

**PRECISION ESTIMATES OF AASHTO T324, “HAMBURG  
WHEEL-TRACK TESTING OF COMPACTED HOT MIX ASPHALT  
(HMA)”**

**APPENDICES  
FOR  
FINAL REPORT**

Prepared for  
National Cooperative Highway Research Program  
Transportation Research Board  
National Research Council

TRANSPORTATION RESEARCH BOARD

NAS-NRC

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# TABLE OF CONTENTS

<b>TABLE OF CONTENTS .....</b>	<b>3</b>
<b>APPENDIX A- INSTRUCTIONS AND DATA SHEET FOR INTERLABORATORY STUDY.....</b>	<b>4</b>
<b>APPENDIX B- INDIVIDUAL GRAPHS OF DEFORMATION VERSUS NUMBER OF CYCLES FROM EACH LABORATORY IN THE ILS .....</b>	<b>11</b>
<b>APPENDIX C- CAUSES OF VARIABILITY OF THE WHEEL TRACK TESTER MEASUREMENTS.....</b>	<b>41</b>
C-1- Effect of Cut on Gyratory Samples.....	41
C-2- Effect of Position of the Wheel with Respect to Specimen .....	42
C-3- Location of Deformation Measurements .....	42
C-4- Effect of Bolt Tightness .....	44
<b>APPENDIX D- STATISTICS OF DEFORMATION OF 19-MM FIELD SPECIMENS .....</b>	<b>45</b>
<b>APPENDIX E- STATISTICS OF NUMBER OF PASSES TO THRESHOLD RUT DEPTH OF WYOMING SPECIMENS.....</b>	<b>82</b>
<b>APPENDIX F- STATISTICS OF CREEP SLOPE.....</b>	<b>107</b>
<b>APPENDIX G- STATISTICS OF STRIP SLOPE.....</b>	<b>132</b>
<b>APPENDIX H- STATISTICS OF NUMBER OF PASSES TO INFLECTION POINT.....</b>	<b>145</b>
<b>APPENDIX I- RECOMMENDED PRECISION ESTIMATES FOR AASHTO T324.....</b>	<b>158</b>

## **APPENDIX A- INSTRUCTIONS AND DATA SHEET FOR INTERLABORATORY STUDY**

## INSTRUCTIONS FOR TESTING GYRATORY SPECIMENS

Dear Participants,

Thank you for participating in the AASHTO T324 interlaboratory study (ILS) for determining precision estimates of Hamburg wheel tracking device. You have received the first set of samples to be tested as part of the ILS. The set includes four 60-mm tall gyratory compacted cylinders for one application of Hamburg testing. Please test the samples within a week of receiving them. Here are the instructions for testing the samples:

1. Prior to Hamburg testing, dry the samples using “CoreDry” (if available) and measure Gmb of the samples using one or more of the listed methods: Saturated surface dry (SSD) following AASHTO T 166, Gilson (G4 device), or Corelok vacuum sealing method following AASHTO T 331. Record the data in the enclosed Excel file (second sheet of the “Hamburg Results Table-Gyr2”).
2. Place a specimen (marked side up) in the polyethylene cutting mold and use masonry saw to make a vertical cut parallel to the edge of the mold.
3. Cut the specimen to the dimensions shown in Figure 1 in order to fit in the molds required for performing the test.
4. Place the high-density polyethylene molds into the mounting tray and fit samples into each one.
5. After Securing the polyethylene molds and samples into the stainless steel mounting tray, the gap between the two polyethylene molds should be 7.5 mm.
6. Fasten the mounting trays into the empty water bath.
7. Start the software supplied with the Hamburg machine and enter the required test information into the computer:
  - a. Date of the test
  - b. Testing temperature of  $122 \pm 1.8^{\circ}\text{F}$  ( $50 \pm 1^{\circ}\text{C}$ )
  - c. Load of  $158 \text{ lb} \pm 1.0 \text{ lb}$
  - d. Rate of 52 pass/min
  - e. Maximum number of passes as 20,000
  - f. Deformation Stopping criteria of 24.0-mm
  - g. Sampling interval of
    - i. every 20-cycle for the first 1000 cycles
    - ii. every 50-cycle for the second 4000 cycles
    - iii. every 100-cycle for the third 5000 cycle
    - iv. every 100-cycle for the fourth 5000 cycles

- v. every 100-cycle for the fifth 5000 cycles
8. Fill the water bath.
  9. Monitor the temperature from the computer screen. Once the temperature of  $122 \pm 1.8^{\circ}\text{F}$  ( $50 \pm 1^{\circ}\text{C}$ ) has been reached, allow an additional 30 minutes for the test samples to be saturated in the water.
  10. Start the test after the test samples have been in the water for 30 minutes at  $122 \pm 2^{\circ}\text{F}$  ( $50 \pm 1^{\circ}\text{C}$ ).
  11. The test should automatically stop when 20,000 cycles have passed or if deformation of 24.0 mm has been reached.
  12. Fill in the required data in the first sheet of the enclosed Excel file "Hamburg Results Table-Gry2".
  13. Email the original raw data file from the test as well as the "Hamburg Results Table-Gyr2" Excel file to Haleh Azari at [hazari@amrl.net](mailto:hazari@amrl.net).

Please do not hesitate to call me or send me an email if you have any questions.

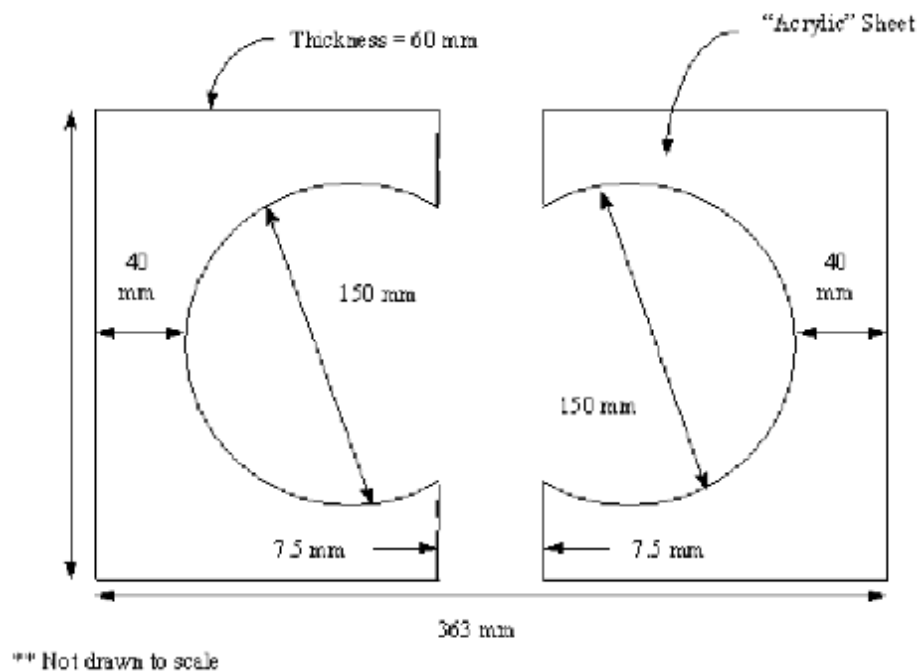


Figure A-1- Top view of test specimen configuration for Hamburg wheel tracking Device  
[Courtesy of TEX-242-F Document]

## INSTRUCTIONS FOR TESTING SLAB SPECIMENS

Dear Participants,

Thank you for participating in the interlaboratory study (ILS) for determining precision estimates of Hamburg wheel tracking device. You have received a set of slab specimens to be tested using the Hamburg device. The set includes two-60-mm tall slabs for one application of Hamburg testing. Please follow the instructions below for testing the specimens and returning the test results:

1. Prior to Hamburg testing, measure the bulk specific gravity of the Specimens using Saturated Surface Dry (SSD) method following AASHTO T 166 or Corelok vacuum sealing method following AASHTO T 331. Record the data in the enclosed Excel file (second sheet of the “Hamburg Results Table”).
2. Use plaster of Paris to rigidly mount the specimens in the mounting trays, compacted side up as indicated on the specimen. Center the Specimen in the mounting tray so the plaster margin surrounding the Specimen is of equal size. Pour the plaster to a height equal to that of the tray so that the space between the specimen and the tray is filled. Allow the plaster to set for at least one hour.
3. Fasten the mounting trays into the empty water bath.
4. Start the software supplied with the Hamburg machine and enter the required test information into the computer:
  - a. Laboratory name
  - b. Date of the test
  - c. Testing temperature of  $122 \pm 2^{\circ}\text{F}$  ( $50 \pm 1^{\circ}\text{C}$ )
  - d. Load of  $158 \text{ lb} \pm 1.0 \text{ lb}$
  - e. Speed of 52 pass/min
  - f. Maximum number of passes as 20,000
  - g. Deformation Stopping criteria of 24.0-mm
  - h. Sampling interval of
    - i. every 20-cycle for the first 1000 cycles
    - ii. every 50-cycle for the second 4000 cycles
    - iii. every 100-cycle for the third 5000 cycle
    - iv. every 100-cycle for the fourth 5000 cycles
    - v. every 100-cycle for the fifth 5000 cycles
5. Fill the water bath.

6. Monitor the temperature from the computer screen. Once the temperature has been reached  $122 \pm 2^{\circ}\text{F}$  ( $50 \pm 1^{\circ}\text{C}$ ), allow the test specimens to be saturated in the water for additional 30 minutes.
7. Start the test after the test specimens have been in the water for 30 minutes at  $122 \pm 2^{\circ}\text{F}$  ( $50 \pm 1^{\circ}\text{C}$ ).
8. The test should automatically stop when 20,000 cycles have passed or if deformation of 24.0 mm has been reached.
9. Fill in the required data in the first sheet of the enclosed Excel file “Hamburg Results Table”.

Email the original raw data file from the test and the “Hamburg Results Table” Excel file to Haleh Azari at [hazari@amrl.net](mailto:hazari@amrl.net).



## RESULTS SHEET

### Bulk Specific Gravity Measurement

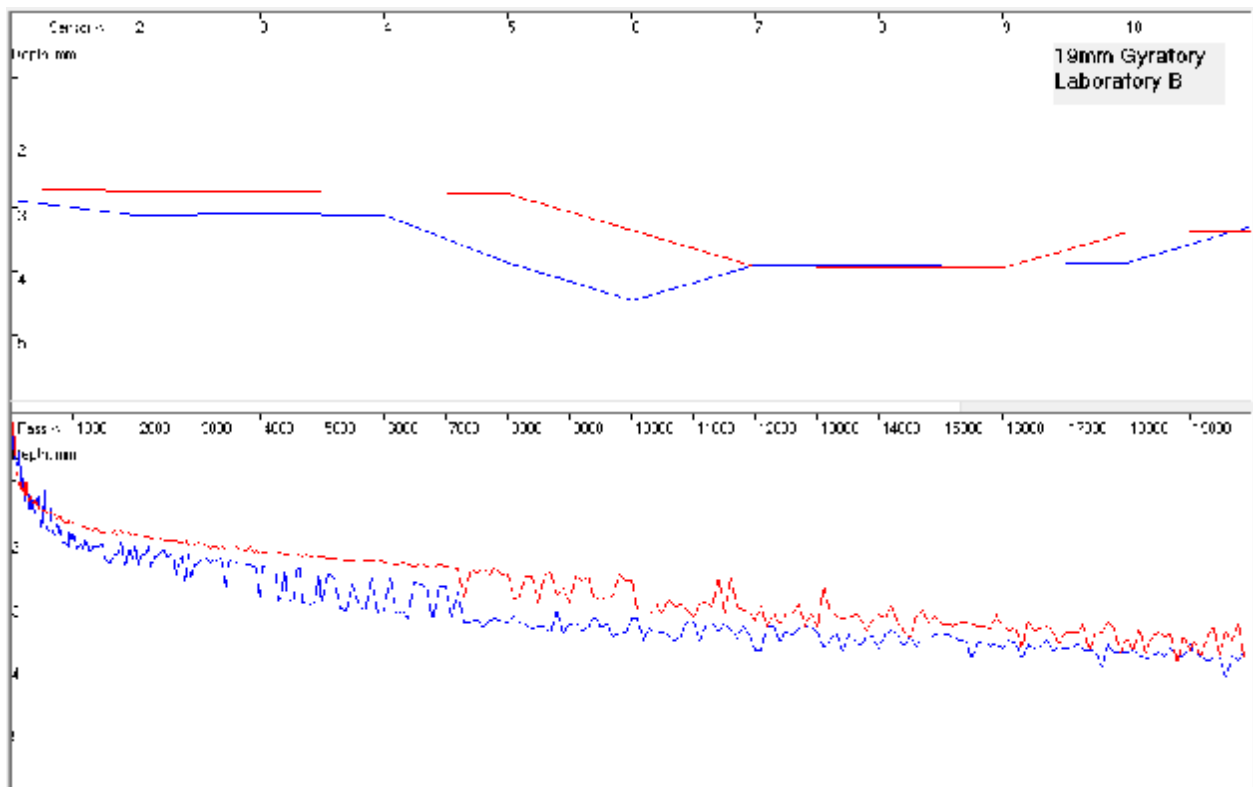
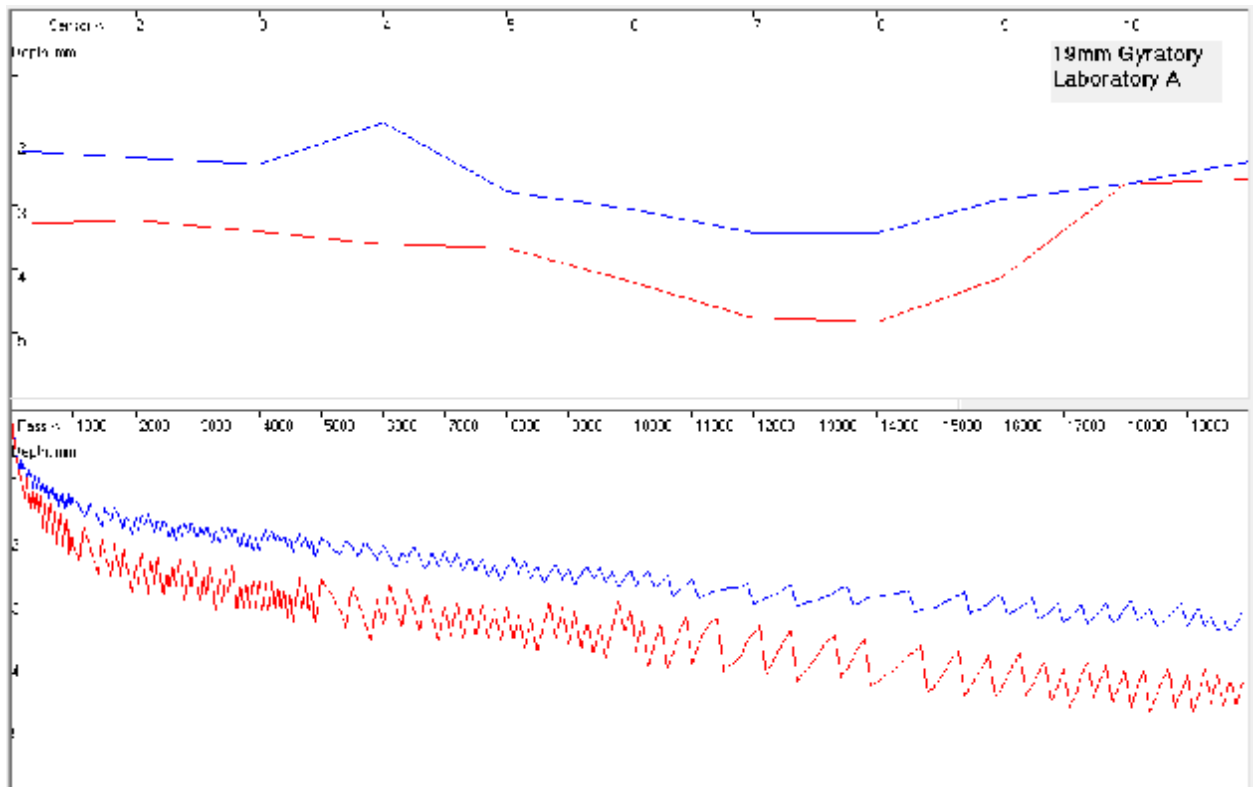
Data Sheet for the ILS of Hamburg Wheel Track Testing- Air Void Results				
Sample ID				
Material				
Sample Type (gyratory, slab)				
Date Received				
Date Tested				
<b>SSD Method</b>				
Sample ID				
Dry Mass in Air, g				
SSD Mass, g				
Mass in Water, g				
Volume, cm <sup>3</sup>				
Bulk Specific Gravity				
<b>Corelok Method</b>				
Sample ID				
Dry Mass of Sample before Sealing, g				
Mass of Bag, g				
Mass of Sealed Sample in Water, g				
Mass of Dry Sample after Submersion, g				
Ratio of Dry Mass to Mass of bag				
Bag Volume Correction Factor				
Volume, cm <sup>3</sup>				
Bulk Specific Gravity				
<b>Gilson Method</b>				
Sample ID				
Dry Mass, g				
Volume, cm <sup>3</sup>				
Bulk Specific Gravity				

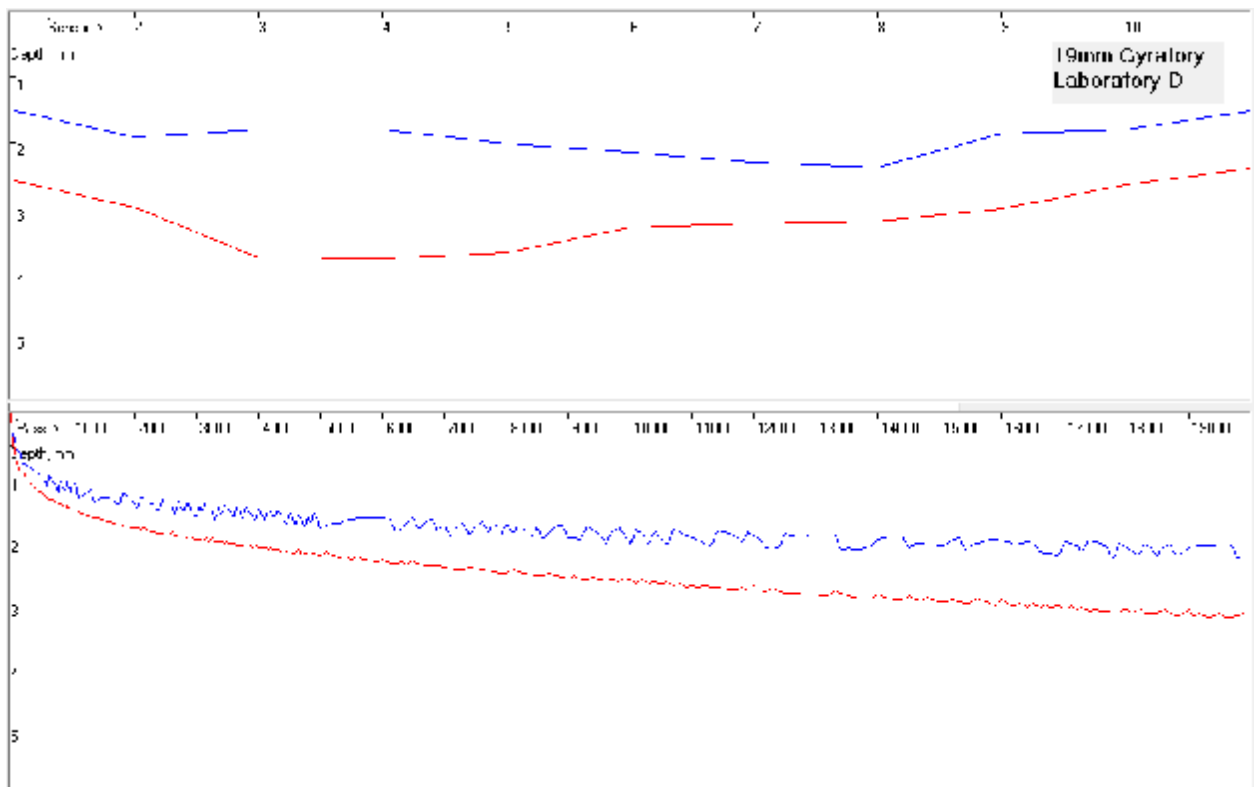
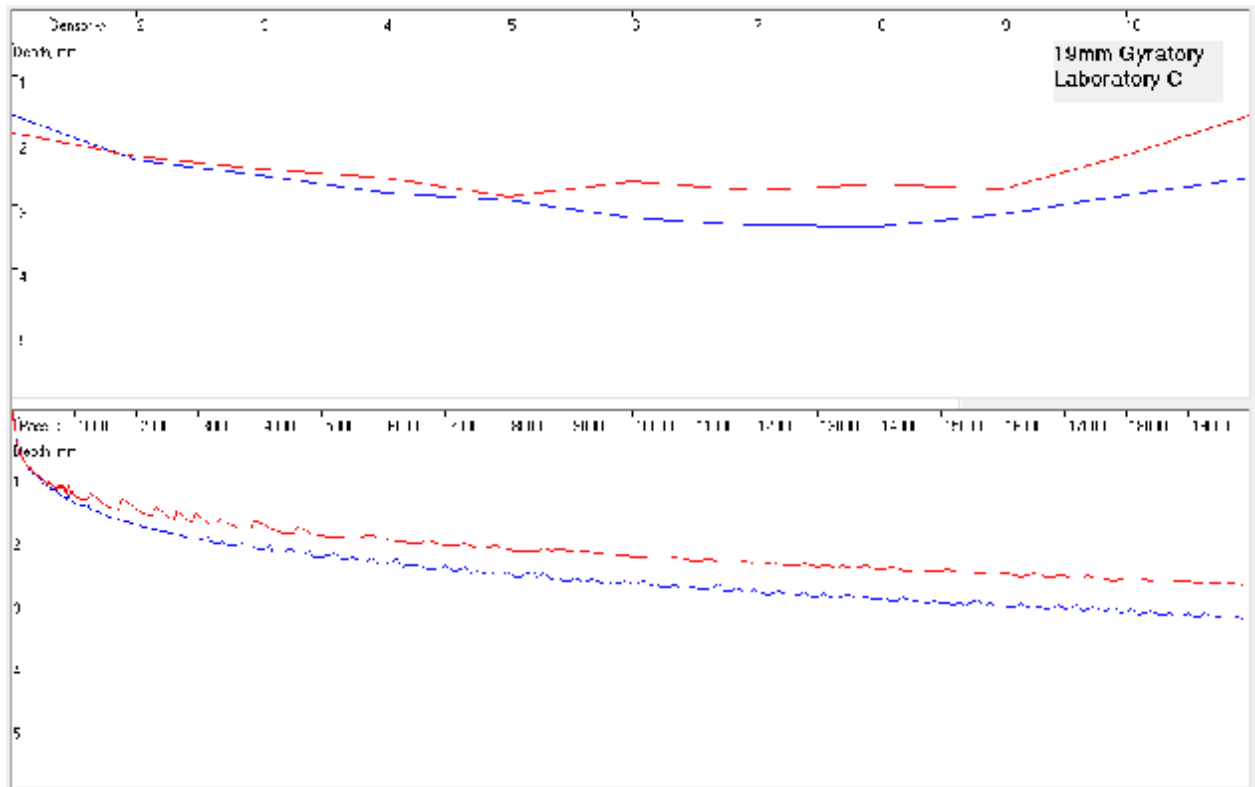
*Hamburg Wheel Track Tester Measurements*

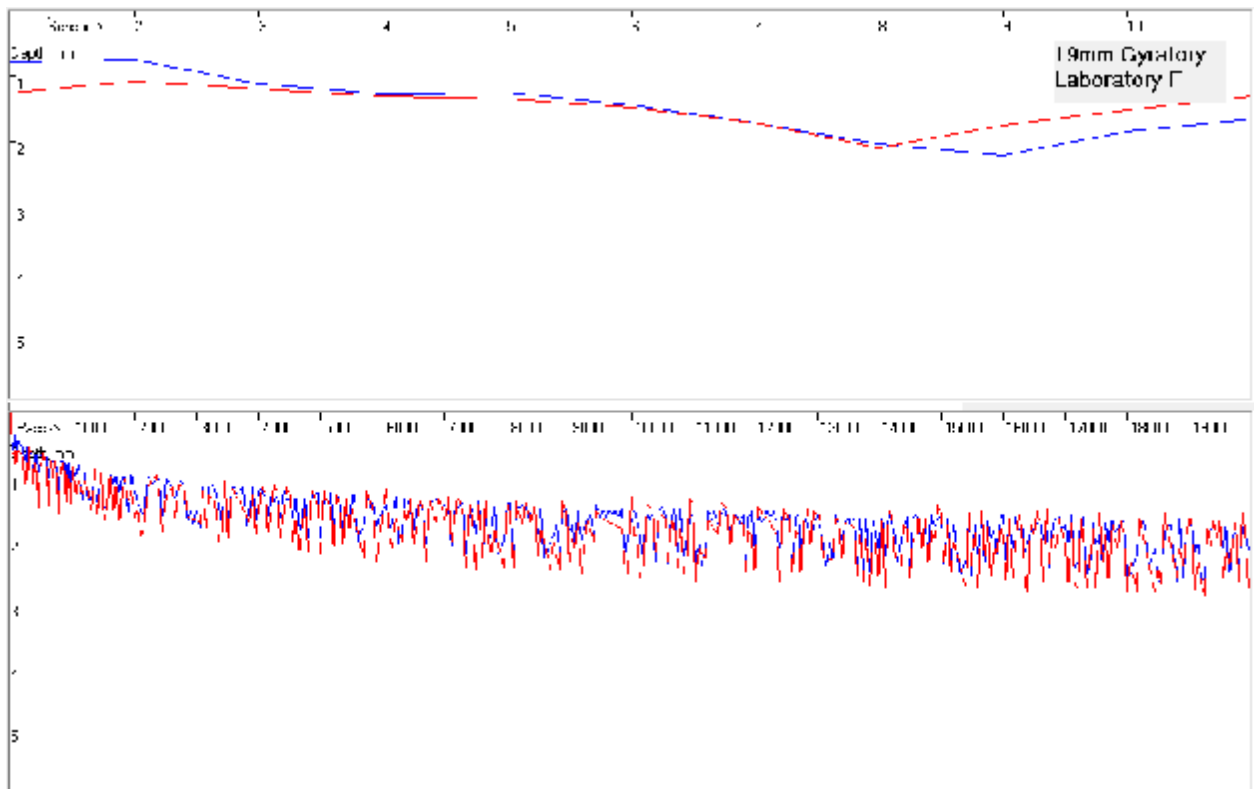
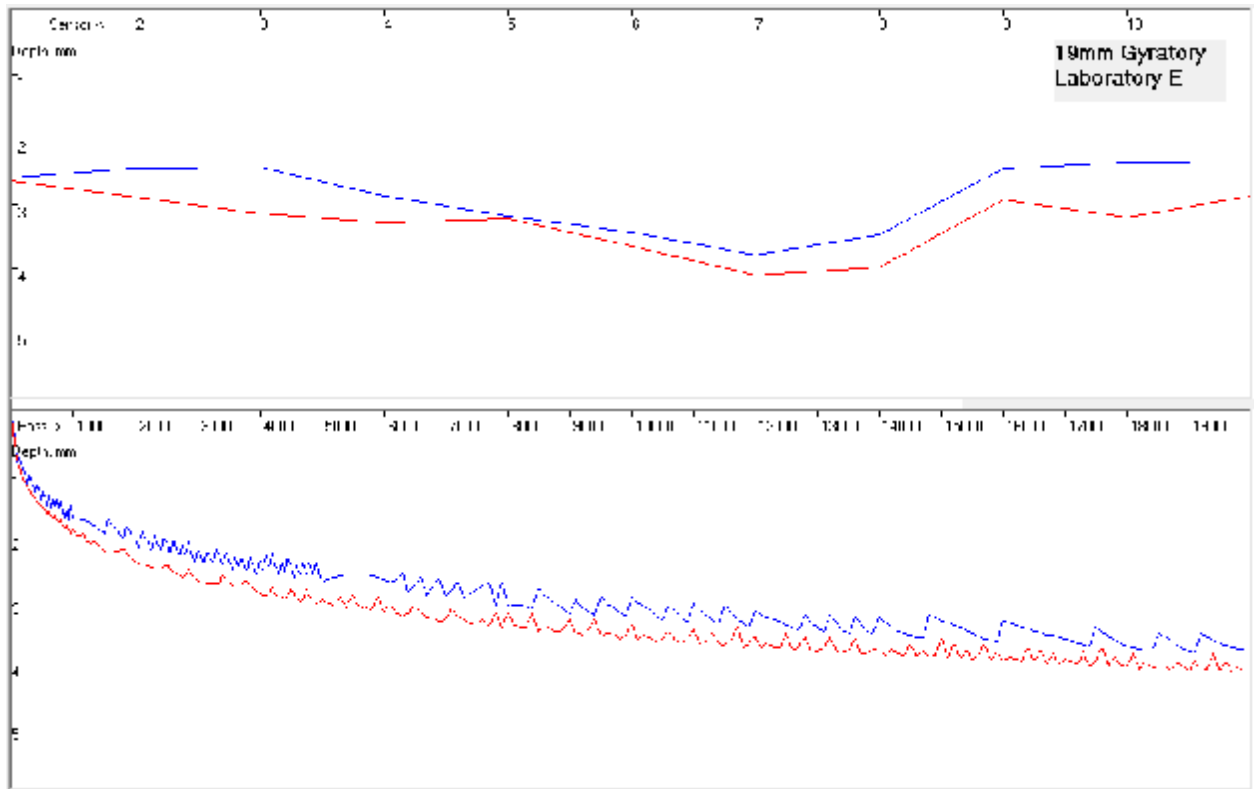
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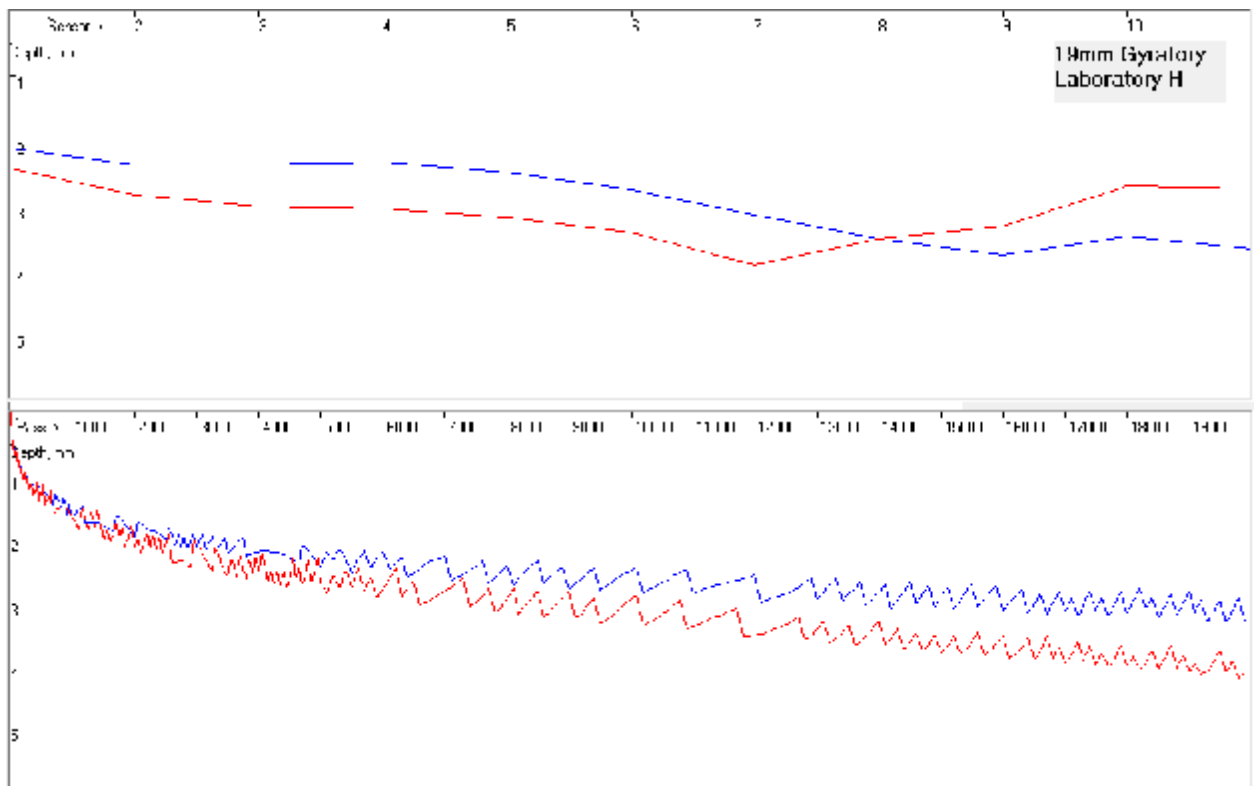
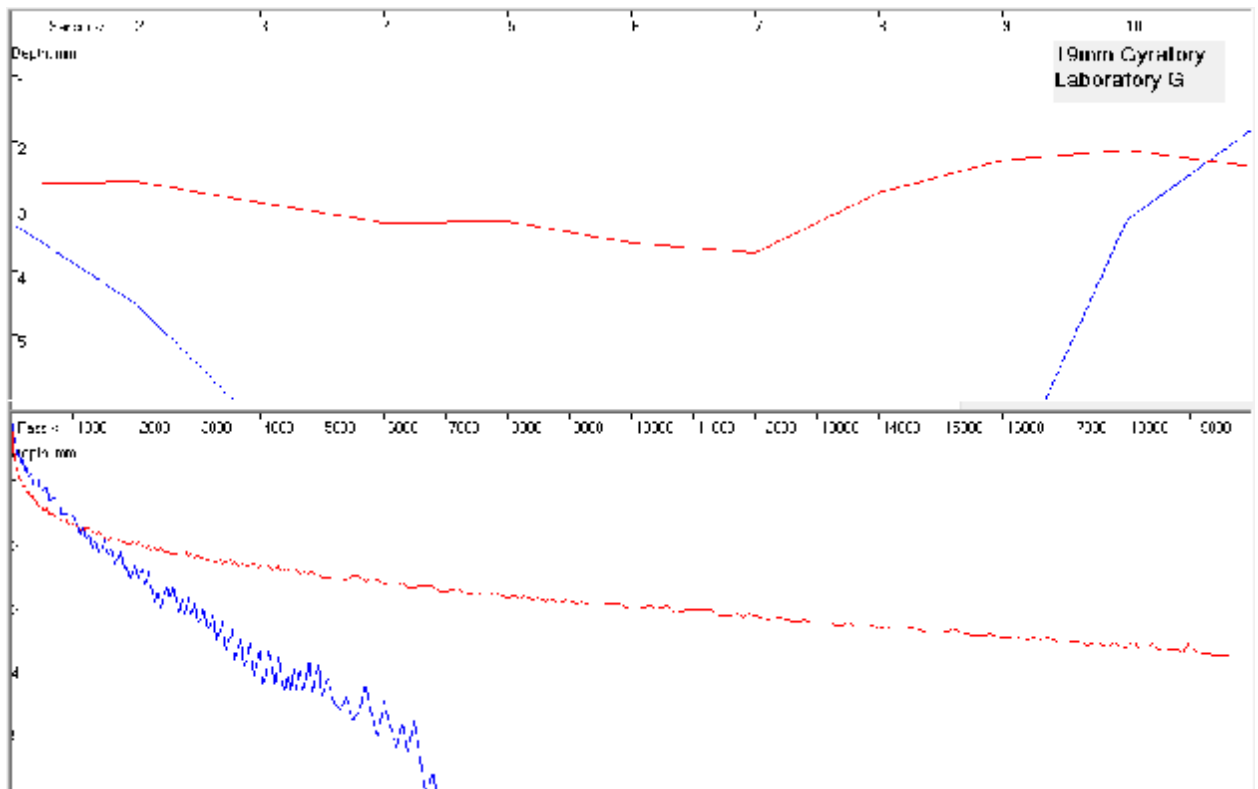
Data Sheet for the ILS of Hamburg Wheel Track Testing- Hamburg Results				
Laboratry Name				
Material				
Sample Type (gyratory, slab)				
Date Received				
Date Tested				
Sample ID				
Samples Location	Right		Left	
Temperature				
Load, N (lbf)				
Rut Depth at 5000 Passes (mm)				
Rut Depth at 10,000 Passes (mm)				
Rut Depth at 15,000 Passes (mm)				
Rut Depth at 20,000 Passes (mm)				
Creep Slope				
Strip Slope				
Stripping Inflection Point (Cycle)				
Visual Damage (0 to 5 rating, 5 being very damaged)				

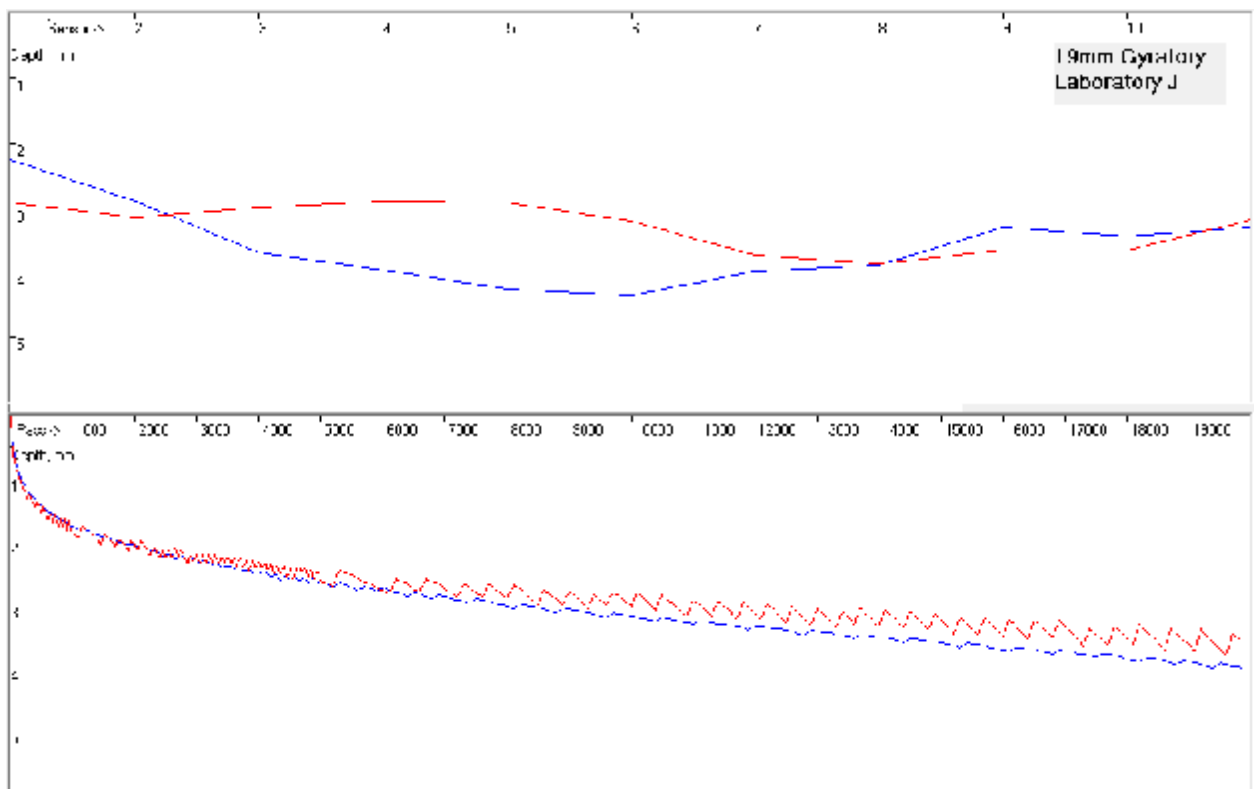
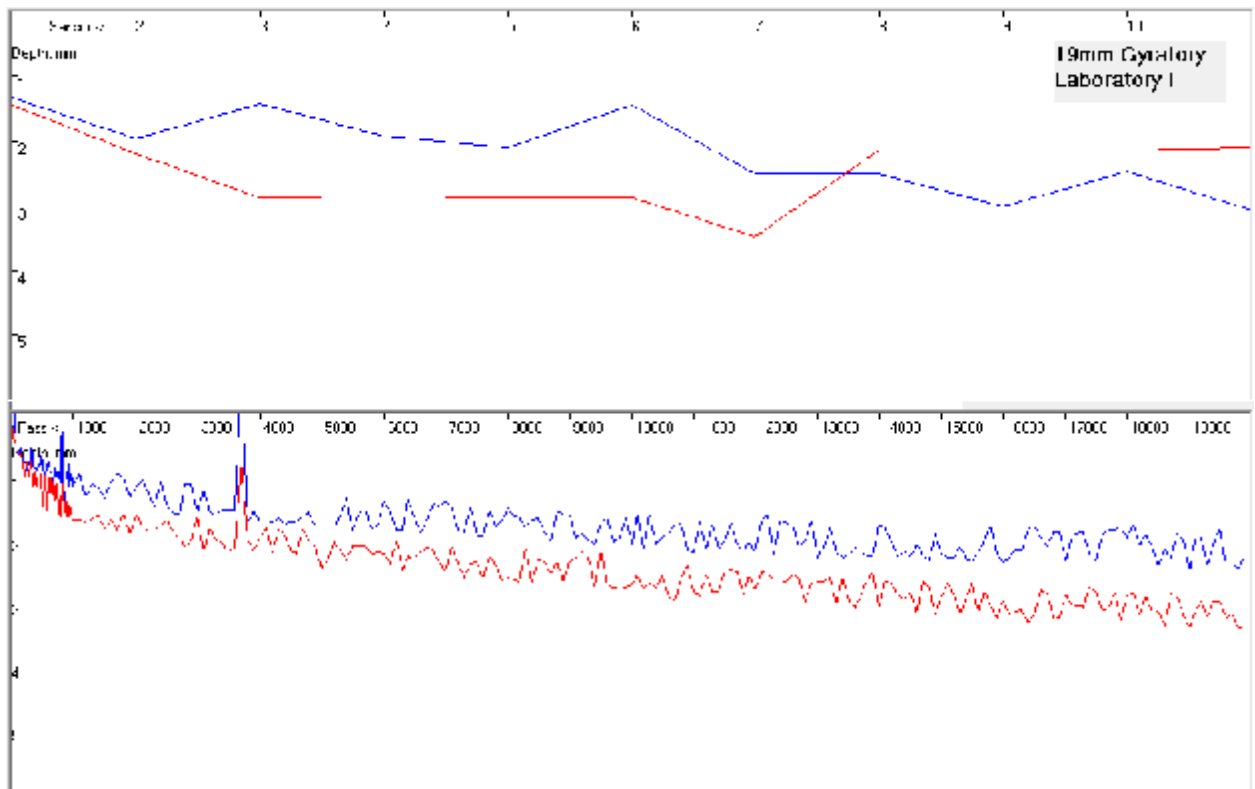
**APPENDIX B- INDIVIDUAL GRAPHS OF DEFORMATION VERSUS  
NUMBER OF CYCLES FROM EACH LABORATORY  
IN THE ILS**



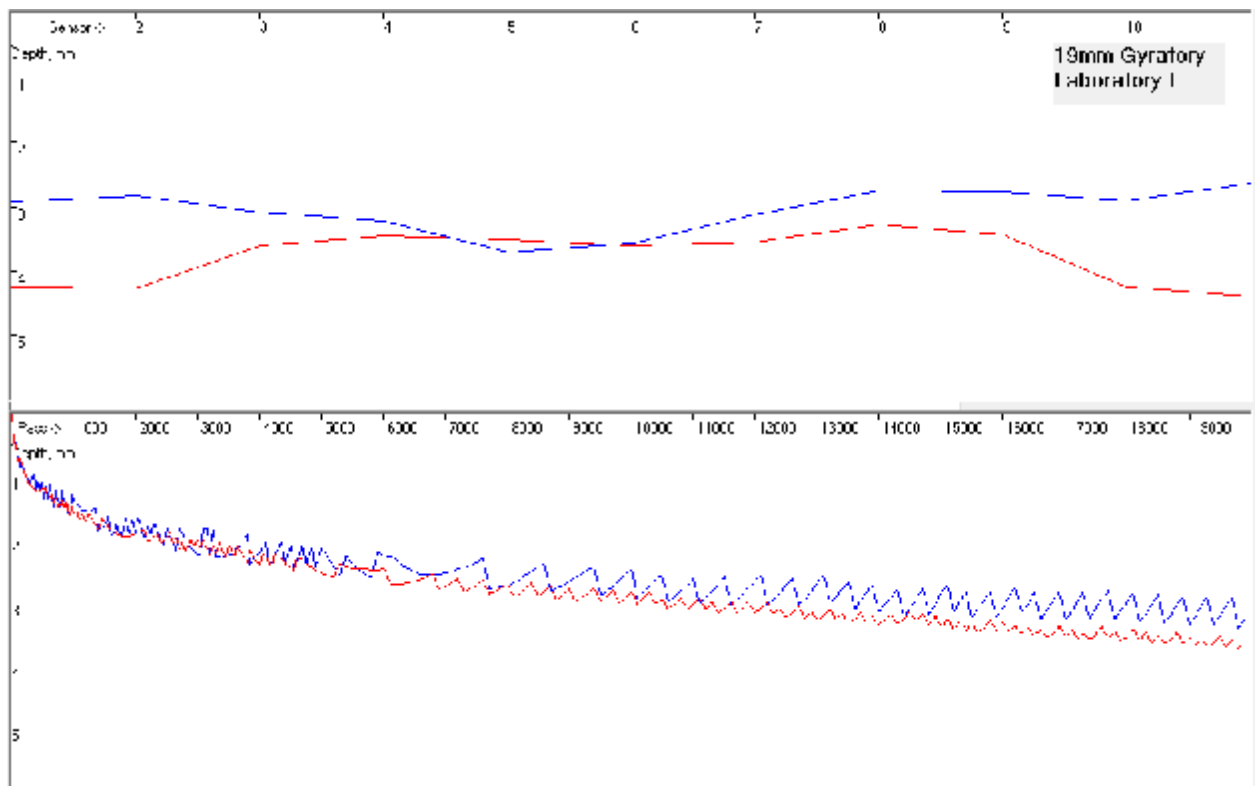
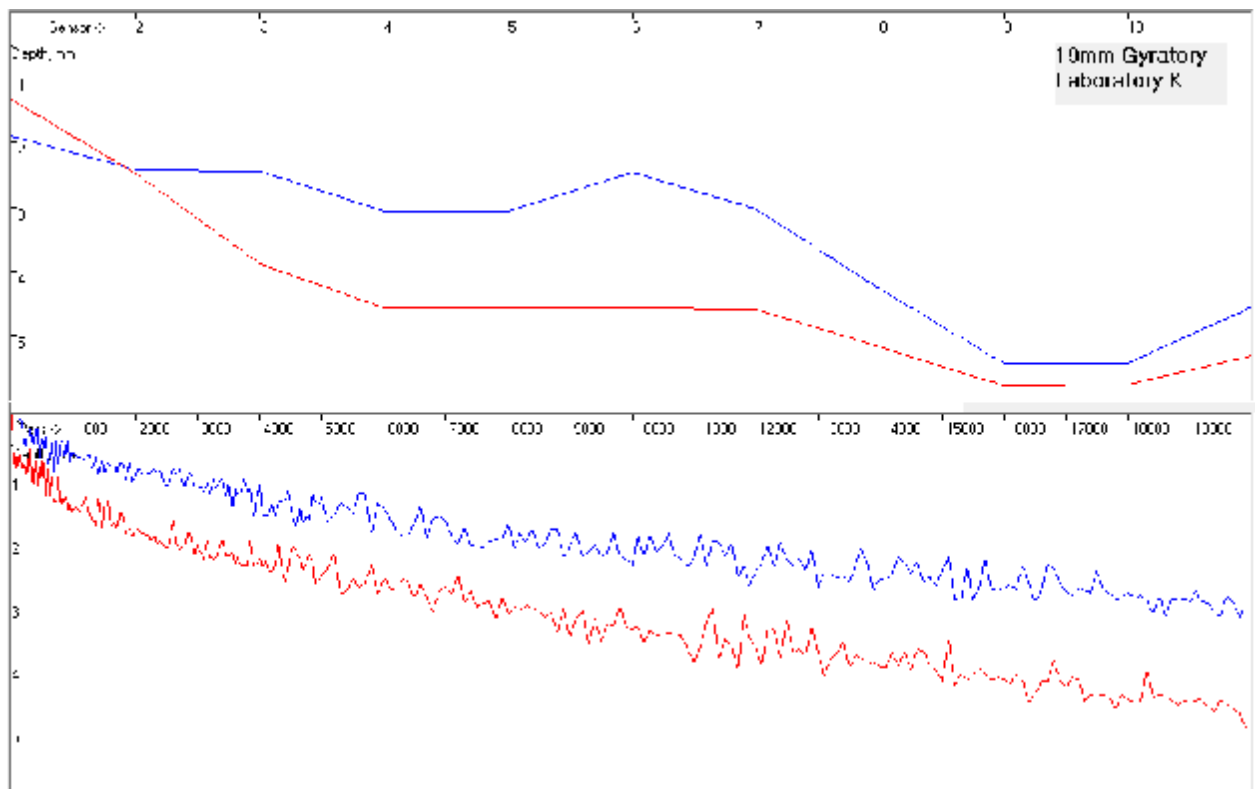


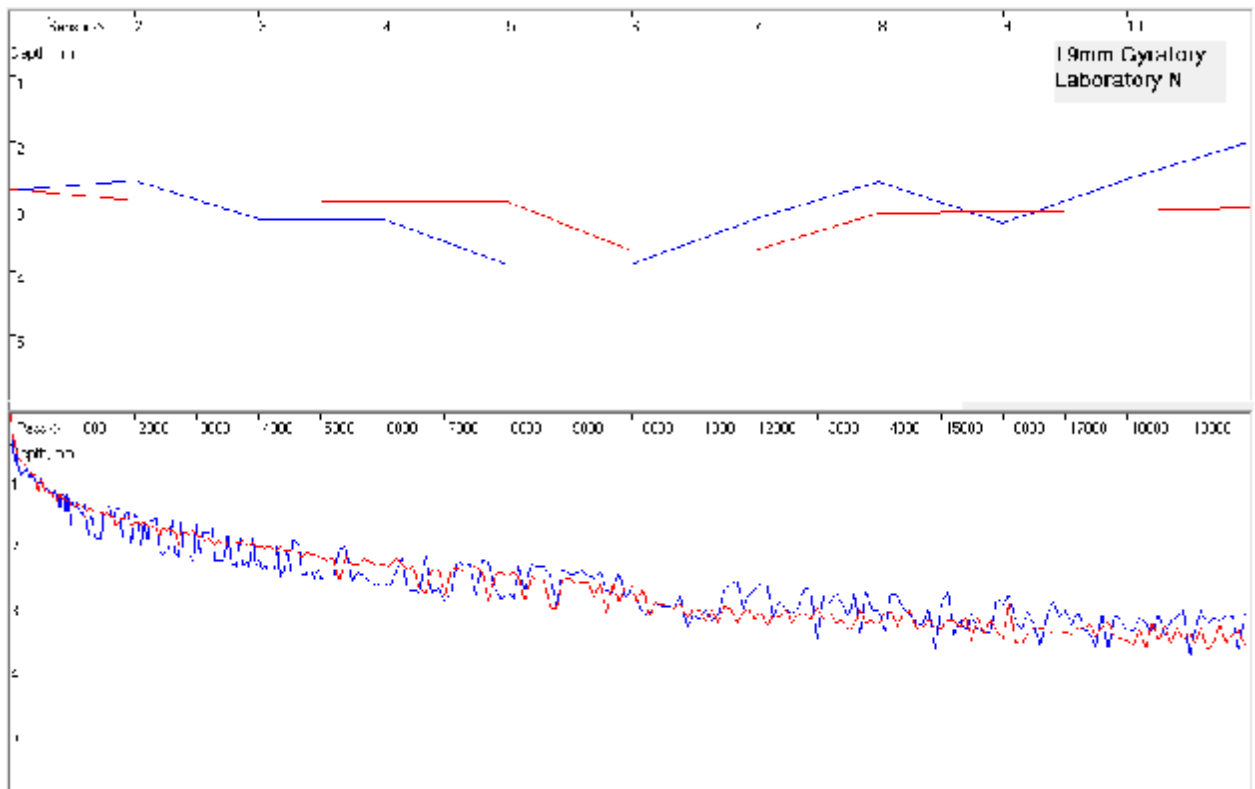
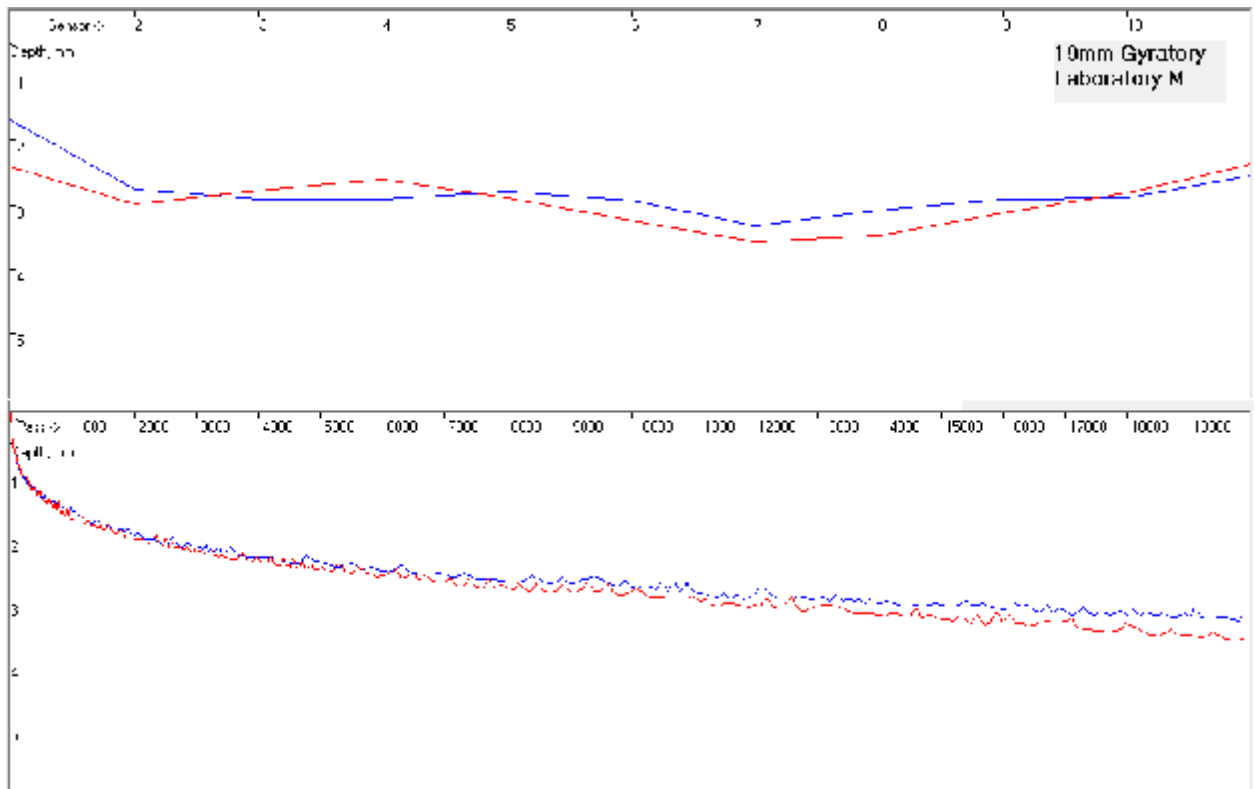


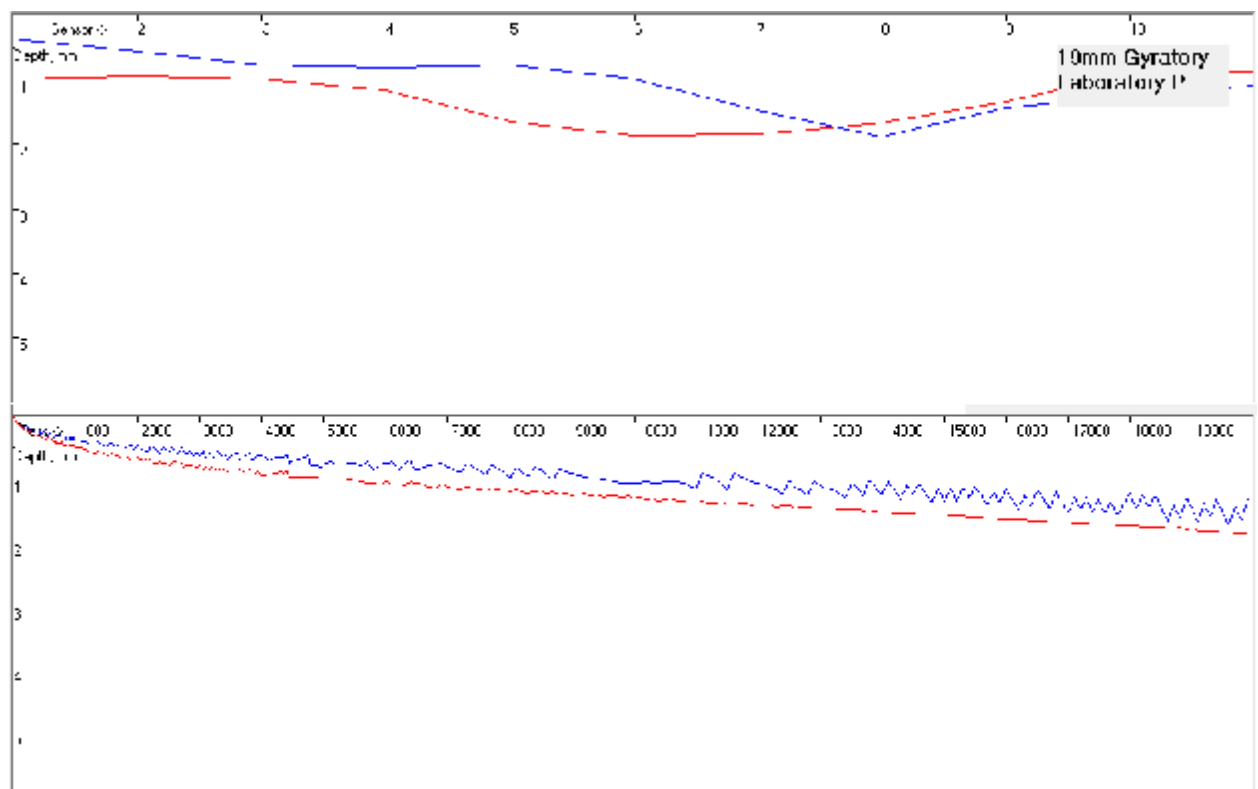
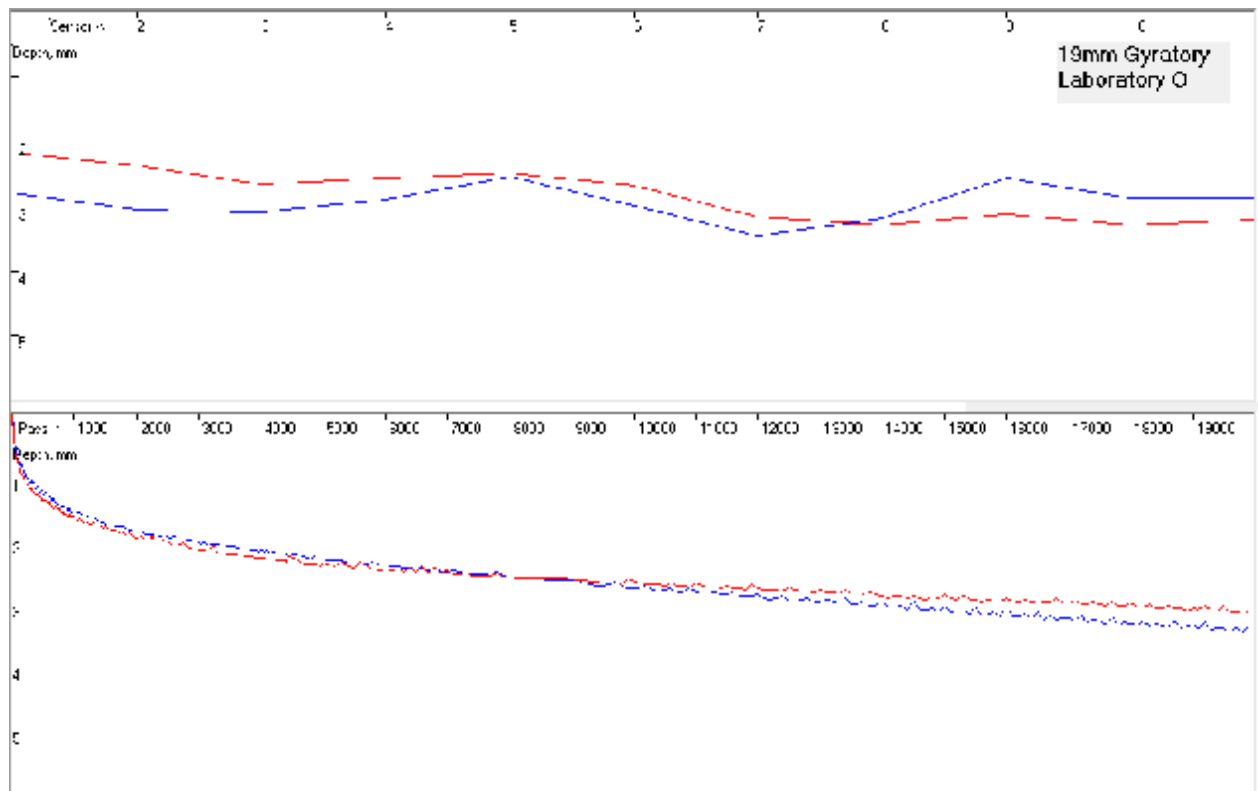


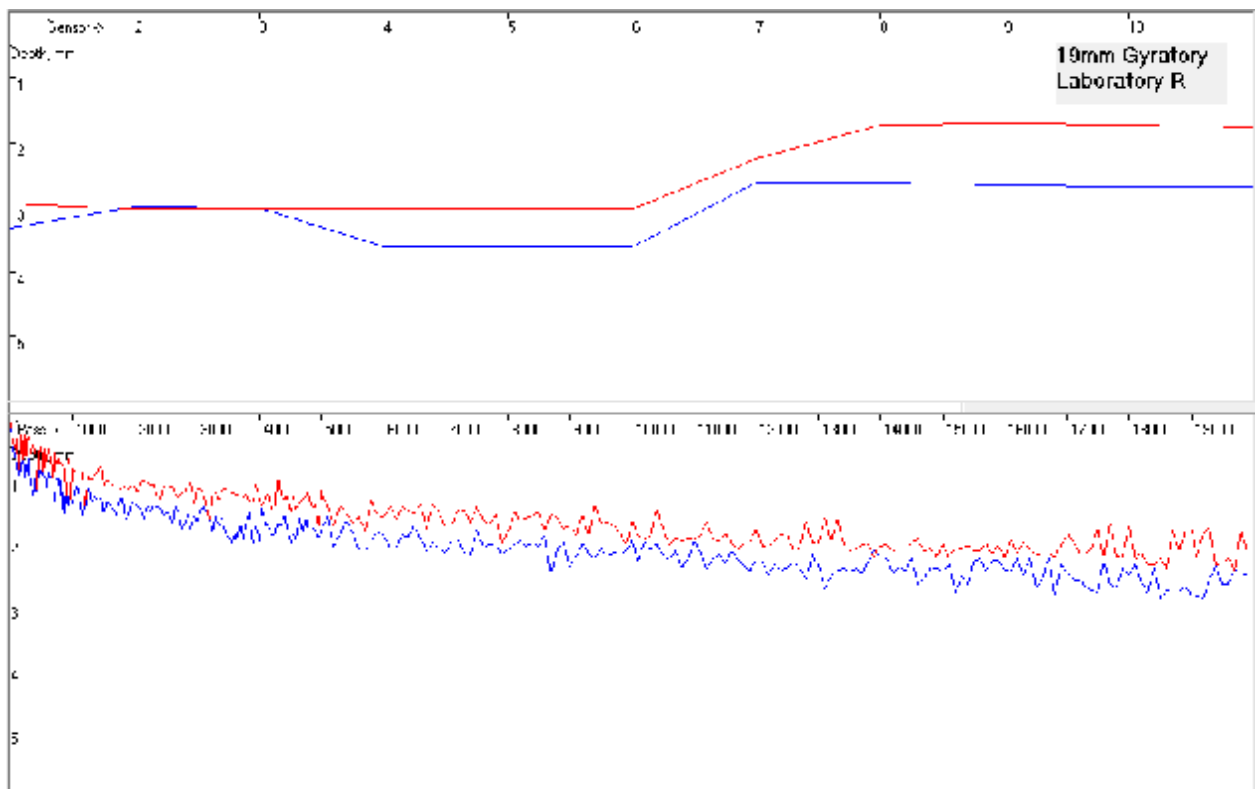
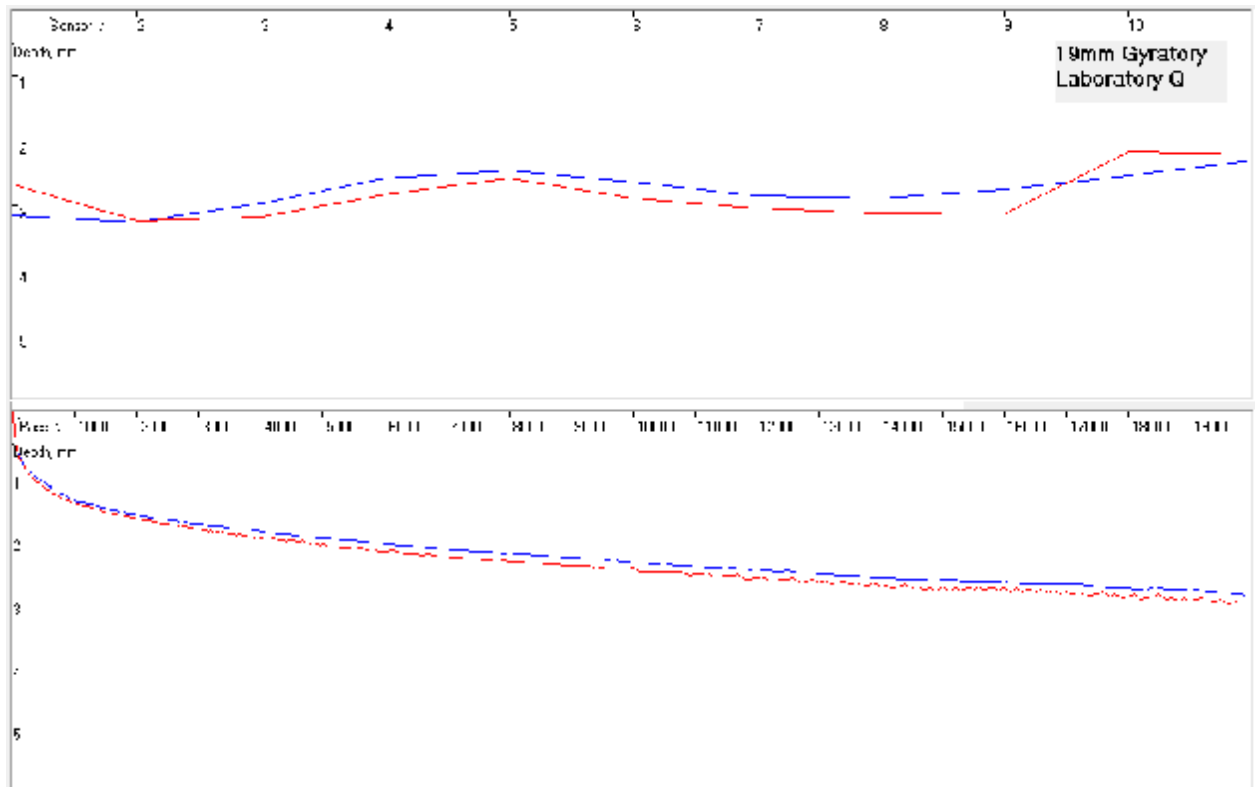


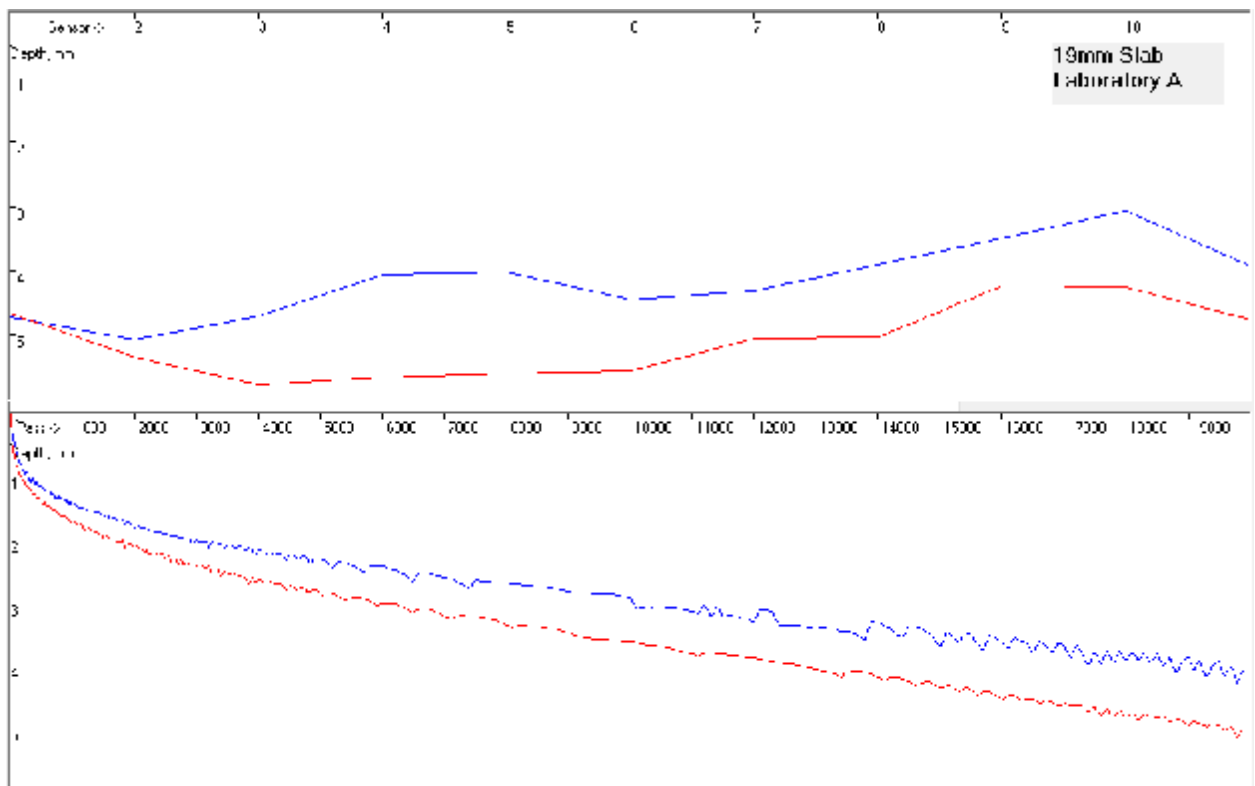
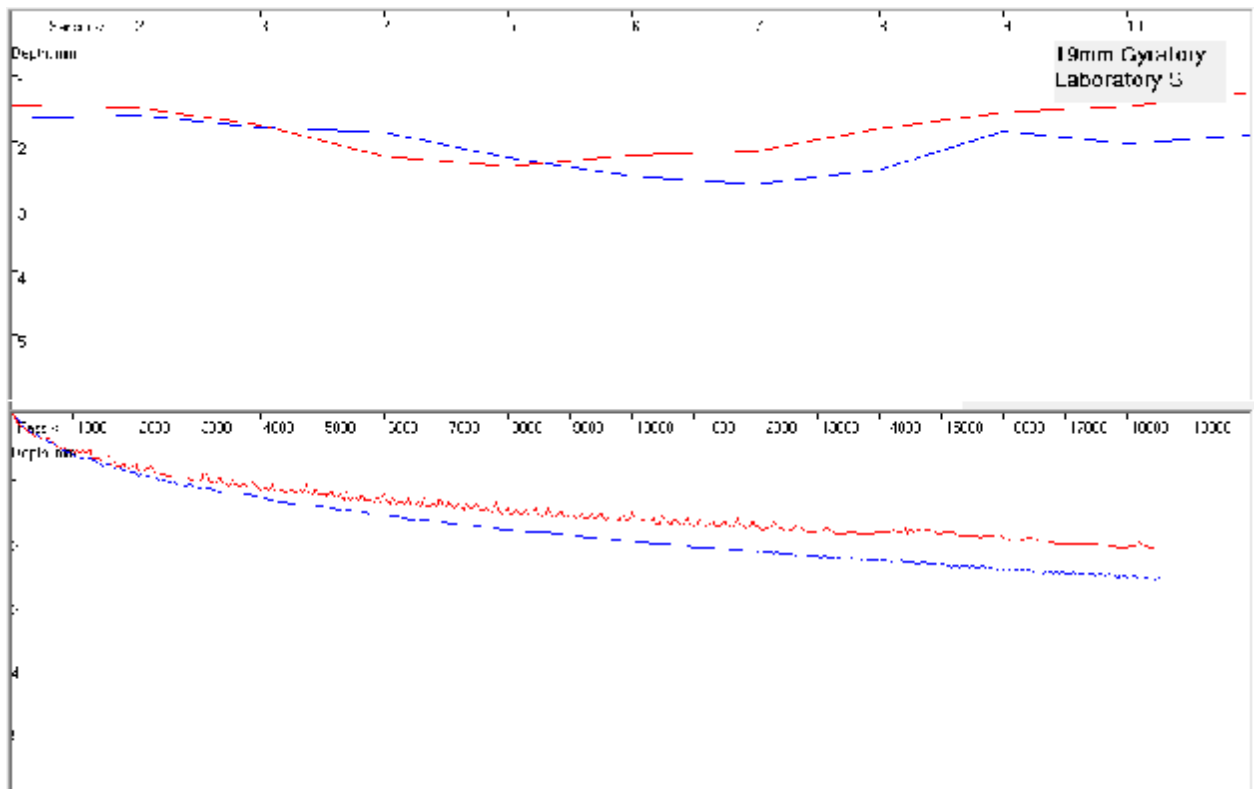


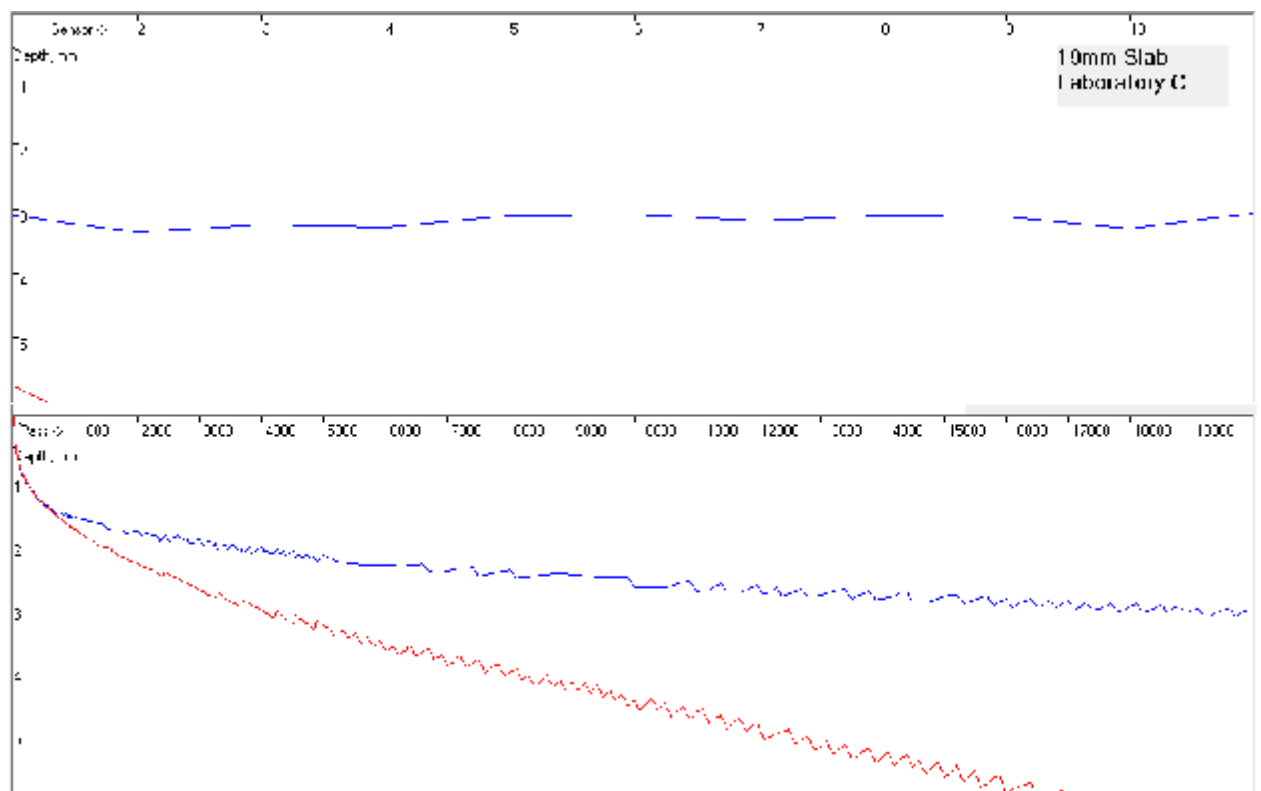
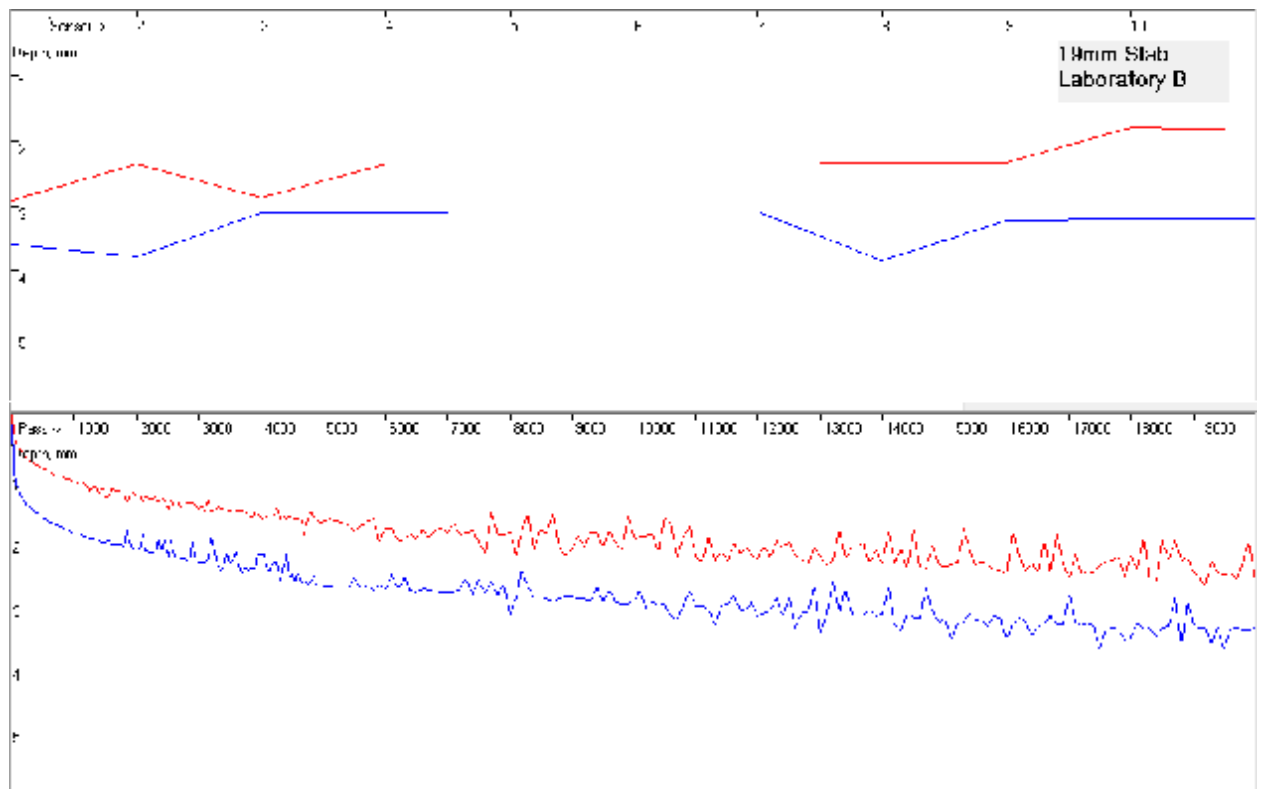


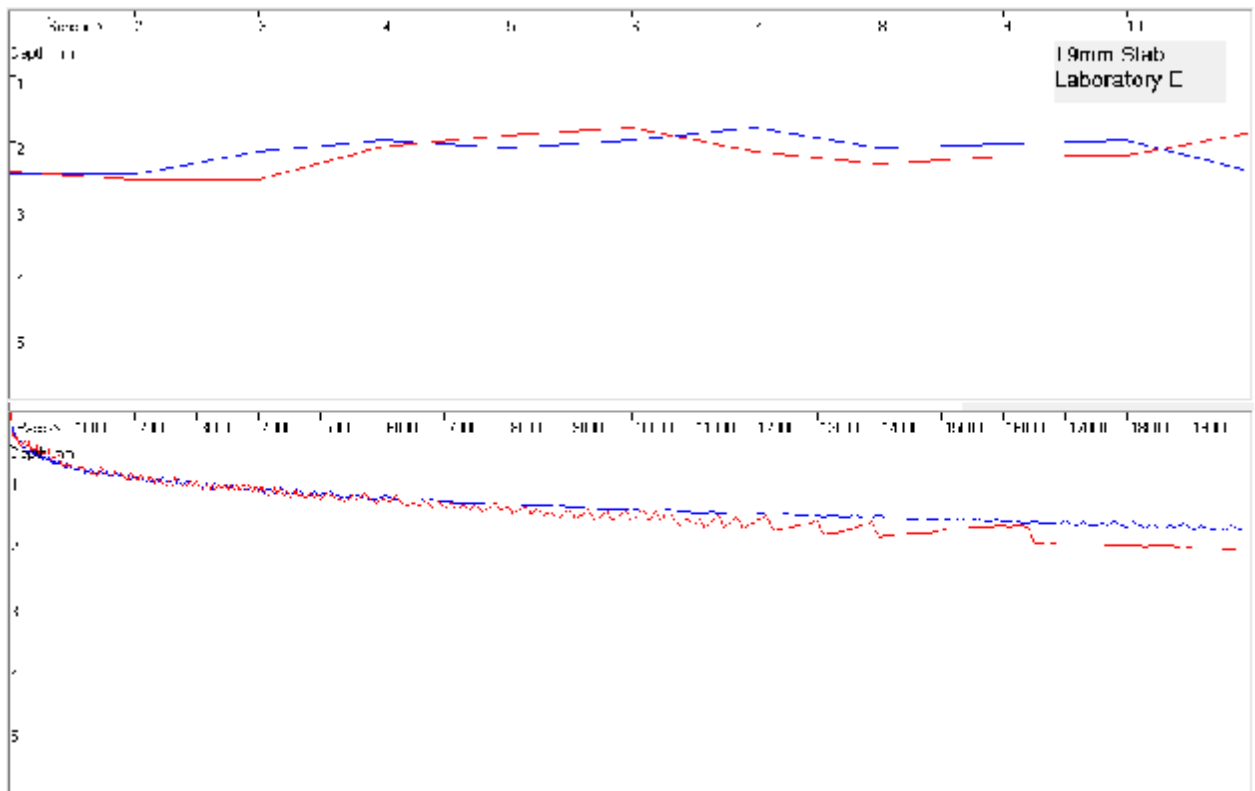
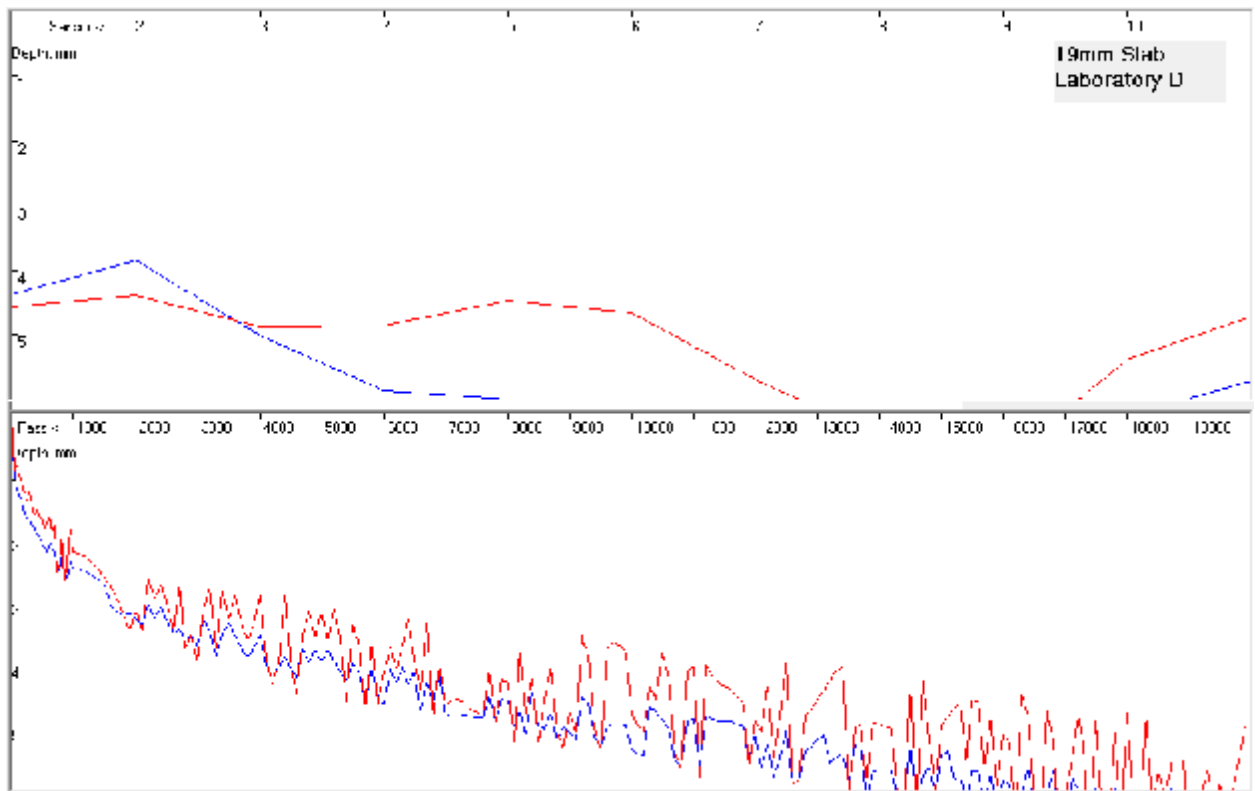


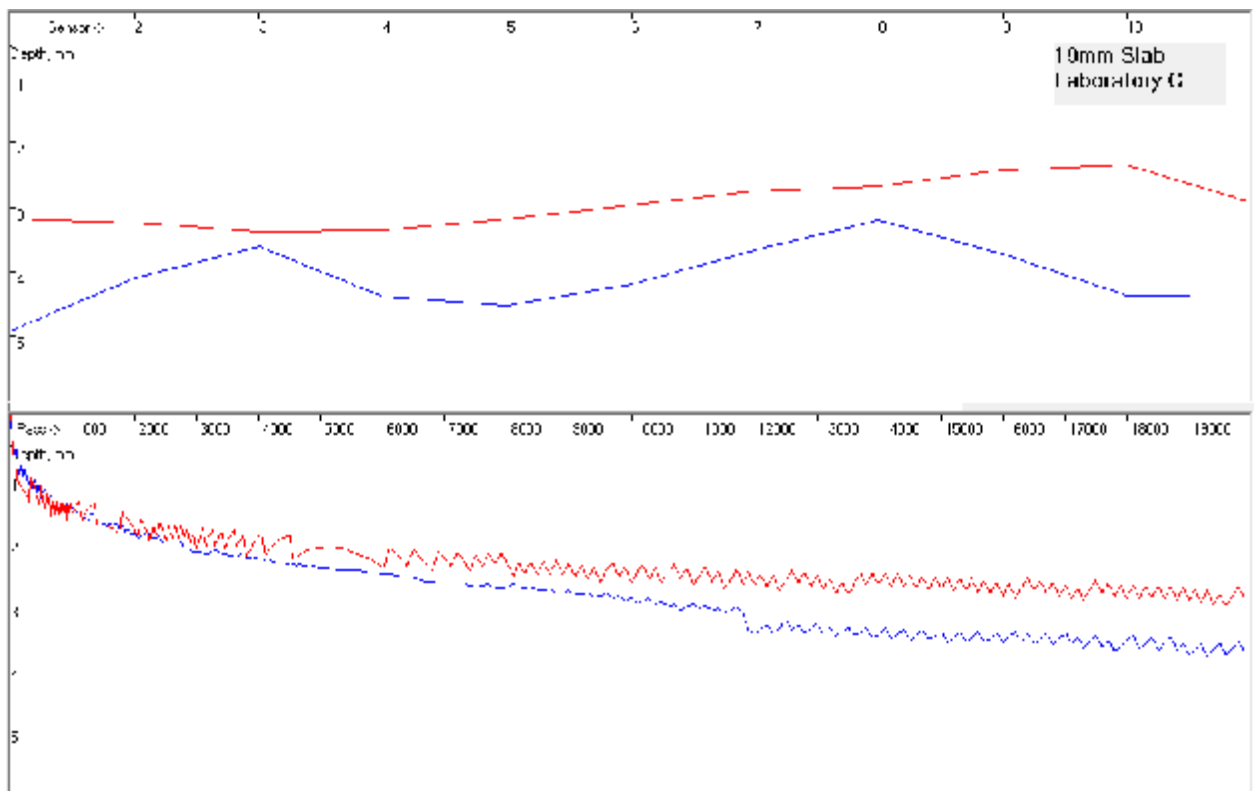
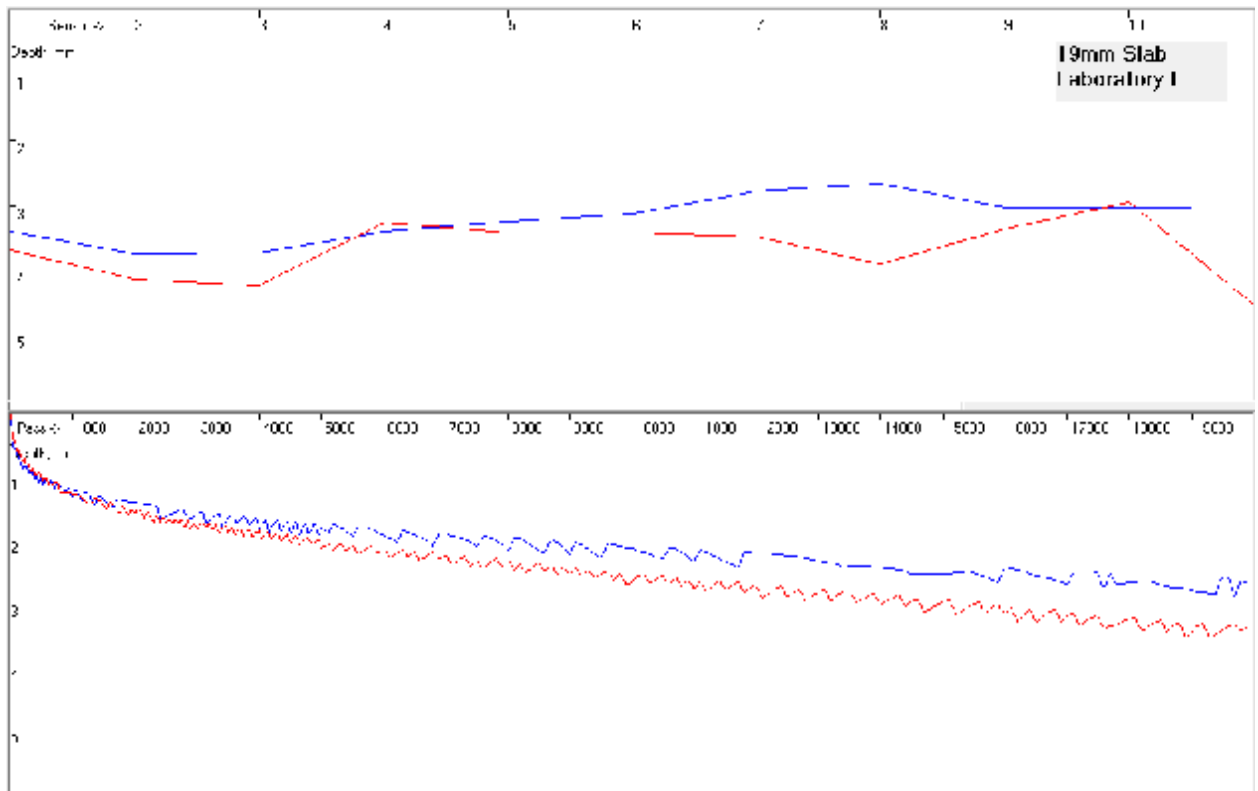




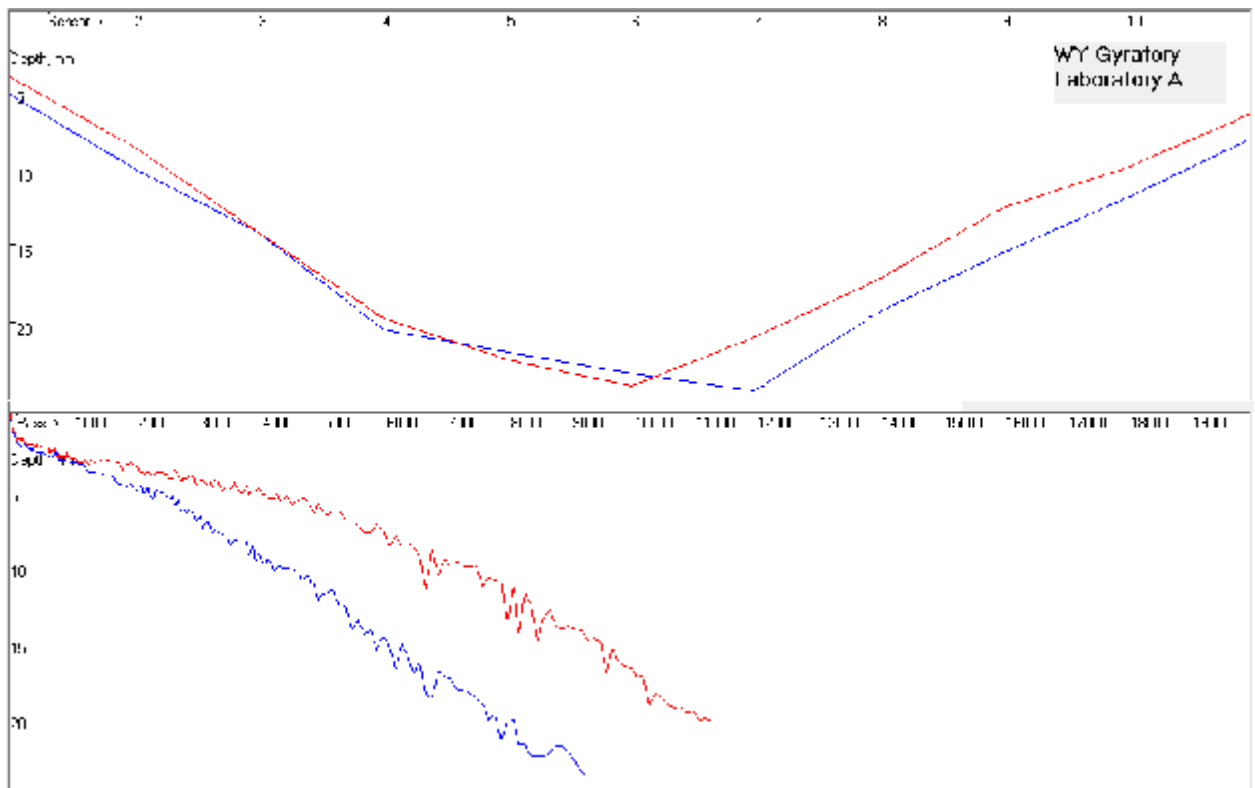
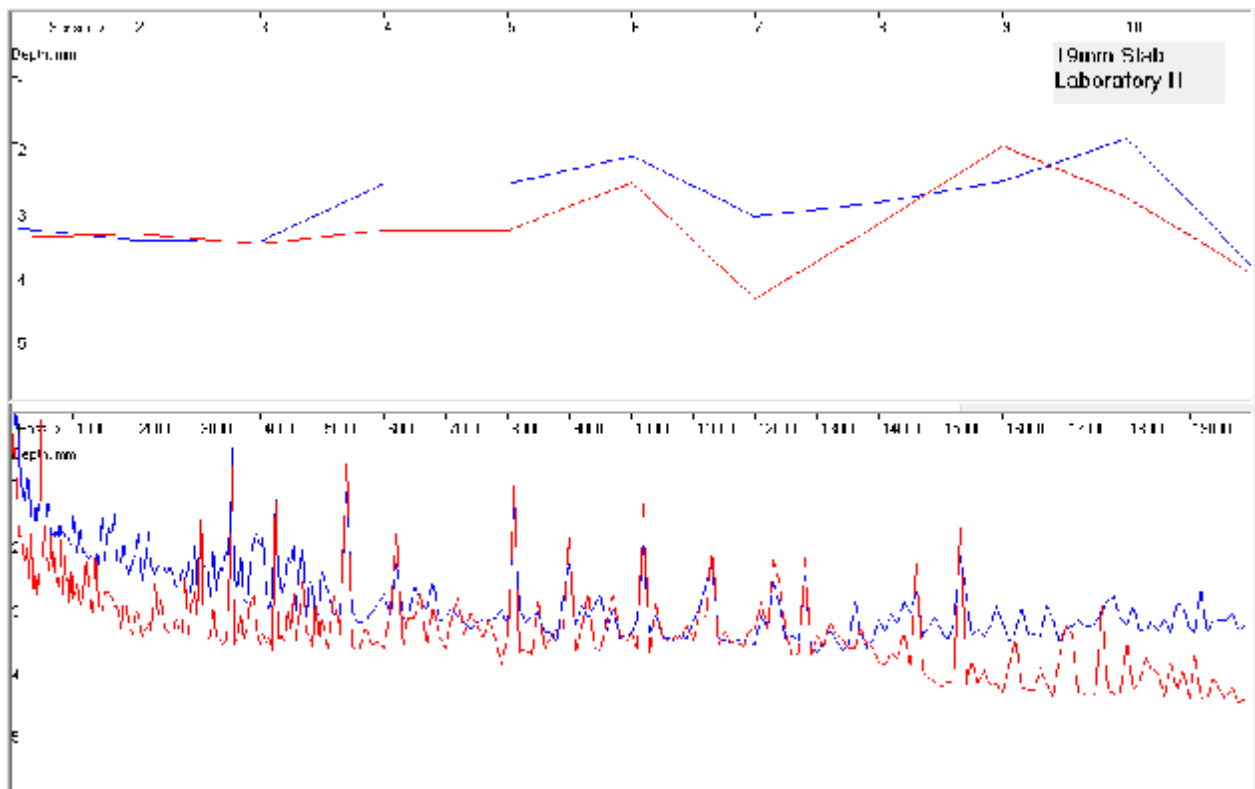


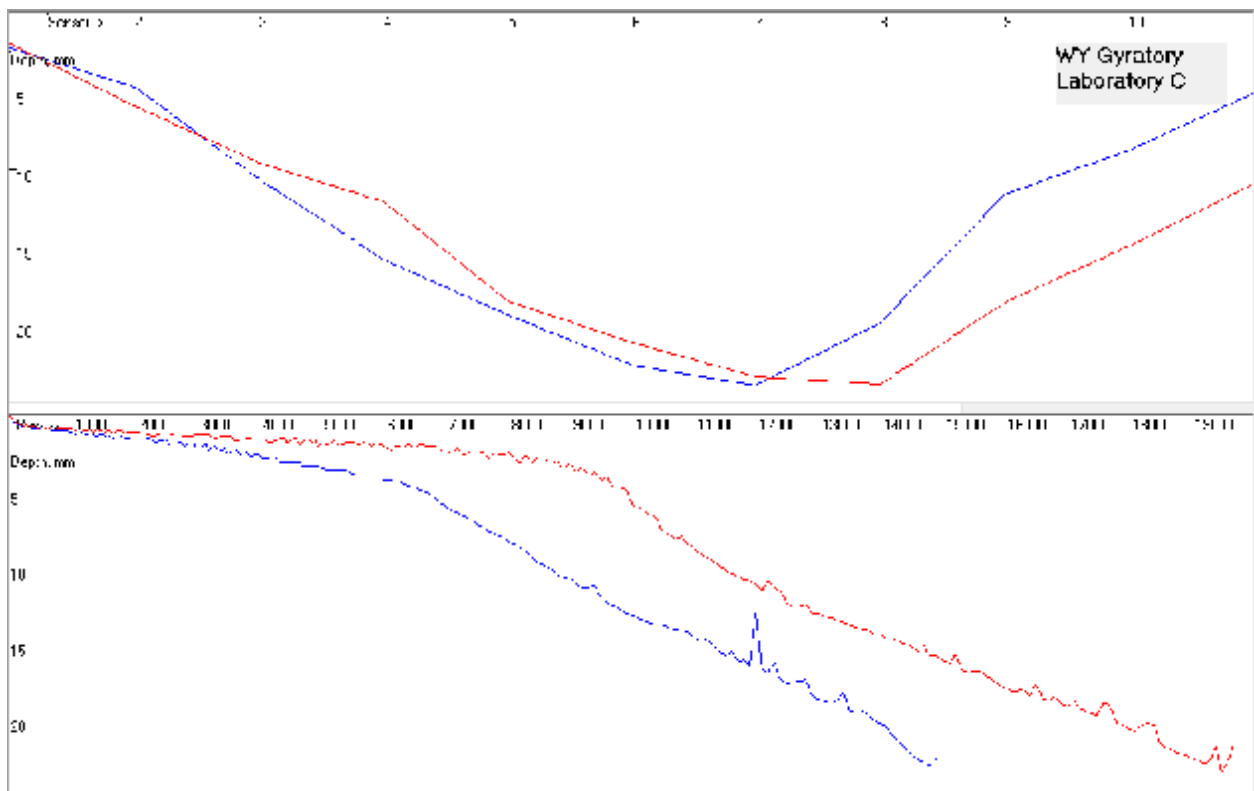
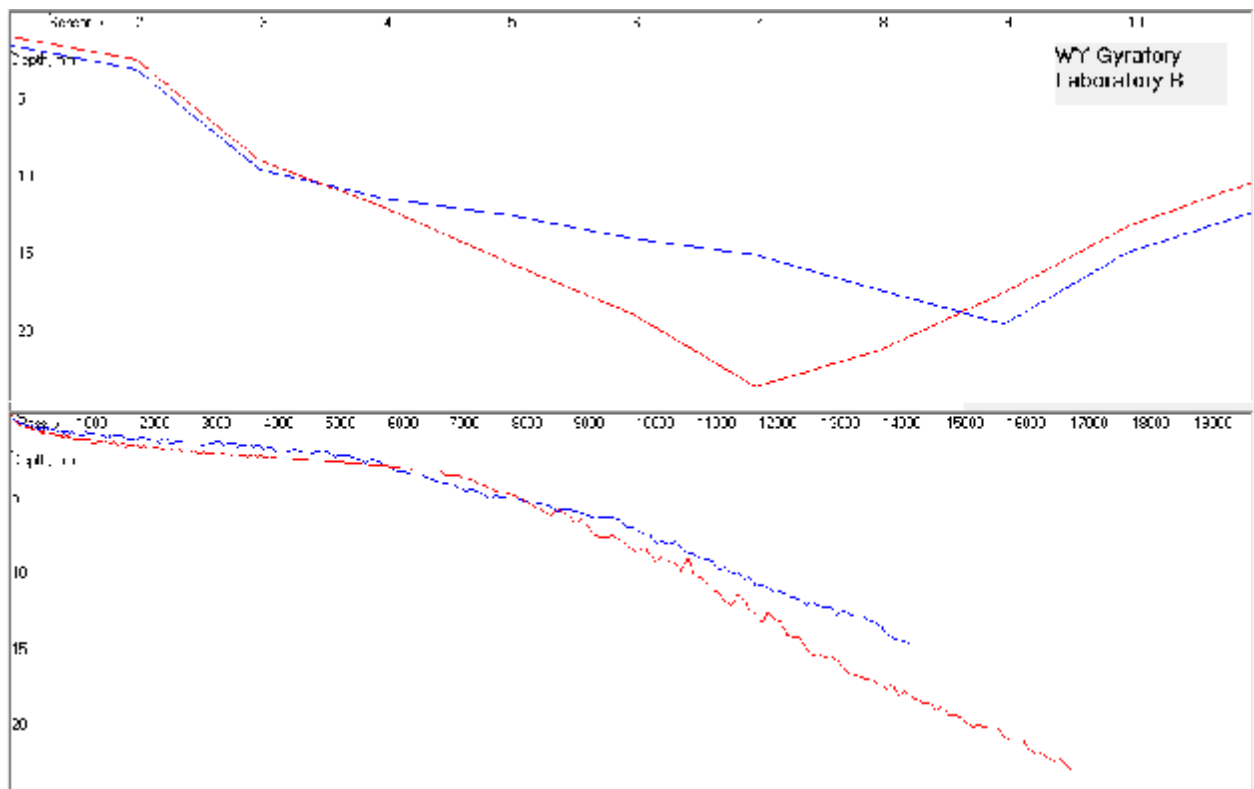


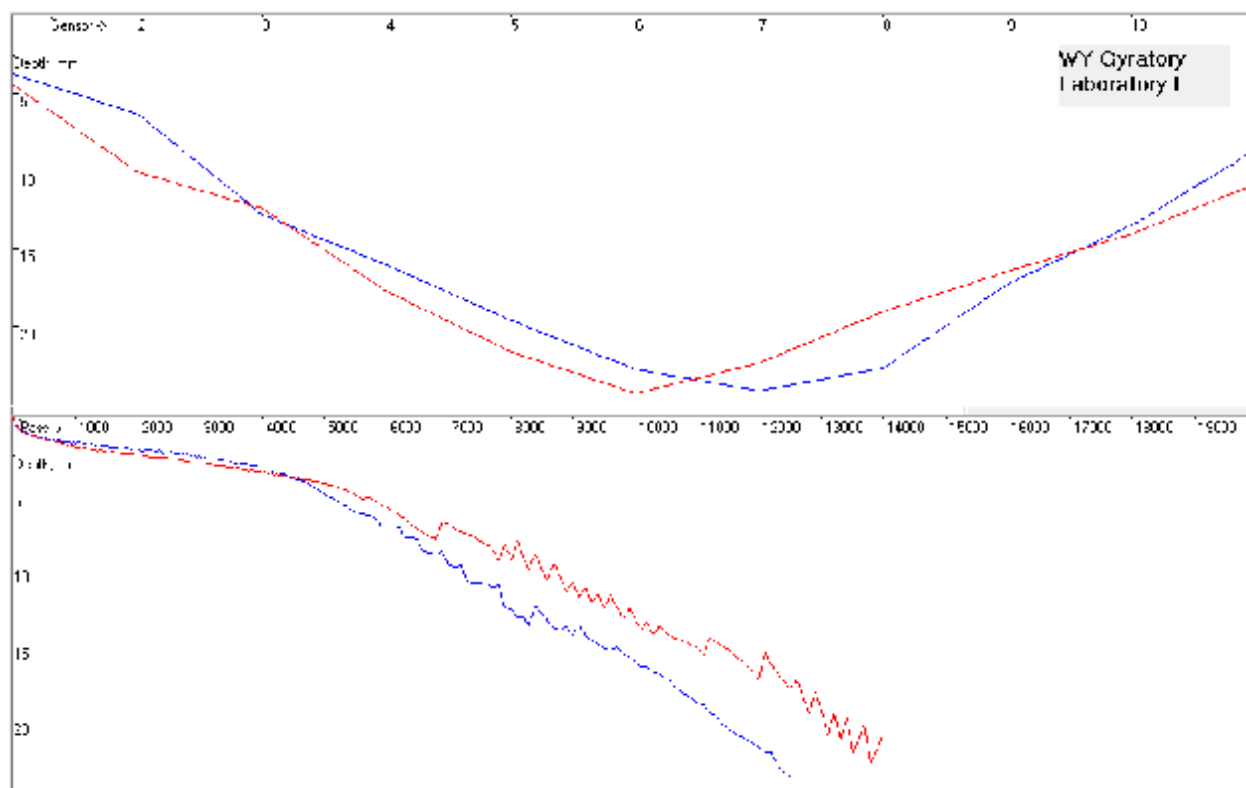
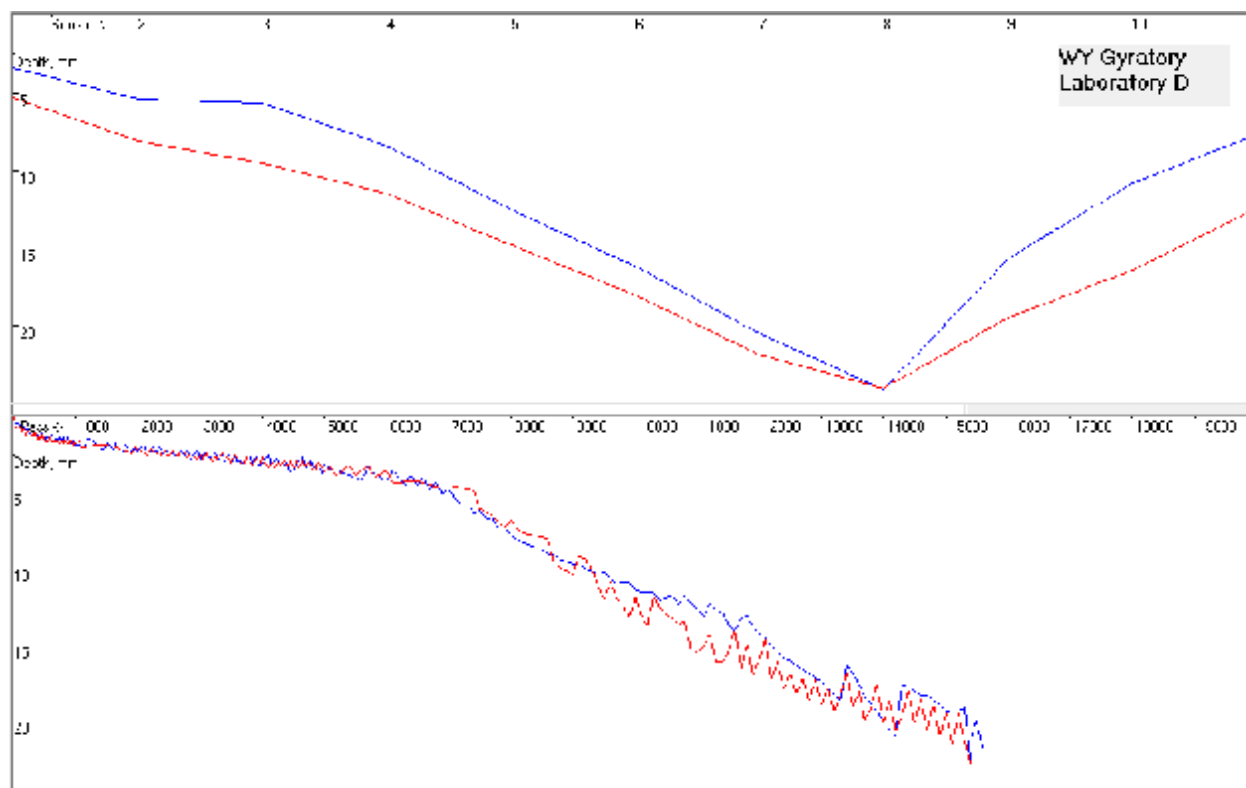


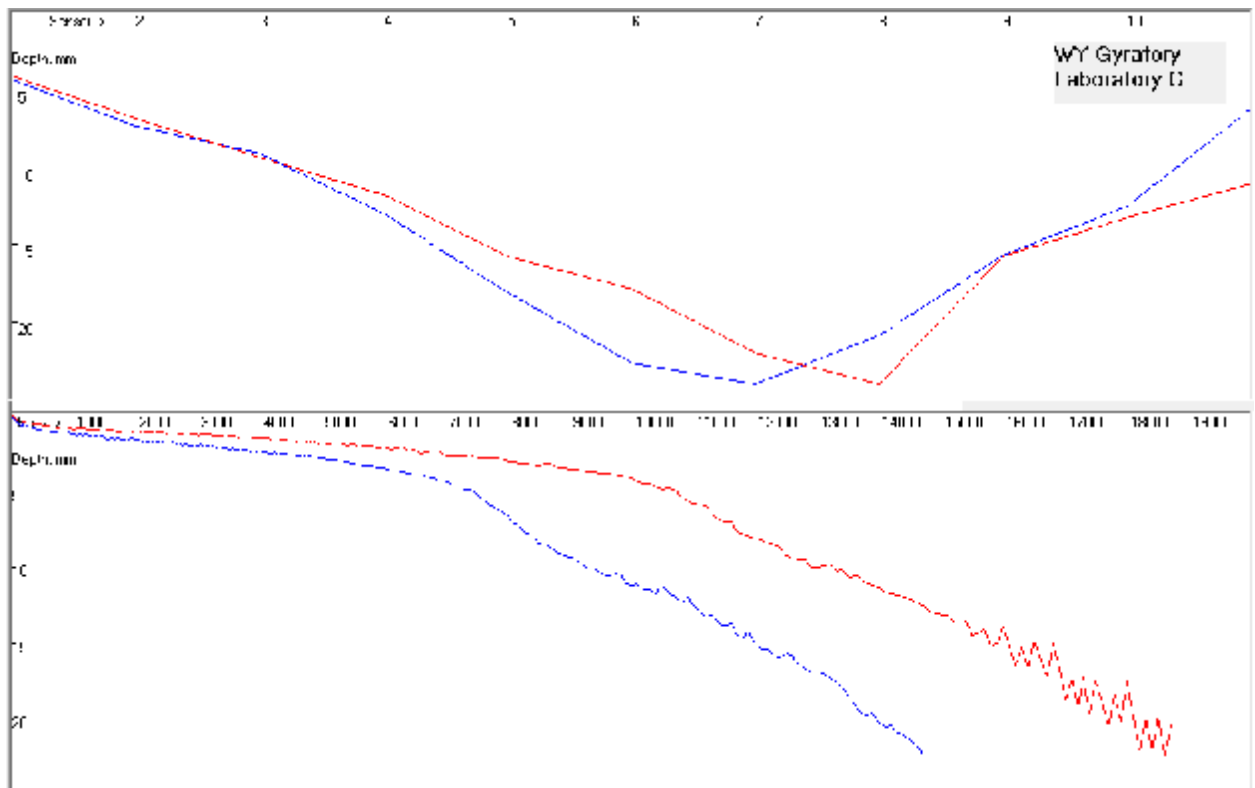
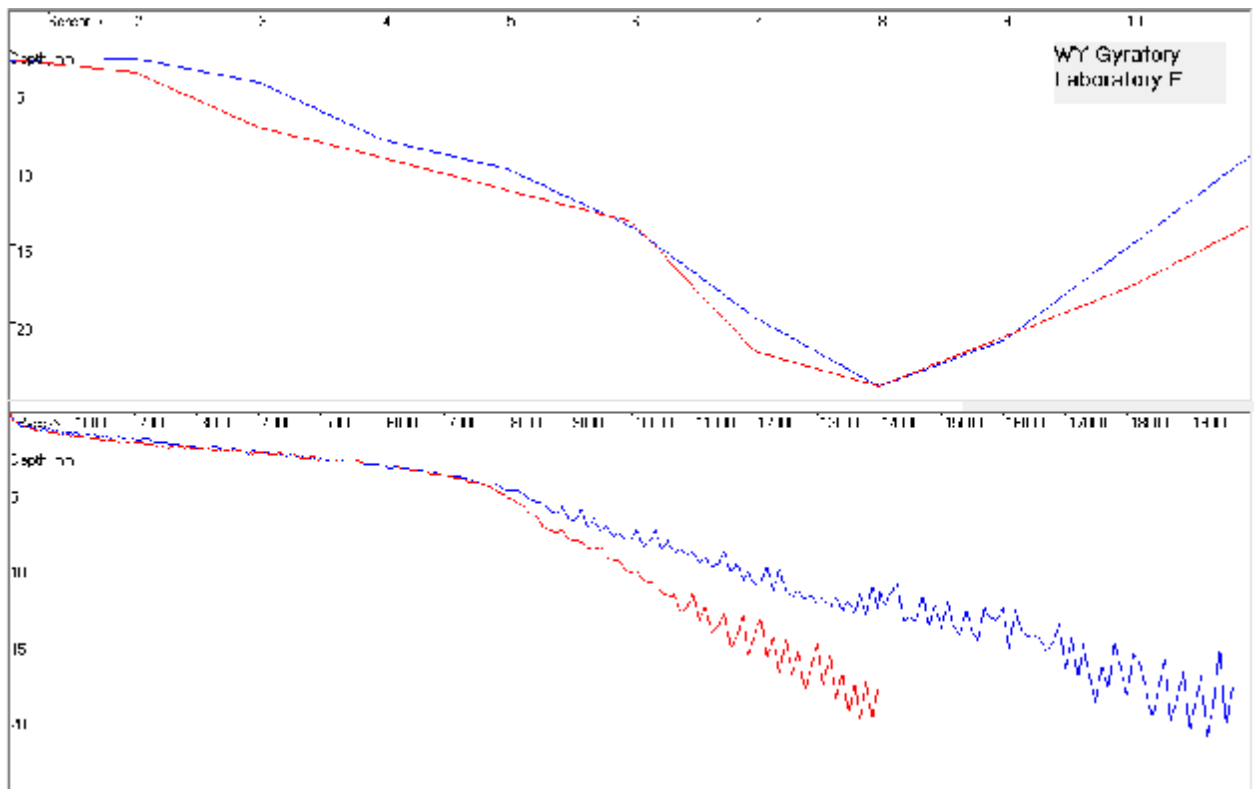


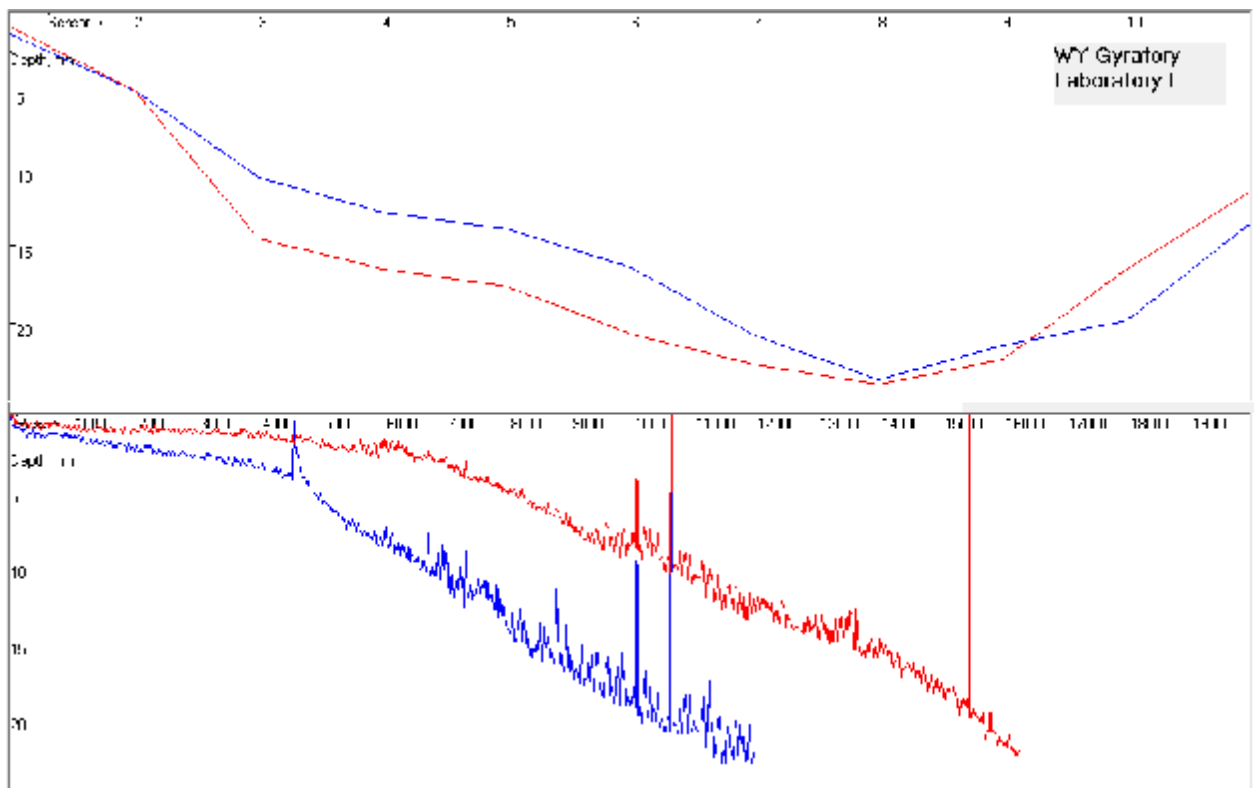
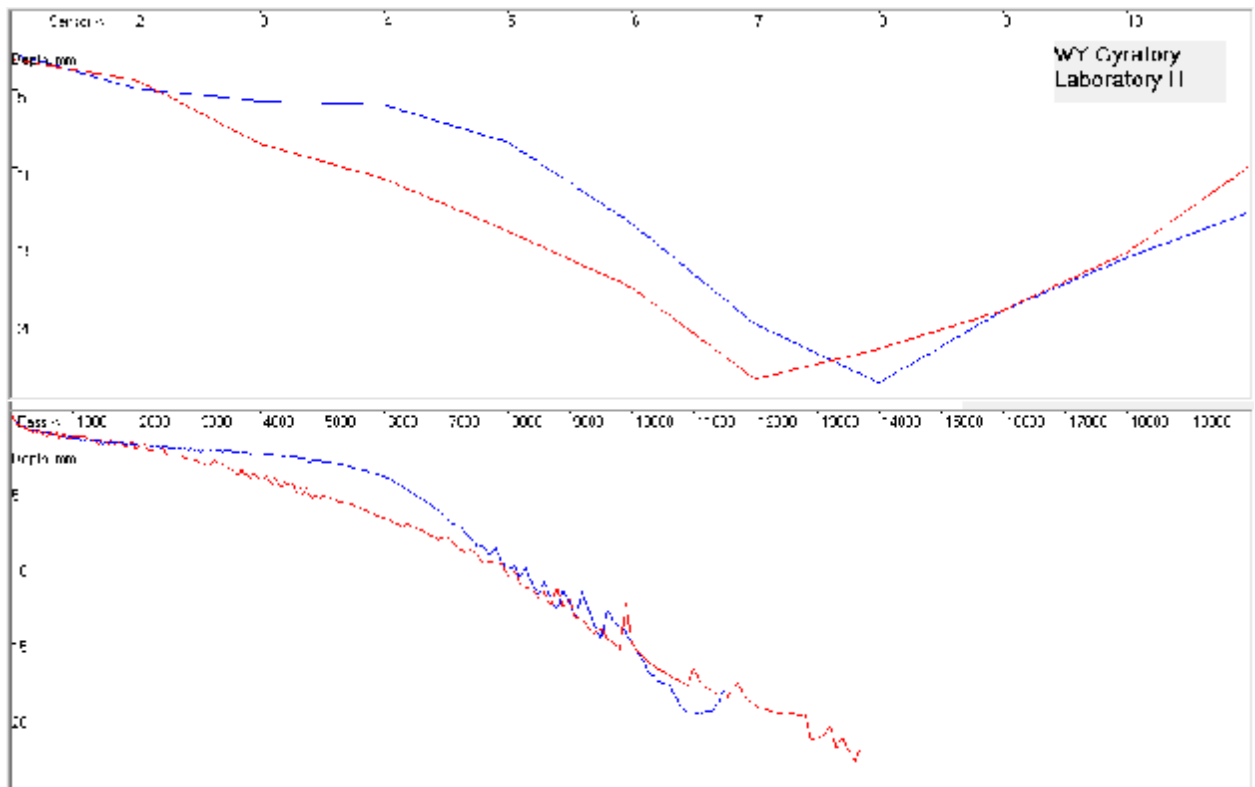


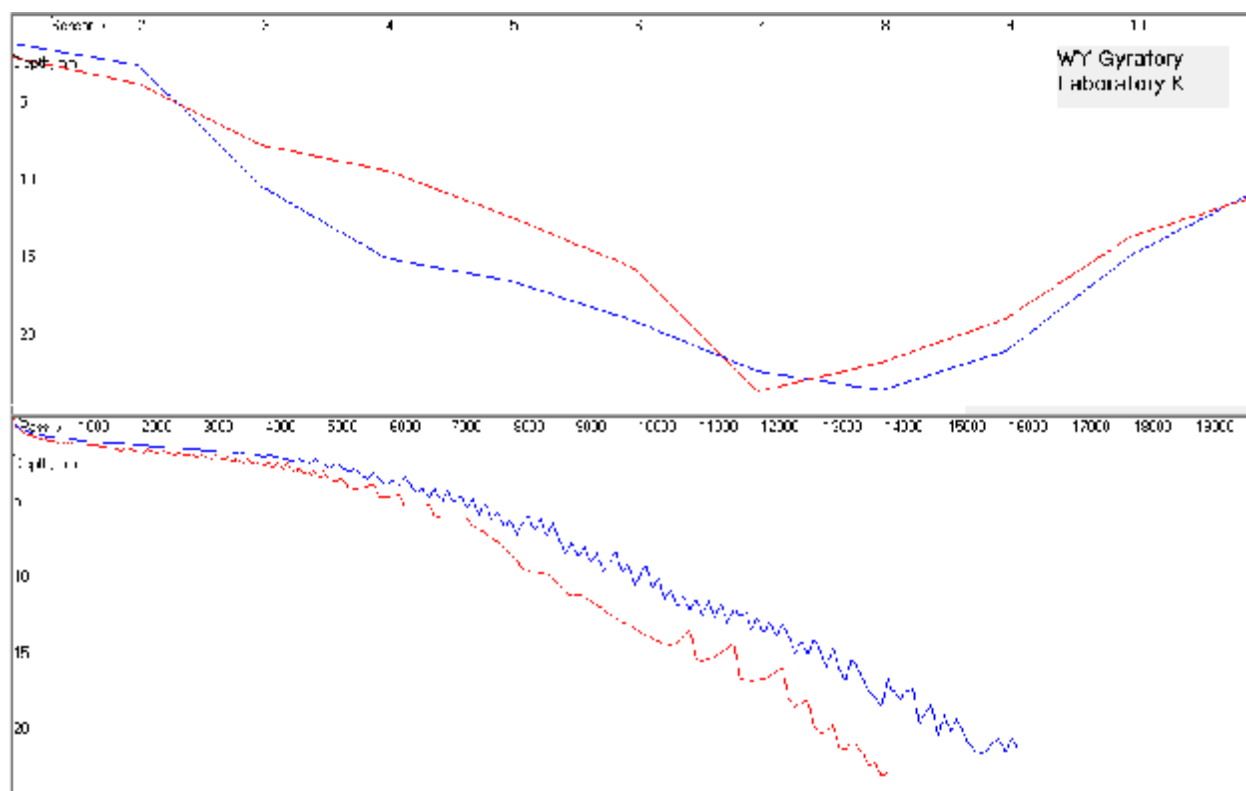
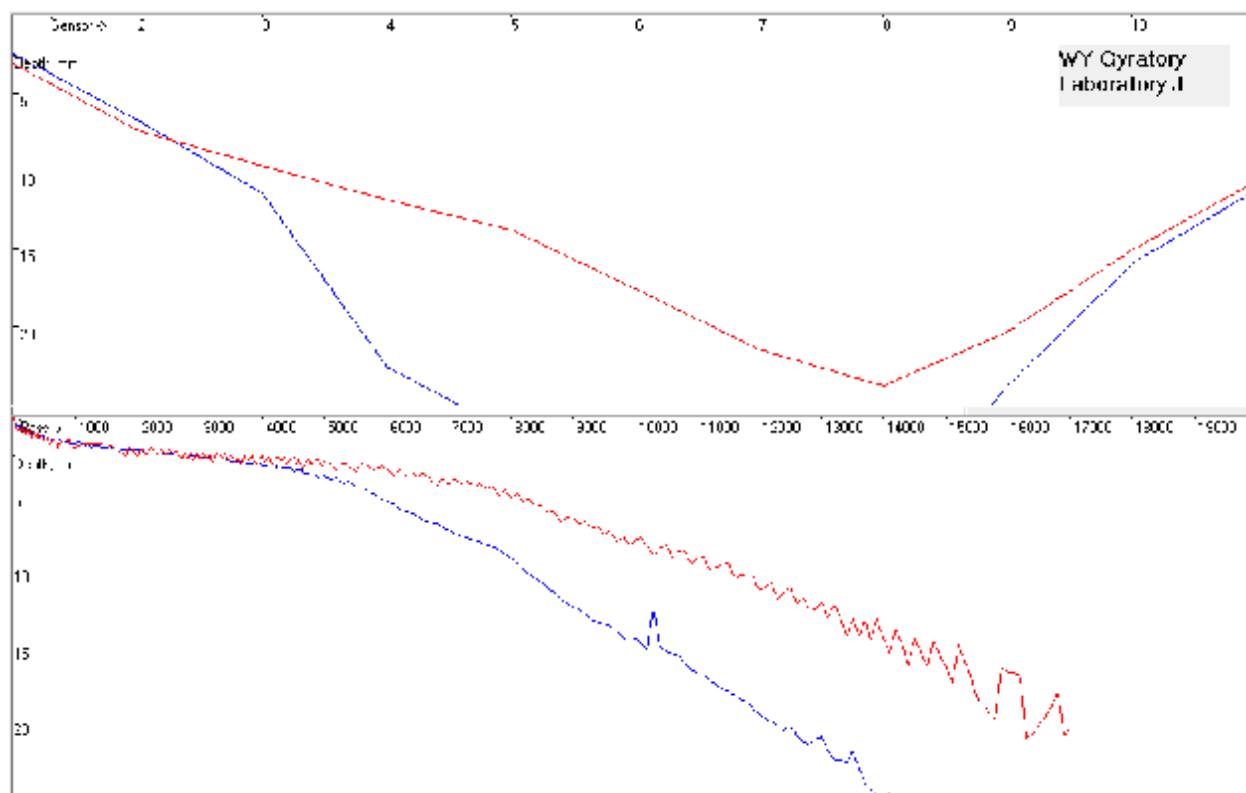


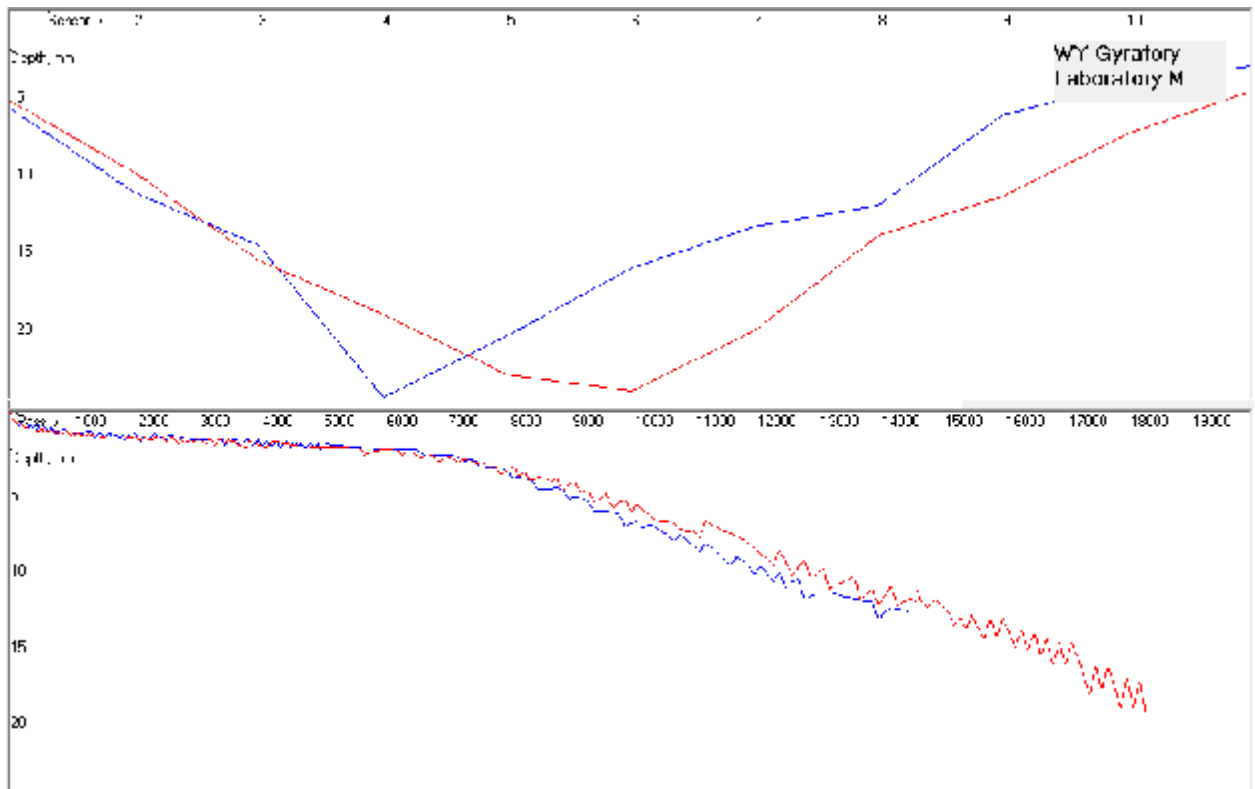
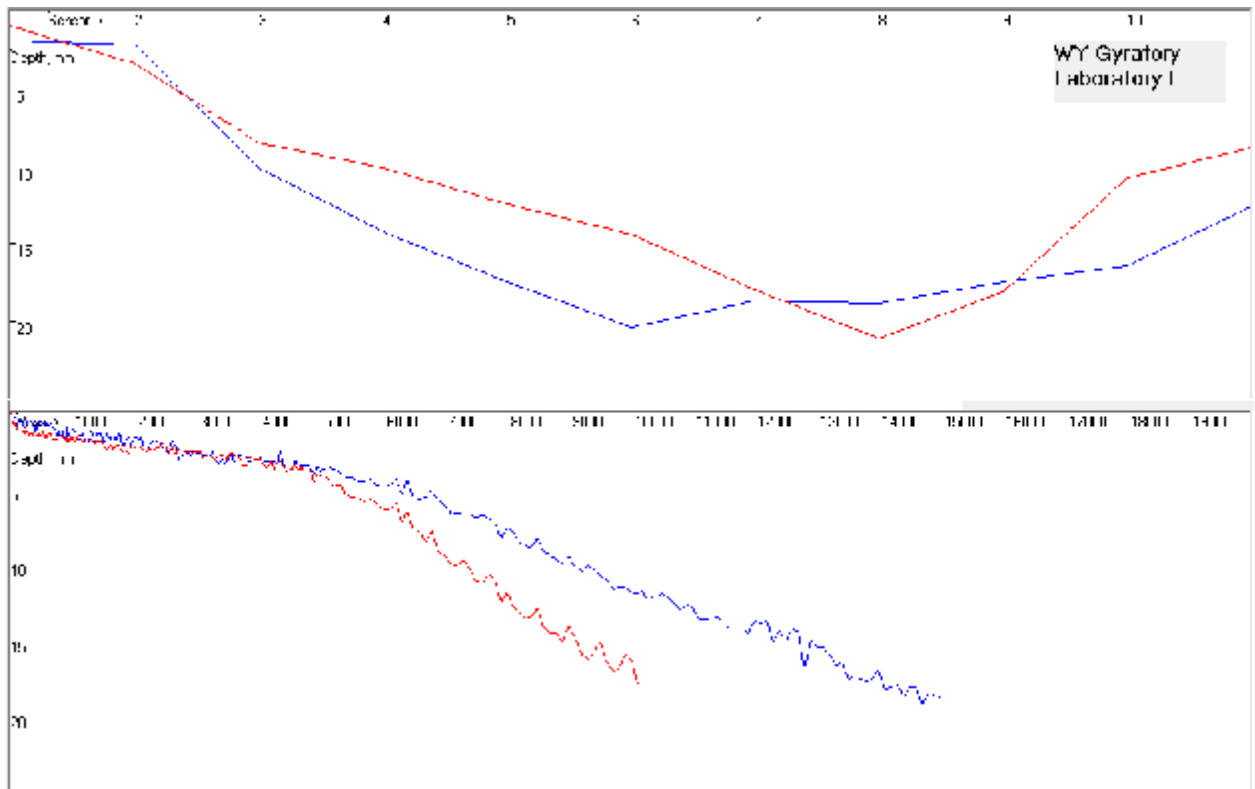


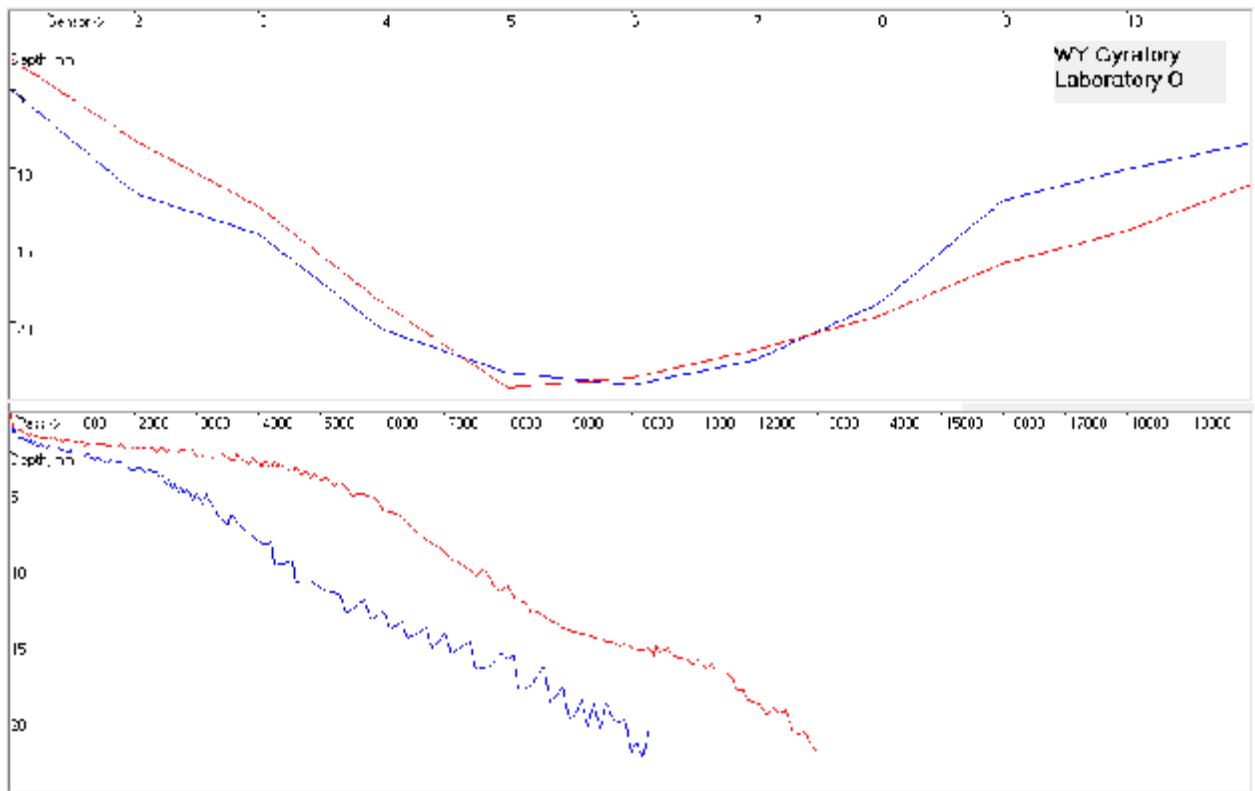
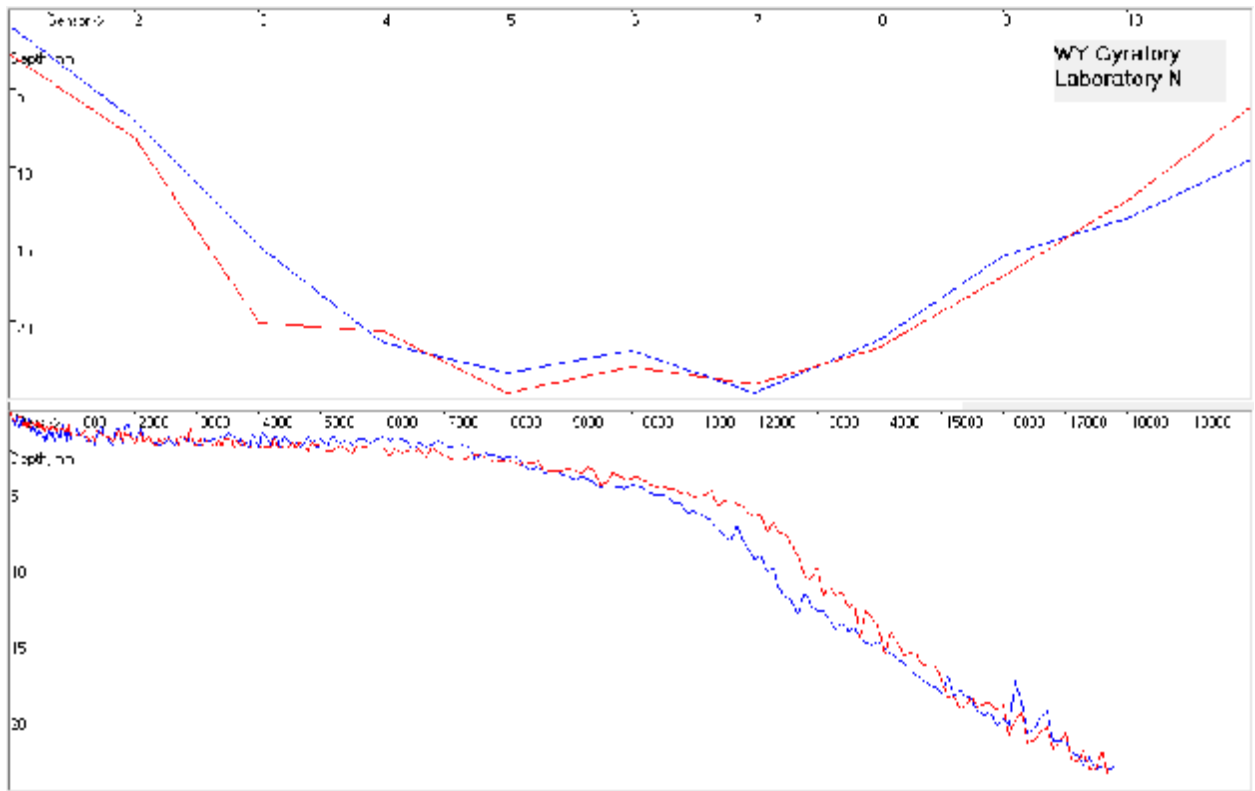




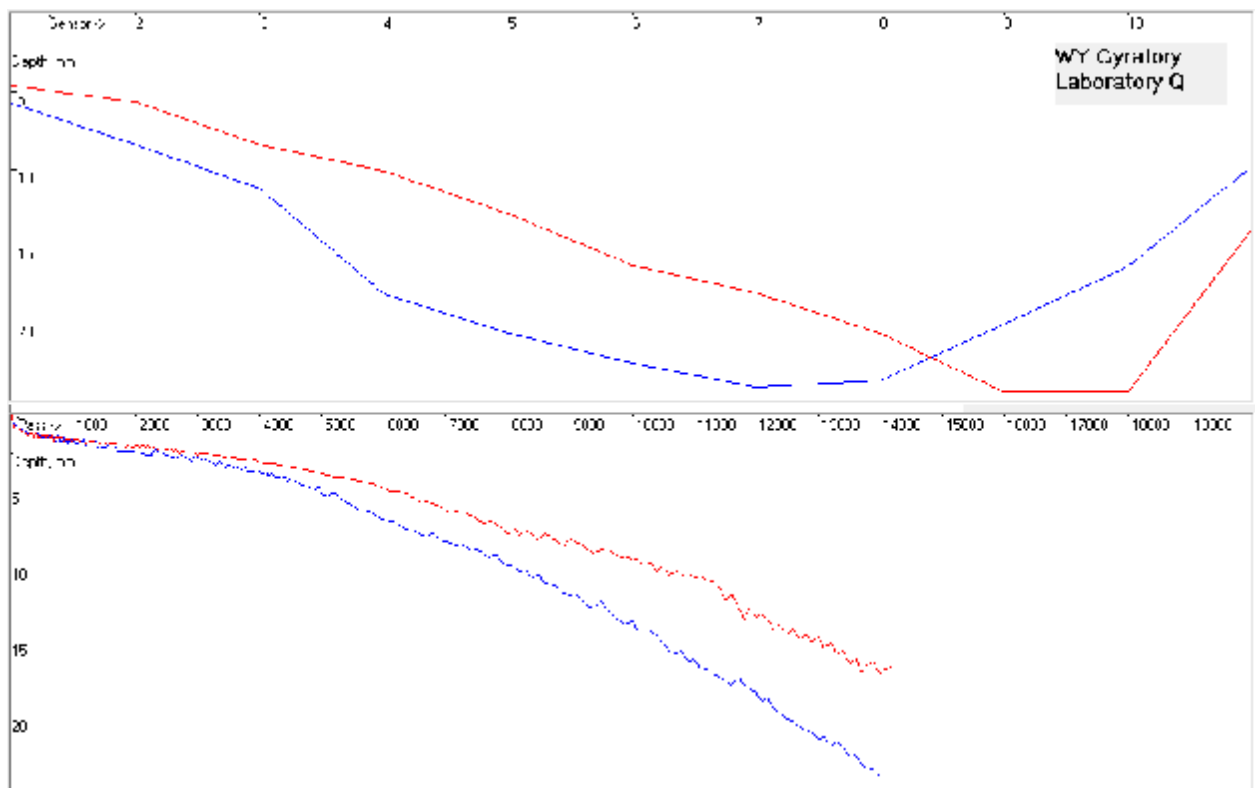
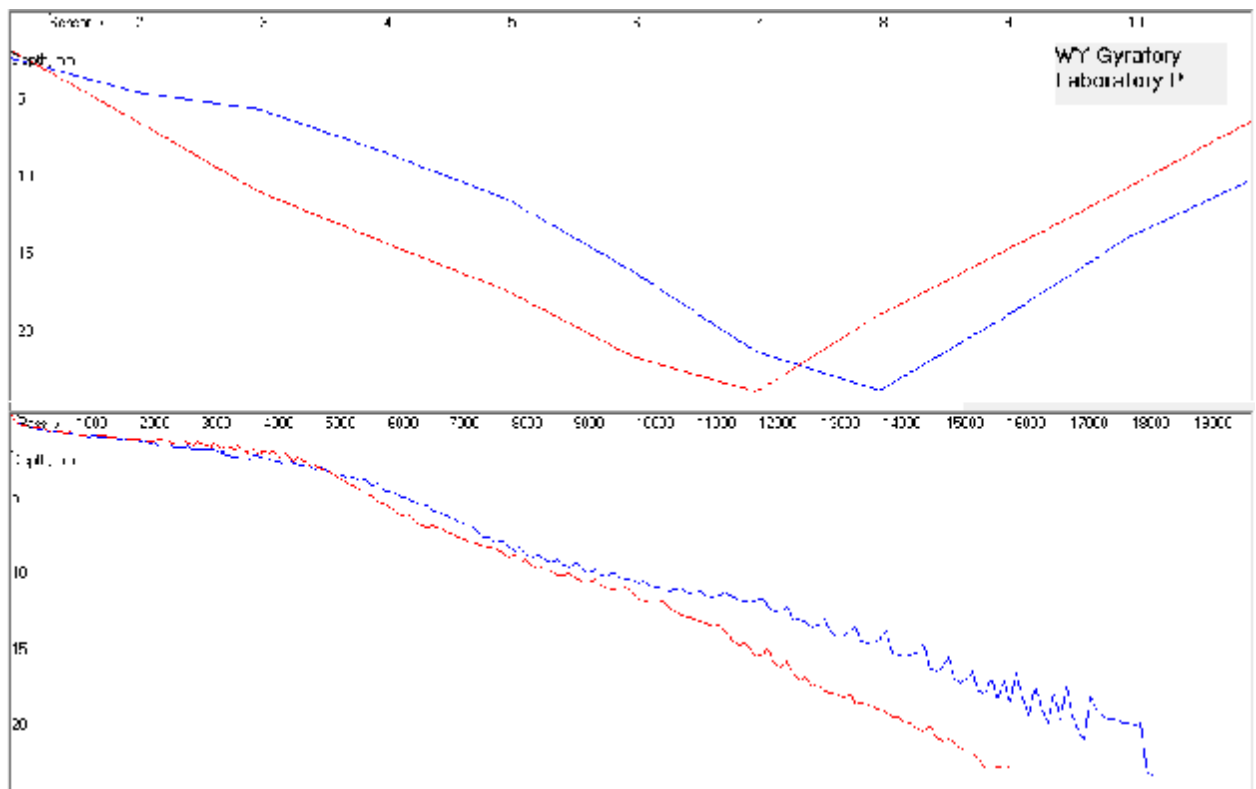


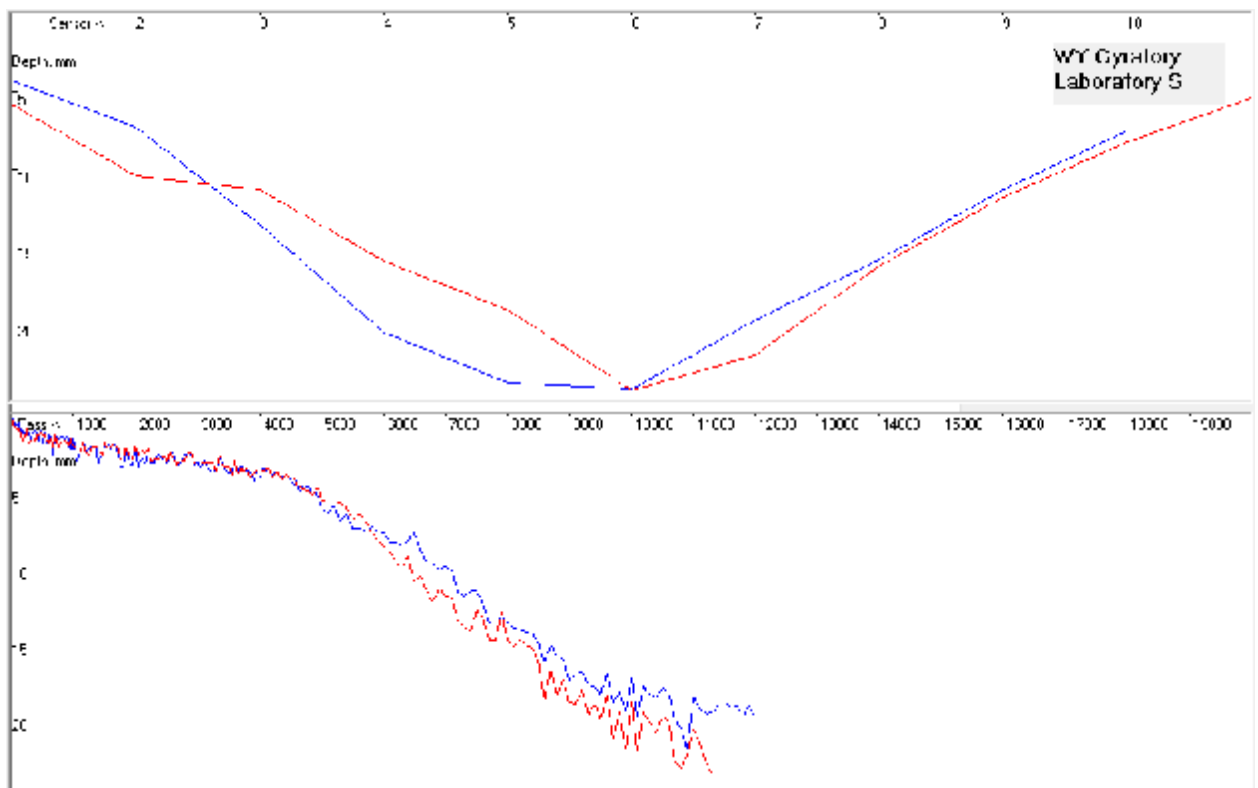
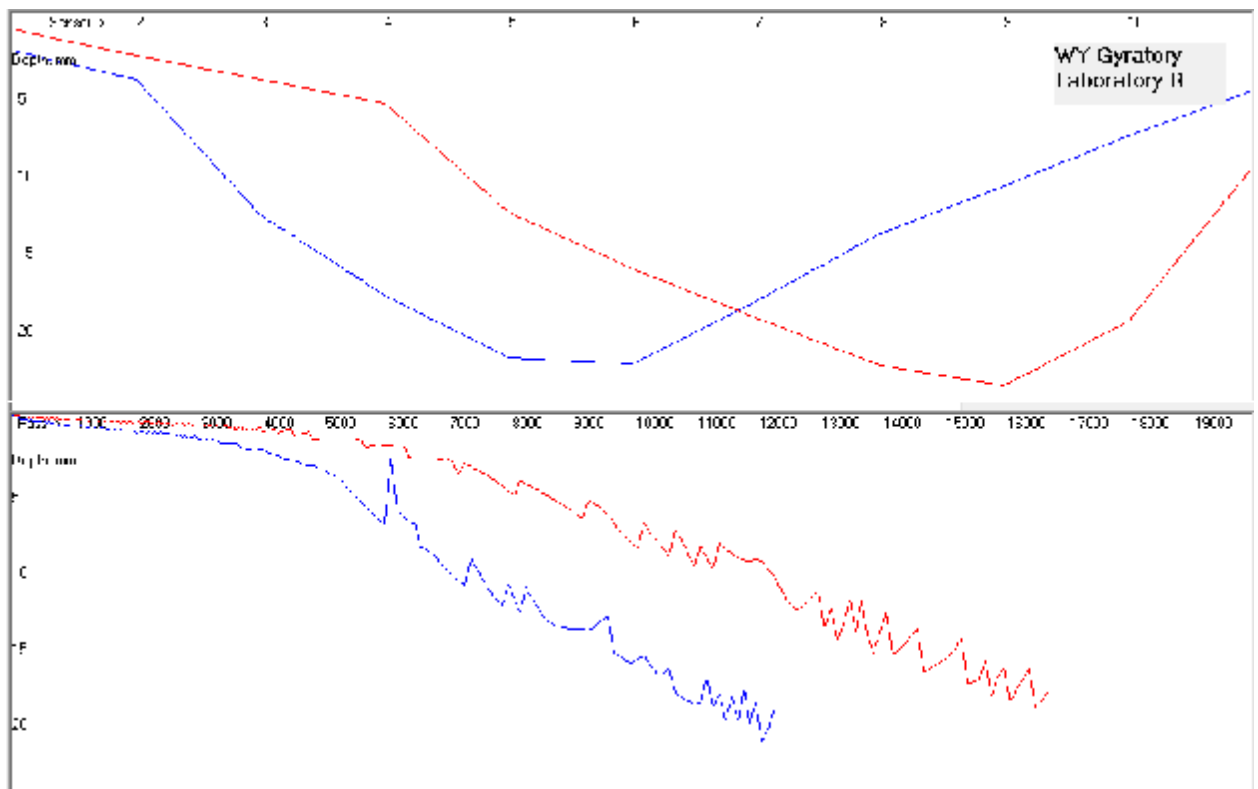


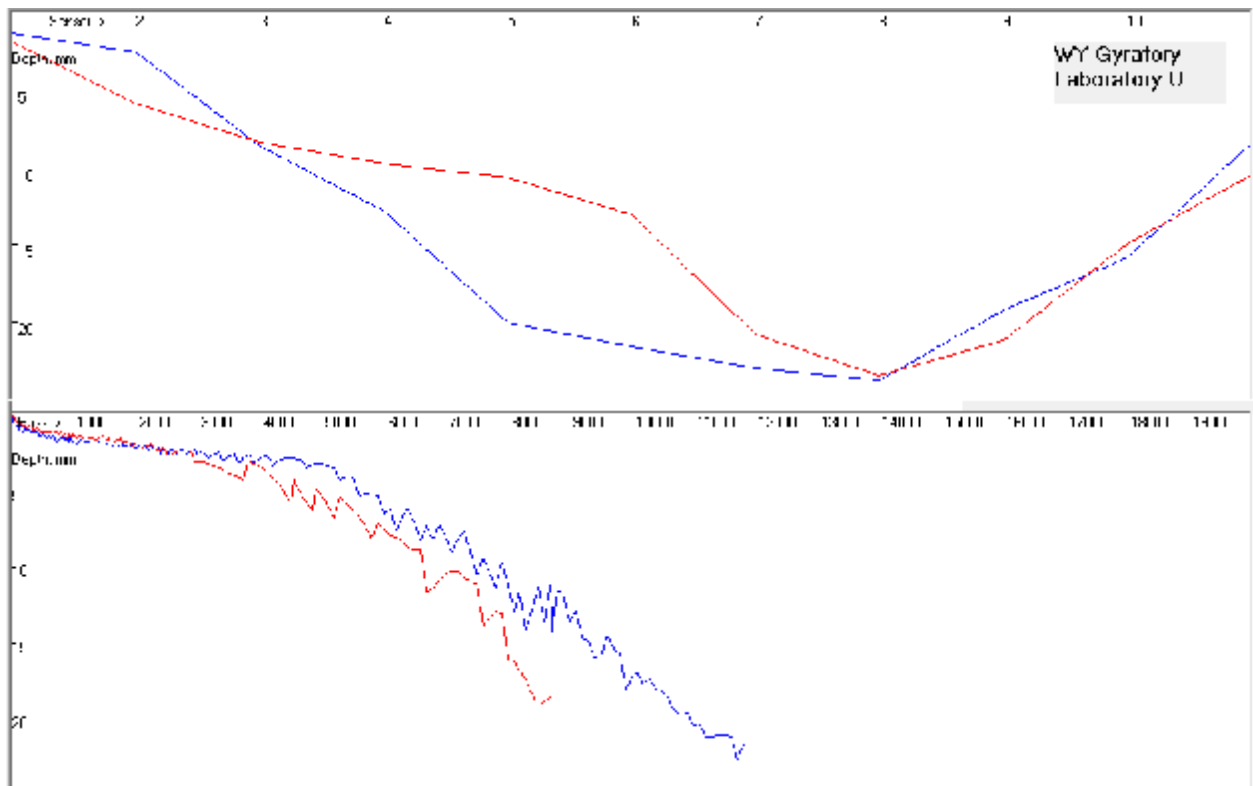
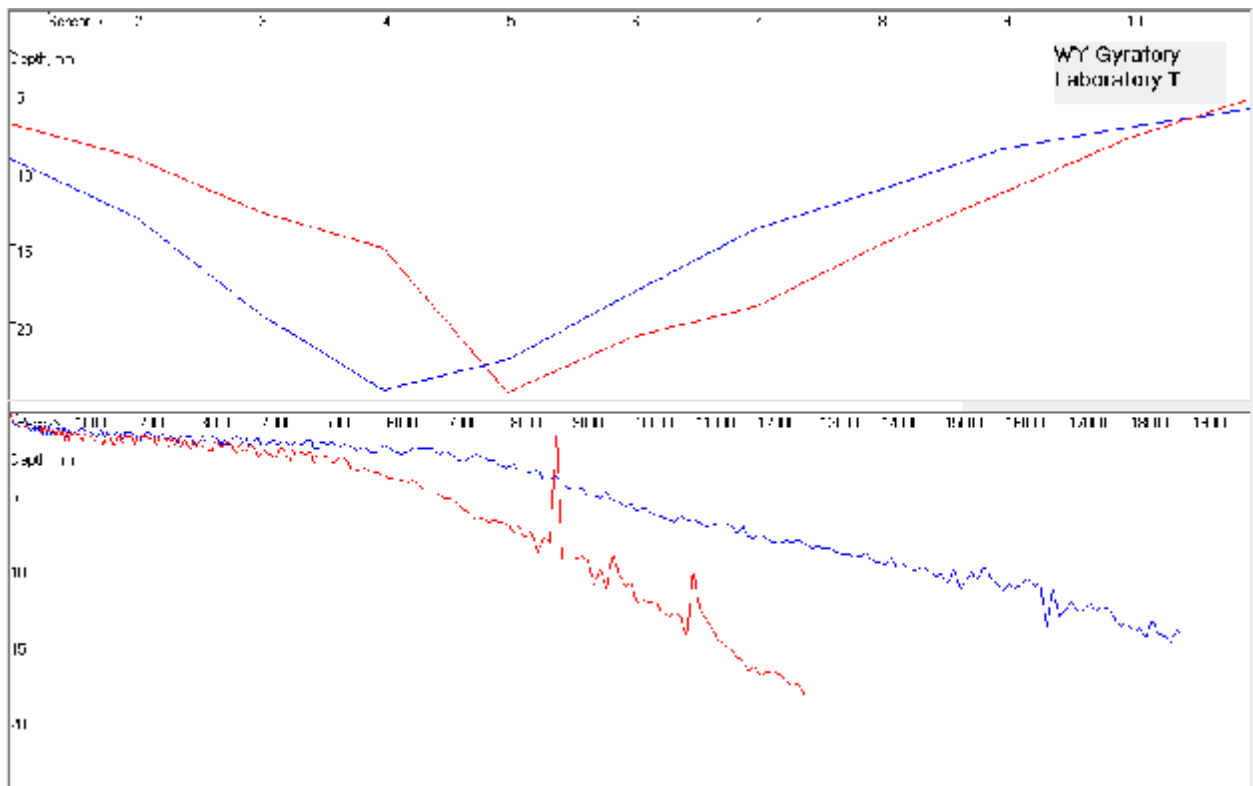


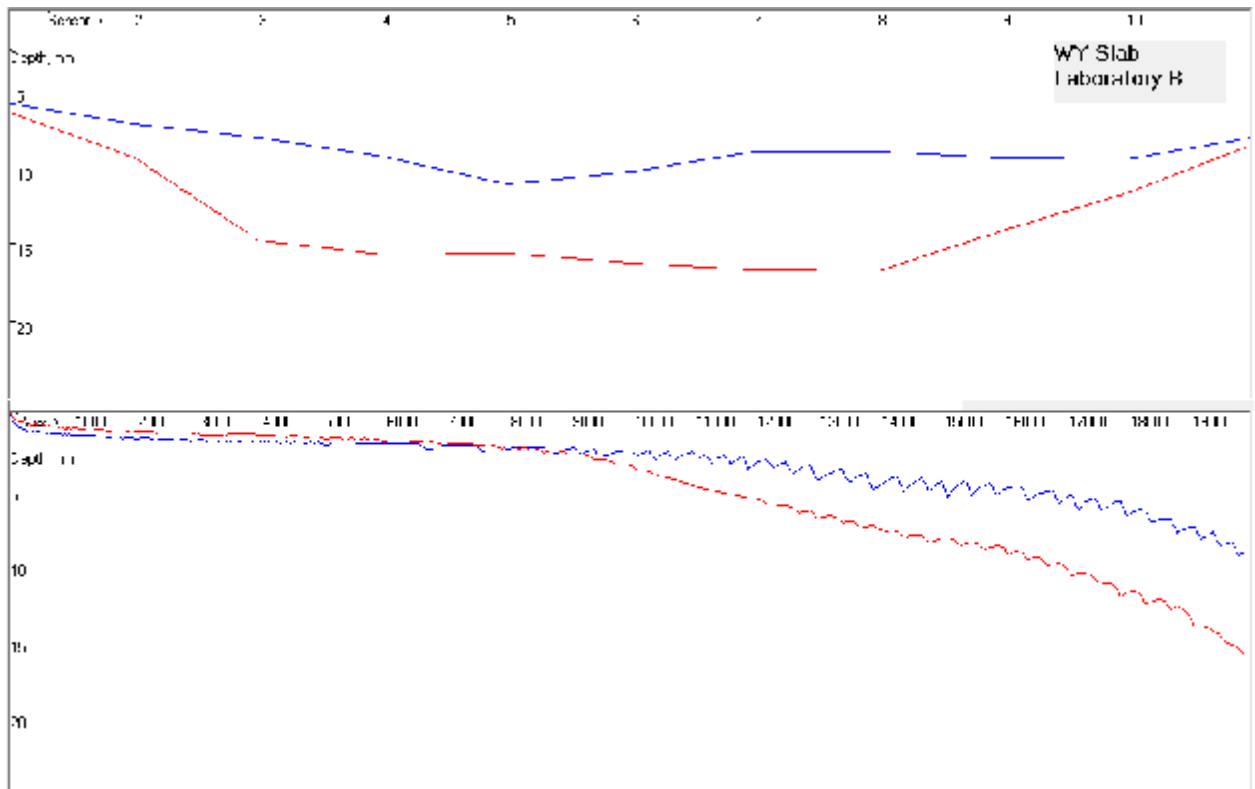
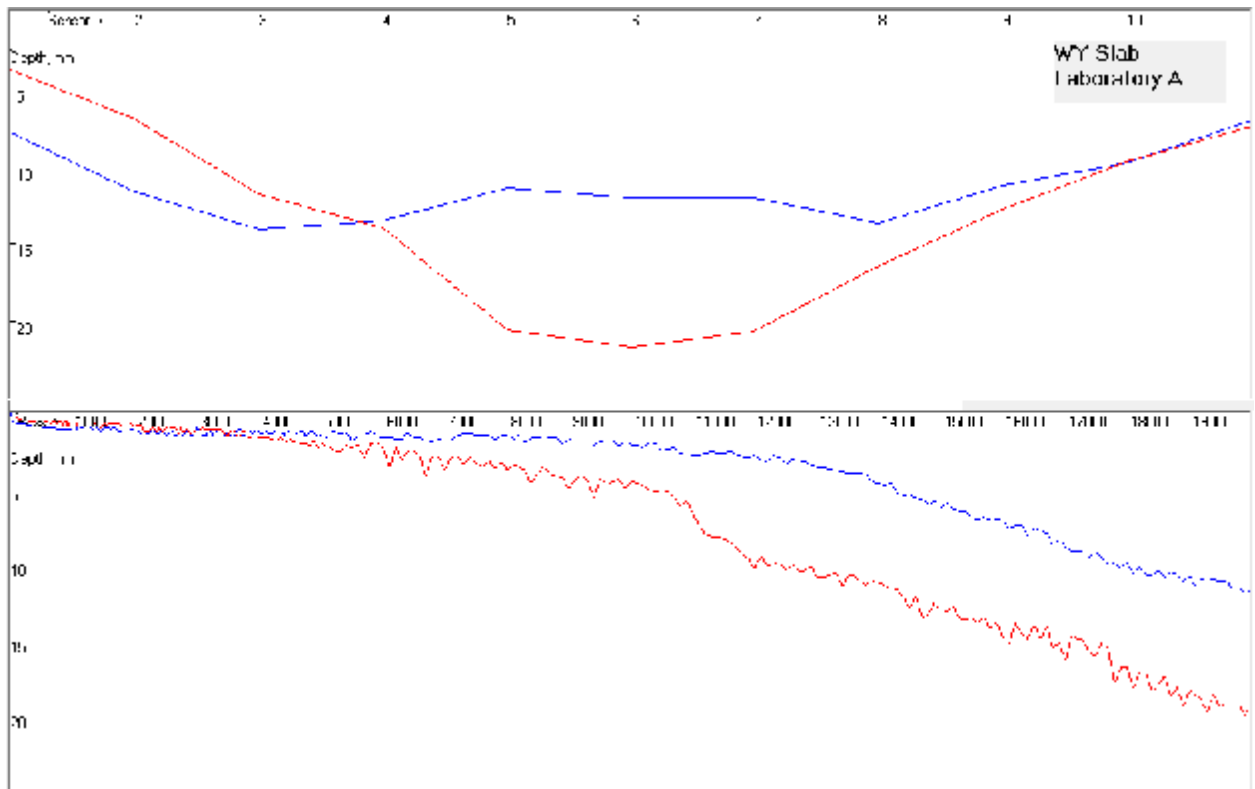


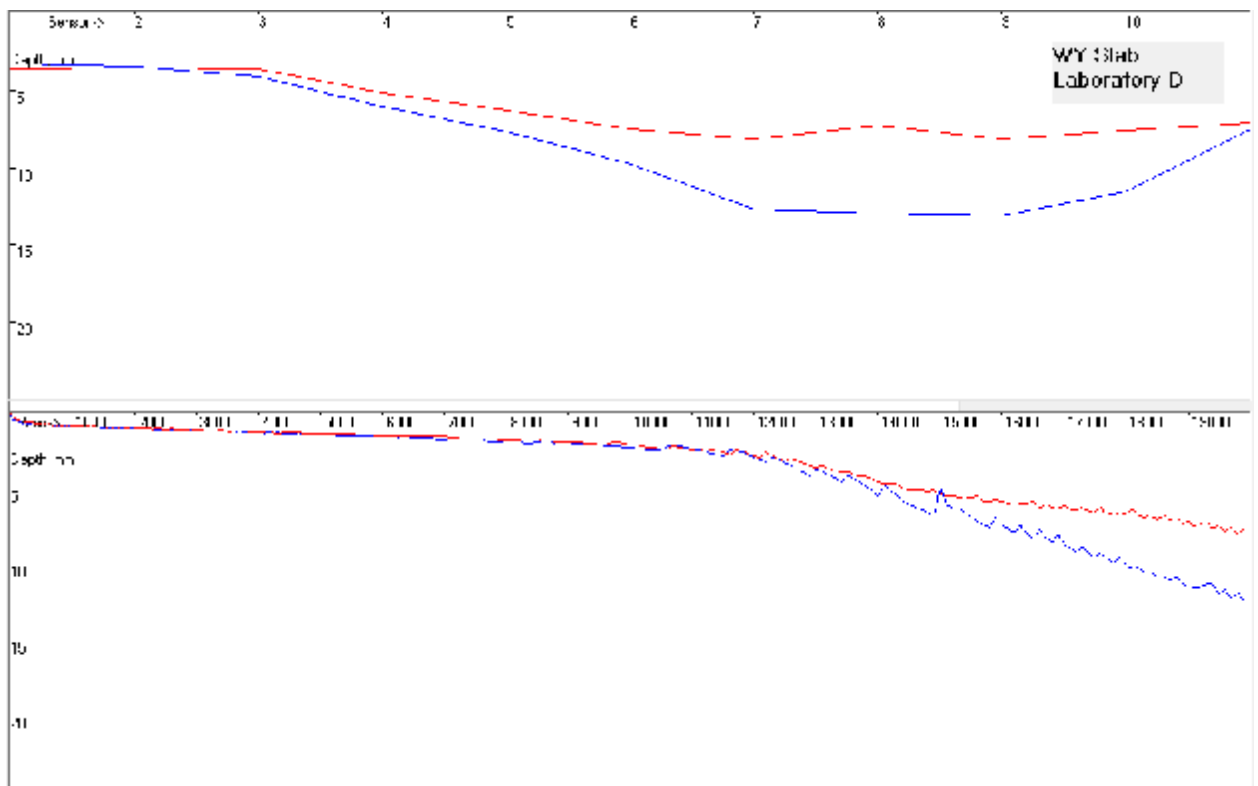
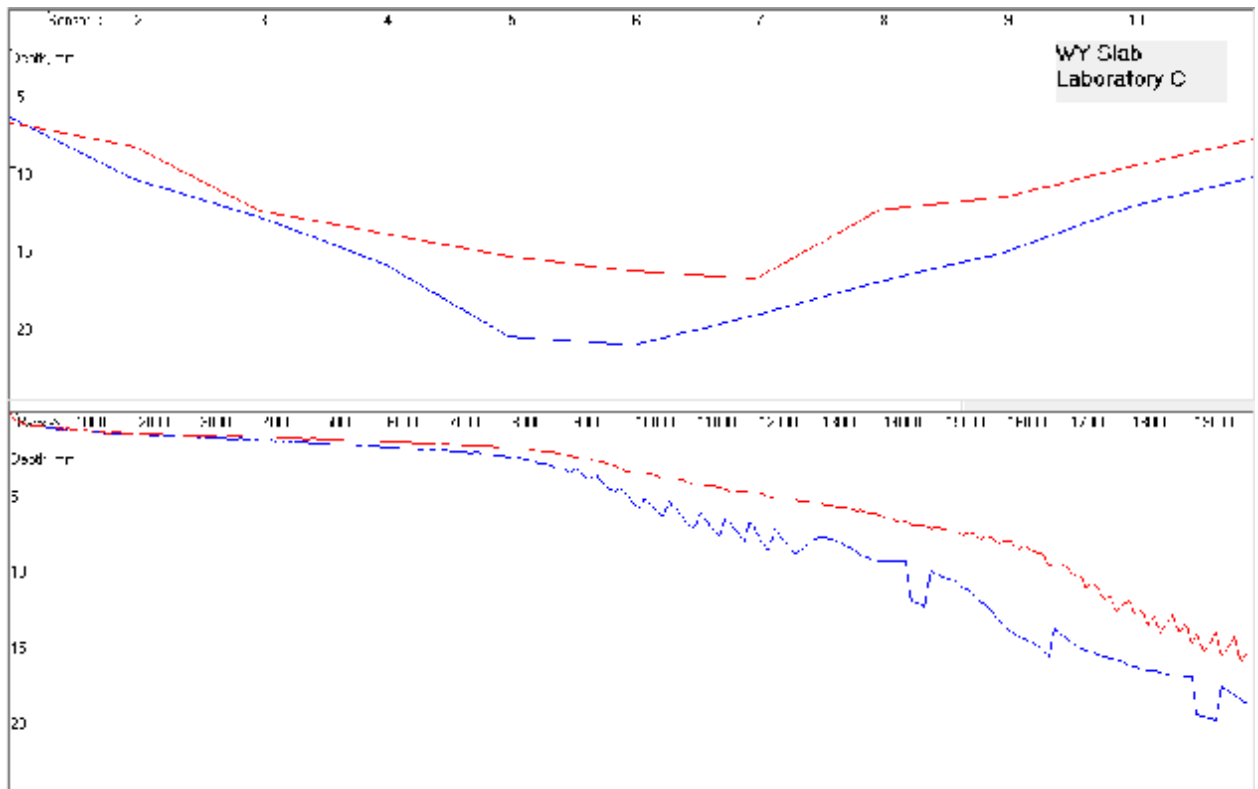


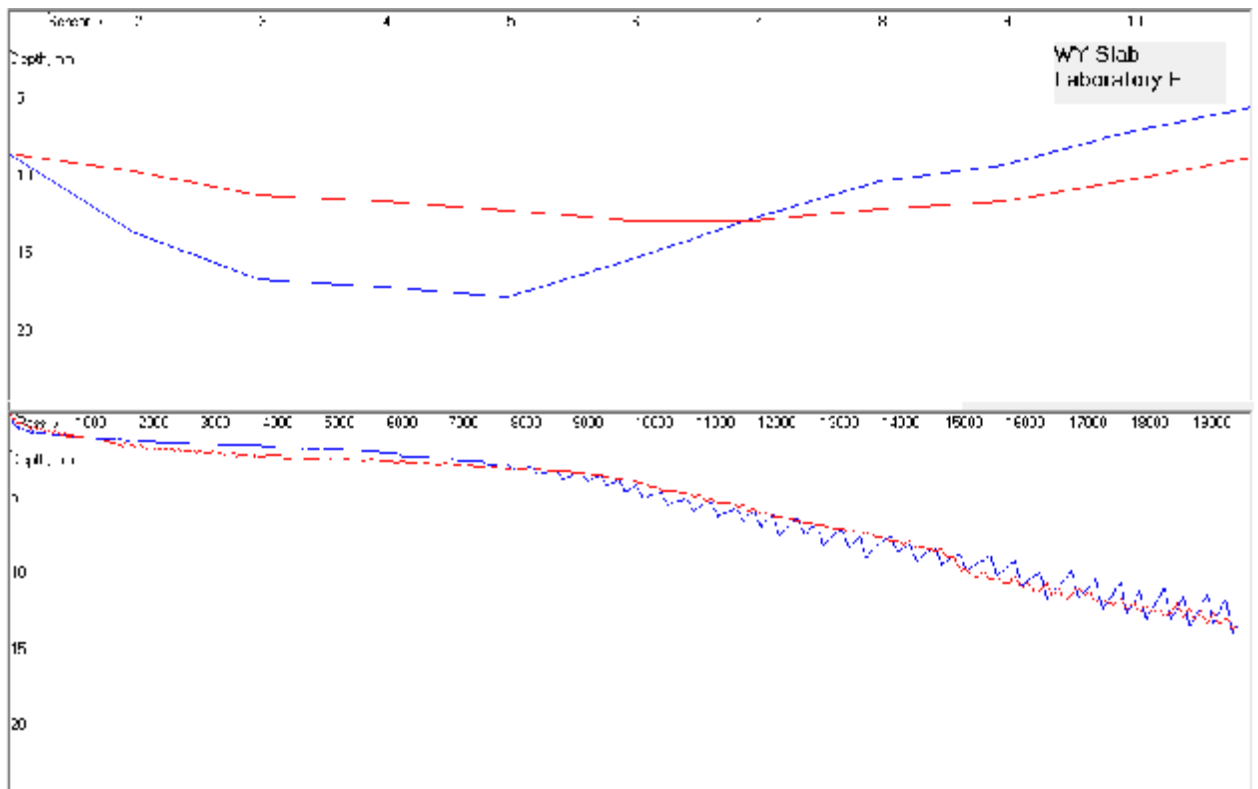
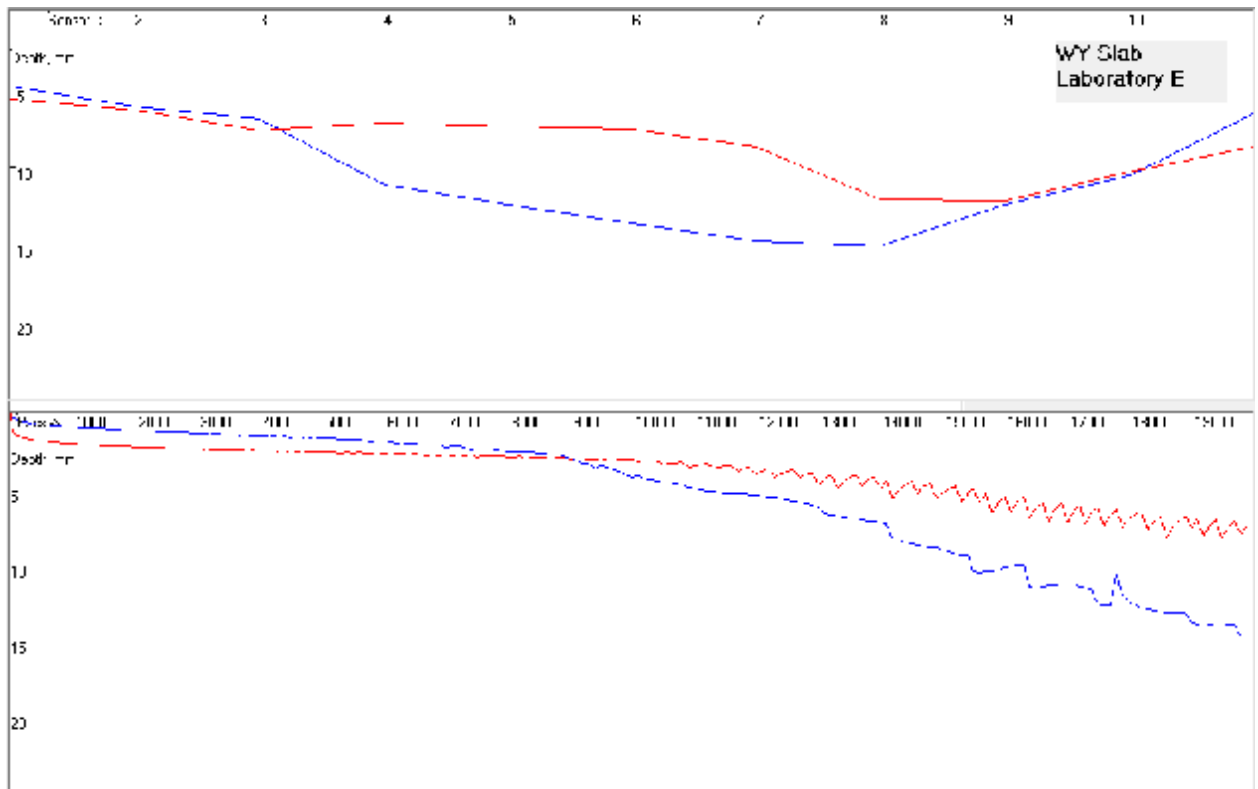


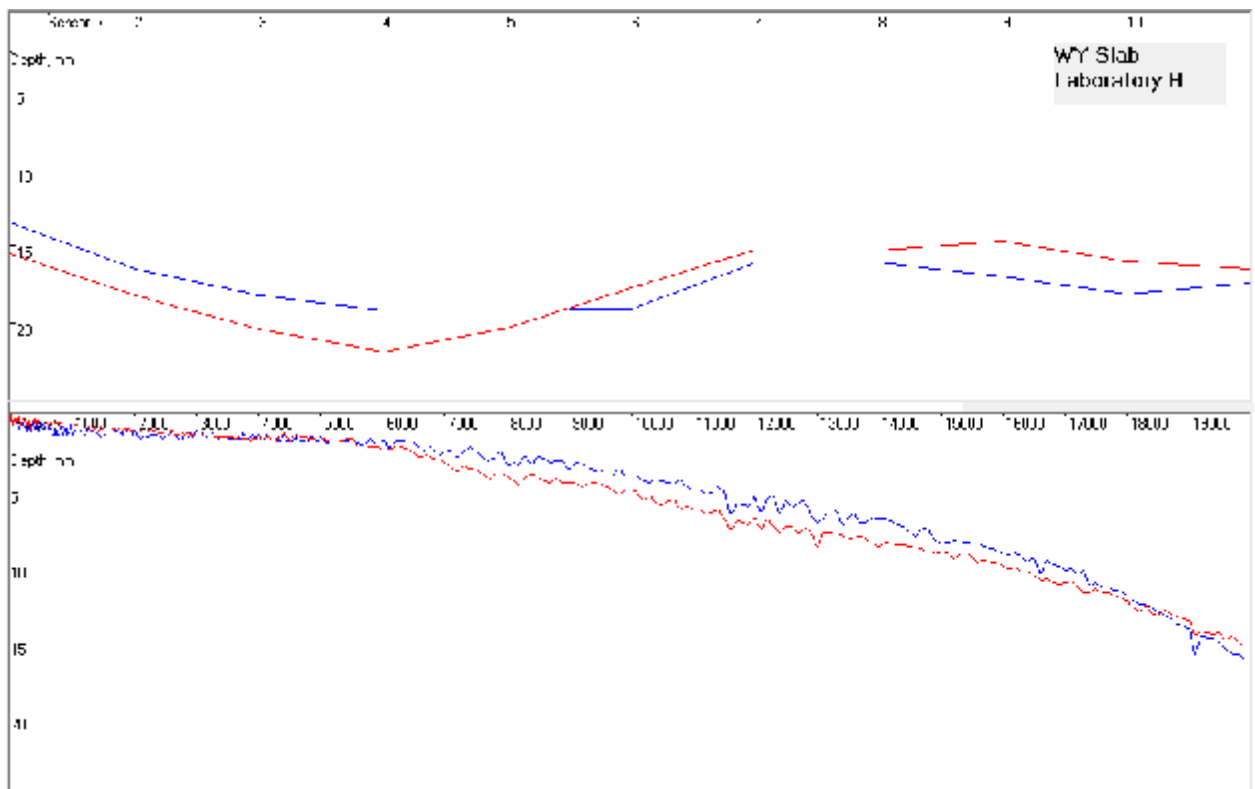
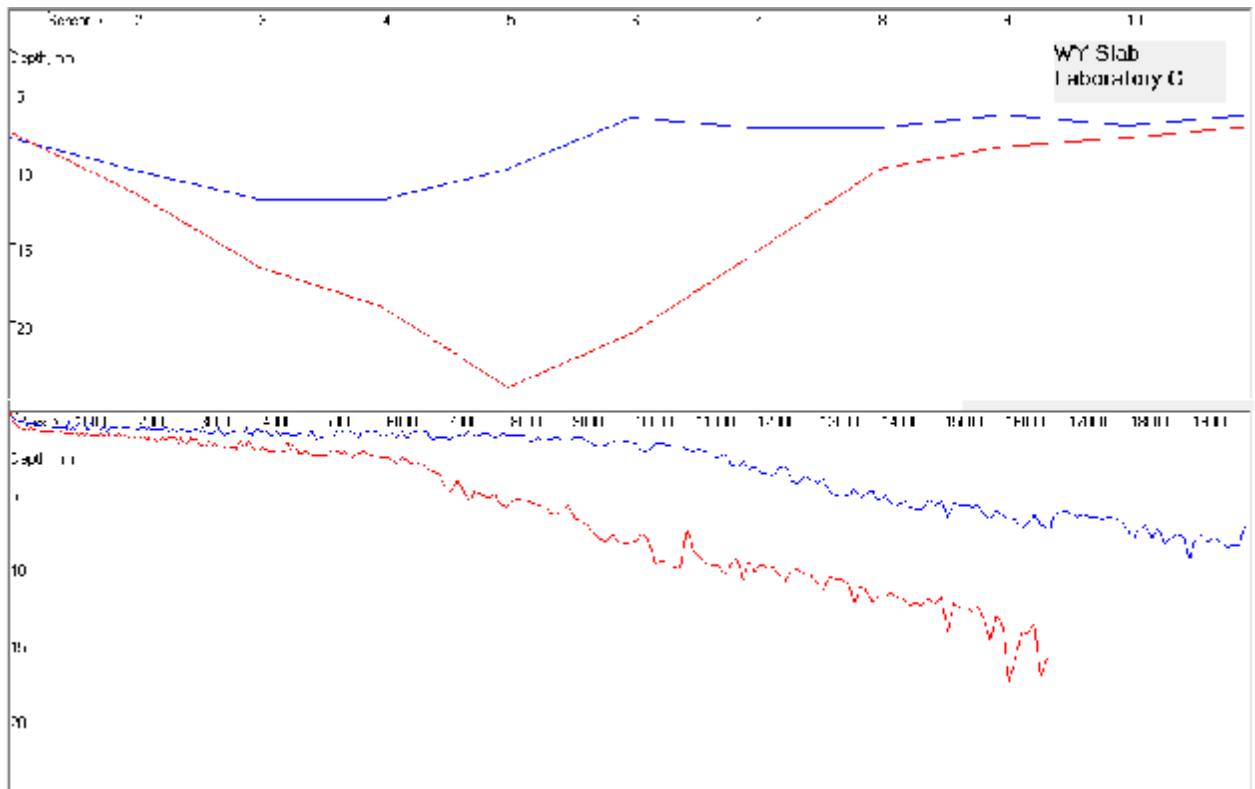


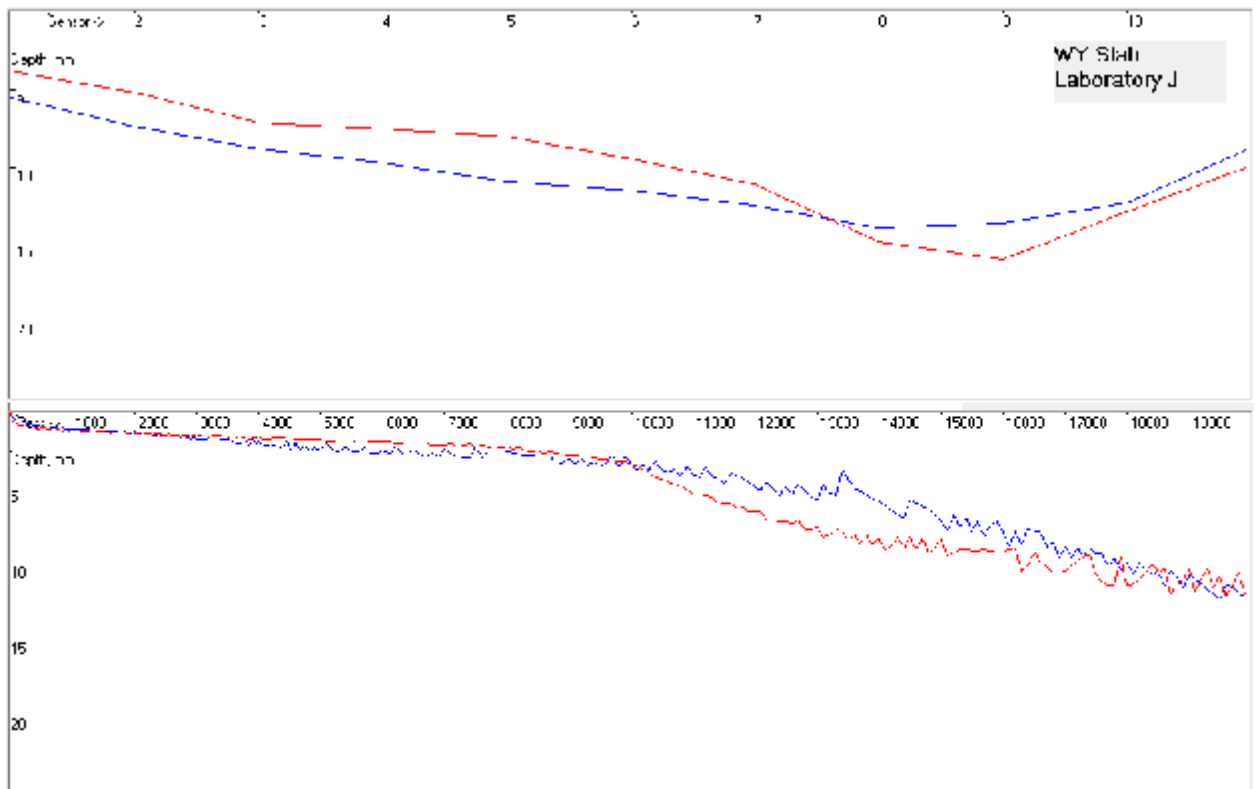
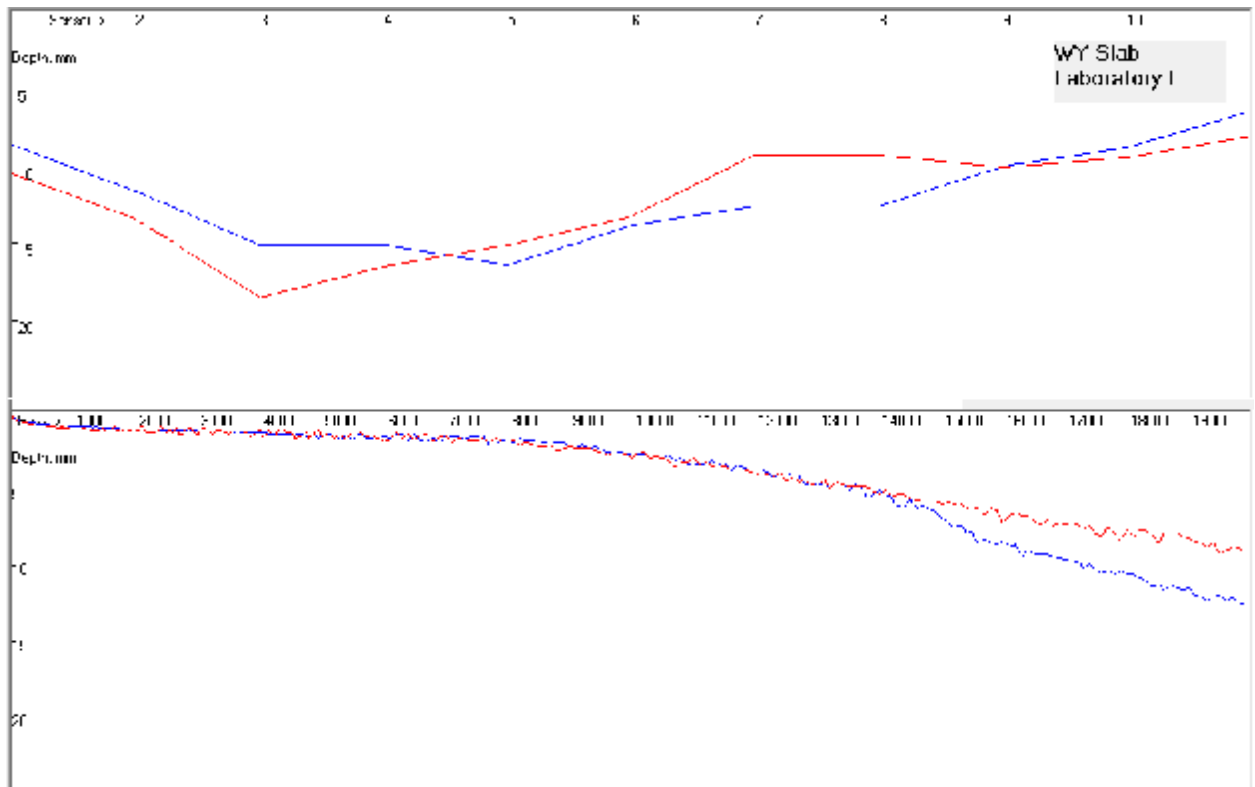














## **APPENDIX C- CAUSES OF VARIABILITY OF THE WHEEL TRACK TESTER MEASUREMENTS**

In Chapter 3, several factors were hypothesized as probable reasons for bias and variability in the measurements from the HWTT. The factors include possible offset in the measurement locations, dynamics of the mechanical system in two-wheel machines, and the effect of cut on the gyratory samples. Research was conducted in-house to more closely investigate several of the factors.

### **C-1- Effect of Cut on Gyratory Samples**

The cut on the gyratory samples is speculated to be a cause of bias and variability from various stand points. The cut exposes the mixture to moisture at the cut surfaces. Such exposure could accelerate stripping or softening of the mastic, leading to more deformation at the mid-point.

The cut also contributes to the bias and variability of the measurements. Although the laboratories were instructed to make the cut to achieve a 7.5-mm gap between the two parts of the mold, some laboratories could not do so because of making too small or too large a cut across the samples' height. This caused increased variability of the test measurements for two reasons.

First, the amount of cut determines the gap width between the molds. A smaller cut would result in a larger gap between the two molds holding the gyratory samples and therefore a decreased confinement around the midpoint of the test specimen. This would result in increased rutting and variability of the measurements.

Second, the amount of cut also determines the length of the specimen and, in turn, how close the wheel would get to the two ends of the test specimen. A larger cut would result in smaller gap and shorter specimen length, which causes the wheel to reach closer to the ends of the specimens or for the wheel to ride onto the mold. Since confinement is too high at the ends due to the proximity of the mixture to the mold on three sides, the deformation is very small. With time, the deformation differential between mid-point and ends would create a downward slope from the ends towards the middle of the specimen and since the deformation at midpoint is larger than that at the ends, a downward movement of the wheel significantly affects the wheel dynamics and thus the deformation pattern. It was observed that because of this differential deformation, the wheel plows toward the mid-point resulting in an even larger deformation at the midpoint. Therefore, there should be upper and lower limits for the amount of cut on the samples.

The above observations could be the reasons for the large deformation at or around the midpoint despite the maximum speed of the wheel at that location. The bias and variability can be improved by increasing the distance between the wheel and the ends of the specimen. This can be accomplished by reducing the amount of cut or not cutting the

gyratory samples. The increased gap between the molds due to reduced amount of cut can be filled with plaster of Paris to provide containment at the mid-point of the specimens.

### **C-2- Effect of Position of the Wheel with Respect to Specimen**

Another factor affecting the variability of results is the location of the wheel with respect to the specimen. It was found that a change in starting position of the wheel with respect to specimen of a little as a few millimeters could result in a difference in the deformation pattern. Currently, there is no specific method for checking the starting position of the wheel with respect to the tray or the specimen, thus the starting point of the wheel may differ for each tray. While positioning the wheel with respect to the tray is a machine adjustment issue, the position of wheel with respect to the specimen within the tray is part of the specimen assembly. Spacers are used to adjust the specimen location and depending on the number and location of the spacers, the position of the wheel with respect to the specimen would change. As a result, the wheel could come closer to the edge of the specimen at one end than the other. This could change the deformation pattern and increase the variability of the test results.

### **C-3- Location of Deformation Measurements**

Anomalies in the measurement locations and spacing were previously shown, with the maximum deformation from the laboratory results occurring at measurement locations 7 and 8 more frequently than at measurement location 6, which should be the midpoint of the specimen (Figure 3-6). This situation can be also seen from the asymmetric deformation profiles found in the test data of several laboratories (graphs in Appendix B). It appeared that actual location of the measurement locations does not agree with their design locations. The asymmetric wheel path found for several laboratories could indicate that the measurement locations are too close to each other at one end and too far apart at the other end as shown in Figure C-1.

The anomaly in measurement locations was investigated. A red plastic guide was prepared and moved from the initial to the final wheel imprint as shown in Figure C-2. The locations of the tab were determined from the deformation readings on the screen after the wheel crossed over the guide, allowing determination of the actual measurement locations. The design measurement locations and the actual locations determined in the experiment are listed in the left panel of Figure C-2 and are shown in Figure C-3. The results showed that measurement location 11 was located 30 mm after the wheel's starting position instead of the design 13 mm. Also, the location of measurement 1 could not be found on the wheel-path (indicated by question mark in Figure C-2). It is possible that the measurement location 1 may be reporting deformation outside of the wheel-path, where the wheel never passes. This situation may also explain the non-symmetric rut profile in Figure C-1. This problem could affect the data analysis even if the deformations from all measurement locations are averaged.

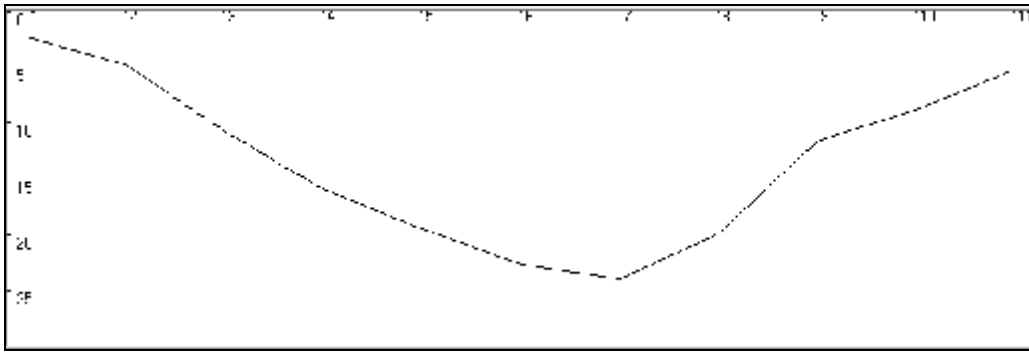


Figure C-1- Rut Profile for Gyratory WY Specimen from one of the participating laboratories

Sensor Number	Observed Distance from Wheel, mm	Design Distance from Wheel, mm
Wheel End		229
1	237?	216
2	217	196
3	195	176
4	175	155
5	160	135
6	135	115
7	115	94
8	95	74
9	70	54
10	50	33
11	30	13
Wheel Start	0	0



Figure C-2- HWTT Measurement Locations

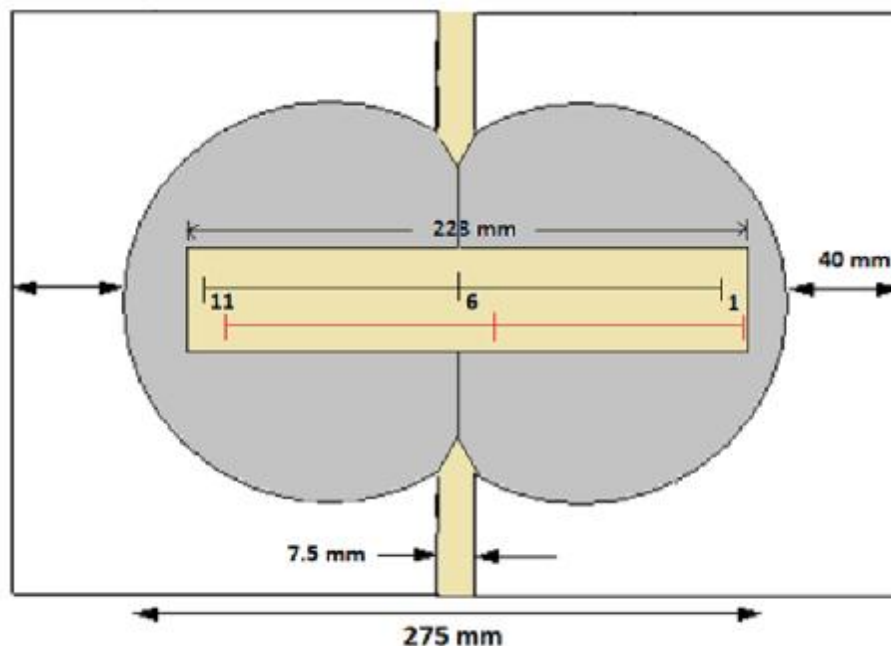


Figure C-3- Determination of HWTT measurement locations; design locations are shown in black and actual locations are shown in red

#### C-4- Effect of Bolt Tightness

Among results received from the laboratories, some were showing excessive deformation at the initial stages of the test. These results were considered as outliers and laboratories commented that the results were affected by loosening of the bolts on the tray holding the molds and specimens. Sections 8.2 and 8.3 of AASHTO T 324 specify securing the specimen and mold system in the tray by tightening the bolts "hand-tight". AMRL investigated this specified tightness by tightening the bolts at first and checking the tightness at several intervals prior to the actual start of the test. It was found that at the end of the 30-min temperature conditioning period, the bolts could lose their tightness although they were properly tightened before the conditioning period. The loosening of the bolts may be partially related to the expansion of the molds with the increase in water temperature due to the high coefficient of thermal expansion of the polyethylene mold material. The movement of the mold due to the gap between its two parts could be another reason for the loosening of the bolts. Use of different materials with lower coefficient of expansion than polyethylene and use of a new mold design with lower gap at the midpoint of specimen should be explored. Meanwhile, it is good practice to retighten the bolts at the end of the 30-min temperature conditioning right before start of the test.

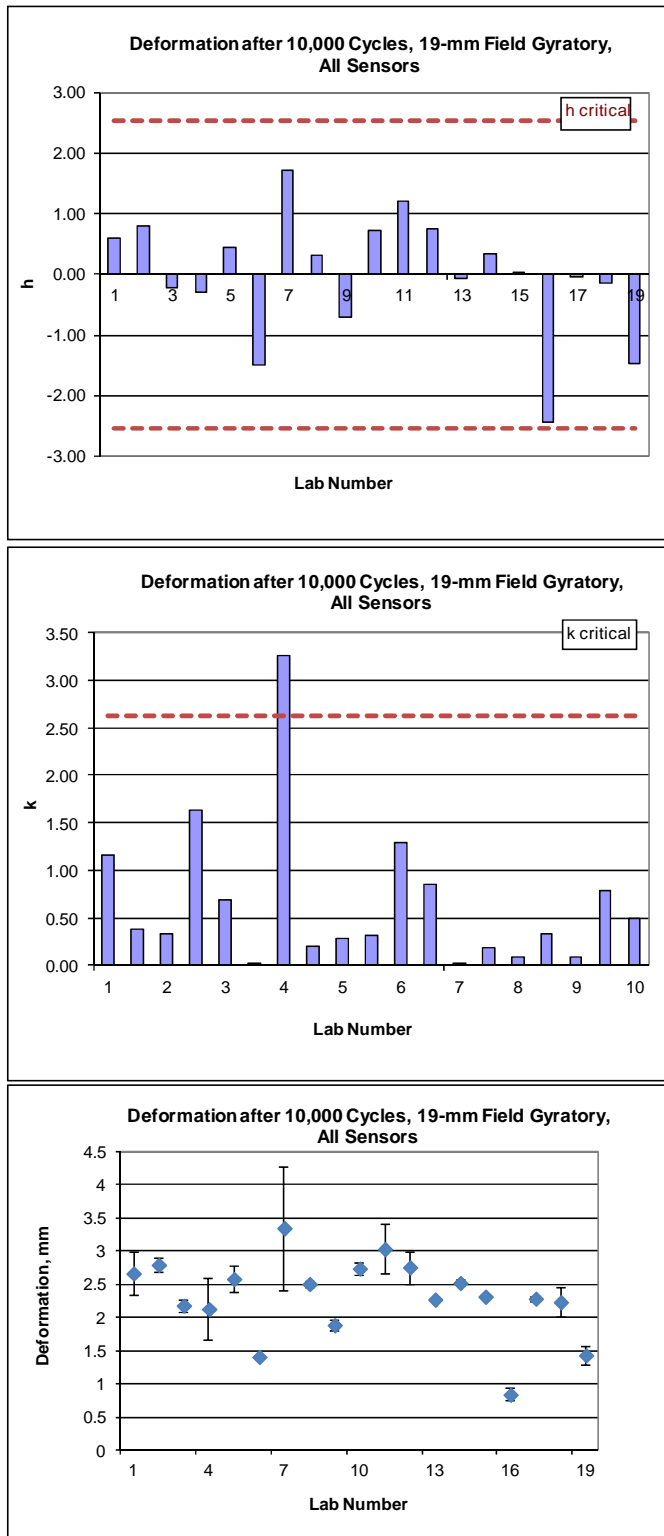
## **APPENDIX D- STATISTICS OF DEFORMATION OF 19-MM FIELD SPECIMENS**

**Table D-1- Statistics of deformation of 19-mm Field gyratory specimens after 10,000 passes; all measurement locations**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	2.33 3.00	2.67	0.47	0.59	1.17	2.67	0.47
2	2.90 2.69	2.79	0.15	0.80	0.38	2.79	0.15
3	2.28 2.09	2.18	0.13	-0.22	0.33	2.18	0.13
4	1.66 2.59	2.13	0.66	-0.31	1.63	2.13	0.66
5	2.39 2.78	2.58	0.28	0.45	0.69	2.58	0.28
6	1.40 1.42	1.41	0.01	-1.51	0.03	1.41	0.01
7	4.28 2.42	3.35	1.32	1.73	3.26	FALSE	FALSE
8	2.45 2.56	2.51	0.08	0.32	0.19	2.51	0.08
9	1.81 1.97	1.89	0.11	-0.71	0.28	1.89	0.11
10	2.83 2.65	2.74	0.13	0.71	0.32	2.74	0.13
11	2.66 3.40	3.03	0.52	1.20	1.30	3.03	0.52
12	2.52 3.00	2.76	0.34	0.74	0.84	2.76	0.34
13	2.28 2.27	2.27	0.01	-0.07	0.03	2.27	0.01
14	2.47 2.57	2.52	0.07	0.35	0.18	2.52	0.07
15	2.34 2.29	2.32	0.03	0.01	0.08	2.32	0.03
16	0.75 0.93	0.84	0.13	-2.45	0.33	0.84	0.13
17	2.26 2.31	2.29	0.04	-0.05	0.09	2.29	0.04
18	2.46 2.01	2.23	0.32	-0.13	0.79	2.23	0.32
19	1.57 1.29	1.43	0.20	-1.47	0.49	1.43	0.20

Counts	19	19	19	19	18	18
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
2.31	0.404	2.54	2.62	2.26	0.275
0.600	0.664			0.561	0.594



**Figure D-1- h and k statistics, median deformations, and measurement errors for 19-mm Field gyrotory specimens after 10,000 passes; all measurement locations**

**Table D-2- Statistics of deformation of 19-mm Field gyratory specimens after 15,000 passes; all measurement locations**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	2.47 3.37	2.92	0.64	0.43	1.12	2.92	0.64
2	3.24 2.96	3.10	0.19	0.69	0.34	3.10	0.19
3	2.55 2.29	2.42	0.18	-0.27	0.32	2.42	0.18
4	182 2.87	2.34	0.74	-0.39	1.30	2.34	0.74
5	2.62 3.03	2.82	0.29	0.30	0.50	2.82	0.29
6	151 150	150	0.01	-157	0.01	150	0.01
7	5.58 2.68	4.13	2.05	2.15	3.59	FALSE	FALSE
8	2.68 2.86	2.77	0.13	0.23	0.23	2.77	0.13
9	2.03 2.25	2.14	0.16	-0.67	0.27	2.14	0.16
10	3.19 2.96	3.07	0.16	0.65	0.28	3.07	0.16
11	3.07 3.89	3.48	0.58	123	102	3.48	0.58
12	2.80 3.43	3.11	0.45	0.71	0.78	3.11	0.45
13	2.61 2.60	2.61	0.00	-0.01	0.01	2.61	0.00
14	2.81 2.88	2.85	0.05	0.33	0.09	2.85	0.05
15	2.64 2.55	2.59	0.06	-0.03	0.10	2.59	0.06
16	0.89 1.11	1.00	0.16	-2.28	0.28	1.00	0.16
17	2.54 2.57	2.56	0.02	-0.08	0.04	2.56	0.02
18	2.85 2.22	2.53	0.45	-0.11	0.79	2.53	0.45
19	185 154	170	0.22	-1.30	0.39	170	0.22

Counts	19	19	19	19	18	18
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
2.61	0.572	2.54	2.62	2.53	0.334
0.707	0.814			0.621	0.665



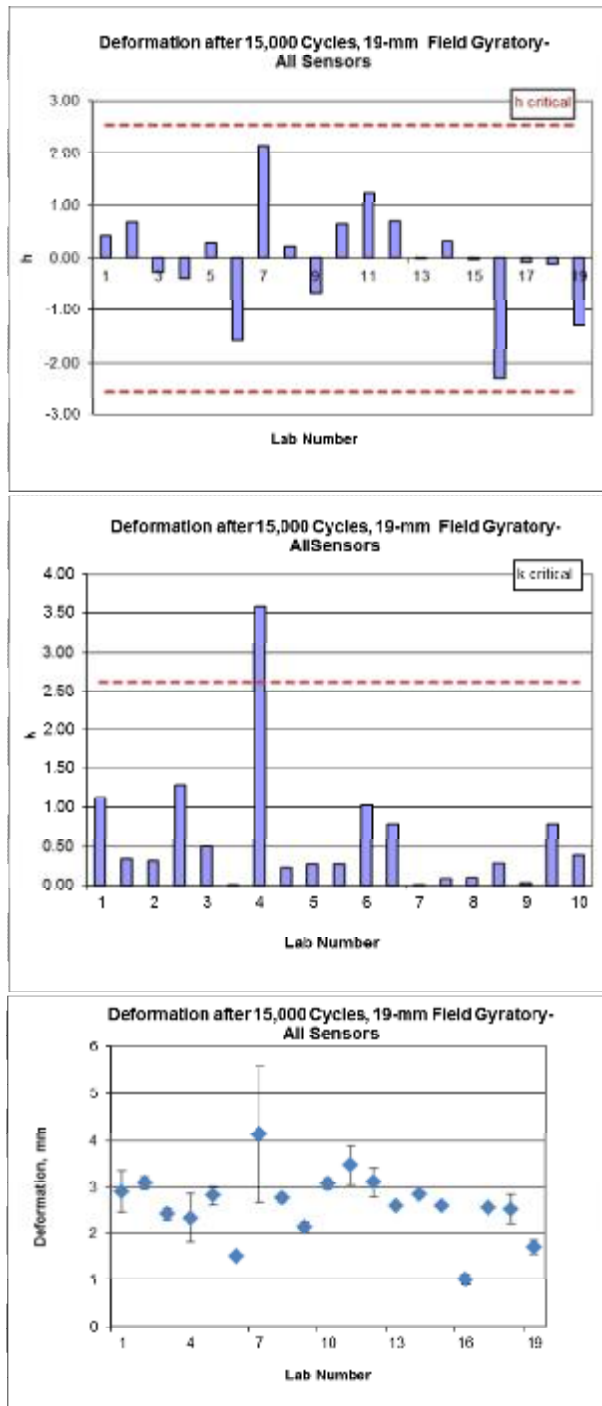


Figure D-2- h and k statistics, median deformation, and the measurement errors for 19-mm Field gyratory specimens after 15,000 passes; all measurement locations

**Table D-3- Statistics of deformation of 19-mm Field gyratory specimens after 20,000 passes; all measurement locations**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	2.60 3.63	3.11	0.73	0.34	0.95	3.11	0.73
2	3.50 2.96	3.23	0.38	0.48	0.50	3.23	0.38
3	2.77 2.44	2.61	0.23	-0.27	0.30	2.61	0.23
4	1.88 3.09	2.48	0.86	-0.41	1.12	2.48	0.86
5	2.79 3.23	3.01	0.31	0.22	0.40	3.01	0.31
6	1.59 1.60	1.59	0.01	-1.48	0.01	1.59	0.01
7	7.01 2.88	4.95	2.92	2.54	3.80	FALSE	FALSE
8	2.89 3.10	3.00	0.15	0.20	0.20	3.00	0.15
9	2.16 2.47	2.31	0.21	-0.62	0.28	2.31	0.21
10	3.51 3.23	3.37	0.20	0.65	0.26	3.37	0.20
11	3.37 4.22	3.79	0.61	1.16	0.79	3.79	0.61
12	2.99 3.76	3.37	0.54	0.65	0.71	3.37	0.54
13	2.76 2.88	2.82	0.08	-0.01	0.11	2.82	0.08
14	3.01 2.80	2.90	0.15	0.09	0.20	2.90	0.15
15	2.89 2.79	2.84	0.07	0.02	0.09	2.84	0.07
16	1.03 1.25	1.14	0.16	-2.03	0.21	1.14	0.16
17	2.75 2.77	2.76	0.01	-0.08	0.02	2.76	0.01
18	3.12 2.43	2.77	0.49	-0.07	0.63	2.77	0.49
19	1.82 1.50	1.66	0.22	-1.40	0.29	1.66	0.22

Counts	19.00	19.00	19.00	19.00	18	18
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
2.83	0.77	2.54	2.62	2.711	0.386
0.833	0.99			0.676	0.729

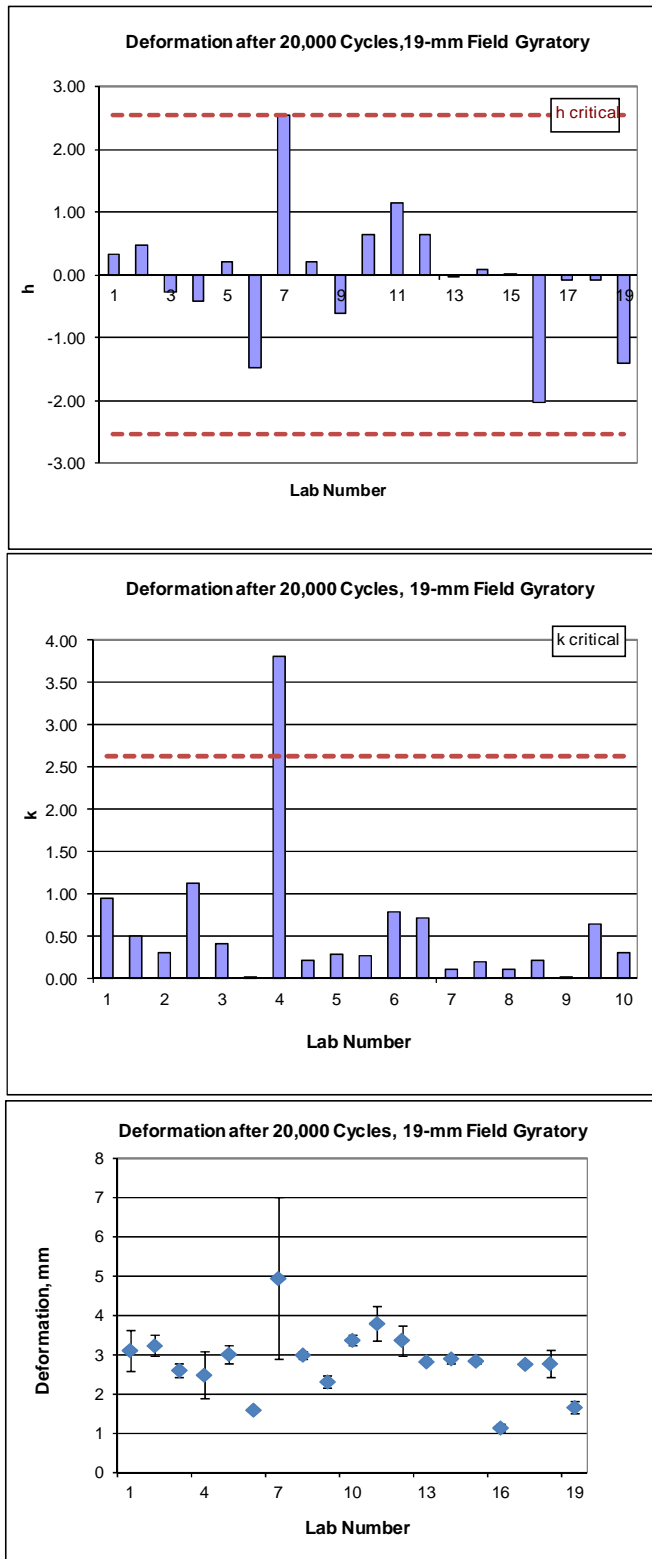


Figure D-3- h and k statistics, median deformation, and the measurement errors for 19-mm Field gyratory specimens after 20,000 passes; all measurement locations

**Table D-4- Statistics of deformation of 19-mm Field slab specimens after 10,000 passes; all measurement locations**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	3.12	3.41	0.40	100	0.64	3.41	0.40
	3.69						
2	2.76	2.37	0.54	-0.58	0.87	2.37	0.54
	1.99						
3	2.67	3.69	1.44	1.42	2.30	FALSE	FALSE
	4.71						
4	1.74	1.71	0.04	-1.59	0.06	1.71	0.04
	1.69						
5	2.57	2.64	0.11	-0.17	0.18	2.64	0.11
	2.72						
6	3.13	2.85	0.39	0.15	0.63	2.85	0.39
	2.58						
7	2.46	2.61	0.21	-0.23	0.33	2.61	0.21
	2.75						

Counts	7	7	7	7	6	6
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
2.75	0.627	2.05	2.30	2.60	0.333
0.654	0.790			0.558	0.606

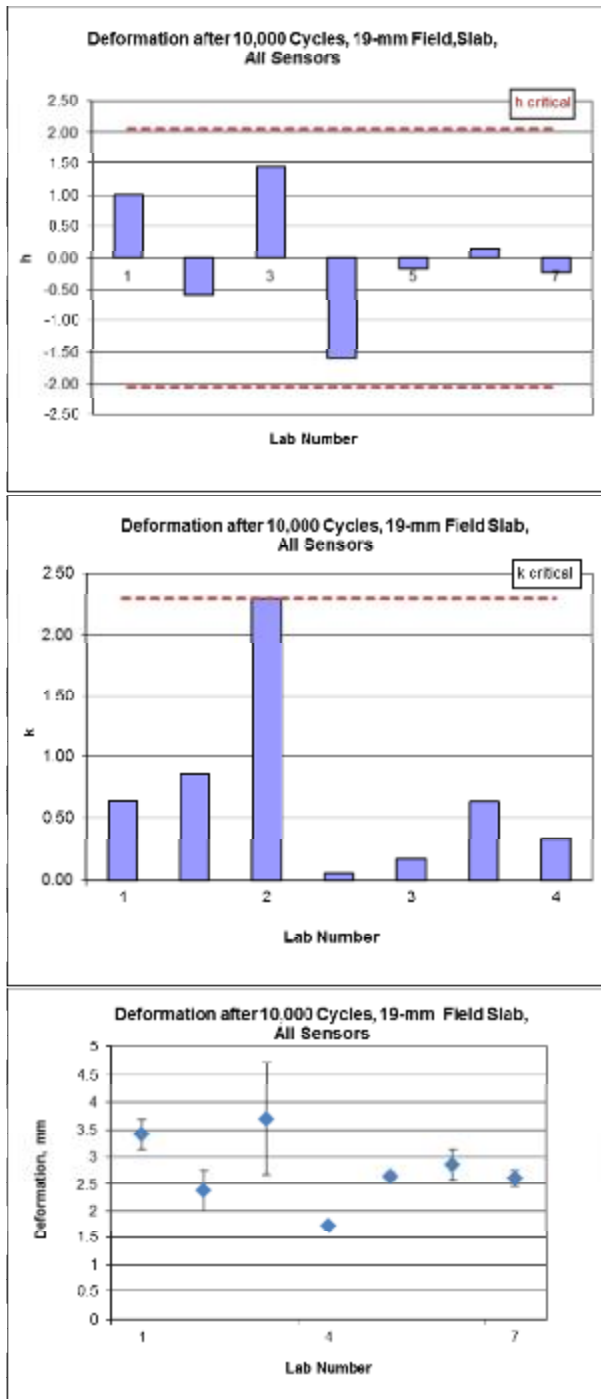


Figure D-4-  $\bar{h}$  and  $\bar{k}$  statistics, median deformation, and the measurement errors for 19-mm Field slab specimens after 10,000 passes; all measurement locations

**Table D-5- Statistics of deformation of 19-mm Field slab specimens after 15,000 passes; all measurement locations**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	3.68	4.02	0.49	0.99	0.54	4.02	0.49
	4.37						
2	2.99	2.62	0.52	-0.69	0.57	2.62	0.52
	2.26						
3	2.93	4.44	2.13	148	2.36	FALSE	FALSE
	5.95						
4	196	195	0.01	-149	0.02	195	0.01
	194						
5	2.92	3.07	0.22	-0.15	0.24	3.07	0.22
	3.23						
6	3.86	3.32	0.76	0.14	0.84	3.32	0.76
	2.78						
7	2.81	2.96	0.21	-0.28	0.24	2.96	0.21
	3.11						

Counts	7	7	7	7	6	6
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
3.20	0.905	2.05	2.30	2.99	0.443
0.838	1.054			0.694	0.762

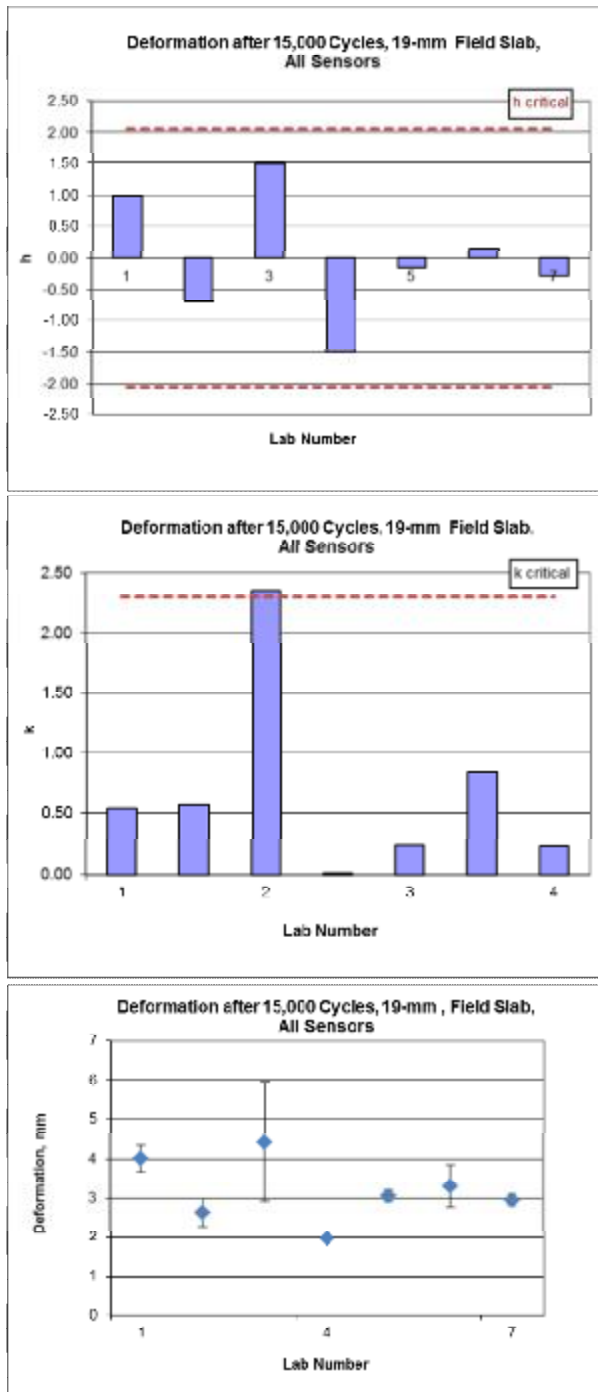


Figure D-5- h and k statistics, median deformation, and the measurement errors for 19-mm Field slab specimens after 15,000 passes; all measurement locations

**Table D-6- Statistics of deformation of 19-mm Field slab specimens after 20,000 passes; all measurement locations**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	4.10	4.54	0.62	0.97	0.52	4.54	0.62
	4.98						
2	3.20	2.81	0.55	-0.71	0.46	2.81	0.55
	2.42						
3	3.14	5.19	2.90	1.59	2.41	FALSE	FALSE
	7.24						
4	2.12	2.14	0.03	-1.36	0.02	2.14	0.03
	2.16						
5	3.25	3.46	0.29	-0.08	0.24	3.46	0.29
	3.66						
6	4.14	3.53	0.85	-0.01	0.71	3.53	0.85
	2.93						
7	2.81	3.12	0.44	-0.41	0.37	3.12	0.44
	3.43						

Counts	7	7	7	7	6	6
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
3.54	1202	2.05	2.30	3.27	0.532
103	1339			0.805	0.889



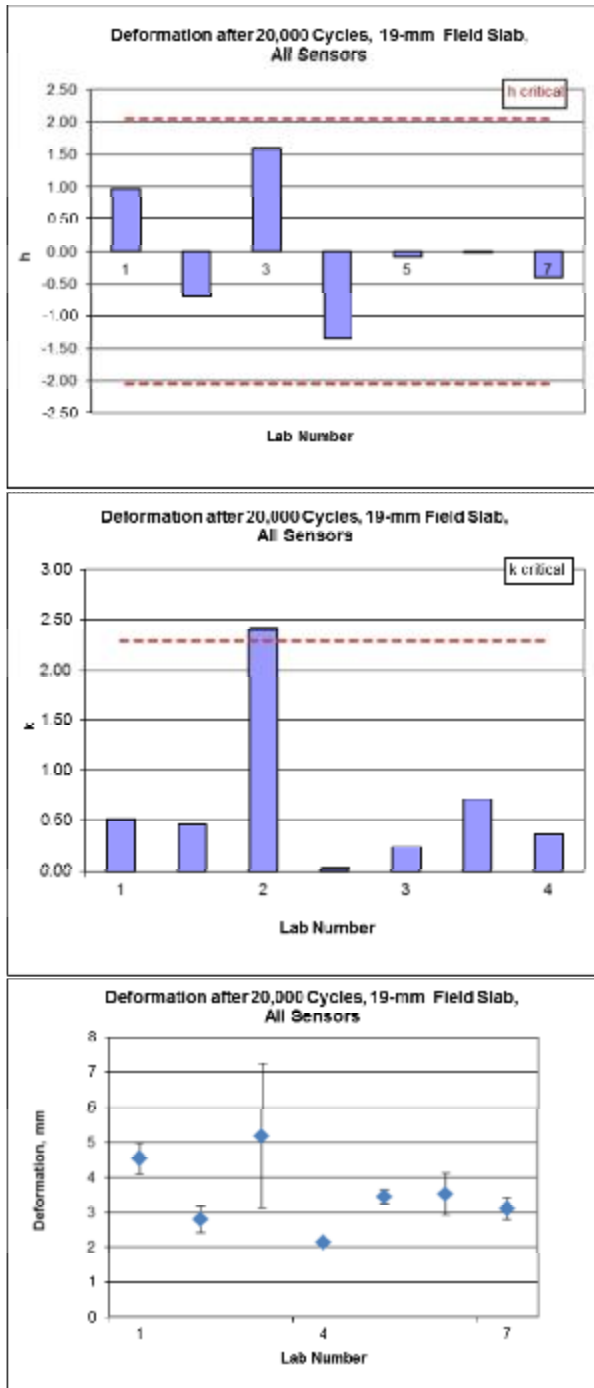


Figure D-6- h and k statistics, median deformation, and the measurement errors for 19-mm Field slab specimens after 20,000 passes; all measurement locations

**Table D-7- Statistics of deformation of 19-mm Field gyratory specimens after 10,000 passes; except middle three measurement locations**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	2.30 2.91	2.61	0.44	0.66	142	2.61	0.44
2	2.67 2.71	2.69	0.03	0.81	0.10	2.69	0.03
3	2.19 2.00	2.09	0.14	-0.23	0.44	2.09	0.14
4	1.60 2.53	2.06	0.66	-0.28	2.13	2.06	0.66
5	2.23 2.63	2.43	0.28	0.36	0.91	2.43	0.28
6	1.37 1.33	1.35	0.03	-1.51	0.09	1.35	0.03
7	3.30 2.25	2.77	0.74	0.96	2.38	2.77	0.74
8	2.47 2.47	2.47	0.00	0.43	0.00	2.47	0.00
9	1.79 1.81	1.80	0.01	-0.73	0.04	1.80	0.01
10	2.67 2.64	2.65	0.02	0.74	0.07	2.65	0.02
11	2.88 3.46	3.17	0.41	1.65	1.34	3.17	0.41
12	2.37 3.04	2.71	0.47	0.84	1.53	2.71	0.47
13	2.21 2.16	2.18	0.04	-0.08	0.14	2.18	0.04
14	2.28 2.48	2.38	0.14	0.27	0.44	2.38	0.14
15	2.34 2.30	2.32	0.03	0.17	0.09	2.32	0.03
16	0.73 0.83	0.78	0.07	-2.50	0.23	0.78	0.07
17	2.28 2.30	2.29	0.02	0.11	0.05	2.29	0.02
18	2.37 1.95	2.16	0.30	-0.11	0.96	2.16	0.30
19	1.47 1.21	1.34	0.19	-1.54	0.61	1.34	0.19

Counts	19	19	19	19	19	19
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
2.22	0.309	2.54	2.62	2.22	0.309
0.58	0.616			0.575	0.616

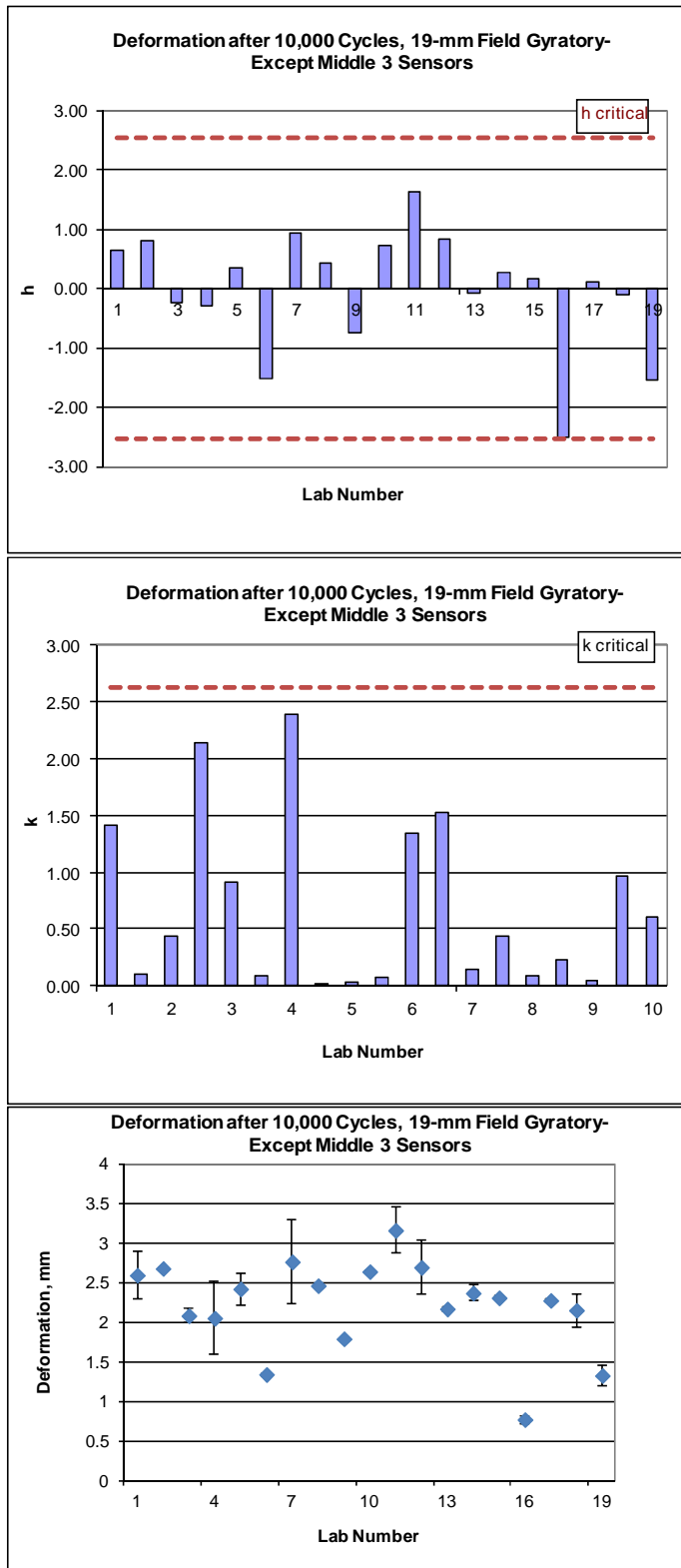


Figure D-7- h and k statistics, median deformation, and the measurement errors for 19-mm Field gyrotory specimens after 10,000 passes; except middle three measurement locations

**Table D-8- Statistics of deformation of 19-mm Field gyratory specimens after 15,000 passes; except middle three measurement locations**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	2.39 3.20	2.80	0.57	0.45	1.34	2.80	0.57
2	3.04 2.98	3.01	0.04	0.78	0.10	3.01	0.04
3	2.45 2.19	2.32	0.18	-0.28	0.43	2.32	0.18
4	1.74 2.79	2.27	0.74	-0.36	1.74	2.27	0.74
5	2.45 2.89	2.67	0.31	0.25	0.74	2.67	0.31
6	1.48 1.42	1.45	0.04	-1.61	0.10	1.45	0.04
7	4.25 2.46	3.36	1.26	1.30	2.98	FALSE	FALSE
8	2.72 2.74	2.73	0.01	0.34	0.03	2.73	0.01
9	2.02 2.05	2.03	0.02	-0.72	0.05	2.03	0.02
10	3.00 2.96	2.98	0.03	0.72	0.06	2.98	0.03
11	3.29 3.91	3.60	0.44	1.68	1.04	3.60	0.44
12	2.64 3.49	3.07	0.61	0.86	1.43	3.07	0.61
13	2.54 2.48	2.51	0.04	0.01	0.10	2.51	0.04
14	2.61 2.75	2.68	0.10	0.27	0.24	2.68	0.10
15	2.63 2.57	2.60	0.05	0.14	0.11	2.60	0.05
16	0.88 0.98	0.93	0.07	-2.41	0.18	0.93	0.07
17	2.57 2.57	2.57	0.00	0.10	0.01	2.57	0.00
18	2.75 2.13	2.44	0.44	-0.09	1.04	2.44	0.44
19	1.71 1.43	1.57	0.20	-1.42	0.46	1.57	0.20

Counts	19.00	19.00	19.00	19.00	18	18
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
2.50	0.423	2.54	2.62	2.46	0.318
0.654	0.719			0.639	0.677

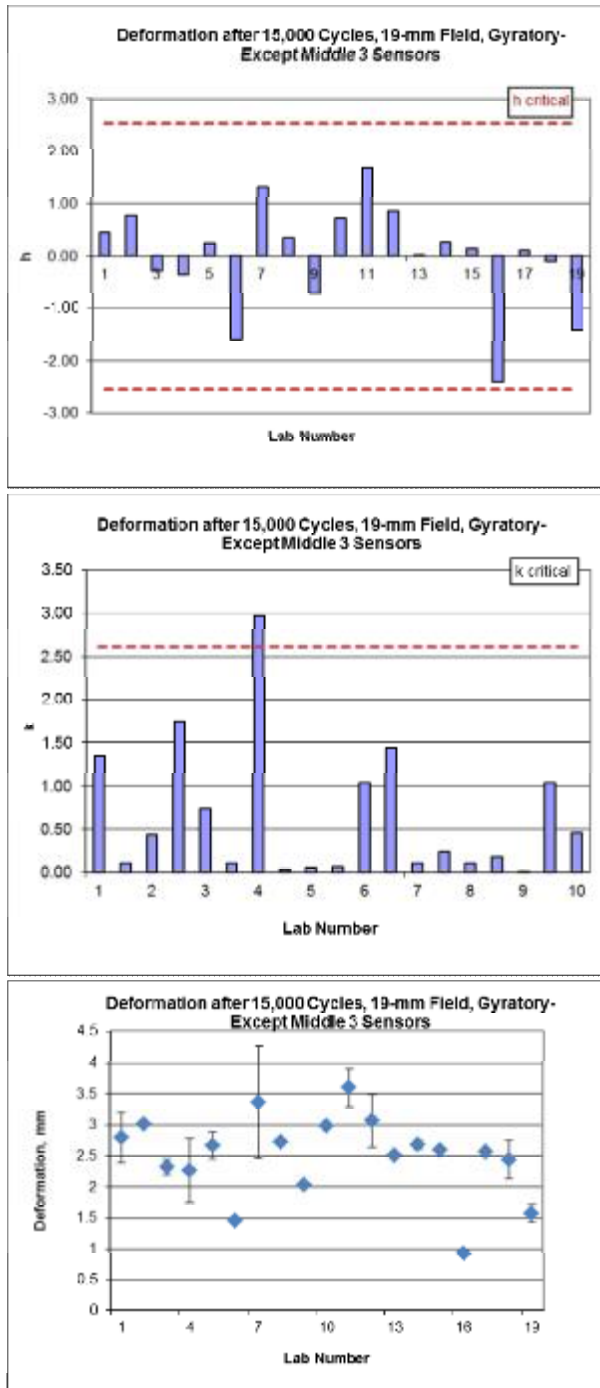


Figure D-8- h and k statistics, median deformation, and the measurement errors for 19-mm Field gyratory specimens after 15,000 passes; except middle three measurement locations

**Table D-9- Statistics of deformation of 19-mm Field gyratory specimens after 20,000 passes; except middle three measurement locations**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	2.49 3.42	2.96	0.66	0.34	1.14	2.96	0.66
2	3.31 2.98	3.15	0.23	0.59	0.41	3.15	0.23
3	2.65 2.33	2.49	0.23	-0.28	0.40	2.49	0.23
4	1.80 3.01	2.40	0.86	-0.41	1.48	2.40	0.86
5	2.58 3.08	2.83	0.35	0.17	0.61	2.83	0.35
6	1.55 1.50	1.53	0.03	-1.57	0.06	1.53	0.03
7	5.44 2.62	4.03	1.99	1.78	3.46	FALSE	FALSE
8	2.94 2.94	2.94	0.00	0.32	0.01	2.94	0.00
9	2.16 2.22	2.19	0.04	-0.68	0.07	2.19	0.04
10	3.29 3.25	3.27	0.03	0.76	0.05	3.27	0.03
11	3.59 4.15	3.87	0.40	1.56	0.69	3.87	0.40
12	2.82 3.83	3.33	0.72	0.83	1.24	3.33	0.72
13	2.69 2.76	2.72	0.05	0.03	0.08	2.72	0.05
14	2.76 2.68	2.72	0.06	0.02	0.11	2.72	0.06
15	2.88 2.81	2.85	0.05	0.19	0.08	2.85	0.05
16	1.01 1.08	1.05	0.05	-2.21	0.09	1.05	0.05
17	2.80 2.77	2.78	0.02	0.10	0.04	2.78	0.02
18	3.05 2.38	2.71	0.47	0.01	0.81	2.71	0.47
19	1.68 1.41	1.55	0.20	-1.55	0.34	1.55	0.20

Counts	19	19	19	19	18	18
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
2.70	0.577	2.54	2.62	2.63	0.360
0.747	0.851			0.694	0.739

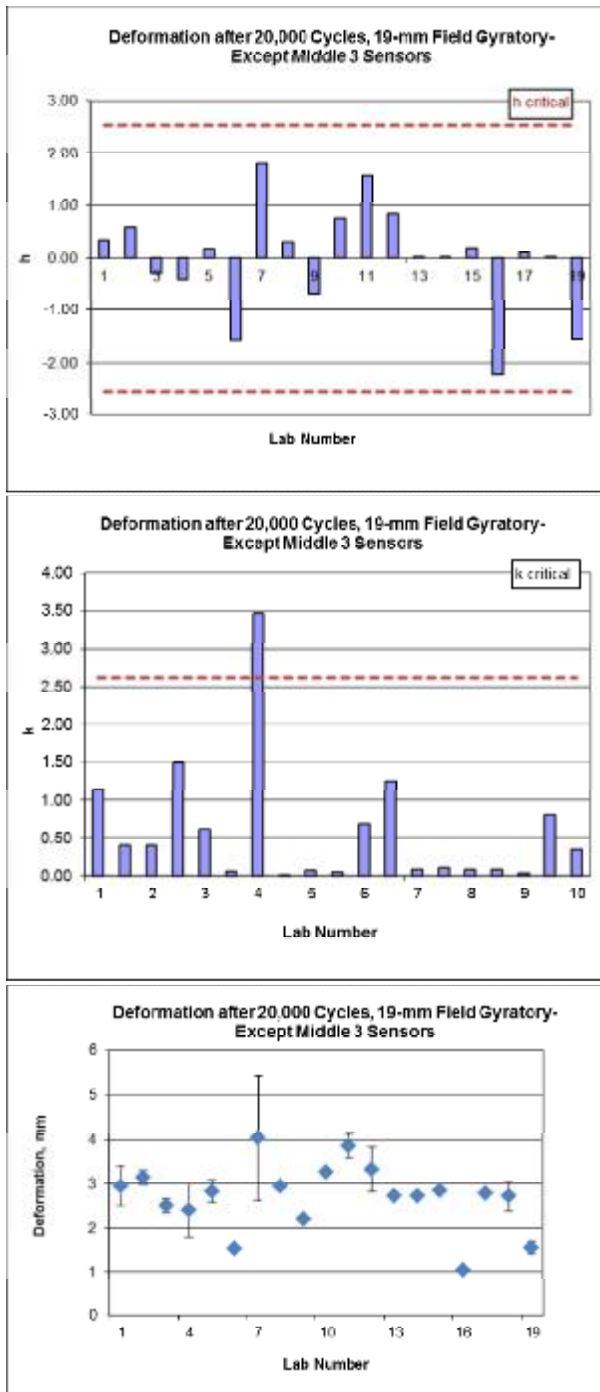


Figure D-9- h and k statistics, median deformation, and the measurement errors for 19-mm Field gyratory specimens after 20,000 passes; except middle three measurement locations

**Table D-10- Statistics of deformation of 19-mm Field slab specimens after 10,000 passes; except middle three measurement locations**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	3.12	3.39	0.38	0.93	0.58	3.39	0.38
	3.66						
2	2.74	2.36	0.54	-0.65	0.83	2.36	0.54
	1.98						
3	2.68	3.75	1.52	1.49	2.32	FALSE	FALSE
	4.83						
4	1.79	1.77	0.02	-1.56	0.03	1.77	0.02
	1.76						
5	2.62	2.71	0.12	-0.11	0.19	2.71	0.12
	2.80						
6	3.13	2.84	0.41	0.08	0.63	2.84	0.41
	2.55						
7	2.48	2.66	0.26	-0.19	0.40	2.66	0.26
	2.84						

Counts	7	7	7	7	6	6
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
2.78	0.654	2.05	2.30	2.62	0.338
0.650	0.797			0.536	0.587



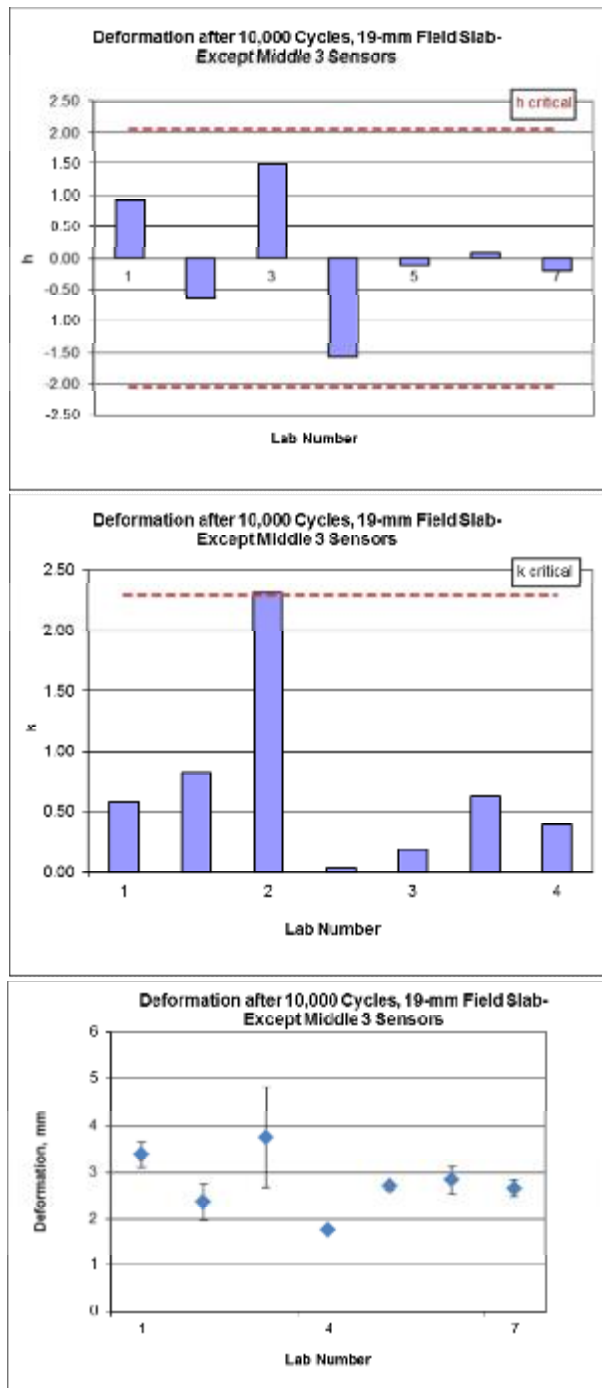


Figure D-10- h and k statistics, median deformation, and the measurement errors for 19-mm Field slab specimens after 10,000 passes; except middle three measurement locations

**Table D-11- Statistics of deformation of 19-mm Field slab specimens after 15,000 passes; except middle three measurement locations**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	3.67	3.99	0.45	0.91	0.48	3.99	0.45
	4.31						
2	2.98	2.60	0.53	-0.73	0.56	2.60	0.53
	2.23						
3	2.95	4.54	2.25	1.57	2.38	FALSE	FALSE
	6.13						
4	2.03	2.02	0.00	-1.43	0.01	2.02	0.00
	2.02						
5	2.98	3.15	0.24	-0.08	0.25	3.15	0.24
	3.32						
6	3.86	3.30	0.78	0.10	0.82	3.30	0.78
	2.75						
7	2.80	2.94	0.19	-0.34	0.20	2.94	0.19
	3.07						

Counts	7	7	7	7	6	6
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
3.22	0.945	2.05	2.30	3.00	0.443
0.840	1.073			0.665	0.735

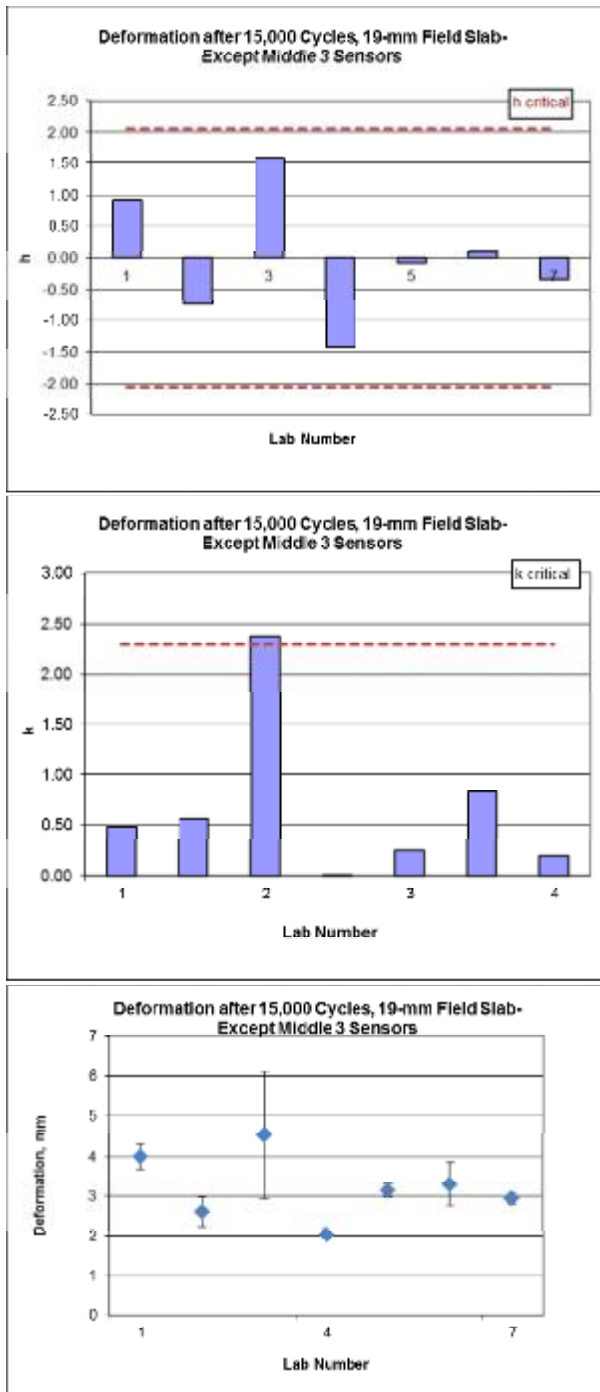


Figure D-11- h and k statistics, median deformation, and the measurement errors for 19-mm Field slab specimens after 15,000 passes; except middle three measurement locations

**Table D-12- Statistics of deformation of 19-mm Field slab specimens after 20,000 passes; except middle three measurement locations**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	4.07	4.47	0.57	0.86	0.45	4.47	0.57
	4.87						
2	3.21	2.80	0.58	-0.75	0.46	2.80	0.58
	2.39						
3	3.16	5.32	3.07	168	2.44	FALSE	FALSE
	7.49						
4	2.20	2.23	0.05	-129	0.04	2.23	0.05
	2.26						
5	3.34	3.55	0.31	-0.02	0.24	3.55	0.31
	3.77						
6	4.14	3.52	0.87	-0.05	0.69	3.52	0.87
	2.91						
7	2.85	3.13	0.39	-0.43	0.31	3.13	0.39
	3.41						

Counts	7	7	7	7	6	6
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
3.58	1259	2.05	2.30	3.28	0.528
1039	1368			0.762	0.849

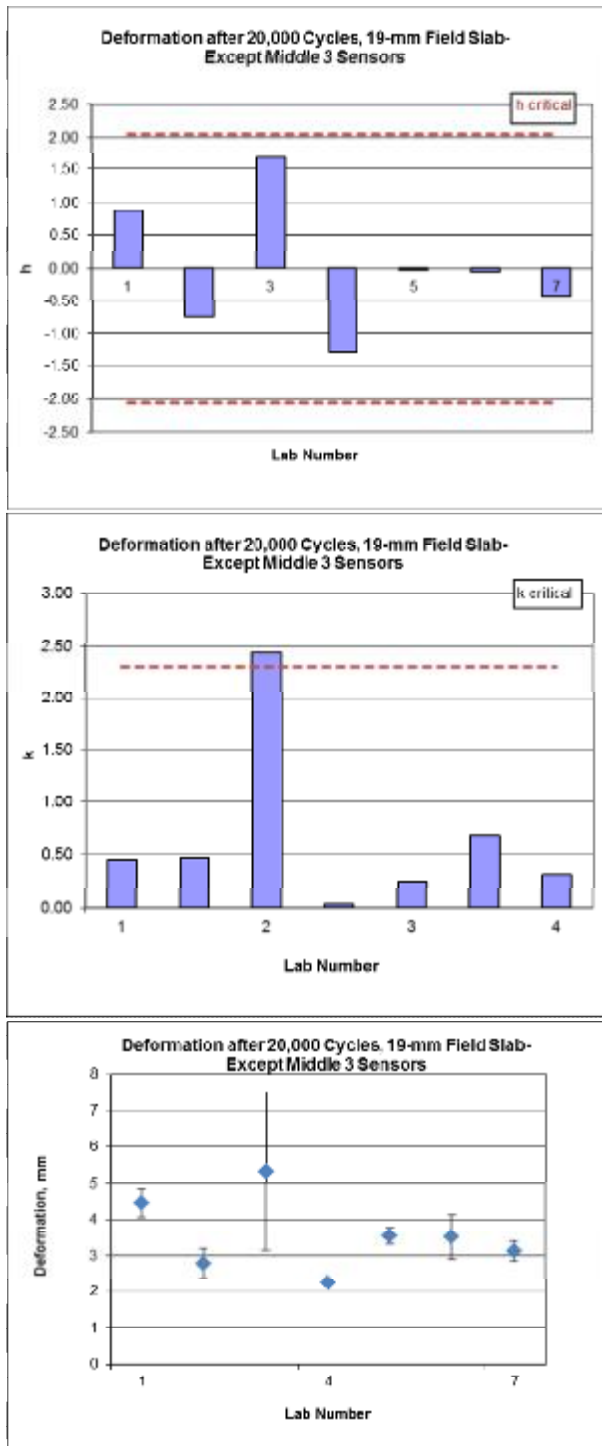


Figure D-12- h and k statistics, median deformation, and the measurement errors for 19-mm Field slab specimens after 20,000 passes; except middle three measurement locations

**Table D-13- Statistics of deformation of 19-mm Field gyratory specimens after 10,000 passes; except two measurement locations at each end**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	2.41	2.83	0.60	0.58	104	2.83	0.60
	3.25						
2	3.08	2.88	0.28	0.65	0.49	2.88	0.28
	2.68						
3	2.47	2.37	0.14	-0.11	0.24	2.37	0.14
	2.27						
4	1.77	2.27	0.72	-0.26	125	2.27	0.72
	2.78						
5	2.54	2.75	0.30	0.45	0.52	2.75	0.30
	2.96						
6	150	154	0.05	-136	0.08	154	0.05
	157						
7	5.54	4.06	2.08	2.43	3.62	FALSE	FALSE
	2.59						
8	2.49	2.60	0.16	0.24	0.28	2.60	0.16
	2.72						
9	185	197	0.17	-0.71	0.30	197	0.17
	2.09						
10	3.06	2.88	0.26	0.65	0.45	2.88	0.26
	2.70						
11	2.54	3.08	0.75	0.95	130	3.08	0.75
	3.61						
12	2.64	2.74	0.14	0.44	0.24	2.74	0.14
	2.84						
13	2.42	2.39	0.05	-0.09	0.08	2.39	0.05
	2.35						
14	2.64	2.65	0.01	0.30	0.02	2.65	0.01
	2.66						
15	2.34	2.32	0.02	-0.18	0.04	2.32	0.02
	2.31						
16	0.84	0.94	0.15	-2.25	0.25	0.94	0.15
	105						
17	2.29	2.37	0.11	-0.12	0.19	2.37	0.11
	2.44						
18	2.51	2.27	0.33	-0.26	0.57	2.27	0.33
	2.04						
19	167	155	0.17	-135	0.30	155	0.17
	142						

Counts	19	19	19	19	18	18
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
2.45	0.57	2.54	2.62	2.36	0.33
0.67	0.78			0.554	0.601

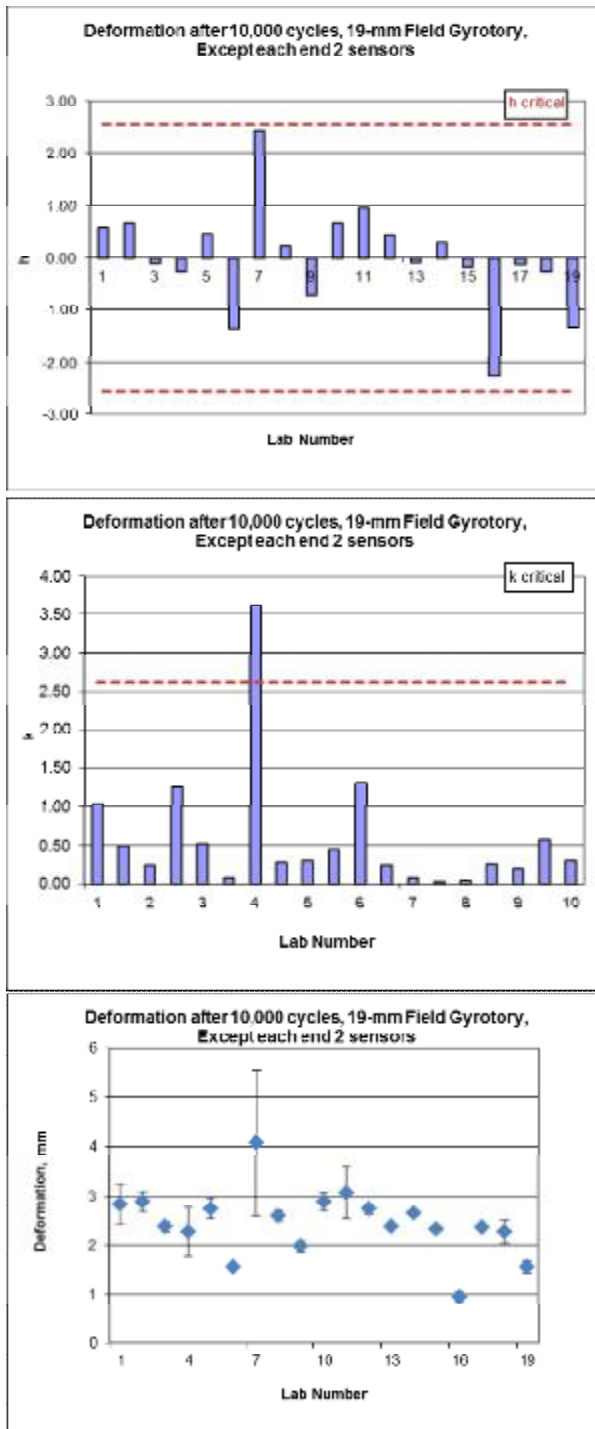


Figure D-13- h and k statistics, median deformation, and the measurement errors for 19-mm Field gyrotory specimens after 10,000 passes; except two measurement locations at each end

**Table D-14- Statistics of deformation of 19-mm Field gyratory specimens after 15,000 passes; except two measurement locations at each end**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	2.56	3.14	0.82	0.44	101	3.14	0.82
	3.72						
2	3.39	3.18	0.30	0.49	0.37	3.18	0.30
	2.97						
3	2.77	2.64	0.18	-0.16	0.22	2.64	0.18
	2.51						
4	1.94	2.51	0.82	-0.32	101	2.51	0.82
	3.09						
5	2.79	3.00	0.29	0.27	0.36	3.00	0.29
	3.20						
6	1.63	1.64	0.01	-1.39	0.02	1.64	0.01
	1.65						
7	7.29	5.10	3.11	2.84	3.84	FALSE	FALSE
	2.90						
8	2.71	2.89	0.25	0.13	0.31	2.89	0.25
	3.06						
9	2.09	2.28	0.26	-0.61	0.32	2.28	0.26
	2.46						
10	3.46	3.23	0.33	0.56	0.41	3.23	0.33
	3.00						
11	2.99	3.56	0.81	0.96	1.00	3.56	0.81
	4.13						
12	2.93	3.07	0.20	0.36	0.25	3.07	0.20
	3.21						
13	2.75	2.74	0.02	-0.04	0.02	2.74	0.02
	2.73						
14	3.00	2.99	0.02	0.26	0.02	2.99	0.02
	2.98						
15	2.64	2.60	0.05	-0.22	0.07	2.60	0.05
	2.56						
16	0.99	1.13	0.20	-2.02	0.24	1.13	0.20
	1.27						
17	2.56	2.63	0.11	-0.17	0.14	2.63	0.11
	2.71						
18	2.90	2.58	0.46	-0.24	0.57	2.58	0.46
	2.25						
19	1.97	1.84	0.18	-1.14	0.23	1.84	0.18
	1.71						

Counts	19	19	19	19	18	18
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
2.78	0.81	2.54	2.62	2.65	0.39
0.82	1.00			0.609	0.669



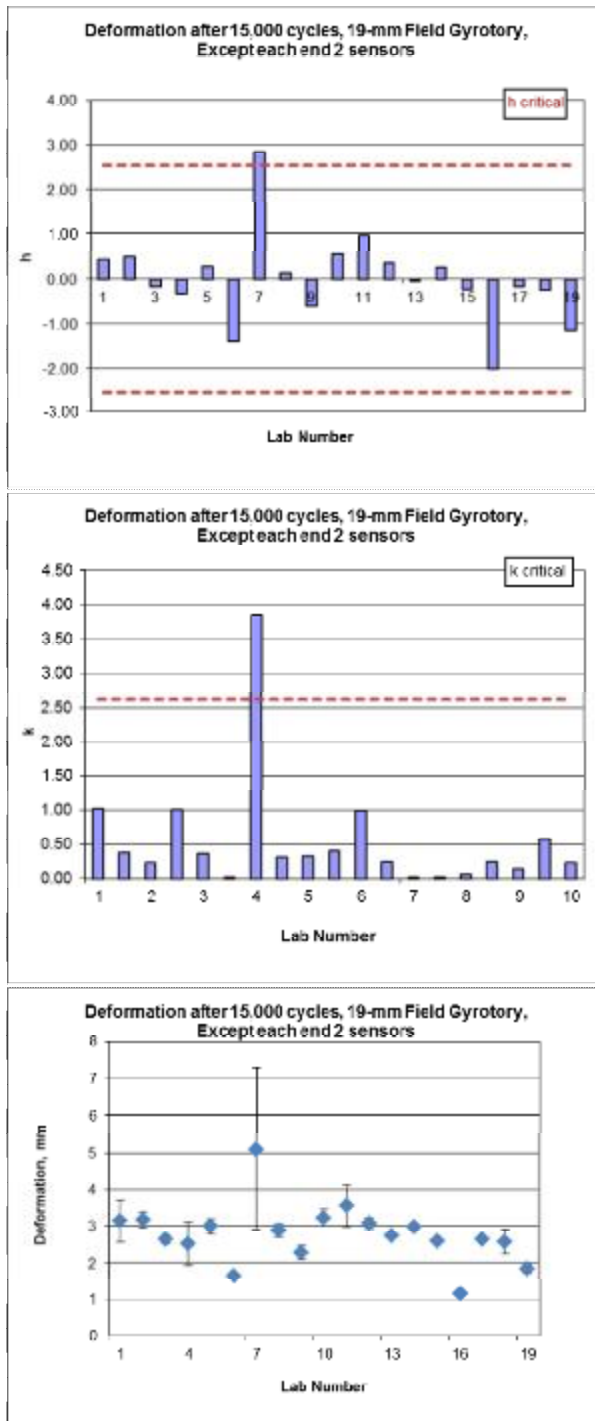


Figure D-14- h and k statistics, median deformation, and the measurement errors for 19-mm Field gyrotory specimens after 15,000 passes; except two measurement locations at each end

**Table D-15- Statistics of deformation of 19-mm Field gyratory specimens after 20,000 passes; except two measurement locations at each end**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	2.72	3.37	0.91	0.35	0.85	3.37	0.91
	4.01						
2	3.65	3.33	0.46	0.31	0.43	3.33	0.46
	3.01						
3	3.03	2.85	0.25	-0.17	0.23	2.85	0.25
	2.68						
4	2.02	2.68	0.94	-0.34	0.87	2.68	0.94
	3.35						
5	3.00	3.21	0.30	0.19	0.28	3.21	0.30
	3.42						
6	1.71	1.74	0.05	-1.28	0.05	1.74	0.05
	1.78						
7	9.15	6.14	4.25	3.13	3.96	FALSE	FALSE
	3.14						
8	2.90	3.12	0.32	0.10	0.30	3.12	0.32
	3.35						
9	2.24	2.48	0.34	-0.54	0.32	2.48	0.34
	2.73						
10	3.84	3.55	0.41	0.53	0.38	3.55	0.41
	3.26						
11	3.31	3.96	0.93	0.94	0.86	3.96	0.93
	4.62						
12	3.13	3.32	0.26	0.29	0.24	3.32	0.26
	3.50						
13	2.93	2.98	0.07	-0.04	0.06	2.98	0.07
	3.03						
14	3.28	3.09	0.27	0.07	0.25	3.09	0.27
	2.90						
15	2.89	2.85	0.05	-0.17	0.05	2.85	0.05
	2.82						
16	1.16	1.30	0.20	-1.73	0.19	1.30	0.20
	1.44						
17	2.73	2.82	0.13	-0.20	0.12	2.82	0.13
	2.91						
18	3.16	2.81	0.49	-0.21	0.46	2.81	0.49
	2.46						
19	1.94	1.80	0.19	-1.22	0.18	1.80	0.19
	1.67						

Counts	19	19	19	19	18	18
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
3.02	107	2.54	2.62	2.85	0.46
1.00	125			0.669	0.744

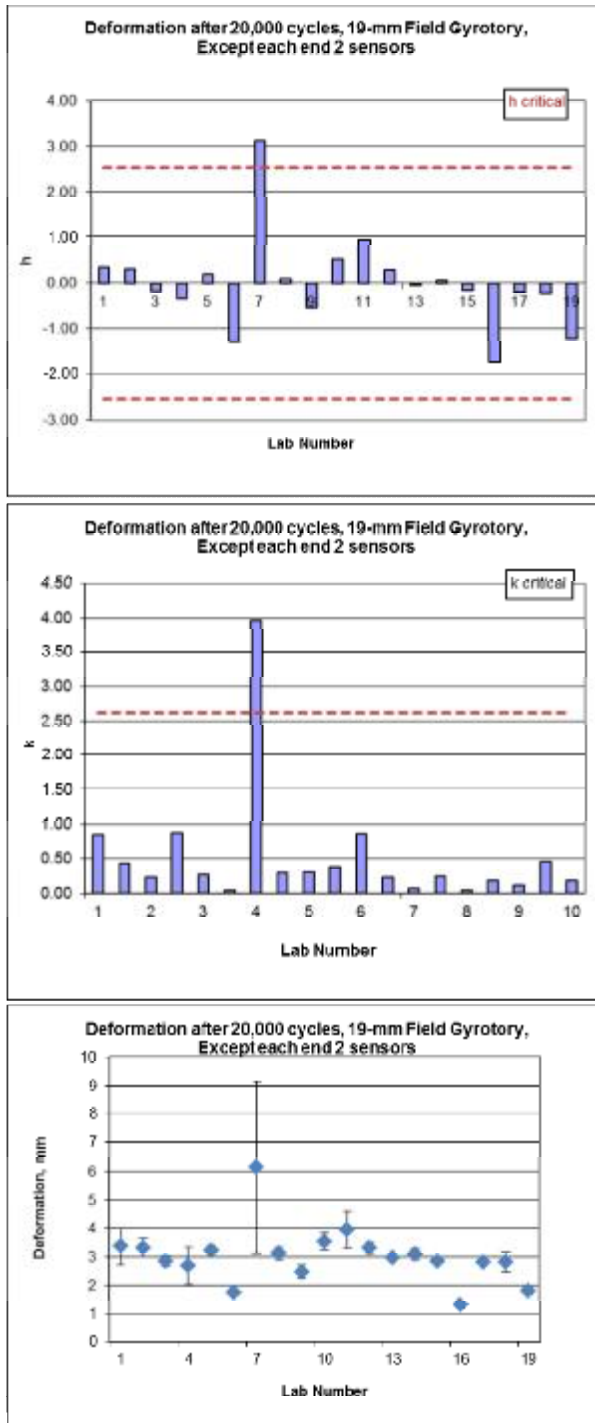


Figure D-15- h and k statistics, median deformation, and the measurement errors for 19-mm Field gyrotory specimens after 20,000 passes; except two measurement locations at each end

**Table D-16- Statistics of deformation of 19-mm Field slab specimens after 10,000 passes; except two measurement locations at each end**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	3.10	3.41	0.44	107	0.75	3.41	0.44
	3.72						
2	2.77	2.40	0.52	-0.47	0.88	2.40	0.52
	2.03						
3	2.65	3.61	1.35	137	2.30	FALSE	FALSE
	4.56						
4	167	165	0.03	-1.62	0.05	165	0.03
	163						
5	2.50	2.59	0.12	-0.18	0.20	2.59	0.12
	2.67						
6	2.97	2.79	0.26	0.12	0.45	2.79	0.26
	2.60						
7	2.38	2.52	0.19	-0.29	0.33	2.52	0.19
	2.65						

Counts	7	7	7	7	6	6
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
2.71	0.59	2.05	2.30	2.56	0.31
0.66	0.78			0.573	0.613

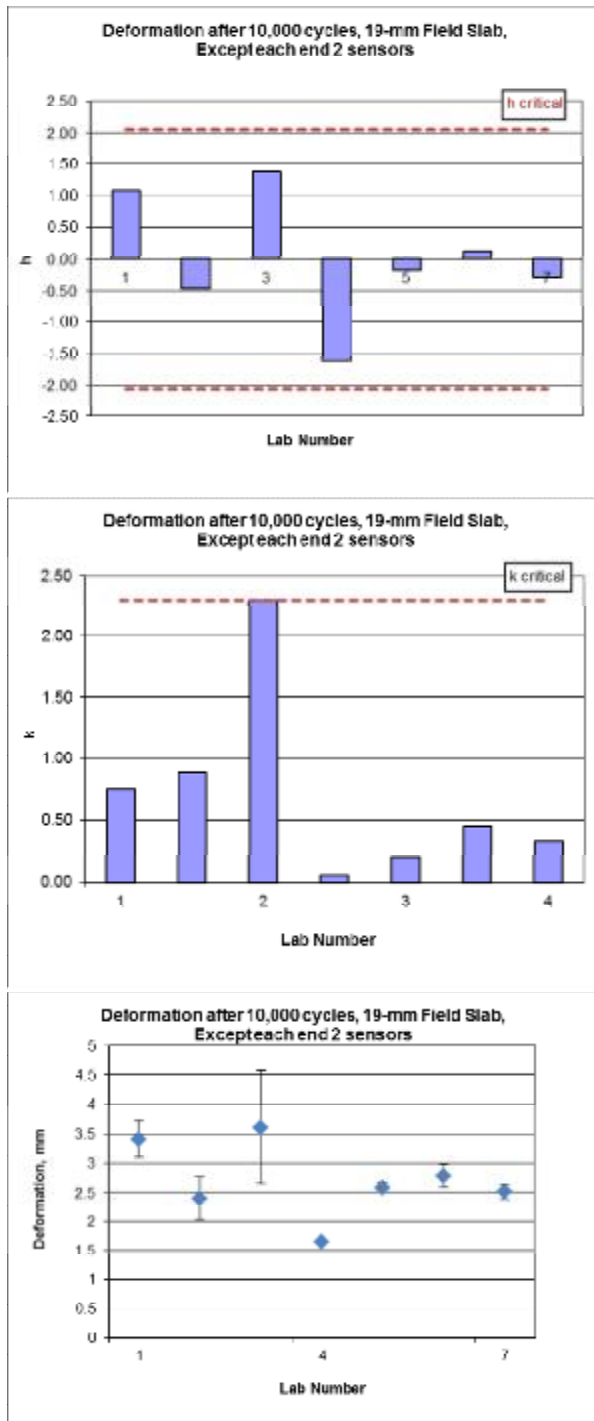


Figure D-16- h and k statistics, median deformation, and the measurement errors for 19-mm Field slab specimens after 10,000 passes; except two measurement locations at each end

**Table D-17- Statistics of deformation of 19-mm Field slab specimens after 15,000 passes; except two measurement locations at each end**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	3.64	4.05	0.59	108	0.69	4.05	0.59
	4.47						
2	2.97	2.63	0.47	-0.60	0.55	2.63	0.47
	2.30						
3	2.91	4.33	2.00	141	2.36	FALSE	FALSE
	5.75						
4	186	186	0.00	-152	0.00	186	0.00
	186						
5	2.86	3.01	0.21	-0.15	0.24	3.01	0.21
	3.16						
6	3.70	3.25	0.63	0.13	0.74	3.25	0.63
	2.80						
7	2.73	2.83	0.14	-0.37	0.17	2.83	0.14
	2.93						

Counts	7	7	7	7	6	6
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
3.14	0.85	2.05	2.30	2.94	0.41
0.84	1.04			0.723	0.780

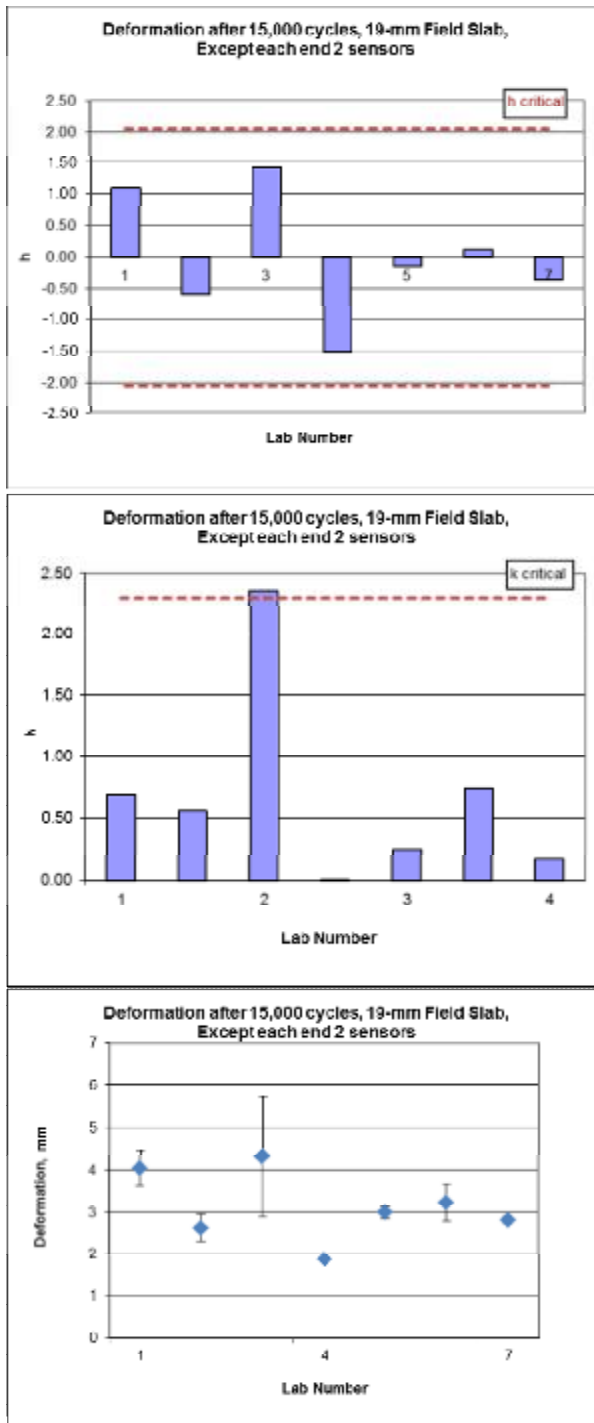


Figure D-17- h and k statistics, median deformation, and the measurement errors for 19-mm Field slab specimens after 15,000 passes; except two measurement locations at each end

**Table D-18- Statistics of deformation of 19-mm Field slab specimens after 20,000 passes; except two measurement locations at each end**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	4.08	4.62	0.77	110	0.68	4.62	0.77
	5.16						
2	3.15	2.82	0.48	-0.65	0.42	2.82	0.48
	2.48						
3	3.11	5.03	2.71	150	2.40	FALSE	FALSE
	6.95						
4	2.00	2.05	0.07	-1.40	0.06	2.05	0.07
	2.10						
5	3.19	3.38	0.28	-0.10	0.25	3.38	0.28
	3.58						
6	3.95	3.45	0.71	-0.04	0.63	3.45	0.71
	2.95						
7	2.75	3.07	0.45	-0.40	0.40	3.07	0.45
	3.39						

Counts	7	7	7	7	6	6
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
3.49	1.13	2.05	2.30	3.23	0.52
1.03	1.30			0.848	0.924



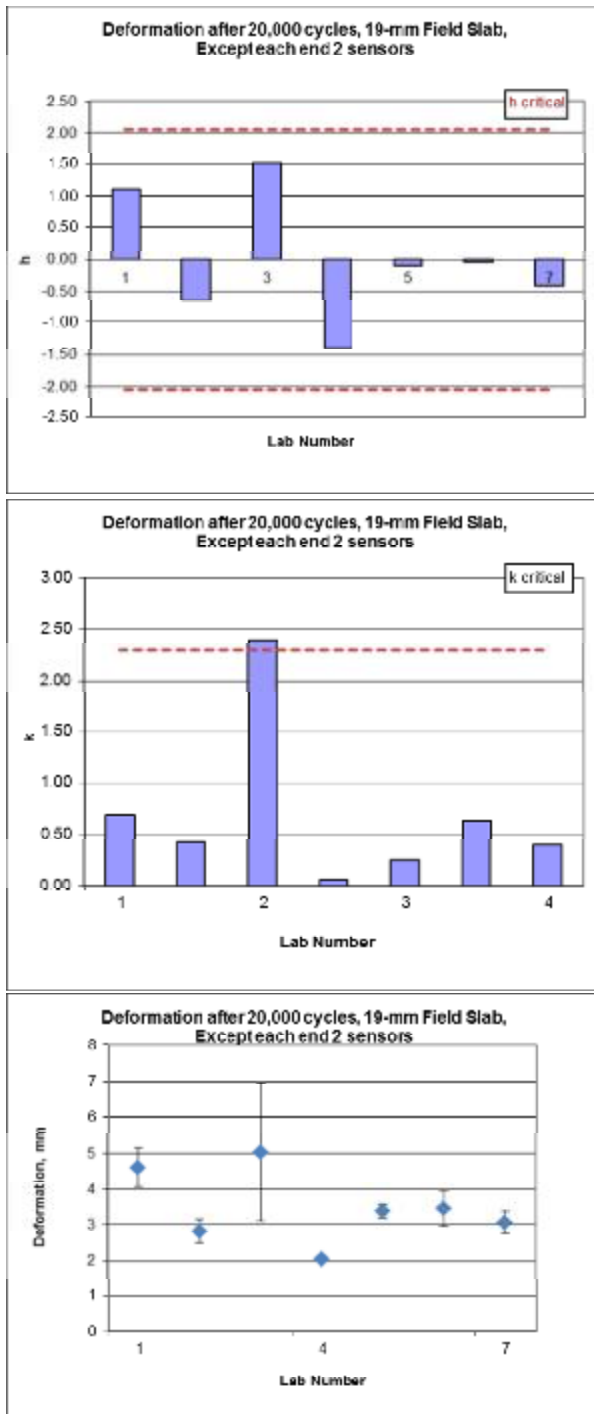


Figure D-18- h and k statistics, median deformation, and the measurement errors for 19-mm Field slab specimens after 20,000 passes; except two measurement locations at each end

## **APPENDIX E- STATISTICS OF NUMBER OF PASSES TO THRESHOLD RUT DEPTH OF WYOMING SPECIMENS**

Table E-1- Statistics of # of passes to 6-mm deformation of WY gyratory specimens; all measurement locations

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	6300 5000	5650	919	-1.13	0.78	5650	919
2	7500 5200	6350	1626	-0.73	1.38	6350	1626
3	6800 5600	6200	849	-0.82	0.72	6200	849
4	3450 5400	4425	1379	-1.84	1.17	4425	1379
5	7500 8600	8050	778	0.25	0.66	8050	778
6	8300 10400	9350	1485	1.00	1.26	9350	1485
7	8200 8300	8250	71	0.36	0.06	8250	71
8	6100 6200	6150	71	-0.85	0.06	6150	71
9	10200 8600	9400	1131	1.02	0.96	9400	1131
10	8500 11600	10050	2192	1.40	1.86	10050	2192
11	6900 6500	6700	283	-0.53	0.24	6700	283
12	5840 8780	7310	2079	-0.18	1.76	7310	2079
13	7000 8600	7800	1131	0.10	0.96	7800	1131
14	7800 7400	7600	283	-0.01	0.24	7600	283
15	6900 5900	6400	707	-0.70	0.60	6400	707
16	8700 9800	9250	778	0.94	0.66	9250	778
17	10700 11900	11300	849	2.12	0.72	11300	849
18	3600 5700	4650	1485	-1.71	1.26	4650	1485
19	8300 7000	7650	919	0.02	0.78	7650	919
20	6600 7400	7000	566	-0.36	0.48	7000	566
21	6700 9300	8000	1838	0.22	1.56	8000	1838
22	5100 6200	5650	778	-1.13	0.66	5650	778
23	9700 7500	8600	1556	0.56	1.32	8600	1556
24	9700 7500	8600	1556	0.56	1.32	8600	1556
25	10100 10100	10100	0	1.43	0.00	10100	0

Counts	25	25	25	25	25	25
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Xdbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X	Corrected Sr / SR
7619	1180	2.61	2.67	7619	1180
1738	1928			1738	1928

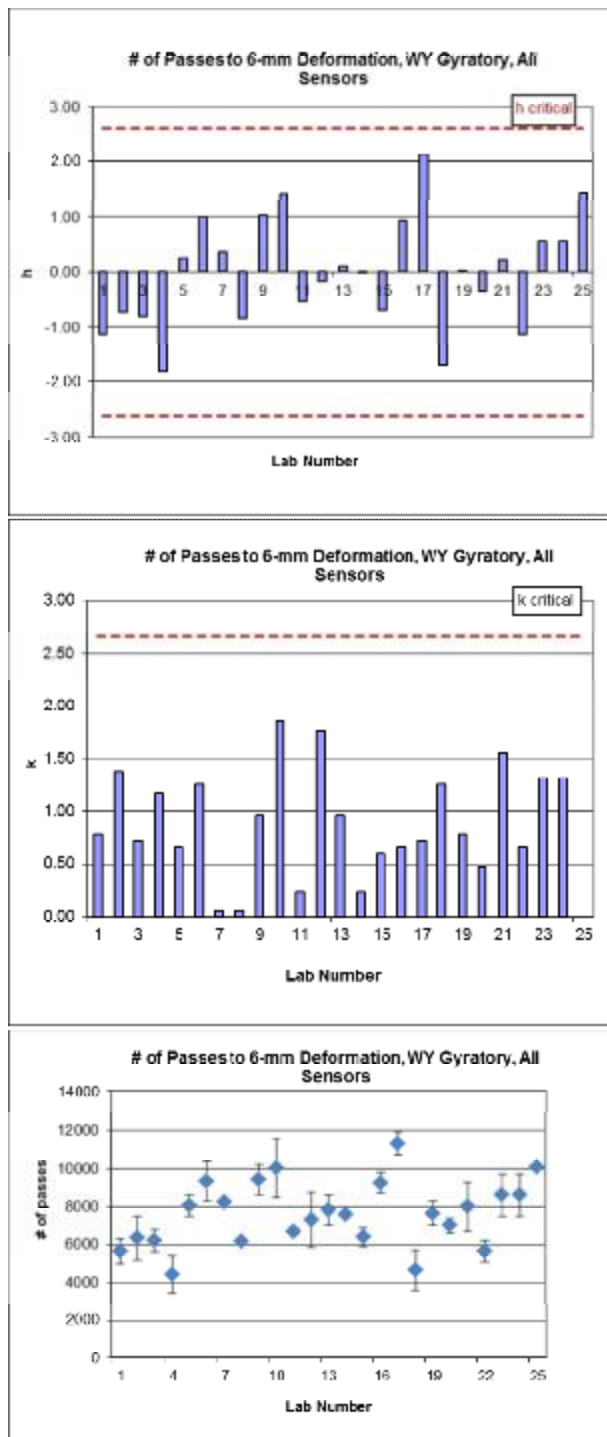


Figure E-1- h and k statistics, median deformation, and the measurement errors of passes to 6-mm deformation of WY gyratory specimens; all measurement locations

**Table E-2- Statistics of # of passes to 12-mm deformation of WY gyratory specimens; all measurement locations**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	12400 8400	10400	2828	-0.65	139	10400	2828
2	12600 8500	10550	2899	-0.59	143	10550	2899
3	9815 7800	8808	1425	-1.35	0.70	8808	1425
4	6900 8800	7850	1344	-1.77	0.66	7850	1344
5	12000 13300	12650	919	0.34	0.45	12650	919
6	12700 14900	13800	1556	0.85	0.77	13800	1556
7	13600 12200	12900	990	0.45	0.49	12900	990
8	9300 10200	9750	636	-0.94	0.31	9750	636
9	17700 12000	14850	4031	1.31	1.99	14850	4031
10	13100 16100	14600	2121	1.20	1.04	14600	2121
11	10200 10300	10250	71	-0.72	0.03	10250	71
12	8940 13180	11060	2998	-0.36	1.48	11060	2998
13	11000 13800	12400	1980	0.23	0.98	12400	1980
14	12300 12000	12150	212	0.12	0.10	12150	212
15	11600 9200	10400	1697	-0.65	0.84	10400	1697
16	12500 15200	13850	1909	0.87	0.94	13850	1909
17	13800 14200	14000	283	0.93	0.14	14000	283
18	6800 8500	7650	1202	-1.86	0.59	7650	1202
19	15500 12500	14000	2121	0.93	1.04	14000	2121
20	10600 11600	11100	707	-0.34	0.35	11100	707
21	10700 15000	12850	3041	0.43	1.50	12850	3041
22	8500 8800	8650	212	-1.42	0.10	8650	212
23	15700 11000	13350	3323	0.65	1.64	13350	3323
24	15700 11000	13350	3323	0.65	1.64	13350	3323
25	15760 15760	15760	0	1.71	0.00	15760	0

Counts	25	25	25	25	25	25
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
11879	2030	2.61	2.67	11879	2030
2270	2686			2270	2686

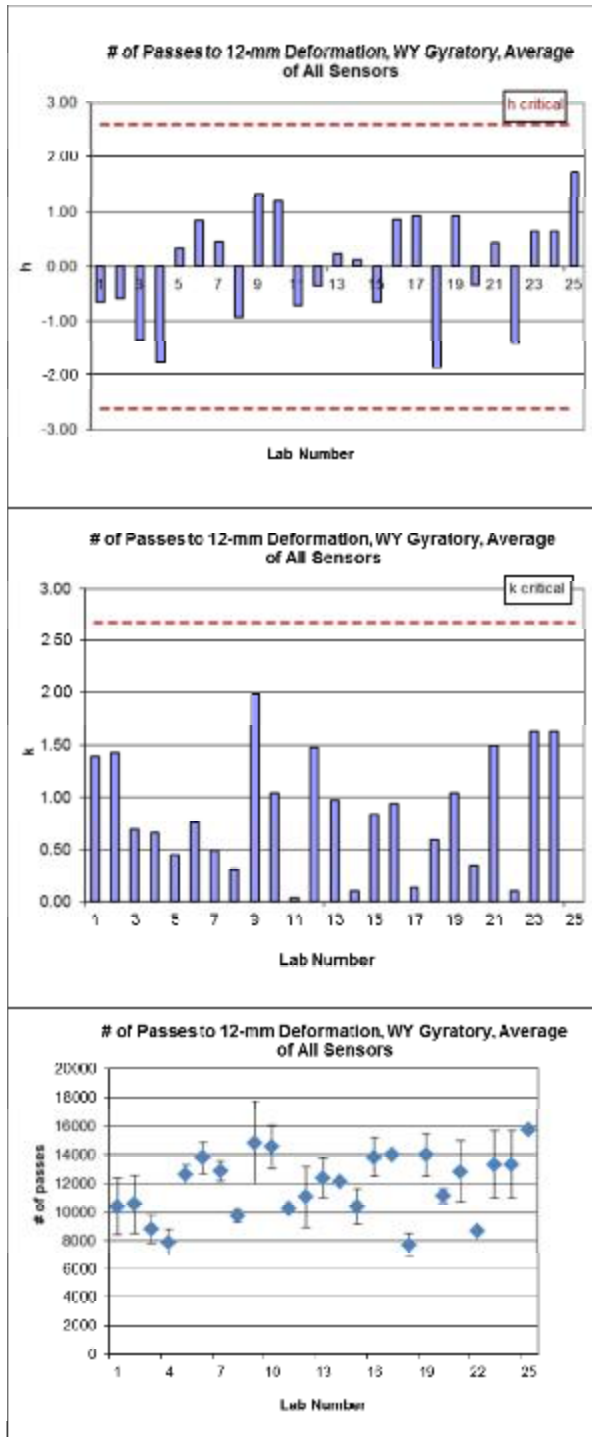


Figure E-2- h and k statistics, median deformation, and the measurement errors for # of passes to 12-mm deformation of WY gyratory specimens; all measurement locations

**Table E-3- Statistics of # of passes to 6-mm deformation of WY slab specimens; all measurement locations**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	12300	11700	849	-0.08	0.52	11700	849
	11100						
2	14300	12600	2404	0.35	1.48	12600	2404
	10900						
3	10000	10650	919	-0.58	0.57	10650	919
	11300						
4	15500	16550	1485	2.24	0.92	16550	1485
	17600						
5	12200	12500	424	0.30	0.26	12500	424
	12800						
6	9300	8550	1061	-1.59	0.65	8550	1061
	7800						
7	9900	10450	778	-0.68	0.48	10450	778
	11000						
8	13400	10800	3677	-0.51	2.27	10800	3677
	8200						
9	12400	12150	354	0.13	0.22	12150	354
	11900						
10	13500	12750	1061	0.42	0.65	12750	1061
	12000						

Counts	10	10	10	10	10	10
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X	Corrected Sr / SR
11870	1620	2.29	2.45	11870	1620
2092	2385			2092	2385

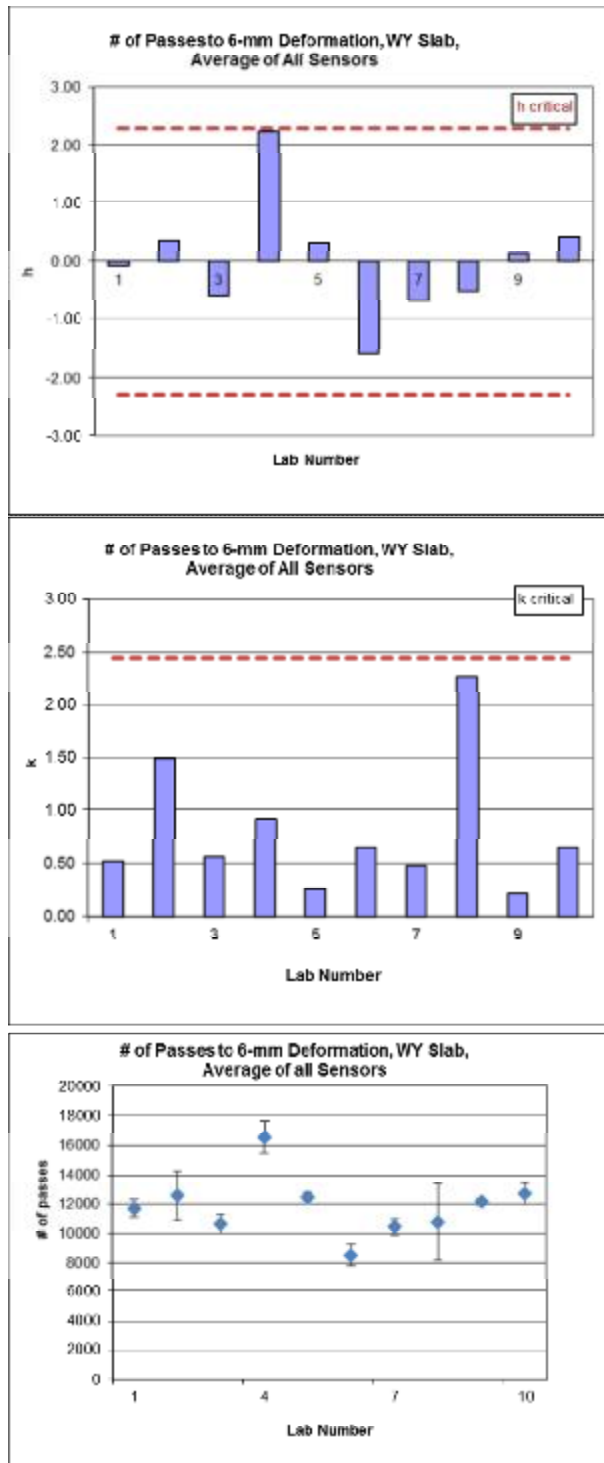


Figure E-3- h and k statistics, median deformation, and the measurement errors for # of passes to 6-mm deformation of WY slab specimens; all measurement locations

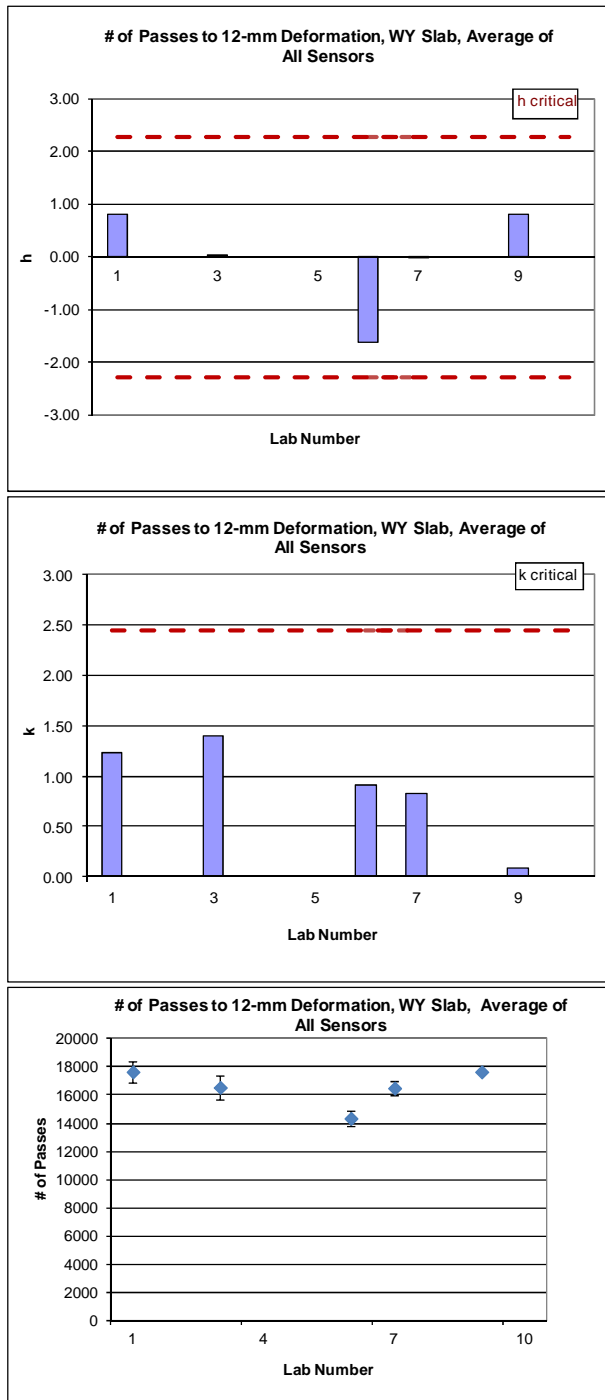


**Table E-4- Statistics of # of passes to 12-mm deformation of WY slab specimens; all measurement locations**

#	Orginal Data	X_bar	S	h	k	X_bar_corr	S_corr
1	18400 16900	17650	1061	0.82	1.24	17650	1061
2							
3	15700 17400	16550	1202	0.01	1.40	16550	1202
4							
5							
6	14900 13800	14350	778	-163	0.91	14350	778
7	16000 17000	16500	707	-0.03	0.82	16500	707
8							
9	17600 17700	17650	71	0.82	0.08	17650	71

Counts	5	5	5	5	5	5
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X	Corrected Sr / SR
16540	858	1.74	2.11	16540	858
1347	1478			1347	1478



**Figure E-4- h and k statistics, median deformation, and the measurement errors for # of passes to 12-mm deformation of WY slab specimens; all measurement locations**

**Table E-5- Statistics of # of passes to 6-mm deformation of WY Gyratory specimens; except middle three measurement locations**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	7300 5400	6350	1344	-102	1.06	6350	1344
2	8400 5400	6900	2121	-0.71	1.68	6900	2121
3	7300 5700	6500	1131	-0.93	0.90	6500	1131
4	4400 6000	5200	1131	-165	0.90	5200	1131
5	7700 9200	8450	1061	0.14	0.84	8450	1061
6	9300 10900	10100	1131	105	0.90	10100	1131
7	9700 8600	9150	778	0.53	0.62	9150	778
8	6900 6700	6800	141	-0.77	0.11	6800	141
9	10800 8800	9800	1414	0.89	1.12	9800	1414
10	9300 12200	10750	2051	141	1.63	10750	2051
11	6900 7000	6950	71	-0.68	0.06	6950	71
12	5940 8960	7450	2135	-0.41	1.69	7450	2135
13	7500 8900	8200	990	0.00	0.78	8200	990
14	8100 7900	8000	141	-0.11	0.11	8000	141
15	7000 6000	6500	707	-0.93	0.56	6500	707
16	9100 11300	10200	1556	1.11	1.23	10200	1556
17	11000 13000	12000	1414	2.10	1.12	12000	1414
18	4000 5800	4900	1273	-181	1.01	4900	1273
19	10000 7800	8900	1556	0.39	1.23	8900	1556
20	7500 7800	7650	212	-0.30	0.17	7650	212
21	8100 9300	8700	849	0.28	0.67	8700	849
22	5600 7100	6350	1061	-102	0.84	6350	1061
23	10400 8100	9250	1626	0.58	1.29	9250	1626
24	10400 8100	9250	1626	0.58	1.29	9250	1626
25	10520 10520	10520	0	128	0.00	10520	0

Counts	25	25	25	25	25	25
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
8193	1262	2.61	2.67	8193	1262
1815	2022			1815	2022

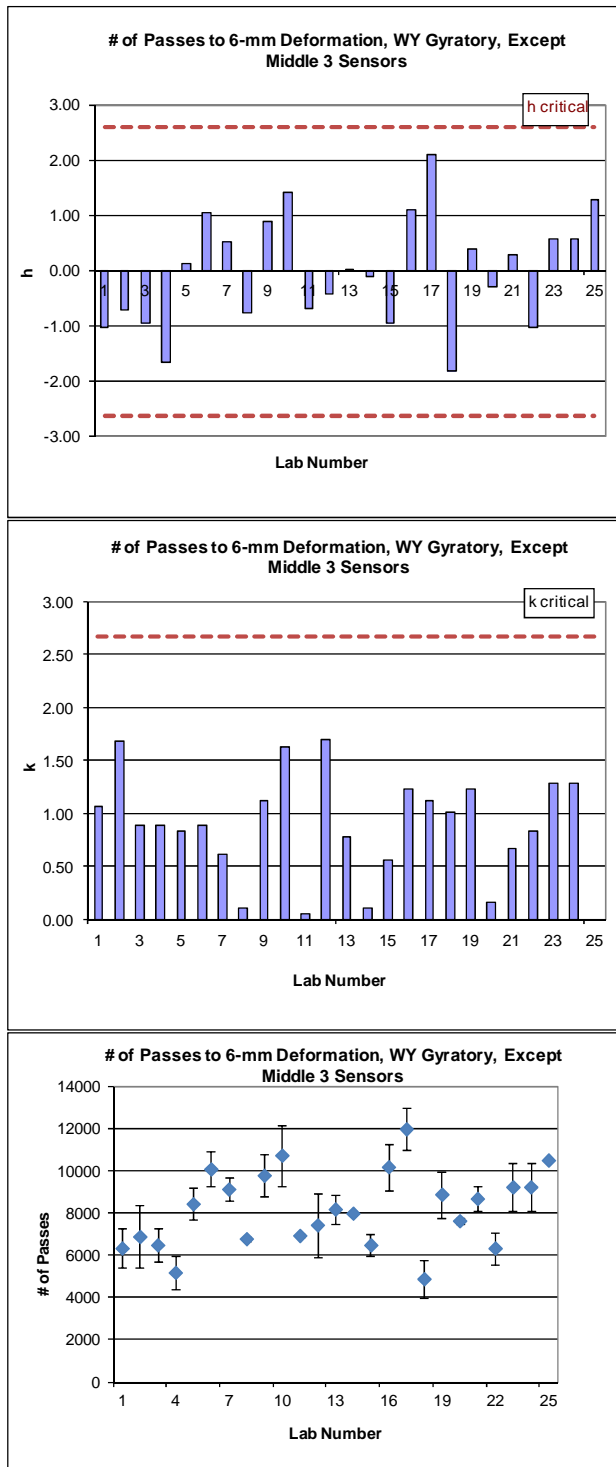


Figure E-5-  $h$  and  $k$  statistics, median deformation, and the measurement errors of # of passes to 6-mm deformation of WY Gyratory specimens; except middle three measurement locations

**Table E-6- Statistics of # of passes to 12-mm deformation of WY Gyrotory specimens; except middle three measurement locations**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	14100 9000	11550	3606	-0.56	1.62	11550	3606
2	13600 9200	11400	3111	-0.62	1.40	11400	3111
3	10800 8400	9600	1697	-1.36	0.76	9600	1697
4	7700 10300	9000	1838	-1.61	0.83	9000	1838
5	12600 15500	14050	2051	0.46	0.92	14050	2051
6							
7							
8	10500 11700	11100	849	-0.75	0.38	11100	849
9	18800 12600	15700	4384	1.14	1.97	15700	4384
10							
11	10600 12400	11500	1273	-0.58	0.57	11500	1273
12	9660 13680	11670	2843	-0.51	1.28	11670	2843
13	12500 14600	13550	1485	0.26	0.67	13550	1485
14	13100 13000	13050	71	0.05	0.03	13050	71
15							
16	13900 17000	15450	2192	1.04	0.99	15450	2192
17	15100 15600	15350	354	1.00	0.16	15350	354
18	8300 9300	8800	707	-1.69	0.32	8800	707
19	17200 14600	15900	1838	1.22	0.83	15900	1838
20	11700 11800	11750	71	-0.48	0.03	11750	71
21							
22							
23	16900 12400	14650	3182	0.71	1.43	14650	3182
24	16900 12400	14650	3182	0.71	1.43	14650	3182
25	16740 16740	16740	0	1.57	0.00	16740	0

Counts	19	19	19	19	19	19
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Xdbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X	Corrected Sr / SR
12919	2225	2.61	2.67	12919	2225
2438	2902			2438	2902

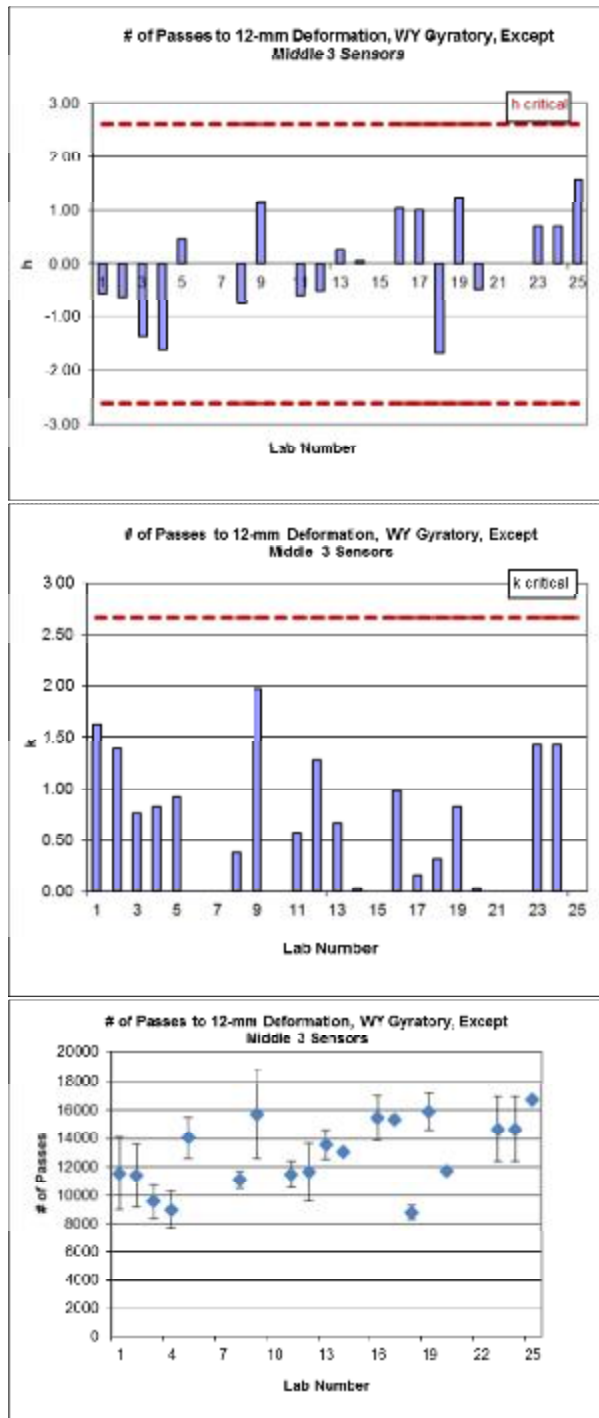


Figure E-6-  $h$  and  $k$  statistics, median deformation, and the measurement errors for # of passes to 12-mm deformation of WY gyratory specimens; except middle three measurement locations

**Table E-7- Statistics of # of passes to 6-mm deformation of WY slab specimens; except middle three measurement locations**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	11700	12050	495	-0.03	0.34	12050	495
	12400						
2	14800	12950	2616	0.37	1.82	12950	2616
	11100						
3	10400	10850	636	-0.57	0.44	10850	636
	11300						
4	16200	17350	1626	2.32	1.13	FALSE	FALSE
	18500						
5	12800	12550	354	0.19	0.25	12550	354
	12300						
6	9100	8550	778	-1.58	0.54	8550	778
	8000						
7	10200	10650	636	-0.65	0.44	10650	636
	11100						
8	13400	11350	2899	-0.34	2.02	11350	2899
	9300						
9	12500	12150	495	0.01	0.34	12150	495
	11800						
10	13400	12800	849	0.30	0.59	12800	849
	12200						

Counts	10	10	10	10	9	9
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Xdbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X	Corrected Sr / SR
12125	1437	2.29	2.45	11544	1414
2256	2474			1391	1713

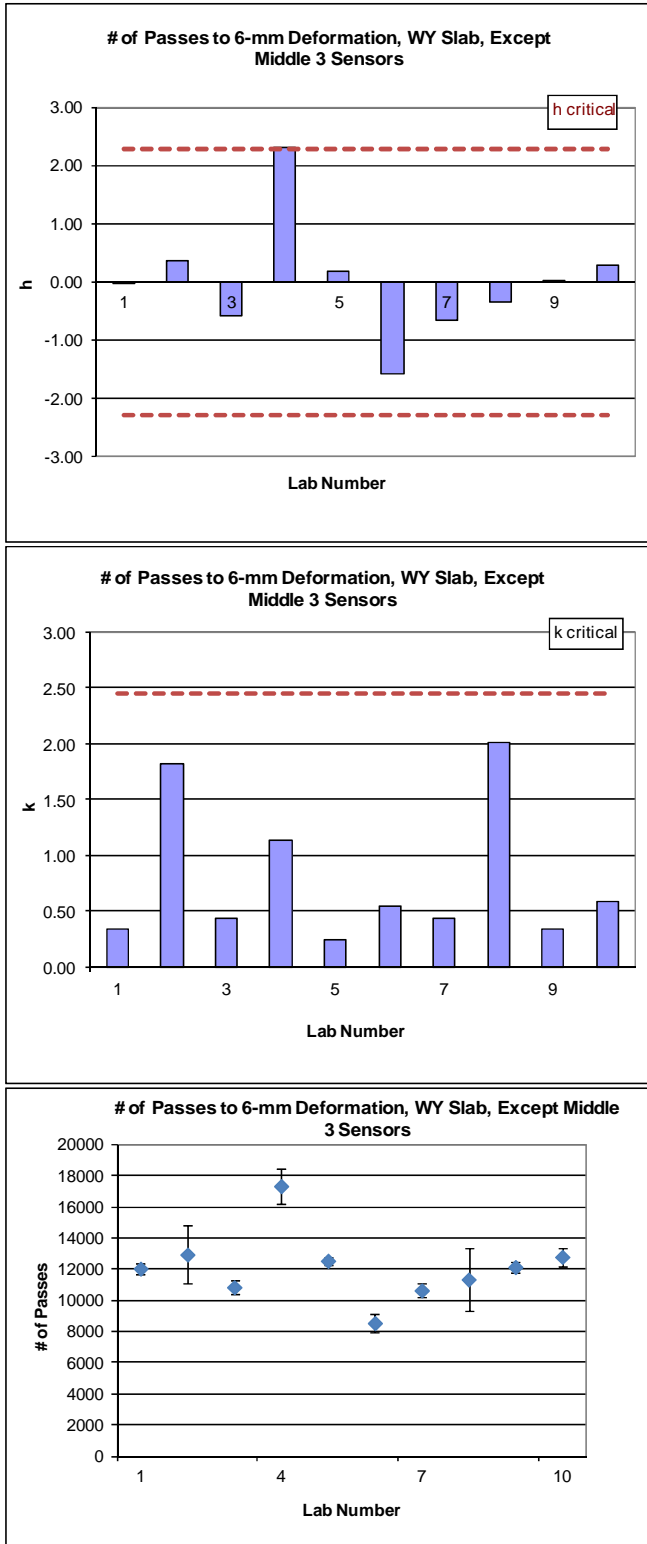


Figure D-7- h and k statistics, median deformation, and the measurement errors for # of passes to 6-mm deformation of WY slab specimens; except middle three measurement locations



**Table E-8- Statistics of # of passes to 12-mm deformation of WY slab specimens; except middle three measurement locations**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	18400 19500	18950	778	0.87	1.07	18950	778
2							
3	17300 18900	18100	1131	0.37	1.55	18100	1131
4							
5							
6	14800 14200	14500	424	-1.72	0.58	14500	424
7	17400 18000	17700	424	0.14	0.58	17700	424
8							
9	18500 17600	18050	636	0.34	0.87	18050	636

Counts	5	5	5	5	5	5
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X	Corrected Sr / SR
17460	728	1.74	2.11	17460	728
1717	1793			1717	1793

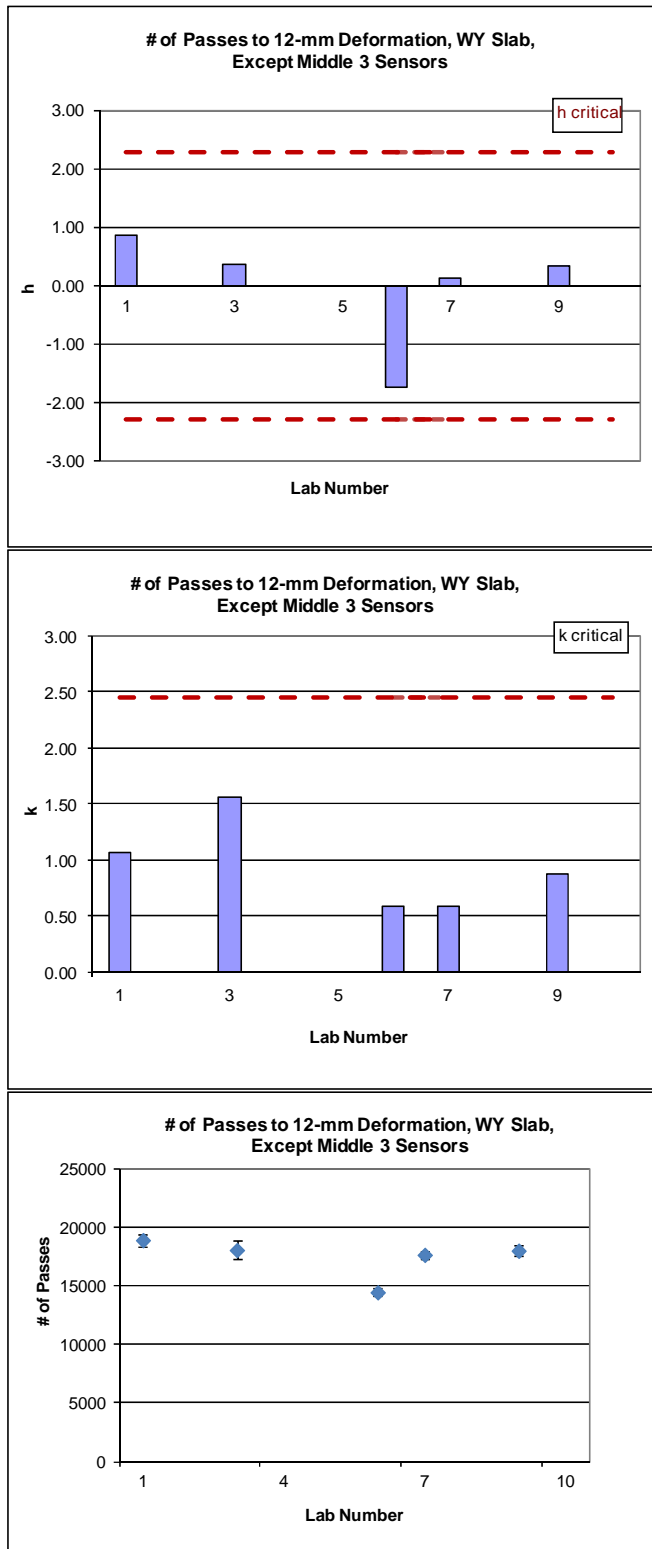


Figure E-8- h and k statistics, median deformation, and the measurement errors for # of passes to 12-mm deformation of WY slab specimens; except middle three measurement locations

**Table E-9- Statistics of # of passes to 6-mm deformation of WY Gyratory specimens; except two measurement locations at each end**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	5600.00 4500.00	5050.00	777.82	-120	0.68	5050.00	777.82
2	6400.00 4600.00	5500.00	1272.79	-0.93	1.12	5500.00	1272.79
3	6200.00 5200.00	5700.00	707.11	-0.81	0.62	5700.00	707.11
4	2800.00 4800.00	3800.00	1414.21	-195	1.24	3800.00	1414.21
5	7200.00 8100.00	7650.00	636.40	0.37	0.56	7650.00	636.40
6	7400.00 9900.00	8650.00	1767.77	0.97	1.55	8650.00	1767.77
7	7600.00 7700.00	7650.00	70.71	0.37	0.06	7650.00	70.71
8	5600.00 5900.00	5750.00	212.13	-0.78	0.19	5750.00	212.13
9	9700.00 8300.00	9000.00	989.95	1.18	0.87	9000.00	989.95
10	7900.00 1100.00	9500.00	2262.74	1.48	1.99	9500.00	2262.74
11	6800.00 5900.00	6350.00	636.40	-0.42	0.56	6350.00	636.40
12	5500.00 8400.00	6950.00	2050.61	-0.06	1.80	6950.00	2050.61
13	6500.00 8000.00	7250.00	1060.66	0.13	0.93	7250.00	1060.66
14	7300.00 7000.00	7150.00	212.13	0.07	0.19	7150.00	212.13
15	6500.00 5300.00	5900.00	848.53	-0.69	0.75	5900.00	848.53
16	8000.00 8900.00	8450.00	636.40	0.85	0.56	8450.00	636.40
17	9900.00 1100.00	10500.00	848.53	2.09	0.75	10500.00	848.53
18	3200.00 5400.00	4300.00	1555.63	-1.65	1.37	4300.00	1555.63
19	7500.00 6200.00	6850.00	919.24	-0.12	0.81	6850.00	919.24
20	6000.00 6700.00	6350.00	494.97	-0.42	0.44	6350.00	494.97
21	6200.00 8800.00	7500.00	1838.48	0.28	1.62	7500.00	1838.48
22	4750.00 5800.00	5275.00	742.46	-1.07	0.65	5275.00	742.46
23	8900.00 7200.00	8050.00	1202.08	0.61	1.06	8050.00	1202.08
24	8900.00 7200.00	8050.00	1202.08	0.61	1.06	8050.00	1202.08
25	8860.00 8860.00	8860.00	0.00	1.10	0.00	8860.00	0.00

Counts	25	25	25	25	25	25
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
7041.40	1137.74	2.61	2.67	7041.40	1137.74
1658.53	1843.35			1658.531	1843.353

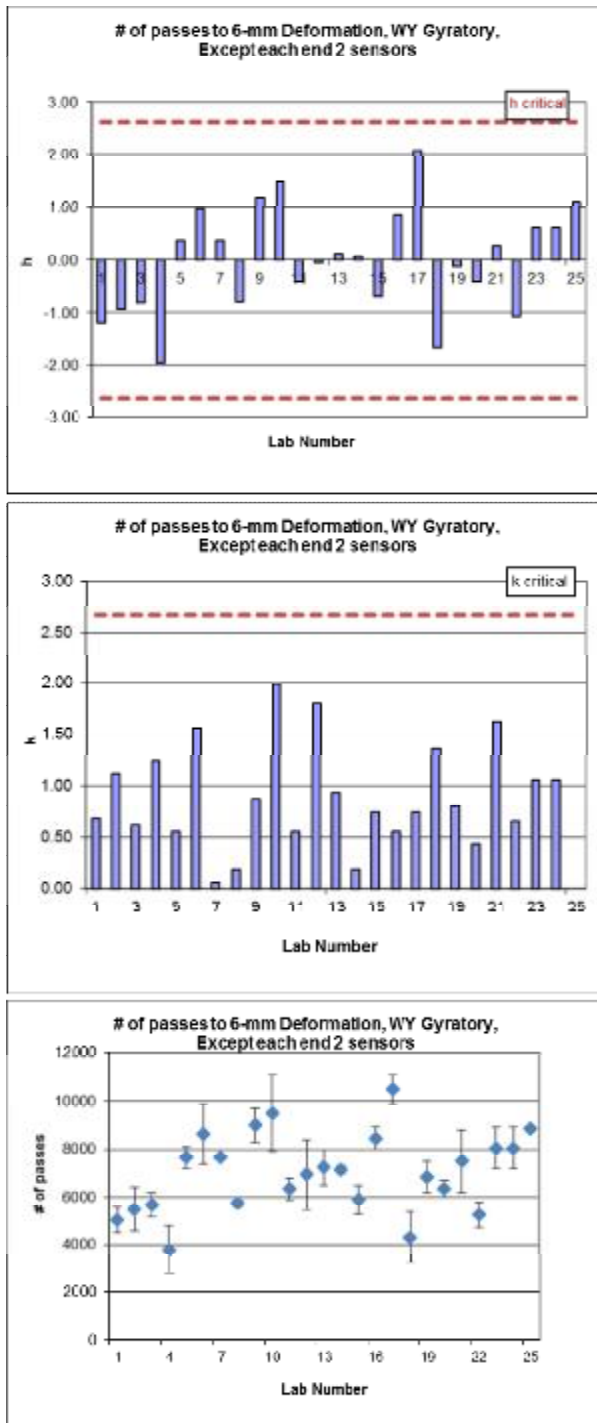


Figure E-9- h and k statistics, median deformation, and the measurement errors of # of passes to 6-mm deformation of WY Gyratory specimens; except two measurement locations at each end

**Table E-10- Statistics of # of passes to 12-mm deformation of WY Gyratory specimens; except two measurement locations at each end**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	10500.00 7600.00	9050.00	2050.61	-0.70	109	9050.00	2050.61
2	10500.00 7200.00	8850.00	2333.45	-0.79	124	8850.00	2333.45
3	8400.00 7100.00	7750.00	919.24	-1.31	0.49	7750.00	919.24
4	5900.00 7600.00	6750.00	1202.08	-1.79	0.64	6750.00	1202.08
5	10800.00 11500.00	11150.00	494.97	0.30	0.26	11150.00	494.97
6	10800.00 13000.00	11900.00	1555.63	0.66	0.83	11900.00	1555.63
7	12100.00 10900.00	11500.00	848.53	0.47	0.45	11500.00	848.53
8	8400.00 9200.00	8800.00	565.69	-0.82	0.30	8800.00	565.69
9	16300.00 11100.00	13700.00	3676.96	1.51	1.95	13700.00	3676.96
10	11200.00 14400.00	12800.00	2262.74	1.08	1.20	12800.00	2262.74
11	9700.00 9200.00	9450.00	353.55	-0.51	0.19	9450.00	353.55
12	8080.00 11500.00	9790.00	2418.31	-0.35	1.28	9790.00	2418.31
13	9600.00 12600.00	11100.00	2121.32	0.28	1.13	11100.00	2121.32
14	11000.00 10400.00	10700.00	424.26	0.09	0.23	10700.00	424.26
15	9800.00 7900.00	8850.00	1343.50	-0.79	0.71	8850.00	1343.50
16	10700.00 12800.00	11750.00	1484.92	0.59	0.79	11750.00	1484.92
17	12800.00 13300.00	13050.00	353.55	1.20	0.19	13050.00	353.55
18	5400.00 7600.00	6500.00	1555.63	-1.91	0.83	6500.00	1555.63
19	13800.00 10800.00	12300.00	2121.32	0.85	1.13	12300.00	2121.32
20	9500.00 10800.00	10150.00	919.24	-0.17	0.49	10150.00	919.24
21	8900.00 13500.00	11200.00	3252.69	0.32	1.73	11200.00	3252.69
22	7600.00 7800.00	7700.00	1414.2	-1.34	0.08	7700.00	1414.2
23	14300.00 9700.00	12000.00	3252.69	0.70	1.73	12000.00	3252.69
24	14300.00 9700.00	12000.00	3252.69	0.70	1.73	12000.00	3252.69
25	14140.00 14140.00	14140.00	0.00	1.72	0.00	14140.00	0.00

Counts	25	25	25	25	25	25
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
10517.20	1882.53	2.61	2.67	10517.20	1882.53
2106.35	2491.72			2106.353	2491.723

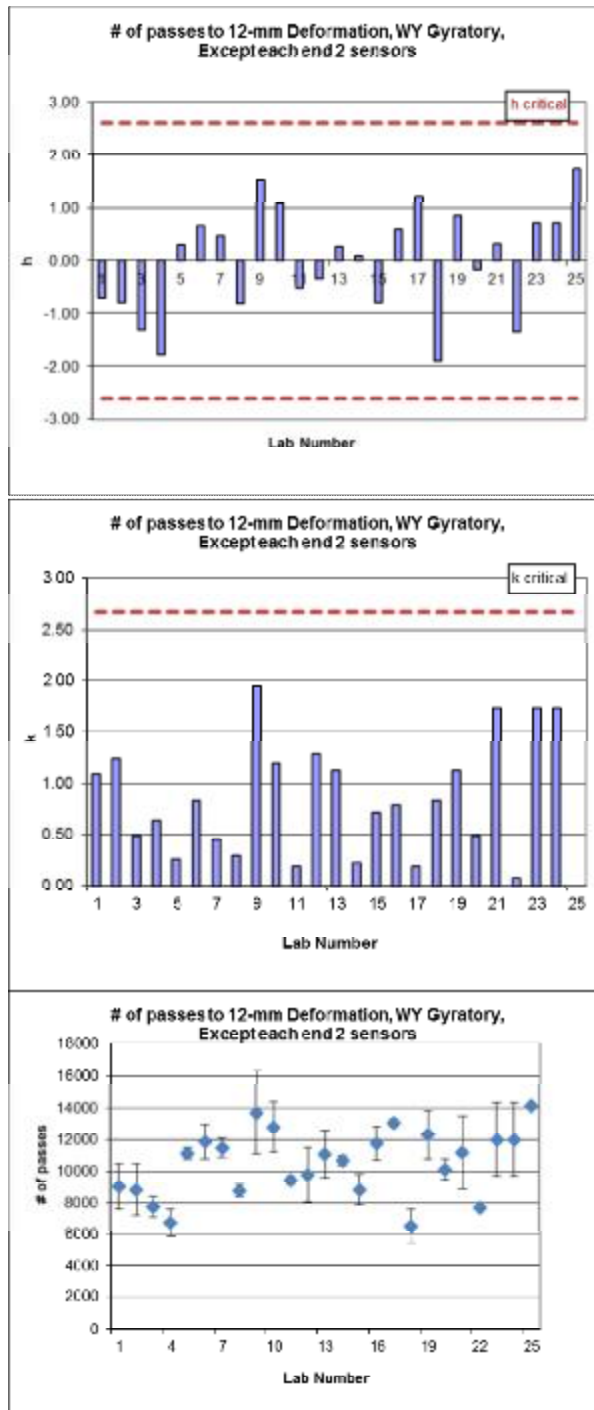


Figure E-10- h and k statistics, median deformation, and the measurement errors for # of passes to 12-mm deformation of WY gyratory specimens; except two measurement locations at each end

**Table E-11- Statistics of # of passes to 6-mm deformation of WY slab specimens; except two measurement locations at each end**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	11400.00 10700.00	11050.00	494.97	-0.23	0.28	11050.00	494.97
2	13900.00 10400.00	12150.00	2474.87	0.35	1.38	12150.00	2474.87
3	9800.00 10800.00	10300.00	707.11	-0.62	0.39	10300.00	707.11
4	14800.00 16800.00	15800.00	1414.21	2.26	0.79	15800.00	1414.21
5	11000.00 12800.00	11900.00	1272.79	0.22	0.71	11900.00	1272.79
6	9600.00 7600.00	8600.00	1414.21	-1.51	0.79	8600.00	1414.21
7	9600.00 10800.00	10200.00	848.53	-0.67	0.47	10200.00	848.53
8	13500.00 7500.00	10500.00	4242.64	-0.51	2.36	10500.00	4242.64
9	11800.00 12000.00	11900.00	1414.2	0.22	0.08	11900.00	1414.2
10	13100.00 11700.00	12400.00	989.95	0.48	0.55	12400.00	989.95

Counts	10	10	10	10	10	10
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
11480.00	1794.71	2.29	2.45	11480.00	1794.71
1908.49	2291.91			1908.490	2291.906

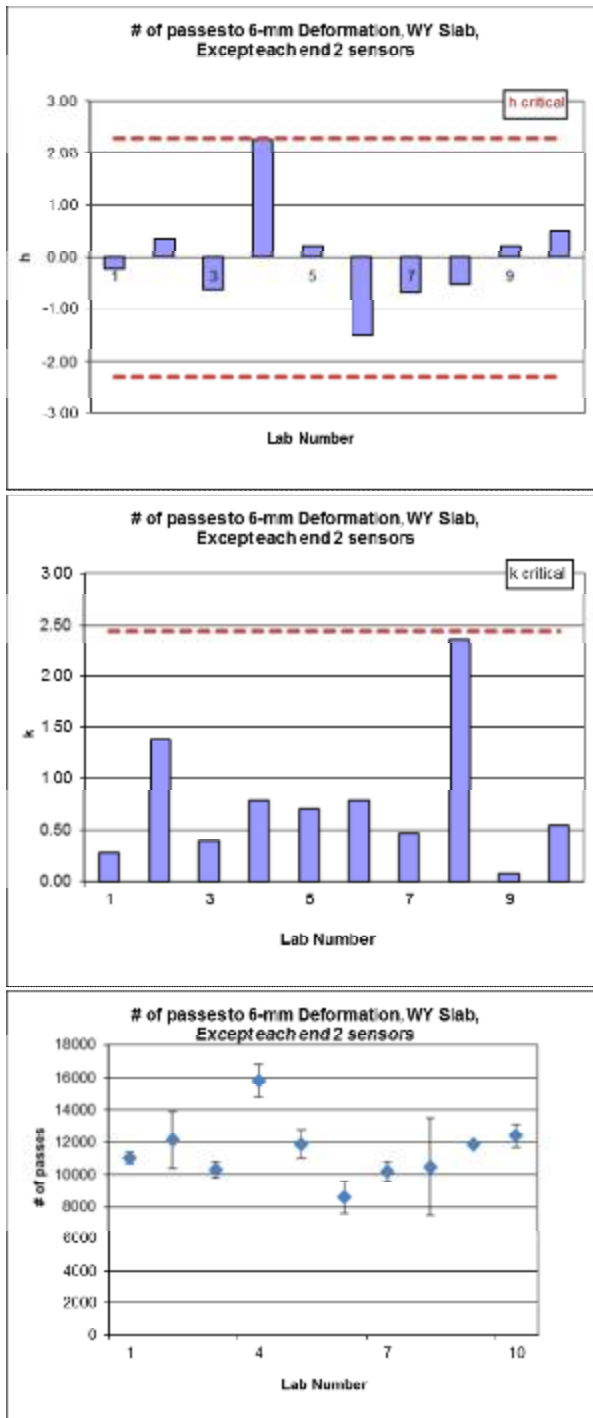


Figure E-11- h and k statistics, median deformation, and the measurement errors for # of passes to 6-mm deformation of WY slab specimens; except two measurement locations at each end



**Table E-12- Statistics of # of passes to 12-mm deformation of WY slab specimens; except two measurement locations at each end**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	17000.00	15950.00	1484.92	-0.04	1.19	15950.00	1484.92
	14900.00						
2	16200.00						
3	14500.00	15500.00	1414.21	-0.33	1.14	15500.00	1414.21
	16500.00						
4							
5	17200.00						
6	15200.00	14100.00	1555.63	-123	125	14100.00	1555.63
	13000.00						
7	14400.00	15200.00	113137	-0.52	0.91	15200.00	113137
	16000.00						
8							
	11400.00						
9	16200.00	16650.00	636.40	0.41	0.51	16650.00	636.40
	17100.00						
10	18000.00	18700.00	989.95	172	0.80	18700.00	989.95
	19400.00						

Counts	6	6	6	6	6	6
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
16016.67	1244.32	2.29	2.45	16016.67	1244.32
1562.90	1793.55			1562.903	1793.553

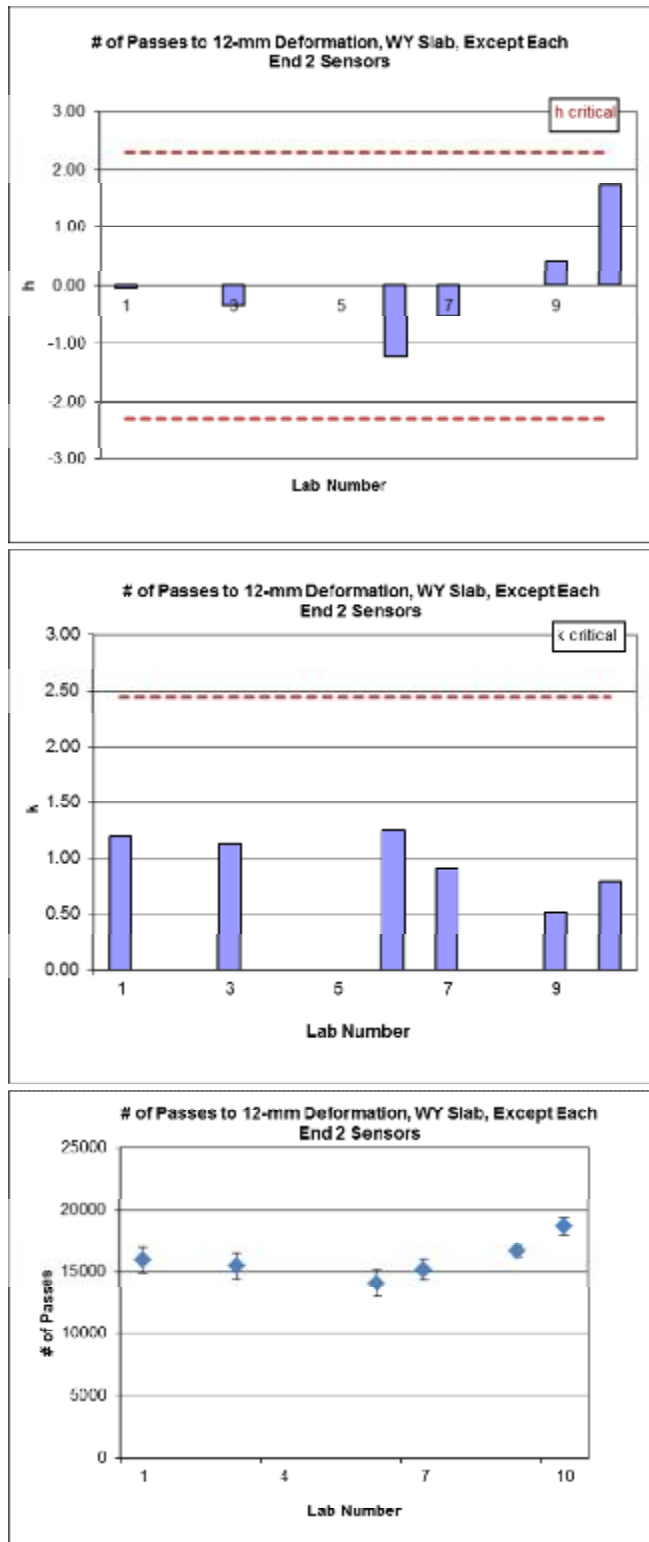


Figure E-12- h and k statistics, median deformation, and the measurement errors for # of passes to 12-mm deformation of WY slab specimens; except two measurement locations at each end

## **APPENDIX F- STATISTICS OF CREEP SLOPE**

**Table F-1- Statistics of creep slope of 19-mm Field gyratory specimens; all measurement locations**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	0.07 0.11	0.09	0.03	-0.08	0.88	0.09	0.03
2	0.10 0.09	0.09	0.01	-0.10	0.22	0.09	0.01
3	0.09 0.07	0.08	0.01	-0.45	0.31	0.08	0.01
4	0.05 0.09	0.07	0.03	-0.90	0.84	0.07	0.03
5	0.09 0.10	0.09	0.01	-0.01	0.28	0.09	0.01
6	0.06 0.06	0.06	0.00	-133	0.04	0.06	0.00
7	0.25 0.08	0.17	0.12	2.74	3.90	FALSE	FALSE
8	0.08 0.10	0.09	0.01	-0.16	0.42	0.09	0.01
9	0.11 0.11	0.11	0.01	0.67	0.17	0.11	0.01
10	0.10 0.09	0.10	0.01	0.19	0.30	0.10	0.01
11	0.12 0.16	0.14	0.02	174	0.72	0.14	0.02
12	0.09 0.13	0.11	0.03	0.65	0.85	0.11	0.03
13	0.08 0.09	0.09	0.00	-0.25	0.12	0.09	0.00
14	0.10 0.09	0.10	0.00	0.08	0.03	0.10	0.00
15	0.09 0.08	0.08	0.01	-0.30	0.26	0.08	0.01
16	0.04 0.05	0.04	0.01	-182	0.23	0.04	0.01
17	0.08 0.08	0.08	0.00	-0.39	0.02	0.08	0.00
18	0.10 0.07	0.08	0.02	-0.31	0.53	0.08	0.02
19	0.10 0.09	0.09	0.01	0.05	0.37	0.09	0.01

Counts	19	19	19	19	18	18
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
0.09	0.03	2.54	2.62	0.09	0.01
0.03	0.03			0.021	0.023

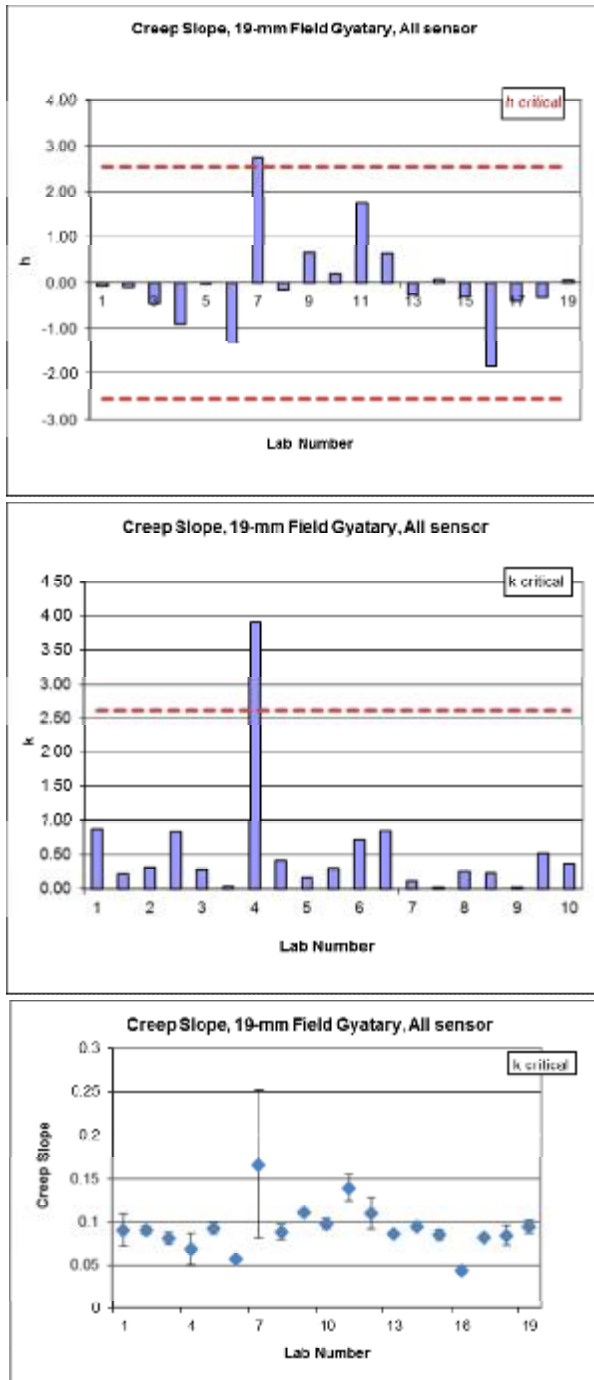


Figure F-1- h and k statistics, median deformations, and measurement errors of creep slope of 19-mm Field gyatary specimens; all measurement locations

**Table F-2- Statistics of creep slope of 19-mm Field slab specimens; all measurement locations**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	0.08	0.10	0.03	0.66	0.44	0.10	0.03
	0.11						
2	0.04	0.03	0.01	-0.99	0.11	0.03	0.01
	0.03						
3	0.04	0.14	0.15	188	2.48	FALSE	FALSE
	0.25						
4	0.03	0.03	0.00	-0.92	0.06	0.03	0.00
	0.04						
5	0.06	0.07	0.01	0.00	0.24	0.07	0.01
	0.08						
6	0.09	0.06	0.04	-0.34	0.73	0.06	0.04
	0.03						
7	0.05	0.06	0.01	-0.29	0.23	0.06	0.01
	0.07						

Counts	7	7	7	7	6	6
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
0.07	0.06	2.05	2.30	0.06	0.02
0.04	0.06			0.024	0.029

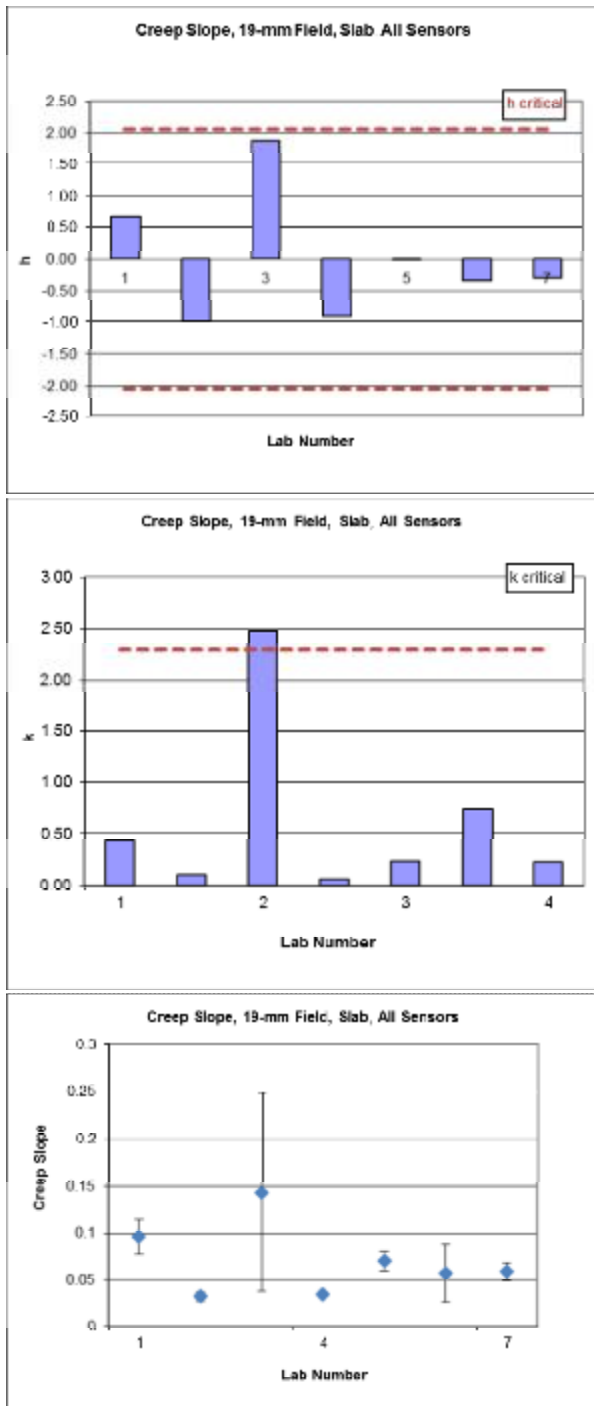


Figure F-2- h and k statistics, median deformations, and measurement errors of creep slope of 19-mm Field slab specimens; all measurement locations

**Table F-3- Statistics of creep slope of 19-mm Field gyratory specimens; except middle three measurement locations**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	0.07 0.10	0.08	0.02	-0.20	1.00	0.08	0.02
2	0.09 0.09	0.09	0.00	0.03	0.06	0.09	0.00
3	0.08 0.07	0.08	0.01	-0.46	0.41	0.08	0.01
4	0.05 0.08	0.07	0.03	-0.97	1.14	0.07	0.03
5	0.08 0.10	0.09	0.01	-0.04	0.55	0.09	0.01
6	0.05 0.05	0.05	0.00	-1.58	0.06	0.05	0.00
7	0.18 0.07	0.13	0.08	1.71	3.53	FALSE	FALSE
8	0.08 0.09	0.09	0.01	-0.09	0.28	0.09	0.01
9	0.11 0.11	0.11	0.00	0.97	0.08	0.11	0.00
10	0.10 0.09	0.09	0.00	0.32	0.05	0.09	0.00
11	0.13 0.15	0.14	0.01	2.20	0.60	0.14	0.01
12	0.09 0.13	0.11	0.03	0.98	1.52	0.11	0.03
13	0.08 0.09	0.08	0.00	-0.18	0.13	0.08	0.00
14	0.08 0.09	0.09	0.00	-0.09	0.09	0.09	0.00
15	0.09 0.08	0.09	0.01	-0.09	0.35	0.09	0.01
16	0.04 0.04	0.04	0.00	-2.10	0.11	0.04	0.00
17	0.08 0.08	0.08	0.00	-0.16	0.01	0.08	0.00
18	0.10 0.07	0.08	0.02	-0.19	0.80	0.08	0.02
19	0.09 0.08	0.09	0.01	-0.06	0.46	0.09	0.01

Counts	19	19	19	19	18	18
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar	Corrected Sr / SR
0.09	0.02	2.54	2.62	0.09	0.01
0.02	0.03			0.021	0.023



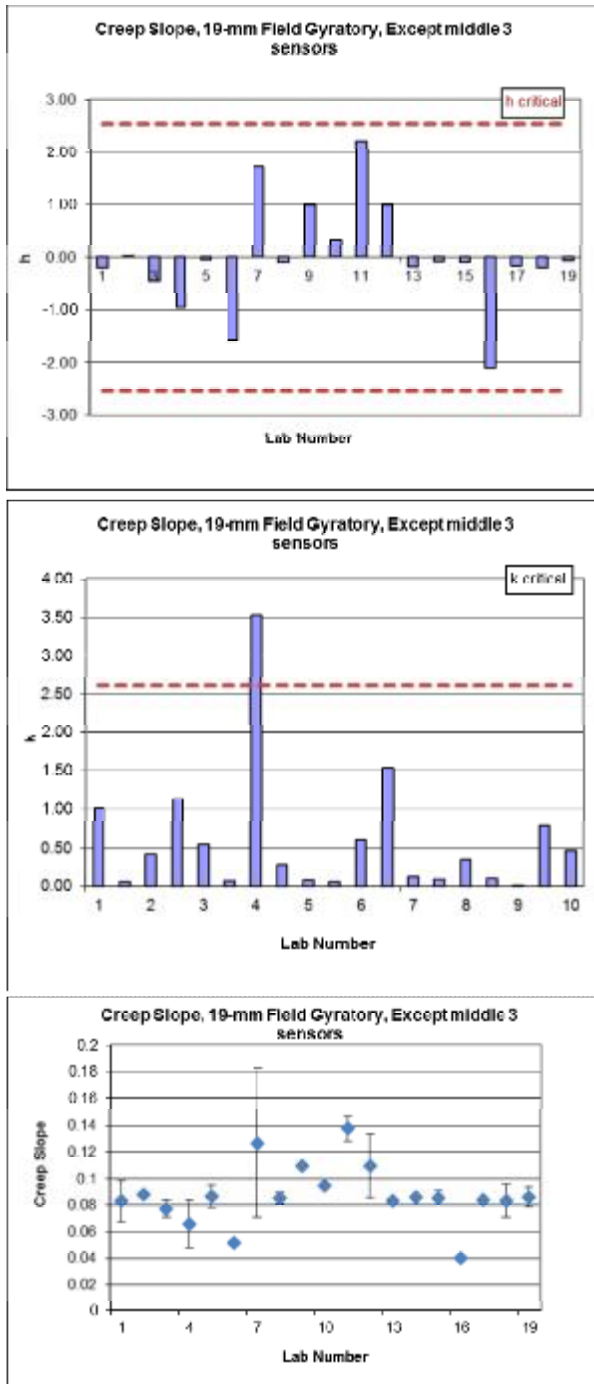


Figure F-3- h and k statistics, median deformations, and measurement errors of creep slope of 19-mm Field gyratory specimens; except middle three measurement locations

**Table F-4- Statistics of creep slope of 19-mm Field slab specimens; except middle three measurement locations**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	0.15	0.16	0.02	0.89	0.29	0.16	0.02
	0.17						
2	0.09	0.09	0.00	-0.97	0.03	0.09	0.00
	0.08						
3	0.09	0.19	0.15	165	2.39	FALSE	FALSE
	0.30						
4	0.07	0.08	0.01	-1.17	0.15	0.08	0.01
	0.08						
5	0.11	0.12	0.02	-0.10	0.30	0.12	0.02
	0.13						
6	0.17	0.13	0.06	0.11	1.03	0.13	0.06
	0.08						
7	0.12	0.11	0.01	-0.42	0.17	0.11	0.01
	0.10						

Counts	7	7	7	7	6	6
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
0.12	0.06	2.05	2.30	0.11	0.03
0.04	0.06			0.031	0.037

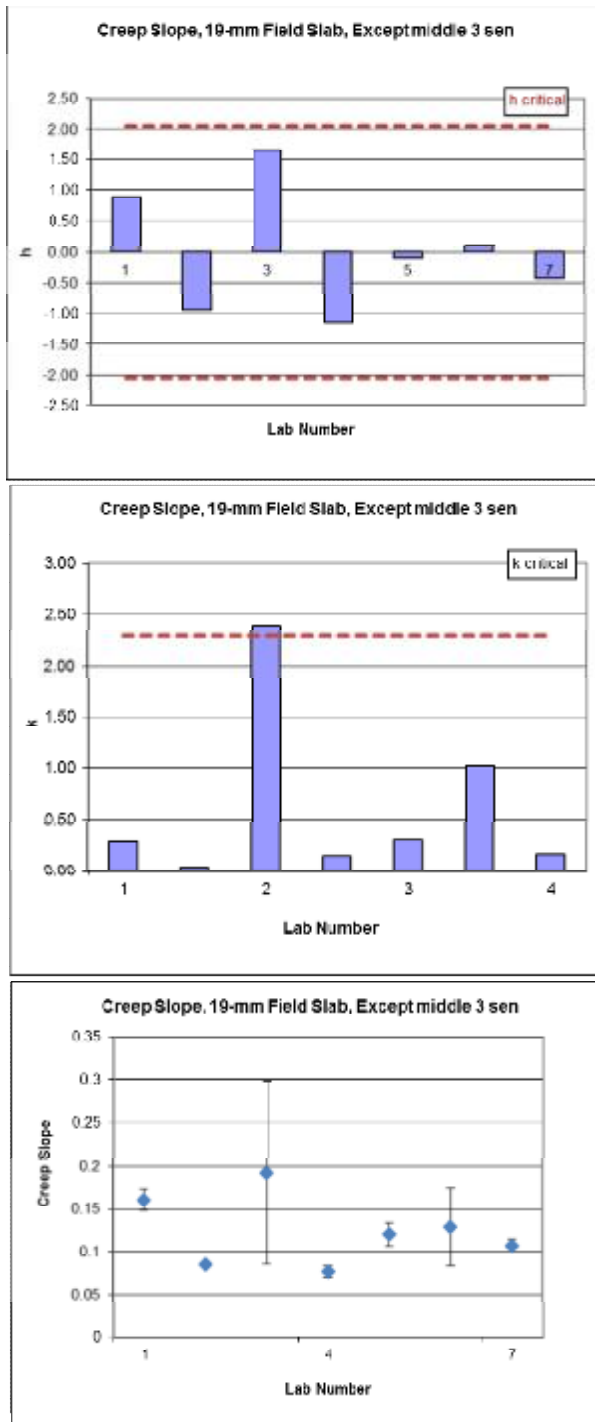


Figure F-4- h and k statistics, median deformations, and measurement errors of creep slope of 19-mm Field slab specimens; except middle three measurement locations

**Table F-5- Statistics of creep slope of 19-mm Field gyratory specimens; except two measurement locations at each end**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	0.08 0.13	0.10	0.04	-0.11	0.46	0.10	0.04
2	0.10 0.09	0.09	0.01	-0.24	0.10	0.09	0.01
3	0.10 0.08	0.09	0.01	-0.29	0.14	0.09	0.01
4	0.06 0.10	0.08	0.03	-0.54	0.38	0.08	0.03
5	0.10 0.10	0.10	0.01	-0.12	0.08	0.10	0.01
6	0.07 0.06	0.07	0.00	-0.72	0.03	0.07	0.00
7	0.56 0.09	0.32	0.33	3.85	4.26	FALSE	FALSE
8	0.08 0.11	0.09	0.02	-0.22	0.25	0.09	0.02
9	0.11 0.12	0.12	0.01	0.17	0.13	0.12	0.01
10	0.12 0.09	0.10	0.02	-0.05	0.26	0.10	0.02
11	0.13 0.18	0.15	0.04	0.78	0.47	0.15	0.04
12	0.10 0.12	0.11	0.01	0.01	0.17	0.11	0.01
13	0.09 0.10	0.09	0.00	-0.25	0.05	0.09	0.00
14	0.11 0.10	0.10	0.01	-0.07	0.07	0.10	0.01
15	0.09 0.08	0.08	0.01	-0.40	0.08	0.08	0.01
16	0.05 0.06	0.05	0.01	-0.97	0.12	0.05	0.01
17	0.08 0.09	0.08	0.00	-0.43	0.06	0.08	0.00
18	0.10 0.07	0.09	0.02	-0.37	0.21	0.09	0.02
19	0.11 0.10	0.10	0.01	-0.05	0.12	0.10	0.01

Counts	19	19	19	19	18	18
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
0.11	0.08	2.54	2.62	0.09	0.02
0.06	0.08			0.021	0.024

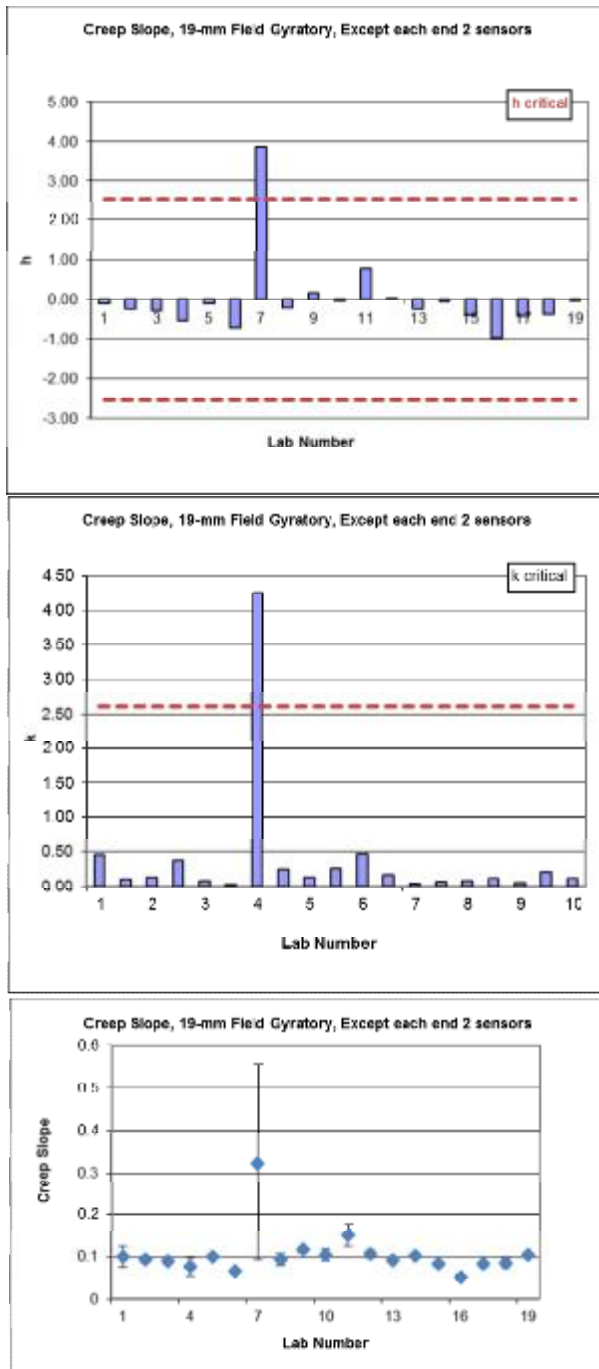


Figure F-5- h and k statistics, median deformations, and measurement errors of creep slope of 19-mm Field gyrotory specimens; except two measurement locations at each end

**Table F-6- Statistics of creep slope of 19-mm Field slab specimens; except two measurement locations at each end**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	0.15	0.17	0.03	1.10	0.50	0.17	0.03
	0.19						
2	0.08	0.08	0.00	-0.96	0.06	0.08	0.00
	0.08						
3	0.08	0.18	0.14	146	2.34	FALSE	FALSE
	0.28						
4	0.06	0.07	0.01	-126	0.18	0.07	0.01
	0.07						
5	0.10	0.11	0.02	-0.12	0.30	0.11	0.02
	0.13						
6	0.17	0.13	0.06	0.15	1.05	0.13	0.06
	0.08						
7	0.11	0.10	0.01	-0.36	0.17	0.10	0.01
	0.10						

Counts	7	7	7	7	6	6
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
0.12	0.06	2.05	2.30	0.11	0.03
0.04	0.06			0.035	0.041

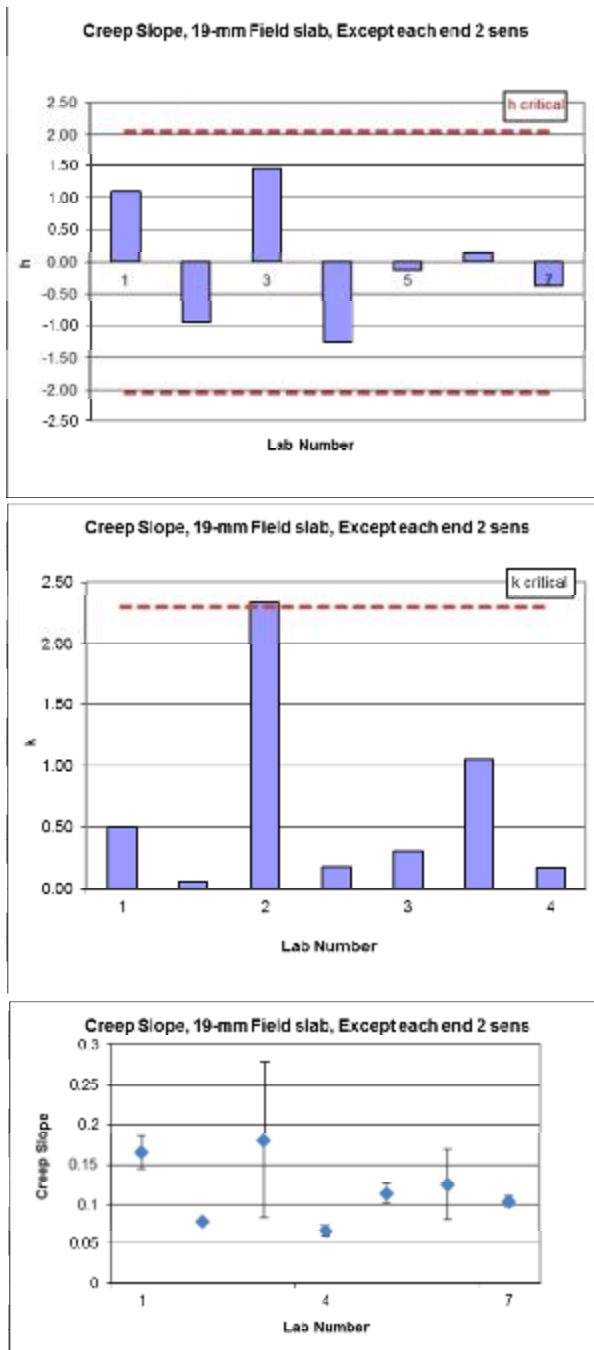


Figure F-6- h and k statistics, median deformations, and measurement errors of creep slope of 19-mm Field slab specimens; two measurement locations at each end

**Table F-7- Statistics of creep slope of WY gyratory specimens; all measurement locations**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	0.47	0.51	0.06	125	0.89	0.51	0.06
	0.55						
2	0.36	0.44	0.11	0.65	157	0.44	0.11
	0.52						
3	0.29	0.32	0.05	-0.42	0.68	0.32	0.05
	0.35						
4	0.72	0.58	0.19	189	2.82	FALSE	FALSE
	0.45						
5	0.30	0.28	0.03	-0.77	0.42	0.28	0.03
	0.26						
6	0.30	0.24	0.08	-109	1.19	0.24	0.08
	0.19						
7	0.29	0.30	0.01	-0.58	0.16	0.30	0.01
	0.31						
8	0.38	0.43	0.07	0.52	101	0.43	0.07
	0.47						
9	0.28	0.28	0.00	-0.78	0.04	0.28	0.00
	0.28						
10	0.27	0.23	0.06	-120	0.82	0.23	0.06
	0.19						
11	0.40	0.40	0.01	0.32	0.10	0.40	0.01
	0.41						
12	0.54	0.46	0.11	0.82	157	0.46	0.11
	0.38						
13	0.42	0.37	0.07	0.07	104	0.37	0.07
	0.33						
14	0.31	0.34	0.05	-0.22	0.69	0.34	0.05
	0.38						
15	0.44	0.49	0.06	104	0.91	0.49	0.06
	0.53						
16	0.25	0.25	0.01	-106	0.11	0.25	0.01
	0.24						
17	0.21	0.20	0.02	-150	0.35	0.20	0.02
	0.18						
18	0.54	0.48	0.09	0.97	126	0.48	0.09
	0.42						
19	0.30	0.35	0.07	-0.11	105	0.35	0.07
	0.40						
20	0.43	0.40	0.03	0.32	0.51	0.40	0.03
	0.38						
21	0.29	0.27	0.03	-0.89	0.50	0.27	0.03
	0.24						
22	0.45	0.40	0.07	0.32	105	0.40	0.07
	0.35						
23	0.24	0.27	0.04	-0.89	0.62	0.27	0.04
	0.30						
24	0.24	0.27	0.04	-0.89	0.62	0.27	0.04
	0.30						
25	0.62	0.62	0.00	2.23	0.00	0.62	0.00
	0.62						

Counts	25	25	25	25	24	24
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
0.37	0.07	2.61	2.67	0.36	0.06
0.11	0.12			0.106	0.114



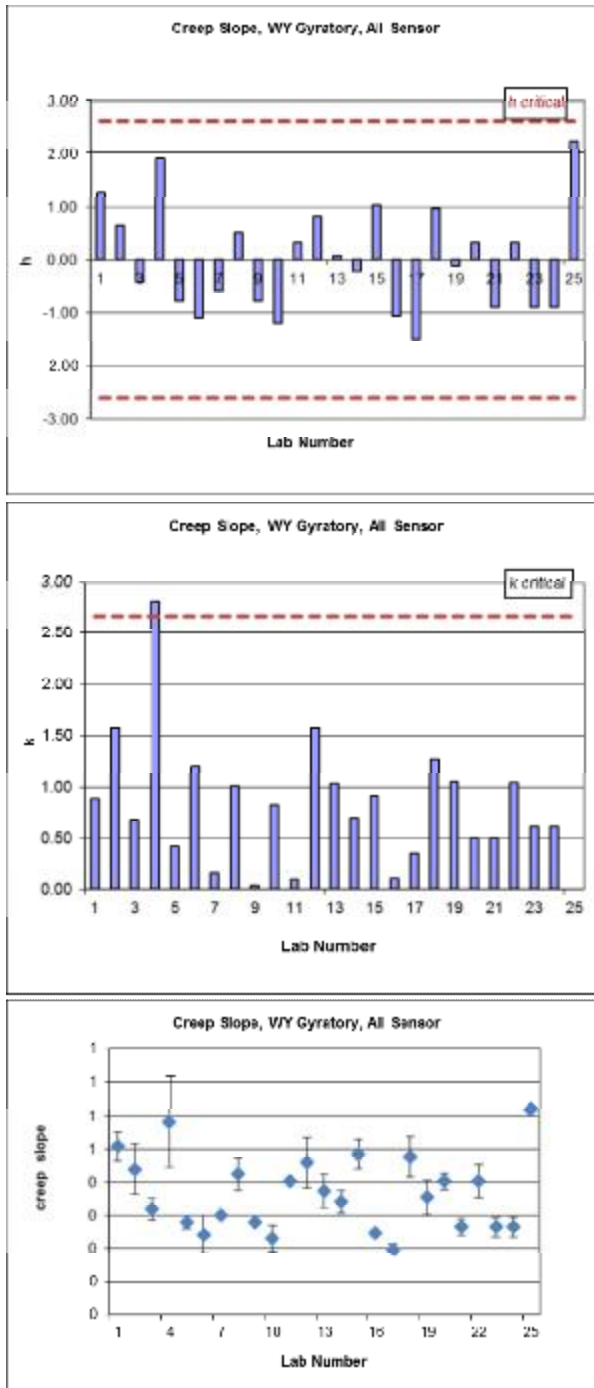


Figure F-7- h and k statistics, median deformations, and measurement errors of creep slope of WY gyrtory specimens; all measurement locations

**Table F-8- Statistics of creep slope of WY slab specimens; all measurement locations**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	0.19	0.23	0.05	0.34	148	0.23	0.05
	0.26						
2	0.17	0.20	0.03	-0.41	111	0.20	0.03
	0.22						
3	0.26	0.23	0.04	0.45	127	0.23	0.04
	0.20						
4	0.14	0.14	0.01	-1.72	0.18	0.14	0.01
	0.15						
5	0.21	0.20	0.02	-0.37	0.55	0.20	0.02
	0.19						
6	0.24	0.26	0.04	1.27	122	0.26	0.04
	0.29						
7	0.28	0.28	0.01	1.79	0.21	0.28	0.01
	0.29						
8	0.17	0.20	0.04	-0.35	130	0.20	0.04
	0.23						
9	0.17	0.19	0.03	-0.50	0.90	0.19	0.03
	0.21						
10	0.21	0.19	0.02	-0.50	0.77	0.19	0.02
	0.18						

Counts	10	10	10	10	10	10
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
0.21	0.03	2.29	2.45	0.21	0.03
0.04	0.05			0.040	0.046

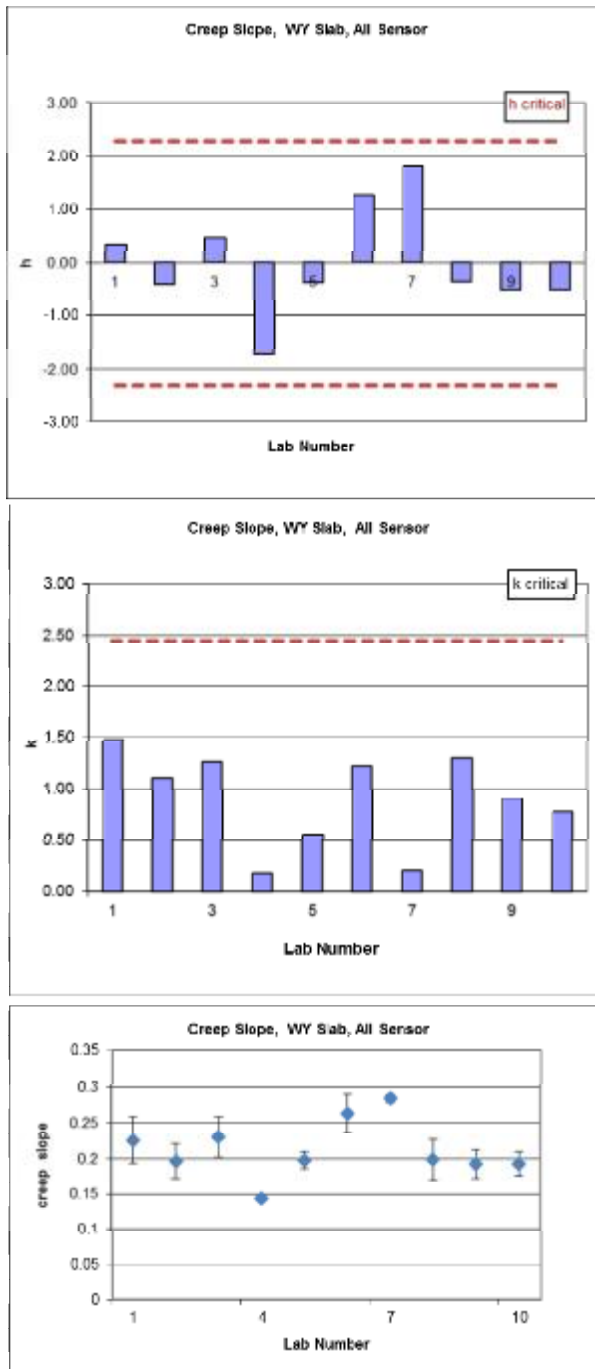


Figure F-8- h and k statistics, median deformations, and measurement errors of creep slope of WY gyratory specimens; all measurement locations

**Table F-9- Statistics of creep slope of WY gyratory specimens; except middle three measurement locations**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	0.38 0.55	0.46	0.12	147	164	0.46	0.12
2	0.33 0.48	0.40	0.10	0.82	142	0.40	0.10
3	0.27 0.32	0.30	0.03	-0.34	0.47	0.30	0.03
4	0.63 0.40	0.52	0.16	2.05	2.19	0.52	0.16
5	0.29 0.24	0.27	0.04	-0.69	0.49	0.27	0.04
6	0.26 0.17	0.21	0.06	-125	0.80	0.21	0.06
7	0.26 0.30	0.28	0.02	-0.53	0.32	0.28	0.02
8	0.32 0.46	0.39	0.09	0.69	129	0.39	0.09
9	0.27 0.27	0.27	0.00	-0.66	0.03	0.27	0.00
10	0.24 0.17	0.21	0.05	-132	0.65	0.21	0.05
11	0.41 0.37	0.39	0.02	0.66	0.33	0.39	0.02
12	0.60 0.32	0.46	0.20	140	2.70	FALSE	FALSE
13	0.40 0.32	0.36	0.05	0.35	0.72	0.36	0.05
14	0.30 0.37	0.34	0.05	0.08	0.72	0.34	0.05
15	0.44 0.47	0.45	0.02	136	0.30	0.45	0.02
16	0.24 0.22	0.23	0.02	-109	0.23	0.23	0.02
17	0.23 0.17	0.20	0.04	-139	0.54	0.20	0.04
18	0.43 0.42	0.43	0.01	107	0.13	0.43	0.01
19	0.26 0.39	0.33	0.09	-0.02	124	0.33	0.09
20	0.37 0.37	0.37	0.00	0.42	0.02	0.37	0.00
21	0.27 0.26	0.26	0.01	-0.73	0.13	0.26	0.01
22	0.42 0.30	0.36	0.08	0.35	1.10	0.36	0.08
23	0.22 0.27	0.25	0.04	-0.89	0.53	0.25	0.04
24	0.22 0.27	0.25	0.04	-0.89	0.53	0.25	0.04
25	0.25 0.25	0.25	0.00	-0.91	0.00	0.25	0.00
Counts		25	25	25	25	24	24
X_dbl_bar / Sx		Sr / SR		h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
0.33		0.07		2.61	2.67	0.32	0.06
0.09		0.11				0.089	0.100

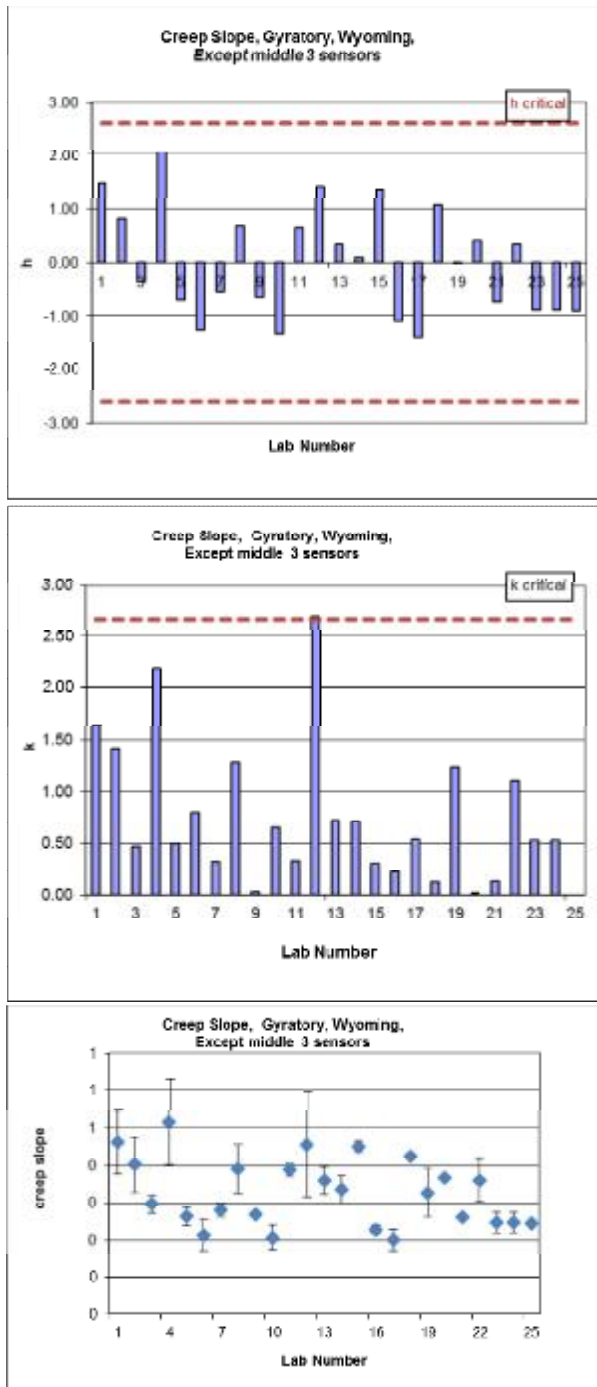


Figure F-9- h and k statistics, median deformations, and measurement errors of creep slope of WY gyratory specimens; except middle three measurement locations

**Table F-10- Statistics of creep slope of 19-mm WY slab specimens; except middle three measurement locations**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	0.19	0.20	0.02	-0.26	0.71	0.20	0.02
	0.22						
2	0.18	0.21	0.04	-0.21	163	0.21	0.04
	0.24						
3	0.26	0.24	0.03	0.49	124	0.24	0.03
	0.21						
4	0.13	0.14	0.01	-1.69	0.48	0.14	0.01
	0.15						
5	0.21	0.20	0.01	-0.27	0.19	0.20	0.01
	0.20						
6	0.26	0.29	0.03	1.64	127	0.29	0.03
	0.31						
7	0.28	0.28	0.01	1.58	0.27	0.28	0.01
	0.29						
8	0.19	0.19	0.00	-0.55	0.05	0.19	0.00
	0.19						
9	0.17	0.20	0.04	-0.40	169	0.20	0.04
	0.23						
10	0.21	0.20	0.02	-0.34	0.72	0.20	0.02
	0.19						
Counts		10	10	10	10	10	10
X_dbl_bar / Sx		Sr / SR		h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
0.22		0.03		2.29	2.45	0.22	0.03
0.04		0.05				0.043	0.047

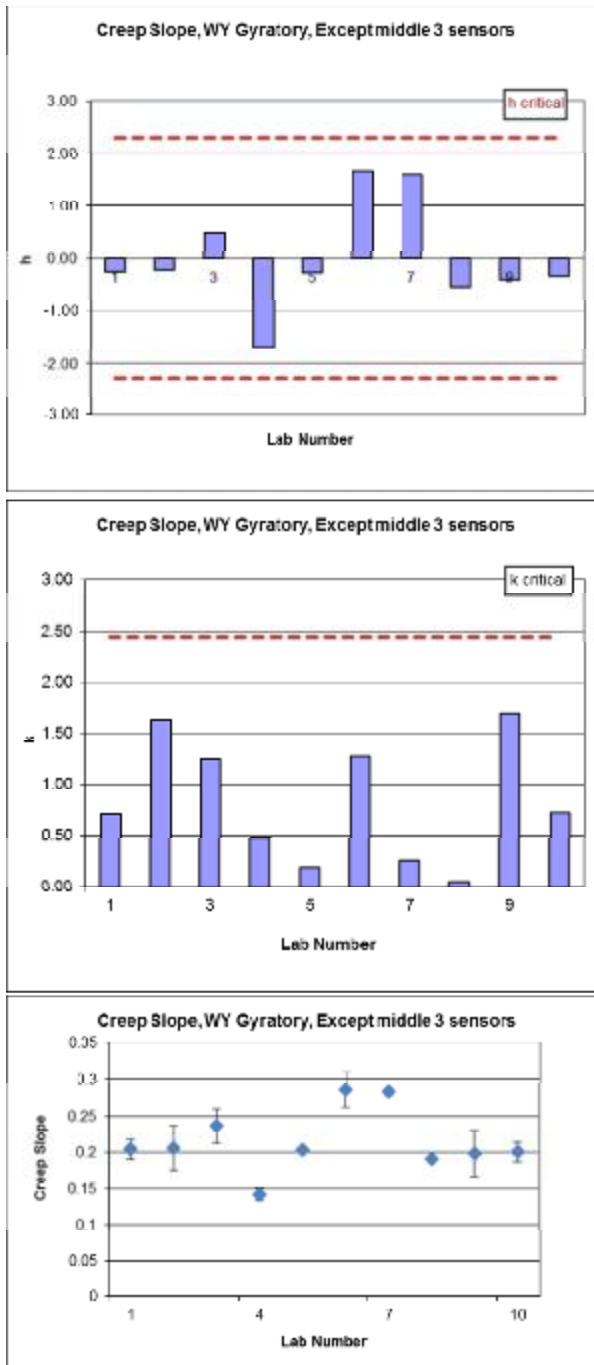


Figure F-10- h and k statistics, median deformations, and measurement errors of creep slope of WY slab specimens; except middle three measurement locations

**Table F-11- Statistics of creep slope of WY gyratory specimens; except two measurement locations at each end**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	0.49 0.57	0.53	0.06	124	0.71	0.53	0.06
2	0.43 0.56	0.49	0.09	0.89	1.12	0.49	0.09
3	0.33 0.40	0.36	0.05	-0.26	0.66	0.36	0.05
4	0.90 0.49	0.69	0.30	2.62	3.74	FALSE	FALSE
5	0.31 0.28	0.30	0.02	-0.82	0.25	0.30	0.02
6	0.37 0.21	0.29	0.11	-0.91	1.44	0.29	0.11
7	0.33 0.34	0.34	0.01	-0.49	0.12	0.34	0.01
8	0.42 0.50	0.46	0.05	0.59	0.68	0.46	0.05
9	0.30 0.30	0.30	0.00	-0.77	0.00	0.30	0.00
10	0.30 0.22	0.26	0.06	-1.15	0.79	0.26	0.06
11	0.37 0.46	0.42	0.06	0.21	0.81	0.42	0.06
12	0.49 0.36	0.43	0.09	0.30	1.18	0.43	0.09
13	0.44 0.36	0.40	0.05	0.06	0.66	0.40	0.05
14	0.33 0.36	0.35	0.02	-0.39	0.29	0.35	0.02
15	0.46 0.53	0.50	0.05	0.91	0.66	0.50	0.05
16	0.31 0.28	0.29	0.02	-0.89	0.27	0.29	0.02
17	0.22 0.19	0.21	0.02	-1.62	0.29	0.21	0.02
18	0.53 0.43	0.48	0.07	0.78	0.93	0.48	0.07
19	0.35 0.44	0.39	0.07	0.00	0.83	0.39	0.07
20	0.42 0.42	0.42	0.00	0.24	0.02	0.42	0.00
21	0.31 0.27	0.29	0.03	-0.92	0.33	0.29	0.03
22	0.47 0.39	0.43	0.06	0.32	0.70	0.43	0.06
23	0.27 0.31	0.29	0.03	-0.86	0.38	0.29	0.03
24	0.27 0.31	0.29	0.03	-0.86	0.38	0.29	0.03
25	0.60 0.60	0.60	0.00	1.77	0.00	0.60	0.00

Counts	25	25	25	25	24	24
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
0.39	0.08	2.61	2.67	0.38	0.05
0.12	0.13			0.099	0.106



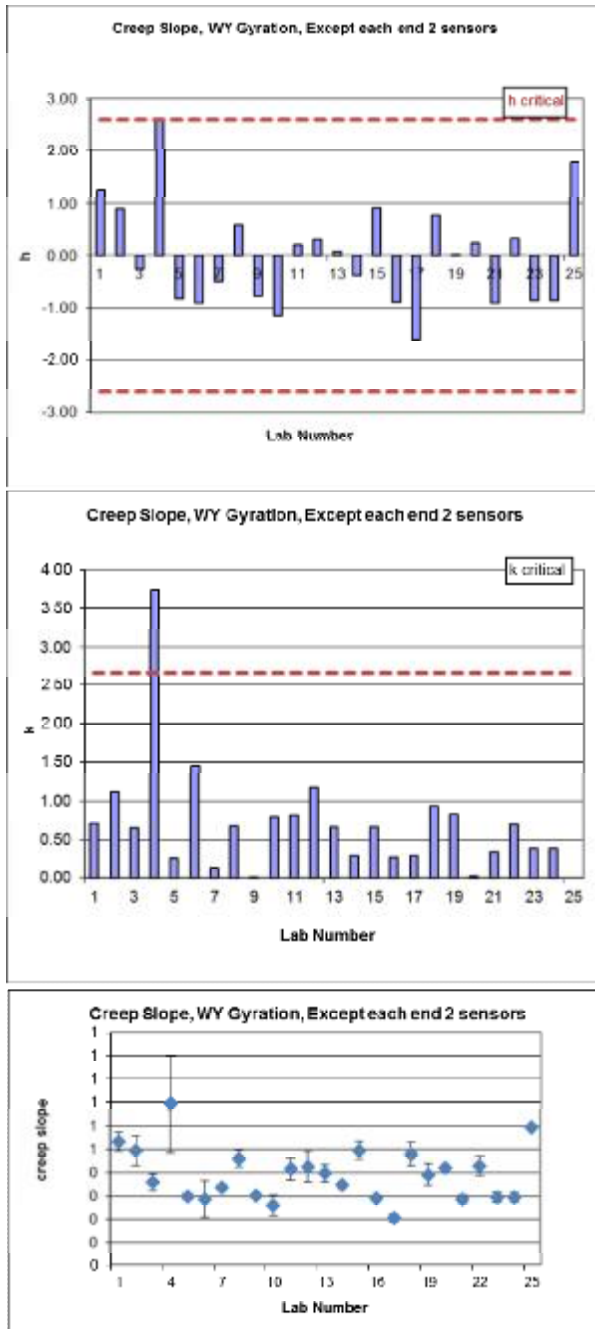


Figure F-11- h and k statistics, median deformations, and measurement errors of creep slope of WY gyratory specimens; except two measurement locations at each end

**Table F-12- Statistics of creep slope of WY slab specimens; except two measurement locations at each end**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	0.18	0.22	0.06	0.00	0.72	0.22	0.06
	0.26						
2	0.16	0.19	0.04	-0.40	0.52	0.19	0.04
	0.22						
3	0.25	0.22	0.04	0.06	0.45	0.22	0.04
	0.20						
4	0.15	0.15	0.00	-0.99	0.05	0.15	0.00
	0.14						
5	0.22	0.19	0.03	-0.33	0.38	0.19	0.03
	0.17						
6	0.20	0.24	0.06	0.27	0.70	0.24	0.06
	0.28						
7	0.27	0.41	0.21	2.66	2.63	FALSE	FALSE
	0.56						
8	0.14	0.20	0.09	-0.24	1.13	0.20	0.09
	0.26						
9	0.17	0.18	0.00	-0.56	0.05	0.18	0.00
	0.18						
10	0.21	0.18	0.03	-0.47	0.40	0.18	0.03
	0.16						
Counts		10	10	10	10	9	9

X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
0.22	0.08	2.29	2.45	0.20	0.05
0.07	0.09			0.027	0.043

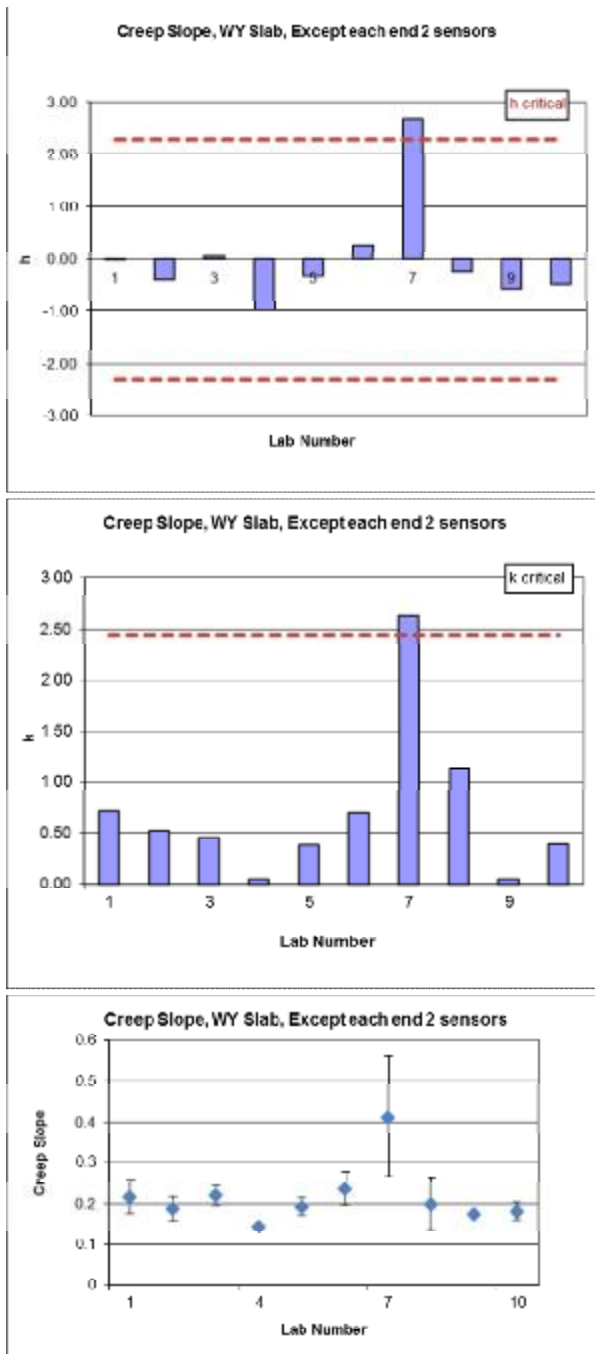


Figure F-12- h and k statistics, median deformations, and measurement errors of creep slope of WY slab specimens; except two measurement locations at each end

## **APPENDIX G- STATISTICS OF STRIP SLOPE**

**Table G-1- Statistics of strip slope of WY gyratory specimens; all measurement locations**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	0.91 121	106	0.21	-0.27	1.12	106	0.21
2	101 1.19	1.10	0.12	-0.06	0.66	1.10	0.12
3	146 181	164	0.24	2.62	129	FALSE	FALSE
4	146 133	140	0.09	1.42	0.48	140	0.09
5	0.99 0.94	0.97	0.03	-0.72	0.19	0.97	0.03
6	103 0.92	0.97	0.08	-0.69	0.41	0.97	0.08
7	0.85 108	0.96	0.17	-0.73	0.89	0.96	0.17
8	137 1.17	127	0.14	0.79	0.74	127	0.14
9	0.65 1.14	0.90	0.35	-106	184	0.90	0.35
10	104 0.97	101	0.05	-0.53	0.27	101	0.05
11	123 100	1.12	0.16	0.04	0.86	1.12	0.16
12	157 133	145	0.17	169	0.89	145	0.17
13	130 0.84	107	0.33	-0.20	175	107	0.33
14	103 103	103	0.00	-0.40	0.01	103	0.00
15	0.94 0.99	0.96	0.03	-0.73	0.16	0.96	0.03
16	104 0.89	0.97	0.10	-0.72	0.56	0.97	0.10
17	1.15 128	121	0.09	0.51	0.50	121	0.09
18	140 128	134	0.08	1.14	0.43	134	0.08
19	0.72 0.93	0.83	0.15	-143	0.80	0.83	0.15
20	126 1.16	121	0.07	0.48	0.38	121	0.07
21	132 0.84	108	0.34	-0.16	178	108	0.34
22	121 147	134	0.18	1.13	0.98	134	0.18
23	0.81 127	104	0.33	-0.36	175	104	0.33
24	0.81 127	104	0.33	-0.36	175	104	0.33
25	0.83 0.83	0.83	0.00	-141	0.00	0.83	0.00

Counts	25	25	25	25	24	24
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
1.11	0.19	2.61	2.67	1.09	0.19
0.20	0.24			0.172	0.216

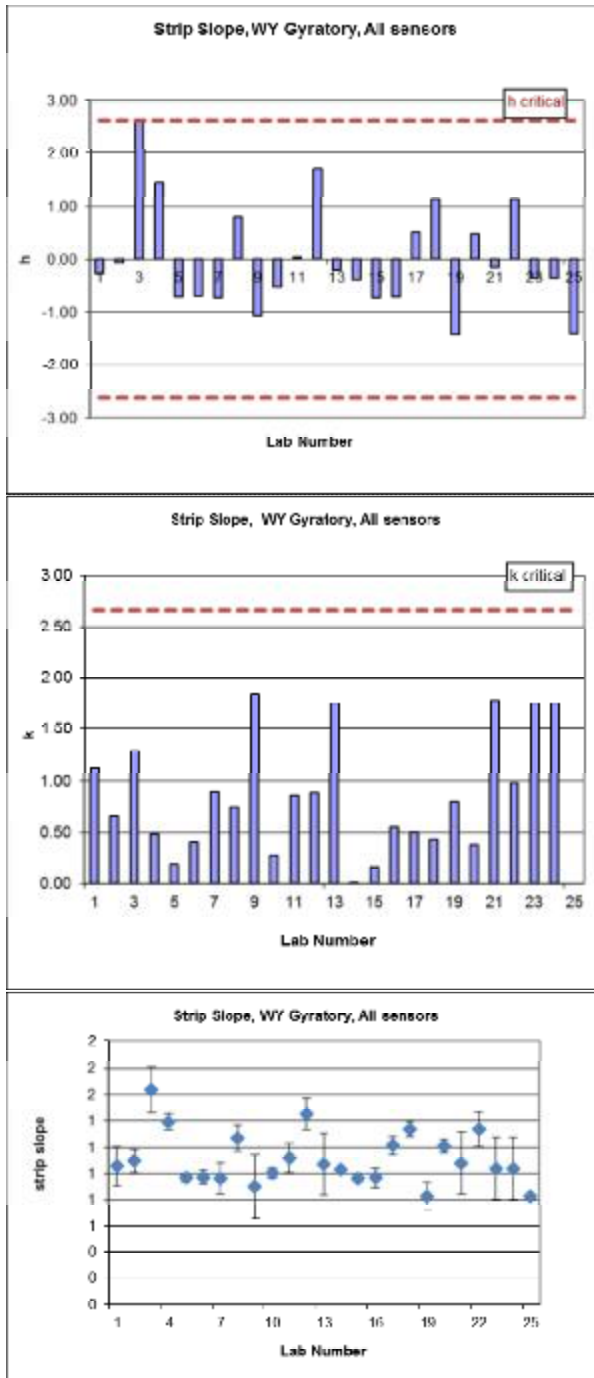


Figure G-1-  $h$  and  $k$  statistics, median deformations, and measurement errors of strip slope of WY gyratory specimens; all measurement locations

**Table G-2- Statistics of strip slope of WY slab specimens; all measurement locations**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	0.65	0.69	0.06	0.04	0.49	0.69	0.06
	0.74						
2	0.55	0.65	0.14	-0.32	1.18	0.65	0.14
	0.75						
3	0.85	0.79	0.08	0.80	0.66	0.79	0.08
	0.74						
4	0.62	0.52	0.15	-1.32	1.23	0.52	0.15
	0.41						
5	0.58	0.52	0.10	-1.33	0.80	0.52	0.10
	0.45						
6	0.96	0.96	0.00	2.06	0.02	0.96	0.00
	0.96						
7	0.67	0.67	0.00	-0.14	0.01	0.67	0.00
	0.67						
8	0.55	0.75	0.28	0.44	2.32	0.75	0.28
	0.94						
9	0.74	0.72	0.03	0.25	0.25	0.72	0.03
	0.70						
10	0.68	0.63	0.07	-0.48	0.60	0.63	0.07
	0.58						

Counts	10	10	10	10	10	10
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
0.69	0.12	2.29	2.45	0.69	0.12
0.13	0.16			0.131	0.156

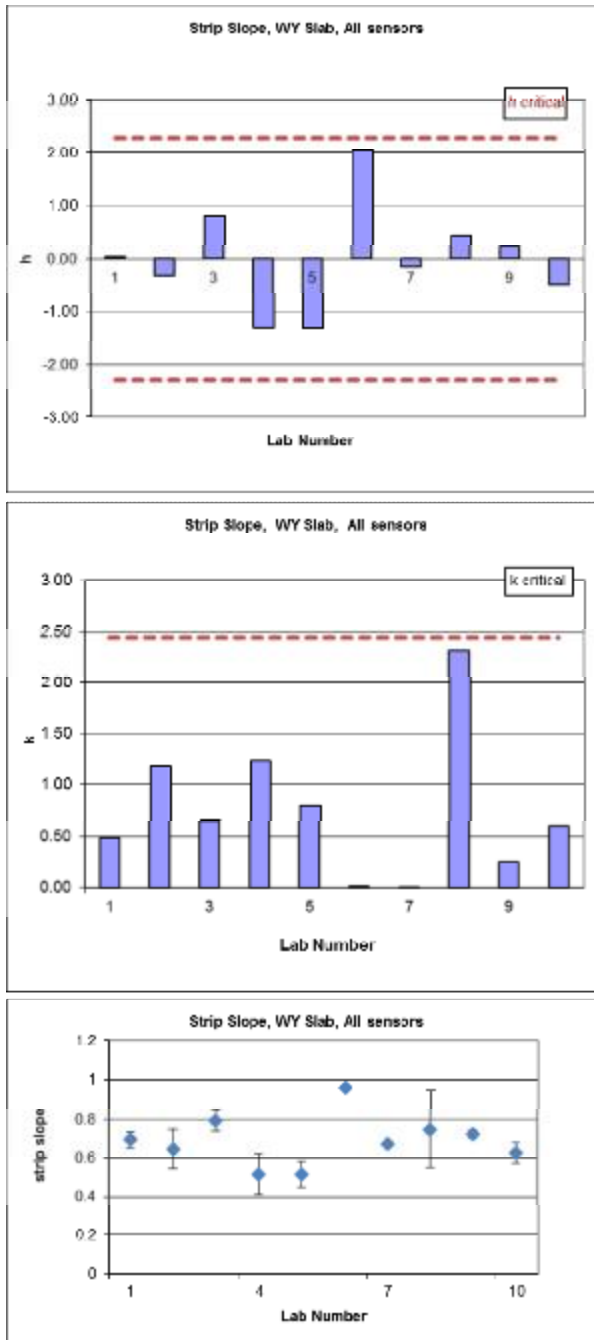


Figure G-2- h and k statistics, median deformations, and measurement errors of strip slope of WY slab specimens; all measurement locations



**Table G-3- Statistics of strip slope of WY gyratory specimens; except middle 3 measurement locations**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	0.81 1.12	0.96	0.22	0.18	141	0.96	0.22
2	0.87 1.09	0.98	0.16	0.27	102	0.98	0.16
3	1.24 1.53	1.38	0.21	2.70	137	FALSE	FALSE
4	1.17 1.02	1.10	0.11	0.99	0.70	1.10	0.11
5	0.92 0.74	0.83	0.12	-0.60	0.81	0.83	0.12
6	0.72 0.79	0.75	0.05	-1.09	0.32	0.75	0.05
7	0.71 0.98	0.84	0.19	-0.54	124	0.84	0.19
8	1.13 0.94	1.04	0.13	0.63	0.86	1.04	0.13
9	0.60 1.06	0.83	0.32	-0.61	2.09	0.83	0.32
10	0.83 0.88	0.85	0.04	-0.48	0.25	0.85	0.04
11	1.11 0.83	0.97	0.20	0.23	127	0.97	0.20
12	1.36 1.12	1.24	0.17	1.84	1.08	1.24	0.17
13	1.03 0.76	0.90	0.19	-0.22	126	0.90	0.19
14	0.88 0.86	0.87	0.02	-0.38	0.11	0.87	0.02
15	0.77 0.86	0.81	0.06	-0.72	0.39	0.81	0.06
16	0.87 0.70	0.79	0.12	-0.88	0.78	0.79	0.12
17	0.93 1.13	1.03	0.14	0.58	0.91	1.03	0.14
18	1.17 1.04	1.10	0.09	1.01	0.62	1.10	0.09
19	0.65 0.73	0.69	0.05	-1.47	0.35	0.69	0.05
20	1.09 1.14	1.11	0.04	1.06	0.23	1.11	0.04
21	1.01 0.75	0.88	0.19	-0.30	122	0.88	0.19
22	0.91 1.11	1.01	0.14	0.46	0.93	1.01	0.14
23	0.69 0.97	0.83	0.20	-0.60	128	0.83	0.20
24	0.69 0.97	0.83	0.20	-0.60	128	0.83	0.20
25	0.69 0.69	0.69	0.00	-1.48	0.00	0.69	0.00
Counts		25	25	25	25	24	24
X_dbl_bar / Sx		Sr / SR		h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
0.93		0.15		2.61	2.67	0.91	0.15
0.17		0.20				0.141	0.177

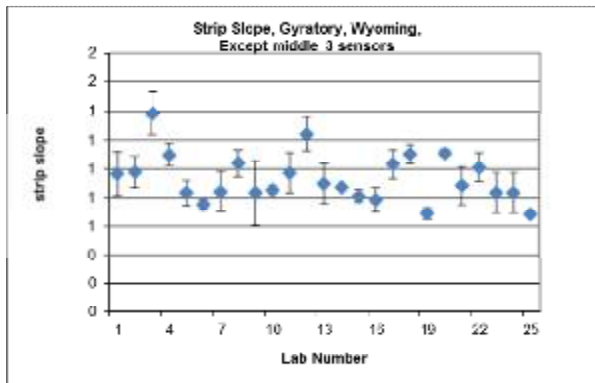
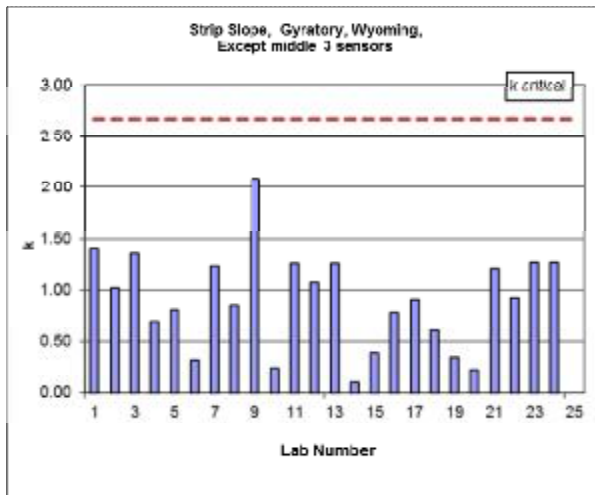
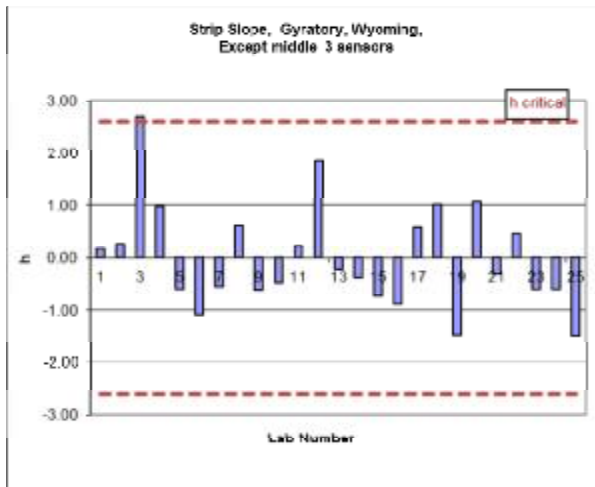


Figure G-3- h and k statistics, median deformations, and measurement errors of strip slope of WY gyratory specimens; except middle 3 measurement locations

**Table G-4- Statistics of strip slope of WY slab specimens; except middle 3 measurement locations**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	0.61	0.59	0.03	-0.25	0.33	0.59	0.03
	0.57						
2	0.50	0.59	0.12	-0.26	154	0.59	0.12
	0.68						
3	0.71	0.66	0.07	0.28	0.86	0.66	0.07
	0.61						
4	0.55	0.46	0.12	-1.24	146	0.46	0.12
	0.38						
5	0.50	0.48	0.03	-1.10	0.34	0.48	0.03
	0.46						
6	0.93	0.94	0.01	2.40	0.15	FALSE	FALSE
	0.95						
7	0.59	0.60	0.02	-0.17	0.23	0.60	0.02
	0.62						
8	0.53	0.64	0.16	0.13	2.02	0.64	0.16
	0.76						
9	0.68	0.68	0.00	0.42	0.06	0.68	0.00
	0.68						
10	0.63	0.60	0.05	-0.22	0.61	0.60	0.05
	0.56						
Counts		10	10	10	10	9	9

X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
0.62	0.08	2.29	2.45	0.59	0.09
0.13	0.14			0.075	0.096

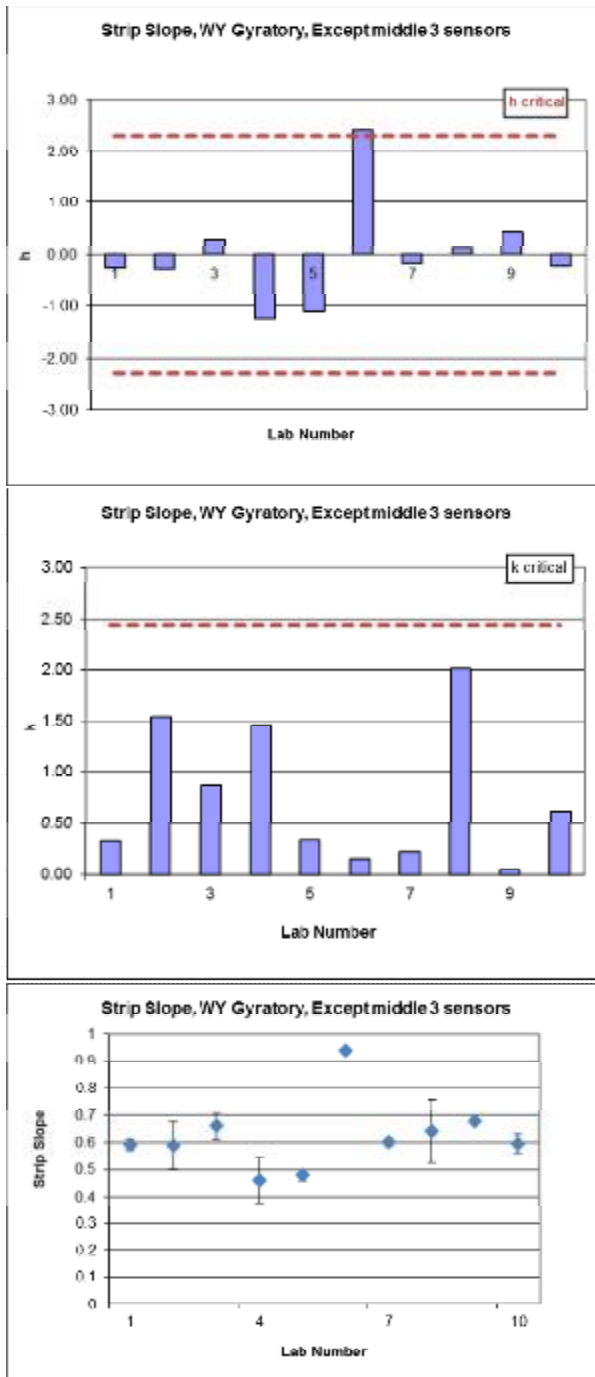


Figure G-4- h and k statistics, median deformations, and measurement errors of strip slope of WY slab specimens; except middle three measurement locations

**Table G-5- Statistics of strip slope of WY gyratory specimens; except two measurement locations at each end**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	107	124	0.23	-0.59	0.94	124	0.23
	140						
2	125	129	0.06	-0.40	0.22	129	0.06
	132						
3	188	2.06	0.25	2.72	100	FALSE	FALSE
	2.24						
4	185	175	0.14	147	0.56	175	0.14
	165						
5	120	121	0.02	-0.69	0.07	121	0.02
	123						
6	137	126	0.15	-0.50	0.62	126	0.15
	115						
7	106	118	0.16	-0.84	0.65	118	0.16
	129						
8	173	159	0.19	0.84	0.77	159	0.19
	146						
9	0.79	107	0.40	-125	159	107	0.40
	136						
10	133	124	0.13	-0.60	0.52	124	0.13
	114						
11	148	134	0.19	-0.18	0.77	134	0.19
	120						
12	186	180	0.08	166	0.32	180	0.08
	174						
13	172	137	0.49	-0.05	196	137	0.49
	102						
14	133	132	0.02	-0.26	0.06	132	0.02
	131						
15	118	122	0.06	-0.66	0.26	122	0.06
	127						
16	138	127	0.16	-0.48	0.63	127	0.16
	115						
17	146	153	0.09	0.57	0.37	153	0.09
	159						
18	172	168	0.05	119	0.20	168	0.05
	165						
19	0.87	103	0.22	-143	0.89	103	0.22
	119						
20	148	136	0.16	-0.08	0.65	136	0.16
	125						
21	173	138	0.49	0.00	197	138	0.49
	104						
22	146	168	0.32	119	127	168	0.32
	191						
23	0.98	131	0.46	-0.32	183	131	0.46
	163						
24	0.98	131	0.46	-0.32	183	131	0.46
	163						
25	114	114	0.00	-0.98	0.00	114	0.00
	114						

Counts	25	25	25	25	24	24
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
139	0.25	2.61	2.67	136	0.25
0.25	0.31			0.210	0.274

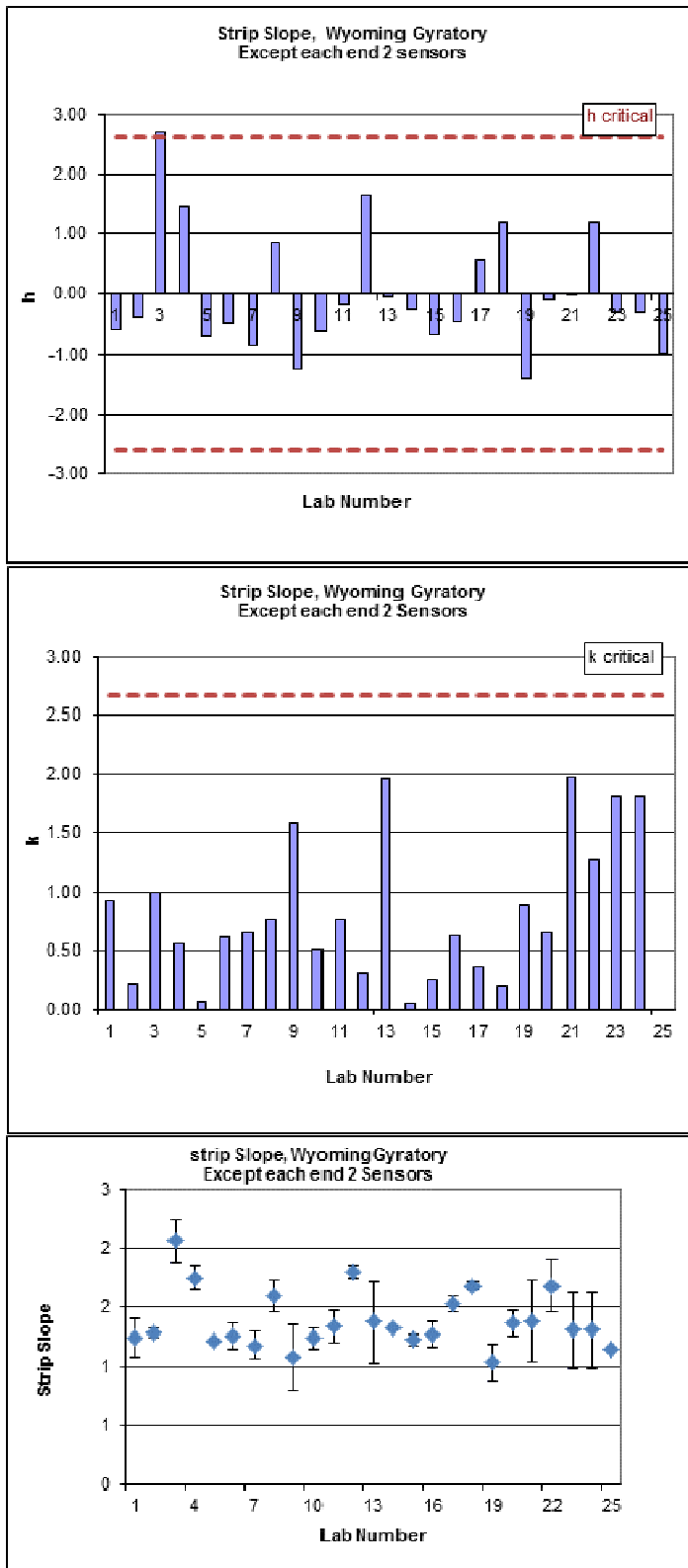


Figure G-5- h and k statistics, median deformations, and measurement errors of strip slope of WY gyratory specimens; except two measurement locations at each end

**Table G-6- Statistics of strip slope of WY slab specimens; except two measurement locations at each end**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	0.75	0.86	0.16	0.44	0.90	0.86	0.16
	0.97						
2	0.62	0.76	0.19	-0.24	1.10	0.76	0.19
	0.90						
3	1.04	0.97	0.11	1.20	0.62	0.97	0.11
	0.89						
4	0.72	0.59	0.19	-1.43	1.07	0.59	0.19
	0.46						
5	0.71	0.60	0.15	-1.34	0.88	0.60	0.15
	0.49						
6	1.00	1.00	0.00	1.43	0.03	1.00	0.00
	1.00						
7	0.82	0.70	0.16	-0.64	0.94	0.70	0.16
	0.59						
8	0.62	0.89	0.38	0.65	2.15	0.89	0.38
	1.15						
9	0.87	0.87	0.01	0.51	0.06	0.87	0.01
	0.86						
10	0.76	0.71	0.07	-0.59	0.40	0.71	0.07
	0.66						
Counts		10	10	10	10	10	10

X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
0.79	0.18	2.29	2.45	0.79	0.18
0.14	0.19			0.144	0.190

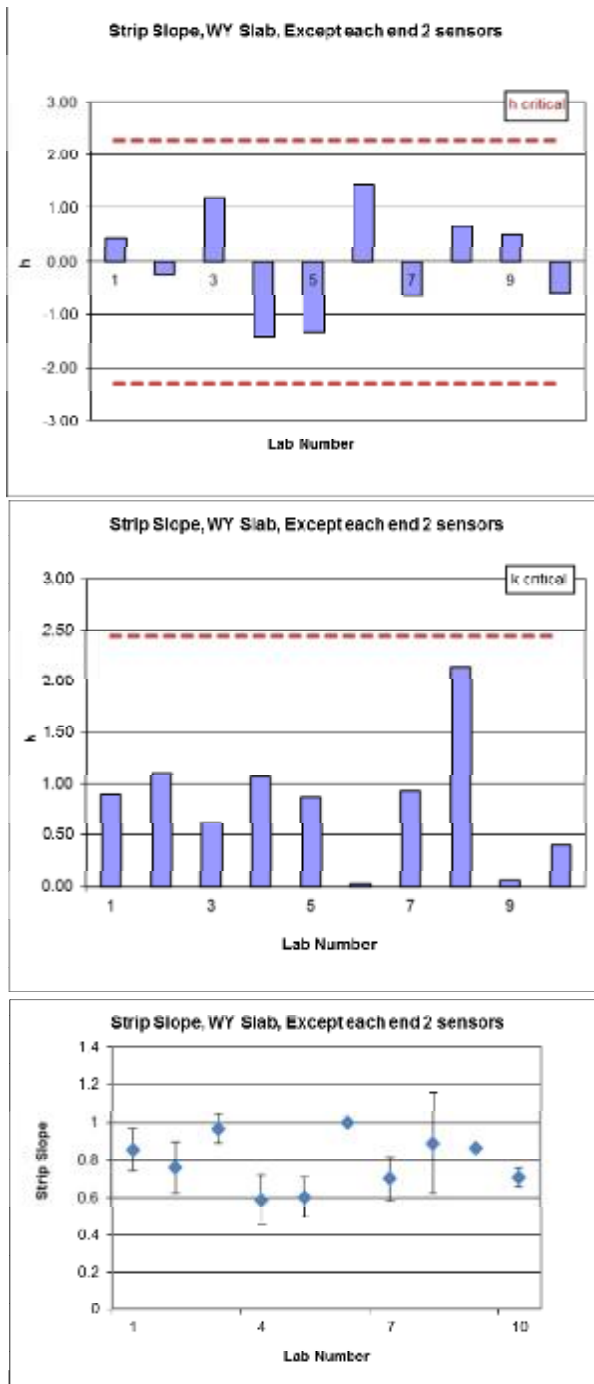


Figure G-6- h and k statistics, median deformations, and measurement errors of strip slope of WY slab specimens; except two measurement locations at each end



## **APPENDIX H- STATISTICS OF NUMBER OF PASSES TO INFLECTION POINT**

**Table H-1- Statistics of # of Cycles to Inflection of WY gyratory specimens; all measurement locations**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	4000.00	2750.00	1767.77	-0.91	165	2750.00	1767.77
	1500.00						
2	4850.00	3775.00	1520.28	-0.50	142	3775.00	1520.28
	2700.00						
3	4650.00	4125.00	742.46	-0.37	0.69	4125.00	742.46
	3600.00						
4	1050.00	2475.00	2015.25	-102	189	2475.00	2015.25
	3900.00						
5	4850.00	5175.00	459.62	0.05	0.43	5175.00	459.62
	5500.00						
6	5200.00	6100.00	1272.79	0.41	1.19	6100.00	1272.79
	7000.00						
7	5000.00	5050.00	70.71	0.00	0.07	5050.00	70.71
	5100.00						
8	4050.00	4050.00	0.00	-0.40	0.00	4050.00	0.00
	4050.00						
9	6500.00	6050.00	636.40	0.39	0.60	6050.00	636.40
	5600.00						
10	5200.00	6450.00	1767.77	0.55	165	6450.00	1767.77
	7700.00						
11	4600.00	4025.00	813.17	-0.40	0.76	4025.00	813.17
	3450.00						
12	4640.00	5830.00	1682.91	0.31	157	5830.00	1682.91
	7020.00						
13	4600.00	4775.00	247.49	-0.11	0.23	4775.00	247.49
	4950.00						
14	4850.00	4750.00	14142	-0.12	0.13	4750.00	14142
	4650.00						
15	4500.00	3000.00	212132	-0.81	198	3000.00	212132
	1500.00						
16	5400.00	5450.00	70.71	0.16	0.07	5450.00	70.71
	5500.00						
17	6200.00	7050.00	1202.08	0.79	1.12	7050.00	1202.08
	7900.00						
18	1700.00	2650.00	1343.50	-0.95	126	2650.00	1343.50
	3600.00						
19	4950.00	4700.00	353.55	-0.14	0.33	4700.00	353.55
	4450.00						
20	4300.00	4375.00	106.07	-0.27	0.10	4375.00	106.07
	4450.00						
21	4100.00	4225.00	176.78	-0.33	0.17	4225.00	176.78
	4350.00						
22	2700.00	3550.00	1202.08	-0.59	1.12	3550.00	1202.08
	4400.00						
23	5300.00	5075.00	318.20	0.01	0.30	5075.00	318.20
	4850.00						
24	5300.00	5075.00	318.20	0.01	0.30	5075.00	318.20
	4850.00						
25	15820.00	15820.00	0.00	4.24	0.00	FALSE	FALSE
	15820.00						

Counts	25	25	25	25	24	24
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
5054.00	1068.83	2.61	2.67	4605.42	1090.87
2540.75	2650.77			1219.291	1442.798

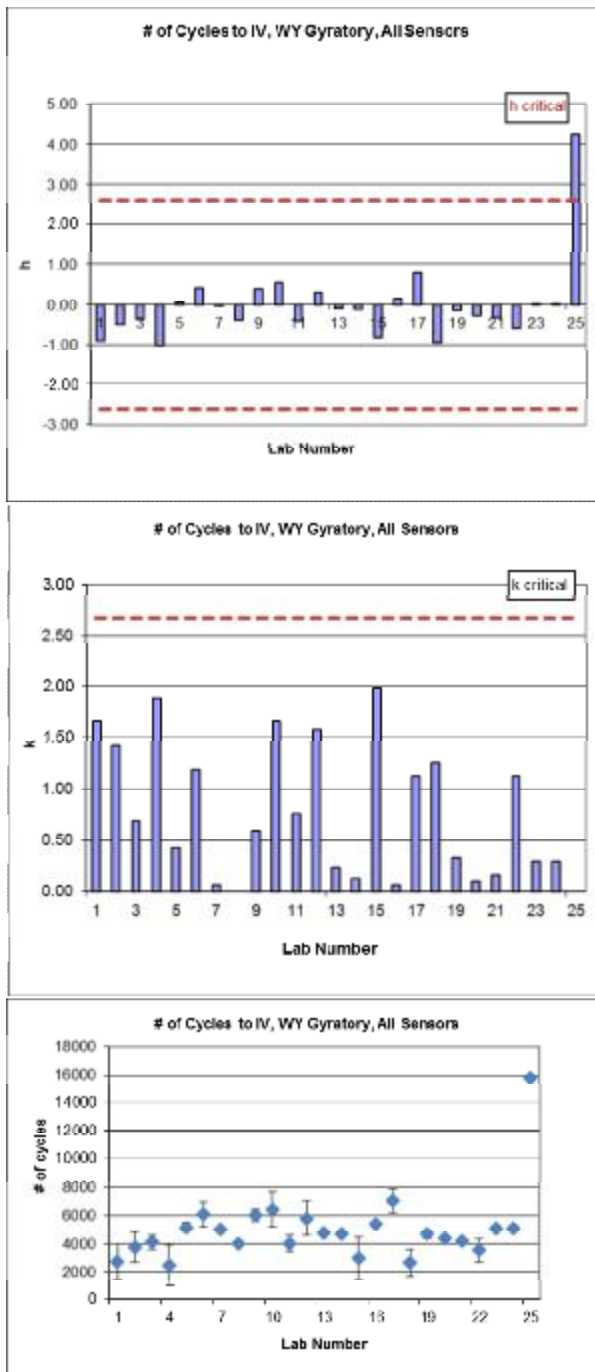


Figure H-1- h and k statistics, median deformations, and measurement errors for # of Cycles to Infection Point of WY gyratory specimens; all measurement locations

**Table H-2- Statistics of # of Cycles to Inflection Point of WY slab specimens; all measurement locations**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	6700.00 5200.00	5950.00	1060.66	-0.88	0.68	5950.00	1060.66
2	10500.00 6100.00	8300.00	3111.27	0.42	2.00	8300.00	3111.27
3	6300.00 7200.00	6750.00	636.40	-0.44	0.41	6750.00	636.40
4	11100.00 12000.00	11550.00	636.40	2.21	0.41	11550.00	636.40
5	6900.00 9900.00	8400.00	2121.32	0.47	1.36	8400.00	2121.32
6	5200.00 4900.00	5050.00	212.13	-1.37	0.14	5050.00	212.13
7	5500.00 7800.00	6650.00	1626.35	-0.49	1.05	6650.00	1626.35
8	8400.00 5400.00	6900.00	2121.32	-0.35	1.36	6900.00	2121.32
9	7200.00 7000.00	7100.00	141.42	-0.24	0.09	7100.00	141.42
10	9400.00 8100.00	8750.00	919.24	0.67	0.59	8750.00	919.24

Counts	10	10	10	10	10	10
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
7540.00	1554.67	2.29	2.45	7540.00	1554.67
1813.81	2120.94			1813.805	2120.941

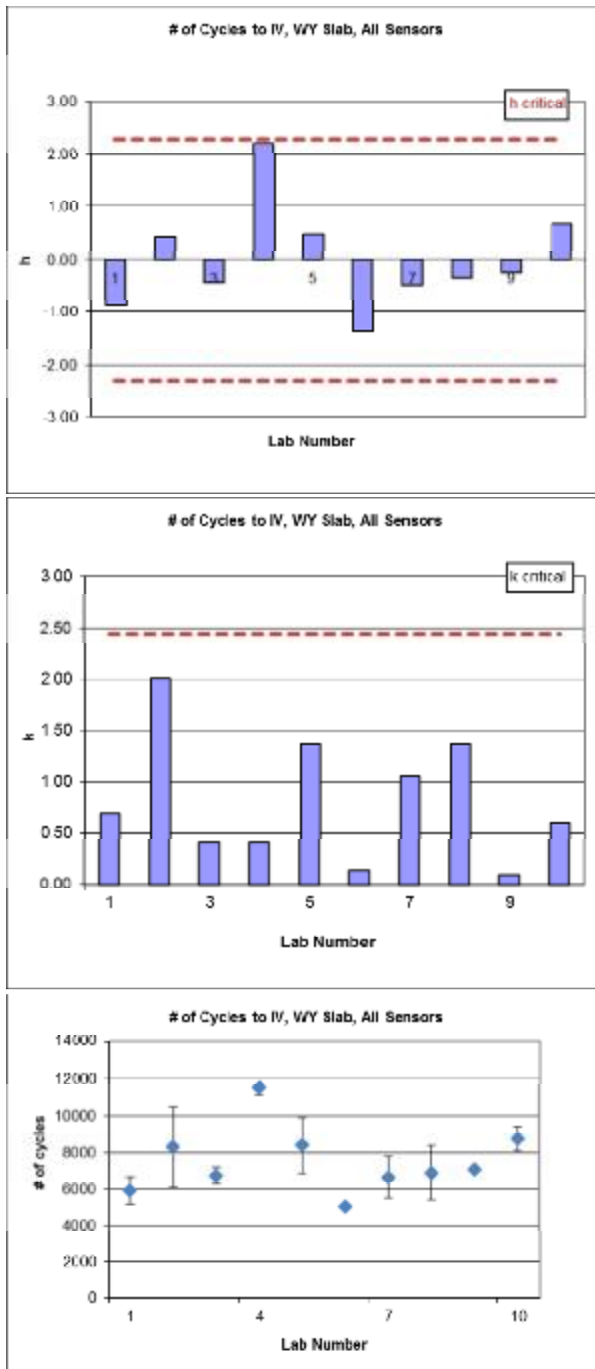


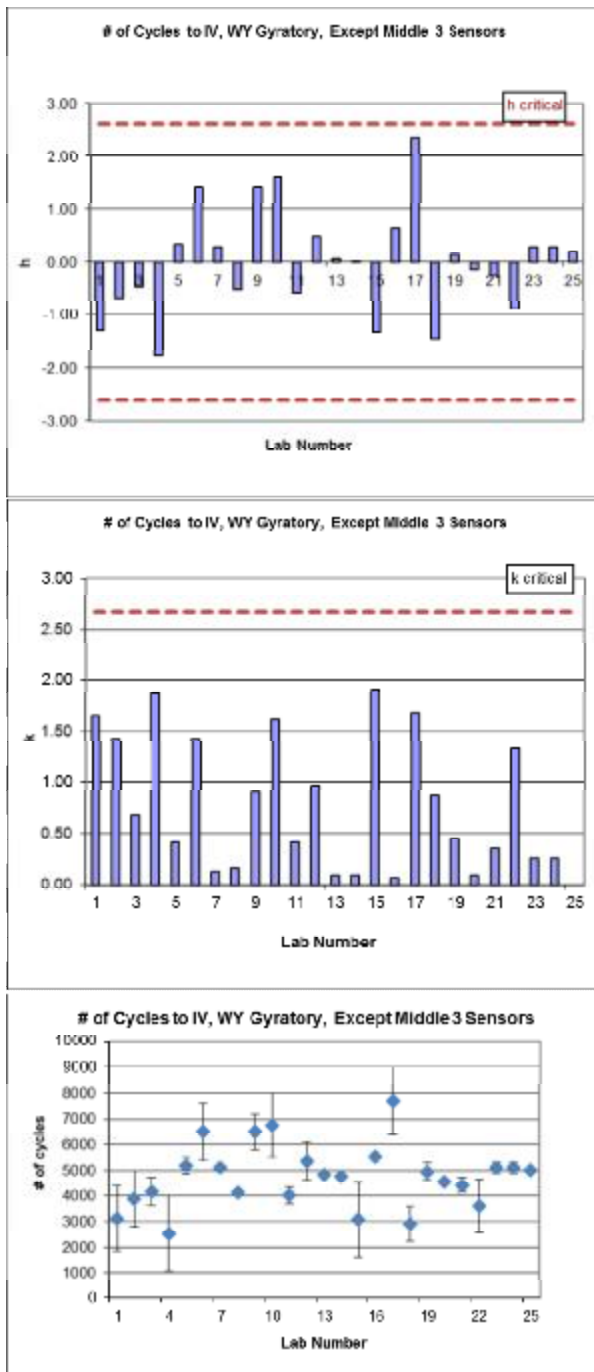
Figure H-2- h and k statistics, median deformations, and measurement errors for # of Cycles to Infection Point of WY slab specimens; all measurement locations

**Table H-3- Statistics of # of Cycles to Inflection Point of WY gyratory specimens; except middle three measurement locations**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	4400.00	3125.00	1803.12	-1.31	165	3125.00	1803.12
	1850.00						
2	5000.00	3900.00	1555.63	-0.69	142	3900.00	1555.63
	2800.00						
3	4700.00	4175.00	742.46	-0.47	0.68	4175.00	742.46
	3650.00						
4	1100.00	2550.00	2050.61	-1.77	188	2550.00	2050.61
	4000.00						
5	4850.00	5175.00	459.62	0.33	0.42	5175.00	459.62
	5500.00						
6	5400.00	6500.00	1555.63	1.40	142	6500.00	1555.63
	7600.00						
7	5200.00	5100.00	14142	0.27	0.13	5100.00	14142
	5000.00						
8	4250.00	4125.00	176.78	-0.51	0.16	4125.00	176.78
	4000.00						
9	7200.00	6500.00	989.95	1.40	0.91	6500.00	989.95
	5800.00						
10	5500.00	6750.00	1767.77	1.60	162	6750.00	1767.77
	8000.00						
11	4350.00	4025.00	459.62	-0.59	0.42	4025.00	459.62
	3700.00						
12	4620.00	5360.00	1046.52	0.48	0.96	5360.00	1046.52
	6100.00						
13	4750.00	4825.00	106.07	0.05	0.10	4825.00	106.07
	4900.00						
14	4850.00	4775.00	106.07	0.01	0.10	4775.00	106.07
	4700.00						
15	4550.00	3075.00	2085.97	-1.35	191	3075.00	2085.97
	1600.00						
16	5600.00	5550.00	70.71	0.64	0.06	5550.00	70.71
	5500.00						
17	6400.00	7700.00	1838.48	2.36	168	7700.00	1838.48
	9000.00						
18	2250.00	2925.00	954.59	-1.47	0.87	2925.00	954.59
	3600.00						
19	5300.00	4950.00	494.97	0.15	0.45	4950.00	494.97
	4600.00						
20	4500.00	4575.00	106.07	-0.15	0.10	4575.00	106.07
	4650.00						
21	4700.00	4425.00	388.91	-0.27	0.36	4425.00	388.91
	4150.00						
22	2600.00	3625.00	1449.57	-0.91	1.33	3625.00	1449.57
	4650.00						
23	5300.00	5100.00	282.84	0.27	0.26	5100.00	282.84
	4900.00						
24	5300.00	5100.00	282.84	0.27	0.26	5100.00	282.84
	4900.00						
25	5000.00	5000.00	0.00	0.19	0.00	5000.00	0.00
	5000.00						

Counts	25	25	25	25	25	25
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
4756	1093	2.61	2.67	4756	1093
1250	1469			1250	1469



**Figure H-3-  $h$  and  $k$  statistics, median deformations, and measurement errors for # of Cycles to Infection Point of WY gyrotory specimens; except middle three measurement locations**

**Table H-4- Statistics of # of Cycles to Inflection Point of WY slab specimens; except middle three measurement locations**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	5500.00	5550.00	70.71	-102	0.05	5550.00	70.71
	5600.00						
2	10500.00	8250.00	3181.98	0.39	2.15	8250.00	3181.98
	6000.00						
3	6500.00	6750.00	353.55	-0.39	0.24	6750.00	353.55
	7000.00						
4	11100.00	11800.00	989.95	2.25	0.67	11800.00	989.95
	12500.00						
5	7000.00	8350.00	1909.19	0.45	1.29	8350.00	1909.19
	9700.00						
6	5100.00	5000.00	1414.2	-130	0.10	5000.00	1414.2
	4900.00						
7	5700.00	6650.00	1343.50	-0.44	0.91	6650.00	1343.50
	7600.00						
8	8500.00	7000.00	2121.32	-0.26	1.43	7000.00	2121.32
	5500.00						
9	7100.00	6950.00	212.13	-0.28	0.14	6950.00	212.13
	6800.00						
10	9200.00	8650.00	777.82	0.60	0.53	8650.00	777.82
	8100.00						

Counts	10	10	10	10	10	10
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
7495.00	1478.34	2.29	2.45	7495.00	1478.34
1914.48	2181.28			1914.484	2181.284



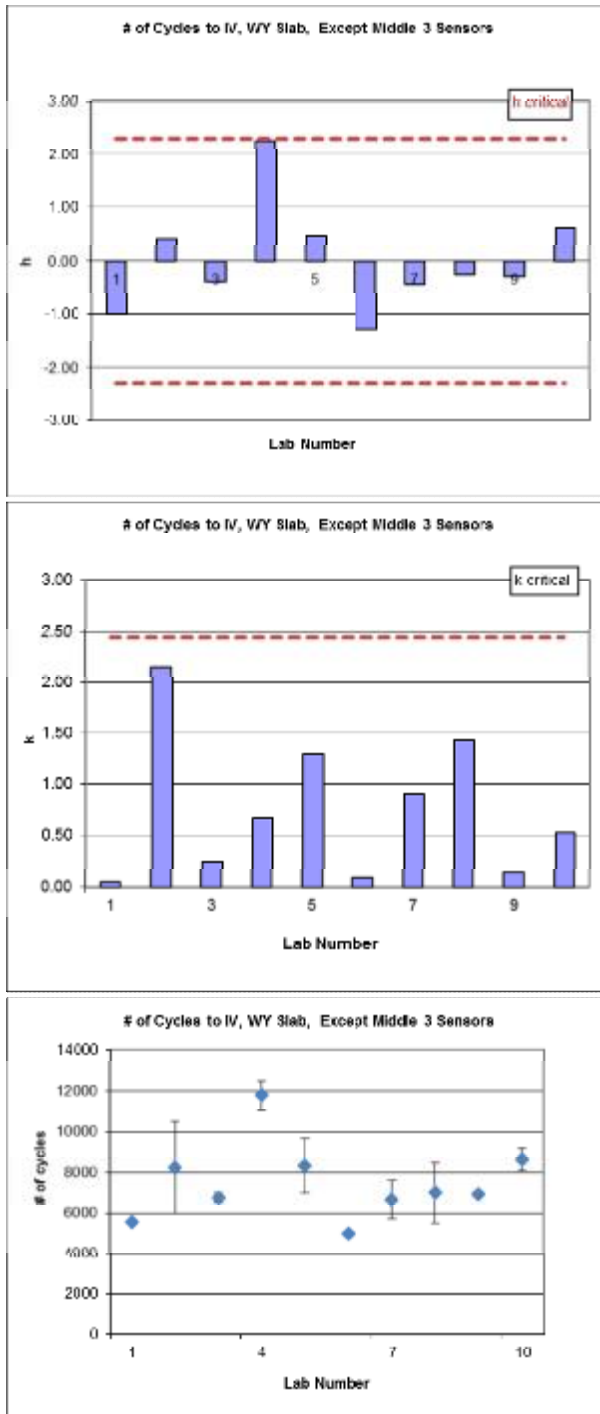


Figure H-4- h and k statistics, median deformations, and measurement errors for # of Cycles to Infection Point of WY slab specimens; except middle three measurement locations

**Table H-5- Statistics of # of Cycles to Inflection Point of WY gyratory specimens; except each end two measurement locations**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	2750.00	1975.00	1096.02	-1.31	0.96	1975.00	1096.02
	1200.00						
2	4450.00	2900.00	2192.03	-0.85	193	2900.00	2192.03
	1350.00						
3	4550.00	4000.00	777.82	-0.30	0.68	4000.00	777.82
	3450.00						
4	1050.00	2150.00	1555.63	-1.22	137	2150.00	1555.63
	3250.00						
5	4900.00	5200.00	424.26	0.30	0.37	5200.00	424.26
	5500.00						
6	4900.00	5650.00	1060.66	0.52	0.93	5650.00	1060.66
	6400.00						
7	4850.00	4900.00	70.71	0.15	0.06	4900.00	70.71
	4950.00						
8	3900.00	3950.00	70.71	-0.33	0.06	3950.00	70.71
	4000.00						
9	6400.00	5950.00	636.40	0.67	0.56	5950.00	636.40
	5500.00						
10	4950.00	5975.00	1449.57	0.69	127	5975.00	1449.57
	7000.00						
11	4700.00	3650.00	1484.92	-0.48	130	3650.00	1484.92
	2600.00						
12	4120.00	5520.00	1979.90	0.46	174	5520.00	1979.90
	6920.00						
13	4400.00	4650.00	353.55	0.02	0.31	4650.00	353.55
	4900.00						
14	4800.00	4700.00	14142	0.05	0.12	4700.00	14142
	4600.00						
15	4150.00	2625.00	2156.68	-0.99	190	2625.00	2156.68
	1100.00						
16	5300.00	5300.00	0.00	0.35	0.00	5300.00	0.00
	5300.00						
17	6000.00	6400.00	565.69	0.90	0.50	6400.00	565.69
	6800.00						
18	1150.00	2300.00	1626.35	-1.15	143	2300.00	1626.35
	3450.00						
19	4850.00	4375.00	671.75	-0.11	0.59	4375.00	671.75
	3900.00						
20	3400.00	3775.00	530.33	-0.41	0.47	3775.00	530.33
	4150.00						
21	3600.00	4200.00	848.53	-0.20	0.75	4200.00	848.53
	4800.00						
22	1550.00	2975.00	2015.25	-0.81	177	2975.00	2015.25
	4400.00						
23	5100.00	4925.00	247.49	0.16	0.22	4925.00	247.49
	4750.00						
24	5100.00	4925.00	247.49	0.16	0.22	4925.00	247.49
	4750.00						
25	12080.00	12080.00	0.00	3.73	0.00	FALSE	FALSE
	12080.00						

Counts	25	25	25	25	24	24
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
4602.00	1137.98	2.61	2.67	4290.42	1161.45
2002.15	2157.80			1284.628	1524.713

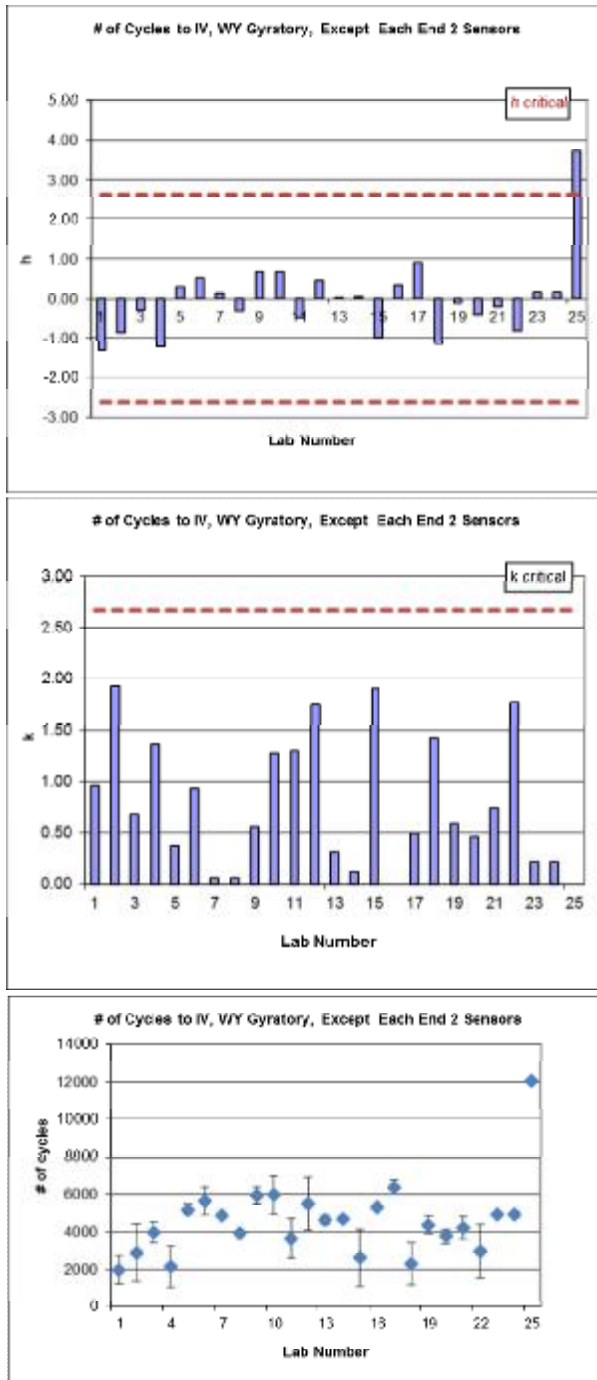


Figure H-5-  $h$  and  $k$  statistics, median deformations, and measurement errors for # of Cycles to Infection Point of WY gytratory specimens; except each end two measurement locations

**Table H-6- Statistics of # of Cycles to Inflection Point of WY slab specimens; except each end two measurement locations**

#	Original Data	X_bar	S	h	k	X_bar_corr	S_corr
1	6500.00 5200.00	5850.00	919.24	-0.61	0.51	5850.00	919.24
2	10300.00 6000.00	8150.00	3040.56	0.46	1.68	8150.00	3040.56
3	6100.00 7000.00	6550.00	636.40	-0.28	0.35	6550.00	636.40
4	10900.00 11700.00	11300.00	565.69	1.92	0.31	11300.00	565.69
5	6400.00 9800.00	8100.00	2404.16	0.44	1.33	8100.00	2404.16
6	5200.00 4950.00	5075.00	176.78	-0.97	0.10	5075.00	176.78
7	5500.00 1250.00	3375.00	3005.20	-1.76	1.66	3375.00	3005.20
8	8700.00 5200.00	6950.00	2474.87	-0.10	1.37	6950.00	2474.87
9	7200.00 8500.00	7850.00	919.24	0.32	0.51	7850.00	919.24
10	8600.00 8200.00	8400.00	282.84	0.58	0.16	8400.00	282.84

Counts	10	10	10	10	10	10
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X_dbl_bar / Sx	Sr / SR	h Critical	k Critical	Corrected X_dbl_bar / Sx	Corrected Sr / SR
7160.00	1808.52	2.29	2.45	7160.00	1808.52
2155.68	2506.46			2155.684	2506.461

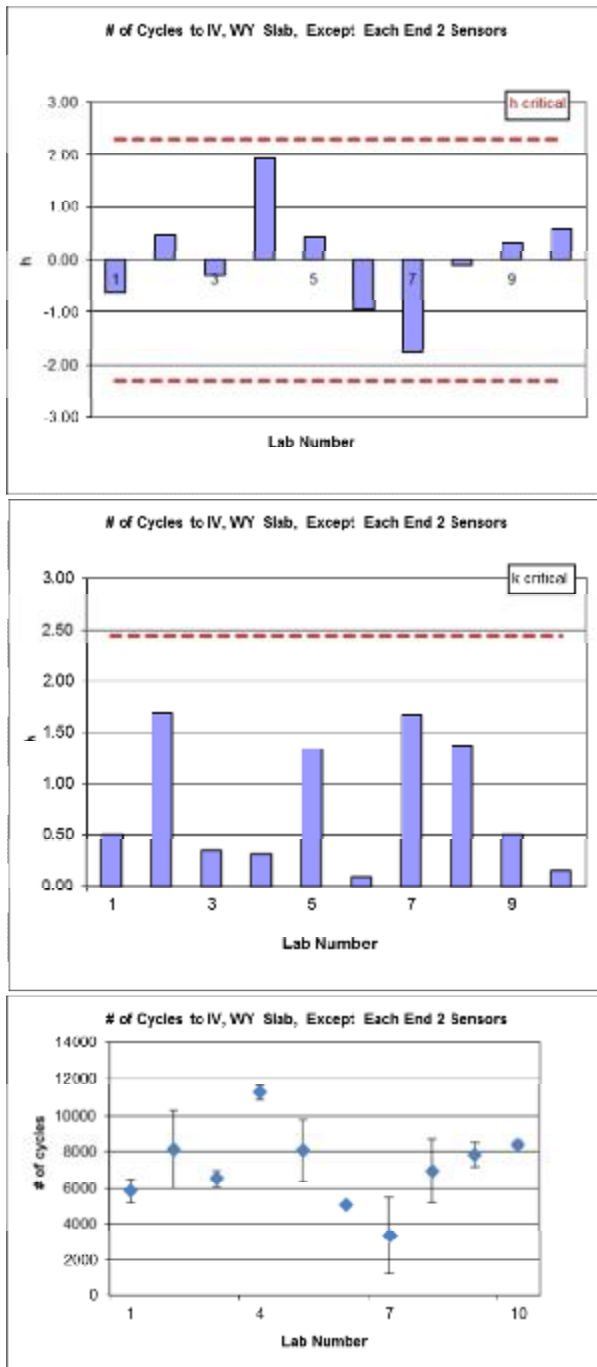


Figure H-6- h and k statistics, median deformations, and measurement errors for # of Cycles to Infection Point of WY slab specimens; except each end two measurement locations

## **APPENDIX I- RECOMMENDED PRECISION ESTIMATES FOR AASHTO T324**

# PRECISION STATEMENT FOR AASHTO T324, HAMBURG WHEEL-TRACK TESTING OF COMPACTED HOT MIX ASPHALT (HMA)

## 1 Precision and Bias

**1.1 Precision** - Criteria for judging the acceptability of deformation after certain number of passes, number of passes to threshold rut depth, number of passes to inflection point, creep slope, and strip slope obtained by this test method are given as follows:

**1.1.1 Single-Operator Precision (Repeatability)** - The single-operator coefficients of variation (1s limit) is shown in Table 1, Column 2. The results of two properly conducted tests obtained in the same laboratory, by the same operator using the same equipment, in the shortest practical period of time, should not be considered suspect, unless the difference in the two results, expressed as a percent of their mean, exceeds the single-operator precision limits given in Table 1, Column 3.

**1.1.2 Multilaboratory Precision (Reproducibility)** - The multilaboratory coefficients of variation (1s limit) is shown in Table 1, Column 4. Two results submitted by two different operators testing the same material in different laboratories shall not be considered suspect unless the difference in the two results, expressed as a percent of their mean, exceeds the multilaboratory precision limits given in Table 1, Column 5.

**Table 1 – Precision Estimates for AASHTO T324**

Properties	Single-Operator		Multilaboratory	
	Coefficient of Variation (%)	Acceptable Range of Two Test Results (Percent of Mean) <sup>a</sup>	Coefficient of Variation (%)	Acceptable Range of Two Test Results (Percent of Mean) <sup>a</sup>
Deformation (mm)	14.2	40.2	26.0	73.6
Number of Passes to Threshold Rut Depth	16.6	47.0	24.2	68.5
Number of Passes to Inflection Point	23.9	67.6	32.1	90.9
Creep Slope (mm/cycle)	16.6	47.0	28.3	80.1
Strip Slope, mm/pass	17.7	50.0	20.8	58.8

<sup>a</sup>These values represent the 1s and d2s limits described in ASTM Practice C670

Note – The precision estimates are based on the analysis of test results from an AMRL interlaboratory study (ILS), which involved testing of gyratory and slab specimens prepared with one lab-mixed, lab-compacted mixture with poor performance and one plant-mixed, lab-compacted mixture with good performance tested at 50°C using PMW wheel track testers. The details of this analysis are presented in the main text of NCHRP Research Results Digest ###.

**Bias**– No information can be presented on the bias of the procedure because no comparison with the material having an accepted reference value was conducted.