THE ATHLETICS CONGRESS
TAC USA

Feb. 1983

Peter S. Riegel
3354 Kirkham Road
Columbus, OH 43221

ROAD RUNNERS CLUB
RRCA
of AMERICA

Measuring Courses for Certification

Runners appreciate the accuracy implied by a certified course. If the measurement is done with care, great accuracy results, and the runners are assured that they have run the advertised distance.

Although there are many ways to measure a course, experience over many years has shown that the calibrated bicycle method is superior to all others, because of the speed and accuracy with which it can be performed. The enclosed material details the measurement procedure involved in laying out a course by means of the calibrated bicycle method.

You do not have to use this method. However, if you anticipate using another method, I strongly urge you to contact me before you do the work, so that we may agree on the steps to be taken.

There are six basic steps involved. They are:
1) Lay out an accurate calibration course
2) Calibrate the bicycle
3) Measure the course - two measurements are required
4) Recalibrate the bicycle
5) Make final adjustments to course length
6) Submit application and supporting documents to me.

I will check the work, and approve it if all is correct. If something's wrong, I'll get in touch with you. Otherwise, I'll send the application on to the Chairman of the National Standards Committee for final approval. He will return a signed certificate to me, which attests to the accuracy of your course, and I'll send it on to you.

Although the measurement procedure may seem complicated at first glance, don't let it fool you. It's really not hard or time-consuming, once you get familiar with it. The main thing is to not be in a hurry, and to be as careful as you can so as to minimize errors.

The accuracy of the measurement depends strongly on the measurer's ability to follow the Shortest Possible Route. If the SPR is not followed carefully a short course will result. Basically, if you stretched a string along the course and drew it tight so that it came within a foot of all corners and went straight through s-bends, it would follow the SPR. Measure like that string!

Because it's difficult to follow the SPR perfectly, an extra length correction has been incorporated into the calibration procedure. Use of this correction assures that your course will still not be short even if you should make small errors in following the SPR.

Read the enclosed material, and if you have questions, get in touch with me.

Sincerely yours,

Peter S. Riegel
Regional Certification Chairman

P. S. Please feel free to copy and distribute these forms and info!

614/424-4009 (work, 8 to 4:30)
614/451-5617 (home, not after 10)

Some Hints on Course Measurement

Plan Ahead - Course measurement is the last of many steps in establishing a course. Be sure to discuss the route with local and state authorities to be sure you're legal. Get the race director involved, so that you are sure you're measuring the course you're supposed to be measuring. If the race is an established one, try to get a runner who has run the course to help. Runners know where runners will run - and they'll take every allowable shortcut!

Find out just how much of the road will be available to the runners. If runners are expected to take a somewhat longer route while a shorter one is available, it may be necessary to include temporary barriers to keep them along the right path. Instructions like "stay on the right side" are universally ignored, unless enforcement exists. It's easier to let them run wherever they want on the road, and measure the shortest path they can take.

It's not always easy to measure, especially in traffic. If you can, try to do your measuring at a time when traffic is light. Early morning is good. If you can't get free of traffic, some arrangement with the police may be made - they might even provide an escort, if you're measuring a race of large local importance.

On corners, be sure to try to measure one foot from the edge of the pavement or from a curb. Every foot you swing wide shortens the course so if you have a lot of turns, you could wind up with a short course if you're not careful.

On s-bends, measure the straightest line that a runner could run. If you have any tricky turns, such as where the runners turn onto grass, you may have to establish a known, marked spot where a traffic cone or a person should be on race day to mark the turn exactly.

Use maps, automobiles, and your calibrated bike to do enough rough measurements so that you have a pretty good idea where the start and finish will be. It's no fun to do your final, official measurement only to find out that the course doesn't come out right. Know which end of the course is most important. If the location of the finish is most important, start your measurement there and measure toward the start. If the start is more important, begin your measurement there.

Tools for measurement

Jones counter

Bicycle with high-pressure tires

steel tape (100 foot is best, but 50 is OK) — 10 lb spring scale

notebook and pencils — thermometer

calculator — hammer

bike tools (if you get a flat, recalibrate before resuming measurement)

Crayon/chalk for temporary pavement marking

Concrete or PK nails for permanent markings

Spray paint

Masking tape for temporary calibration course layout marking

lunch

More Measurement Facts

Measuring twice - To reduce the chances of a mistake, two complete course measurements are required. After you have established your working constant, and have figured out just how many counts each mile should take, go out and mark each mile temporarily on the first measurement. If your constant was 15275 counts per mile, the first mile should take 15275. At the second mile the count will be 30550, and so on. Once you have laid out the course, ride over it again, stopping at each of the marks you laid out on your first measurement. Record the exact count where you stopped. It will differ slightly from the first measurement. If the difference is small, don't worry about it. If you find a big (more than 4 ft per mile) difference, you probably made a mistake. Find it and correct it. If you do a decent job, your two measurements will agree within 0.08 percent (about 4 feet per mile). Failure to accurately follow the Shortest Possible Route is the most common source of measurement disagreement.

Once you have gotten your two measurements, recalibrate the bike to find your Constant for the Day and then figure the exact length of your course. Adjust it to the proper length. If your race is short, you may not wish to adjust the individual miles. However, on a long course, the final adjustment may make one of your miles come out quite short or long. For instance, if your marathon course has to be lengthened or shortened by 120 feet, you may want to adjust each individual mile by 120/26.2 feet per mile. or else that last 385 yards may seem awfully long or short to the runners. You don't have to do it, but the runners will appreciate it if you do.

Measuring Wheels - You may wish to use a measuring wheel instead of a calibrated bicycle. You may, but the procedure is the same. You must calibrate before and after just as with a bike. If two people use the wheel, each must calibrate with it, before and after, just as with bikes. Calibration allows the combination of operator and wheel to be verified. Often two people can use the same wheel and get different measurements.

You must walk when using a wheel to measure. Don't jog with the wheel, or even worse, sit in the trunk of a car and hold the wheel out the back. You will get a lousy measurement. Measuring wheels measure well only when operated at walking speed. When operated at higher speeds they tend to skip on bumps and lose their accuracy.

Rechecking - TAC and RRCA depend on the genuine desire of the measurer to do a good job. In all probability, your course will not be checked, so it is up to you to be sure it is right. If you follow the instructions, you will obtain a good, reliable measurement.

If an open record is ever set on your course it will be remeasured by a member of the National Standards Committee. The re-measurer does not get to add the 0.1 percent extra that you use in your measurement. If he finds your course short of its proper length, the certification will be withdrawn. This could be extremely embarrassing to the race director who will have to deal with disgruntled runners. So follow the instructions carefully, and do your best.

DIRT & GRASS — MUST BE CHECKED BY STEEL TAPE.
CALL ME FOR DETAILS. Pete

Establishing a Calibration Course

The calibration course should be laid out with extreme care. If it is done sloppily, any measurements using it as a base are worthless.

The course must be straight and at least ½ mile long. To lay out a course, do the following:

1) Stick a piece of masking tape on the pavement and mark a start point with a sharp-pointed marker.

2) measure the temperature at ground level by laying the thermometer on the pavement. If it's sunny, shade the thermometer.

3) Stretch the steel tape out for its full length and stick another piece of masking tape to the pavement under the steel tape.

4) Have the rear tapeman get a good grip and hold the rear mark exactly on the start point while you pull the steel tape tight with a 10 pound pull. Use a spring scale to pull the tape.

5) Mark the masking tape when you have 10 pounds tension. You now have two marks that are 100 feet apart. If you're not sure where the zero mark is on your tape, use the 1 foot mark as a zero, and you'll then be marking 99 foot intervals. The exact length of the calibration course is not important, just so it's long enough.

6) Repeat the process until you have measured at least ½ mile (I use 27 lengths of a 100 foot tape)

7) Starting from the end you've just reached, repeat the process in the opposite direction, using a different color pen to make the marks Do not re-use your first set of marks, but make new marks on the second measurement.

8) Measure all the way back to your starting point. You will find that your two measurements are not exactly the same. If you have been careful they should agree within two to four inches.

9) Measure pavement temperature again.

10) Drive a nail at each end of the distance you measured. Your course is now laid out. Its exact length will be the average measured distance, corrected for temperature. Follow the example to see how this is done.

11) Ride the bike along the entire length of the calibration course, and record total counts. Do the same for any 100 foot interval. If you measured 27 tape lengths, the count of the total course should be about 27 times the count for 100 feet. It is not uncommon for people to measure a course with great precision, agreeing in both directions within an inch or two - but omitting to count an entire 100 foot length in their calculation. The bike ride checks for this - the two runs should agree within 1 percent of each other if the course is right.

INSTRUCTIONS FOR USE OF JONES COURSE MEASURING DEVICE

PRICE
$20.00 POSTPAID
-FEB '83

To calibrate the counter, measure a half mile or one kilometer course using a steel tape with 10 lb. (4.5 kg) tension.

Record the reading of the Course Measuring Device at the beginning and end of the course. Only read when the bike is advancing to the mark. If you overshoot by a few inches, back up behind the mark so that the counter is advancing as you come again to the mark. This will eliminate "backlash". Ride over the course at least twice. Record the results as shown in the example:

	Run 1	Run 2
STOP	86590	94449
START -	78735	- 86592
Difference	7855	7857

Subtract and take the average. If a half-mile course, multiply by two for counts per mile. If a mile or kilometer course use the average. For this example we get (if from a half-mile course):

counts per mile = 15712 (9763 per km)

Then we use this to figure the number of counts for the desired distance. For example, for a 10 mile course it would be 157120 counts. Since the counter only records 5 digits, note that it will "turn over" about every 6.4 miles (10.2 km).

For a 20 kilometer course (12.4274. . . miles) it would be 12.427424 x 15712 = 195260 counts or 20 x 9763 = 195260 counts. (We recommend the use of a calculator to aid in these computations.) When measuring the actual course, read the counter as the bike is set at the starting point and add the desired counts to get the number to obtain at the finish. You may want to compute the count for each mile (or kilometer) mark. Then each mile can be marked for use by the runners during the race.

If you measure an existing course and want to find its length, determine the total number of counts and divide by the counts per mile. For example, using the counts per mile from above, if the total counts for the course was 166734 this would be:

166734/15712 = 10.6119 miles = 10 miles 1077 yds
or 166734/9763 = 17.0782 km = 17 km 78 Meters

. . . . . .

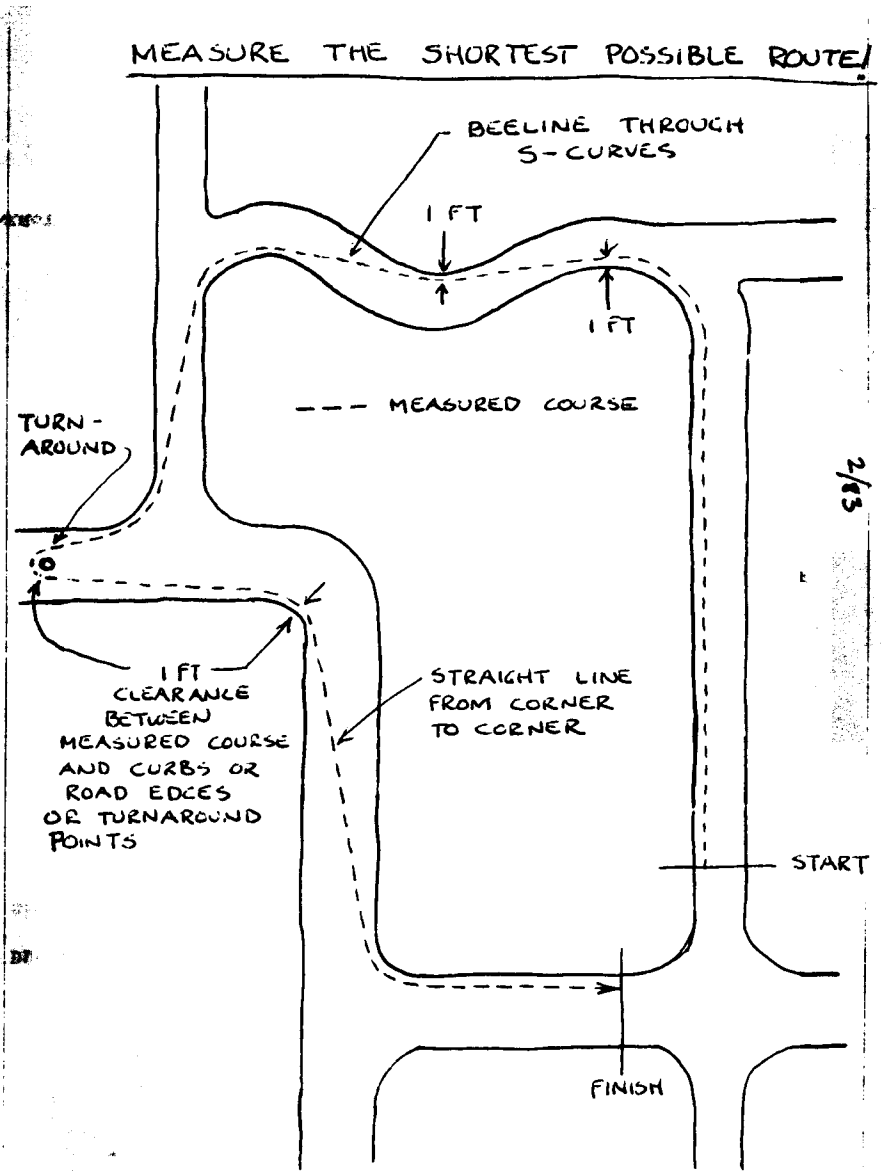
For your convenience, the following conversion factors are given:

1 mile	=	1.609344 kilometers (exact)
1 kilometer	=	0.62137119. . . miles
5 kilometers	=	3.106856. . . "
10 kilometers	=	6.213711. . . "
15 "	=	9.320568. . . "
20 "	=	12.427424. . . "
25 "	=	15.534280. . . "

Marathon = 42195 meters
= 42.195 kilometers
= 26 miles 385 yards
= 26.21875 miles

The Jones Course Measuring Device is available from:

New York Road Runners Club
Box 881 FDR Station
New York, New York 10150
Attn: Bill Noel (212) 860-4455


MEASURE THE SHORTEST POSSIBLE ROUTE!
BEELINE THROUGH S-CURVES
1 FT
1 FT
MEASURED COURSE
TURN-AROUND
1 FT CLEARANCE BETWEEN MEASURED COURSE AND CURBS OR ROAD EDGES OR TURNAROUND POINTS
STRAIGHT LINE FROM CORNER TO CORNER
START
FINISH

CALIBRATION COURSE DATA SHEET

Note: You may use a calibration course that has already been certified, instead of laying out a special course. If you used a certified calibration course, indicate its name and location:

If you laid out a calibration course, fill out the following:

Date 7 OCT 82 Start time 7:15 AM Finish time 9:00 AM

Pavement Temperature at Start 53 at Finish 59 Avg 56

Measured length of course: First 2700.00 FT Second 2700'-3¼" / 2700.27' Average 2700.14'

Bicycle Check for gross mistake in measurement: Note: if you used another checking method, explain it.

COUNTS FOR FULL CAL COURSE = 8074

COUNTS FOR 100 FT = 300

$\frac{8074}{300} = 26.91$

WE USED 27 LENGTHS.

ROUGH CHECK OK

Temperature correction = .00000645 x (length) x (68F - Avg pavement temp)

Temperature correction = $.00000645 \times 2700.14 \times (68-56) = .21$ FT

Note: you must use a steel tape or tool of equal accuracy. Did you use a steel tape? YES If not, what did you use?

If the pavement temperature is less than 68F, the tape will be short. If pavement temperature is greater than 68F, the tape will be long. A steel tape is exactly 100 feet long at 68F, when supported horizontally and stretched with a ten pound pull. So, if the pavement is cool, subtract the temperature correction from the measured course length. If it's warmer, add the correction.

Calibration Course length = Average length ± Temperature Correction

Calibration Course Length = 2700.14 - .21 = 2699.93

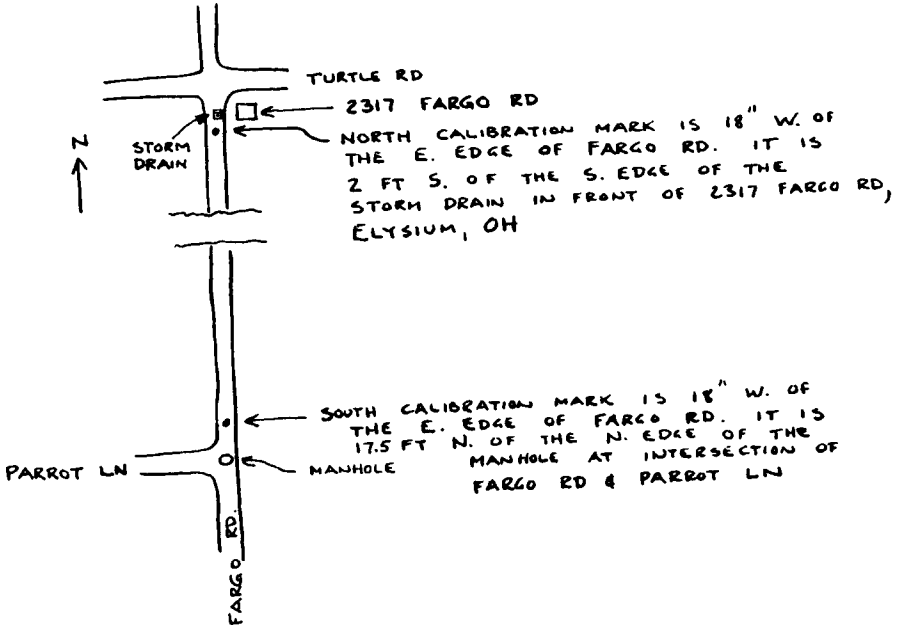
Note: Mark the end points in a permanent way (such as nails or chisel marks). Paint will fade. This calibration course, once certified, can be used to measure many courses. Take care of it!

Answer the following:

1) Name and address of leader of team that measured the calibration course:
JOHN DOE - 123 ACCURATE RD - PERFECTION, OH 43807
2) What experience has the leader had in measuring?
HAS HELPED MEASURE OTHER COURSES AND FOLLOWED INSTRUCTIONS
3) How many persons helped measure the calibration course? List their duties:
1) HEAD TAPEMAN 2) REAR TAPEMAN 3) DATA RECORDER
4) How many times did you measure the calibration course? 2
5) How did you check the tension in the tape while measuring? USED A SPRING SCALE - 10 LB TENSION
6) Are the start and finish of the calibration course located on the road where the bicycle wheel can touch them, or elsewhere?
ON THE ROAD
7) Did the tape have any kinks, crimps or splices? NO

8) Electronic Measuring Device: If you used an electronic measuring device to lay out the calibration course, give: Name of device, who operated it and his qualifications/experience, results, date, location of course, and copies of field notes and calculations. Describe how start and finish points are permanently marked.

9) Submit sketch of calibration course start and finish points. Include name of road, its location, and taped distances from nearby permanent landmarks.



BICYCLE CALIBRATION DATA SHEET

Date of measurement 16 OCT 82

Name of measurer JOHN DOE

1) Ride the calibration course 4 times, recording data as follows:

Ride	Start Count	Finish Count	Difference
1	120691	128765	8074
2	128799	136871	8072
3	136903	144976	8073
4	145015	153087	8072

Pre-measurement Average Count 8072.75

Time of Day 7:15 AM

Temperature 53 F

Length of Calibration Course (feet) 2699.93

Extra length correction = 1.001

Working Constant = $\frac{\text{Pre-measurement average count x 5280 feet per mile x 1.001}}{\text{Length of calibration course in feet}}$

Working Constant = $\frac{8072.75 \times 5280 \times 1.001}{2699.93} = 15802.91$ COUNTS PER MILE USE 15803

2) Now, measure the course, including all intermediate distances, using the working constant. Enter data on the "COURSE MEASUREMENT DATA SHEET".

3) Recalibrate the bicycle by riding the calibration course 2 times, recording data as follows:

Ride	Start Count	Finish Count	Difference
1	350300	358366	8066
2	358400	366465	8065

Post-measure Average Count 8065.5

Time of day 10:30 AM

Temperature 63 F

Avg Count for the day = $\frac{1}{2}$ (pre-measure avg count + post measure avg count)

Average Count for the day = $\frac{1}{2}(8072.75 + 8065.5) = 8069.125$

Constant for the Day = $\frac{\text{Avg count for the day x 5280 feet per mile x 1.001}}{\text{Length of calibration course in feet}}$

Constant for the Day = $\frac{8069.125 \times 5280 \times 1.001}{2699.93} = 15795.8$ COUNTS PER MILE

Remember, each day's measurement must be preceded and followed by a calibration run. You may measure as much as you want in a day, just so calibration precedes and follows it in the same day. This is done to minimize the error due to changes in tire pressure due to thermal expansion or slow leakage.

COURSE MEASUREMENT DATA SHEET

Name of course or race ELYSIUM 10K

Name of Measurer #1 JOHN DOE

Working Constant for Measurer #1 15803

Time started 7:45 AM Time Finished 9:00 AM Date 16 OCT 82

Temperature at start 53 F at finish 57 F

2/83

Name of Measurer #2 JOHN DOE

Working Constant for Measurer #2 15803

Time started 9:10 AM Time finished 10:15 AM Date 16 OCT 82

Temperature at start 57 F at finish 62 F

Measurement data - Use the first measurement ride to lay out the points. Use the second measurement ride to check the location of those same points.

Point	Count #1	Count #2	Location of Point
FINISH	154000	350148	37 FT W OF "NO PARKING" SIGN BY WEED SHO
6 MI	157377	346772	CENTER OF DRIVEWAY, 2180 FARGO RD
5 MI	173180	330974	3 FT W. OF TP # 3004-8B ON JAMES RD.
4 MI	188983	315181	68 FT N OF "NO DOGS ALLOWED" SIGN ON BIKE PA
3 MI	204786	299384	17 FT S OF DRINKING FOUNTAIN ON BIKE PATH
2 MI	220589	283592	4 FT W OF "BURIED CABLE" SIGN ON RIVER ST.
1 MI	236392	267795	8 FT N OF "JOY CAFE" SIGN ON JOY ST.
START	252195	252000	TP # 3014-6C IN FRONT OF MERCOR HOWE.

Elapsed count #1= 98195 Elapsed count #2= 98148

After measuring, recalibrate the bikes and, using the Constant for the Day, calculate the measured length of the course:

Length by #1 = Count/Constant for the Day(#1)

Length by #1 = 98195/15795.8 = 6.21653 MI

Length by #2 = Count/Constant for the Day(#2)

Length by #2 = 98148/15795.8 = 6.21355 MI

DIFFERENCE = .00298 MI = 15.7 FT

Minimum length as measured = 6.21355 MI

DESIRED LENGTH = 6.21371 MI

Using a steel tape, add or subtract distance as required to bring the minimum length to the same value as the desired course length.

How much did you add or subtract, and where did you do it (start or finish)?

6.21355 - 6.21371 = .00016 MI = .84 FT

ADDED 1 FT TO MEASURED LENGTH AT START

Note: You need not adjust intermediate miles, unless certification for the intermediate distances is desired. Did you adjust them? How? NO

APPLICATION FOR RACE COURSE CERTIFICATION: THE CALIBRATED BICYCLE METHOD

Answer all Questions (use additional paper if necessary).

Name of race. ELYSIUM 10K
City and state where race is held. ELYSIUM, OH
Location of race course start (town, state).
Location of course finish (town, state). ELYSIUM, OH
Name, address, telephone number of person in charge of course measurement.
JOHN DOE, 123 ACCURATE RD, PERFECTION OH 614/555-6602
Name and address of Race Director.
M. OFFOT - 82 JALOUSIE BLVD. - ALTIBOR, OH 48604
Sponsor(s) of race.
WEED SHOE STORE
List exact length of course 10K - 6.21371 MI

What was the difference between the first and second measurements? 16 FT
Did you use the Extra Length Correction of 1.001? YES

What did you do about the differences between measurements ?
USED THE ONE THAT MADE THE COURSE LONGEST
How much time did each race course measurement take?
1 HOUR
If not a new course, what is the course record, and who holds it?
NEW COURSE
List name(s) of any other race(s) which will use this same course.

If this is to be an annual event, who will be responsible for identifying the start and finish (and turn around, if any) points before each race; and, who will inspect the measured route annually to detect road changes, and to make appropriate changes as needed, and apply for re-certification of the course ? Give name and address.
RACE DIRECTOR - SEE ABOVE
Describe course route: name of all streets, roads, trails, from start to finish, indicating all left and right turns.
SEE MAP
Describe which side or half of each road that will be used to race on, and tell how you plan to keep runners there.
RUNNERS CAN RUN WHERE THEY PLEASE, BUT MUST STAY ON PAVEMENT
Where on the road, in relation to the runner's path or to curbs, lines, etc. was the race course measured?
SHORTEST POSSIBLE ROUTE — STRAIGHT LINES THRU S-BENDS, 1 FT. FROM CURBS & ROAD EDGES
Describe how you measured around corners at intersections and around curves, using diagrams.
SLOWED DOWN AT CORNERS TO STAY 1 FT FROM CURBS - OTHERWISE FOLLOWED SPR
Name the park if course is located in one.
Submit a map of the course. Need not be to scale. Include indication for north direction.
Terrain of course (circle answer): very-flat (mostly-flat) slightly-rolling mostly-rolling hilly very-hilly mostly downhill mostly-uphill mountainous

Type of surface on race course (give percentages)

45	city streets (curbed)		graded dirt road
25	paved roads (no curbs)		ungraded dirt road
	concrete sidewalk		dirt/grass (off road)
	concrete/brick pavement		grass
	gravel road	30	paved bike path
	smooth trail		unpaved bike path
	rocky trail		track
	trail (single file)		other (describe)

On another sheet of paper, describe how you measured non paved parts of course.

Type of course configuration (check one)

	Single loop		Out-and-back ____ times
	Same loop ____ times		Multiple out-and-back ____
	Double loop ____ times		Point-to-point
	Partial loop	X	Keyhole (out-loop-back)
	Multiple loops (different)		Other (describe)

Altitude of race course above sea-level: start 780 low 740
peak 790 finish 780

Straight line distance between race course start and finish.
70 FEET

List intermediate splits measured and permanently marked.
ALL MILE SPLITS MARKED WITH PAINT

Send copy of diagrams showing exact locations, including street names, of start and finish (and turn around, if any), giving taped distances fr these points to nearby permanent landmarks, so that a stranger can find them. SEE MAP

Describe how you marked the start and finish (and turn around), e.g. na paint, etc. PAINT AND CONCRETE NAILS AT START & FINISH

Did the same person ride the bicycle on both the road calibration course and on the race course measurement ? YES

Were the calibration course andthe race course dry while measuring ? YES

Did you calibrate the bicycle and measure the race course all in one da on each measuring occasion ? YES

Did you calibrate the bicycle on a Road Calibration Course which has beer previously approved by The Athletics Congress Standards Committee (or AAU) ? NO

If so, list name, city, state of race course that was certified using it.

If not, submit a "Calibration Course Data Sheet" which describes how the calibration course was measured.

Length of Road Calibration Course 2699.93 FT

BE SURE TO BE CLEAR ABOUT HOW FAR YOU MEASURED FROM CURBS & ROAD EDGES

Did you use a Jones counter on the measuring bicycle (a Jones counter measures 20 counts for each revolution of the bicycle wheel) YES

If you didn't use a Jones counter, what did you use, and how many counts per wheel revolution does it register?_____

* * * * * * * * *

Return the following material to the Certification Chairman (address below)

1) Completed Application for Race Course Certification 2 copies + SASE

2) Completed Calibration Course Data Sheet (2 pages) if you laid out a calibration course. + $3.00

3) A completed Bicycle Calibration Data Sheet for each measurer

4) A completed Course Measurement Data Sheet

* * * * * * * * *

Certification Chairman

Peter S. Riegel
3354 Kirkham Road
Columbus, OH 43221

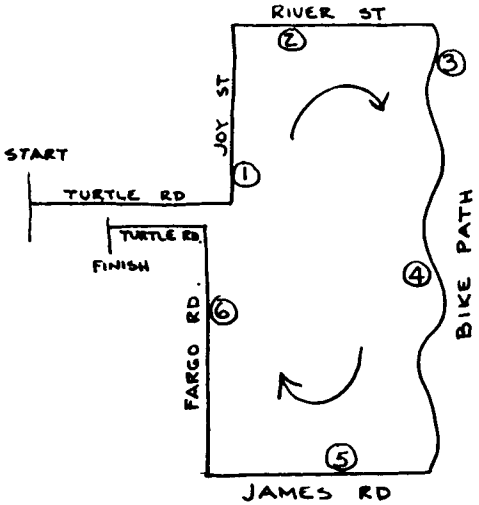
614/424-4009 (work, 8 to 4:30)
614/451-5617 (home, not after 10)

* * * * * * * * * *

It is our intention to make the measurement process as accurate as possible without imposing undue hardship on the people who have to do the measuring. If you have any comments or suggestions as to how the procedure might be improved, please write them below:

If your course will have runners staying on one side of the road, physical barriers will be required to keep them there. The locations of these barriers must be marked on the road, and their exact locations put on the map. If this seems like too much trouble, you should assume that runners will shortcut all they can and measure that way. Course monitors are nice, but we all have seen them absent or ignored by runners. If you must keep runners to one side, go ahead and try to do it, but don't measure that way, unless you are prepared to document every permanent marker that you put in place. Instead, measure the most direct, shortest route the runners can take.

Your map should be good enough so that a perfect stranger could exactly locate the start, finish, and turnaround (if any), and find his way along the proper route without any assistance. Look at it - is it good enough?



N

ELYSIUM 10K

EXACT LOCATION OF:

START : ~~EVER WITH~~ 1 FT W OF TP #3014-6C IN FRONT OF MERGOR HARDWARE STORE, 2717 TURTLE RD, ELYSIUM, OH

FINISH : 37 FT W. OF "NO PARKING" SIGN IN FRONT OF WEED SHOE STORE, 2953 TURTLE RD, ELYSIUM, OH

MEASURED FOR CERTIFICATION BY JOHN DOE

2/83

CALIBRATION COURSE DATA SHEET

Note: You may use a calibration course that has already been certified, instead of laying out a special course. If you used a certified calibration course, indicate its name and location:

If you laid out a calibration course, fill out the following:

Date_____Start time_____Finish time_____

Pavement Temperature at Start_____at Finish_____Avg_____

Measured length of course: First_____Second_____Average_____

Bicycle Check for gross mistake in measurement: Note:if you used another checking method, explain it.

Temperature correction = .00000645 x (length) x (68F - Avg pavement temp)

Temperature correction =

Note: you must use a steel tape or tool of equal accuracy. Did you use a steel tape?_____If not, what did you use?_____

If the pavement temperature is less than 68F, the tape will be short. If pavement temperature is greater than 68F, the tape will be long. A steel tape is exactly 100 feet long at 68F, when supported horizontally and stretched with a ten pound pull. So, if the pavement is cool, subtract the temperature correction from the measured course length. If it's warmer, add the correction.

Calibration Course length = Average length ± Temperature Correction

Calibration Course Length = _____

Note: Mark the end points in a permanent way (such as nails or chisel marks). Paint will fade. This calibration course, once certified, can be used to measure many courses. Take care of it!

2/83

Answer the following:

1) Name and address of leader of team that measured the calibration course:

2) What experience has the leader had in measuring?

3) How many persons helped measure the calibration course? List their duties:

4) How many times did you measure the calibration course?

5) How did you check the tension in the tape while measuring?

6) Are the start and finish of the calibration course located on the road where the bicycle wheel can touch them, or elsewhere?

7) Did the tape have any kinks, crimps or splices?

8) Electronic Measuring Device: If you used an electronic measuring device to lay out the calibration course, give: Name of device, who operated it and his qualifications/experience, results, date, location of course, and copies of field notes and calculations. Describe how start and finish points are permanently marked.

9) Submit sketch of calibration course start and finish points. Include name of road, its location, and taped distances from nearby permanent landmarks.

BICYCLE CALIBRATION DATA SHEET

Date of measurement _____

Name of measurer _____

1) Ride the calibration course 4 times, recording data as follows:

Ride	Start Count	Finish Count	Difference

Pre-measurement Average Count _____

Time of Day _____

Temperature _____

Length of Calibration Course (feet) _____

Extra length correction = 1.001

Working Constant (counts per mile) = $\frac{\text{Pre-measurement average count x 5280 feet per mile x 1.001}}{\text{Length of calibration course in feet}}$

Working Constant =

2) Now, measure the course, including all intermediate distances, using the working constant. Enter data on the "COURSE MEASUREMENT DATA SHEET".

3) Recalibrate the bicycle by riding the calibration course 2 times, recording data as follows:

Ride	Start Count	Finish Count	Difference

Post-measure Average Count _____

Time of day _____

Temperature _____

Avg Count for the day = $\frac{1}{2}$ (pre-measure avg count + post measure avg count)

Average Count for the day =

Constant for the Day (counts per mile) = $\frac{\text{Avg count for the day x 5280 feet per mile x 1.001}}{\text{Length of calibration course in feet}}$

Constant for the Day =

Remember, each day's measurement must be preceded and followed by a calibration run. You may measure as much as you want in a day, just so calibration precedes and follows it in the same day. This is done to minimize the error due to changes in tire pressure due to thermal expansion or slow leakage.

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COURSE MEASUREMENT DATA SHEET

Name of course or race_____

Name of Measurer #1 _____

Working Constant for Measurer #1_____

Time started_____Time Finished_____Date_____

Temperature at start_____ at finish_____

Name of Measurer #2_____

Working Constant for Measurer #2_____

Time started_____Time finished_ _____Date_____

Temperature at start_____at finish_____

Measurement data - Use the first measurement ride to lay out the points. Use the second measurement ride to check the location of those same points.

Point	Count #1	Count #2	Location of Point

Elapsed count #1= _____ Elapsed count #2=_____

After measuring, recalibrate the bikes and, using the Constant for the Day, calculate the measured length of the course:

Length by #1 = Count/Constant for the Day(#1)

Length by #1 =

Length by #2 = Count/Constant for the Day(#2)

Length by #2 =

Minimum length as measured = _____

Using a steel tape, add or subtract distance as required to bring the minimum length to the same value as the desired course length.

How much did you add or subtract, and where did you do it (start or finish)?

Note: You need not adjust intermediate miles, unless certification for the intermediate distances is desired. Did you adjust them? How?

APPLICATION FOR RACE COURSE CERTIFICATION: THE CALIBRATED BICYCLE METHOD

Answer all Questions (use additional paper if necessary).

Name of race.
City and state where race is held.
Location of race course start (town, state).
Location of course finish (town, state).

Name, address, telephone number of person in charge of course measurement.

Name and address of Race Director.

Sponsor(s) of race.

List exact length of course_____

What was the difference between the first and second measurements? _____

Did you use the Extra Length Correction of 1.001? _____

What did you do about the differences between measurements ?

How much time did each race course measurement take?

If not a new course, what is the course record, and who holds it?

List name(s) of any other race(s) which will use this same course.

If this is to be an annual event, who will be responsible for identifying the start and finish (and turn around, if any) points before each race; and, who will inspect the measured route annually to detect road changes, and to make appropriate changes as needed,and apply for re-certification of the course ? Give name and address.

Describe course route: name of all streets, roads,trails, from start to finish, indicating all left and right turns.

Describe which side or half of each road that will be used to race on, and tell how you plan to keep runners there.

Where on the road, in relation to the runner's path or to curbs, lines, etc. was the race course measured?

Describe how you measured around corners at intersections and around curves, using diagrams.

Name the park if course is located in one.
Submit a map of the course. Need not be to scale. Include indication for north direction.
Terrain of course (circle answer): very-flat mostly-flat slightly-rolling mostly-rolling hilly very-hilly mostly downhill mostly-uphill mountainous

Type of surface on race course (give percentages)

_____city streets (curbed)
_____paved roads (no curbs)
_____concrete sidewalk
_____concrete/brick pavement
_____gravel road
_____smooth trail
_____rocky trail
_____trail (single file)
_____graded dirt road
_____ungraded dirt road
_____dirt/grass (off road)
_____grass
_____paved bike path
_____unpaved bike path
_____track
_____other (describe)

On another sheet of paper, describe how you measured non paved parts of course.

Type of course configuration (check one)

_____Single loop
_____Same loop_____times
_____Double loop_____times
_____Partial loop
_____Multiple loops (different)
_____Out-and-back _____times
_____Multiple out-and-back_____
_____Point-to-point
_____Keyhole (out-loop-back)
_____Other (describe)

Altitude of race course above sea-level: start_____low_____
peak_____finish_____

Straight line distance between race course start and finish.

List intermediate splits measured and permanently marked.

Send copy of diagrams showing exact locations, including street names, of start and finish (and turn around, if any), giving taped distances from these points to nearby permanent landmarks, so that a stranger can find them.

Describe how you marked the start and finish (and turn around), e.g. nails, paint, etc.

Did the same person ride the bicycle on both the road calibration course and on the race course measurement ?

Were the calibration course andthe race course dry while measuring ?

Did you calibrate the bicycle and measure the race course all in one day on each measuring occasion ?

Did you calibrate the bicycle on a Road Calibration Course which has been previously approved by The Athletics Congress Standards Committee (or AAU) ?

If so, list name, city, state of race course that was certified using it.

If not, submit a "Calibration Course Data Sheet" which describes how the calibration course was measured.

Length of Road Calibration Course _____

Did you use a Jones counter on the measuring bicycle (a Jones counter measures 20 counts for each revolution of the bicycle wheel) _____

If you didn't use a Jones counter, what did you use, and how many counts per wheel revolution does it register?_____

$3.00

* * * * * * * * *

Return the following material (two copies, please) along with a SASE and ~~one dollar~~ for reply. Send to Regional Certification Chairman (below).

1) Completed Application for Race Course Certification

2) Completed Calibration Course Data Sheet (2 pages) if you laid out a calibration course.

3) A completed Bicycle Calibration Data Sheet for each measurer

4) A completed Course Measurement Data Sheet

* * * * * * * * *

Regional Certification Chairman

Peter S. Riegel
3354 Kirkham Road
Columbus, OH 43221

614/424-4009 (work, 8 to 4:30)
614/451-5617 (home, not after 10)

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It is our intention to make the measurement process as accurate as possible without imposing undue hardship on the people who have to do the measuring. If you have any comments or suggestions as to how the procedure might be improved, please write them below: