



CYCLE FRIENDLY DESIGN GUIDE

Guidance on designing roads, traffic management schemes and new developments to promote cycle use



• EDINBURGH •
THE CITY OF EDINBURGH COUNCIL
CITY DEVELOPMENT

The place of cycling in the *moving FORWARD* transport strategy.

Cycling has many advantages. Bicycles occupy little space and cause no air or noise pollution. They are cheap to use and to provide for. Cycling gives exercise and is good for individual health.

Edinburgh has the highest bicycle use of the larger Scottish cities, but in 1991 only 1.9% of journeys to work were made by bike. There is great potential to increase this figure. For example, nearly two thirds of Edinburgh residents' journeys to work are of less than 3 miles. Over this distance cycling is usually faster than car or bus. Cycling can compete with the car more effectively than public transport for many journeys, especially to destinations in suburban areas.

*With the above facts in mind the *moving FORWARD* strategy aims to double the percentage of journeys to work by bicycle to 4% by the end of the century and increase the percentage to 10% by 2010. Experience in the cities of Scandinavia and central Europe suggests that this kind of major increase can be achieved with determined effort.*

The Role of this Design Guide

Surveys show that the key factor in deterring people from cycling is danger. Though development of a specific cycle route network is being pursued, most cycle trips will continue to use the general road network. So to make cycling safer the design of the whole road network must become much more cycle friendly. Cycle storage is also a significant problem.

This design guide aims to assist engineers, planners and developers in designing road and traffic schemes and new developments in such a way that they are cycle friendly.

Of course it is not possible to give detailed advice on all aspects of design for cyclists in a guide as brief as this. A list of publications giving more information is given at the end of this guide.

Designing for the Cyclist

The cyclist has to drive, power and balance their vehicle simultaneously. This combination gives designing for the bicycle its special characteristics. Several key principles of cycle friendly design are outlined below.

1 The bicycle is a vehicle. When designing for cyclists criteria analogous to those used for designing for motor traffic must be used. Criteria for sightlines, minimum radii etc, are given on page 7.

2 Bicycles are muscle powered. Therefore cycle friendly design should aim to minimise energy losses. The most frequent causes of energy loss are stopping, hills and sharp corners. Cyclists should not be required to dismount on cycle routes.

3 Bicycles have no crumple zone! The vulnerability of cyclists is obvious from accident statistics. Many cycle facilities (eg cycle lanes, advanced stop lines and cycle tracks) aim to separate cyclists from sources of danger.

4 A design does not have to have cycle facilities to be cycle friendly (and vice versa). Though cycle facilities are often helpful, much can be done to assist cyclists in less obvious ways. Examples include avoiding 'critical widths' for overtaking at pedestrian refuge islands (page 4), avoiding the installation of new conventional roundabouts (page 5) and careful design of traffic calming measures (page 4). Conversely a poorly designed 'cycle route', for example a shared footway with frontage access, substandard width or poor sightlines, can be more dangerous for cyclists (and pedestrians) than the road it is avoiding.

5 Both adults and children cycle. Encouragement of bicycle use by children is important to increasing to the role of cycling as a means of transport. Child cyclists are unable to cope with heavy traffic which a commuter cyclist might tolerate for the sake of speed and directness. Child and recreational cyclists put safety and enjoyment first.

Maintenance

Maintenance is crucial to the continued success of both on and off street cycle routes. Poor surfaces, overhanging vegetation, ponding, worn markings, broken glass, poor lighting etc, all affect cyclists more quickly and more seriously than motorists and are a continuous source of complaint.

It is therefore essential that cycle tracks, both on and off road, are inspected and maintained on a similar basis to the rest of the road network.

Signing

The quality, frequency and coherence of signing is crucial to the successful operation of cycle routes. Continuity of destinations is also crucial. Consideration can be given to naming off road routes and using these on signs.

Particular attention must be given to signing off-road routes from the main road network.

Signs should generally be white on blue.

Cycle signing must be maintained on the same basis as other road signs.

Temporary works/diversions

Temporary closures of roads should provide exemptions for cyclists and pedestrians, particularly where alternative routes involve a considerable detour. One way workings should not force cyclists into narrow lanes and traffic light cycle times must allow cyclists enough time to clear the works.

On-Street Cycle Facilities – Part 1

NB:

Signals and pedestrian facilities not shown for clarity
Great care must be taken when considering junctions where left and/or right manoeuvres are signalled separately

Signs and markings to the following diagrams required as appropriate:

958.1
959.1
967
955
960.1
962.1
1004
1004.1
1049
1057
1057 (variant)

Cycle Lane widths:

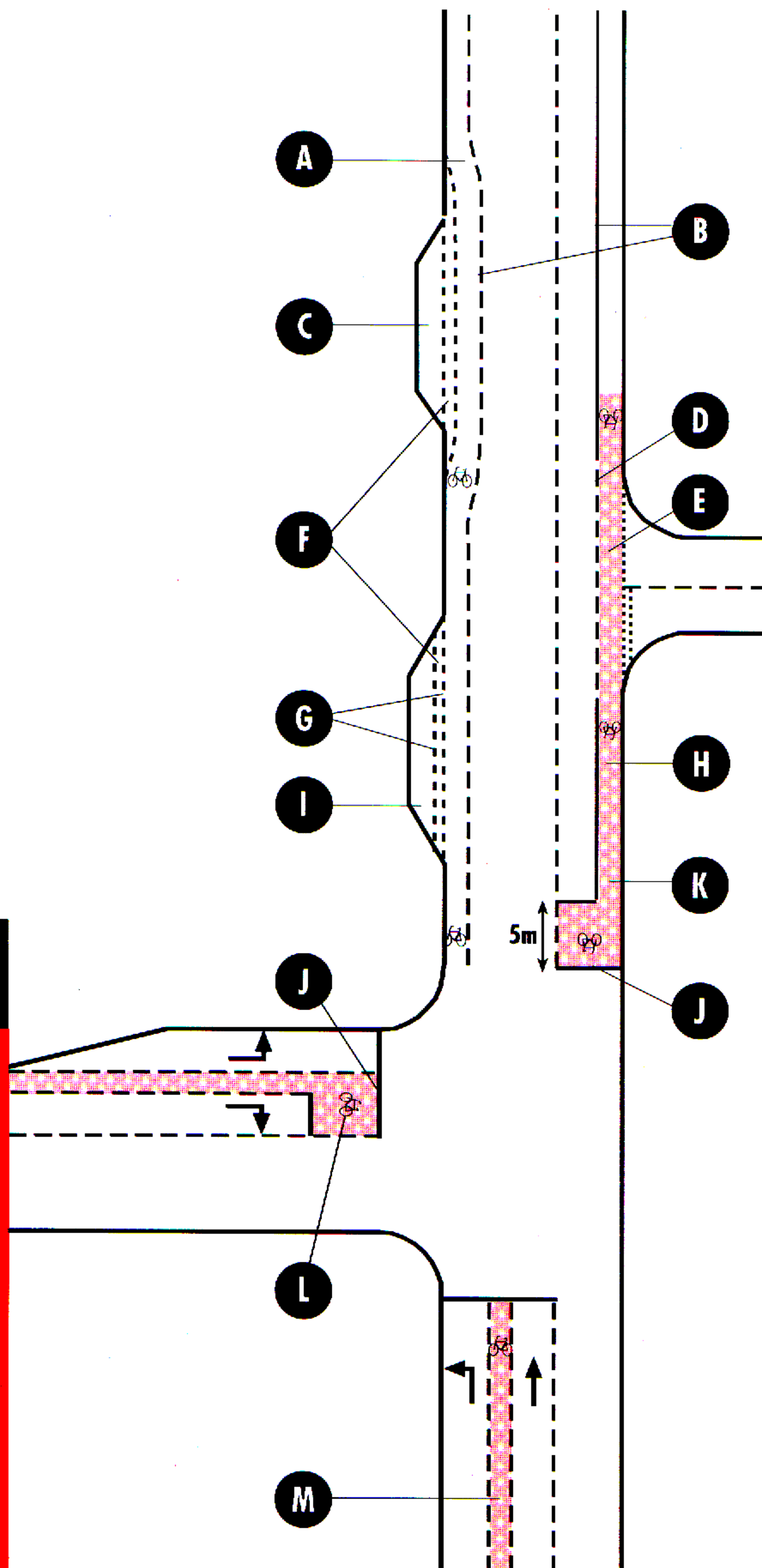
1.75m desirable minimum

1.5m normal minimum.

For lane widths below 1.5m consult the Cycle Team.

See also the table on page 10.

- A** Cycle lane markings to be minimum radius 15m.
- B** Cycle lane may be advisory (broken lines) or mandatory (solid line). Mandatory lanes require an Order.
- C** Parking/loading bay to be 1.75m (2.5m desirable for loading). See also F below.
- D** Advisory cycle lane across side road.
- E** Red surface preferred across side road.
- F** Dividing strip to be: 1.0m preferred
0.75m desirable
0.5m minimum
- G** Markings to Diag. 1010 - 100mm width.
- H** Absolute minimum lane width on signal approach to be 1.0m. Widths below 1.5m - consult Cycle Team.
- I** Parking /Loading.
- J** Advanced stop line to cater for right turning cyclists.
- K** Red surface required in cycle box and normally on up to 30m signal approach. (Shorter distances may be suitable).
- L** Non-standard cycle symbol required.
- M** Ahead cycle lane. No advanced stop line required. (Right turn unavailable).



On-Street Cycle Facilities – Part 2

NB:

Signals and pedestrian facilities not shown for clarity

Great care must be taken when considering junctions where left and/or right manoeuvres are signalled separately.

See also the table on page 10.

Signs and markings to the following diagrams required as appropriate:

958.1
959.1
967
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960.1
962.1
1004
1004.1
1049
1057
1057 (variant)

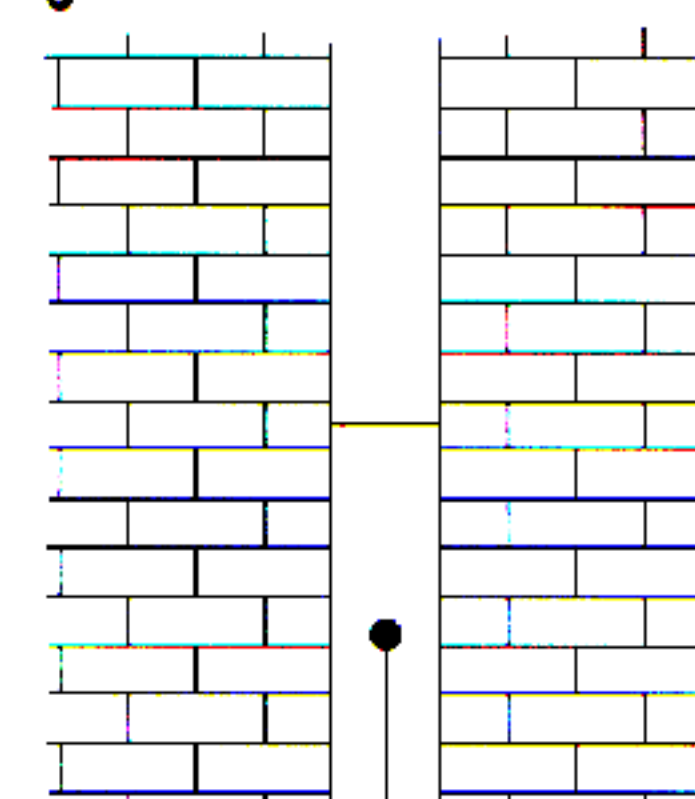
The edge marking should be laid outside the stated width of the cycle lane.

On stretches of road where two or more general traffic lanes are required, the width of the inside lane should be maximised commensurate with maintaining a 3.0m outside lane (30 mph) (3.3m in 40 mph).

Streets with sett surface

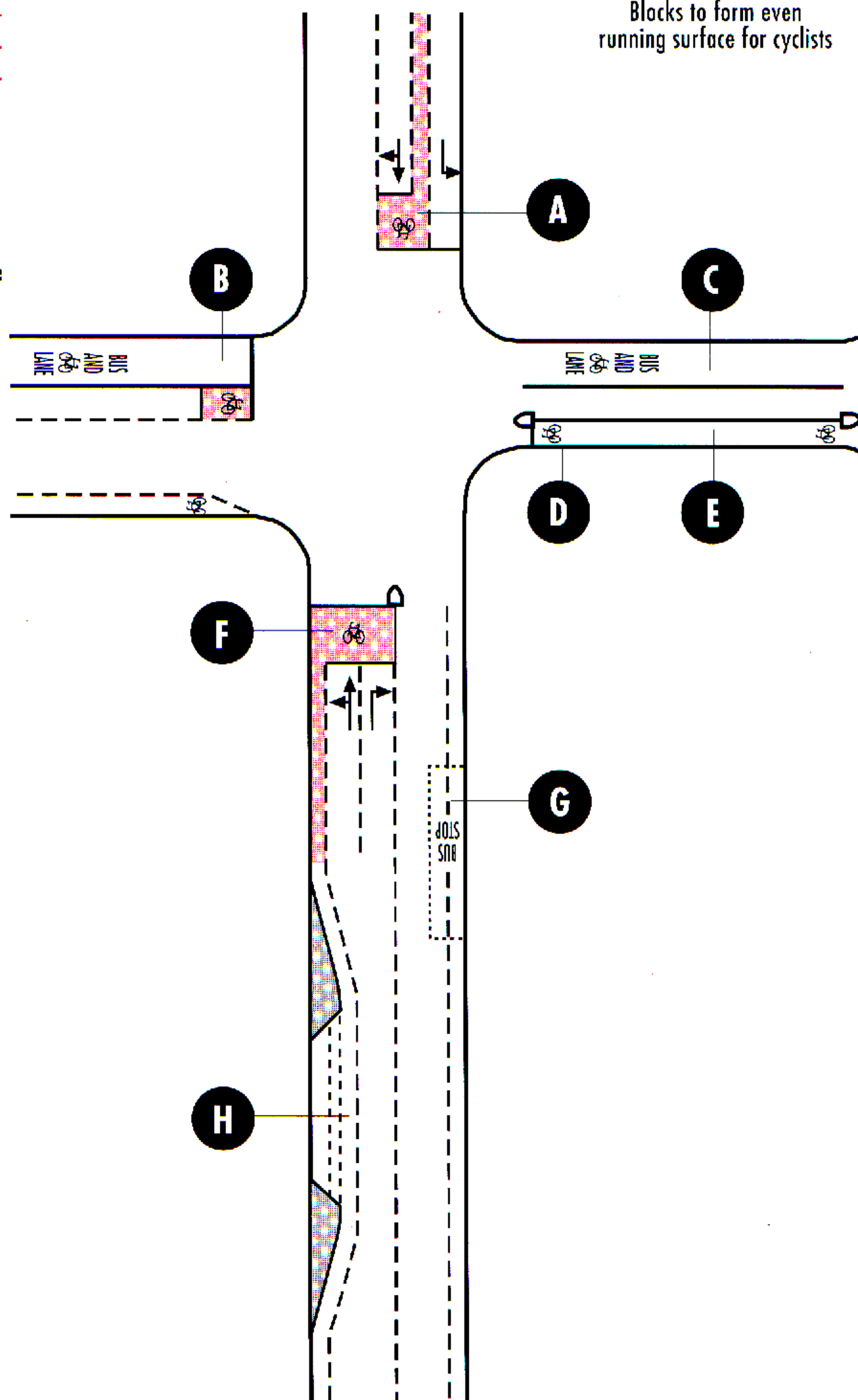
Please contact the Cycle Team at an early stage in the design of surfacing or resurfacing schemes involving setts. Use of large stone blocks to form a narrow track for cyclists may be justified (see diagram).

Diagram : Streets with sett surface



Blocks to form even running surface for cyclists

- A** Advanced stop line for ahead and right turn cyclists. (Left filter operating therefore no advanced stop line for left turn).
- B** Width of bus and cycle lane should be maximised, commensurate with maintaining a 3.0m outside lane.
- C** Minimum width for bus to overtake cycle in lane is 4.25m and 4.6m desirable. 3.0m absolute minimum locally.
- D** Contra flow cycle lane 2.0m absolute minimum.
- E** Contra-flow cycling must be allowed for in any new one-way scheme.
- F** Advanced stop line. (Cycle lane at kerb as there is not a dedicated left turn facility).
- G** Cycle lane markings should be continued through bus stops and pelican crossing zig-zags.
- H** Cycle lane taken outside area of frontage parking. (See page 2 and table on page 10 for details).



On-Street Cycle Facilities – Part 3

Lane widths, traffic calming, refuges and One Way streets

Signs and markings to the following diagrams required as appropriate:

958.1

959.1

967

955

960.1

962.1

1004

1004.1

1049

1057

1057 (variant)

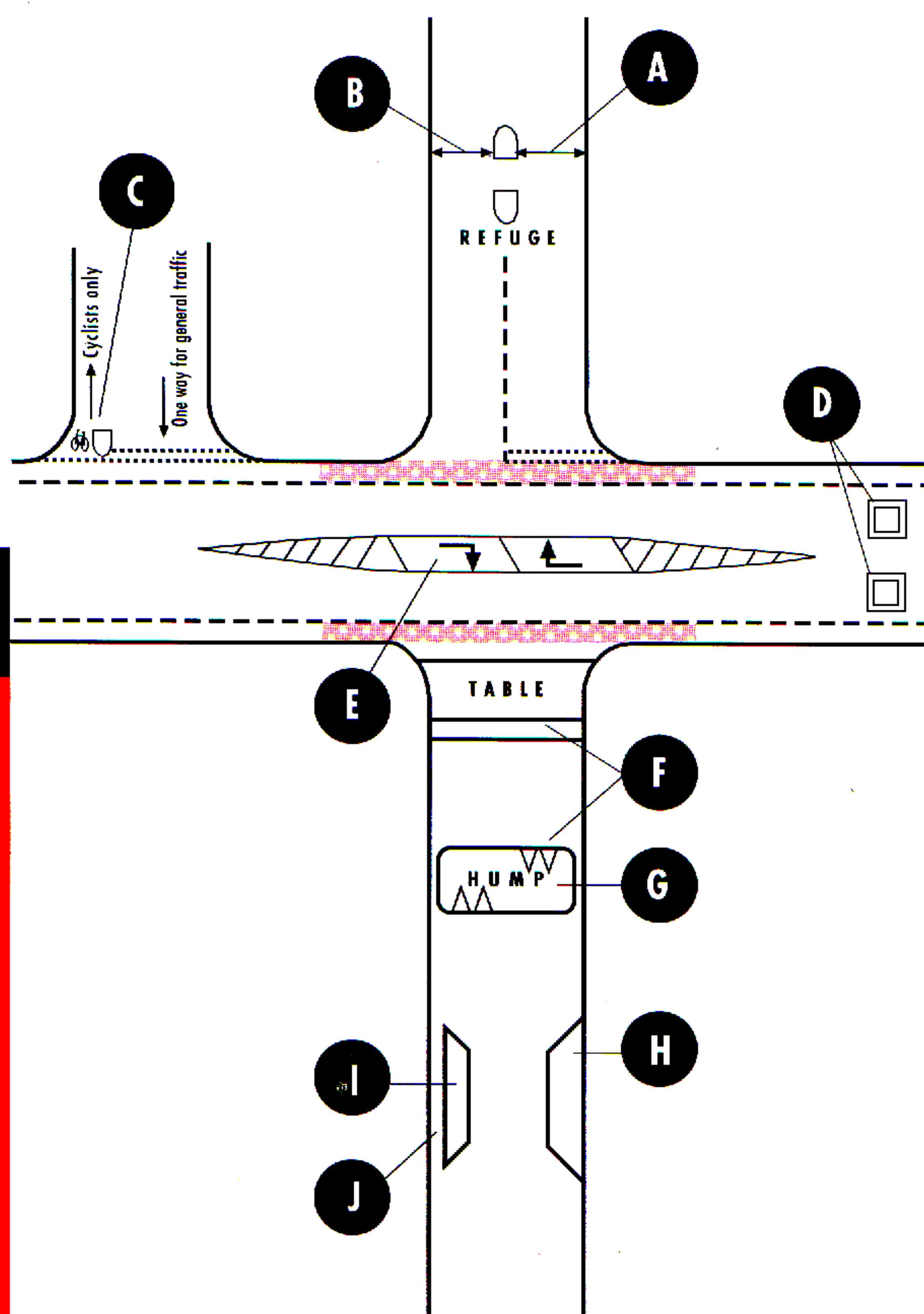
Traffic Calming – general note

Particular attention must be paid to avoiding sudden changes in level, uneven surfaces, or forcing cyclists into the path of oncoming traffic. Where possible 'bypass' routes should be introduced so that cyclists can safely avoid the measure altogether.

Speed humps and tables should be 'sinusoidal'.
(See page 6).

- A** Minimum gap: >3.85m desirable. If >4.25m then can include cycle lane.
- B** Critical width: 2.6m to 3.85m not desirable as it may encourage dangerous overtaking. Contact Cycle Team. NB: 2.6m only suitable within 20 mph zones.
- C** One Way Street – Cycle gate
It is a Council policy to allow contra-flow cycling in all new one way schemes. Requirement for segregation depends on volume of motor traffic.
- D** Speed cushions are cycle as well as bus friendly. Careful design is needed to stop cars from bypassing the cushions.
- E** Where it is proposed to install right turning lanes, every effort must be made to retain cycle lanes through the junction area. Consideration should be given to reduced lane widths, especially for the right turning traffic where this is mostly light vehicles.
- F** Transition must be flush.
- G** Should be 'sinusoidal'. (See page 6).
- H** Buildouts on major roads should not preclude the possibility of providing cycle lanes.
- I** Narrowing or narrowing with hump/table – provide bypass.
- J** Minimum gap: 1.5m desirable
1.0m absolute.

Note: Cyclists should be exempted from all road closures.



Roundabouts

The Cycle Team must be consulted on any proposals for new conventional roundabouts (including those associated with new development) as soon as they are being considered or are known.

High quality segregated cycle facilities with signalled crossings of arms will generally be required, if such roundabouts are installed.

Traditional UK roundabout designs have a poor safety record for vulnerable road users, particularly cyclists (Ref.11 *Cyclists and Roundabouts*) and make it hard to give buses priority.

With this in mind the introduction of roundabouts should generally be avoided within the built-up area.

Where they are introduced the intention must be to maximise safety for all road users, particularly the most vulnerable, such as pedestrians and cyclists, rather than to maximise capacity.

The cycle friendliness of the main design options is discussed below.

1 Conventional roundabouts (solid island, 2 or more approach and/or circulating lanes).

These are poor for cycle (and pedestrian) safety and their introduction should be avoided, particularly within the built-up area.

2 Low speed conventional roundabouts (single lane entries, single circulating carriageway).

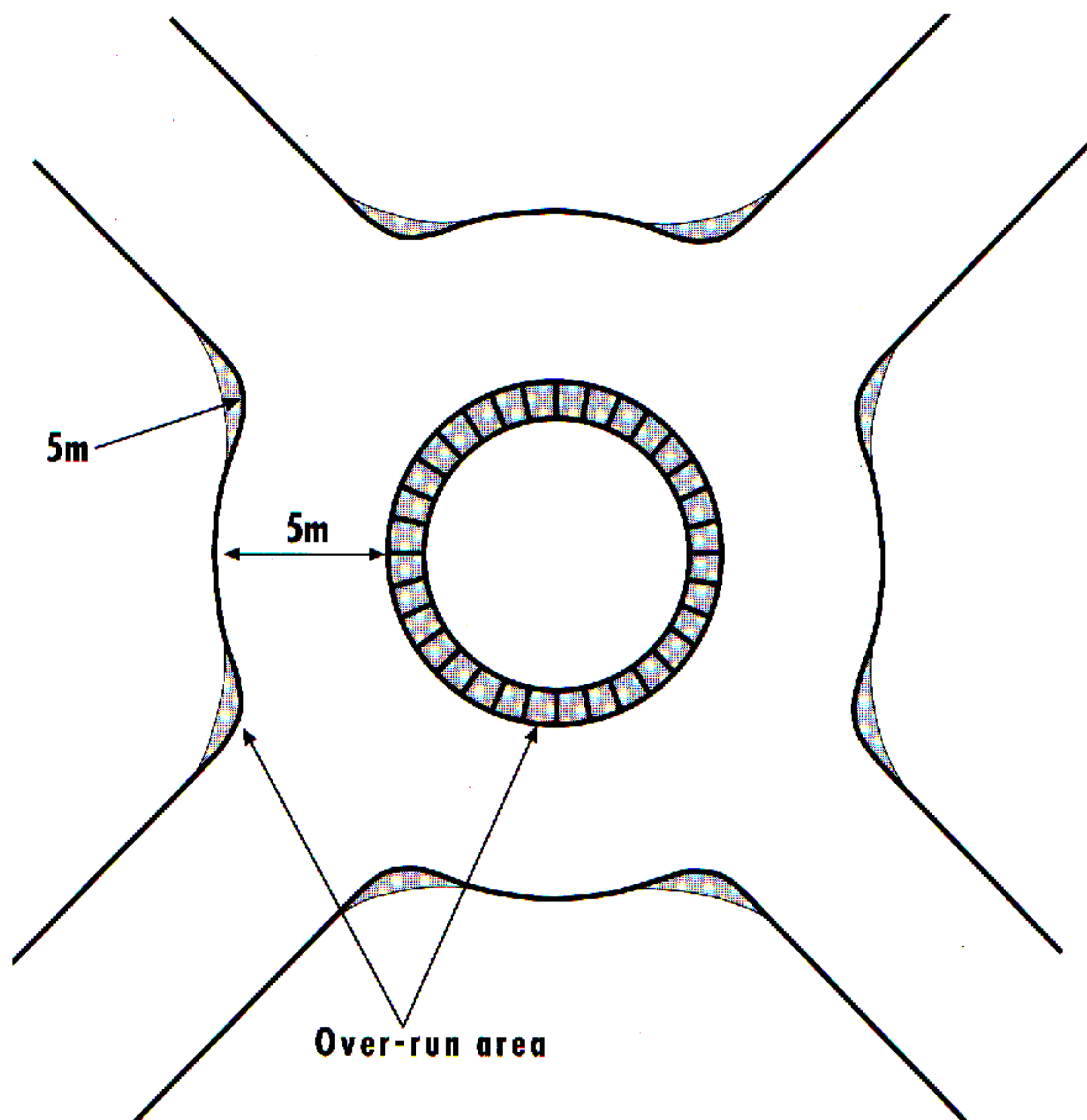
These are designed to minimise entry, circulating and exit speeds. They appear to perform satisfactorily in safety terms but are still perceived as dangerous by cyclists. An illustrative design is shown on this page. (Ref.3).

3 Mini roundabout.

These appear to be satisfactory junction type in terms of cycle safety (Ref.11 *Cyclists and Roundabouts*). Safety for cyclists and other road users is maximised by designs which minimise entry, circulating and exit speeds.

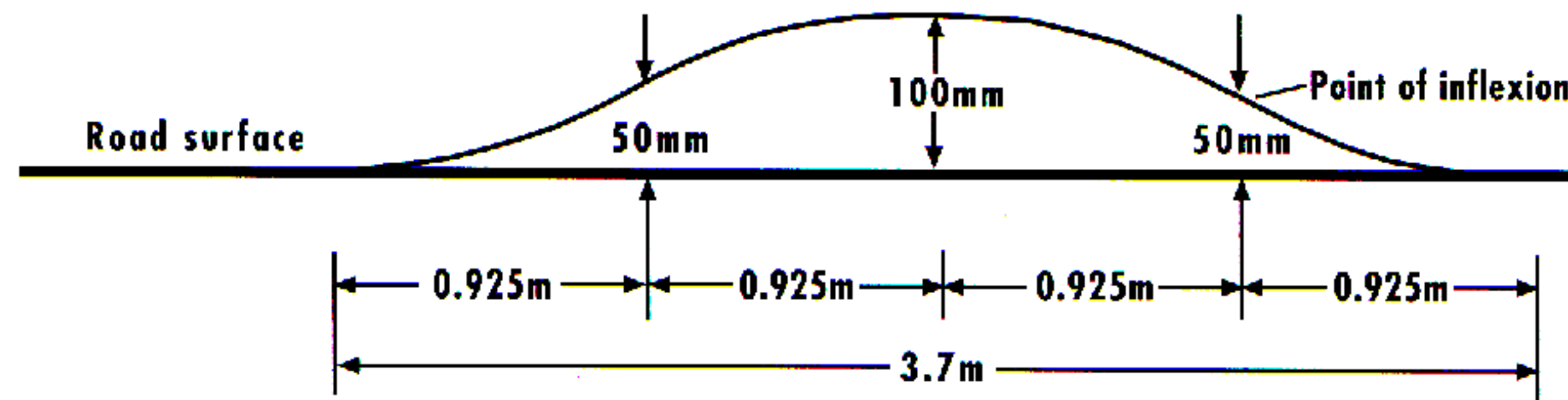
The Cycle Team must be consulted on any proposals involving two or more lanes on any entry or on the circulating carriageway.

A raised central island which encourages low vehicle speeds and prevents motor vehicles from overtaking cyclists through the mini roundabout appears beneficial.

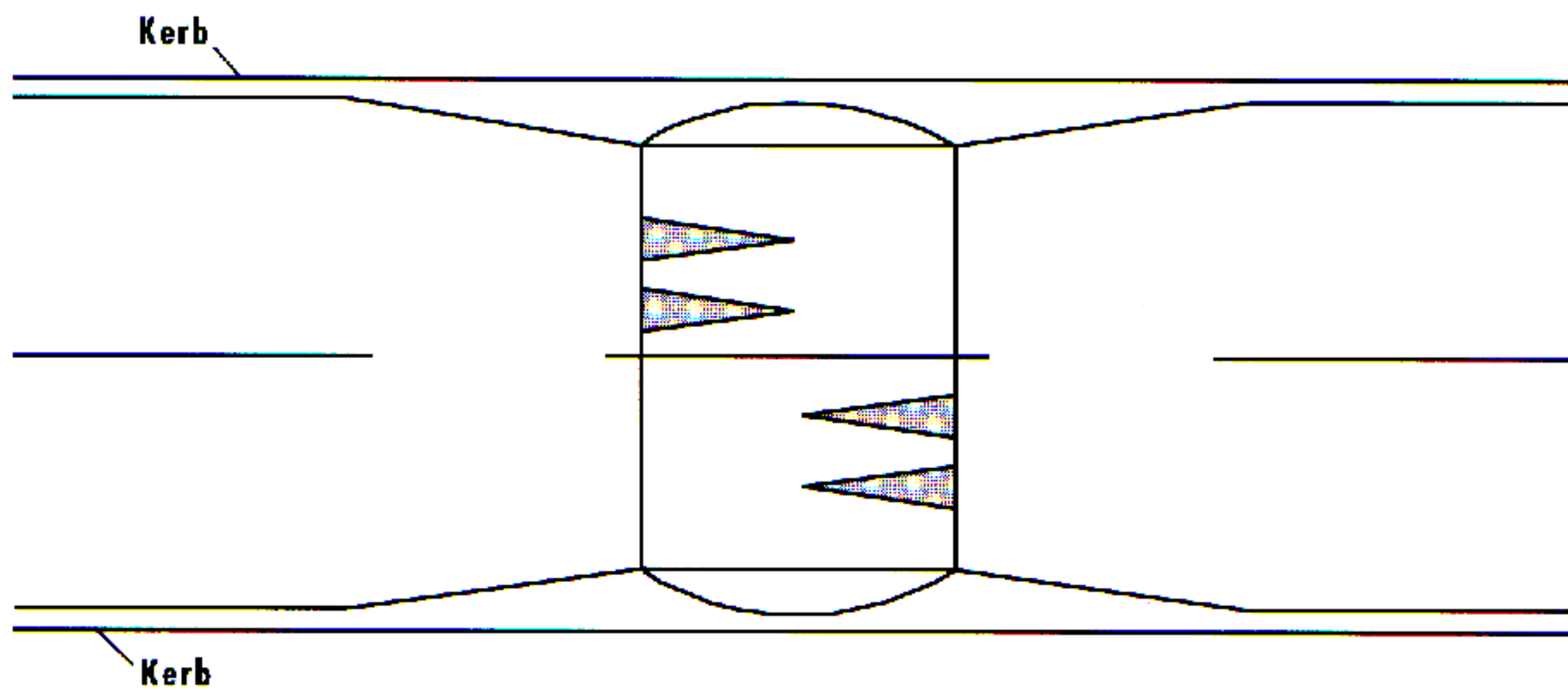


Cycle Friendly Road Humps

Standard profile road humps are uncomfortable for cyclists and should not, therefore, be installed. 'Sinusoidal' road humps appear to be as effective at reducing traffic speeds without causing problems for cyclists. At present (December 1997) sinusoidal road humps require site authorisation from the Scottish Office.



Cross section of sinusoidal road hump.
(Not to scale)



Plan view of sinusoidal road hump
(Not to scale)

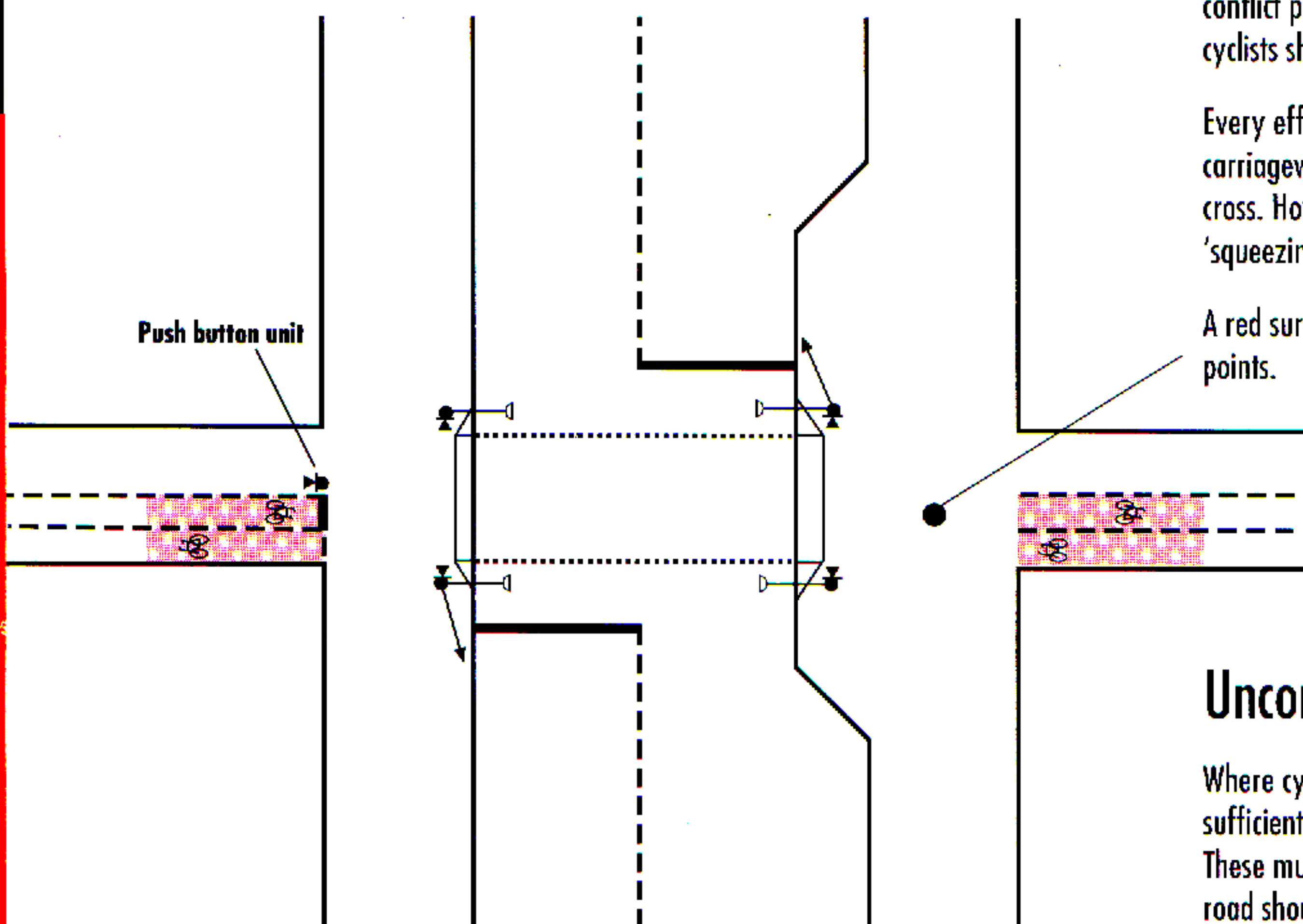
Toucan Crossings

Indicative only

Toucan crossings currently (December 1997) require Scottish Office approval. Care must be taken to avoid conflict points with pedestrians. Microwave detection of cyclists should be employed.

Every effort must be made to reduce the width of carriageways which pedestrians and cyclists are required to cross. However, this should not be at the expense of 'squeezing' cyclists on the road being crossed.

A red surface material may be appropriate at crossing points.



Uncontrolled Cycle Crossings

Where cycle flows are low and the road to be crossed is sufficiently wide, central refuge islands are beneficial. These must be at least 2m wide. Cyclists using the main road should not be squeezed. (See above).

Off-Street Cycle Tracks

Signs and markings to the following diagrams required as appropriate:

956
957
1049
1049.1
1057

It is vital to remember that cycle tracks are also used by pedestrians and wheel-chair users, including blind and partially sighted people.

Directional Signing

There should be clear directional signing at the access points to and along all cycle tracks. Consult Cycle Team for guidance on appropriate destinations.

Segregation of Cyclists and Pedestrians.

On routes within the urban area cyclists should generally be segregated from pedestrians by a raised white line (Diag. 1049.1) or a kerb, minimum height 25mm.

Widths

Segregated urban routes: desirable minimum width

- 2.0m cycles
- 2.0m pedestrians

absolute minimum width: — 1.5m cycles
— 1.5m pedestrians.

Unsegregated urban routes: desirable minimum width

- 4.0m

absolute minimum width — 2.5m
(may be 2.0m in rural areas)

These widths are for **unbounded** routes. A minimum of 0.5m (0.25m) should be added for routes bounded on both sides (one side).

Verge width

Desirable: — 2.0m

A Toucan crossing. (See page 6).

B Cycle Tracks adjacent to roads
Widths apply as for stand alone paths. There must also be a 'verge' (grass or block paving).
— preferred minimum 2.0m
— desirable minimum 1.0m
— absolute minimum 0.5m for 30mph roads.
Greater widths will be required on higher speed roads.
Designs for cycle track entry/exit points from carriageway. (See Ref.1).

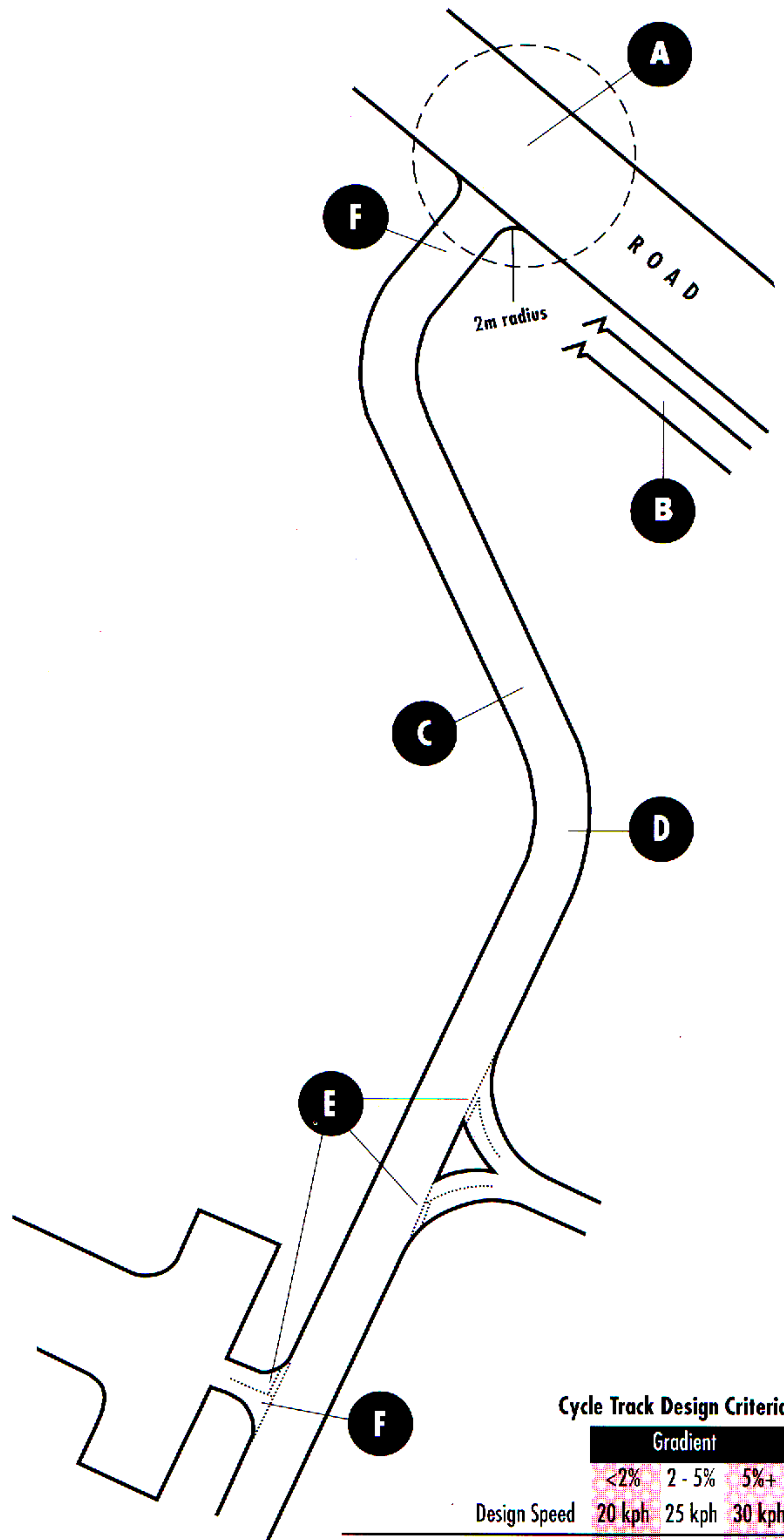
C Crossfall 2.5%

D Maximum gradient: — 1:20 desirable
— 1:12 locally.

If gradients steeper than 1:20 are proposed then consult the Cycle Team.

E Junctions of off-street cycle tracks should have priority indicated.

F Bollard may be required. (See page 11).



Cycle Track Design Criteria

	Gradient		
	<2%	2 - 5%	5%+
Design Speed	20 kph	25 kph	30 kph
Desirable minimum radius ^a	15m ^b	20m ^b	25m ^b
Stopping sight distance	20m	30m	40m
'y' distance for visible splays ^c	25m	30m	35m

^a Cycleway centre line radius

^b Consult Cycle Team if lower radii are proposed

^c 'y' distance as per Design Manual for Roads and Bridges where 'x' distance is 2.4m.

Vertical curves shall be provided at all changes in gradient. The curvature shall be large enough to provide for comfort.

Development Control Examples

As part of the development control process all possible opportunities should be taken to create direct routes for cyclists and pedestrians. For example:

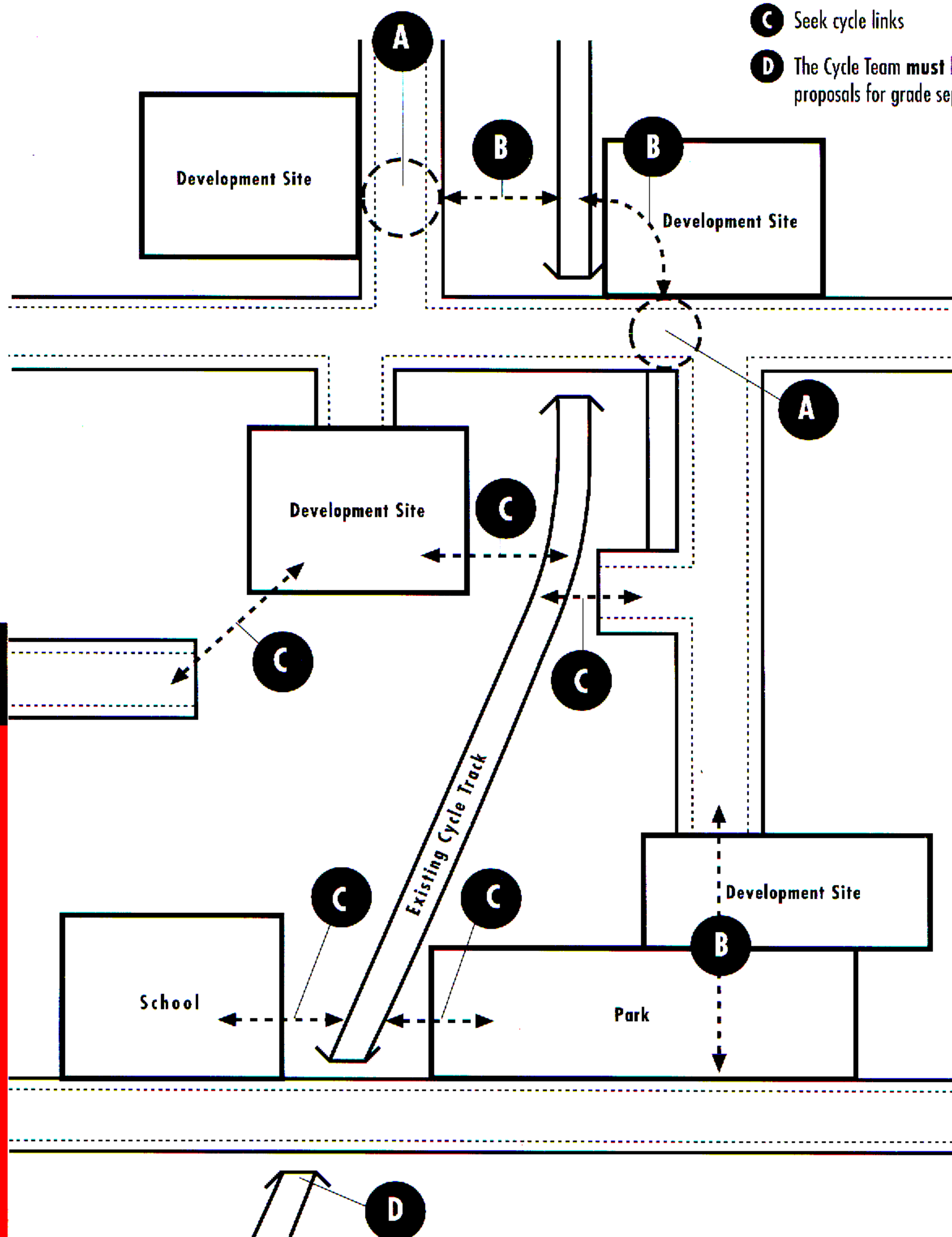
- creating accesses to and from existing cycleways
- allowing secondary accesses for cyclists and pedestrians into developments
- creating links between minor roads or cycleways through new developments
- improving the quality of cycle routes.

A Toucan crossing required

B Cycle link required

C Seek cycle links

D The Cycle Team **must** be consulted on any new proposals for grade separated cycle crossings.



Parking Requirements

Cycle parking within developments must be conveniently located near to the entrances of buildings, adequately lit, well signed and not hidden out of sight.

Numerical standards are available from Development Control officers.

Fully secure, weather protected parking is required for all employee cycle parking and for residential cycle parking.

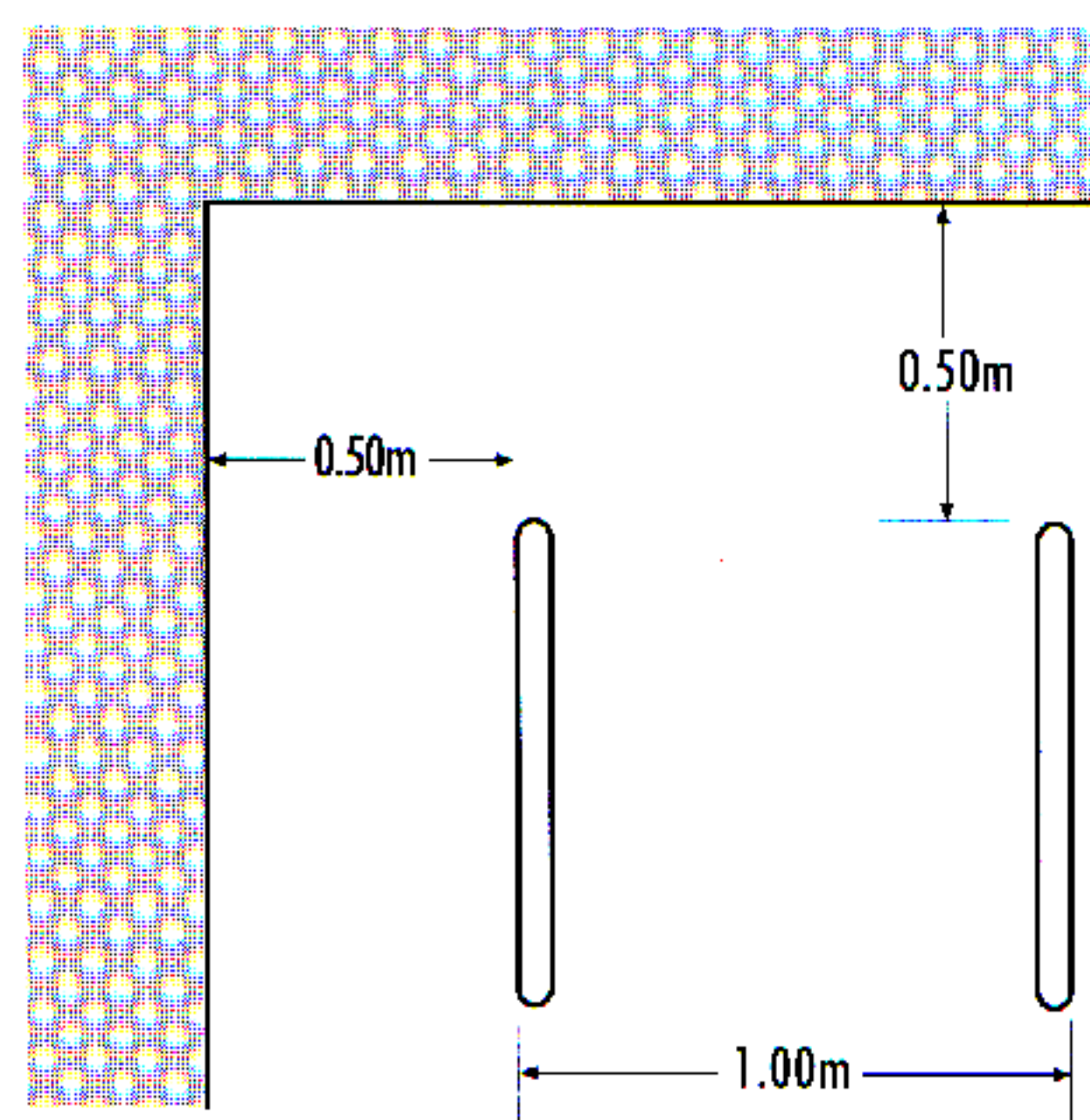
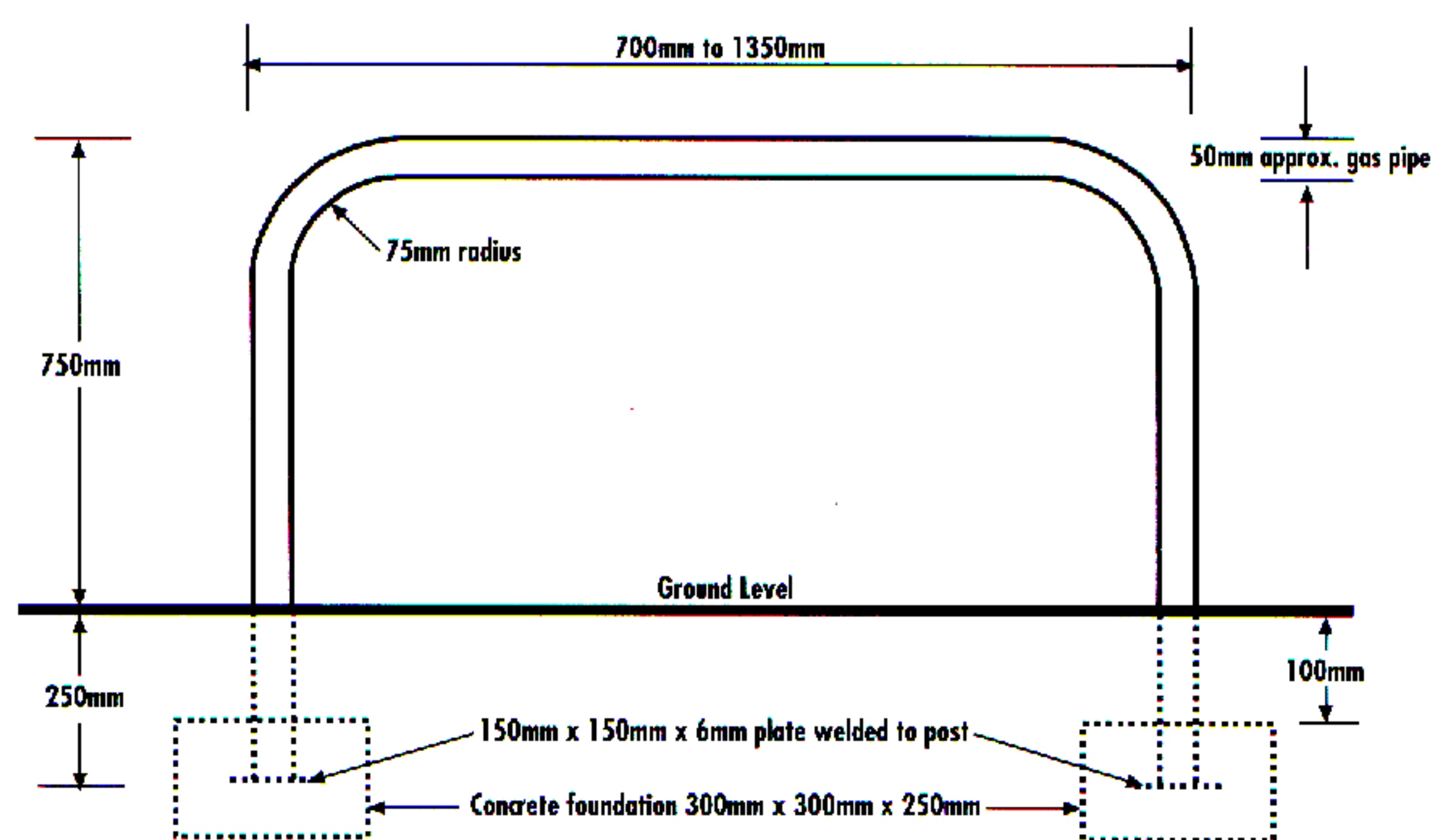
Weather protection may also be required for customer parking.

Generally, the acceptable types are:—

- 'Sheffield' style
- Rail or guard rail
- Wall bracket
- Cycle locker.

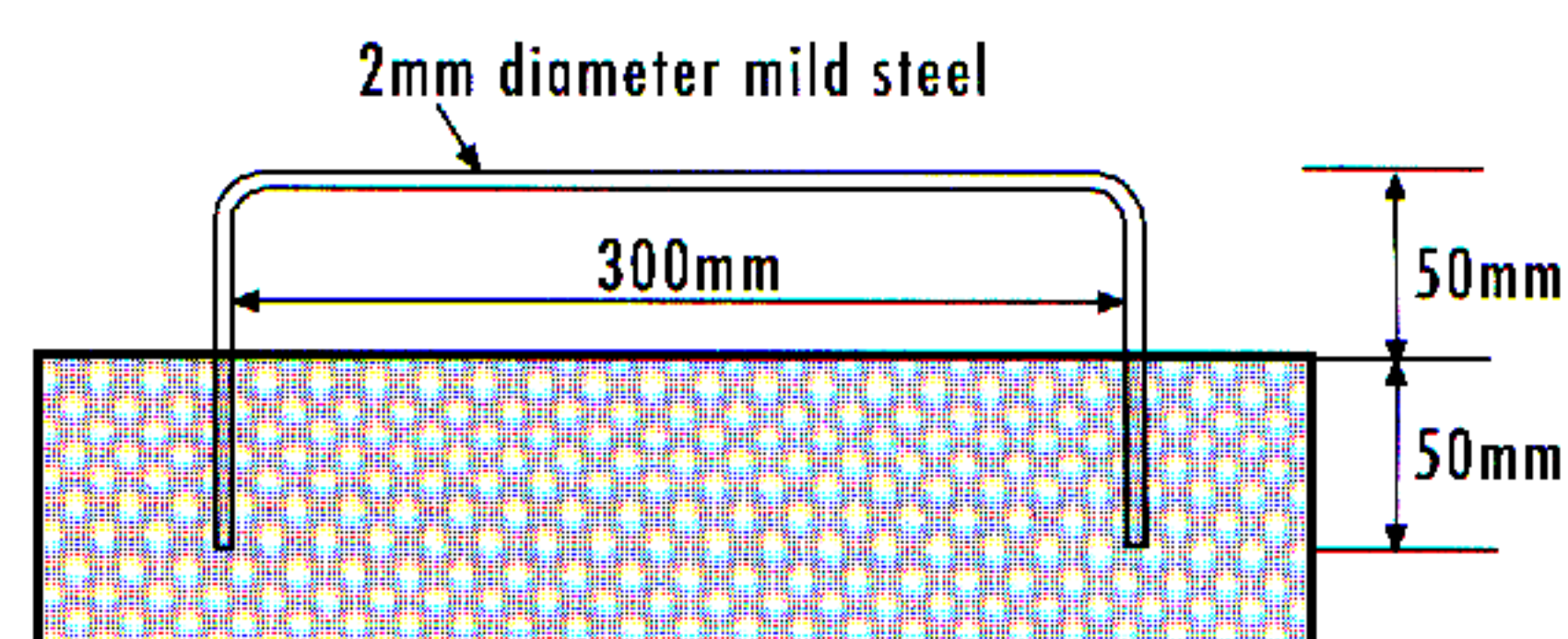
Types which only support the wheels are not suitable. Other types or innovative designs should be submitted to the Cycle Team for approval.

Sheffield cycle stand (not to scale)

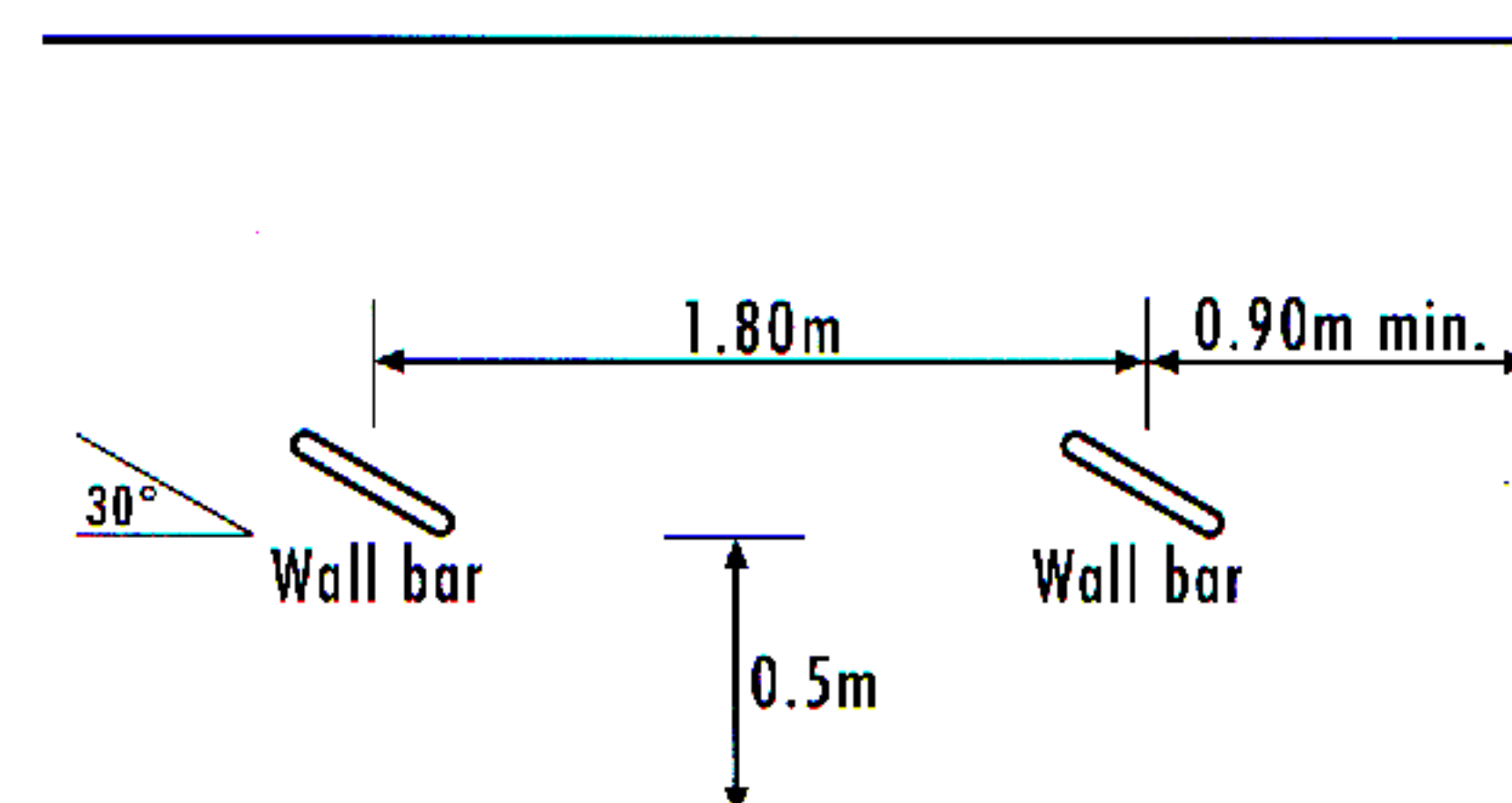


Stand layout

Wall bars



Plan (not to scale)
(Alternative to wall bar is continuous rail)



Elevation

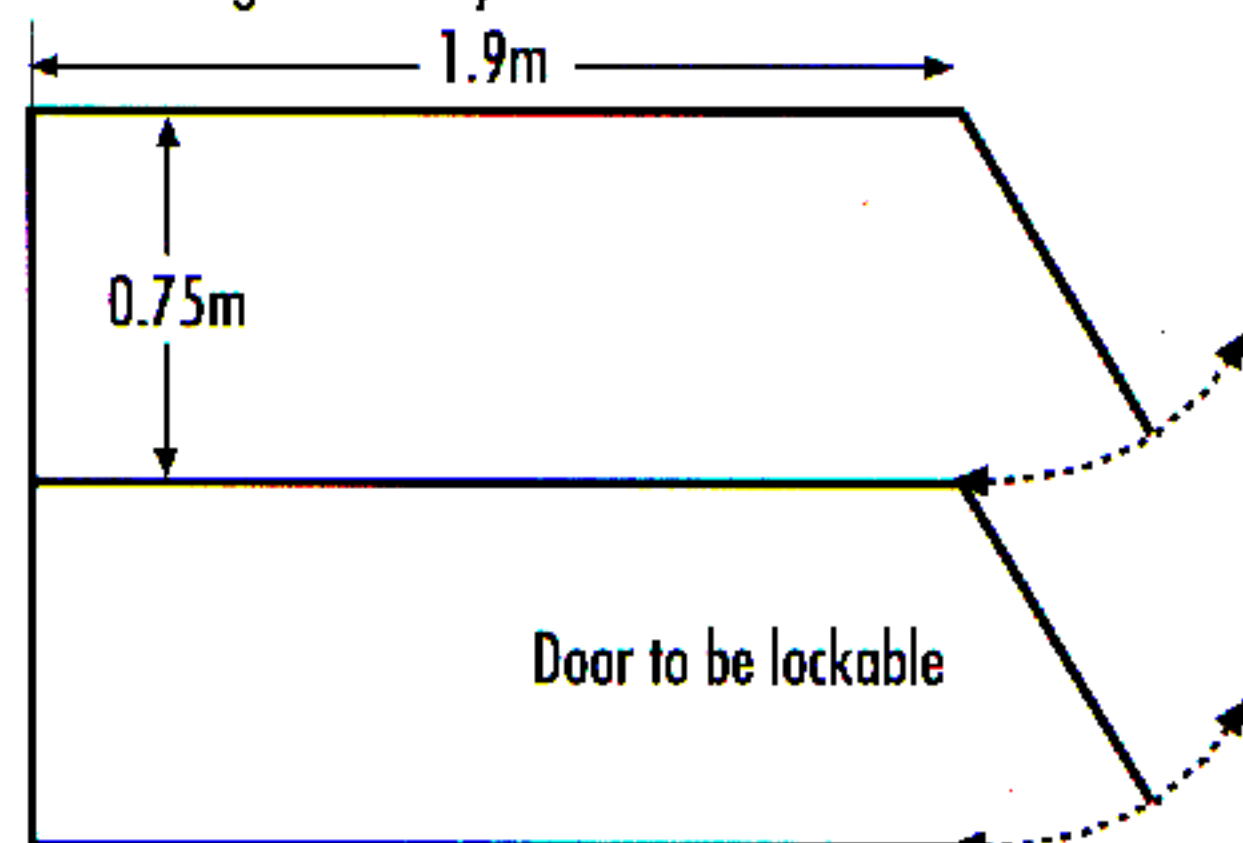
A Cycle Lockers B Secure Cycle Store

A Dimensions and suggested layout

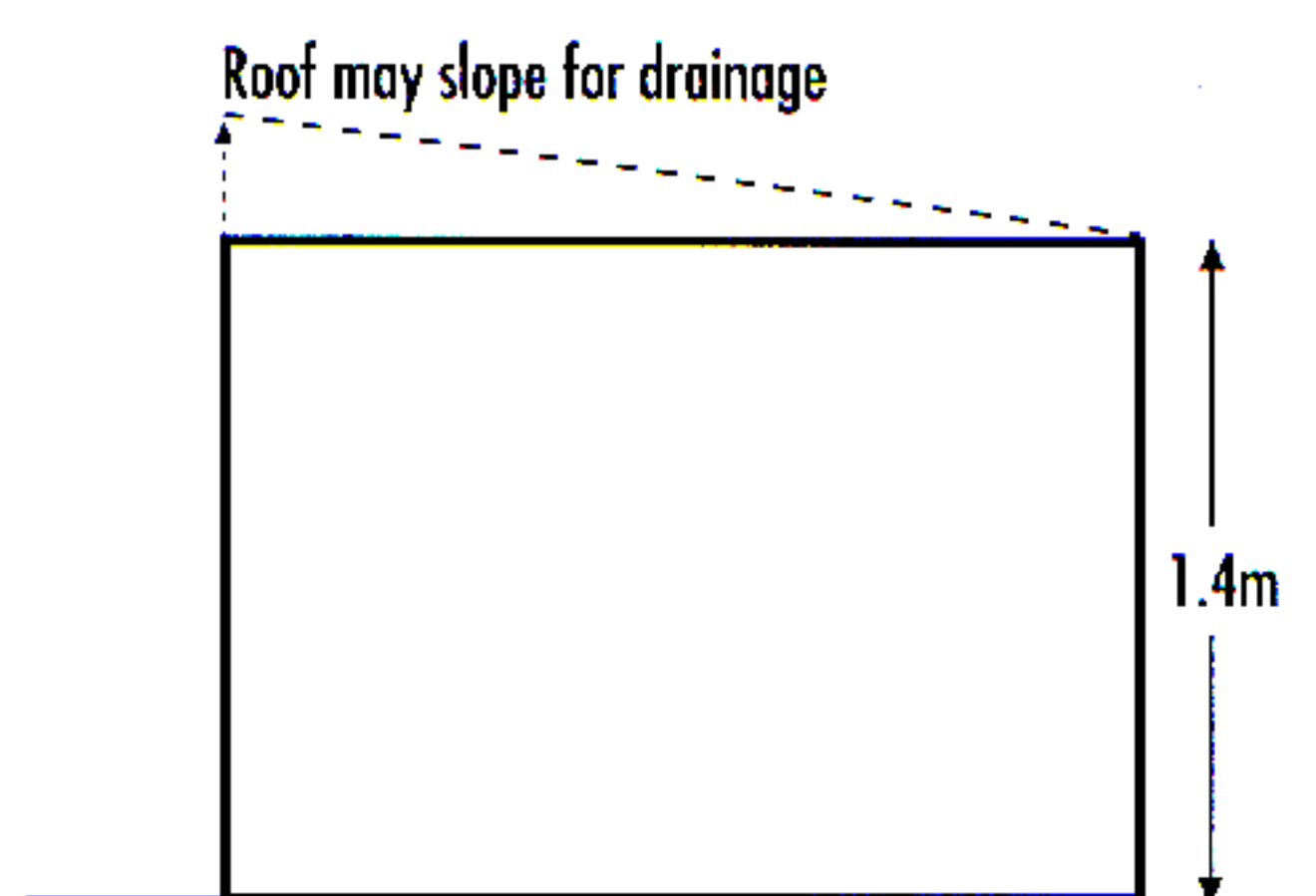
Dimensions are minimum acceptable
 Minimum space in front of door to be 1.5m.

Plan View

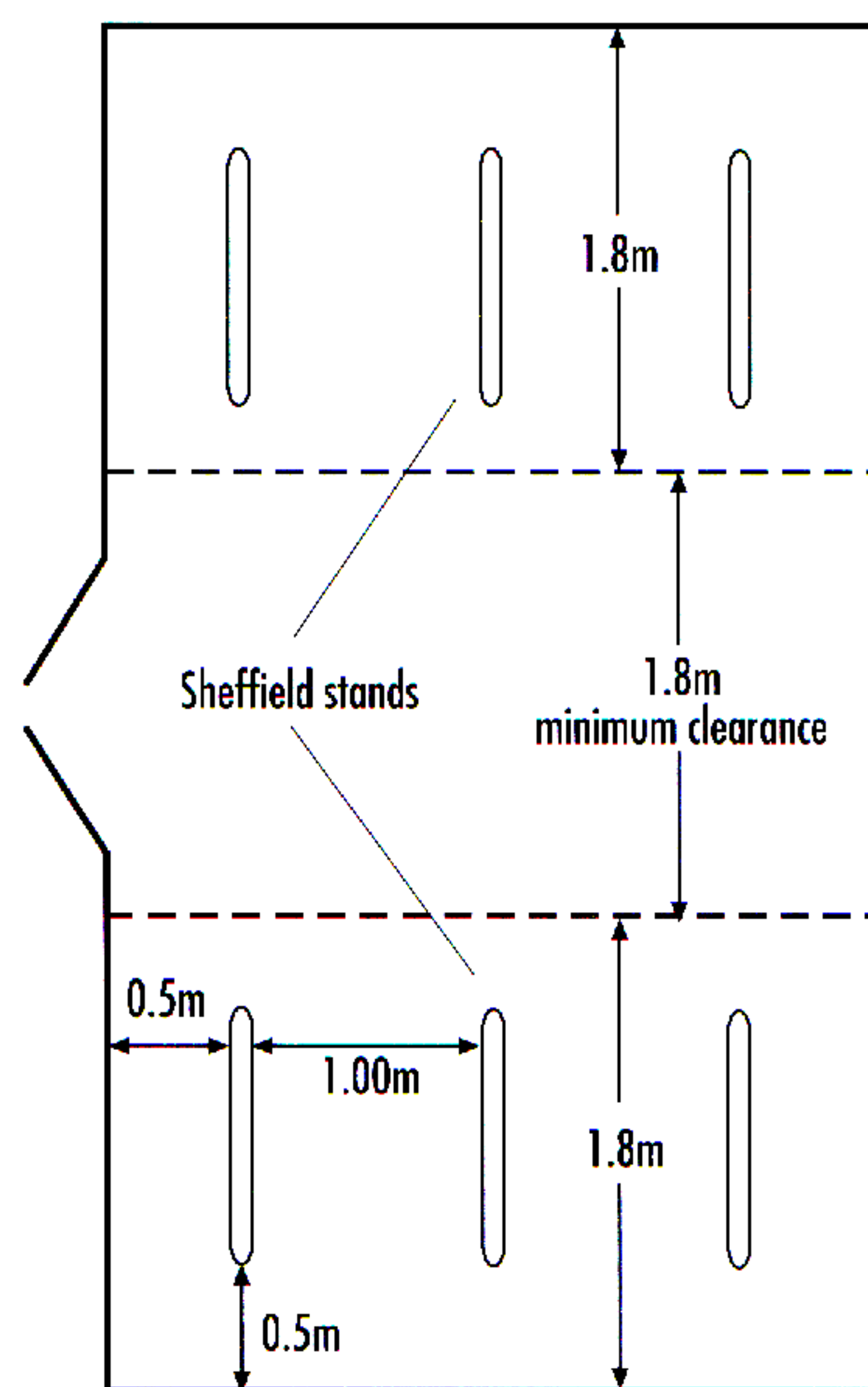
Single sided cycle locker



Elevation



B Possible layout. (Indicative only).



Cycle Lanes and On-Street Parking Dimensions

Minimum road widths required for cycle lanes. Widths required*

PARKING		DIRECTION 1				DIRECTION 2				Total width required
		Parking	Door opening strip	Cycle lane	General lane	General lane	Cycle lane	Door opening strip	Parking	
None	Absolute minimum**			1.25	2.75	2.75	1.25			8.0
	Desirable minimum			1.5	3.0	3.0	1.5			9.0
One side	Absolute minimum**	1.8	0.5	1.25	2.75	2.75	1.25			10.3
	Desirable minimum	1.8	0.7	1.5	3.0	3.0	1.5			11.5
Both sides	Absolute minimum**	1.8	0.5	1.25	2.75	2.75	1.25	0.5	1.8	12.6
	Desirable minimum	1.8	0.7	1.5	3.0	3.0	1.5	0.7	1.8	14.0

Notes * If greater widths are available, wider cycle lanes of 1.75m are desirable. Narrower cycle and vehicle lanes may be acceptable on approaches to signalled junctions.
 ** If widths below those shown as desirable are to be used, please consult the Cycle Team.

Access Barriers

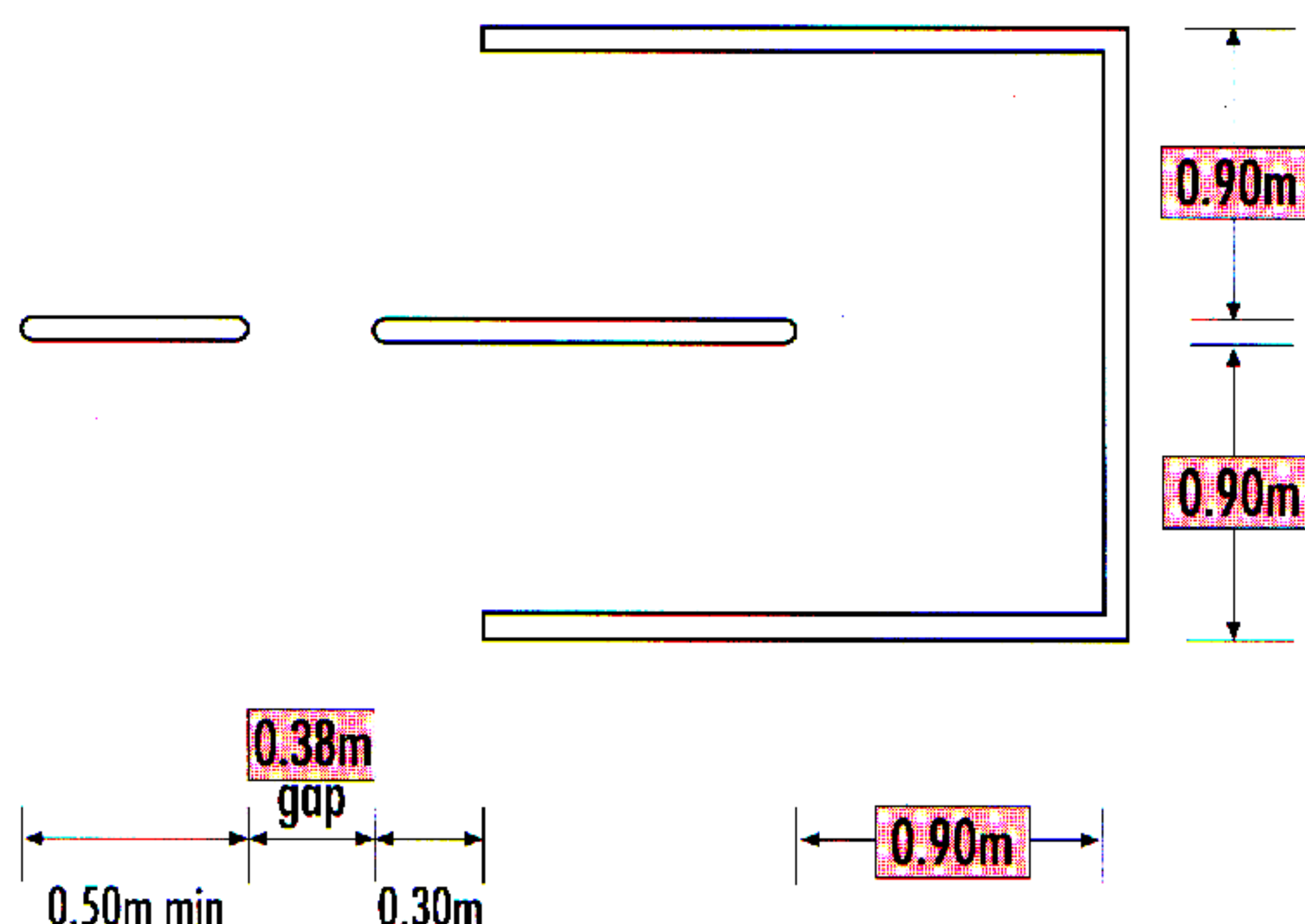
Access barriers are an impediment to convenient cycle and pedestrian use. Within the urban area barriers should not be installed on new cycleways. However the design of cycleway entrances should allow for later installation of barriers of the design shown, if problems arise with illegal use of the cycleway by motor cyclists.

Initially a robust bollard should be installed as shown opposite.

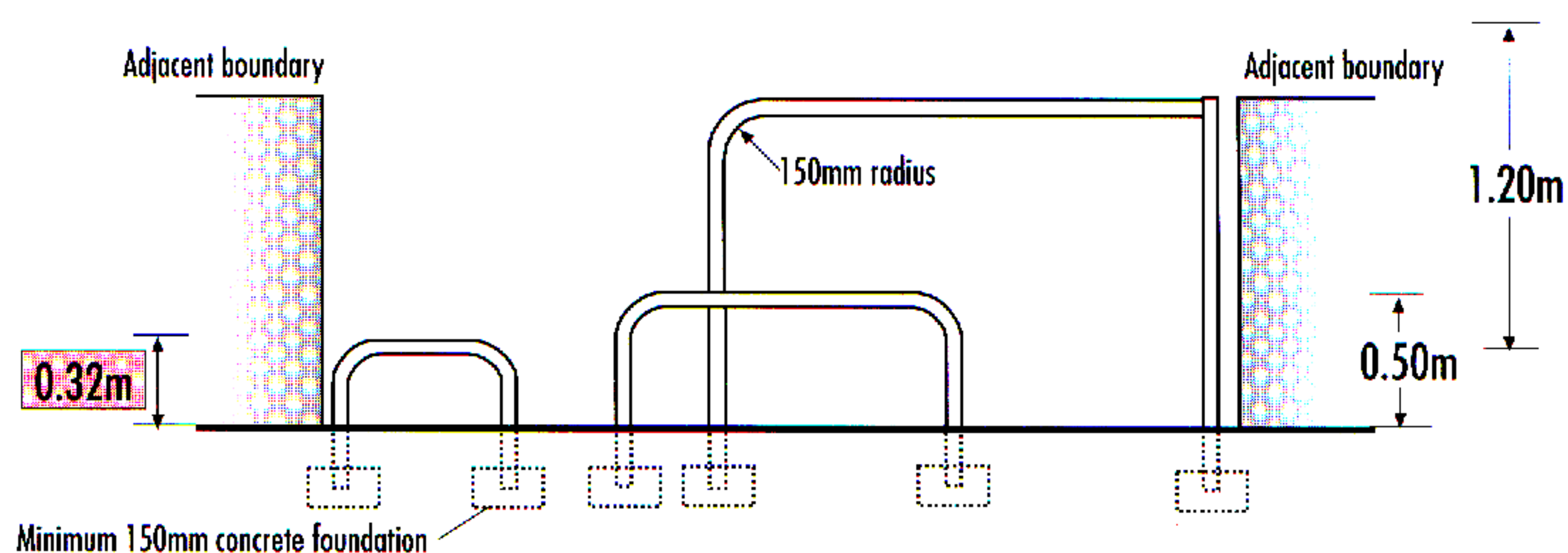
Barriers **must** take account of the needs of cyclists, pedestrians, push chairs, prams and wheel chair users.

Boxed dimensions in red are critical to the effective operation of the barrier

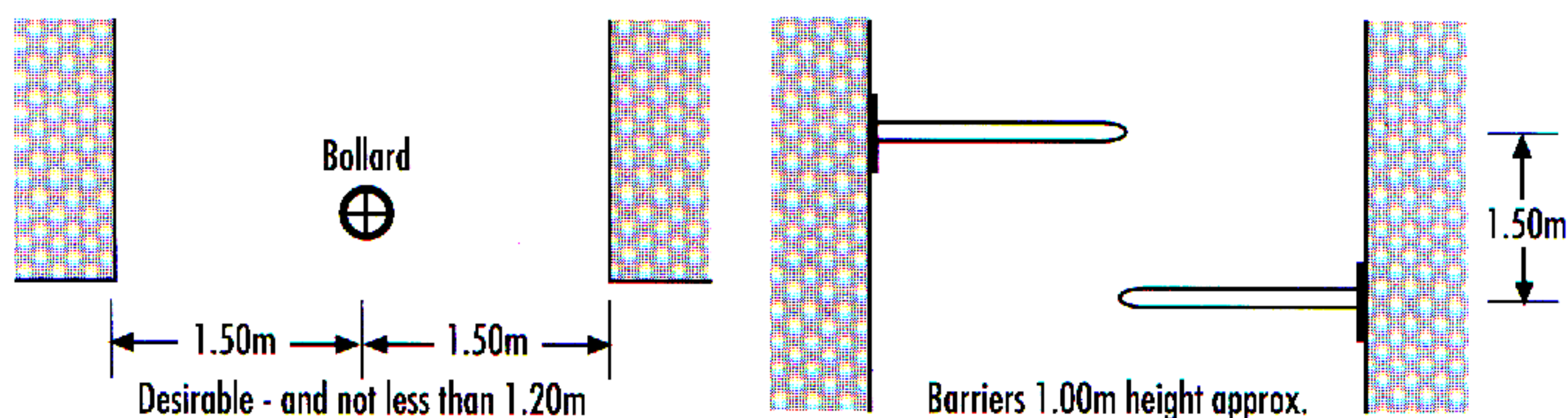
Plan of barrier with wheel chair bypass



Section through barrier



Alternatives to full barrier



Documents and Publications used by The City of Edinburgh Council

(Recommended publications are in **bold type**)

- 1 National Cycle Network Design Guidance. Issue 2**
Sustrans, 35 King Street, Bristol.
Tel: 01179 268893. (£25).
- 2 Cycle Friendly Infrastructure: Guidelines for Planning and Design**
Cyclists Touring Club, Coterrell House,
69 Meadow, Godalming, Surrey, GU7 3HS.
Tel: 01483 417217. (£15).
- 3 Sign Up for the Bike, Design Manual for a Cycle Friendly Infrastructure**
CROW, PO Box 37, NL-6710 BA EDE,
Netherlands.
Tel: 00318380 20410. (£20 approx).
- 4 The National Cycling Strategy**
Department of Transport, DITM Division,
Zone 3/23 Great Minster House,
76 Marsham Street, London, SW1P 4DR.
- 5 TAU Leaflet 5/96 – Advanced Stop Lines.**
The Scottish Office, Development Dept,
Transport and Local Roads Division,
Zone 2-E Victoria Quay,
Edinburgh, EH6 6QQ.
Tel: 0131 244 0839. (Free).
- 6 TAU Leaflet 3/96 – Bike and Ride**
The Scottish Office, Development Dept,
Transport and Local Roads Division,
Zone 2-E Victoria Quay,
Edinburgh, EH6 6QQ.
Tel: 0131 244 0839. (Free).
- 7 TAU Leaflet 9/95 – Cycling Bibliography**
The Scottish Office, Development Dept,
Transport and Local Roads Division,
Zone 2-E Victoria Quay,
Edinburgh, EH6 6QQ.
Tel: 0131 244 0839. (Free).
- 8 The Bicycle in Denmark – Present Use and Future Potential
Trafikministeriet, Frederiksholm Kanal 27,
DK-1220 Kobenhavn K.
Tel: +45 3392 3355 Fax: +45 3312 38 93.
(Free).
- 9 More Bikes – Policy Into Best Practice
Cyclists Touring Club, Coterrell House,
69 Meadow, Godalming, Surrey, GU7 3HS.
Tel: 01483 417217. (£10).
- 10 Safety of Cyclists in Urban Areas – Danish Experiences – Traffic Safety and Environment Report 10.
Danish Road Directorate, Niels Juels
Gade 13, Postboks 1569, DK-1020
Kobenhavn K.
Tel: +45 3393 3338, Fax: +45 3315 6335.
(Free).
- 11 Cyclists and Roundabouts – A Review of Literature
Cyclists Touring Club, Coterrell House,
69 Meadow, Godalming, Surrey, GU7 3HS.
Tel: 01483 417217. (£10).



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