MEASUREMENT PROCEDURE FOR A ROAD RACE COURSE

Prepared by:

The Road Course Measurement and Certification Sub-Committee

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ROAD RACE COURSE MEASUREMENT USING THE CALIBRATED BICYCLE METHOD

These five steps must be followed to take an accurate measurement of a race course:

1. calibrate the bicycle (or bicycles) on a calibration course (called pre-calibration);

2. measure the race course;

3. check calibration (called post-calibration);

4. make adjustments to the race course following the post-calibration;

5. fill in the measurement report and submit it for analysis.

BICYCLE CALIBRATION

Before starting, make sure you have all the required material (see document on measuring a calibration course), as well as a bicycle safety helmet.

1. Install the "Jones" counter according to the manufacturer's instructions. Ride 2 or 3 kilometers to stabilize tire temperature and pressure.

2. Make a note of the ground temperature, wind speed and direction, condition of the pavement, names of the cyclists, and the date. Make sure that the bicycle's tires are inflated to the correct pressure (they should be fairly hard), and do nothing to change their pressure while measuring the course.

3. At the start of the calibration course place the axle of the bicycle's front wheel above the mark, and make a note of the reading on the counter and the starting time. Ride to the mark at the end of the calibration course and note down the new reading on the counter. You must repeat this process <u>at least four times</u> in order to obtain a constant. Ride in as straight a line as possible and at the same speed you intend to ride when measuring the race course (usually between 10 and 15 km.p.h.). After repeating the process four times, make a note of the time it took to do so.

4. Calculate the difference between the reading on the counter at the start and the reading on the counter at the end of each of the four calibrations.

5. Find the average of the four calibrations.

6. Each calibration that exceeds or falls short of the average by 2.5 units should be rejected. The calibration course should be ridden again in order to find the calibration that will replace the one that has been rejected. You will need four good calibrations to have an acceptable pre-constant.

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7. Next, a short-course prevention factor of 0.1% is added to the average of the four accepted calibrations. In other words, the race course will be lengthened by 0.1% in order to ensure that it measures at least the distance that has been announced. This factor must be calculated and added to the average of the four calibrations in order to come up with the "Working Constant" you are trying to find.

This "Working Constant" is good for this day only, and is the one that is used to measure the race course.

Example: average of the four calibrations: 9242 units/kilometre
(also called pre-constant)
times the short-course prevention factor x 1.001
9251.24

"Working Constant" wanted 9251

MEASUREMENT OF THE RACE COURSE

1. Go to the starting point chosen for the measurement of the course.

2. Calculate the product of the "Working Constant" obtained by each mile/ kilometre-marker you are trying to find (at the very least: starting point, first kilometre/mile, every five kilometres/miles therafter, last kilometre/mile, and finish). Add to each product the reading on the counter at the start. Check your calculations. Make a note of the time that measurement of the course is started and of the ground temperature.

3. It is advisable to take measurements in teams of two or more, if possible, so that each cyclist will have his own calculations. In this way, it will be possible to detect errors more quickly and double check immediately at the temporary kilometer/mile-markers. Ride the race course following the ideal line of running, (the one the best runner would take, while taking into consideration the restrictions given by the race director as to where he will control the runner's path. On streets with curbs, ride 30 centimetres away from the curb; on streets without curbs, ride 20 centimetres from the edge (see map). Do not ride any faster than 20 km.p.h.; speed must be controlled when riding downhill and on bumpy roads. Slow down to measure properly around corners. All unpaved portions of the race course must be measured with a steel tape.

4. Along the way, temporarily identify each kilometre/mile on the ground, as well as in the notebook.

5. Temporarily mark the finishing points on the ground, as well as in the notebook.

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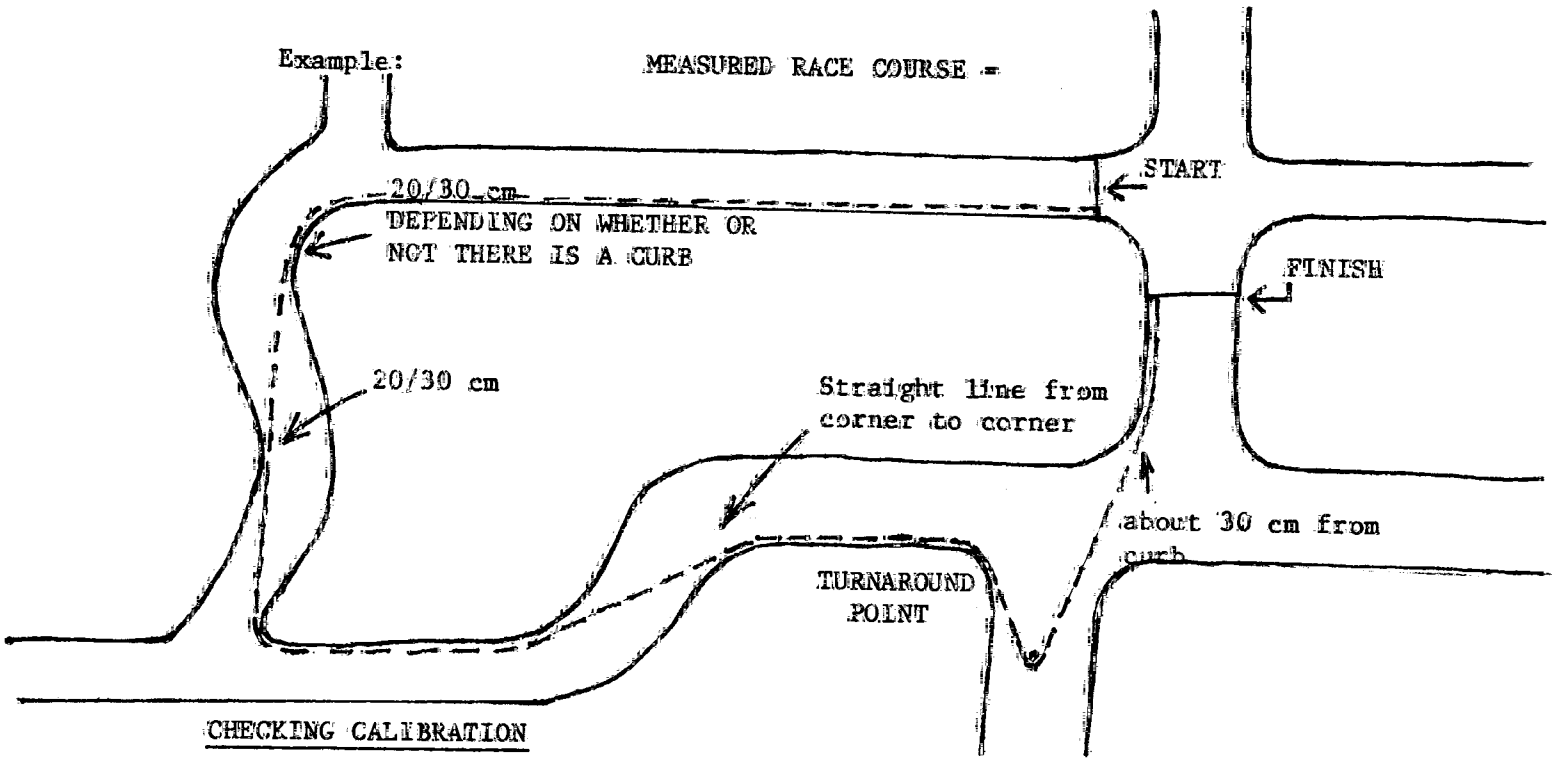
6. Measure the difference between the measurements and write it down in the notebook. Make a note of the time and the temperature after all measurements have been completed.

7. For organizational purposes, if the start and finish lines are within 400 metres of each other, measure and report this distance. For statistical purposes, if the straight-line distance between the start and finish lines is less than 10% of the total course distance, measure it and report it also.

8. A number of measurers prefer to measure from the finish to the start. This allows for a better choice of courses, as often finish lines are predetermined and cannot be moved. When measuring from finish to start, measurers must take care to ensure that they do indeed measure the course that the best runner would take, if he were running in the direction opposite to the one of measurement!



CHECKING CALIBRATION

1. Check the calibration of the bicycle as soon as you have finished measuring the race course. Follow steps 3, 4, 5 and 6 in the section on bicycle calibration.

2. The "POST-CONSTANT" (the one which has just been obtained) must be compared to the "PRE-CONSTANT" obtained before measuring the race course. (Neither Pre nor Post Constants have the 0.1% S.C.P.F. added to them).

Example: "PRE-CONSTANT" (before measuring)	9242
"POST-CONSTANT" (after measuring)	9247
Sum	18489
Divided by two	9244.5
Difference	+2.5

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FINAL ADJUSTMENTS TO THE RACE COURSE

1. In the example given above, the cumulative correction of 2.5 units per kilometre must be added to each kilometre. Therefore, 2.5 correction units must be calculated for each kilometre when measuring the race course. For example, a 10-kilometre course would require a correction of 25 units. To adjust the course measurements with a steel tape, we divide 2.5 by the average of the pre-constant and the post-constant, then multiply by 1,000 to get the correction in metres. To adjust the course by bicycle, we use the units calculated.

2. After calculating the adjustments to be made to each measurement of the race course, we write these adjustments down in the notebook and proceed to ground correction. The difference between the shortest and the longest adjusted measurement must be less than the product of 60 centimetres times the length of the race course in kilometres. Therefore, for a 10-kilometre race course, a difference of less than 6 metres would be acceptable.

3. Once a minimum of three acceptable measurements has been obtained, the average of these measurements is used to represent the advertized distance of the road race.

4. Permanently identify start and finish lines. Take reference measurements by using permanent markers and record these measurements in the notebook. Calculate in units and in metres the adjustments to be made to each kilometre of the race course of the chosen measurement. If the course is measured from finish to start, as in the example given above, 25 units would be added to the start of the course, 22.5 units to the first kilometre (or the 9th kilometre measured) and 2.5 units to the first kilometre measured (or the 9th kilometre of the course), and no adjustment would be made to the finish of the course.

   Note: These necessary adjustments clearly illustrate why only "temporary" marks are made on the ground at the locations determined for the kilometre-markers when initial measurements of the course are being taken.

5. Make the necessary adjustments to each kilometre/mile-marker. Make a note of the time taken to make the final adjustments to the race course. Take reference measurements by using permanent markers for the intermediate kilometres/miles (every five kilometres) and note them down in the notebook. Give a precise description in the notebook of all the kilometre/mile-markers. As you ride on the course, take the time to sketch out the line representing the measured path including restricted areas and surrounding detail.

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NOTES:

1. A race course can be measured twice in a row using the same calibrated bicycle, or two measurements can be taken simultaneously using two calibrated bicycles (this also applies when more than two measurements of a race course are required).

2. It is essential that the same cyclist ride the same calibrated bicycle during calibration, when measuring the course, and when checking the calibration -- otherwise, the measurements will be distorted. All three operations must be carried out on the same day. It is also important that speed, riding style, and the weight of the load remain as constant as possible during the three operations.

3. For the safety and protection of the measurer, it is always preferable to have an escort - either police officers or a car with flashing lights following. For safety, always wear a safety vest, of a highly visible colour (usually fluorescent orange).

4. Do not take measurements if it is very windy or raining.

5. "Jones" counters can be obtained in (at least) two ways:

   (a) by sending $35.00 in Canadian funds to:

   The Canadian Track and Field Association
   333 River Road
   Ottawa, Ontario CANADA
   K1L 8H9

   (b) by sending $20.00 in U.S. funds to:

   New York Road Runners Club
   P.O. Box 881
   FDR Station
   New York, NY
   U.S.A. 10050
   ATTENTION: Mr. Bill Noel

6. For the safety of all, always insist that measurers be 18 years of age or older.

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FILLING OUT THE MEASURING REPORT

The measuring report produced and signed by the lead course measurer must contain all the information necessary to explain and demonstrate to the certifiers the manner in which the course was measured and all the information (maps, kilometre/mile splits, sketches, etc.) that the race organizer needs to run the race using the course AS CERTIFIED.

THE COURSE MAP

A course map showing the ideal line of running as measured is an essential part of the report and it also becomes part of the certificate of accurate distance issued by the Canadian Track & Field Association. This specially designed course map will be used by the certifiers, the race organizer and the runners. For our purposes the map needs to be drawn on a framed 8½" x 11" single sheet of white paper and drawn in black for reproduction purposes.

In drawing your map you might find it helpful to "widen" the streets relative to their length (1 centimetre wide streets) on a maximum 11" x 17" sheet of paper and have the drawing reduced on modern photocopying machines, to the required 8½" x 11" size.

A good map would enlarge sections where more detail is needed and shrink sections where less detail is needed; it would also not include unnecessary single cross-streets, but would show important landmarks for reference. The map must include a line representing the ACTUAL MEASURED PATH through the course. You may find the use of LETRALINE convenient for tracing that line. The map must also include a blown-up section of the exact location of the START, FINISH, and any TURN-AROUND points. This is done by giving precise tape-measured distances from nearby permanent landmarks.

An example of a good course map is to be found on page 7.

ACKNOWLEDGEMENTS

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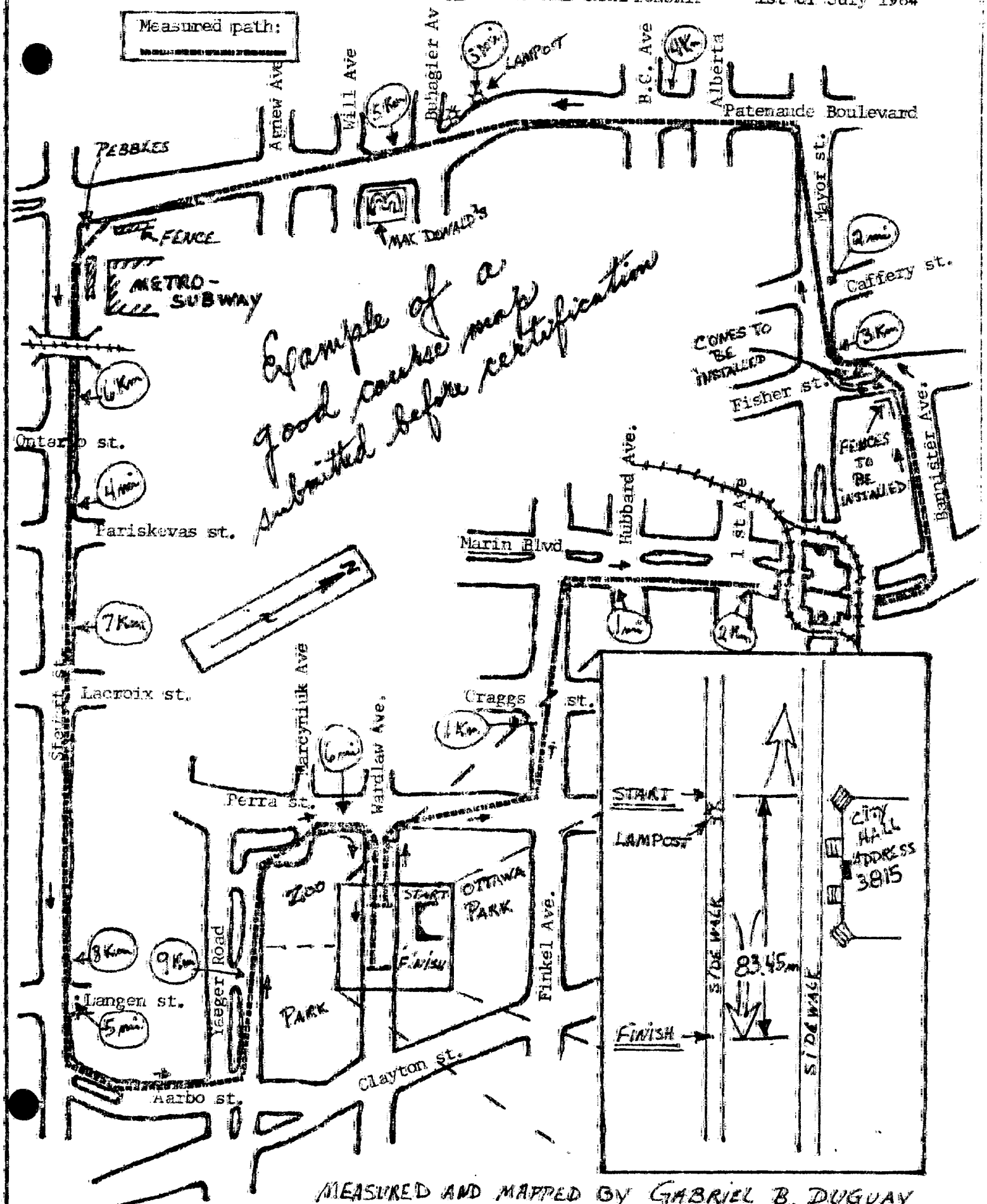
THE SERIOUS RUNNERS 10 KILOMETRES NATIONAL CHAMPIONSHIP 1st of July 1984



MEASURED AND MAPPED BY GABRIEL B. DUGUAY
(NOT TO SCALE)