

MARKING AN ATHLETIC TRACK

The following procedure describes a method of marking out a grass track for both track and field events. Although the method is designed for tracks of 400m circumference with two straights and curves, much of the information is also applicable to circular tracks or oval tracks, or to tracks of other than 400m circumferences.

One point about the size of a track - the distance around the inside line is NOT 400m - on a grass track it is 398.74 metres. This is because all distances on a grass track are measured 20cm (0.2m) out from the inside edge of a lane, as this is where an athlete's feet are expected to land. So for a track with two straights 70m long and two curves of radii 41.18m the inside line has a total length of 398.74 metres, while the total distance around an imaginary line 20cm (0.2m) out (ie. two 70m straights and two curves of 41.38m radius) would be 400.00 metres. On a track with a 5cm high kerb such as Sydney Athletic Field, lane 1 is measured 30cm (0.3m) out from the kerb, while all other lanes are measured 20cm (0.2m) out.

i) Preliminaries

The first job is to decide where the track is to be located, bearing in mind low spots where water lies or spots of poor drainage, uneven ground or potholes, high ground or slopes which would be suitable for spectators, and the total area available. The overall dimensions of a six lane track, total length (L) and total width (W), are given in the table overleaf.

Top of the list is a lane marking machine. A tennis court line marker is suitable (may be available second hand) using weed killer and red oxide mixture or a paint mixture. An oil marker can be constructed by mounting a drum, with open end utmost, on three wheels in a tricycle fashion, with the front wheel being a felt-covered wooden wheel 5cm wide. A tap in the side of the drum will allow the oil to drip onto the front wheel. It is advisable, if using a council facility, to check their requirements in this regard.

Other items needed are measuring tapes (preferable 100m long, otherwise as long as possible), marking cord (thin rope or heavy twine, a number of 100m lengths), marking pegs (treated 5cm by 5cm timber about 20cm long, sharpened at one end and painted white the other), quantity of pencil sized pegs and sundry stakes, hammers etc.

ii) The Straights

Having decided where the track is to be located, hammer in pegs at points A and B (refer to Fig.2), measuring the length of the straight between the centres of the peg tops. Now locate peg C by measuring the distance AC (see Table 1) from the centre of peg A to the furthest edge of peg C, and also diagonal BC to ensure the angle is 90°. Do not hammer this peg in fully yet. Using a similar procedure locate pegs D, E & F, and check that the four pegs are true by measuring the major diagonals DE and CF, and checking that the distance CD and EF are equal to AB. When all final adjustments have been made the pegs can be hammered just below ground level and fixed permanently. Hammer in stakes about 1m long next to each peg for sighting purposes.

Now the straights are marked out. Stretch a marker cord tightly between C and D and mark the line so that the line marker runs over the centre of the pegs. Pegs or stakes are now placed 1.22m apart along the lines DI and CH, marker cords are stretched between appropriate points and the lanes are marked such that all lanes are 1.22m from the outside of one line to the outside of the next line. The same procedure is used to mark the straights EF to JG.

Table 1

Length of Straight	Radius	Diagonals
AB	AC AE BD BF	BC BE
60m	44.36m	74.62m
70m	41.18m	81.21m
80m	38.00m	88.57m
90m	34.81m	96.50m
100m	31.63m	104.88m
Major Diagonals	Total Length and Width for 6 lanes	
CF DE	L	W
107.10m	163.36m	103.36m
108.09m	167.00m	97.00m
110.34m	170.64m	90.64m
113.78m	174.26m	84.26m
118.33m	177.90m	77.90m

Diagram can be found later in the Chapter. (Fig.1).

iii) The Curves

Next the curves are marked. It is important that great care is taken with marking the inside lane, as any errors here will be repeated in the other lanes. Pull the measuring tape tightly from A to C, and holding the tape firmly at the centre of peg A swing the tape from C to E, marking the semicircle about every 30cm with pencil-size pegs. These pegs are only lightly pushed in, and the outside edge of the lane marking wheel will force them aside. In this manner the radius AC is measured to the outside of the line.

The other semicircular lanes are easily marked as follows: make a loop at one end of a marking cord and place it over a stake located next to peg A. With coloured tape of a contrasting colour (electrical insulating tape is ideal) make a mark on the cord at a distance AC from A with the cord stretched, and then make further marks at intervals of 1.22m for the required number of lanes. Now pull the cord tightly until the first mark is level with the outside of the line as marked above, and mark the other semicircles with pegs about 30cm. With a good supply of pegs the whole 6 lanes can be marked at the one time. The same procedure is used to mark the semicircles at the other end of the track.

iv) Finishing the Straights

With suitable stakes and marking cord, the main straight can be extended back to KM. To avoid confusion for athletes running the curve in lanes, these lines need not be fully marked, but only short lengths which intersect the curved lines if this is considered desirable. This is illustrated in Figure 1, on the following page.

Finish line FG is marked at right angle to EF by sighting the stake located next to peg D. The 100m starting line can now be marked such that the edge of the finish line nearer to the start is exactly 100m from the edge of starting line further from the finish. Similar starting lines can be marked for 50m, 70m, 60m hurdle & 80m hurdle events if desired. It is advisable to extend all start and finish lines 2 to 3 metres on either side of the track so that the start and finish posts can be kept well away from the track.

Hurdles location points should be marked only halfway across each lane so that there is no confusion with the starting lines. The distances of the hurdles marks can be obtained from your Association office.

v) Inside Tracks

It may be desirable to have an extra straight track on the infield, similar to that shown in Fig.1. Points A and B serve as good reference points for this purpose. There is plenty of scope for positioning the tracks to suit local conditions.

vi) Staggered Starts

Staggered starts are needed for 200m and 400m events (and in some states 800m events) to ensure all competitors cover exactly the same distance. For tracks of 400m circumference with lanes 1.22m wide, the exact amount of stagger needed is 7.66m per lane for the 400m, and 3.83m per lane for the 200m, regardless of the shape of the track. For tracks of other size (usually between 300m and 400m) the 200m staggers will still be 3.83m per lane for lanes of width 1.22m, but the 400m staggers will depend on the actual size and shape of the track.

These distances are measured along an imaginary line 20cm (0.2m) out from the outside edge of each lane, and each lane is measured independently as follows: in lane 2 place pegs 20cm (0.2m) out from the outside edge of the lane on the left and measure around this curve 7.66m from the rear of line FG to the rear of the stagger line. Stretch a marking cord from peg B through this point across lane 2 and mark the staggered start line which will then be at right angles to the inside border of the lane. Lane 3 is marked similarly at a distance of $2 \times 7.66 = 15.32\text{m}$ from FG; Lane 4 is marked at a distance of $3 \times 7.66 = 22.98\text{m}$ from FG; and so on.

For the 200m staggers an imaginary or temporary line CH is needed to measure from Lane 1. Lane 1 start is placed at C; Lane 2 start is measured 3.83m around from CH by the method above; Lane 3 start is measured $2 \times 3.83 = 7.66\text{m}$ around from CH; Lane 4 start is measured $3 \times 3.83 = 11.49\text{m}$ around from CH; and so on.

For 800m staggers, please contact your Association office for correct marking procedures.

vii) Pack Starts

For races with pack starts the starting line is curved so that each runner starts the same distance from the finish. To determine the 800m start, (for States where a pack start is used) stand at where you think the curved starting line might meet the outside line and sight where the tangent meets the line 20cm (0.2m) out from the inside line. Place pegs 20cm (0.2m) out from the inside line, going around the curve. Place the zero end of a measuring tape on the last peg and measure the distance around the pegs to the line FG. Swing the tape out across the lanes and insert pegs at this distance. Join up the pegs with the line marker. For the 1500m start, point R (see Fig 1) must be established by measuring back from D, along a line 20cm (0.2m) from the inside line (use pegs as above), a distance equal to (100m minus length of straight), i.e. for a 70m straight measure back 30m, or for a 90m straight measure back 10m, etc.

The remaining procedure is the same as for the 800m start. The only difficulty will be with tracks having a straight of 80m, or 90m, in which case the point where the tangent meets the running line will be about 100m away.

This method of making a curved starting line is applicable to tracks of any size or shape, once the starting position in lane 1 has been determined.

viii) 4 x 100 Relay

For the first change the "scratch line" (the middle of the changeover zone) has already been marked (point R) by measuring back from DI along a line 20cm (0.2m) out from the inside line, a distance of (100m minus length of straight). The scratch line for lane 2 is measured back from DI a distance of (100m minus length of straight minus 3.83m). For a track with a 70m straight this distance becomes $(30 - 3.83) = 26.127\text{m}$.

The scratch line for lane 3 is measured back (100m - length of straight - 2 x 3.83m), which for a track with a 70m straight becomes $(30 - 7.66) = 22.34\text{m}$. For lane 4 the distance is (100m - length of straight - 3 x 3.83m), which for a track with a 70m straight becomes $(30 - 11.49) = 18.51\text{m}$, and so on. All measurements are made 20cm (0.2m) out from the inside boundary of each lane.

For the second change the 200m staggered starting lines are the scratch lines so no further measurements are needed.

For the third change, the scratch lines are determined by measuring back from EJ a distance of (100m minus length of straight) in each lane, along a line 20cm (0.2m) out from the inside boundary of each lane. For a track with a 70m straight, a distance of 30m would be measured back in each lane.

The limits of the changeover zones can be marked 10m in front of and 10m behind each scratch line. To avoid confusion these marks should only extend half way across each lane. A 10m acceleration zone, or run-in zone, can also be marked in front of the changeover zone if desired.

ix) 4 x 400m Relay

For the 4 x 400m relay, where the first lap and the first curve of the second lap are run in lanes, the starting positions are calculated as 400m stagger + 200m stagger + an advancement to compensate for the runners in the outside lanes having further to run to reach the inside lane at the end of the back straight in the second lap. The amount of the advancement must be calculated separately for each lane and each size track, and Table 2 shows the results of these calculations. For example, the position of the starting line in Lane 4 of a track with 80m straights is measured around from F'G a distance of (normal 400m stagger + normal 200m stagger + 0.08m) = $(22.98 + 11.49 + 0.08) = 34.55\text{m}$.

Advancement for different sized tracks

Table 2

Lane No.	Length of Straight				
	60m	70m	80m	90m	100m
1	0.00m	0.00m	0.00m	0.00m	0.00m
2	0.01m	0.01m	0.01m	0.01m	0.01m
3	0.05m	0.04m	0.04m	0.03m	0.03m
4	0.11m	0.10m	0.08m	0.07m	0.07m
5	0.20m	0.17m	0.15m	0.13m	0.12m
6	0.31m	0.27m	0.23m	0.21m	0.19m
7	0.45m	0.38m	0.34m	0.30m	0.27m
8	0.16m	0.52m	0.46m	0.41m	0.37m
9	0.80m	0.68m	0.60m	0.53m	0.48m

The scratch line for the first change is measured around from FG a distance of (normal 200m stagger + advancement as above). For lane 4 of a track with 80 straights this distance would be $(3 \times 3.83 + 0.08\text{m}) = 11.57\text{m}$. The limits of the changeover zones can be marked 10m on either side of these marks, while the changeover zones for the second and third changes are 10m on either side of FG. There is no acceleration or run-in zone in the 4 x 400m relay.

In practise all these marks would make a very confusing array on a grass track where there is a limit on the number of colours that can be used, so for most purposes it would be preferable to only mark the starting positions and use the normal 400m starts for the first change.

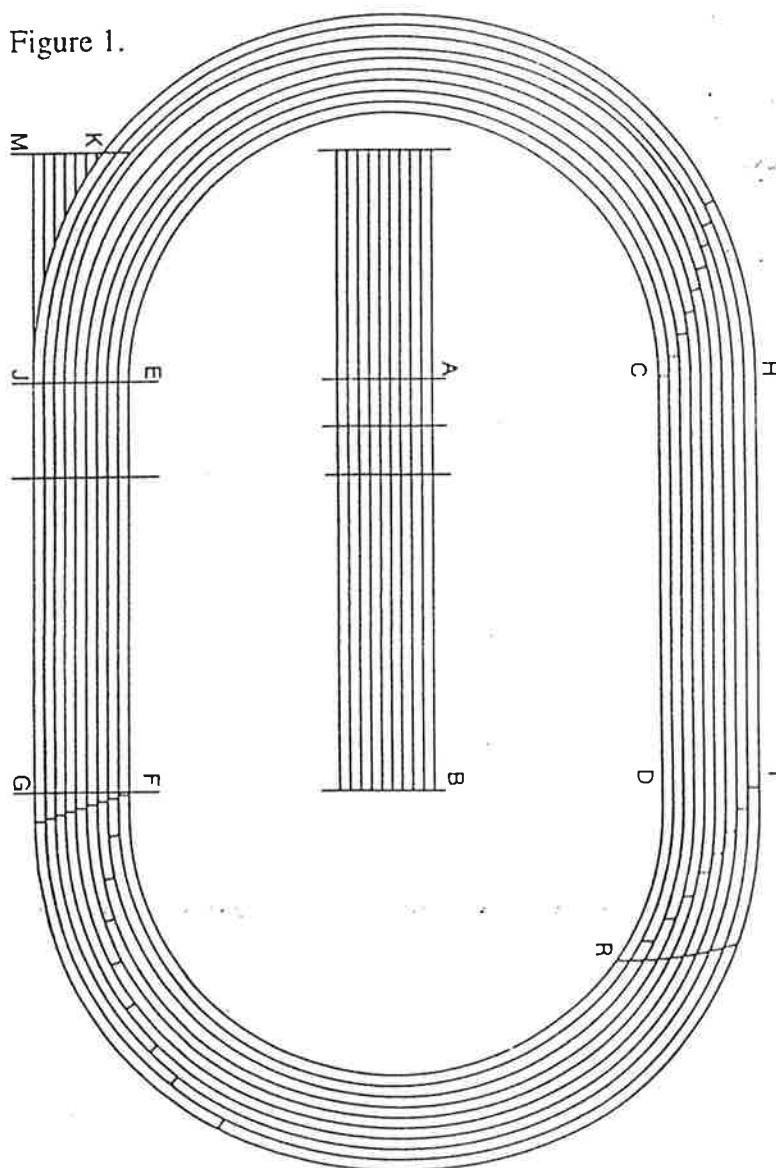
x) The Last Step

Take cross-sightings of the six main pegs A,B,C,D,E and F using reasonably permanent features such as buildings, poles, trees, etc, and mark these on a plan to help in finding them in twelve months time.

For any important meetings, flags should be placed on the inside line at intervals of 5 metres so as to prevent any competitor running on the line. They should be placed at an angle of 60° to the ground, sloping away from the runners. Flags approximately 25cm by 20cm in size mounted on stakes 45cm long are the most suitable for this purpose.

LAYOUT FOR A 400m TRACK WITH 70m STRAIGHTS

Figure 1.



FIELD EVENT MARKINGS

Markings for the field events are fairly simple, the main ones being for the shot and discus sectors. If there are no permanent circles, the first job is to mark circles with diameters of 2.135m for the shot and 2.50 for the discus, with a line through the centre separating the front from the back half of the circle and extending at least 75cm (0.75m) on each side. The 40° sector lines are measured by locating pegs at points B and C to suit the dimensions shown in Fig 2. The markings shown every 2m for the shot and every 5m for the discus are very handy for making approximate measurements, for example at the practice sessions. These are marked by measuring the approximate distances from the inside of the front edge of the circle or stop board, placing a peg at that point, and then marking the arc by using the centre of the circle.

A run-up lane for the long jump and triple jump could be marked as follows:

Place stakes symmetrically at each end of the sand pit 1.22m apart, these stakes being used to locate the ends of the run-up lane.

Check that the end points are also 1.22m apart, join the stakes with marking cord and mark the lanes.

i) Throwing Circles

a) Discus

IAAF Rule 182

Construction:

Circles shall be made of band iron, steel or other suitable material, the top of which shall be flush with the ground outside. The interior of the circle may be constructed on concrete, asphalt or other firm, but not slippery, material. The surface of the interior shall be level and 14mm-26mm lower than the upper edge of the rim of the circle.

Measurements:

The inside diameter of the circle shall be 2.50 metres (+/-5mm). The rim of the circle shall be at least 6mm thick, and shall be painted white.

Layout of a Discus Circle:

A white line 50mm wide shall be drawn from the top of the metal rim extending for at least 0.75m on either side of the circle. It may be painted, or made of wood or other suitable material. The rear edge of the white line shall form a prolongation of a theoretical line through the centre of the circle at right angles to the centre line of the throwing sector.

The Landing Sector:

The maximum allowance for the overall downward inclination of the landing sector, in the throwing direction, shall not exceed 1:1000.

The landing section shall be marked with white lines 50mm wide at an angle of 40° such that the lines, if extended would pass through the centre of the circle.

A distinctive flag or marker shall also be provided to mark the existing Association or Centre Record.

Discus Throwing Cage:

All discus throws shall be made from an enclosure or cage to ensure the safety of spectators, officials and competitors.

The cage should also be designed, manufactured and maintained so as to stop the discus so there is no danger of it ricocheting off the cage, back towards the athlete or over the top of the net. Provided it satisfies this, any form of cage design and construction can be used.

The cage should be U-shaped in plan.

Provision should be made in the design and construction of the cage to prevent a discus forcing its way through any joints in the cage or the netting or underneath the netting panels.

The netting for the cage can be made from suitable natural or synthetic fibre cord or, alternatively, from mild or high tensile steel wire. The maximum mesh size shall be 50mm for steel wire and 44mm for cord netting. The minimum size of cord or wire depends on the construction of the cage, but the minimum breaking strain should be 40kg.

b) Shot Put

IAAF Rule 181

Stop Board Construction:

The board shall be painted white and made of wood or other suitable material in the shape of an arc so that the inner edge coincides with inner edge of the circle. It shall be placed mid-way between the sector lines, and be so made that it can be firmly fixed to the ground.

Circle Construction:

Construction to be the same as the discus.

Measurements:

The board shall measure 112mm to 300mm wide, 1.21m to 1.23m long on the inside and 98mm to 102mm high in relation to the level of the inside of the circle.

The Landing Sector:

The landing sector shall consist of cinders or grass or suitable material on which the shot makes an imprint.

The maximum allowance for the overall downward inclination of the landing sector in the putting direction shall not exceed 1:1000.

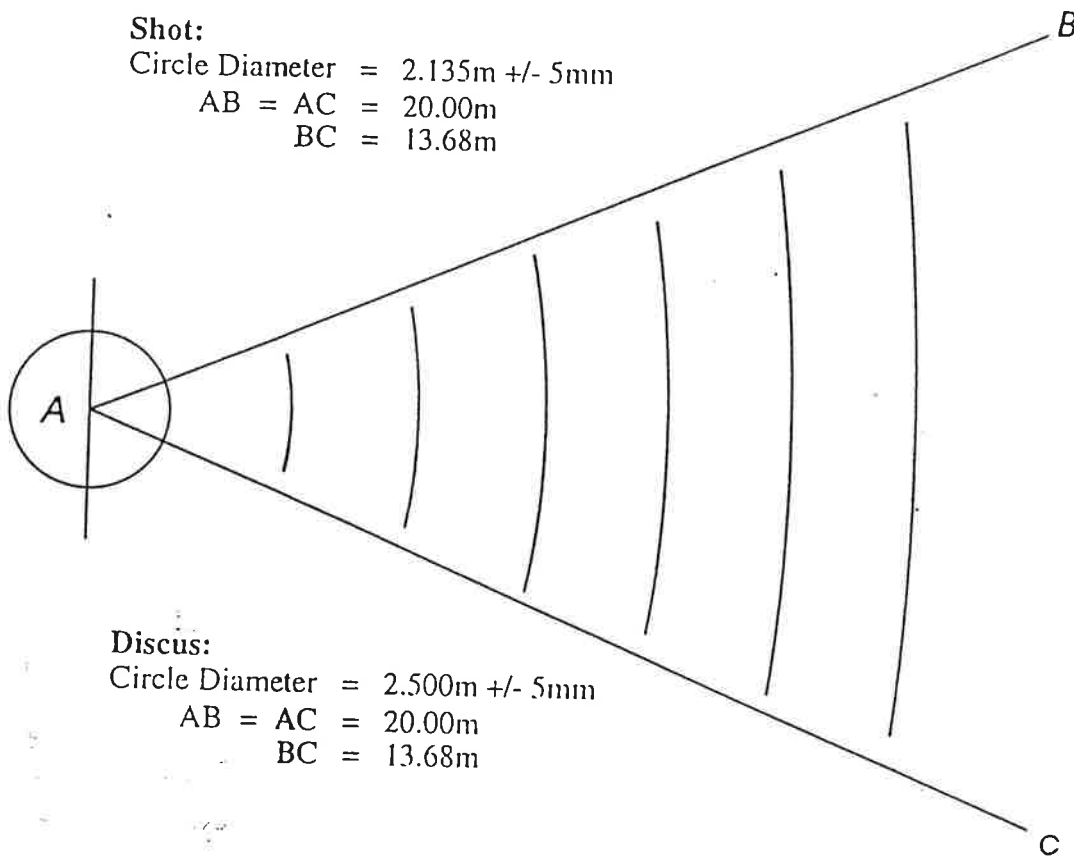
The landing sector shall be marked with white lines 50mm wide at an angle of 40° such that the lines, if extended, would pass through the centre of the circle.

A distinctive flag or marker may be provided to mark the best throw of each competitor, in which case, it shall be placed along, and outside, the sector lines.

A distinctive flag or marker shall also be provided to mark the existing Association or Centre Record.

Figure 2.

THROWING CIRCLE MARKINGS



c) Javelin

The javelin is thrown from an arc at the end of the runway 30 to 36.5 metres long and four metres wide into a throwing sector of angle 29 degrees. Where conditions permit, the minimum length of the runway should be 33.5 metres.

From the throwing end of the runway measure back along the centre of the runway precisely eight metres. Mark this spot with a spike or peg, as it forms the centre of the throwing arc at the end of the runway and of the sector.

From this point tension an eight-metre length of string and scribe an arc at the end of the runway. Line this arc twice to produce a line of width seven centimetres. Where the arc meets the sides of the runway, extend the arc ends at right angles to the runway edges for 75 centimetres. Once again mark these lines twice to produce a line seven centimetres wide. All lines on the entire field are five centimetres wide except those that mark the throwing arc for the javelin.

To be a valid throw, the javelin must fall within the inner edges of two lines marking a sector of 29 degrees. The sector may be accurately laid out by making the distance between the two sector lines 20 metres at a point 40 metres distance from the centre of the throwing arc along one of the sector lines. The sector lines should be continued for a minimum distance of 50 metres and their ends marked with red flags.

d) High Jump Area

IAAF Rule 171

The Runway and Take off Area:

- a) The minimum length of the runway shall be 15 metres.
- b) The maximum overall inclination of the runway and take off area shall not exceed 1:250 in the direction of the centre of the cross-bar.
- c) The take off area must be level. If portable mats are used, all references to the level of the take off area must be construed as referring to the level of the top surface of the mat.

Apparatus:

Uprights:

Any style of uprights or posts may be used, provided they are rigid.

They shall have supports for the cross bar firmly fixed to them.

They shall be sufficiently tall as to exceed the maximum height to which the cross bar can be raised by at least 100mm.

The distance between the uprights shall not be less than 4.00 metres nor more than 4.04metres.

Cross-Bar:

The cross-bar shall be of wood, metal or other suitable material, circular in cross-section.

The length of the cross-bar shall be between 3.98m and 4.02m. The maximum weight of the cross-bar shall be 2kg.

The diameter of the cross-bar shall be 29mm - 31mm. Each end of the bar shall be constructed such that it has one flat or concave surface (29 - 35mm x 150 - 200mm) for the purpose of resting on the supports of the uprights.

Those parts of the bar which rest on the supports shall be smooth. They may not be covered with rubber or any other material which has the effect of increasing the friction between them and the supports.

iv) Long/Triple Jump Area

IAAF Rule 173 + 174

The Runway:

The minimum length provided for the runway shall be 40 metres. The runway should have a minimum width of 1.22 metres and a maximum width of 1.25 metres. The runway should be marked by white lines 50mm in width. Where conditions permit the minimum length should be 45 metres.

The maximum allowance for lateral inclination of the runway shall not exceed 1:100 and the overall inclination in the running direction 1:1000.

Markers:

A competitor may place alongside the runway a marker (supplied or approved by the Organising Committee) to assist in the run-up and take-off. However, if such markers are not supplied, they may use adhesive tape but not chalk or similar substance.

The Landing Area:

The landing area shall have a minimum width of 2.75 metres and a maximum width of 3 metres. It shall, if possible, be so placed that the middle of the runway, if extended, would coincide with the middle of the landing area.

The landing area should be filled with soft damp sand, the top surface of which shall be level with the take-off board.