wheel path
      - will put core back in-place on AC sections

    - equipment capable of cutting one inch deeper than estimated pavement thicknesses below
      - 271018 4.5 inch AC
      - 271028 9.6 inch AC
      - 274040 8.2 inch PCC
      - 276251 7.9 inch AC

    - saw three to four inch wide trench for conduit
      - from outer wheel path to outside pavement/shoulder

- materials

  - coordinate with Materials and Research Laboratory — Sackcrete, peagravel

Warren Hudson

  - asphalt patch for conduit trench
    - estimate 500 pounds

  - water for mixing sackcrete and equipment clean-up
    - estimate 30 gallons

- pavement repairs

  - patch conduit trench on AC shoulders with asphalt patch

  - assist with core or block replacement on AC sections

  - assist with rapid set concrete patch for instrumentation hole and conduit trench on PCC pavements

Generator 3500 watt

Mn/DOT Materials and Research Laboratory

- drill rig and operator
  - only required for instrument installation (first day)

  - if possible, cut 12 inch core for instrumentation
    - 12 inch inside diameter core barrel required
    - core located in outer wheel path

  - bore one six-inch diameter hole for piezometer
    - 14 foot depth
    - located on shoulder

  - bore one 12 inch diameter hole for instrumentation
    - solid stem auger preferred
    - eight foot depth
    - located in outer wheel path
    - NCRCO has 12 inch diameter auger with two-inch hex drive

  - bore one 12 inch diameter hole for equipment cabinet
    - two feet deep
    - located about 26 feet outside the driving lane in the ditch

  - bore one six-inch diameter hole for the instrumentation pole
    - 10 feet deep
    - located adjacent to the equipment cabinet in the ditch

- materials

  - cover assembly for piezometer
    - must function for ten years
    - able to open in the winter

  - sackcrete for piezometer cover and instrumentation pole
    - estimate four bags required

  - quick set concrete to repair PCC sections
    - only for 274040 by Grand Rapids
    - estimate three to four cubic feet

  - bentonite pellets for sealing piezometer
    - five gallon bucket

  - filter sand for piezometer
    - 400 pounds (four bags)
    - particle size not critical

  - pea gravel for equipment cabinet
    - 500 pounds
    - 3/8 inch size preferred

NCRCO (Braun Intertec) and FHWA Staff

- instrumentation
  - provide all instrumentation
  - install all instrumentation
    - may ask DOT people for assistance

- monitoring activities
  - will collect all required monitoring data

Closing Comments

.71018 – WHEN CRACK REPAIR? PROCEDURE?
– REPAIR PRIOR TO INSTALLATION?

– Cut grass

– Report to Dist. in Spring for load restricti

MP. 114 frost tube

Charge ID. (MN) → Charge Identifier 00Y310Y##

– four digit work item

– Gopher One Call – Utility Clearance

– PR – FHWA ON SITE

– SAFETY

– Utility to R.O.W. – permits for trenth

* PRIMARY CONTACTS IN DIST. FOR SMP

fax 327450

LTPP SEASONAL MONITORING MEETING

Aug 12, 1993 Brainerd

	Name	AFF./Office	Dist	Phone No
*	Andy Istvanovich	Grand Rapids Sup.	1B	(218) 327-4493
	Harland Vitalis	Maplewood Lab		(612) 779-5610
	Eugene Tormonen	" "		" " "
	John Savaloja	Materials	3A	218/828-2271
	Bob Matthews	Materials	3A	218 828-2231
*	Tom Stanko	Maint	2	218-755-3799
*	Lee Furdham	Maint.	3A	218-828-2472
	Don Hardy	Maint.	3A	218-828-2478
	Craig Gilbertson	Materials	2	218-755-3807
	PAT HUSTON	SOILS	1	218-723-4883
	Kelvin Howieson	Soils	3	218-828-2240
	ROBIN ALLEN	MATERIALS	3A	218-828-2768
	Ford Maurer	Pav't Mgt.	C.O. MR&E	(612) 779-5568
✓	RON URBACH	BRAUN INTERTEC		612-776 7522
	Joseph Korzilius	MN/DOT Pavt Dgn.		612-779-5565
✓	WILLIAM LOHR	FHWA (TRAINEE)		612 776 7520
	KEN WATSNICE	MnDOT	3A	218-828-2481
	Warren Pladsen	MnDOT	MR&E	612-779-5612
*	Bud Wyborny	MnDOT	4A	218-847-1562
	Tom Swenson	MnDOT	4	218-846-0743
✓	BOB VAN SAMBEEK	BRAUN INTERTEC		1-800-344-7477 612-776-7522
✓	GENE SKOK	" "		" " "

ASPHALT INSTITUTE

SECTION ID	HIGHWAY	MILEPOINT	CONTROL SECTION	DISTRICT	DISTRICT MAINTENANCE SUPERINTENDANT	MAINTENANCE SUB AREA SUPERVISOR	DISTRICT MATERIALS ENGINEER	DISTRICT SOILS ENGINEER
271018	US 10 EB	140.15	4902	3A	LEE PURDHAM (218) 828-2472 BRAINERD	GARY LOUDAN (612) 632-6116 LITTLE FALLS	KEN WASNIE (218) 828-2481 BRAINERD fax 2544	KEVIN HOWIESON (218) 828-2240 BRAINERD
271028	US 10 EB	58.28	5607	4A	DENNIS REDIG (218) 847-1575 DETROIT LAKES	JOE STEGMAIER (218) 847-1500 DETROIT LAKES	BUD WYBORNY (218) 847-1562 DETROIT LAKES	TOM SWENSON (218) 846-0743 DETROIT LAKES
276251	US 2 WB	113.00	0406	2A	LARRY SCHANUS (218) 755-2943 BEMIDJI	TOM STANKO (218) 755-3799 BEMIDJI	GRAIG GILBERTSON (218) 755-3807 BEMIDJI	TODD VONASEK (218) 755-3992 BEMIDJI
274040	US 2 WB	173.21	3103	1B	WOODIE CRAIG (218) 749-7793 VIRGINIA	ANDY ISTANOVICH (218) 327-4493 GRAND RAPIDS	ROD GARVER (218) 723-4835 DULUTH	PAT HUSTON (218) 723-4883 DULUTH

if not in call 749-7793

Post-It™ brand fax transmittal memo 7671 | # of pages ▸ 1

To BOB VAN SAM BEEK	From DAVE BULLOCK
Co. BRAUN	Co. MN/DOT
Dept.	Phone # 779-5942
Fax # 776-7201	Fax # 779-5616

Traffic Control Contacts

BRAUN℠
INTERTEC

Braun Intertec Pavement, Inc.
1983 Sloan Place
St. Paul, Minnesota 55117-2004
612-776-7522 Fax: 776-7201

Engineers and Scientists Serving the Built and Natural Environments

Memorandum

Date: August 31, 1993

To: Andy Istvanovich - Maintenance Sub Area Supervisor fax 218-327-4500

From: Robert J. Van Sambeek RV

Re: Instrument Installation and Monitoring Activities for GPS Section 274040 on US-2 Westbound MP 173.

This letter is a follow up to District level responsibilities discussed at the August 12, 1993 meeting in Baxter, MN. Also, Fred Maurer asked that all work related to the FHWA-LTPP project be billed to charge I.D. 00 310 ####, where #### represents the four digit work item.

* Utility Clearance
  - MP 173.23 to MP 173.09 of westbound US-2.
    - 700 feet total from 100 feet east of Sta.0+00 to 100 feet west of Sta.5+00.
    - Stations marked on right edge of driving lane with white paint.
    - Clear driving lane and 40 feet north of section into the ditch.

* If possible, mow grass in area identified for utility clearance, or bring weed whip to site on September 21st.

* Traffic Control September 21st and 22nd (Schedule September 23rd as contingency day for weather delays or equipment break down).
  - Full lane closure MP 173.23 to MP 173.09 in the westbound driving lane.
  - Traffic control in-place by 7:30 AM both days.

* Pavement Saw and Operator on September 21st.
  - Able to saw about 9.0 inch depth.
  - Cut 16 inch square block out of the pavement in the outer wheel path.
    - Remove block in one piece to bond back in-place later in the day.
  - Cut four inch wide trench from outer wheel path across 11 foot paved shoulder.

* Materials for Equipment Installation and Pavement Repairs.
  - Six bags sackcrete.
  - 500 pounds 3/8 inch pea gravel or trap rock.
  - Three cubic feet quick set PCC.
  - 500 pounds asphalt patch.
  - Water for sackcrete, quick set PCC, and equipment clean-up (Approx. 30 gallons).

* Patch four inch wide trench and assist with block replacement in the outer wheel path.

BRAUN℠
INTERTEC

9/17/93

274040

- FIBER OPTIC CABLES (TWO) ALONG ROAD
- PUT B.M. BESIDE EQUIP. CABINET
- HOW TO PROCESS SOIL ?

BRAUN℠
INTERTEC

274040

8/31/93

Mn / DOT

BM

Dickson Hoile
296-1542
- locations to shoot in later on

- Surplus rod + pvc from Mn/ROAD

- Look @ ALL 4 SITES

John Zollers
- Caps for BM

- EQUIPMENT
  - Power hammer
  - Grinder
  - etc.

} Geo. crew. - ~~tool~~ Loan

- Warren still looking into caps for BM.
  - will talk to Harland Vitalis about installing.

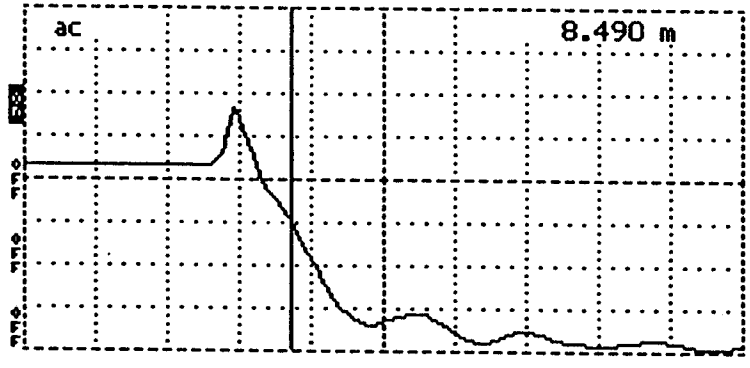
Appendix B-2: Pre-Installation Equipment Checks/Calibration Information

Appendix B-2 contains the following data sheets for the pre-installation equipment checks/calibration:

- Data Sheet SMP-C01: TDR Probe Check;
- Data Sheet SMP-C02: Thermistor and Air Temperature Probe Check;
- Data Sheet SMP-C03: Electrical Resistivity Probe Check;
- Data Sheet SMP-C04: Function Generator, Multi-meter, and Switch Box Checks; and
- Data Sheet SMP-C05: Tipping-Bucket Rain Gauge Calibration.

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [27] LTPP Section ID [4040]

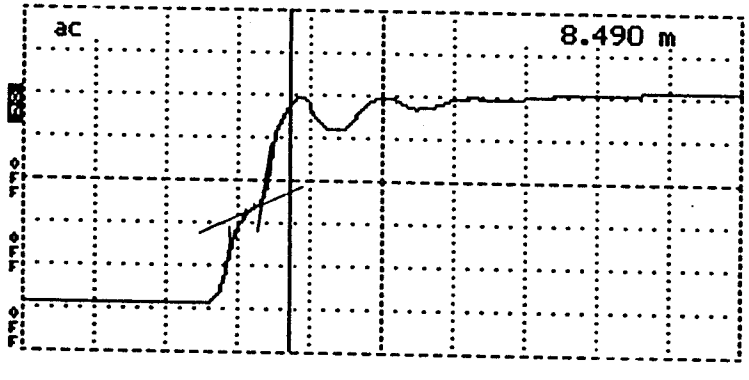
Cursor ..... 8.490 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
/P 0.50
loise Filter..... 8 avg
ower..... ac



Tektronix 1502B TDR
Date 9-2-93
Cable 274040 - 27D01
Notes SHORTED
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"Shorted at Start"	N/A	N/A

Cursor ..... 8.490 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
Vp 0.50
Noise Filter..... 8 avg
Power..... ac

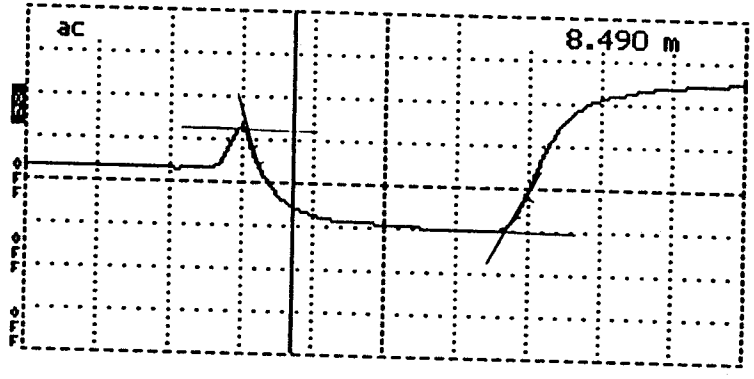


Tektronix 1502B TDR
Date 9-3-93
Cable 274040 - 27D01
Notes IN AIR
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[1]
"In Air"	0.11	1.17

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [27] LTPP Section ID [40 40]

Cursor ..... 8.490 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
VP 0.50
Noise Filter..... 8 avg
Power..... ac



Tektronix 1502B TDR
Date 9-2-93
Cable 274040-27001
Notes
H_2O
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	0.90	78.62

[1] If dielectric constant not between 0.75 and 2.0, contact FHWA LTPP Division
[2] If dielectric constant not between 76 and 84, contact FHWA LTPP Division

Note: Dielectric constant is determined as follows:

$$\varepsilon = \left[\frac{(L_a)}{(L)(V_p)}\right]^2 = \left[\frac{(D_2 - D_1)}{(L)(V_p)}\right]^2$$

where ε = dielectric constant; L_a = apparent length of probe, m; L = actual length of probe units (= 0.203 m (8 in) for FHWA probes); V_p = phase velocity setting (= 0.99).

TDR Probe Serial Number: 27001 TDR Probe Length, L: .(1) m Length of Coax Cable: (1). m

Comments: (1) Not measured 1993, used 0.203 m for "L", and 0.5 for "Vp"

Prepared by: JAH Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 16/NOV/95 (installed 1993)

Data Sheet SMP-C01: TDR Probe Check (Continued)

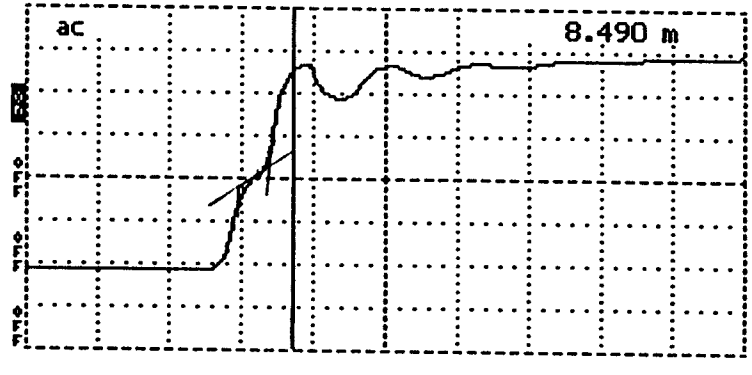
LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [27] LTPP Section ID [4 0 4 0]

'irsor ..... 8.490 m
stance/Div..... .25 m/div
rtical Scale.... 177 mρ/div
. ..... 0.50
se Filter..... 8 avg
ver..... ac

Tektronix 1502B TDR
Date 9-2-93
Cable 274040 - 27D02
Notes SHORTED
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"Shorted at Start"	N/A	N/A

:ursor ..... 8.490 m
istance/Div..... .25 m/div
'ertical Scale.... 177 mρ/div
'P 0.50
'oise Filter..... 8 avg
'ower..... ac

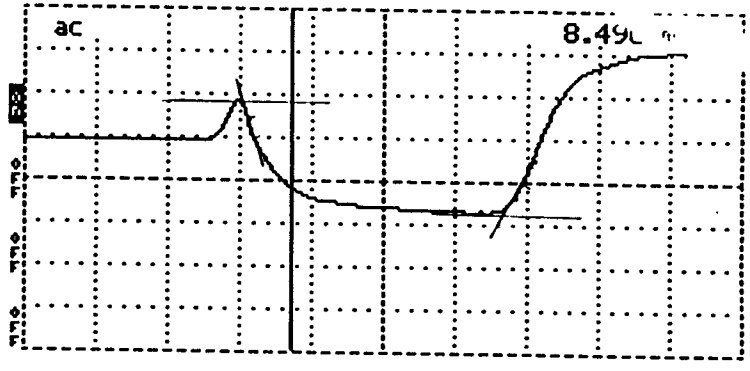


Tektronix 1502B TDR
Date 9-2-93
Cable 274040 - 27D02
Notes AIR
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[1]
"In Air"	0.11	1.17

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [27] LTPP Section ID [4040]

Cursor ..... 8.490 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
VP 0.50
Noise Filter..... 8 avg
Power..... ac



Tektronix 1502B TDR
Date 9-2-93
Cable 27040-27D02
Notes
Hac
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	0.91	80.38

[1] If dielectric constant not between 0.75 and 2.0, contact FHWA LTPP Division
[2] If dielectric constant not between 76 and 84, contact FHWA LTPP Division

Note: Dielectric constant is determined as follows:

$$\varepsilon = \left[\frac{(L_a)}{(L)(V_p)}\right]^2 = \left[\frac{(D_2 - D_1)}{(L)(V_p)}\right]^2$$

where ε = dielectric constant; L_a = apparent length of probe, m; L = actual length of probe units (= 0.203 m (8 in) for FHWA probes); V_p = phase velocity setting (= 0.99).

TDR Probe Serial Number: 27D02 TDR Probe Length, L: __.(1)__ m Length of Coax Cable: (1).__ m

Comments: (1) Not measured in 1993, used 0.203 M for "L" and 0.5 for "Vp"

Prepared by: JAH Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 16/NOV/95 (installed 1993

Data Sheet SMP-C01: TDR Probe Check (Continued)

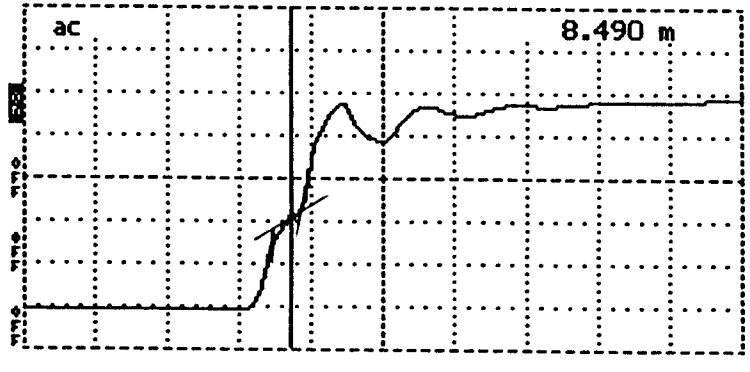
LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [27] LTPP Section ID [4040]

Cursor ..... 8.490 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
VP 0.50
Noise Filter..... 8 avg
Power..... ac

Tektronix 1502B TDR
Date 9-2-93
Cable 274040-27D03
Notes SHORTED
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"Shorted at Start"	N/A	N/A

ursor ..... 8.490 m
stance/Div..... .25 m/div
rtical Scale.... 177 mρ/div
..... 0.50
ise Filter..... 8 avg
ver..... ac

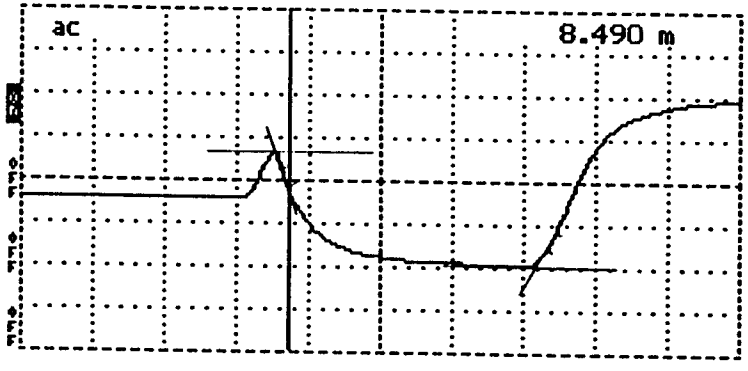


Tektronix 1502B TDR
Date 9-2-93
Cable 274040-27D03
Notes AIR
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"In Air"	0.11	1.12

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [27] LTPP Section ID [4040]

Cursor ..... 8.490 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
Vp 0.50
Noise Filter..... 8 avg
Power..... ac



Tektronix 1502B TDR
Date 9-2-93
Cable 27040 -27D03
Notes
H_2O
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	0.92	82.16

[1] If dielectric constant not between 0.75 and 2.0, contact FHWA LTPP Division
[2] If dielectric constant not between 76 and 84, contact FHWA LTPP Division

Note: Dielectric constant is determined as follows:

$$\varepsilon = \left[\frac{(L_a)}{(L)(V_p)}\right]^2 = \left[\frac{(D_2 - D_1)}{(L)(V_p)}\right]^2$$

where ε = dielectric constant; L_a = apparent length of probe, m; L = actual length of probe units (= 0.203 m (8 in) for FHWA probes); V_p = phase velocity setting (= 0.99).

TDR Probe Serial Number: 27D03 TDR Probe Length, L: _.(1)_ m Length of Coax Cable: _(1)._ m

Comments: (1) Not measured in 1993, used 0.203 m for "L" and 0.5 for "Vp"

Prepared by: JAH Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 16/NOV/95 (installed 1993)

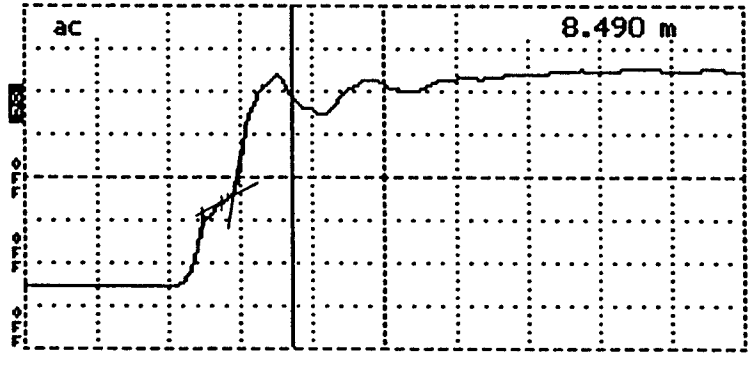
LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [27] LTPP Section ID [4040]

Cursor ..... 8.490 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
VP 0.50
Noise Filter..... 8 avg
Power..... ac

Tektronix 1502B TDR
Date 9-2-93
Cable 274040 - 27D04
Notes
SHORTED
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"Shorted at Start"	N/A	N/A

Cursor ..... 8.490 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
VP 0.50
Noise Filter..... 8 avg
Power..... ac

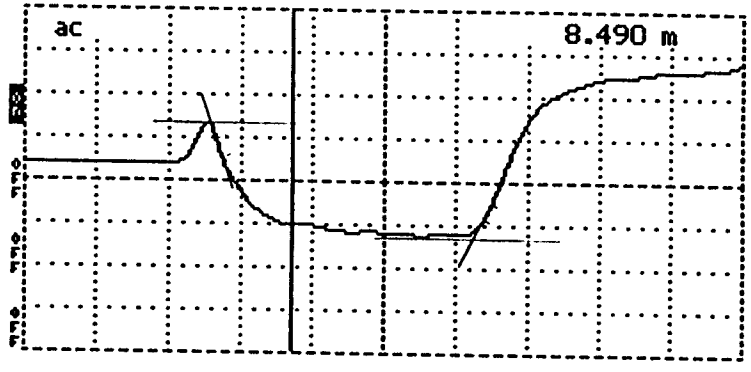


Tektronix 1502B TDR
Date 9-2-93
Cable 274040 - 27D04
Notes
AIR
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[1]
"In Air"	0.12	1.40

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [27] LTPP Section ID [4040]

Cursor ..... 8.490 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
Vp 0.50
Noise Filter..... 8 avg
Power..... ac



Tektronix 1502B TDR
Date 9-2-93
Cable 274040 - 27D04
Notes
H2O
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	0.91	80.38

[1] If dielectric constant not between 0.75 and 2.0, contact FHWA LTPP Division
[2] If dielectric constant not between 76 and 84, contact FHWA LTPP Division

Note: Dielectric constant is determined as follows:

$$\varepsilon = \left[\frac{(L_a)}{(L)(V_p)}\right]^2 = \left[\frac{(D_2 - D_1)}{(L)(V_p)}\right]^2$$

where ε = dielectric constant; L_a = apparent length of probe, m; L = actual length of probe units (= 0.203 m (8 in) for FHWA probes); V_p = phase velocity setting (= 0.99).

TDR Probe Serial Number: 27D04 TDR Probe Length, L: _ . (1) _ m Length of Coax Cable: (1) . _ m

Comments: (1) Not measured in 1993, used 0.203 m for "L" and 0.5 for "Vp"

Prepared by: JAH Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 16/NOV/95 (installed 1993)

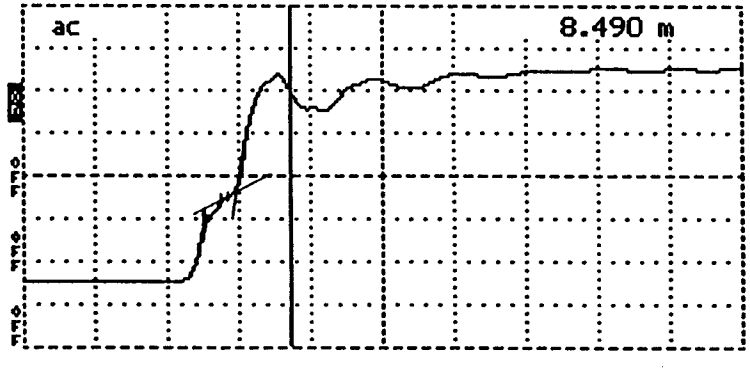
LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [27] LTPP Section ID [4040]

Cursor ..... 8.490 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
Vp 0.50
Noise Filter..... 8 avg
Power..... ac

Tektronix 1502B TDR
Date 9-2-93
Cable 274040-27D05
Notes SHORTED
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"Shorted at Start"	N/A	N/A

Cursor ..... 8.490 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
Vp 0.50
Noise Filter..... 8 avg
Power..... ac

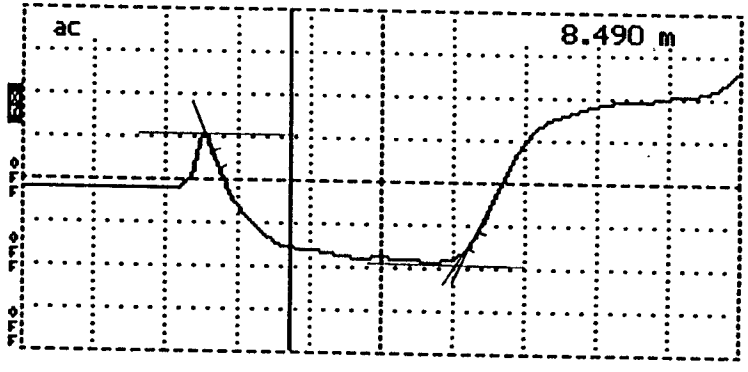


Tektronix 1502B TDR
Date 9-2-93
Cable 274040-27D05
Notes AIR
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[1]
"In Air"	0.12	1.40

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [27] LTPP Section ID [4040]

Cursor ..... 8.490 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
VP 0.50
Noise Filter..... 8 avg
Power..... ac



Tektronix 1502B TDR
Date 9-2-93
Cable 274040-27D05
Notes
Hy U

Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	0.99	75.17

[1] If dielectric constant not between 0.75 and 2.0, contact FHWA LTPP Division
[2] If dielectric constant not between 76 and 84, contact FHWA LTPP Division

Note: Dielectric constant is determined as follows:

$$\varepsilon = \left[\frac{(L_a)}{(L)(V_p)}\right]^2 = \left[\frac{(D_2 - D_1)}{(L)(V_p)}\right]^2$$

where ε = dielectric constant; L_a = apparent length of probe, m; L = actual length of probe units (= 0.203 m (8 in) for FHWA probes); V_p = phase velocity setting (= 0.99).

TDR Probe Serial Number: 27D05 TDR Probe Length, L: _.(1)_ _ m Length of Coax Cable: (1)._ m

Comments: (1) Not measured in 1993, used 0.203 m for "L" and 0.5 for "Vp"

Prepared by: JAH Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 16/NOV/95 (installed 1993)

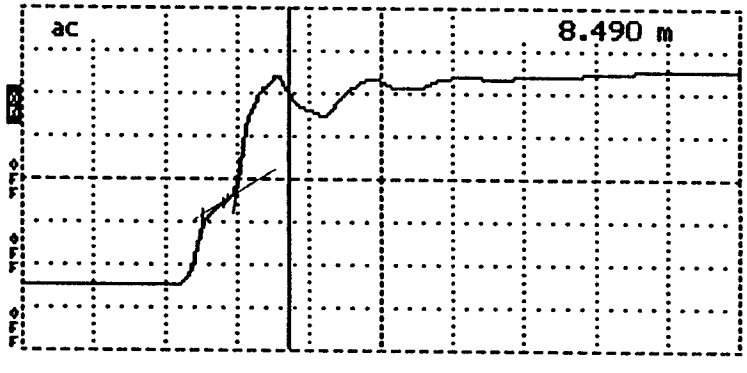
LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [27] LTPP Section ID [4040]

ursor ..... 8.490 m
istance/Div..... .25 m/div
ertical Scale.... 177 mρ/div
..... 0.50
ise Filter..... 8 avg
wer..... ac

Tektronix 1502B TDR
Date 9-2-93
Cable 274040 & 27DOC
Notes SHORTED
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"Shorted at Start"	N/A	N/A

Cursor ..... 8.490 m
istance/Div..... .25 m/div
ertical Scale.... 177 mρ/div
P 0.50
oise Filter..... 8 avg
ower..... ac

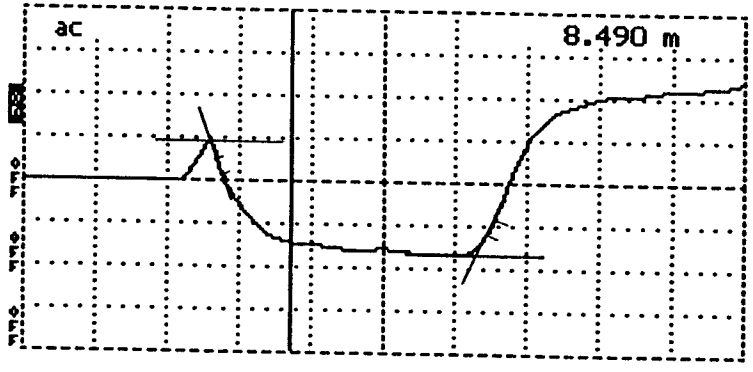


Tektronix 1502B TDR
Date 9-2-93
Cable 274040-& 27DOC
Notes AIR
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[1]
"In Air"	0.12	1.40

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [27] LTPP Section ID [4040]

:rsor ..... 8.490 m
:stance/Div..... .25 m/div
rtical Scale.... 177 mρ/div
..... 0.50
ise Filter..... 8 avg
wer..... ac



Tektronix 1502B TDR
Date 9-2-93
Cable 274040 - 27D06
Notes
H_2O

Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	0.92	82.16

[1] If dielectric constant not between 0.75 and 2.0, contact FHWA LTPP Division
[2] If dielectric constant not between 76 and 84, contact FHWA LTPP Division

Note: Dielectric constant is determined as follows:

$$\varepsilon = \left[\frac{(L_a)}{(L)(V_p)}\right]^2 = \left[\frac{(D_2 - D_1)}{(L)(V_p)}\right]^2$$

where ε = dielectric constant; L_a = apparent length of probe, m; L = actual length of probe units (= 0.203 m (8 in) for FHWA probes); V_p = phase velocity setting (= 0.99).

TDR Probe Serial Number: 27D06 TDR Probe Length, L: _.(1)__ m Length of Coax Cable: _(1)._ m

Comments: (1) Not measured in 1993, used 0.203 M for "L," and 0.5 for "Vp"

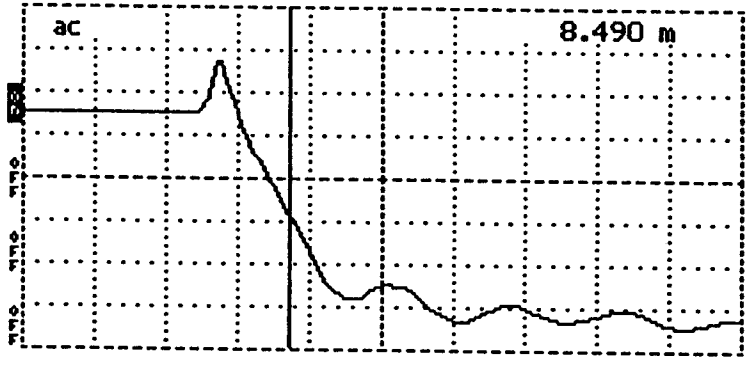
Prepared by: JAH Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 16/NOV/95 (installed 1993)

Data Sheet SMP-C01: TDR Probe Check (Continued)

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [27] LTPP Section ID [4040]

Cursor ..... 8.490 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
VP 0.50
Noise Filter..... 8 avg
Power..... ac

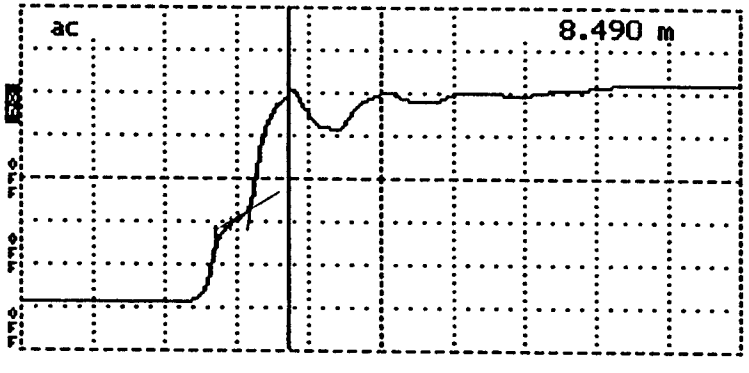


Tektronix 1502B TDR
Date 9-2-93
Cable 274040-27D07
Notes SHORTED

Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"Shorted at Start"	N/A	N/A

Cursor ..... 8.490 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
VP 0.50
Noise Filter..... 8 avg
Power..... ac



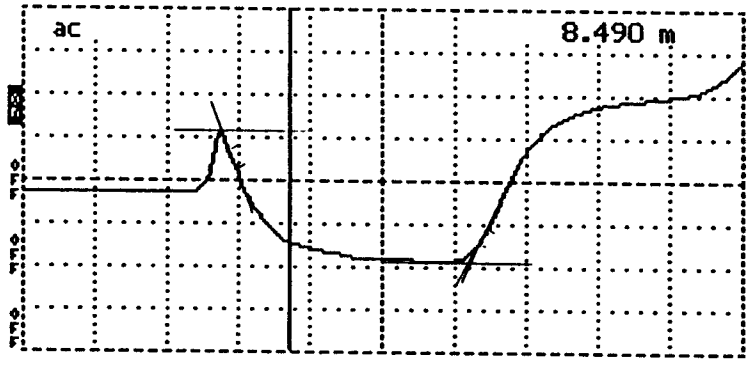
Tektronix 1502B TDR
Date 9-2-93
Cable 274040-27D07
Notes AIR

Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[1]
"In Air"	0.12	1.40

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [27] LTPP Section ID [4040]

Cursor ..... 8.490 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
VP 0.50
Noise Filter..... 8 avg
Power..... ac



Tektronix 1502B TDR
Date 9-2-93
Cable 214040-27D07
Notes
Hg o
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	0.99	25.12

[1] If dielectric constant not between 0.75 and 2.0, contact FHWA LTPP Division
[2] If dielectric constant not between 76 and 84, contact FHWA LTPP Division

Note: Dielectric constant is determined as follows:

$$\varepsilon = \left[\frac{(L_a)}{(L)(V_p)}\right]^2 = \left[\frac{(D_2 - D_1)}{(L)(V_p)}\right]^2$$

where ε = dielectric constant; L_a = apparent length of probe, m; L = actual length of probe units (= 0.203 m (8 in) for FHWA probes); V_p = phase velocity setting (= 0.99).

TDR Probe Serial Number: 27D07 TDR Probe Length, L: __.(1)__ m Length of Coax Cable: (1).__ m

Comments: (1) Not measured in 1993, used 0.203 M for "L" and 0.5 for "Vp"

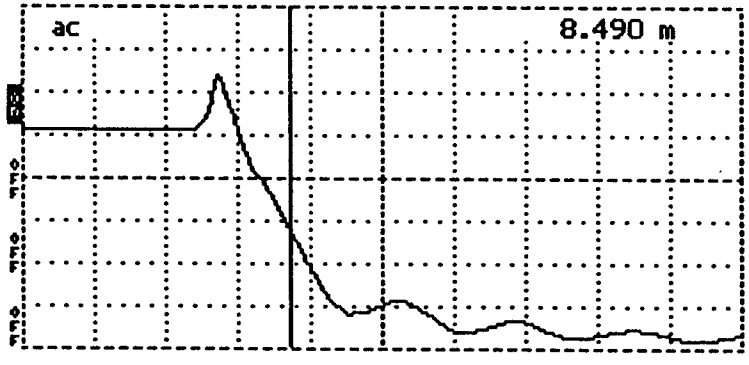
Prepared by: JAH Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 16/NOV/95 (installed 1993)

Data Sheet SMP-C01: TDR Probe Check (Continued)

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [27] LTPP Section ID [4040]

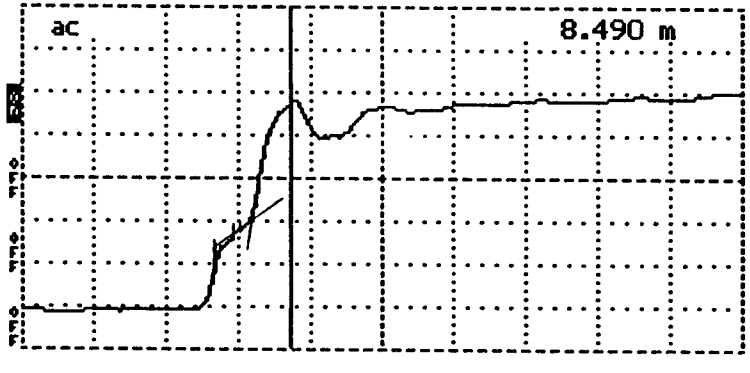
:ursor ..... 8.490 m
'istance/Div..... .25 m/div
'ertical Scale.... 177 mρ/div
'P 0.50
loise Filter..... 8 avg
'ower..... ac



Tektronix 1502B TDR
Date 9-2-93
Cable 274040 - 27DOB
Notes SHORTED
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"Shorted at Start"	N/A	N/A

rsor ..... 8.490 m
:tance/Div..... .25 m/div
rtical Scale.... 177 mρ/div
..... 0.50
ise Filter..... 8 avg
ver..... ac

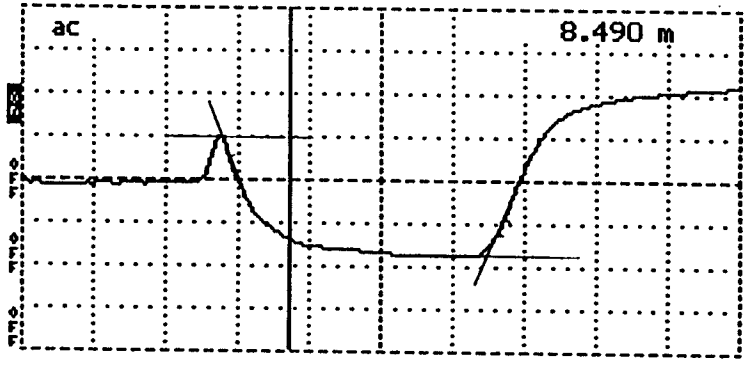


Tektronix 1502B TDR
Date 9-2-93
Cable 274040 - 27DOB
Notes AIR
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[1]
"In Air"	0.13	1.64

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [27] LTPP Section ID [4040]

ursor ..... 8.490 m
istance/Div..... .25 m/div
ertical Scale.... 177 mρ/div
P 0.50
oise Filter..... 8 avg
ower..... ac



Tektronix 1502B TDR
Date 9-2-93
Cable 274040-27D08
Notes
H_2O

Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	0.92	82.16

[1] If dielectric constant not between 0.75 and 2.0, contact FHWA LTPP Division
[2] If dielectric constant not between 76 and 84, contact FHWA LTPP Division

Note: Dielectric constant is determined as follows:

$$\varepsilon = \left[\frac{(L_a)}{(L)(V_p)}\right]^2 = \left[\frac{(D_2 - D_1)}{(L)(V_p)}\right]^2$$

where ε = dielectric constant; L_a = apparent length of probe, m; L = actual length of probe units (= 0.203 m (8 in) for FHWA probes); V_p = phase velocity setting (= 0.99).

TDR Probe Serial Number: 27D08 TDR Probe Length, L: (1) m Length of Coax Cable: (1) m

Comments: (1) Not measured in 1993, used 0.203 M for "L", and 0.5 for "Vp".

Prepared by: JAH Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 16/NOV/95 (installed 1993)

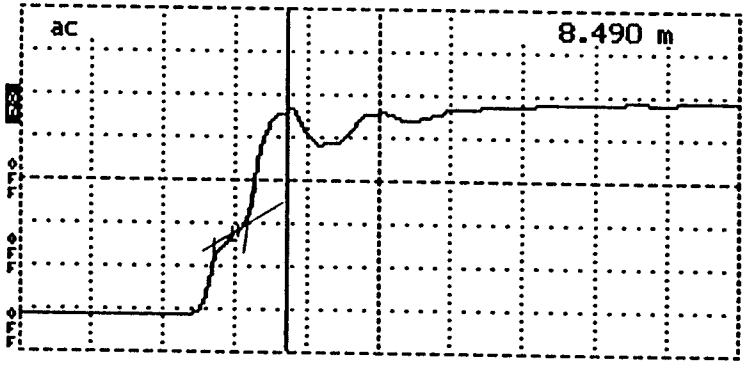
LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [27] LTPP Section ID [4040]

ursor ..... 8.490 m
istance/Div..... .25 m/div
ertical Scale.... 177 mρ/div
P 0.50
oise Filter..... 8 avg
ower..... ac

Tektronix 1502B TDR
Date 9-2-93
Cable 274040-327009
Notes SHORTED
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"Shorted at Start"	N/A	N/A

ursor ..... 8.490 m
istance/Div..... .25 m/div
ertical Scale.... 177 mρ/div
P 0.50
oise Filter..... 8 avg
ower..... ac

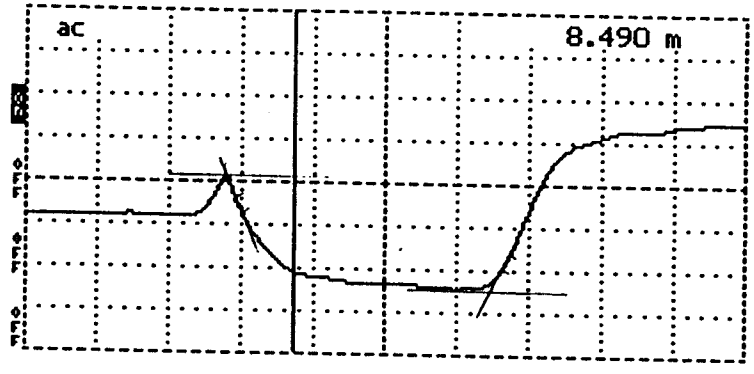


Tektronix 1502B TDR
Date 9-2-93
Cable 274040-327009
Notes AIR
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[1]
"In Air"	0.13	1.64

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [27] LTPP Section ID [4040]

ursor ..... 8.490 m
istance/Div..... .25 m/div
ertical Scale.... 177 mρ/div
P 0.50
oise Filter..... 8 avg
ower..... ac



Tektronix 1502B TDR
Date 9-2-93
Cable 274040 27D09
Notes Hgc

Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	0.91	80.38

[1] If dielectric constant not between 0.75 and 2.0, contact FHWA LTPP Division
[2] If dielectric constant not between 76 and 84, contact FHWA LTPP Division

Note: Dielectric constant is determined as follows:

$$\varepsilon = \left[\frac{(L_a)}{(L)(V_p)}\right]^2 = \left[\frac{(D_2 - D_1)}{(L)(V_p)}\right]^2$$

where ε = dielectric constant; L_a = apparent length of probe, m; L = actual length of probe units (= 0.203 m (8 in) for FHWA probes); V_p = phase velocity setting (= 0.99).

TDR Probe Serial Number: 27D09 TDR Probe Length, L: _.(1)_ m Length of Coax Cable: _(1)._ m

Comments: (1) Not measured in 1993, used 0.203 M for "L" and 0.5 for "Vp"

Prepared by: JAH Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 16/NOV/95 (installed 1993)

Data Sheet SMP-C01: TDR Probe Check (Continued)

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [27] LTPP Section ID [4040]

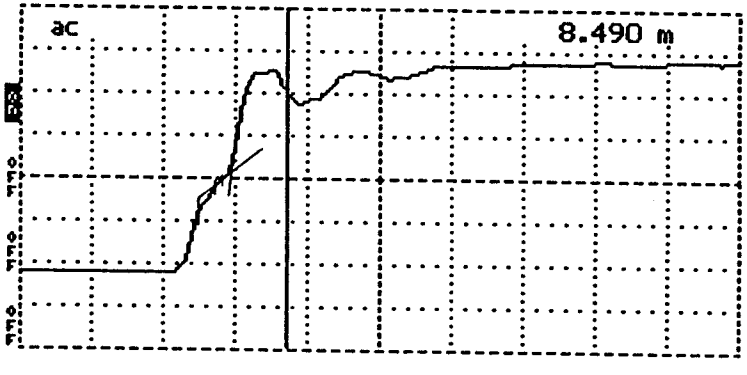
ursor ..... 8.490 m
istance/Div..... .25 m/div
ertical Scale.... 177 mρ/div
P 0.50
oise Filter..... 8 avg
ower..... ac

Tektronix 1502B TDR
Date 9-2-93
Cable 274040 ~~to~~ 27D10
Notes
SHORTED

Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"Shorted at Start"	N/A	N/A

ursor ..... 8.490 m
istance/Div..... .25 m/div
ertical Scale.... 177 mρ/div
P 0.50
oise Filter..... 8 avg
ower..... ac



Tektronix 1502B TDR
Date 9-2-93
Cable 274040 ~~to~~ 27D10
Notes
Dim

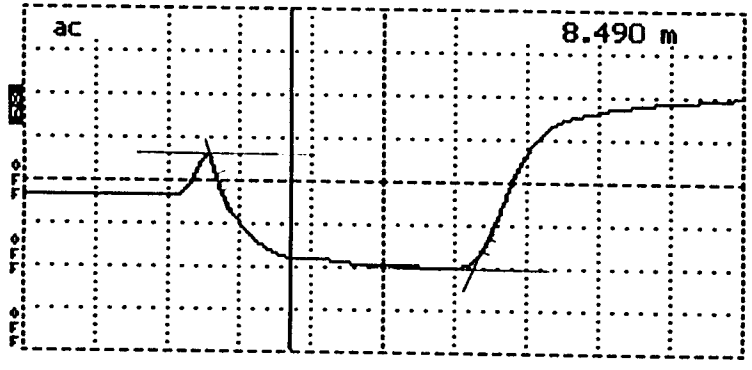
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[1]
"In Air"	0.12	1.40

Data Sheet SMP-C01: TDR Probe Check

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [27] LTPP Section ID [4040]

Cursor ..... 8.490 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
Vp 0.50
Noise Filter..... 8 avg
Power..... ac



Tektronix 1502B TDR
Date 9-2-93
Cable 274040-27D10
Notes
Hpc
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	0.92	82.16

[1] If dielectric constant not between 0.75 and 2.0, contact FHWA LTPP Division
[2] If dielectric constant not between 76 and 84, contact FHWA LTPP Division

Note: Dielectric constant is determined as follows:

$$\varepsilon = \left[\frac{(L_a)}{(L)(V_p)}\right]^2 = \left[\frac{(D_2 - D_1)}{(L)(V_p)}\right]^2$$

where ε = dielectric constant; L_a = apparent length of probe, m; L = actual length of probe units (= 0.203 m (8 in) for FHWA probes); V_p = phase velocity setting (= 0.99).

TDR Probe Serial Number: 27D10 TDR Probe Length, L: __.(1)__ m Length of Coax Cable: __(1).__ m

Comments: (1) Not measured in 1993, used 0.203 M for "L", and 0.5 for "V_p"

Prepared by: JAH Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 16NOV95 (installed 1993)

LTPP Seasonal Monitoring Program Data Sheet SMP-C02 Thermistor Probe Check	Agency Code [27] LTPP Section ID [4040]

Thermistor Probe Assigned Serial Number : [27 D T]

Air Temperature Probe Assigned Serial Number: [27 D A T]

Thermistor Number	Distance from Top (m)	Temperature (°C) – Calibration in: Ice-Bath; T = (1) °C	Other Water Bath; T = (1) °C	Comments
1	0.000	2.3	37.5	in SS
2	0.152	2.0	37.2	PART OF
3	0.305	1.4	37.1	PROBE
4	.023	2.6	36.9	
5	.101	0.8	37.9	
6	.175	0.6	38.3	
7	.249	0.7	38.3	
8	.326	0.7	38.2	
9	.478	1.4	38.0	
10	.630	1.4	38.0	
11	.785	1.8	37.9	
12	.935	1.8	38.0	
13	1.087	1.7	38.2	
14	1.240	2.0	38.2	
15	1.392	1.9	38.7	
16	1.545	1.8	38.6	
17	1.697	2.2	39.0	
18	1.845	1.4	39.2	
End	(1)	n/a	n/a	
Air Probe	n/a	(1)	(1)	

Comments: (1) NOT RECORDED IN 1993

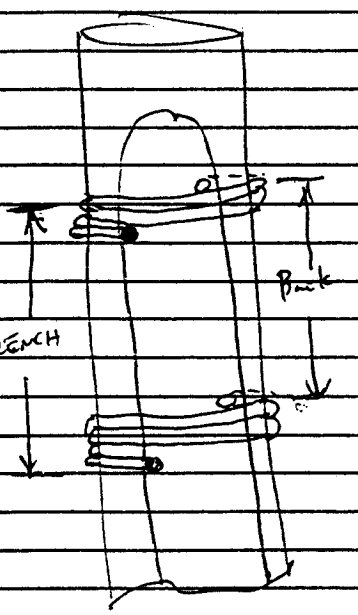
Prepared by: RJV/JAH Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 21 / NOV / 95 (From 1993 INSTALLATION)

LTPP Seasonal Monitoring Program Data Sheet SMP-C03 Resistivity Probe Check	Agency Code [27] LTPP Section ID [4040]

Electrical Resistivity Serial Number: 27 D R

DB37 Connector Pin Number	Electrode Number	Distance from Top (m) Line 1	Line 2	~~Avg~~	Continuity ✓	Spacing (m)	Comments
36	1	_.___	_.___	0.031		_.___	* TWO LINES ON PROBE
35	2	_.___	_.___	0.080		0.049	IN 1993 FOR "SPACING"
34	3	_.___	_.___	0.131		_.051	VERSUS DIST. FROM
33	4	_.___	_.___	0.182		_.051	TOP.
32	5	_.___	_.___	0.234		_.052	
31	6	_.___	_.___	0.285		_.051	* GUESSING "TRENCH"
30	7	_.___	_.___	0.337		_.052	SPACINGS ARE ALL
29	8	_.___	_.___	0.387		_.051	TOO LARGE FROM
28	9	_.___	_.___	0.438		_.051	OUTSIDE TO OUTSIDE
27	10	_.___	_.___	0.488		_.051	MEASUREMENT
26	11	_.___	_.___	0.540		_.051	
25	12	_.___	_.___	0.590		_.050	
24	13	_.___	_.___	0.641		_.052	* ADJUSTED DATA TO
23	14	_.___	_.___	0.692		_.051	GET #36 @
22	15	_.___	_.___	0.743		_.051	ABOUT 1805 mm.
21	16	_.___	_.___	0.793		_.050	
20	17	_.___	_.___	0.844		_.051	
19	18	_.___	_.___	0.894		_.050	
18	19	_.___	_.___	0.943		_.050	
17	20	_.___	_.___	0.996		_.053	
16	21	_.___	_.___	1.047		_.051	
15	22	_.___	_.___	1.098		_.052	
14	23	_.___	_.___	1.149		_.051	
13	24	_.___	_.___	1.200		_.051	
12	25	_.___	_.___	1.249		_.050	
11	26	_.___	_.___	1.301		_.051	
10	27	_.___	_.___	1.352		_.051	*TRENCH
9	28	_.___	_.___	1.403		_.052	
8	29	_.___	_.___	1.453		_.050	
7	30	_.___	_.___	1.504		_.051	
6	31	_.___	_.___	1.557		_.053	
5	32	_.___	_.___	1.608		_.051	
4	33	_.___	_.___	1.658		_.051	
3	34	_.___	_.___	1.710		_.052	
2	35	_.___	_.___	1.759		_.050	
1	36	_.___	_.___	1.810		_.051	
	Bottom	_.___	_.___	1.830	n/a	n/a	



Comments: Data from 1993 "spacings" adjusted to get distance from top.

Prepared by: RSV/JAH Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 21 / NOV / 95 (FOR 1993 INSTALL)

LTPP Seasonal Monitoring Program Data Sheet SMP-C04 Function Generator, Multimeter, and Switch Box Checks	Agency Code [27] LTPP Section ID [40 40]

Start Time (military): _ _ _ _

Test Position	Switch Settings		Voltage (ACV)		Current (ACA)		Measured Resistance R = V/I (ohms)	Known Resistance (ohms)
	I_1 V_1	I_2 V_2	Range Setting	Reading	Range Setting	Reading		
36	36	37					R1 =	R1 =
37	37	38					R2 =	R2 =
38	38	39					R3 =	R3 =
39	39	00					R4 =	R4 =
36	36	37					R1 =	R1 =
37	37	38					R2 =	R2 =
38	38	39					R3 =	R3 =
39	39	00					R4 =	R4 =
36	36	37					R1 =	R1 =
37	37	38					R2 =	R1 =
38	38	39					R3 =	R1 =
39	39	00					R4 =	R2 =

Comments: NOT DONE IN 1993

Prepared by: RJV

Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 27 / DEC / 95 (FOR 1993 INSTALL)

LTPP Seasonal Monitoring Program Data Sheet SMP-C05 Rain Gauge Calibration	Agency Code [27] LTPP Section ID [4040]

General Information:

Manufacturer: TEXAS ELECTRONICS, INC

Model Number: TRP-525M

Serial Number: 12070

Note: The screen should be tacked inside the funnel using silicon at three to four points to prevent loss from wind.

Rain Gauge Calibration Data					
Trial	Start Time (Military)	End Time (Military)	Volume (ml)	Number of Tips	Adjustment[1] No. of Turns
1	____	____	___.	___.	_._
2	____	____	___.	___.	_._
3	____	____	___.	___.	_._

[1] Adjust gauge to obtain 100 tips ± 3 for 473 ml of water.

Comments: FORM NOT USED IN 1993 PROCEDURE. GAUGE WAS CALIBRATED, BUT DATA WAS NOT RECORDED.

Prepared by: Robert Van Sambeek Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 27 / DEC / 95 (FOR 1993 INSTALL)

Appendix C-1: Instrumentation Installation Information

Appendix C-1 contains the following installation data sheets and associated field notes:

- Data Sheet SMP-I01: List of Installed Instrumentation;
- Data Sheet SMP-I02: Instrumentation Locations;
- Data Sheet SMP-I03: Log of Piezometer Hole;
- Data Sheet SMP-I04: Log of Instrumentation Hole;
- Data Sheet SMP-I05: Field Gravimetric Moisture Contents;
- Data Sheet SMP-I05(A): Lab Gravimetric Moisture Contents;
- Data Sheet SMP-I05(B): Gravimetric Moisture Comparison;
- Data Sheet SMP-I06: TDR Moisture Content; and
- Data Sheet SMP-I07: Representative Dry Density.

Note: Photographs and video footage of the installation are available from the Southern RCO.

27 SD 93A

LTPP Seasonal Monitoring Program Data Sheet SMP-I01 Instrumentation Installed and Participants	Agency Code [27] LTPP Section ID [4040]

List of Equipment:

Equipment	Quantity	Serial Number(s)
Instrument Hole:		
Thermistor Probe	01	27DT
Resistivity Probe	01	27DR
TDR Sensors	10	27D01 to 27D10
Equipment Cabinet:		
Campbell Scientific CR10 Datalogger	01	16526
Battery Package	01	5650
Weather Station:		
Rain Gauge	01	12070
Air Temperature Probe	01	27DAT
Radiation Shield	01	———
Observation Piezometer/Bench Mark:	01	n/a

List of Participants:

Name of Participant	Agency/Employer
Robert Van Sambeek	Braun Intertec Corporation
Ronald Urbach	" " "
Dana Miller	" " "
Bruce Pelkey	" " "
Andy Istvanovich	Mn DOT – Dist. 1B
Harland Vitalis	Mn DOT – M+R
Eugene Tormonen	" "
LARRY Peirce	SRCC of LTPP

Prepared by: Jerome Dicks Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 10/DEC/95 (For 21Sep93 Install)

2 2 S D 9 3 A

LTPP Seasonal Monitoring Program Data Sheet SMP-I02 Installed Instrument Location	Agency Code [2 7] LTPP Section ID [4 0 4 0]

Longitudinal and Transverse Location of Instrumentation:

Instrument	Station (Customary Units)		Offset (m)[1]	
	Planned	Actual	Planned	Actual
Instrumentation Hole	5+10	5+10	0.76	0.76
Observation Piezometer	4+50	4+50	-3.66	-3.66
Equipment Cabinet	5+10	5+10	-7.62	-7.62
Weather Station	5+10	5+10	-7.93	-7.95
DCT Bm		5+16		-7.93

[1] Transverse distance in meters from pavement edge (see LTTP Manual for FWD Testing) with (+) values toward mid-lane and (-) towards shoulder

Depth Location of Instrumentation:

Instrument		Depth from Pavement Surface to Top of Probe (m)		Comments
		Planned	Actual	
Thermistor Probe	Metal Top	0.025	0.025	Not measured.
	Metal Bottom	0.180	0.180	Not measured.
	PVC Top	0.254	0.254	
Resistivity Probe		0.254	0.254	

PIEZ. DEPTH BELOW PAVEMENT 0.4113 meters on 22-Sep-1993

TDR Number	Depth from Pavement Surface to Probe (m)		Comments
	Planned Location	Actual Location	
1	0.279	0.275	All depths ± 0.005m
2	0.432	0.430	from 1993 data
3	0.584	0.585	recorded in inches.
4	0.737	0.735	
5	0.889	0.890	Expect high moistures
6	1.041	1.050	from TDRs from
7	1.194	1.200	seepage from base
8	1.346	1.360	material into hole.
9	1.651	1.645	
10	1.955	1.935	

ATTACH TOP-VIEW SKETCH OF INSTRUMENTATION HOLE SHOWING DIRECTION OF TRAFFIC AND LOCATION OF THERMISTOR AND RESISTIVITY PROBES. LABEL PROBES "T" AND "R", RESPECTIVELY

Prepared by: Jerome Dicks Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 10/Dec/95 (For 21 Sep 93 Install)

2 7 S D 9 3 A

LTPP Seasonal Monitoring Program Data Sheet SMP-I03 Log of Piezometer Hole	Agency Code [2 7] LTPP Section ID [4 0 4 0]

Operator: H. VITALIS Equipment Used: MOBILE CORE/DRILL

Location: Station: 4 + 5 0 Offset: − 3 . 6 6 m (from lane edge)

Bore Hole Diameter: 2 0 3 . mm Auger Type: Solid stem

Scale (m)	Depth from Surface[1] (m)	Material Description	Material Code[2]
	0.457	GRAVEL BASE	302
0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0	4.420	SILTY CLAY GRAY AND BROWN	131
4.5 5.0			

[1] Format: _ . _ _ _ m; [2] Format: _ _ _

Prepared by: Jerome Dicks Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 1 2 / D E C / 9 5 (For 21 Sep 93 Installation)

BRAUN[SM]
INTERTEC 274040

9-21-93

PIEZOMETER / BENCHMARK.

THE HOLE WAS DRILLED WITH A 8 INCH SOLID STEM AUGER.

THE HOLE WAS DRILLED TO A DEPTH 14.5 FEET BELOW THE SURFACE.

THE PIEZOMETER WAS 14' 2" LONG TIP TO TIP.

A 5 GALLON PAIL OF SOIL WAS TAKEN FROM THE 2' TO 5' DEPTH. THIS SAMPLE MAY BE USED FOR LABORATORY TESTING AT A LATER DATE.

FILTER SAND WAS PLACED FROM THE BOTTOM A DEPTH OF 9 FEET 9 INCHES.

BENTONITE PELLETS WERE PLACED ABOVE THE FILTER SAND TO A DEPTH OF 8 FEET.

SOIL REMOVED DURING DRILLING WAS USED AS BACKFILL ABOVE THE BENTONITE SEAL. THIS FILL SOIL WAS PLACED TO ABOUT 2 FEET BELOW GROUND SURFACE.

A STEEL SLEEVE WAS PLACED AROUND THE TOP OF THE PIEZOMETER. THE SLEEVE WAS 2 FEET LONG. SAKRETE MIX WAS USED AS BACKFILL AROUND THE SLEEVE.

THE TOP OF THE SLEEVE WAS ABOUT 4 INCHES BELOW GROUND SURFACE.

2 7 S D 9 3 A

LTPP Seasonal Monitoring Program Data Sheet SMP-I04 Log of Instrumentation Hole	Agency Code [2 7] LTPP Section ID [4 0 4 0]

Operator: H. VITALIS Equipment Used: MOBILE/CORE/DRILL

Location: Station: 5 + 1 0 Offset: 0 . 7 6 m (from lane edge)

Bore Hole Diameter: 2 9 2 . mm

Scale (m)	Strata Change[1] (m)	Material Description	Material Code[2]
0.10 0.20	0.210	PCC	730
0.30 0.40	0.410	GRAVEL BASE	303
0.50 0.60 0.70 0.80	0.840	SILTY CLAY REDISH BROWN	131
0.90 1.00 1.10 1.20 1.30 1.40 1.50 1.60 1.70 1.80 1.90 2.00	2.060	SILTY CLAY BROWN	131
2.10 2.20 2.30 2.40 2.50			

[1] Format: _ . _ _ _ m; [2] Format: _ _ _

Prepared by: Jerome Dicks Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 1 2 / D E C / 9 5 (For 21-Sep-93 Installation)

BRAUNSM
INTERTEC 274040

9-21-93

TIPPING BUCKET RAINGAGE / AIR TEMPERATURE PROBE

THE BOTTOM SECTION WAS 9 FEET 10 INCHES LONG.

THE HOLE WAS DRILLED WITH A 8 INCH AUGER. THE BOTTOM WAS 9 FEET DEEP.

THE 9'10" SECTION WAS BACKFILLED WITH DRY PACK SAKRETE. THIS WAS COMPACTED AS THE BACKFILLING WAS DONE. THE DRY PACK WAS PLACED UP TO 4½ FEET BELOW THE SURFACE.

SOIL REMOVED DURING DRILLING WAS USED AS BACK FILL ABOVE ~~ABOVE~~ THE SAKRETE TO THE SURFACE. THIS WAS ALSO COMPACTED AS IT WAS PLACED.

THIS POLE WAS PLACED WITHIN 6" OF THE EQUIPMENT CABINET.

LTPP Seasonal Monitoring Program Data Sheet SMP-I05 Field Gravimetric Moisture Content	Agency Code [27] LTPP Section ID [4040]

TDR Probe	Probe Depth[1] (m)	Moisture Sample No.	Pan No.	Wt. of Pan (gms) = A	Wt. of Pan + Wet Soil (gms) = B	Wt. of Pan + Dry Soil (gms) = C	Wt. of Dry Soil (gms) = D = C - A	Wt. of Water (gms) = E = B - C	Moisture Content (%) = w = E/D * 100
1	0.270	10	2	222.0	1012.0	965.1	743.1	46.9	6.3
2	0.430	9	1	222.0	692.8	615.9	393.9	76.9	19.5
3	0.580	8	4	220.9	838.0	743.5	522.6	94.5	18.1
4	0.740	7	3	223.6	717.1	638.3	414.7	78.8	19.0
5	0.890	6	2	222.0	757.5	664.4	442.4	93.1	21.0
6	1.050	5	1	222.0	828.0	704.5	482.5	123.5	25.6
7	1.200	4	4	220.9	768.1	683.1	462.2	85.0	18.4
8	1.360	3	3	223.6	817.2	719.8	496.2	97.4	19.6
9	1.640	2	2	222.0	791.4	670.0	448.0	121.4	27.1
10	1.940	1	1	222.0	967.4	807.7	585.7	159.7	27.3

[1] Distance in meters from pavement surface to TDR probe

Comments: DATA FROM 1993 WORKSHEET. SECTION INSTALLED 22-SEP-1993

* MOISURE DATA FROM TDR'S SHOULD BE HIGHER FROM WATER SEEPING FROM BASE LAYER AND RUNNING DOWN SIDES OF HOLES.

Prepared by: RJV/JAH Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 21/NOV/95 (FOR 27-SEP-1993 INSTALL)

LTPP Seasonal Monitoring Program Data Sheet SMP-I05 (A) LAB ~~Field~~ Gravimetric Moisture Content	Agency Code [27] LTPP Section ID [4040]

TDR Probe	Probe Depth[1] (m)	Moisture Sample No.	Pan No.	Wt. of Pan (gms) = A	Wt. of Pan + Wet Soil (gms) = B	Wt. of Pan + Dry Soil (gms) = C	Wt. of Dry Soil (gms) = D = C - A	Wt. of Water (gms) = E = B - C	Moisture Content (%) = w = E/D * 100
1	0.270								6.1
2	0.430								18.3
3	0.580								18.4
4	0.740								18.7
5	0.890								20.4
6	1.050								22.1
7	1.200								19.8
8	1.360								23.3
9	1.640								25.5
10	1.940								26.8

[1] Distance in meters from pavement surface to TDR probe

Comments: LAB MOISTURES DONE BY MN DOT

Prepared by: RJV/JAH Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 21 NOV 95 (FOR 24-SEP-1993 INSTALL)

LTPP Seasonal Monitoring Program Data Sheet SMP-I05 (B) Gravimetric Moisture Comparison	Agency Code [27] LTPP Section ID [4040]

TDR	SMP-I02 TDR Depth (m)	SMP-I04 Material Code	Lab Data[1] Dry Density (pcf) sta. 5+62	TDR Installation Data		Gravimetric Moistures		Comments
				SMP-I06 La[2] (m)	Calculated Gravimetric (percent)	SMP-I05 Field (percent)	SMP-I05A Lab (percent)	
1	0.275	303	128.9	0.72	11.7	6.3	6.1	
2	0.430	131	113.2	1.03	22.7	19.5	18.3	Seepage from base layer may effect TDR values. compared to I05 and I05A
3	0.585	131	113.2	1.00	22.0	18.1	18.4	
4	0.735	131	113.2	1.03	22.8	19.0	18.7	
5	0.890	131	113.2	1.05	23.3	21.0	20.4	
6	1.050	131	113.2	1.09	24.3	25.6	22.1	
7	1.200	131	113.2	0.99	21.8	18.4	19.8	
8	1.360	131	113.2	1.12	25.0	19.6	23.3	
9	1.645	131	113.2	1.22	27.1	27.1	25.5	
10	1.935	131	113.2	1.15	25.7	27.3	26.8	

TDR Gravimetric moistures calculated using equations on pages II-2 and II-5 of FHWA-RD-94-110 with La = 0.203 m, and Vp = 0.99.

Comments: - Dry Density from Form 504 as follows; Base = 128.9 pcf dry and Subgrade = 113.2 pcf dry. Form T44 had Base @ 140 pcf @ 6% OMC.
- Expect TDR values to be high from moisture seeping into hole from the base material.

Prepared by: RJV / JJD Employer: Braun Intertec Corporation Date (dd/mmm/yy): 27 / Dec / 95

$$\omega = \left(-330.72 + 4526.78\,La^2 - 2103.88\,La^4 + 402.25\,La^6\right)/\gamma_d \quad ; \quad La \text{ (meters)},\ \gamma_d \text{ (pcf)},\ \omega \text{ (\%)}$$

2 7 SD 93 A

LTPP Seasonal Monitoring Program Data Sheet SMP-I06 TDR Moisture Content	Agency Code [27] LTPP Section ID [4040]

Required Settings:

Dist./Division: 0.25 m
Phase Velocity: 0.99
Noise Filter: 1 average

Probe Number	Probe Depth[1] (m)	Time (military)	Apparent Length (m)	Dielectric Constant[2]	Comments
1	0.270	(1)	0.72	12.83	
2	0.430		1.03	26.26	
3	0.580		1.00	24.75	Seepage from
4	0.740		1.03	26.26	base layer
5	0.890		1.05	27.29	during
6	1.050		1.09	29.41	installation.
7	1.200		0.99	24.26	
8	1.360		1.12	31.05	
9	1.640		1.22	36.84	
10	1.940		1.15	32.73	

[1] Distance in meters from pavement surface to TDR probe
[2] Dielectric constant is determined as follows:

$$\varepsilon = \left[\frac{(L_a)}{(L)(V_p)}\right]^2 = \left[\frac{(D_2 - D_1)}{(L)(V_p)}\right]^2$$

where ε = dielectric constant; L_a = apparent length of probe, m; L = actual length of probe units (= 0.203 m (8 in) for FHWA probes); V_p = phase velocity setting (= 0.99).

ATTACH TDR TRACES TO THIS DATA SHEET.

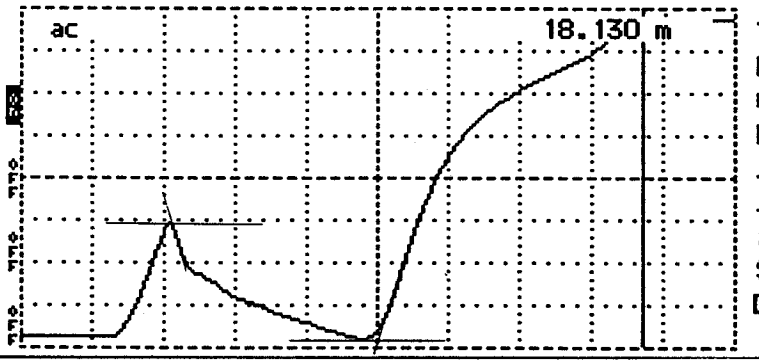
Comments: (1) NOT RECORDED IN 1993.

Prepared by: RJV (From 1993 DATA) Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 16 / NOV / 95 (From 21-SEP-1993 INSTALLATION)

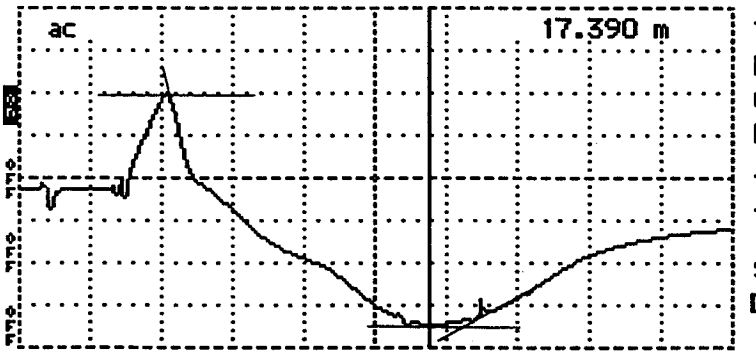
21-SEP-1993 | DBNX92700 B6 | TDR TRACES - INSTALL 274040 | 1/2

..... 18.130 m
/Div..... .25 m/div
Scale.... 77.0 mρ/div
..... 0.99
ter..... 8 avg
..... ac
Para?



Tektronix 1502B TDR
Date 9-21-93
Cable 274040 #1
Notes (27D01)
~~CLAY~~
GRAVEL BASE
Input Trace 6" depth
Stored Trace
Difference Trace

..... 17.390 m
/Div..... .25 m/div
Scale.... 77.0 mρ/div
..... 0.99
ter..... 8 avg
..... ac
Para?

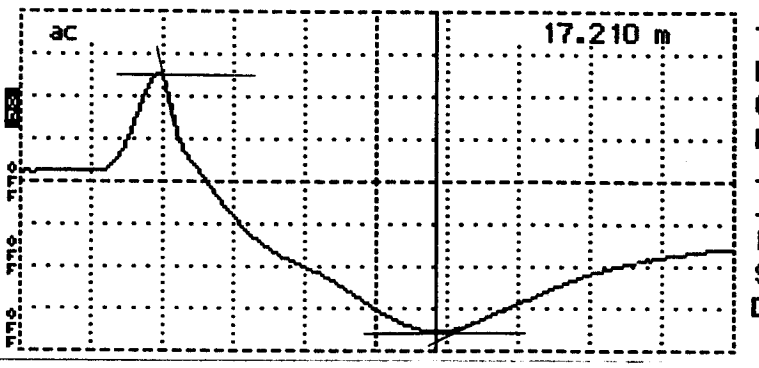


Tektronix 1502B TDR
Date 9-21-93
Cable 274040 #2
Notes (27D02)
CLAY
Input Trace
Stored Trace
Difference Trace

..... 17.680 m
/Div..... .25 m/div
Scale.... 77.0 mρ/div
..... 0.99
ter..... 8 avg
..... ac
Para?

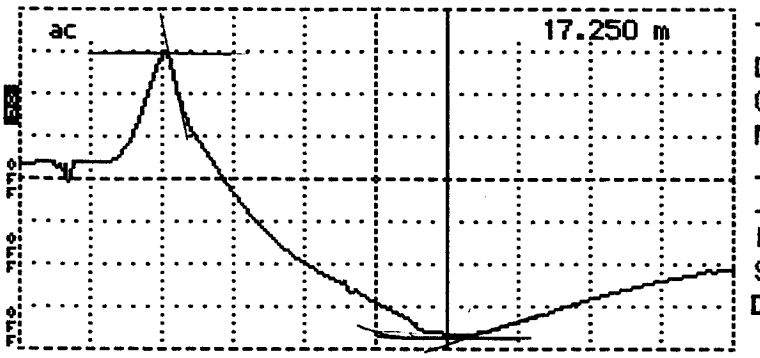
Tektronix 1502B TDR
Date 9-21-93
Cable 274040 #3
Notes (27D03)
CLAY
Input Trace
Stored Trace
Difference Trace

..... 17.210 m
/Div..... .25 m/div
Scale.... 77.0 mρ/div
..... 0.99
ter..... 8 avg
..... ac
Para?



Tektronix 1502B TDR
Date 9-21-93
Cable 274040 #
Notes (27D04)
CLAY
Input Trace
Stored Trace
Difference Trace

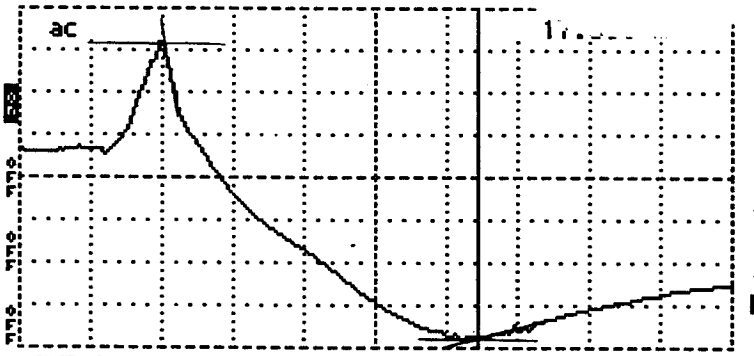
..... 17.250 m
Div..... .25 m/div
Scale.... 77.0 mρ/div
..... 0.99
ter..... 8 avg
..... ac
Para?



Tektronix 1502B TDR
Date 9-21-93
Cable 274040 #5
Notes (27D05)
CLAY
Input Trace
Stored Trace
Difference Trace

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

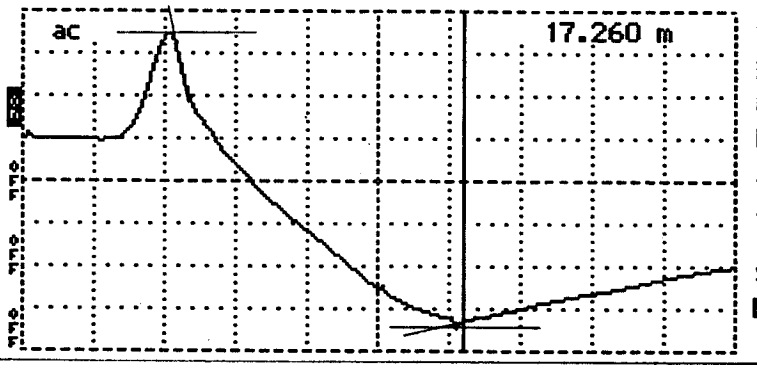
..... 17.360 m
Div..... .25 m/div
Scale.... 77.0 mρ/div
..... 0.99
er..... 8 avg
..... ac
Para?



Tektronix 1502B TDR
Date 9-21-93
Cable 274040 #6
Notes (27D06)
CLAY

Input Trace
Stored Trace
Difference Trace

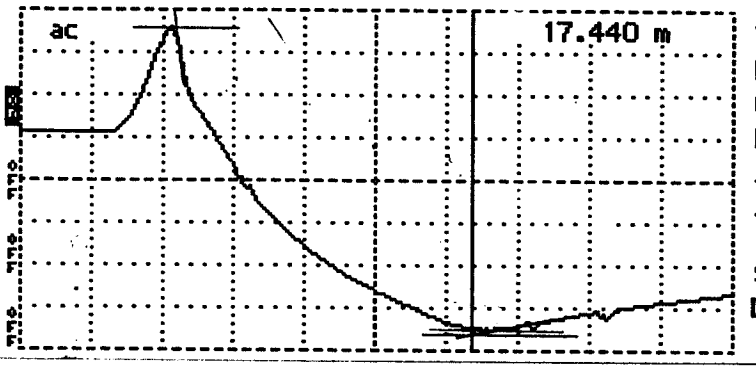
..... 17.260 m
Div..... .25 m/div
Scale.... 77.0 mρ/div
..... 0.99
er..... 8 avg
..... ac
Para?



Tektronix 1502B TDR
Date 9-21-93
Cable 274040 #7
Notes (27D07)
CLAY

Input Trace
Stored Trace
Difference Trace

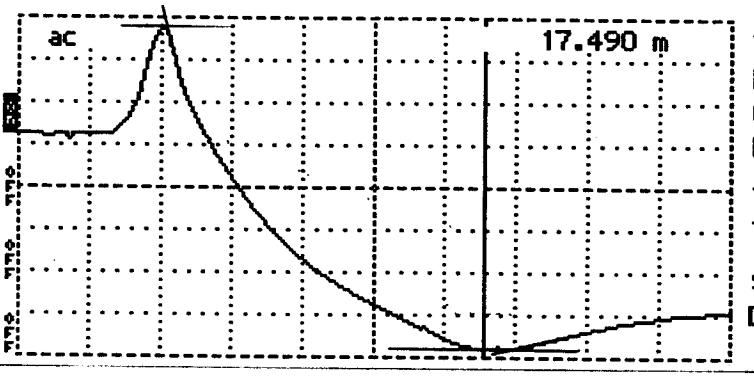
..... 17.440 m
Div..... .25 m/div
Scale.... 77.0 mρ/div
..... 0.99
er..... 8 avg
..... ac
Para



Tektronix 1502B TDR
Date 9-21-93
Cable 274040 #8
Notes 27D08
CLAY

Input Trace
Stored Trace
Difference Trace

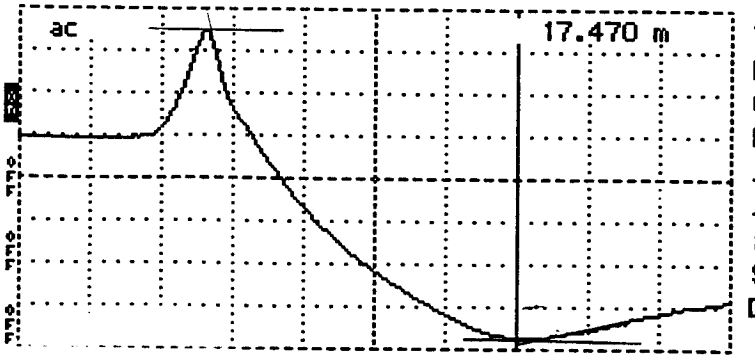
..... 17.490 m
Div..... .25 m/div
Scale.... 77.0 mρ/div
..... 0.99
er..... 8 avg
..... ac
Para?



Tektronix 1502B TDR
Date 9-21-93
Cable 274040 #
Notes 27D09
CLAY

Input Trace
Stored Trace
Difference Trace

..... 17.470 m
Div..... .25 m/div
Scale.... 77.0 mρ/div
..... 0.99
er..... 8 avg
..... ac
Para



Tektronix 1502B TDR
Date 9-21 ~~[illegible]~~93
Cable 274040 #10
Notes 27D10
CLAY

Input Trace
Stored Trace
Difference Trace

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

274040

PIEZOMETER
274040

274040

274040

274040

274040

THERMISTOR PROBE
RESISTIVITY PROBE
274040

Workmate 350
274040

Appendix D-1: Initial SMP Monitoring Data Collection

Appendix D-1 contains the following data sheets with information collected the day after instrumentation installation:

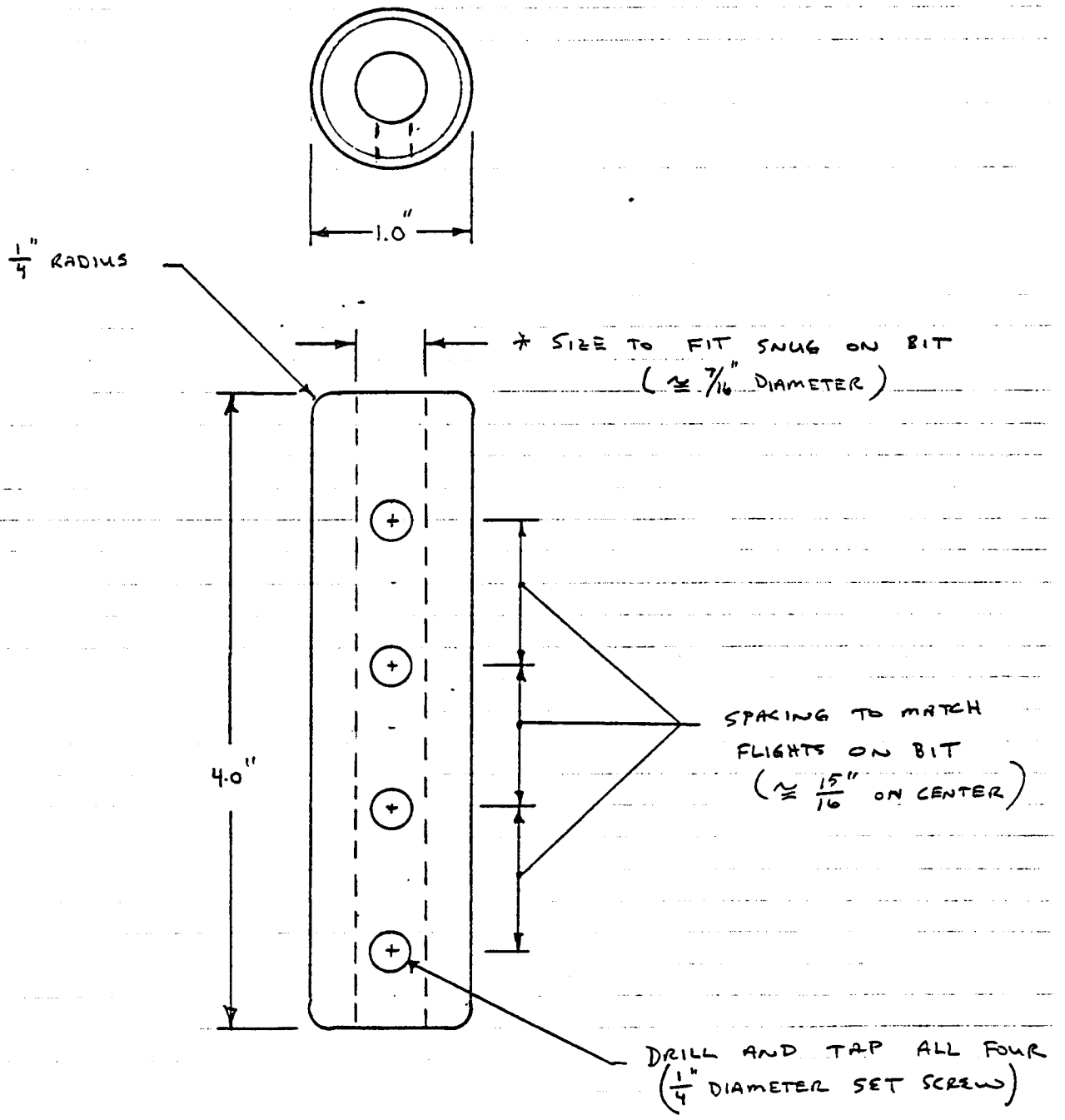
- Data Sheet SMP-D03: Contact Resistance Measurements;
- Data Sheet SMP-D04: Four-Point Resistivity Measurements;
- Data Sheet SMP-D05: Ground Water Table Measurements;
- Data Sheet SMP-D06: Joint Opening Measurement;
- Data Sheet SMP-D07: Joint Faulting Measurement; and
- Data Sheet SMP-D09: Surface Elevation Measurements - PCC Pavements.

BRAUN℠ INTERTEC

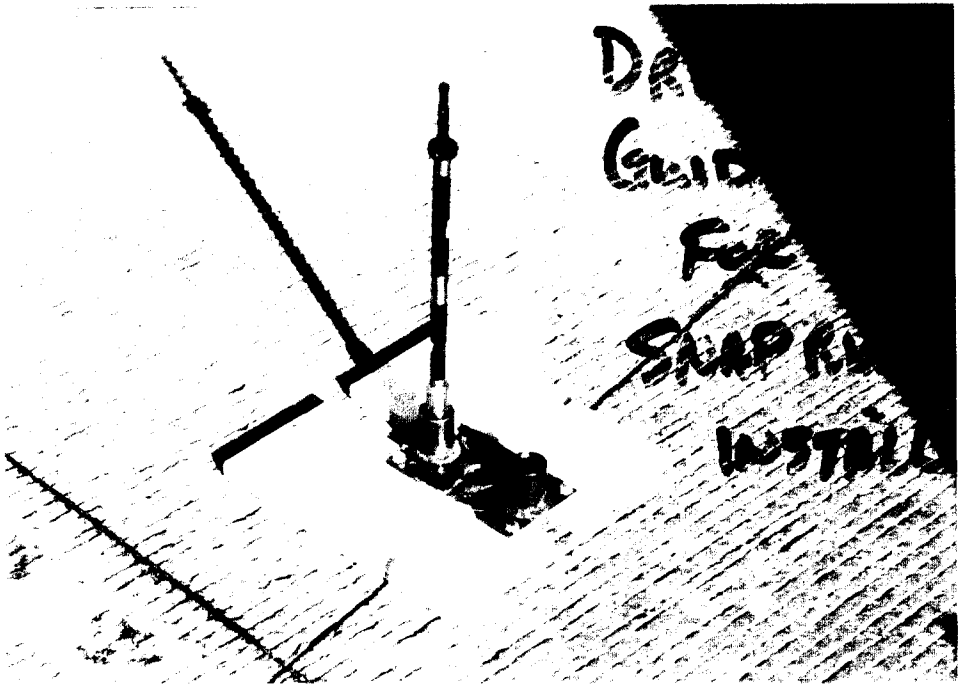
Description: DEPTH AND POSITION DRILL GUIDE

Project No: DBNX92700 B5

Date: 7/29/93 By: ROBERT VAN SAMBEEK



MATL. – STEEL



9/24/93

FROST TUBE
@ GRAND RAPIDS
(274040)
Mn Sta. 5435
INSTALL PRIOR
TO END OF
OCTOBER
RV

PAT HUSTON
District Soils Engineer

District One
1123 Mesaba Ave.
Duluth, MN 55811

218-723-4830
DISCONNECTED
Office (218) ~~723-4883~~
Fax (218) 723-4761

ANDREW ISTVANOVICH
maint. supervisor

9/24/93
for traffic control if no one @

VIRGINIA OFFICE
749-7793

2606 E. Hwy. 2
Grand Rapids, MN 55744

Tel.: (218) 327-4493

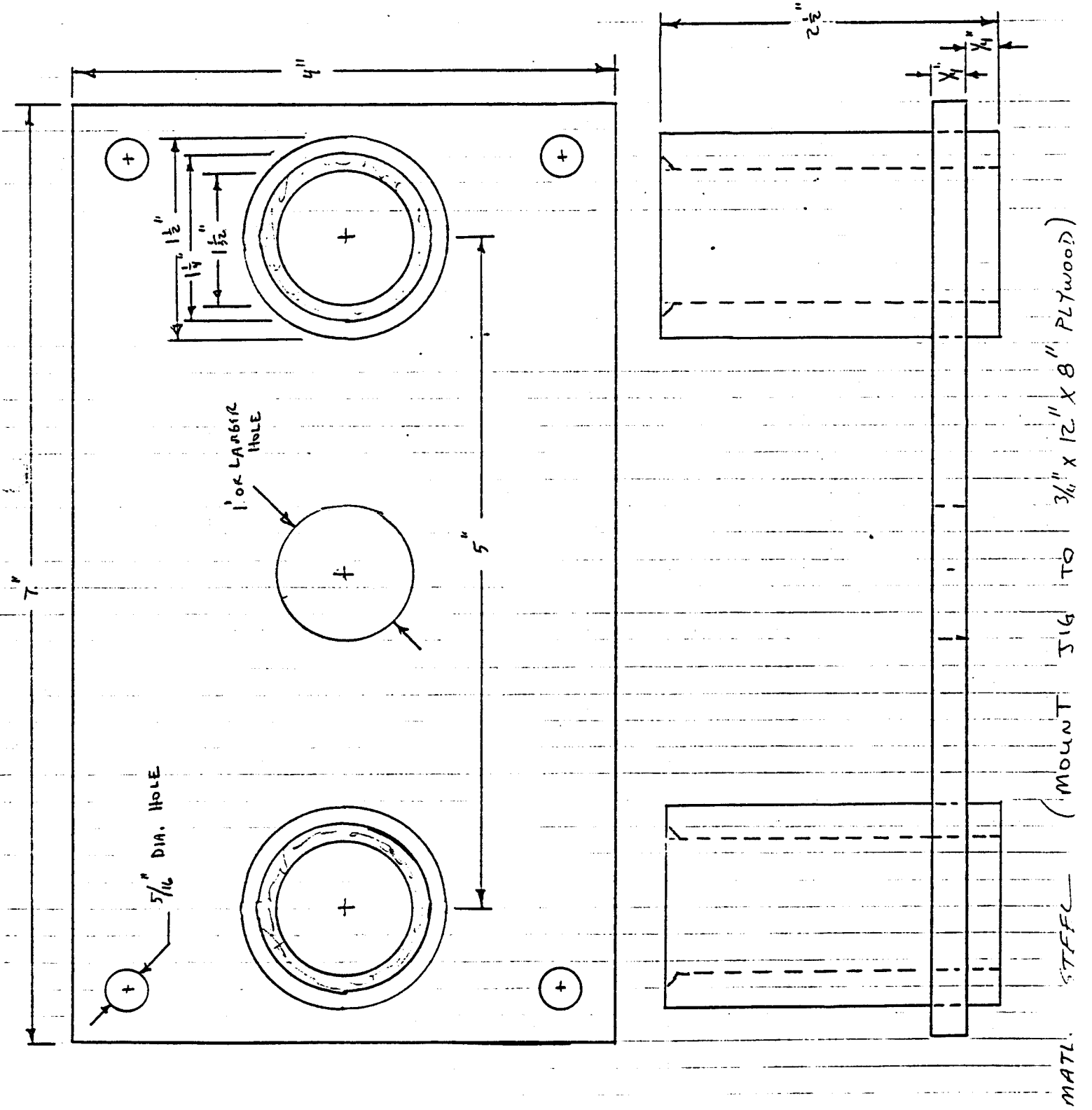
talk to receptionist
RV

BRAUN℠
INTERTEC

Description: JOINT MOVEMENT TEMPLATE

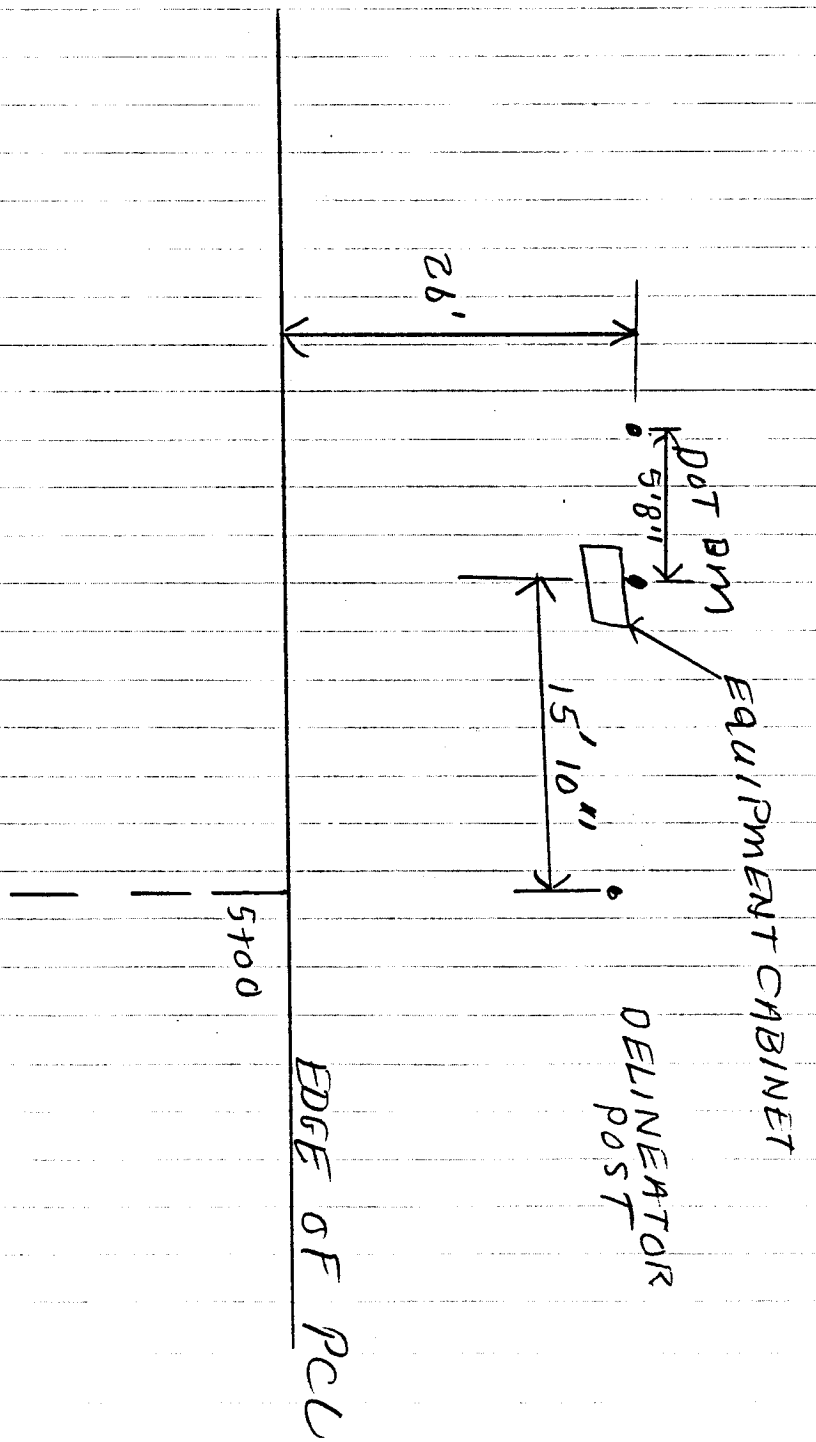
Project No: DBNX 92 700 85

Date: 7/29/93 By: Robert Van Tambeck



BRAUNSM
INTERTEC 274040

9-22-93



27 SD93A

LTPP Seasonal Monitoring Program Data Sheet SMP-I07 Representative Dry Density	Agency Code [27] LTPP Section ID [4040]

Depth of Representative Sample (from pavement surface): __ . __ __ m

Dry Density Determination:

a. Tare Weight of Empty Mold: __ __ __ __ g (__ . __ __ lb)

b. Weight of Mold and Compacted Soil: __ __ __ __ g (__ . __ __ lb)

c. Weight of Compacted Sample (b - a): __ __ __ __ g (__ . __ __ lb)

d. Unit Weight of Compacted Soil = [(b - a) / 943.0] = __ . __ __ g/cm^3

([(b - a) * 30] = __ __ __ . __ lb/ft^3)

e. Dry Density of Compacted Soil = [d / (100 - r)] = __ . __ __ g/cm^3

(__ __ __ . __ lb/ft^3)

Moisture Content Determination:

m. Tare Weight of Pan: __ __ __ . __ g

n. Weight of Pan and Moisture Sample: __ __ __ . __ g

o. Weight of Pan and Dry Sample: __ __ __ . __ g

p. Weight of Moisture (n - o): __ __ __ . __ g

q. Weight of Dry Sample (o - m): __ __ __ . __ g

r. Moisture Content by Weight = [(p / (p + q) * 100] = __ __ . __ %

Comments: NOT DONE IN 1993

Prepared by: Robert Van Sambeek Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 27 / DEC / 95 (for 21-Sep-93 install.)

2750930

LTPP Seasonal Monitoring Study Data Sheet ~~R1~~ D03 Contact Resistance Measurements	* State Code [27] * Test Section Number [4040]

1. Date (Month - Day - Year) NOV [11-16-93]

2. Time Measurements Began (Military) [13:50] 14:05

3. Comments USING SIG. GEN. W/ ALK. BATS VS NICAD, FAWA 304

Test Position	Connections I_1 V_1	Connections I_2 V_2	Voltage (ACV) Range Setting	Voltage (ACV) Reading	Current (ACA) Range Setting	Current (ACA) Reading	Notes	$R = \frac{E}{I}$
1	1	2	V	9.65	uA	1343		7200 FROM
2	3	2		5.02	↓	3651		1400 TRANS
3	3	4		2.965	mA	5.11		600
4	5	4		2.926		5.26		600
5	5	6		2.800		5.29		500
6	7	6		2.625		5.45		500
7	7	8		2.544		5.49		500
8	9	8		2.340		5.53		400
9	9	10		2.280		5.66		400
10	11	10		2.299		5.69		400
11	11	12		2.124		5.78		400
12	13	12		1.970		5.92		300
13	13	14		1.780		6.07		300
14	15	14		1.701		6.21		300
15	15	16		1.672		6.20		300
16	17	16		1.594		6.31		250
17	17	18		1.800		6.09		300
18	19	18		1.901		5.97		300
19	19	20		1.940		5.95		300
20	21	20		2.080		5.82		350
21	21	22		1.860		6.03		300
22	23	22		1.635		6.25		250
23	23	24		≠ 0		≠ 0	#24 OUT	—
24	25	24		1.417		6.37		200
25	25	26		1.759		6.12		300
26	27	26		1.614		6.27		250
27	27	28		1.176		6.57		200
28	29	28		1.217		6.55		200
29	29	30		1.287		6.53		200
30	31	30		1.414		6.34		200
31	31	32		1.510		6.24		250
32	33	32		1.324		6.42		200
33	33	34		1.292		6.46		200
34	35	34		1.522		6.32		250
35	35	36		1.376		6.35		200
36	37	38						
37	38	39						
38	39	40						

ENTERED DEC 29 1995 BRAUN INTERTEC BY:

Preparer RJV Employer BRAUN INTERTEC

Figure III-5 - Contact Resistant Measurements - Data Sheet R1

275D93D

LTPP Seasonal Monitoring Study Data Sheet ~~R2~~ D04 Four-Point Resistivity Measurements	* State Code [27] * Test Section Number [4040]

1. Date (Month - Day - Year) NOV [11-16-93]
2. Time Measurements Began (Military) [13:30]
3. Comments SIG. GEN. USING ALKALINE VS. NICAD BATTERIES, FHWA BOX

Test Position	Connections				Voltage (ACV)		Current (ACA)		Notes
	I_1	V_1	V_2	I_2	Range Setting	Reading	Range Setting	Reading	
1	1	2	3	4	mV	120.4	μA	1365	
2	2	3	4	5		152.2	↓	3647	
3	3	4	5	6		187.4	mA	5.03	
4	4	5	6	7		153.0		5.35	
5	5	6	7	8		162.4		5.31	
6	6	7	8	9		144.5		5.48	
7	7	8	9	10		146.1		5.47	
8	8	9	10	11		134.2		5.59	
9	9	10	11	12		143.0		5.73	
10	10	11	12	13		128.6		5.73	
11	11	12	13	14		125.3		5.89	
12	12	13	14	15		118.3		5.98	
13	13	14	15	16		105.6		6.07	
14	14	15	16	17		111.4		6.23	
15	15	16	17	18		92.0		6.00	
16	16	17	18	19		100.3		6.14	
17	17	18	19	20		104.2		6.02	
18	18	19	20	21		93.6		5.78	
19	19	20	21	22		103.7		6.09	
20	20	21	22	23		93.3		6.00	
21	21	22	23	24		*0.2		*0.0	#24 OUT
22	22	23	24	25		80.0		6.23	
23	23	24	25	26		80.0		6.08	
24	24	25	26	27		89.0		6.55	
25	25	26	27	28		76.3		6.48	
26	26	27	28	29		82.2		6.17	
27	27	28	29	30		82.6		6.52	
28	28	29	30	31		77.6		6.40	
29	29	30	31	32		83.0		6.41	
30	30	31	32	33		90.3		6.51	
31	31	32	33	34		79.0		6.28	
32	32	33	34	35		81.6		6.26	
33	33	34	35	36		80.4		6.65	

INTERED
DEC 29 1995
BRAUN INTERTEC

Preparer RJV Employer BRAUN INTERTEC

Figure III-6 - Four-Point Resistivity Measurements - Data Sheet R2

275093B

LTPP Seasonal Monitoring Study Form ~~W1~~ D05 Ground Water Table Measurement	State Code [27] Test Section Number [4040]

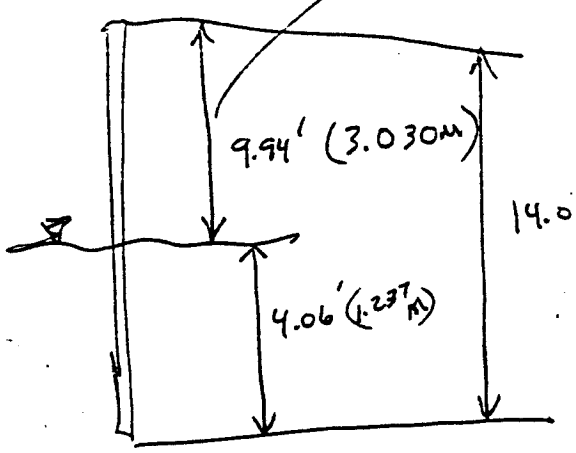
Depth to water (M)

Number	Time	Well Depth (ft)	Water Depth (ft)	Weather Conditions*	Comments
1	0803	14.0	4.06	DRIZZLE	
2					
3					
4					
5					

Convert to meters

* Use only these weather terms: Sunny, Partly Cloudy, Cloudy, Drizzle, Rain

Enter into database 3.030 M



ENTERED
DEC 29 1995
BRAUN INTERTEC
BY:

Collected by: RRU Employer: Braun Intertec Date: 8-22-93 Sep

Figure III-7 - Ground Water Table Measurements - Data Sheet W1

LTPP Seasonal Monitoring Program Data Sheet SMP-D06 Joint Opening Measurement	Agency Code [27] LTPP Section ID [4040]

Station	Time (military)	Joint Opening (mm) Offset (PE): 0.30 m	Offset (ML): 1.83 m	Offset (ILE): 3.35 m	Joint Width (mm)
3+85	1300	116.51	116.41	116.89	
117.3					
4+12	1301	116.38	116.69	116.15	
125.6					
4+40	1302	116.59	116.89	116.26	
134.1					
4+66	1302	116.54	116.36	116.46	
142.0					
4+94	1303	116.54	117.40	116.69	
150.6					
5+21	1304	116.05	115.82	116.10	
158.8					

Comments:

Prepared by: Transfer from 1993 sheet Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 18/Oct/93

(Entered into Sunscheet 29/Dec/95)

M = Metric

27 JUN 93

LTPP Seasonal Monitoring Study Form ~~B5~~ D07 Joint Faulting Measurement	State Code 274040 [27] Test Section Number [4040]

	Joint/Crack (OWP 0.76)	Point Distance (Feet)	Faultmeter Reading (mm)
0900	J ~~2.5'~~ 1	386.5 117.3	00
0901	J 2	412.6 125.7	00
0902	J 3 134.1	440.	10
0903	J 4	440. 142	00
0904	J 5	494. 150.5	01
0905	J 6	521. 158.8	01
	7		
	8		
	9		
	10		

	Joint/Crack (IWP 2.90)	Point Distance (Feet)	Faultmeter Reading (mm)
	J ~~9.0'~~ 1	386.	00
	J 2	412.6	01
	J 3	440.	07
	J 4	466.	01
	J 5	494.	00
	J 6	521.	00
	7		
	8		
	9		
	10		

	Joint/Crack (ML 1.83)	Point Distance (Feet)	Faultmeter Reading (mm)
	J ~~6.0'~~ 1	386.	01
	J 2	412.6	00
	J 3	440.	04
	J 4	466.	00
	J 5	494.	01
	J 6	521.	00
	7		
	8		
	9		
	10		

ENTERED
DEC 29 1995
BRAUN INTERTEC
BY:

COMMENTS: ASSUMED 9:00 AM for ~~times~~ 1ST JOINT and +1min for each JOINT thereafter

Prepared by: RRU Employer: Braun Intertec Date: ~~9~~ Sep/22/93

Figure III-9 - Joint Faulting Measurements - Data Sheet F1

(1000 hrs)

LTPP Seasonal Monitoring Study Form ~~E3~~ D09 Surface Elev. Measurements PCC			State Code [27] GPS Section No. 274040 Test Section Number [4040] Sheet 1 of 3			
STA.	BS	HI	IFS	FS	ELEV	REMARKS
MN DOT BM	1.5483	~~11.5483~~			~~10.0000~~	BM (DOT)
PIEZOMETER	0.8888			.8888	~~10.6595~~	PIEZOMETER

Calculate in Rims?

TYPE OF INSTRUMENT [NA 2000]

RV

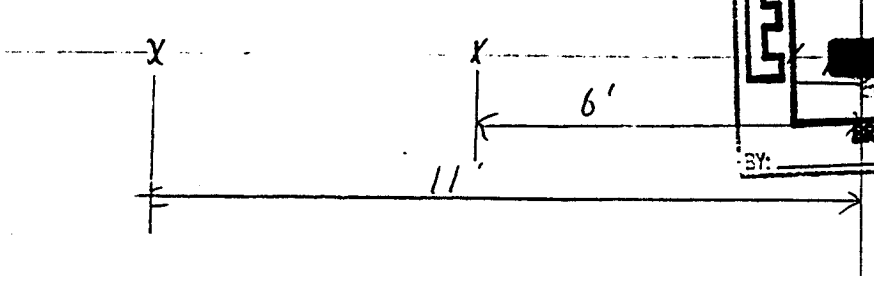
See current form.

STA.	Slab Edge Outer (0.3M)	Mid Slab (1.95M)	Slab Edge Inner (3.35M)	REMARKS
3+8~~65~~ ELEV	.3958 ~~11.1525~~	.3707 ~~11.1776~~	.3514 ~~11.1969~~	JOINT DOWN SIDE
3+8~~85~~ ELEV	.3963 ~~11.1520~~	.3718 ~~11.1765~~	.3518 ~~11.1965~~	JOINT UP SIDE
~~3+97.27~~ 3+99 ELEV	.4083 ~~11.1400~~	.3825 ~~11.1653~~	.3660 ~~11.1823~~	MID SLAB
4+12 ELEV	.4234 ~~11.1349~~	.3987 ~~11.1596~~	.3810 ~~11.1673~~	JOINT
4+12 ELEV	.4248 ~~11.1335~~	.3990 ~~11.1493~~	.3822 ~~11.1661~~	JOINT
4+~~28.2~~ 4+26 ELEV	.4354 ~~11.1129~~	.4131 ~~11.1354~~	.3982 ~~11.1504~~	MID SLAB
4+40 ELEV	.4545 ~~11.0938~~	.4311 ~~11.1172~~	.4124 ~~11.1359~~	JOINT DOWN SIDE
4+40 ELEV	.4642 ~~11.0841~~	.4379 ~~11.1104~~	.4163 ~~11.1320~~	JOINT UP SIDE

Prepared by: RRU Employer: Braun Intratec Date: Sep 8/22/93

Surface Elevation Measurements: PCC Pavements - Data Sheets E3

ELEV. LOC.



ENTERED
[redacted] 29 1995
BY:

LTPP Seasonal Monitoring Study Form ~~E3~~ D09 Surface Elev. Measurements PCC			State Code [27] GPS Section No. 274040 Test Section Number [4040] Sheet 2 of 3			
STA.	BS	HI	IFS	FS	ELEV	REMARKS
		11.5453				

TYPE OF INSTRUMENT [NA2000]

STA.	Slab Edge Outer	Mid Slab	Slab Edge Inner	REMARKS
4+53 ELEV 138.1	.4775 ~~11.0678~~	.4475 ~~11.1008~~	.4285 ~~11.1198~~	MID SLAB
~~4+67~~ ELEV 4+66 142	.4954 ~~11.0527~~	.4665 ~~11.0818~~	.4476 ~~11.1007~~	JOINT DOWN SIDE
4+67 ELEV 4+66 142.1	.4960 ~~11.0523~~	.4674 ~~11.0809~~	.4489 ~~11.0977~~	JOINT UP SIDE
~~4+79~~ ELEV 4+80 146.3	.5121 ~~11.0362~~	.4835 ~~11.0648~~	.4629 ~~11.0854~~	MID SLAB
4+94 ELEV 150.6	.5278 ~~11.0205~~	.4962 ~~11.0521~~	.4749 ~~11.0734~~	JOINT DOWN SIDE
4+94 ELEV 150.7	.5277 ~~11.0206~~	.4974 ~~11.0507~~	.4758 ~~11.0725~~	JOINT UP SIDE
5+07 ELEV 154.5	.5371 ~~11.0142~~	.5056 ~~11.0457~~	.4859 ~~11.0339~~	MID SLAB
+ ELEV				

Prepared by: RAM Employer: BRAUN INTRATEC Date: Sep 8/22/93

Surface Elevation Measurements: PCC Pavements - Data Sheets E3

Continue pg. 3/3

ENTERED DEC 29 1995 BRAUN INTERTEC

275D93B

LTPP Seasonal Monitoring Study Form ~~E3~~ D09 Surface Elev. Measurements PCC			State Code [27] GPS Section No. 274040 Test Section Number [4040] Sheet 3 of 3			
STA.	BS	HI	IFS	FS	ELEV	REMARKS
		11.5793				

TYPE OF INSTRUMENT [NA 2000]

Do not enter into Smicheck

STA.	Slab Edge Outer	Mid Slab	Slab Edge Inner	REMARKS
5+09 3" ELEV	.5280 11.0203			INST HOLE
5+10 11" ELEV	.5281 11.0202			INST HOLE
5+21 158.8 ELEV	.5465 ~~11.0018~~	.5201 ~~11.0282~~	.5005 ~~11.0478~~	JOINT DOWN SIDE
5+21 158.9 ELEV	.5472 ~~11.0011~~	.5221 ~~11.0262~~	.5017 ~~11.0466~~	JOINT UP SIDE
+ ELEV				
+ ELEV				
+ ELEV				
+ ELEV				

Prepared by: RRU Employer: Braun Intertec Date: Sep 8/22/93

Surface Elevation Measurements: PCC Pavements - Data Sheets E3

ENTERED
DEC 29 1995
BRAUN INTERTEC

Appendix D-2: Routine SMP Monitoring Data Collection Summary

Appendix D-2 contains the following information:

- Standard LTPP SMP data tracking log;
- Field testing information sheet; and
- Screen prints documenting equipment problems.

27SD - 274040, US-2 WB LANES, 9 MILES WEST OF GRAND RAPIDS, MN (MP 173.1)

Date dd/mmm/yy (ctrl+shft+d)	Visit ID	ONSITE Data			MOBILE Data		Manual Data								FWD Data				Distress		Profile		Comments
		Pvmt. Temp.	Air Temp.	Rain	TDR	Frost Volts	Backup Temp	Backup TDR	Frost 2-Pt.	Frost 4-Pt.	Water Table	Pvmt. Elev.	Joint Open.	Joint Fault	Man. Temp.	No. of Cycles/Visit OWP	ML	PE	M	P	P	D	
02-Jun-93																				X			
28-Jul-93																			X				
20-Aug-93																					X		
21-Sep-93	93A														X	0	1	0					ONLY J0 AND J1 FWD TESTS PERFORMED, INSTALLATION, MANUAL TDR.
22-Sep-93	93B	X	X	X	X	X					X	X		X	X	3	3	3					NO RESISTIVITY SWITCH BOX. INSTALLED JOINT SNAP RINGS.
18-Oct-93	93C	X	X	X	X	X					X		X		X	2	2	2					SEALED INSTRUMENTATION BLOCK, NO RESISTIVITY SWITCH BOX.
04-Nov-93																					X		
16-Nov-93	93D	X	X	X	X	X			X	X	X	X	X	X	X	2	2	2					TWO ONSITE FILES, ADDED RELAY TO ONSITE PANEL.
16-Dec-93	93E	X	X	X	X	X					X		X	X	X	1	1	1					WEATHER LIMITED TESTING, BAD RESISTIVITY SWITCH BOX.
20-Jan-94	94A	X	X	X	X	X										0	0	0					WEATHER CONDITIONS LIMITED TESTING. BAD RESISTIVITY SWITCH BOX.
17-Feb-94	94B	X	X	X	X	X			X	X	X	X	X	X	X	2	2	2	X				
21-Feb-94																					X		
17-Mar-94	94C	X	X	X	X	X					X		X		X	1	1	1					BAD RESISTIVITY DATA. BAD FAULTMETER DATA.
31-Mar-94	94D	X	X	X	X	X					X	X	X	X	X	2	2	2					PARTIAL RESISTIVITY DATA.
14-Apr-94	94E	X	X	X	X	X			X	X	X		X	X	X	2	2	2					
21-Apr-94																					X		
04-May-94	94F	X	X	X	X	X			X	X	X	X	X	X	X	2	2	2					
18-May-94	94G	X	X	X	X	X			X	X	X		X	X	X	1	1	1					FWD D1 READINGS BAD.
23-Jun-94	94H	X	X	X	X	X			X	X	X		X	X	X	1	1	1					
16-Jul-94																					X		
28-Jul-94	94I	X	X	X	X	X			X	X	X		X	X	X	2	2	2					
25-Aug-94	94J	X	X	X	X	X			X	X	X	X	X	X	X	2	2	2					REPLACED INSTR. BLOCK (SEE PHOTOS), MISSING SOME FWD TESTS.
30-Sep-94	94K	X	X	X	X	X			X	X	X		X	X	X	2	2	2					SEALED NEW INSTRUMENTATION BLOCK.
13-Oct-94	94L	X	X	X	X	X			X	X	X		X	X	X	2	2	2					FAULTMETER PROBLEMS, PIEZ. NOT COVERED PRIOR TO ARRIVAL.
09-Nov-94																					X		
10-Nov-94	94M	X	X	X	X	X			X	X	X	X	X	X	X	2	2	2					
17-Nov-94																					X		PROFILE DATA NOT RECIEVED BY RCO.
08-Dec-94	94N	X	X	X	X	X			X	X						0	0	0					WEATHER CONDITIONS LIMITED TESTING.

27SD - 274040, US-2 WB LANES, 9 MILES WEST OF GRAND RAPIDS, MN (MP 173.1)

Date dd/mmm/yy (ctrl+shft+d)	Visit ID	ONSITE Data			MOBILE Data		Manual Data								FWD Data				Distress		Profile		Comments
		Pvmt. Temp.	Air Temp.	Rain	TDR	Frost Volts	Backup Temp	Backup TDR	Frost 2-Pt.	Frost 4-Pt.	Water Table	Pvmt. Elev.	Joint Open.	Joint Fault	Man. Temp.	No. of Cycles/Visit OWP	ML	PE	M	P	P	D	
12-Jan-95	95A	X	X	X	X	X			X	X	X	X	X	X	X	2	2	2					TWO ONSITE FILES, ADDED RELAY TO PANEL.
20-Jan-95																					X		PROFILE DATA NOT RECIEVED BY RCO.
09-Feb-95	95B	X	X	X	X	X			X	X	X					0	0	0					WEATHER CONDITIONS LIMITED TESTING, PROBLEM WITH LEVEL II TDR'S
17-Mar-95	95C	X	X	X	X	X			X	X	X	X	X	X	X	2	2	2					
31-Mar-95	95D	X	X	X	X	X			X	X	X	X	X	X	X	2	2	2	X				
14-Apr-95	95E	X	X	X	X	X			X	X	X		X	X	X	2	2	2					
28-Apr-95	95F	X	X	X	X	X			X	X	X	X	X	X	X	2	2	2					
11-May-95	95G	X	X	X	X	X			X	X	X	X	X	X	X	3	3	3					
16-Jun-95	95H	X	X	X	X	X			X	X	X	X	X	X	X	2	2	2					

274040 - 27SD

Updated 31-Oct-95

LOCATION - US-2 WB Lanes, 9 Miles West of Grand Rapids, MN (MP 173.1)
CONTACTS - Andy Istvanovich (218) 327-4493, Receptionist (218) 749-7793
TEMP HOLES - Sta 5+03, Depths are about 1.0 ", 4.0", and 7.0" (PCC thickness=8.0")

TEST LOCATIONS:

J1	J2	J3	J4	J5
399	386	399	385	386
426	413	426	412	413
453	441	454	440	441
480	467	481	466	467
507	495	BLK	494	495
---	---	---	521	522

DISTRESS COMMENTS:

Sta J1 - Midpanel tests.

507 D3 ADJACENT TO INSTRUMENTATION HOLE

Sta J2 and J3 - Corner and Mid-edge tests.
(none)

Sta J4 and J5 - Load transfer tests in the OWP.
(none)

PIEZOMETER - Sta 4+50, 2.0 feet from edge of paved shoulder, Depth = 4.265M

FROST TUBE - Sta 5+35, midlane.

ELEVATIONS - Mn/DOT BM 5+16, 16 feet from edge of paved shoulder.

Offsets:	PE	ML	ILE
(M)	0.30	1.83	3.35
(ft)	1.0	6.0	11.0
	(hole)	(hole)	(hole)

Sta: BJ/AJ 385 412 440 466 494 521
MP 399 426 453 480 507
Only AJ at Sta. 3+85 and BJ at Sta. 5+21.

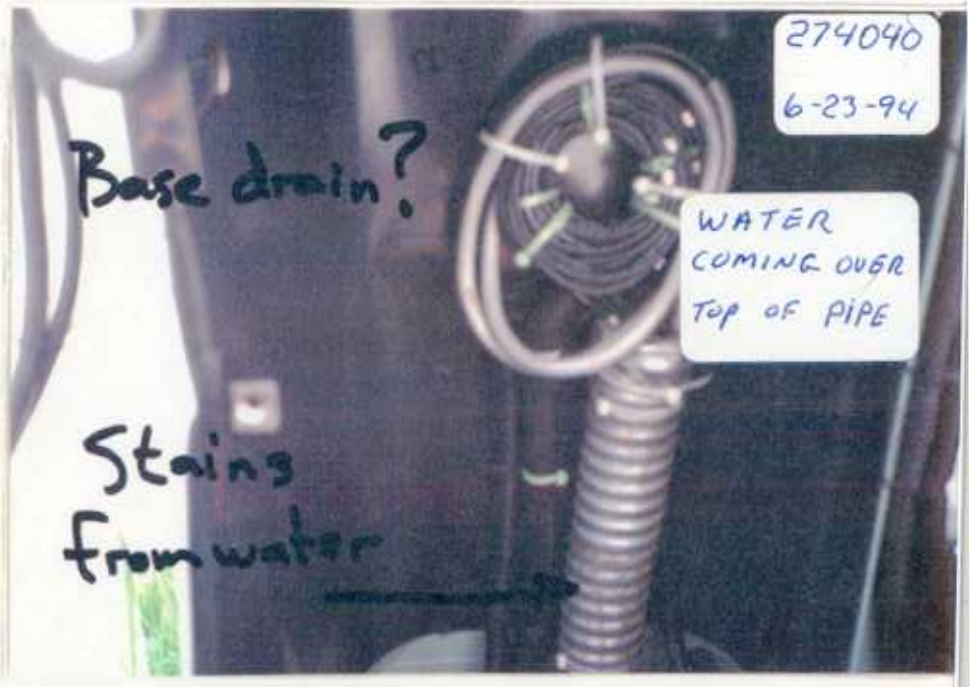
FAULTMETER

Offsets:	OWP	ML	IWP
(M)	0.76	1.83	2.90
(ft)	2.5	6.0	9.5

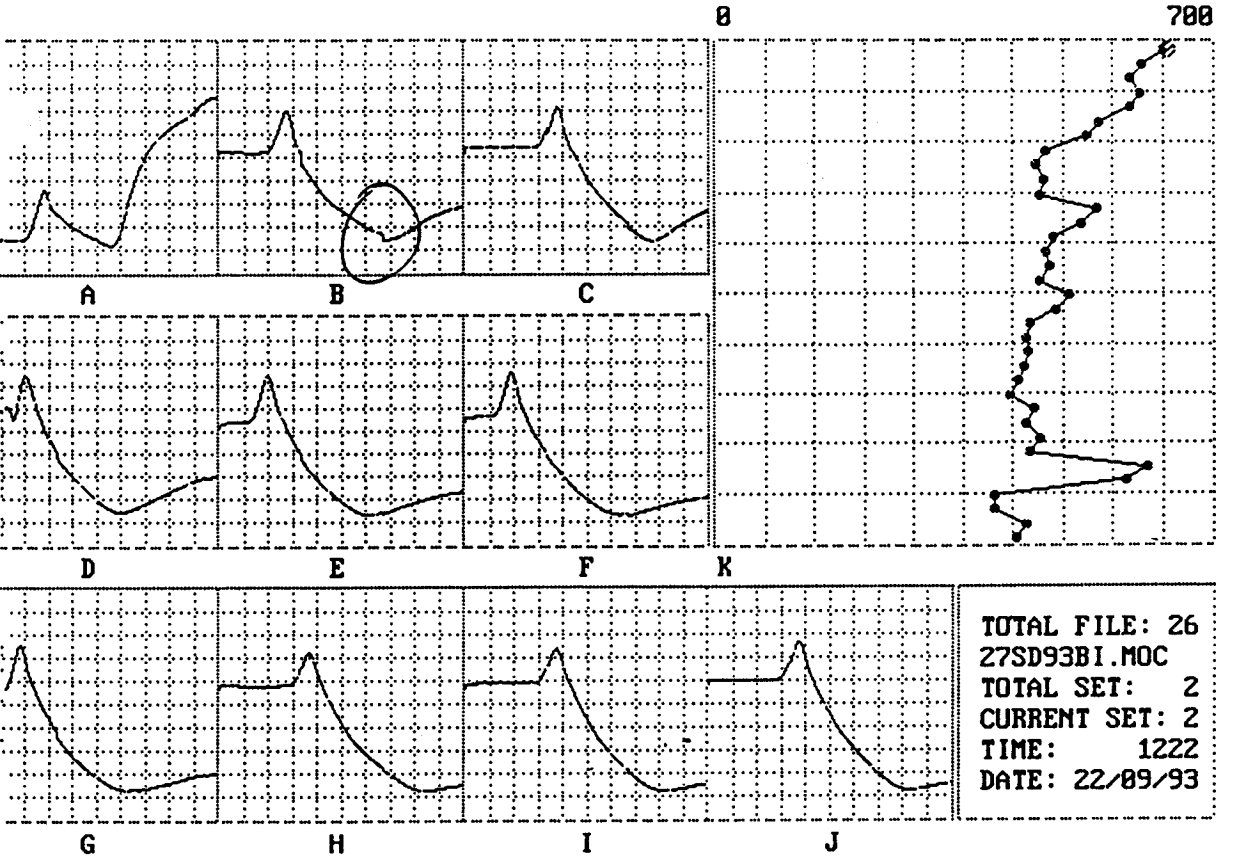
Sta: 3+85, 4+12, 4+40, 4+66, 4+94, 5+21

COMMENTS - Traffic control - Marty and Bob
- Test J1 at Sta 5+07 (black cross). Do not test Sta 5+11.

DOT
Benchmark
274040


274040
6-23-94
Base drain?
WATER
COMING OVER
TOP OF PIPE
Stains
from water

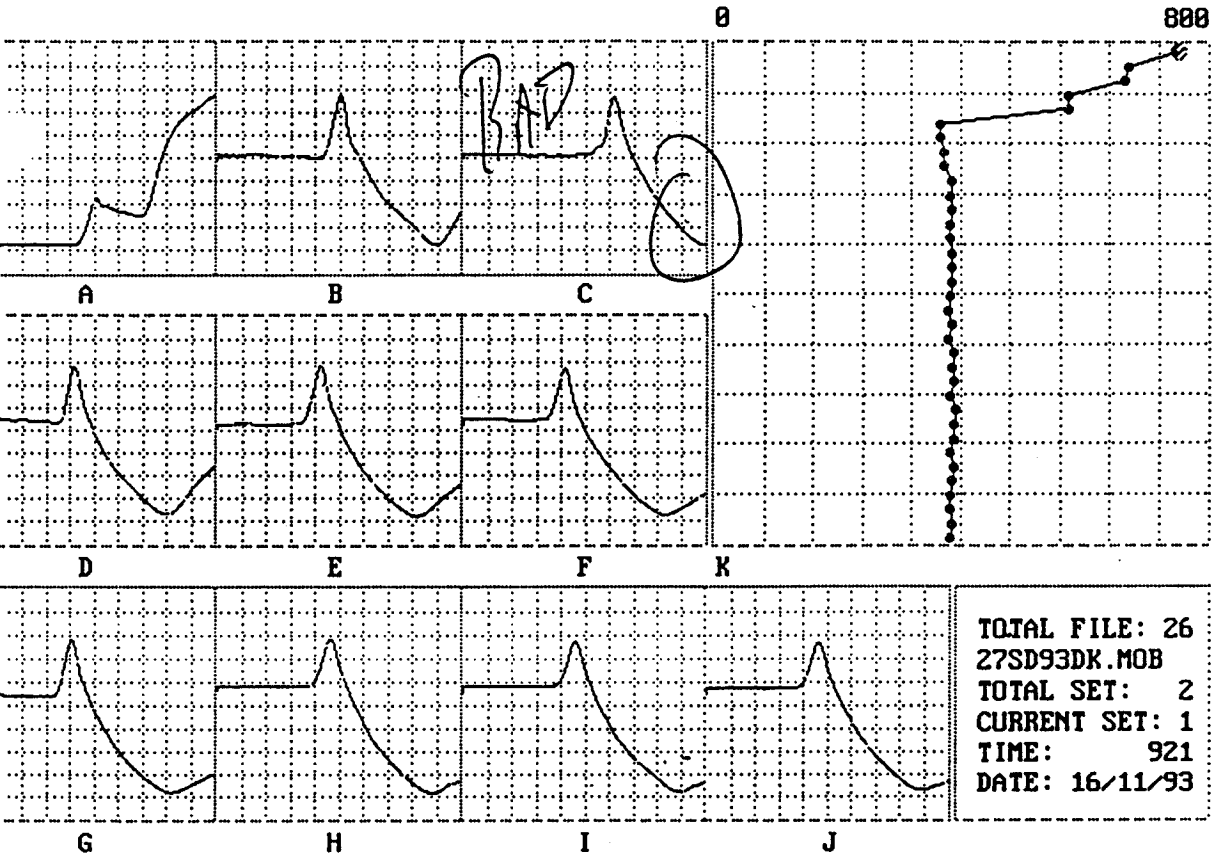
274040
4-94
Snaprings rusting.
Last how long?



TOTAL FILE: 26
27SD93BI.MOC
TOTAL SET: 2
CURRENT SET: 2
TIME: 1222
DATE: 22/09/93

tter=Curve to select (↔): PgU/PgD=Prior/Next set: Ctrl+PgU/PgD=Prior/Next File

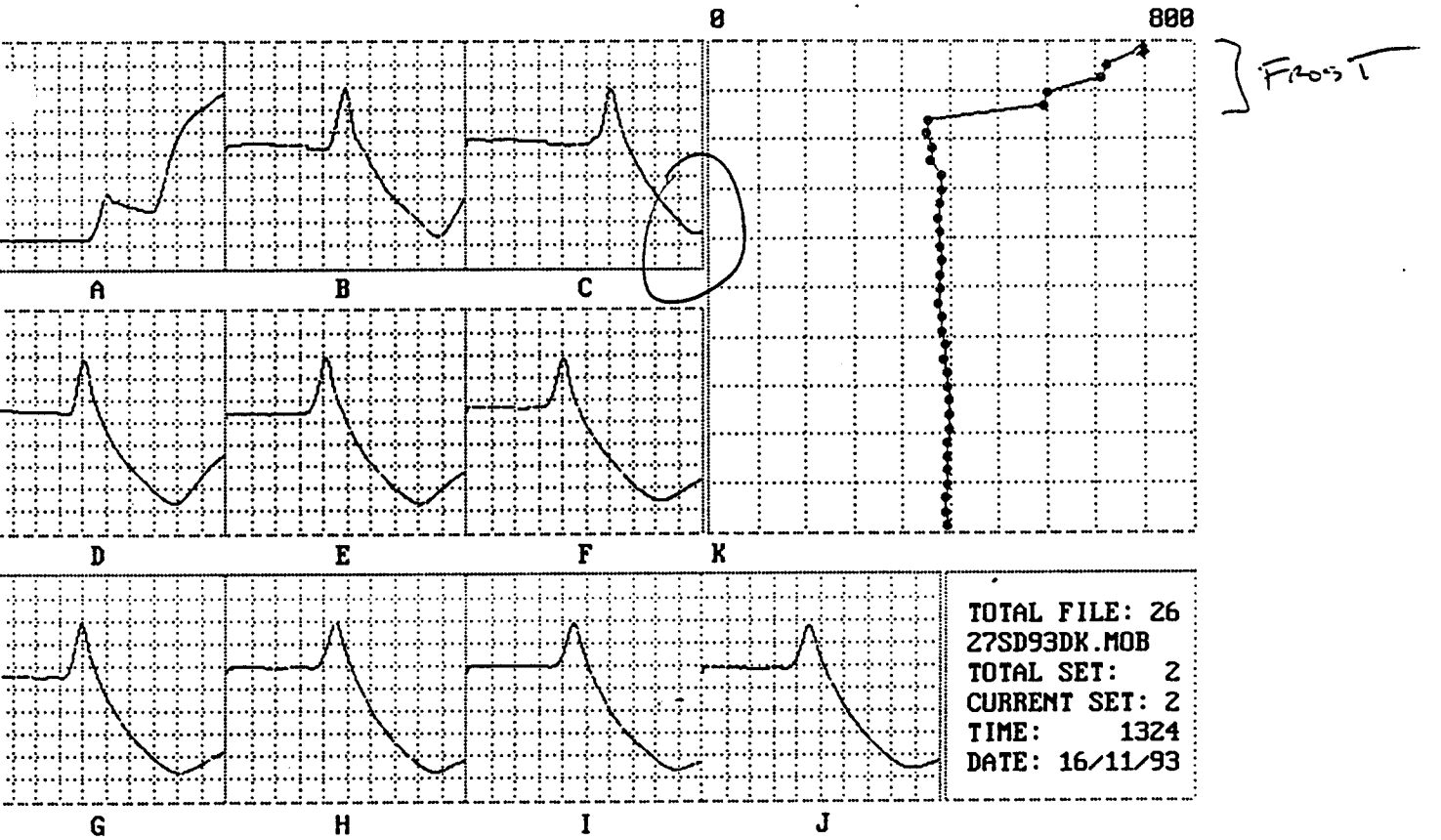
PROBLEM WITH VERTICAL SHIFT FROM CABLE READER — COLD RELATED.



tter=Curve to select (*): PgU/PgD=Prior/Next set: Ctrl+PgU/PgD=Prior/Next File

MISSING 2ND INFLECTION POINT

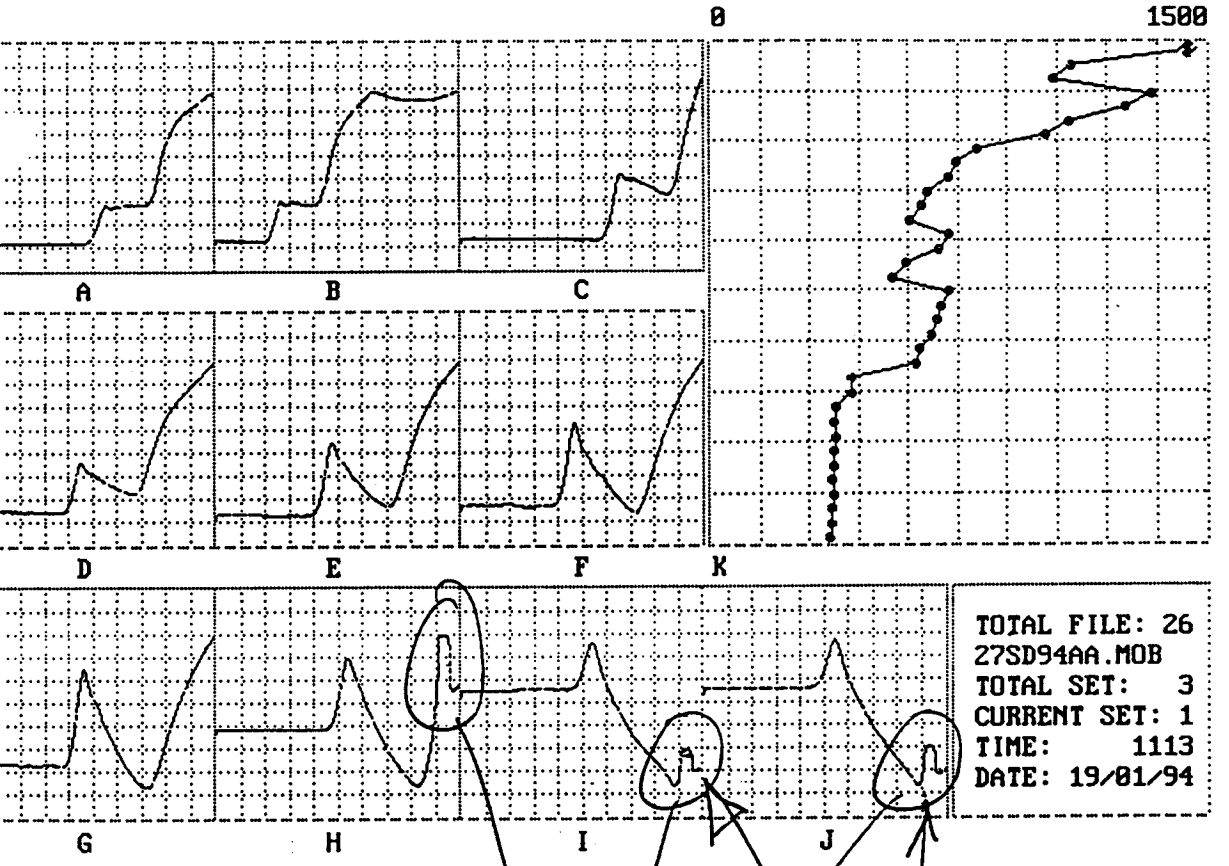
ON TDR #3



ter=Curve to select (*): PgU/PgD=Prior/Next set: Ctrl+PgU/PgD=Prior/Next File

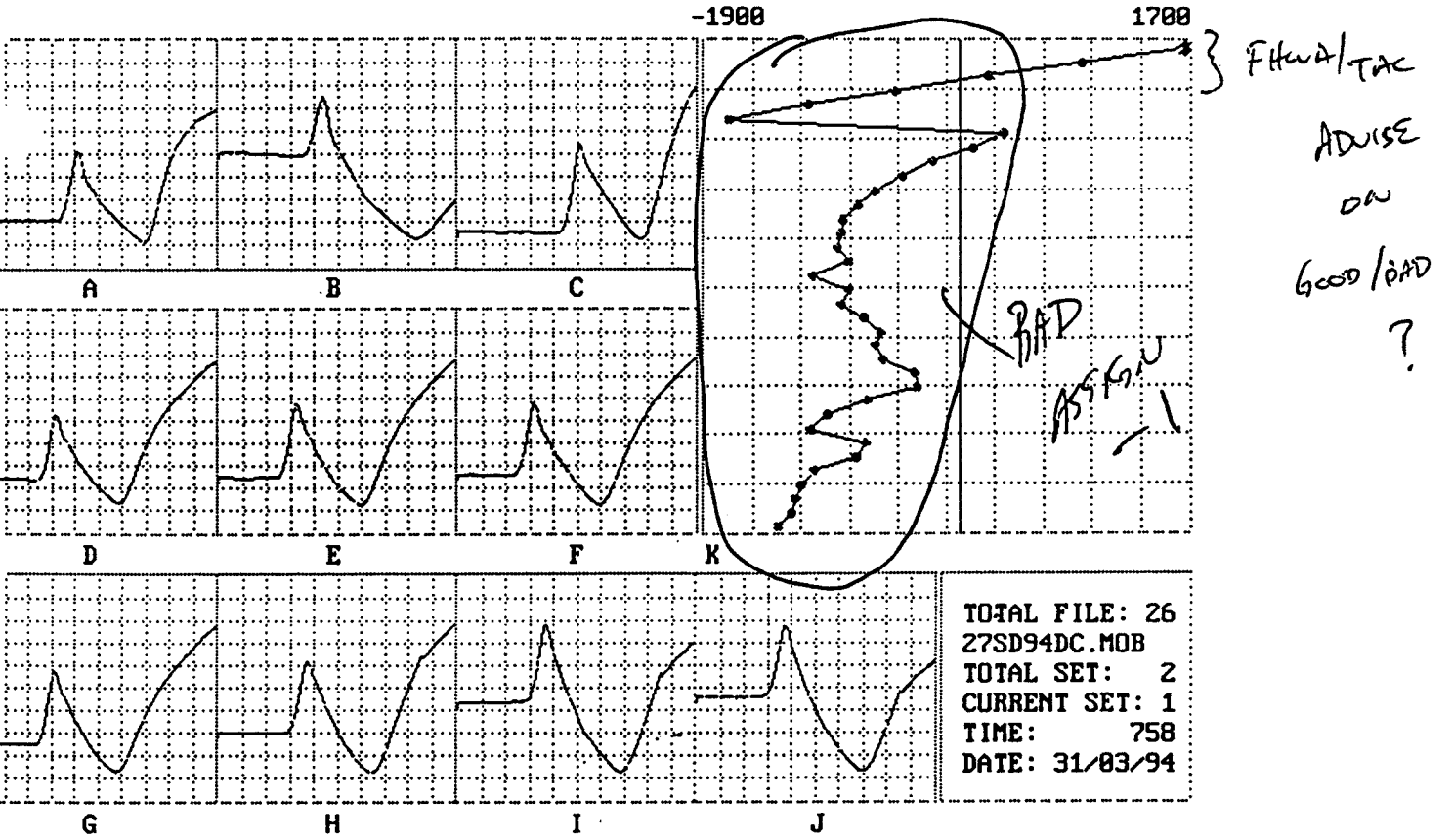
FHWA / TAC ADVISE ON TDR #3

SECOND INFLECTION POINT

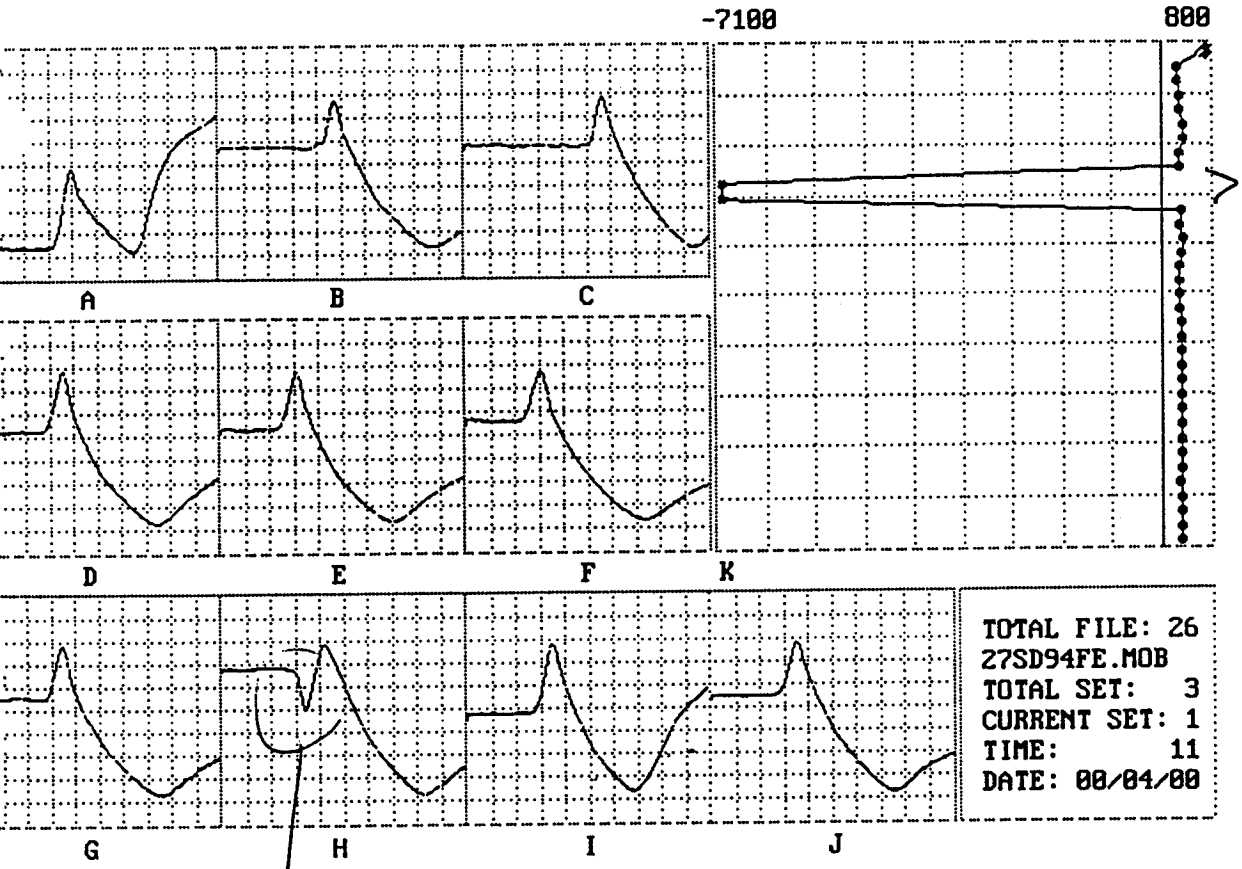


FHWA / TAC ADVISE ON GOOD / BAD

COLD TEMPERATURE PROBLEM WITH CABLE READER CAUSING VERTICAL SHIFTS.



etter=Curve to select (*): PgU/PgD=Prior/Next set: Ctrl+PgU/PgD=Prior/Next File

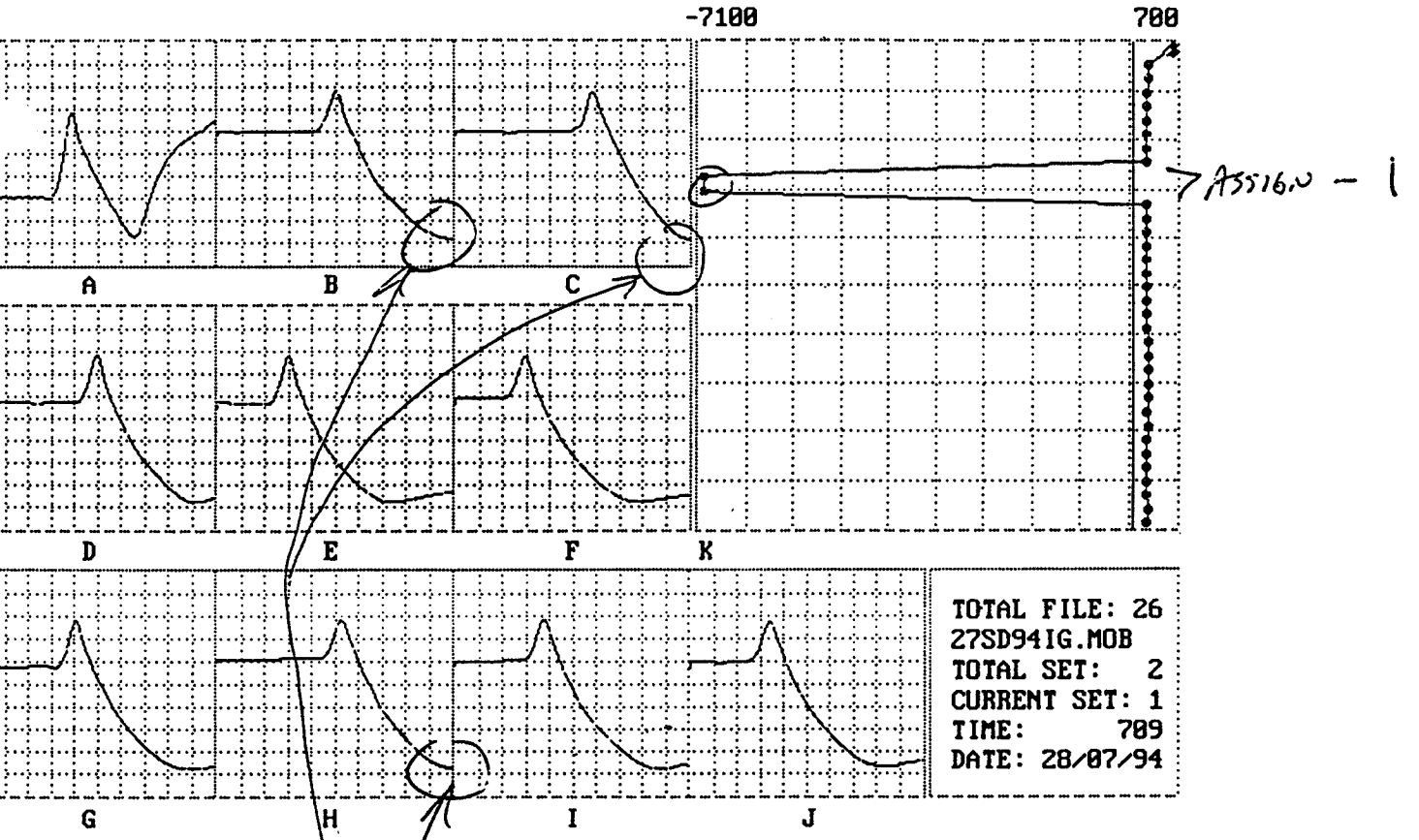


ASSIGN - 1

etter=Curve to select (*): PgU/PgD=Prior/Next set: Ctrl+PgU/PgD=Prior/Next File

MOISTURE IN BNC BULK HEAD

ON PROBE ?



BAD - NO SECOND INFLECTION

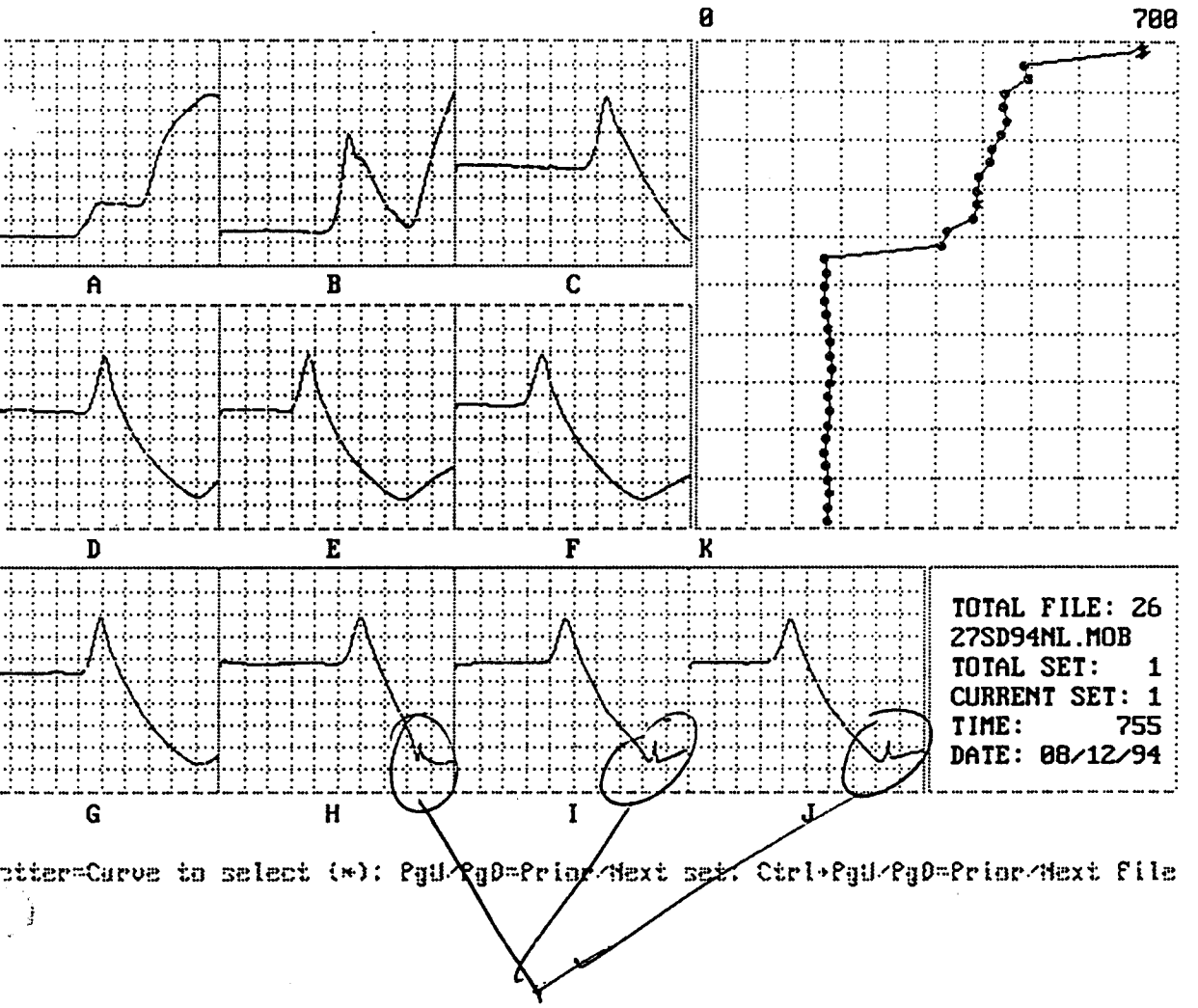
FHWA/TAC ADVISE

- CAN SAY ~~AT LEAST~~

$L_A >$ —, OR

JUST NOT USE

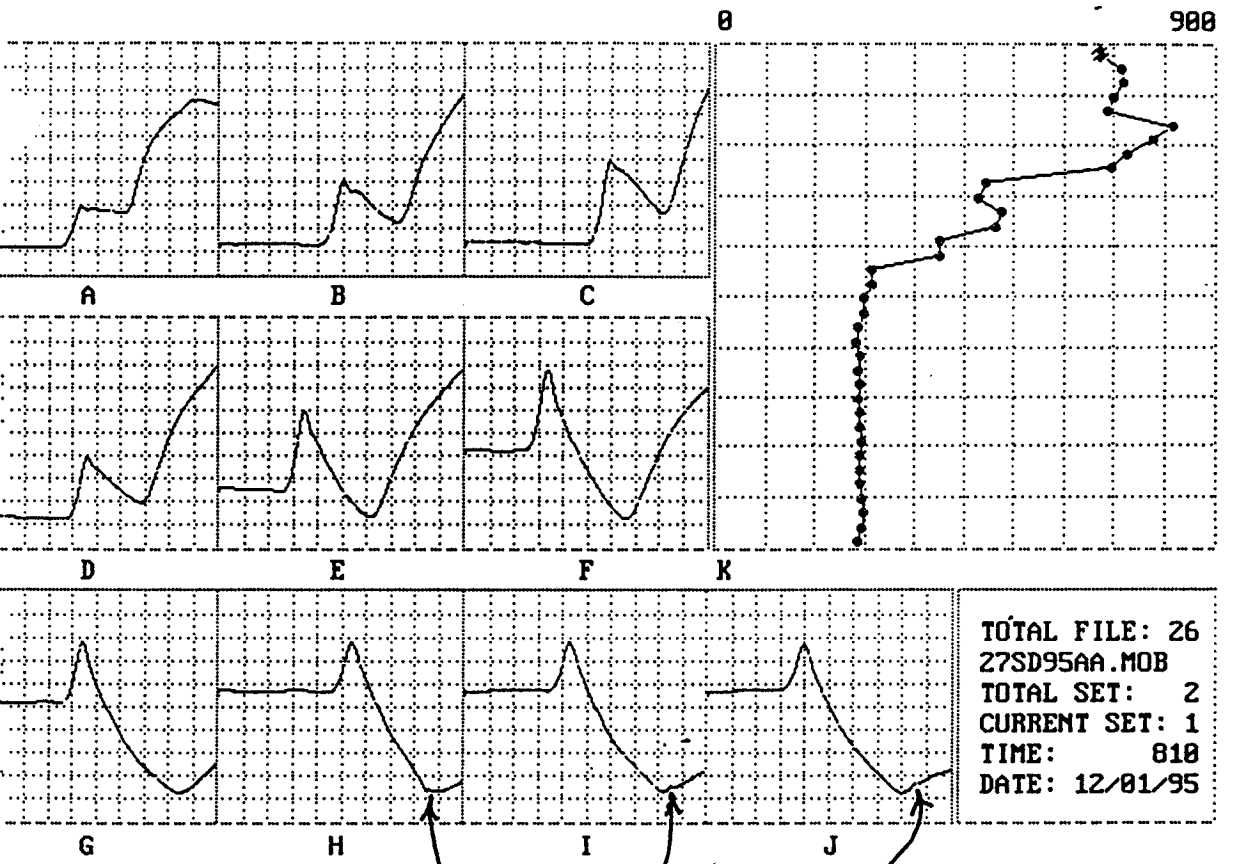
AT ALL.



CABLE READER PROBLEM

- TOO COLD
- CAUSING VERTICAL SHIFT

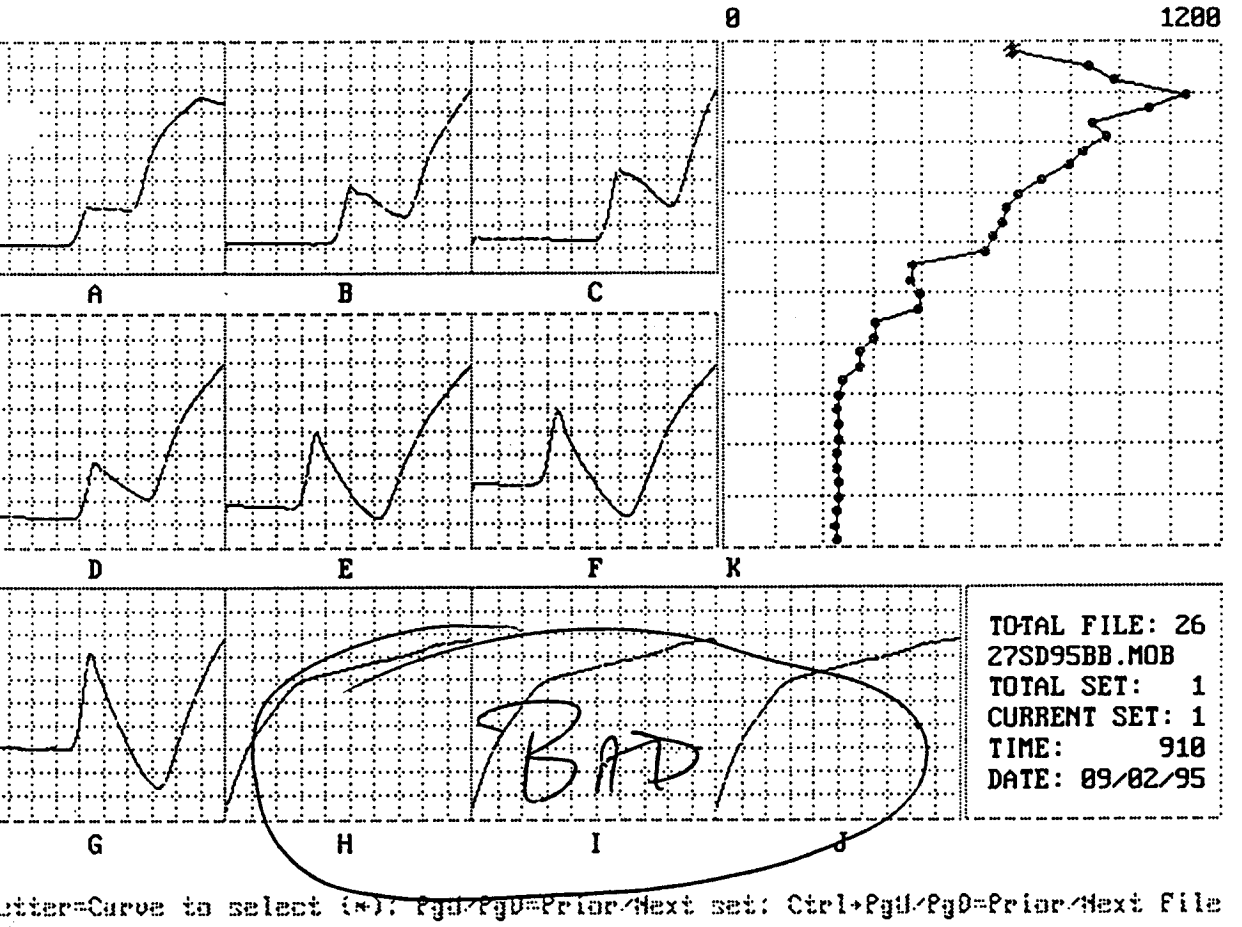
FHWA/TAC ADVISE ON GOOD/BAD!



tter=Curve to select (*): PgU/PgD=Prior/Next set: Ctrl+PgU/PgD=Prior/Next file

— SMALL VERTICAL SHIFT FROM CABLE READER (COLD)

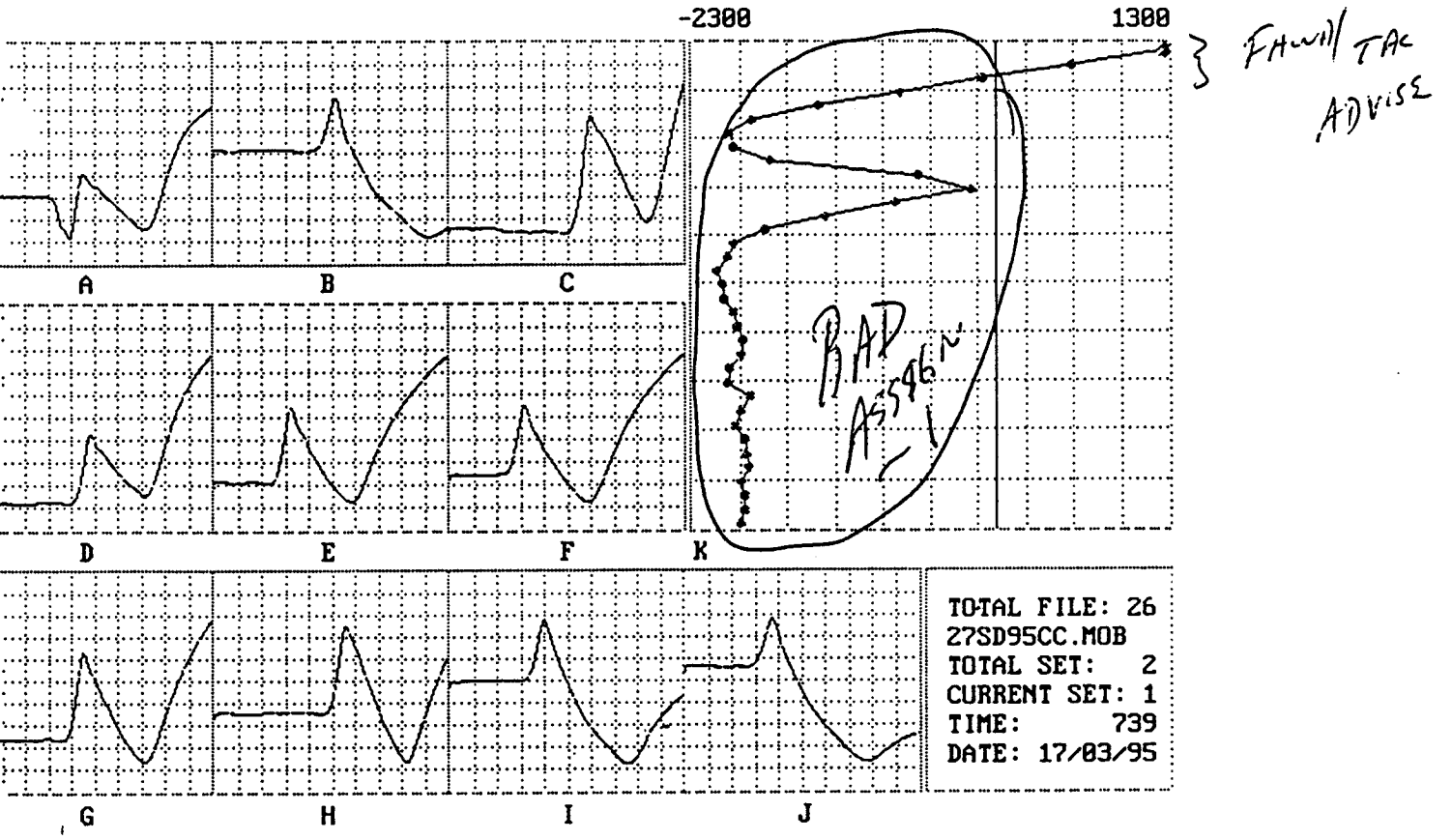
— FHWA/TAC ADVISE ON GOOD/BAD



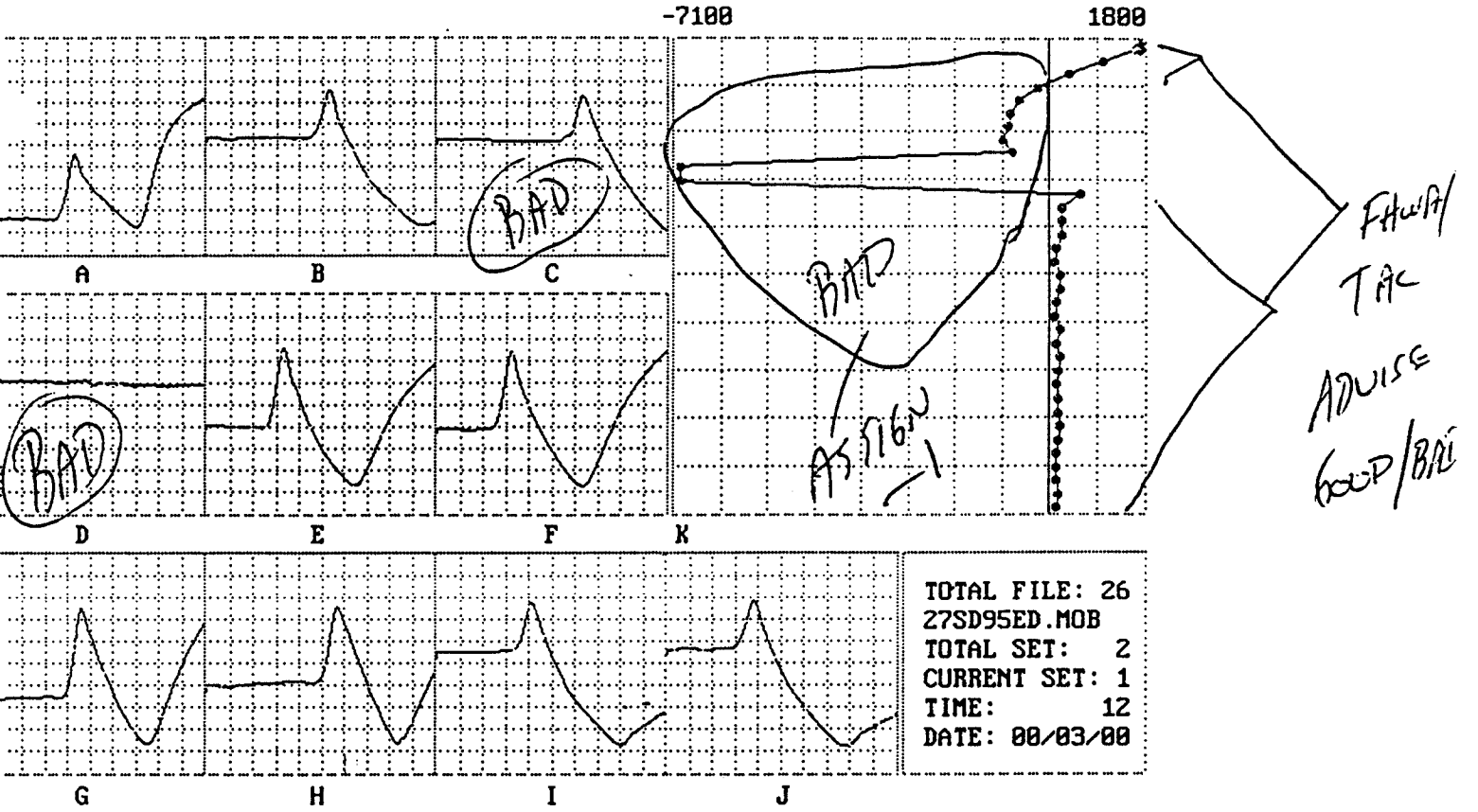
utter=Curve to select (*); PgU/PgD=Prior/Next set: Ctrl+PgU/PgD=Prior/Next File

TDR 8 9 10 ?

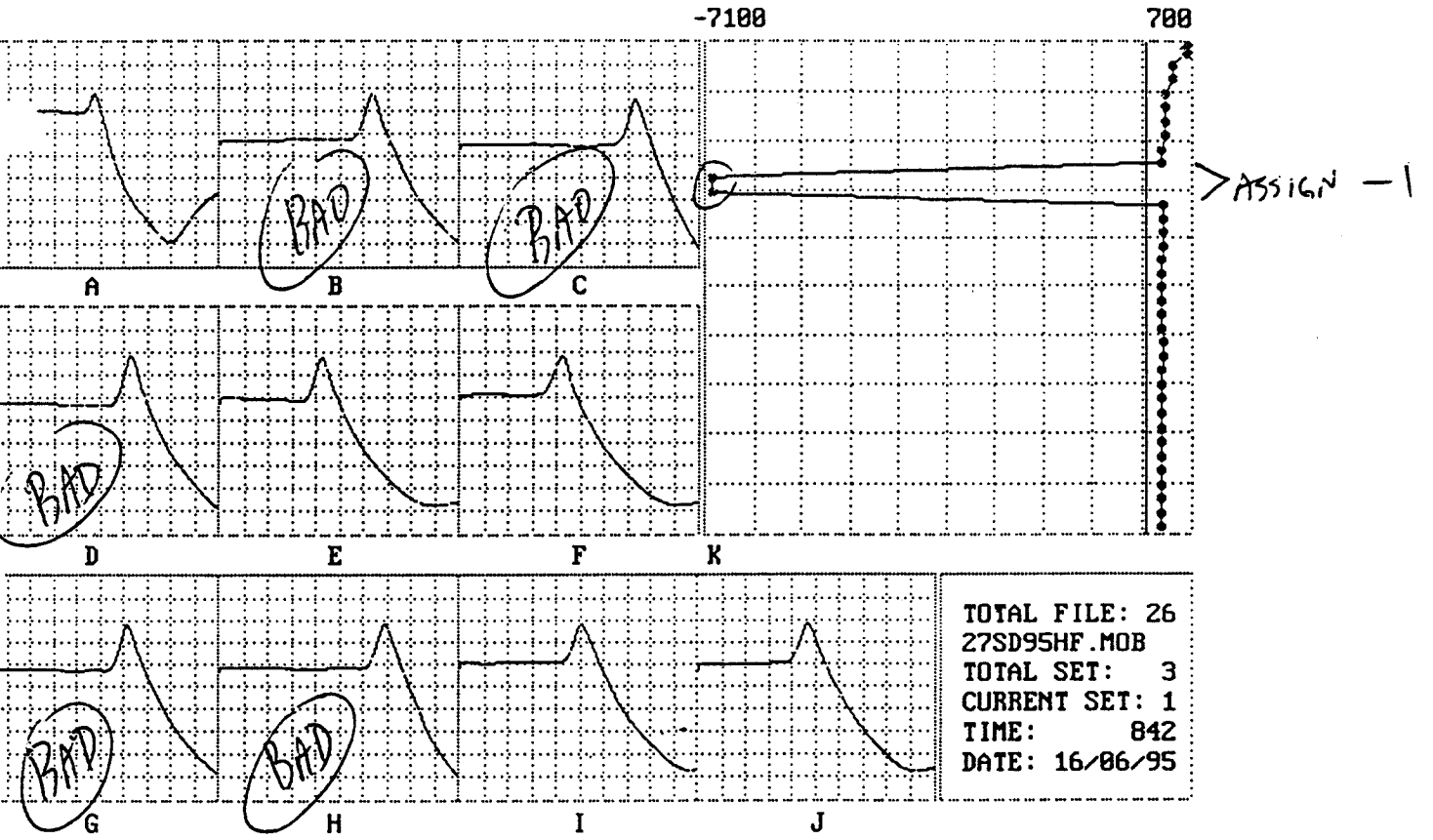
LEVEL II BOARD PROBLEM ?



ctter=Curve to select (*): PgU/PgD=Prior/Next set: Ctrl+PgU/PgD=Prior/Next File



tter=Curve to select (*): PgU/PgD=Prior/Next set: Ctrl+PgU/PgD=Prior/Next File

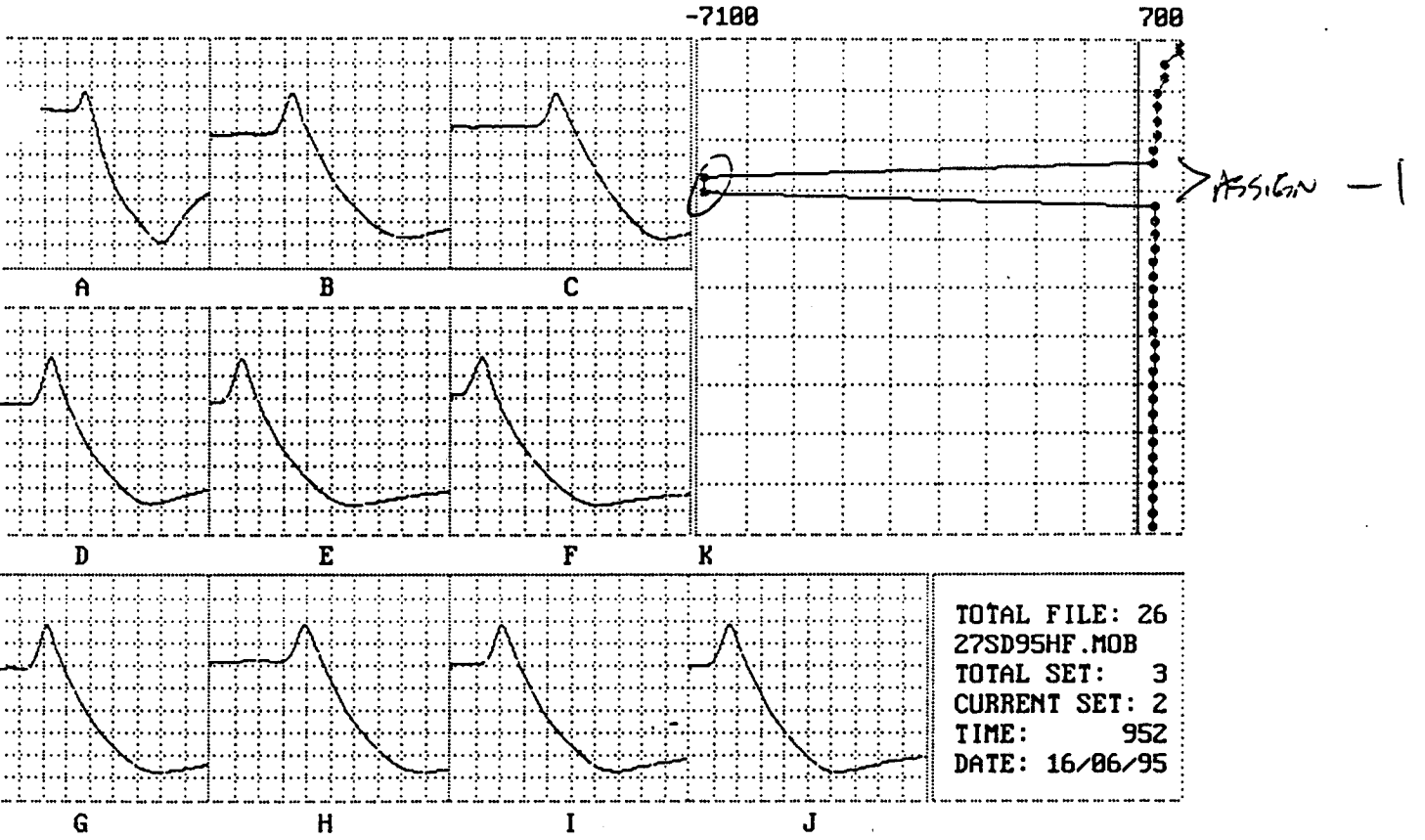


utter=Curve to select (*): PgU/PgD=Prior/Next set: Ctrl+PgU/PgD=Prior/Next File

WHY ALL TRACES SHIFT?

– WRONG MOBILE PROGRAM?

– SET 2 AND 3 ARE GOOD!

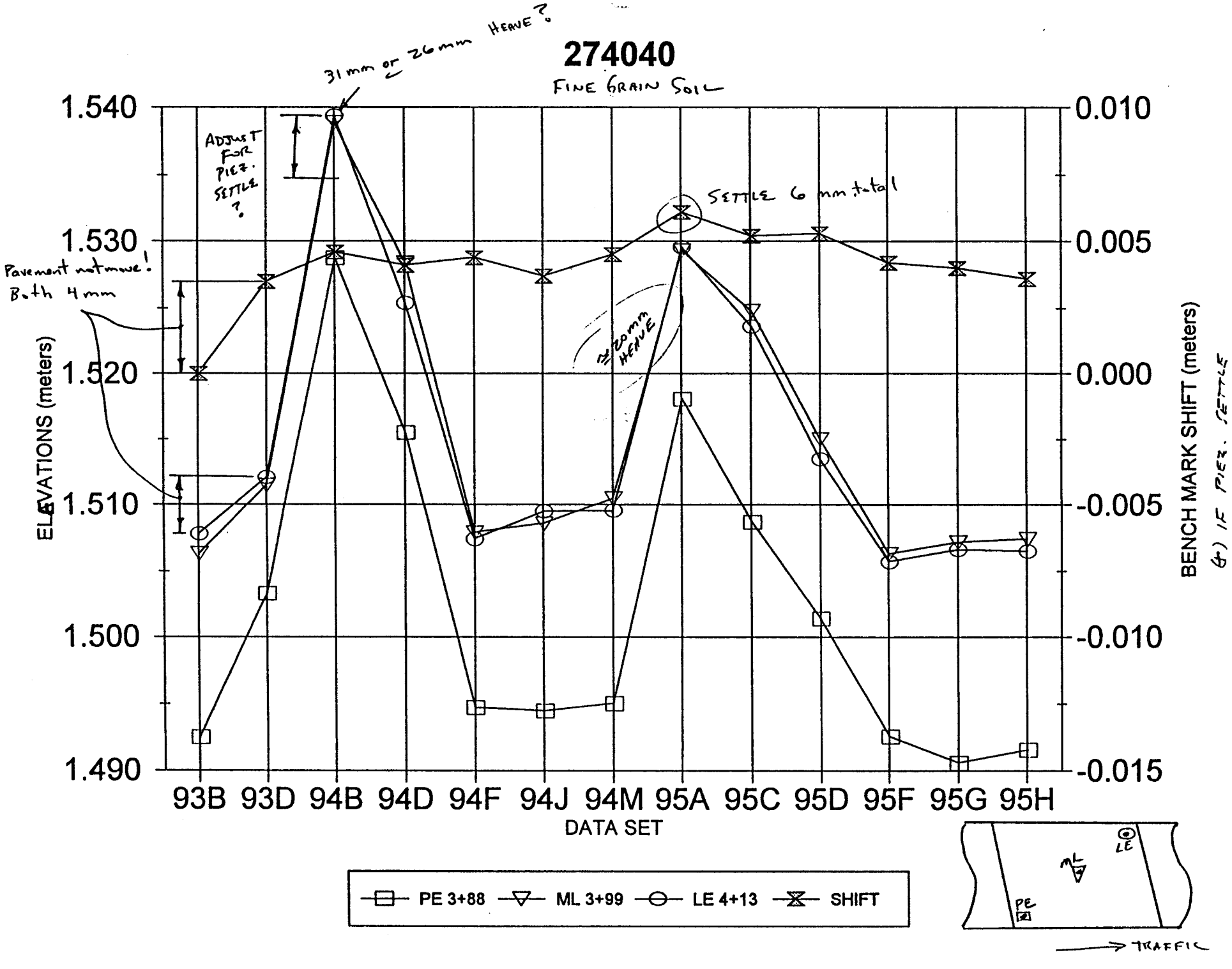


tter=Curve to select (*): PgU/PgD=Prior/Next set: Ctrl+PgU/PgD=Prior/Next File

COMPARE TO SET 1.

274040

FINE GRAIN SOIL



Appendix D-3: GPS Section 274040 Instrumentation Block Replacement

Appendix D-3 contains the following information:

- Field notes for instrumentation block replacement; and
- Photographs documenting instrumentation block replacement.

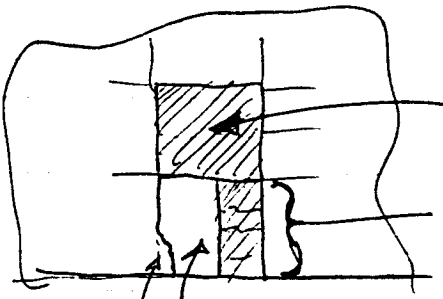
BRAUNSM
INTERTEC

Description: SMP 275D REPAIRS

Project No: DBNX92700 B6

Date: 9/25/94 By: RV

Removed old block and broken part of original PCC

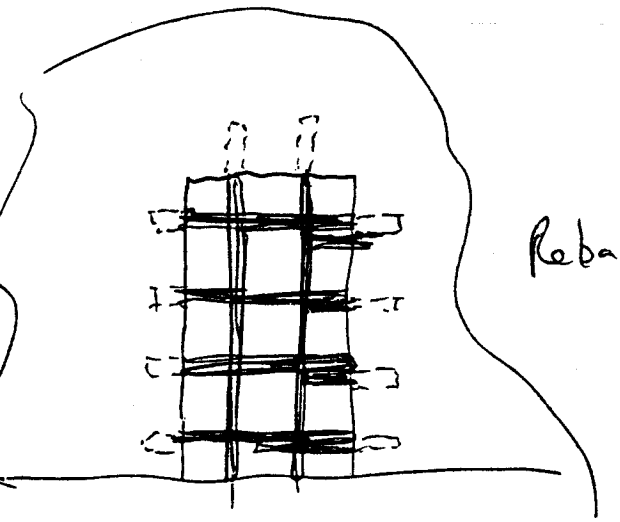


patched area

broken into pieces

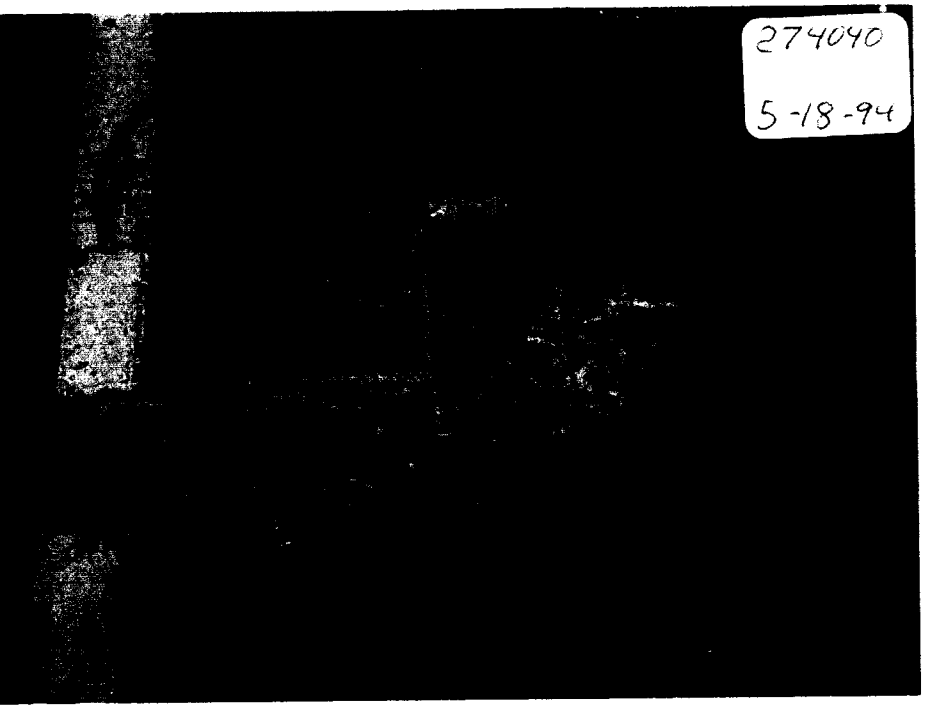
additional area removed to replace

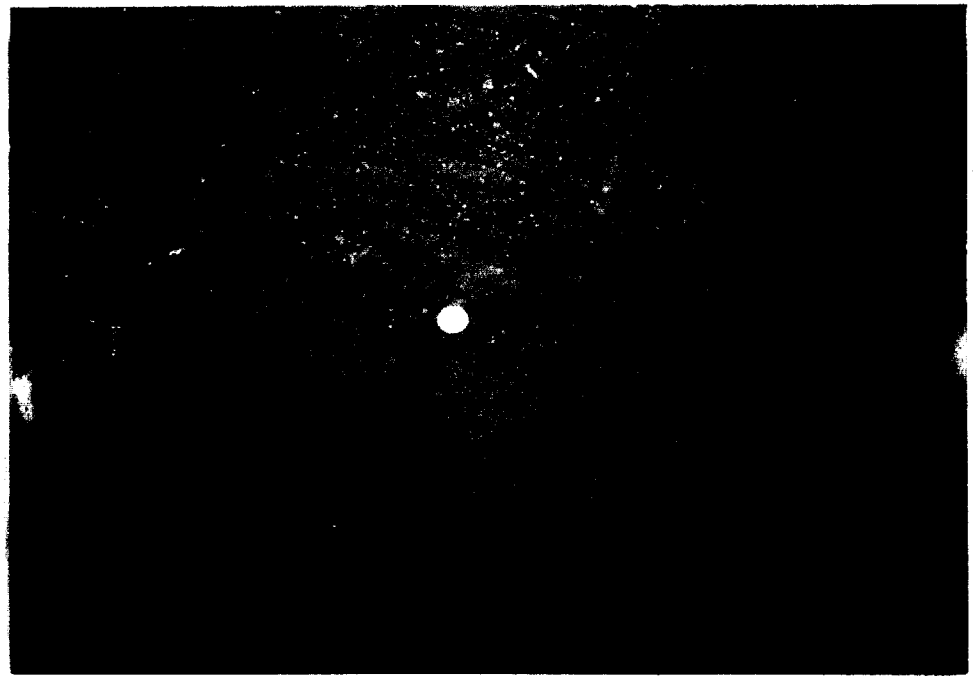
drilled across to square up patched area

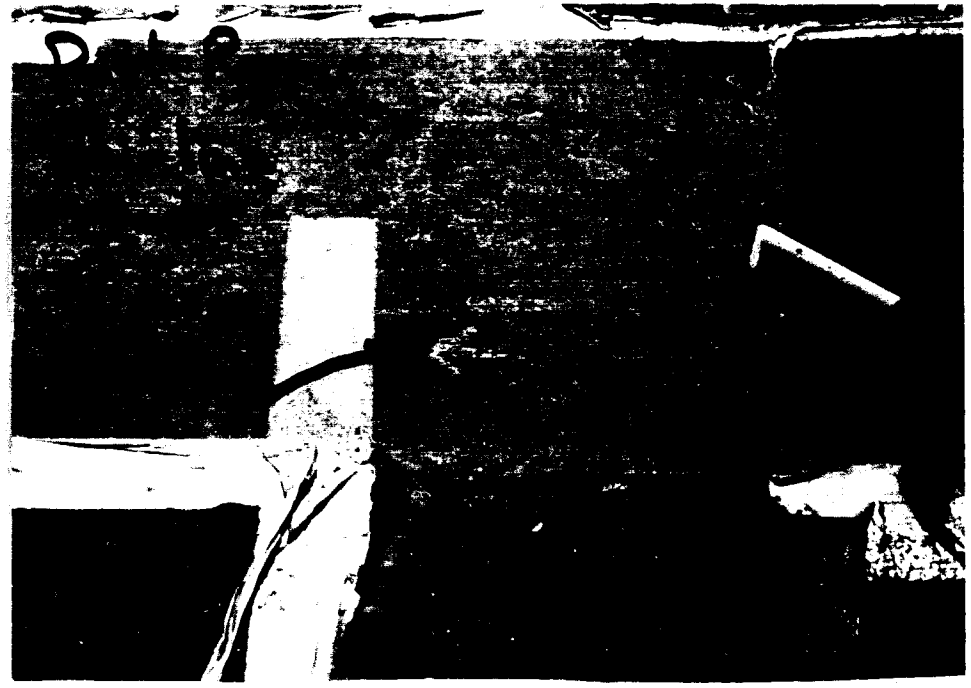


Rebar installed and tied.

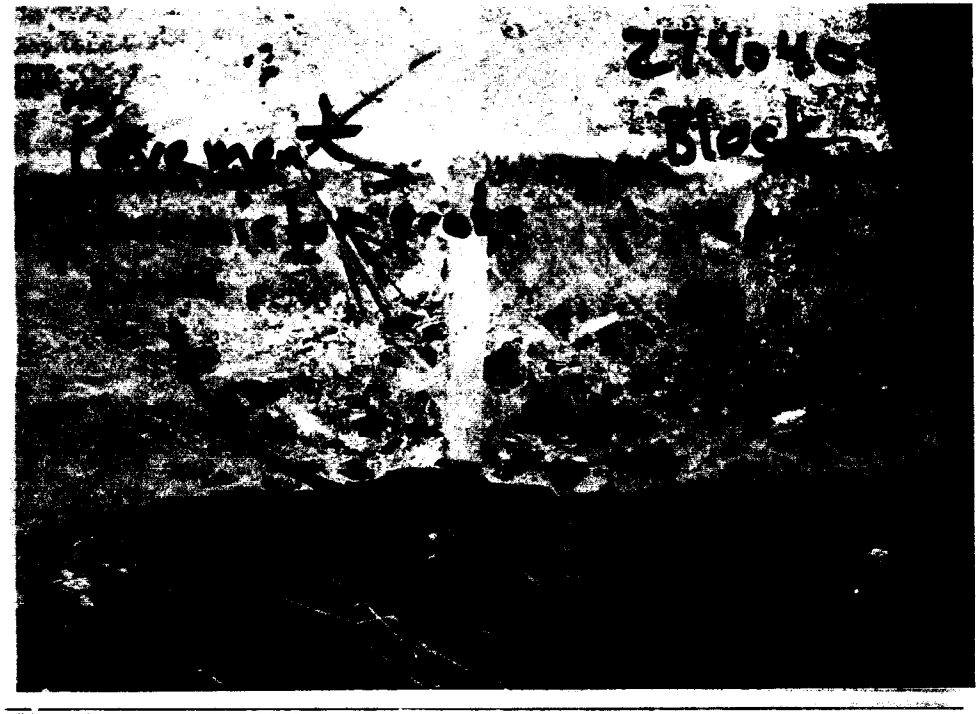
- wetted exposed PCC
- used polymer modified rapid set material (2000 psi in one ~~hour~~)
- covered patch
- set ~ 3 hrs. prior to traffic

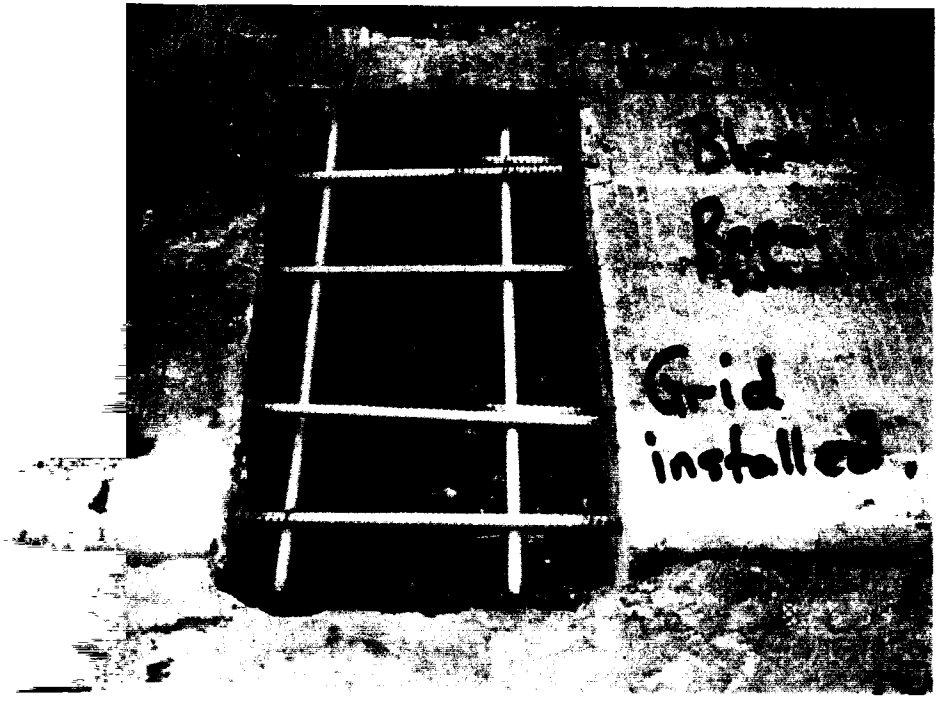

274040
5-18-94

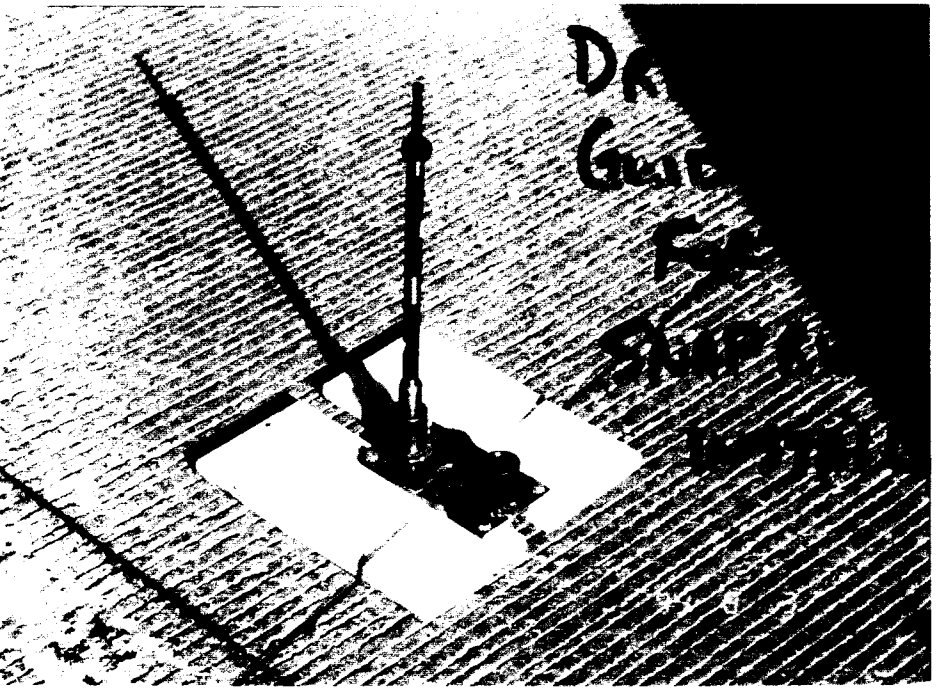


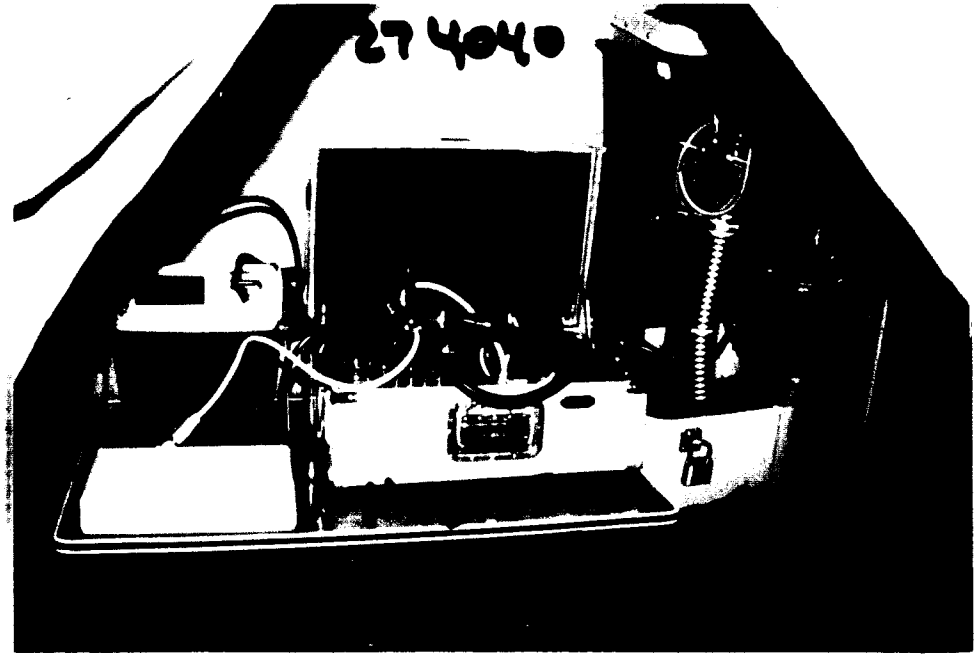
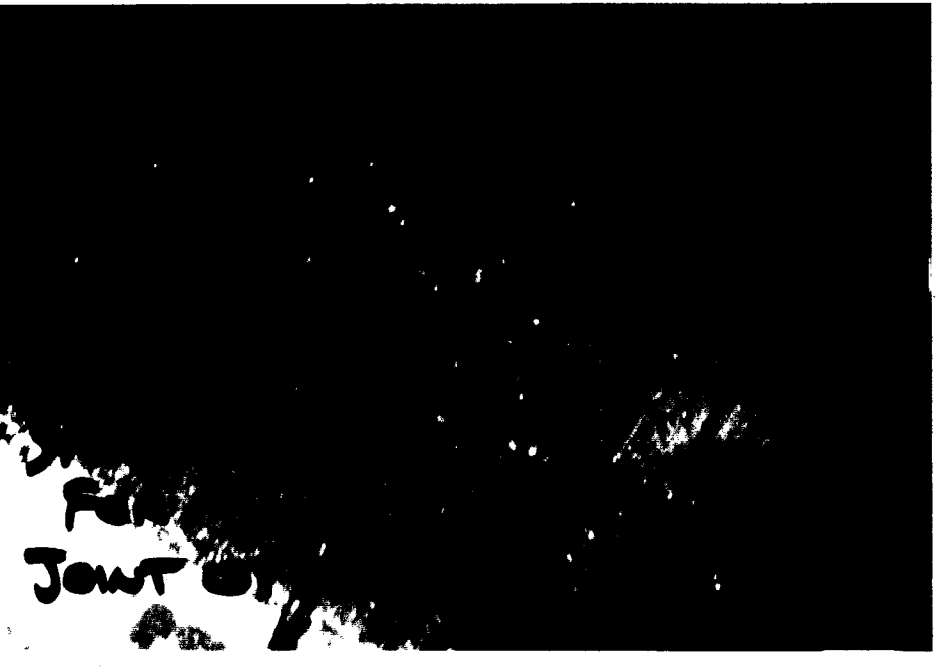
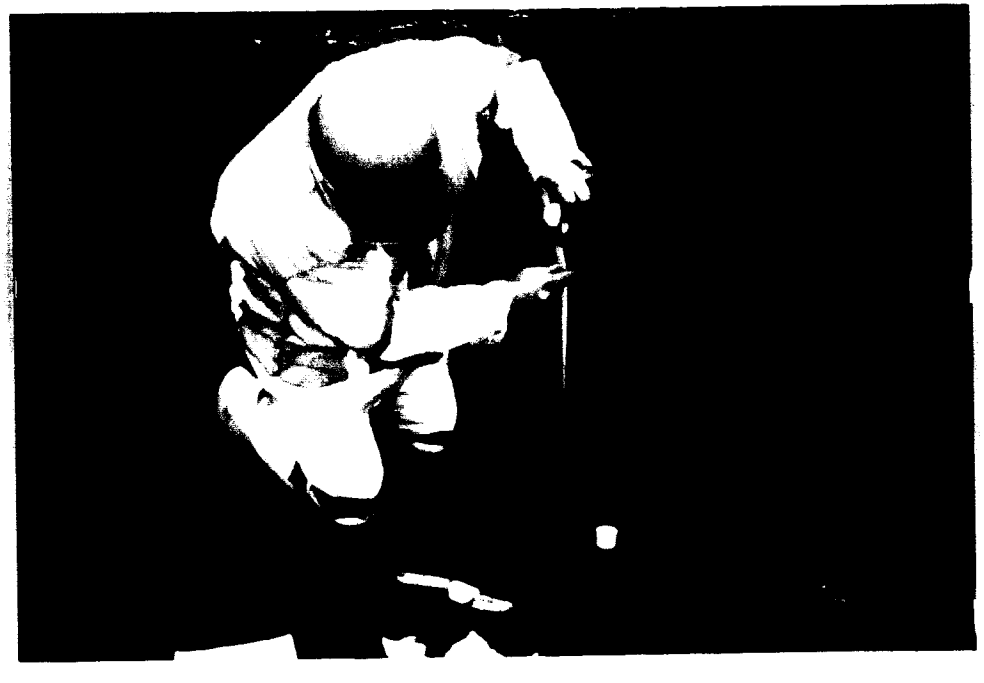


C-LINE #C2084
35MM PRINTS








27 4040