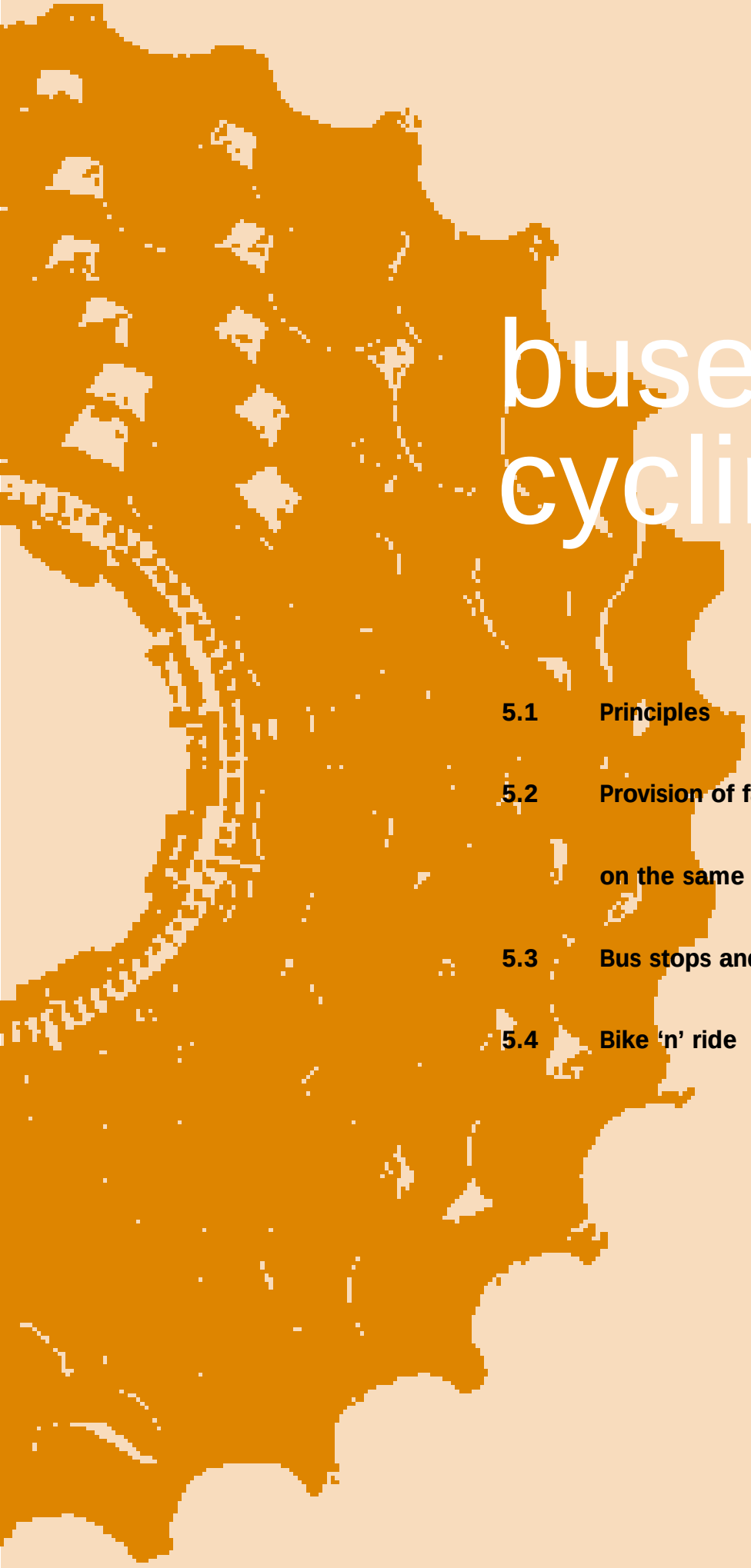


buses & cycling

5.1 Principles

5.2 Provision of facilities for buses and cyclists on the same road

5.3 Bus stops and cycle facilities

5.4 Bike ‘n’ ride

5.1 Principles

Public transport and cycling are both considered environment-friendly modes of traffic, and are very often promoted in traffic policy plans. Where public transport and cycling facilities meet, an integrated design must ensure that neither mode inconveniences the other. The requirements of an integrated design for both modes are: safety, comfort and directness (neither should be unnecessarily delayed).

The recommendations given below deal with situations where the two traffic modes meet. The issues addressed are:

- facilities for buses and cycling on the same roadway;
- bus lay-bys, bus stops and cycle facilities;
- parking facilities for cyclists near public transport.

5.2 Provision of facilities for buses and cyclists on the same road.

Basically there are four different types of facility:

- physical segregation;
- visual segregation;
- mixed use of the bus lane (by bus and bicycle only);
- streets used predominately by cyclists and buses.

The type of segregation required in these situations depends on the following criteria:

- function of the route for both cyclists and buses;
- cycle volumes and frequency of buses;
- driving speed;
- car parking;
- room required by each mode;
- cost.

Table 5.1 gives an overview of how these criteria have an impact on deciding which facilities to implement.

TABLE 5.1 | PUBLIC TRANSPORT AND CYCLING ON THE SAME ROAD SECTION

Criteria Shape	Function of the road in the network	Volumes (per hour) one direction)	Speed of bus	Parking and other facilities	Implementation room (bus and cycle only) and costs	Remarks
Physical segregation See figure 5.1	Main use is for public transport and cycling.	Frequency = > 20 buses Cycle volumes = > 200	50 - 70 km/h	Parking can be installed between the cycle track and the bus lane.	Width of 5.75m. Will have the highest costs.	Optimum design recommended for all situations.
Visual segregation See figure 5.2	Important use by both public transport and cycling.	Frequency = < 20 buses Cycle volumes = > 100	< 50 km/h	Parking can only be installed on the left-hand side of the on-road cycle track, but this is not recommended. Short stay parking in front of shops must be avoided.	Width of 4.75m.	Can be an alternative to physical segregation if speed is below 50 km/h
Mixed use of bus lane	Less important use for buses and cycling. Main routes should be planned elsewhere.	Frequency = 10 - 20 buses Cycle volumes = < 100	approx. 30 - 50 km/h	Low level of parking movements allowed alongside the bus route only	Width of 4.25m.	Only applicable on short sections and with low speeds.
Mixed street use (but used predominately by cyclists and buses) one-way or two-ways See figure 5.3a and 5.3b	Predominately used by buses and cyclists. Other motorised traffic is subordinate.	Bus frequency may range from low to high frequencies. The cycle volumes may vary from low to high.	< 30 km/h	Limited parking along the street, but preferably organised in squares and /or garages	Width can be variable: if two-way: 9.30 - 6.50m. if only one-way 6.20 - 4.25m	Due to traffic calming, the quality of life and safety in an area is improved.

5.2.1 Physical segregation

Where to apply

While no strict warrants are available, it is clear that segregated cycle facilities are needed where buses travel at high speeds (> 50 km/h), and when the bus frequencies are high (>20/hour per direction).

Specification

- A bus lane can be physically segregated from a cycle track by use of:
- a strip of paving set (see § 3.5);
- a raised edge (see § 3.5);
- an adjacent cycle track (see § 3.5);
- a parking lane, whether or not in combination with one of the options mentioned above (see § 3.5).

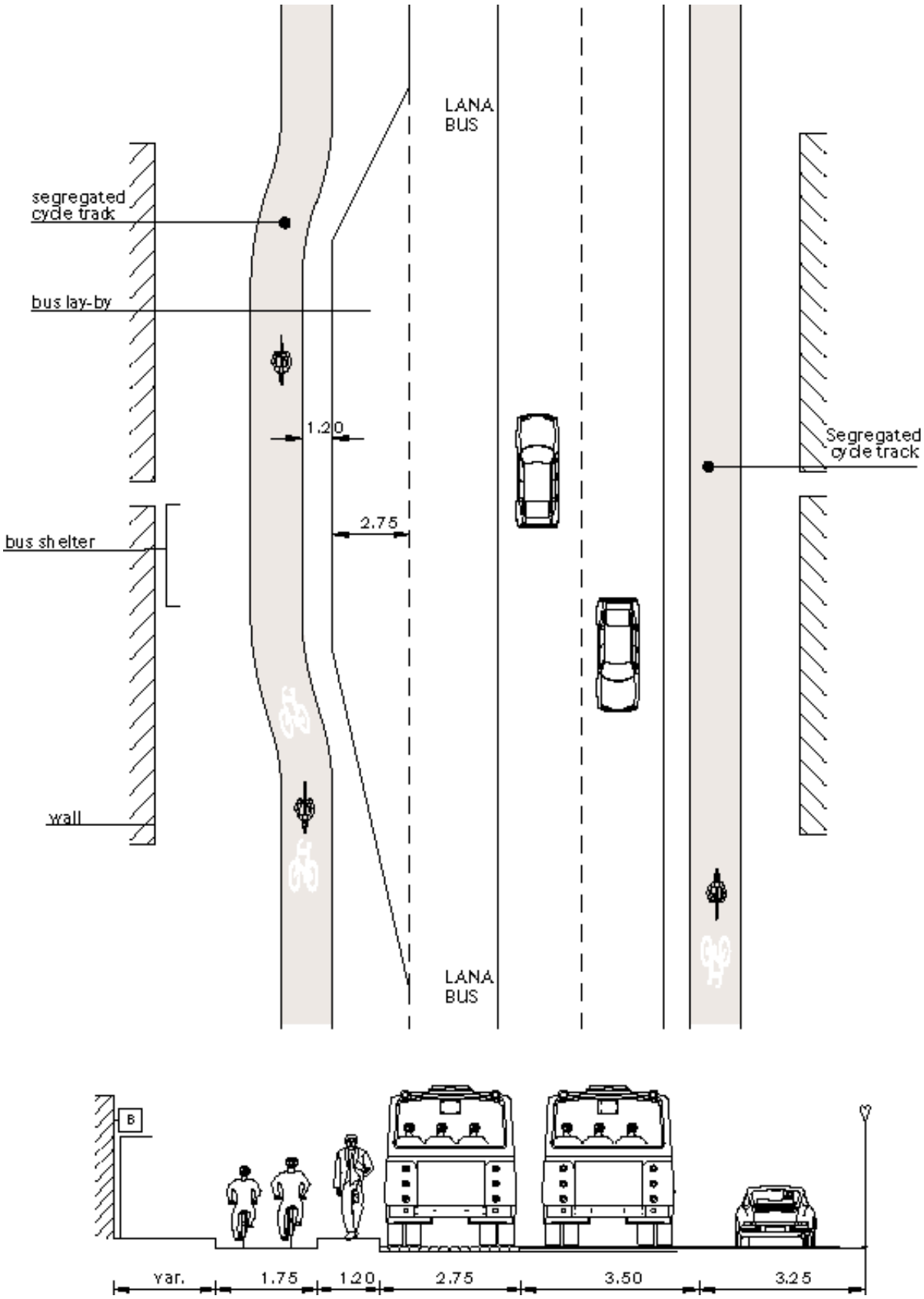
Dimensions

- The minimum width of the cycle track must be 1.50m.
- The width of the bus lane should be 3.25m.
- The recommended dimensions for the different types of physical segregation are given in § 3.5.

General comments

- Physical segregation is the best design since neither mode will inconvenience the other. Regardless of traffic volumes it can be used in all situations, however it should be noted that in corridors with high bus frequencies and speeds, the need for physical segregation is greatest.
- When there is no room for physical segregation or visual segregation, the only alternative is to reduce the driving speed of the buses to a maximum of 50 km/h.
- Car parking facilities should be placed between the cycle track and the bus lane.
- A width of 0.30m on the paving set strip must always be left free. This is to allow for the overhang of bus wing mirrors.
- Physical segregation can be integrated with the design for a bus lay-by and bus stops (see § 5.3).

FIGURE 5.1 | SEGREGATION BY MEANS OF PAVING SET STRIP



5.2.2 Visual segregation (fig 5.2)

Where to apply

While no strict warrants are available, basic segregation can be applied when the speeds of buses are below 50 km/h and when bus frequencies are not too high (preferably below 20/hour).

Specification

- An on-road cycle track is installed directly beside the bus lane.
- The on-road cycle track is coloured red and indicated with a cycle logo.
- When motorised traffic may cross the on-road cycle track, a broken white line should be used.
- When there is no reason for motorised traffic to cross the on-road cycle track, the marking should consist of a solid white line.

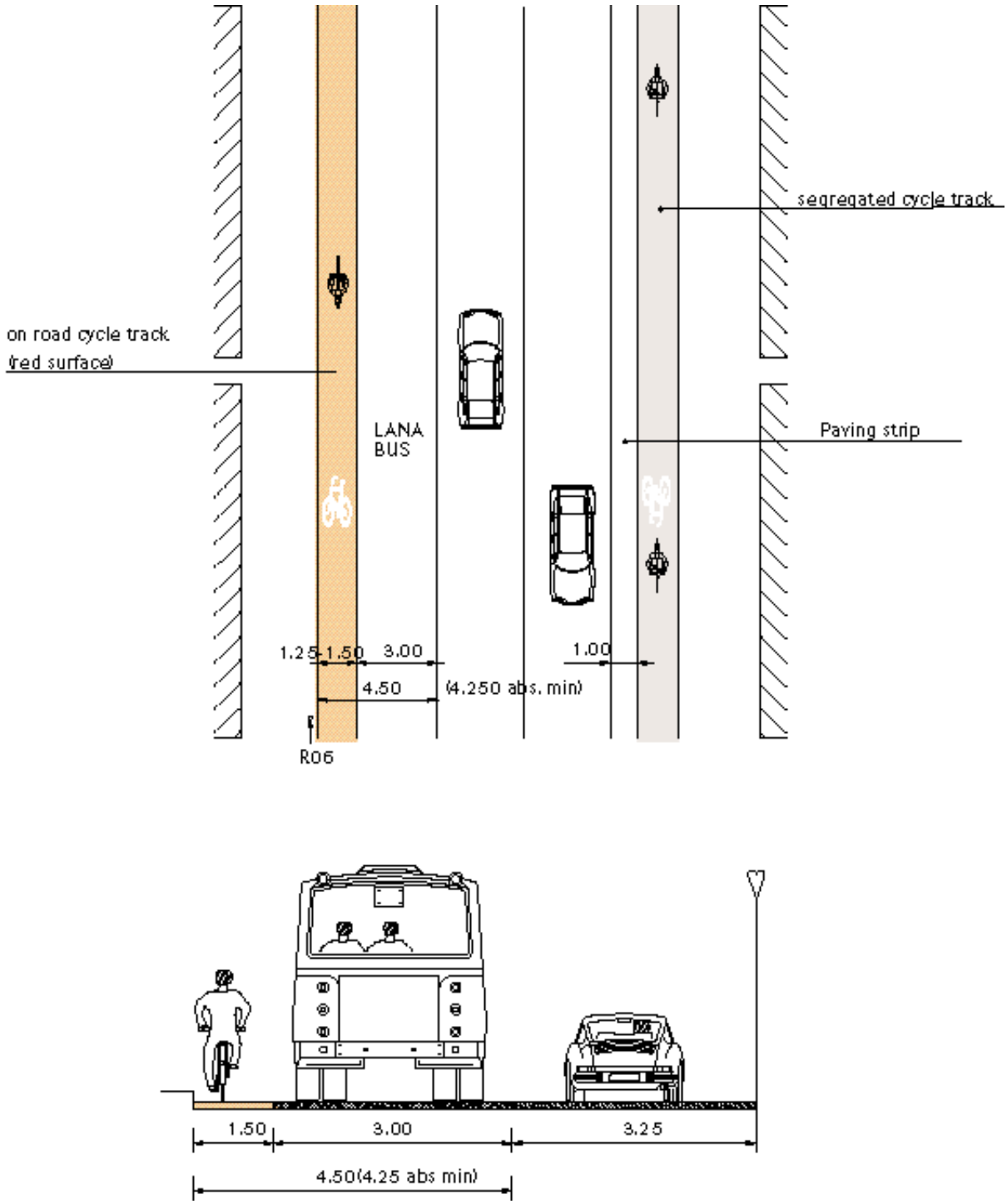
Dimensions

- The minimum width of the on-road cycle track must be 1.25m; preferably it should be 1.50m.
- The preferred width of the bus lane (adjacent to the on-road cycle track) is 3.00m. This leads to a lower driving speed and more available manoeuvring space.
- The combined minimum width of the bus lane and on-road cycle track must be no less than 4.25m. Preferably it should be 4.50m.

General comments

- The red surface of the on-road cycle track indicates clearly the position for cycle traffic and buses at the same time.
- It should be remembered that during rush-hours high volumes of buses and cyclists can cause conflicts, particularly when cyclists want to overtake each other. The on-road cycle track should therefore preferably be 1.50m wide.
- Parking can be a problem because motor vehicles have to cross a bus lane and on-road cycle track to reach the parking bays.
- When a parking lane is installed it is always preferable to place the cycle traffic on the left of the parking lane. This lay-out requires little extra width compared to placing the parking lane on the left of the on-road cycle track.

FIGURE 5.2 | VISUAL SEGREGATION



5.2.3 Shared use of the bus lane (fig 5.3a, b)

Where to apply

In principle cyclists should always have access to with-flow bus lanes if no other cycle facilities are provided. Shared use can apply with the following conditions:

- bus speeds should be 30 km/h or less;
- bus frequencies (< 10 per hour) and cycle volumes should be low otherwise the likelihood of accidents will dramatically increase. This might happen during rush-hours;
- does not apply to contra flow bus lanes.

Specification

- Shared use of a bus lane by cyclists and buses.
- The bus lane is marked with a solid white line.
- The name “Bus Lána ” is marked on the road surface.

Legal status

- Cyclist may use the with-flow bus lane.

Dimensions

- The width of a bus lane should preferably be 4.00m. The minimum width is 3.50m. This will leave room for buses to overtake cyclists.

General comments

- This design can only be used on roads where buses and cycle traffic have a minor function. If the road function is higher, this solution can be accepted but only over short distances (e.g. at the approach to a junction or while crossing a bridge). In these circumstances bus speeds should be kept below 30 km/h.
- Where feasible at bus stops, cyclists should be able to overtake the stationary bus on the left hand side. The best design option is shown in figure 5.3b. If a left side facility is not provided, cyclists will overtake the bus on the right hand side. This latter situation can lead to dangerous conflicts with motorised traffic.

FIGURE 5.3A | SHARED USE OF THE BUS LANE

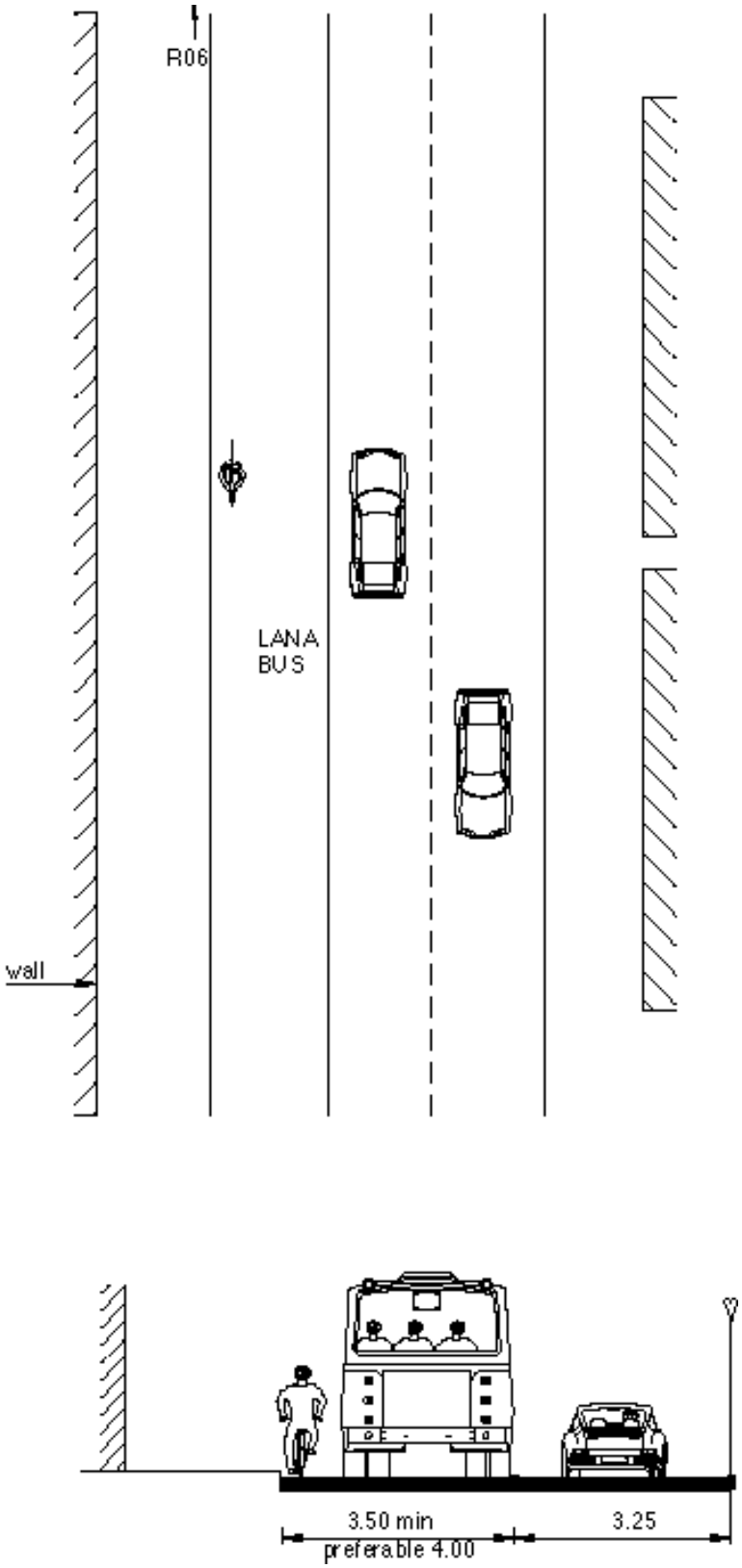
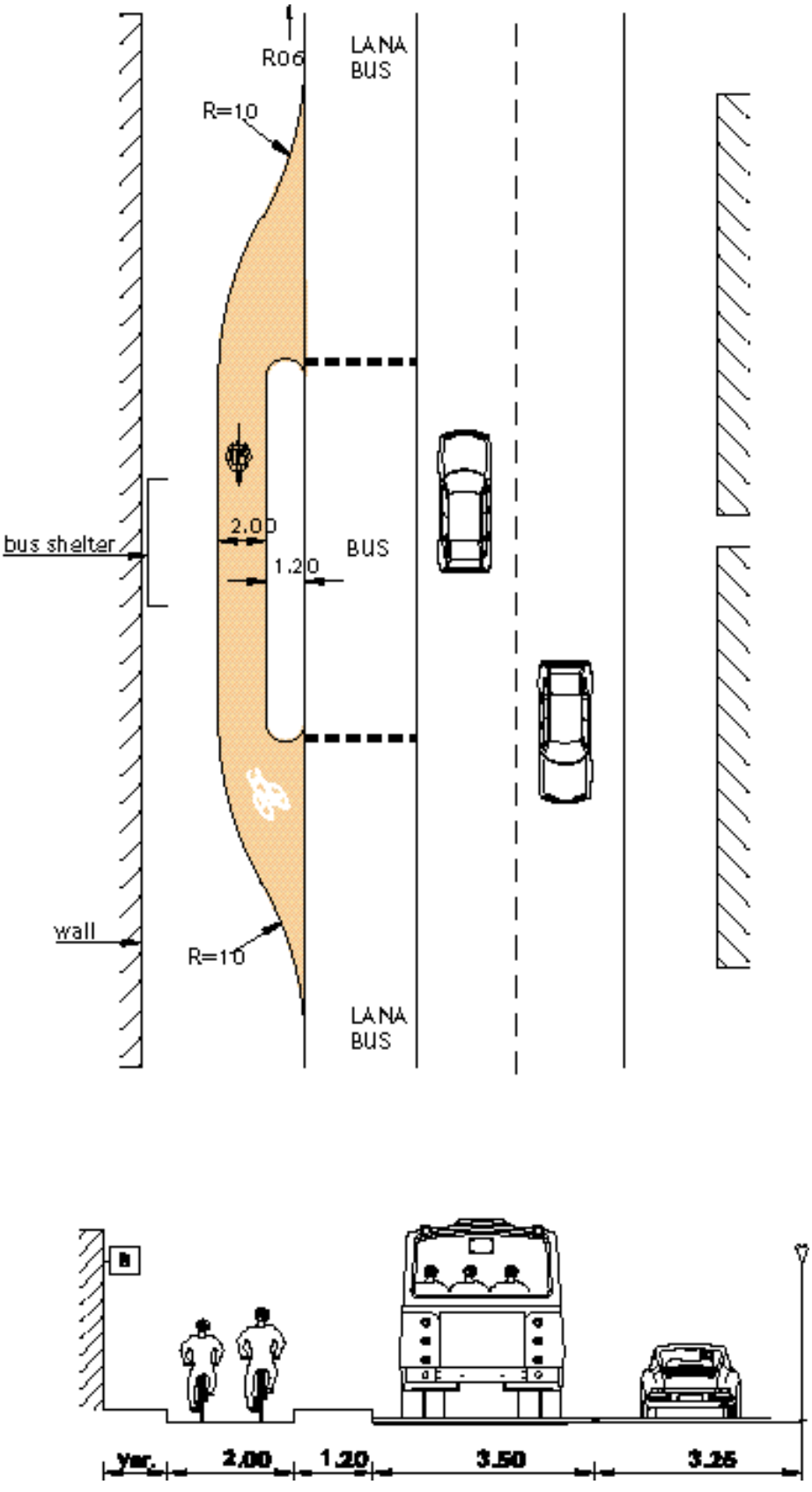


FIGURE 5.3B | SHARED USE WITH SEGREGATION AT A BUS STOP



5.2.4 Cycle track alongside contra-flow bus lane (fig 5.3c)

Where to apply

While cyclists are not permitted to use contra-flow bus lanes, it is permitted to provide a cycle track in parallel with them.

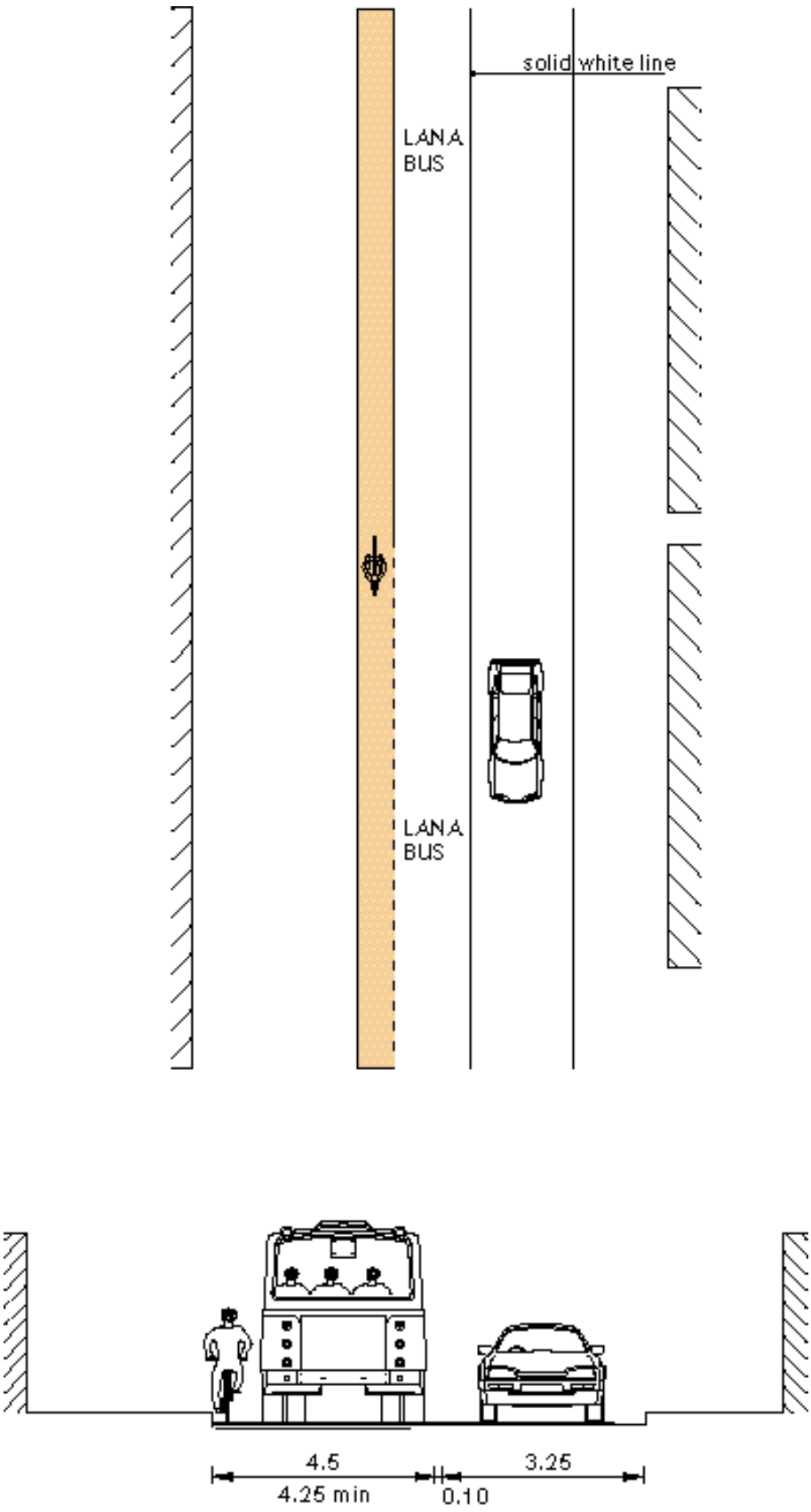
Dimensions

- The width of a bus lane should preferably be 4.50m. The minimum width is 4.25m.

General comment

- If a width of 4.50m is available an on-road cycle track of 1.50m should be implemented (see § 5.2.2).

FIGURE 5.3C | CONTRA FLOW BUS LANE ALONGSIDE CYCLE TRACK



5.2.5 Streets used predominately by cyclists and buses (fig 5.4, 5.5)

Where to apply

As a result of traffic calming and other traffic management measures, streets can be made predominantly accessible to cycles and buses. Car traffic is not prohibited, but will only have access to homes, shops or other destinations.

For example,

- traffic management schemes in city centres, where some roads are only accessible to buses and cycle traffic;

Specification

Streets predominantly for use by cyclists and buses can be treated in two ways:

- one-way streets for buses with two-way cycle traffic;
- two-way streets for buses with two-way cycle traffic.

Dimensions

Depending on cycle volumes and the bus frequencies, the recommended warrants concerning the width of the carriageway are given in table 5.2.

General comments

- On sections of road longer than 300m, and where bus speeds are high, cycle traffic should be segregated, either visually or physically, from bus traffic.
- One-way streets which only allow cycle traffic to travel in one direction are not recommended. Cyclists will take every possible shortcut to ensure a fast journey and will use a one-way street when going in the opposite direction.

TABLE 5.2 | RECOMMENDED WIDTHS FOR STREETS USED PREDOMINATELY BY CYCLISTS AND BUSES

Width/Volumes	Cycle volumes/hour	Bus frequencies/direction/hour
4.60m figure 5.4	two-way > 100	one-way, low (< 10)
6.20m figure 5.4	two-way > 100	one-way, high (> 20)
6.60m figure 5.5	two-way > 100	two-ways, low (< 10)
9.30m figure 5.5	two-way > 100	two-ways, high (> 20)

FIGURE 5.4 | STREETS USED PREDOMINATELY BY CYCLISTS AND ONE-WAY BUS TRAFFIC

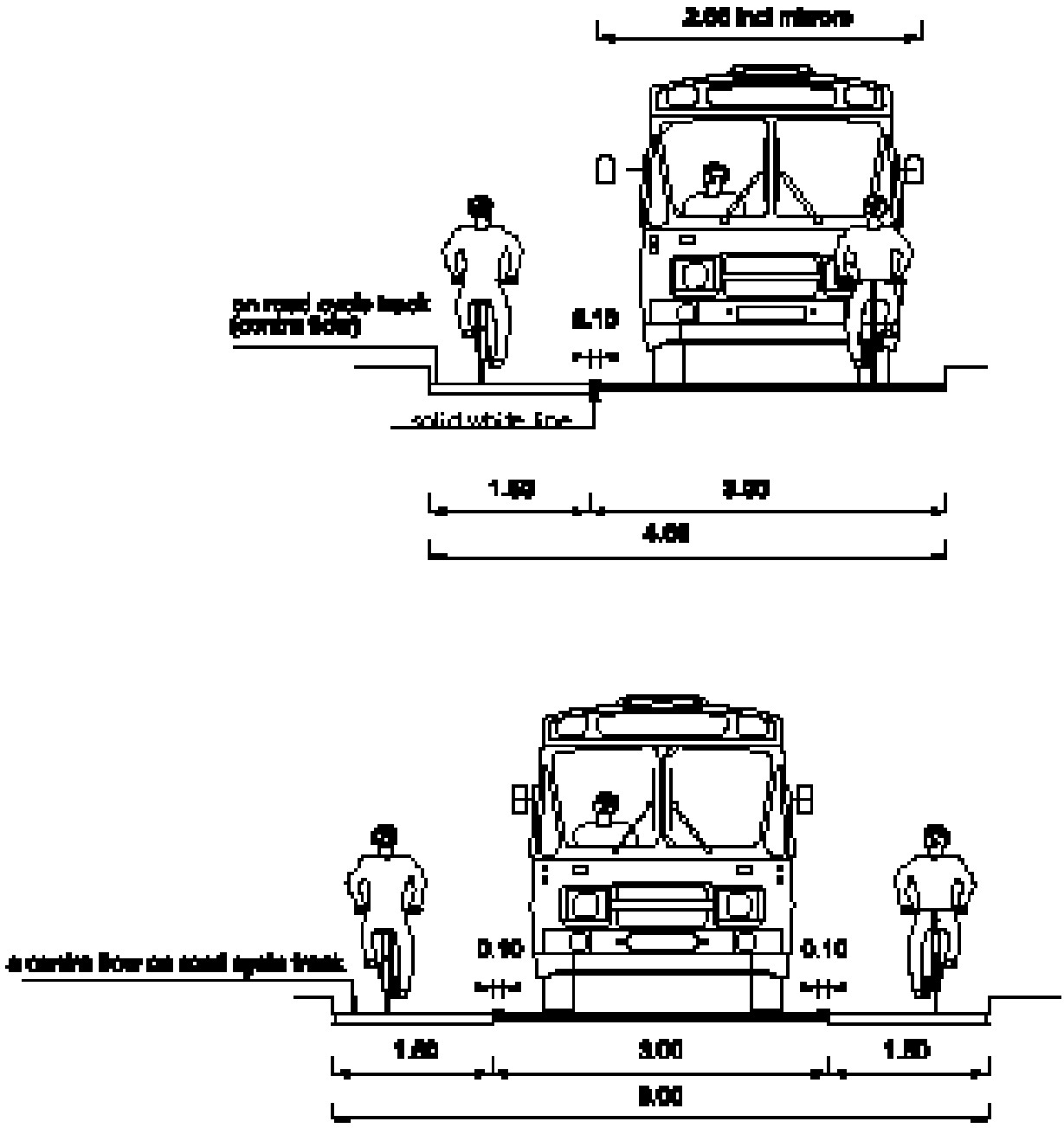
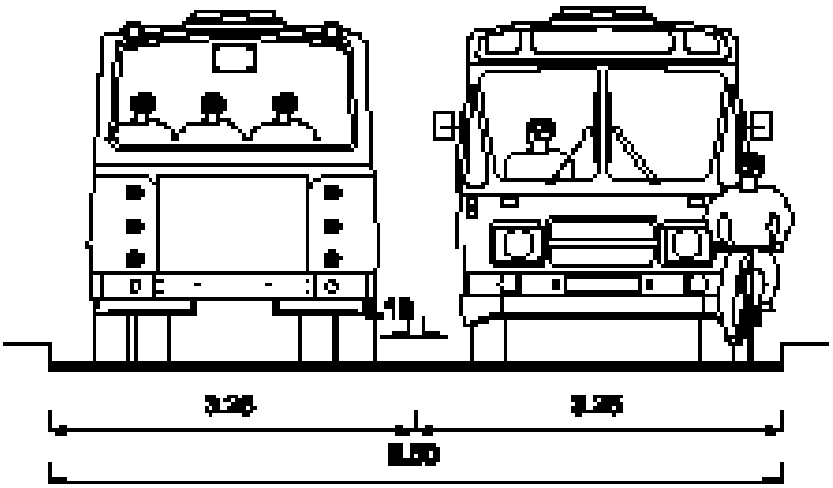
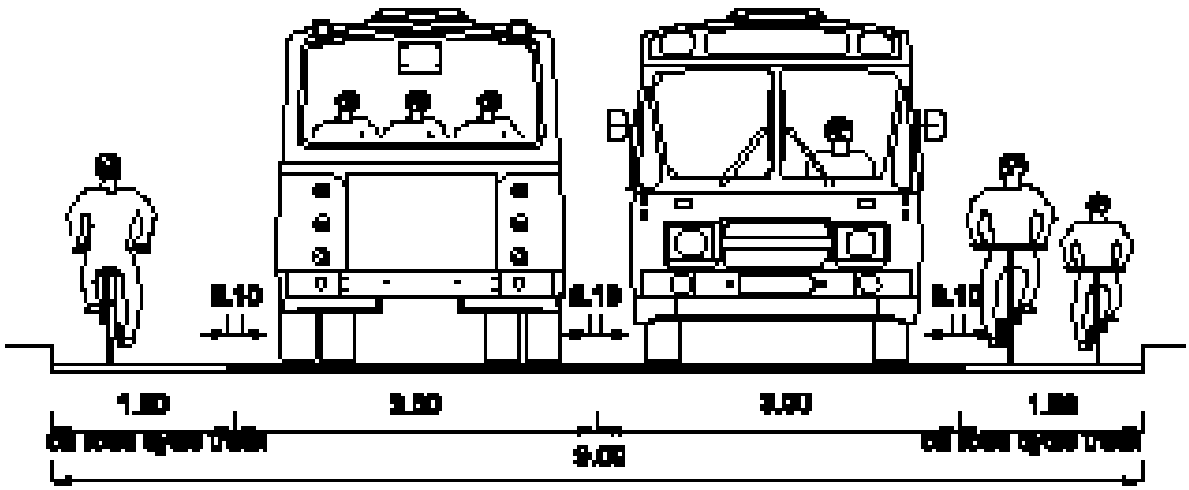


FIGURE 5.5 | STREETS USED PREDOMINATELY BY CYCLISTS AND TWO-WAY BUS TRAFFIC





5.3 Bus stops and cycle facilities

Cycle facilities at bus stops and bus lay-bys can be categorised as:

- physically segregated;
- visually segregated (with an on-road cycle track);
- having no cycle facilities.

It is desirable that the type of cycle facilities installed at bus stops and lay-by's be consistent with those facilities being provided for the rest of that section of road. Table 5.3 gives guidance on how to achieve this, and also sets out alternative designs where these may be necessary.

Possible locations for a bus shelter

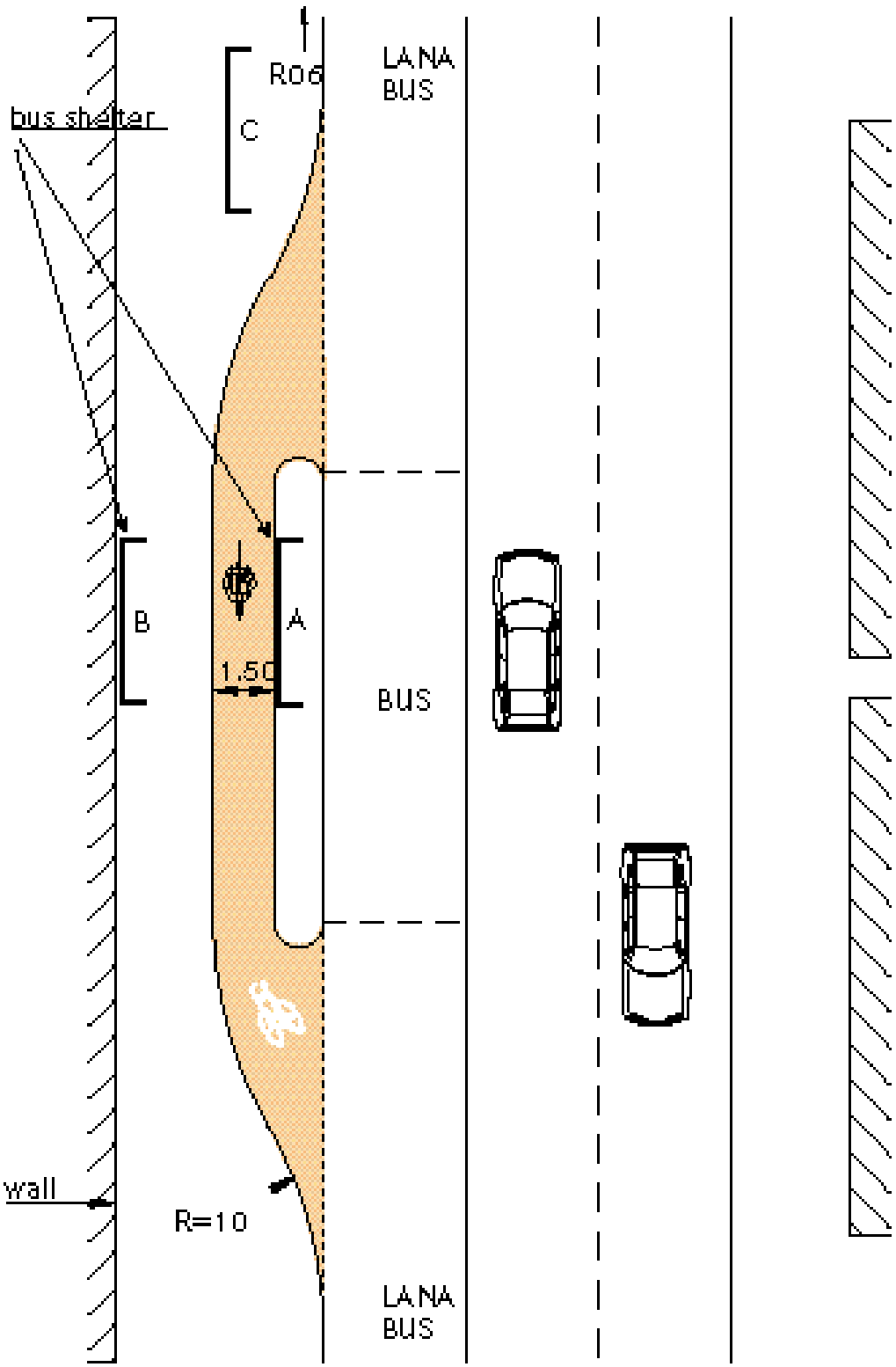
Possible locations for a bus shelter are shown in figure 5.6.

- Option A is the best location.
- Option B and C do not create serious conflicts between bus passengers and cyclists as passengers will normally be able to see a bus coming at a distance, and will have enough time to cross the cycle track safely.

TABLE 5.3 | CYCLE FACILITIES AT BUS STOPS

Cycle facility at the bus stop or lay-by	Cycle facility leading to the bus stop or lay-out	Reasons for an adjusted design	Possible alternatives
Cycle facility at the bus stop or lay-by	Cycle facility leading to the bus stop or lay-by	Reasons for an adjusted sign	Possible alternatives
physical segregation	segregated cycle tracks	no room for segregation	visual segregation and slowing down the approach speed of the encroaching buses
visual segregation passengers	on road cycle tracks	high volumes of waiting passengers high speed of encroaching buses, the conflicts with motorised traffic and a stopped bus on the carriageway is too high.	physical segregation
bus stop on the road	road with mix use	high volumes of waiting passengers	physical segregation

FIGURE 5.6 | THREE POSSIBLE LOCATIONS FOR A BUS SHELTER



5.3.1 Bus stop with physically segregated cycle facilities

Where to apply

- A bus stop with physically segregated cycle facilities is recommended in all situations as the segregation minimises possible conflicts between cyclists and buses.
- No strict criteria are available. However it is clear that segregated cycle facilities are needed on main roads with high volumes and high speeds of motorised traffic, as well as high bus frequencies and speeds (> 50 km/h).

Specification

- Cyclists are physically segregated from the carriageway and the bus traffic.
  This segregation can be achieved with:
  - a by-pass behind the bus shelter (see figure 5.7);
  - a paved boarding strip; in this case the cycle track divides the bus shelter from the boarding point (see figure 5.8);
  - a raised adjacent cycle track (see figure 5.9). Note there is very limited space between the cycle track and the bus lane.

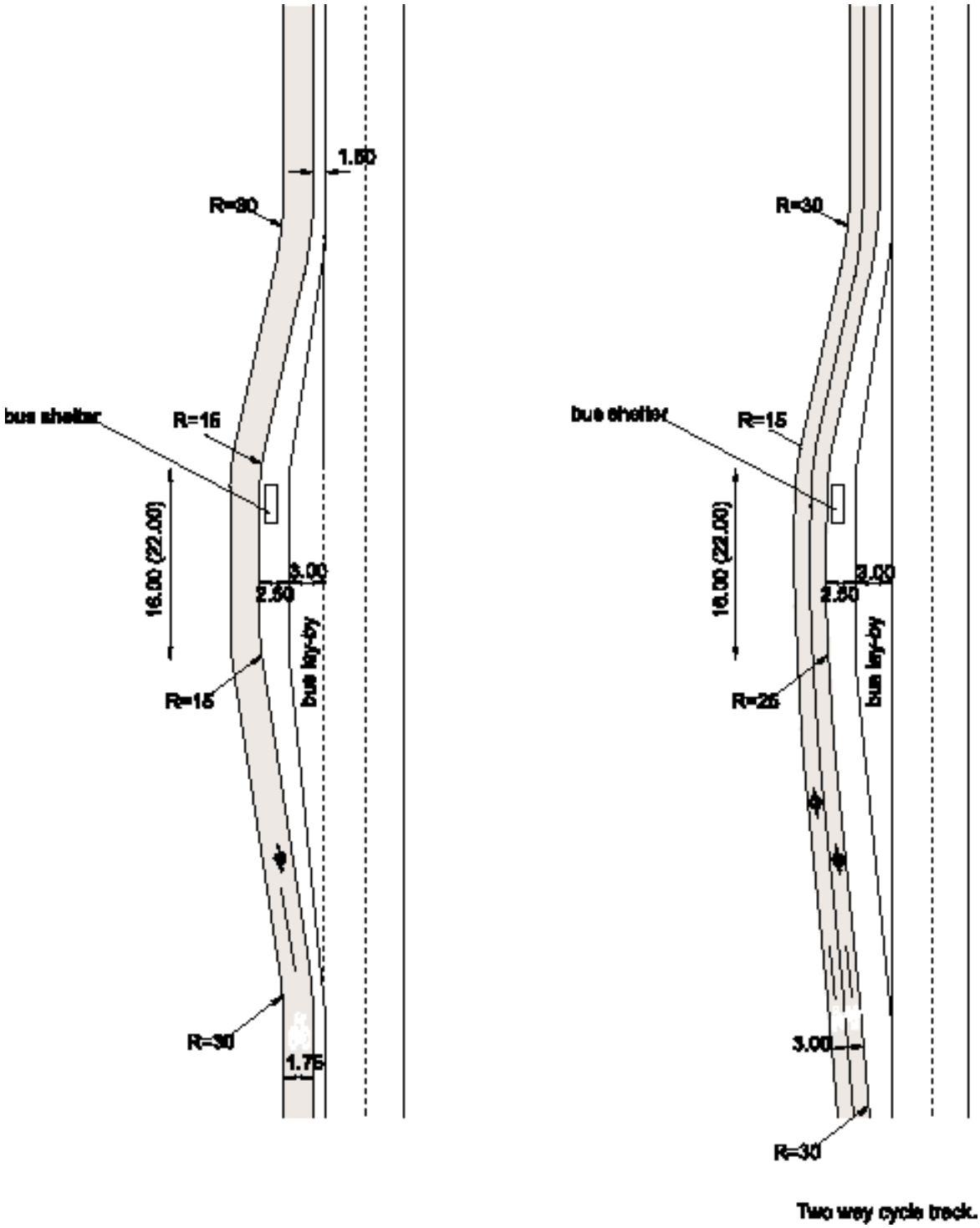
Dimensions

- Cycle track passing behind the bus lay-by:
  - the minimum width of the cycle track is 1.50m;
  - minimum radii to bend the cycle track around the bus shelter are 15m.
- Boarding strip:
  - the minimum width of the cycle track is 1.50m;
  - width of the paving set is 1.20m; this will give enough room for passengers to board and leave the bus.
- Raised adjacent cycle track:
  - width of the cycle track is 1.50m and has a red surface;
  - remaining width for passengers must be at least 1.20m;
  - the crossing point for bus passengers is indicated with a different colouring. Cyclists must give priority to passengers boarding and unboarding.

General comments

- The width needed for a bus shelter can be determined as follow:
  width of the bus shelter + 0.30m (width behind bus shelter) + 0.90m (width in front of the bus shelter).

FIGURE 5.7 | CYCLE TRACK PASSING BEHIND THE BUS SHELTER



Two way cycle track.

FIGURE 5.8 | BUS SHELTER WITH A SEGREGATING VERGE BETWEEN THE CYCLE TRACK AND THE BUS STOP

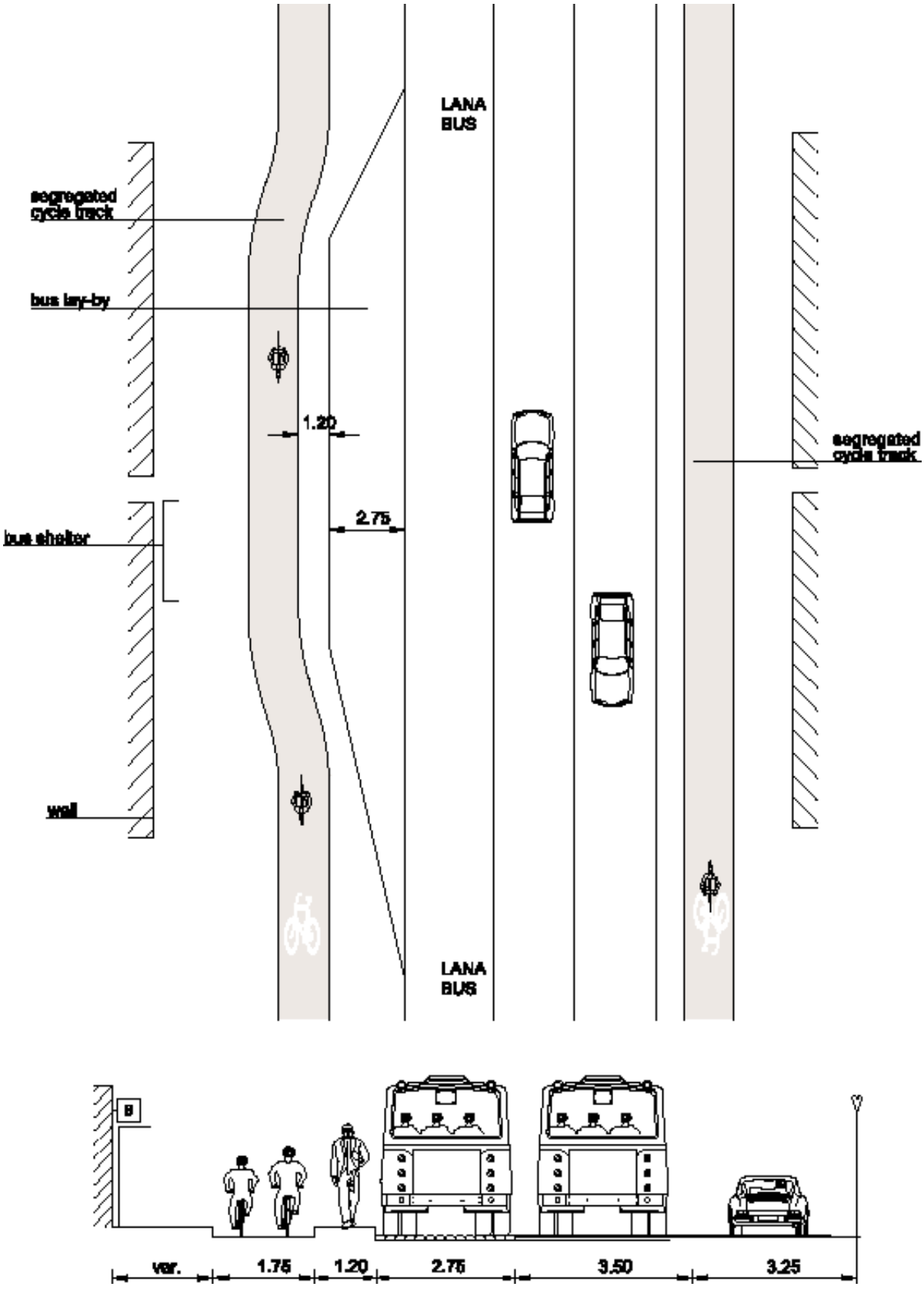
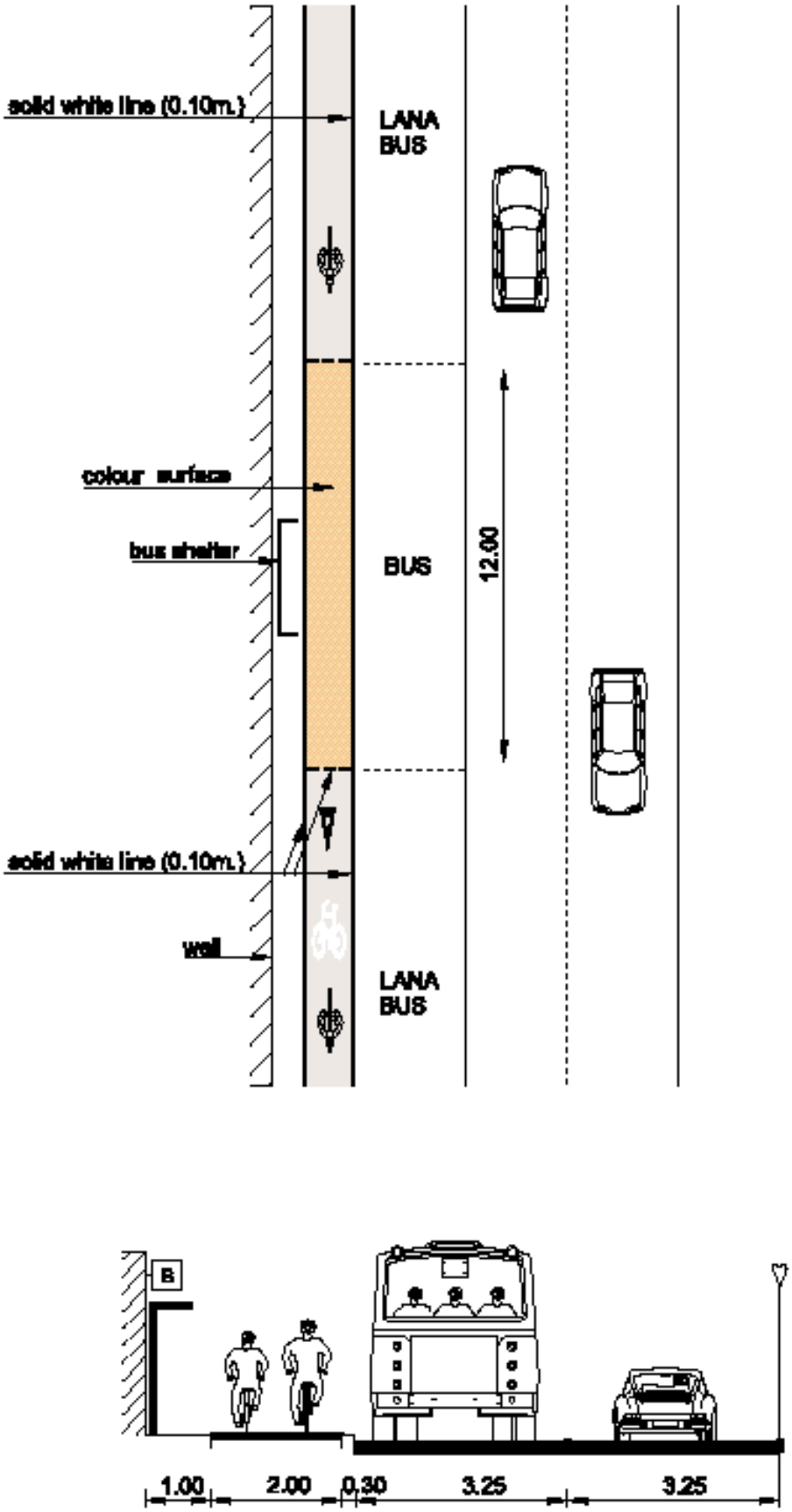


FIGURE 5.9 | ADJACENT CYCLE TRACK PASSING THE BUS SHELTER IN FRONT



5.3.2 Bus stop with on-road cycle tracks (fig 5.10)

When to apply

Two designs are possible:

- an on-road cycle track passing a bus lay-by;
- an on-road cycle track passing a bus stop without a bus lay-by.

No strict criteria are available for the provision of a bus lay-by. The recommendation is to install a bus lay-by at 6000 pcu/24hours with bus frequencies above 10/hour. Bus lay-bys should always be constructed on roads with a speed limit over 50 km/h.

On-road cycle tracks should not end before a bus stop or bus lay-by. They should be continuous (unless the on-road cycle track is merged into a segregated cycle track around the bus lay-by or bus stop).

Specification

An on-road cycle track passing either a bus lay-by or a bus stop without a bus lay-by should:

- follow the carriageway;
- be marked with red surfacing and cycle logos;
- in the case of a bus lay-by, be marked with broken white lines at both sides (this will allow buses to cross the on-road cycle track) see option A of figure 5.10;
- in the case of a bus stop without a bus lay-by the lane must be marked with a solid white line between the on-road cycle track and the carriageway (buses will have to stop on the carriageway to embark passengers and not on the on-road cycle track).

Dimensions

- The width of the on-road cycle track is 1.50m.
- The width of the bus lay-by is at least 2.75m, so that the bus does not block the on-road cycle track.
- The dimensions of the bus lay-by must be consistent with low approach speeds (approximately 30 km/h). This will increase the safety of buses weaving with cycle traffic.
- Merging a segregated cycle track into an on-road cycle track should be completed 50m before a bus stop.

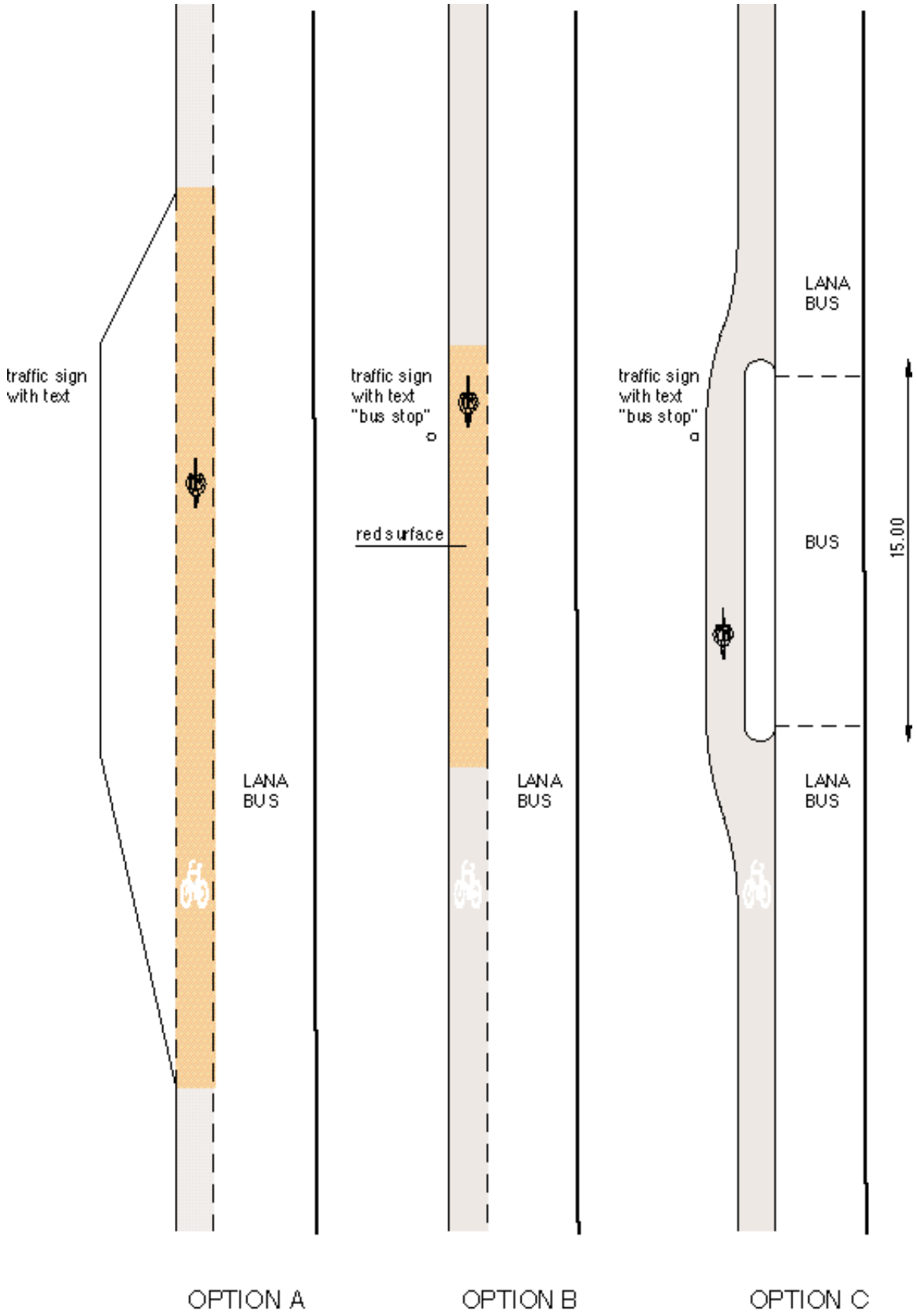
Legal status

- Weaving buses (coming from behind) should give way to cyclists going straight ahead.
- Buses are not allowed to stop on an on-road cycle track with a continuous line.
- Buses are allowed to stop on an on-road cycle track with a broken line.

General comments

- A strip of paving can be used to minimise the conflicts between passengers and cyclists (see option C of figure 5.10). This is a good alternative when the volumes of passengers are high.
- Buses find it more difficult to leave a lay-by than a bus stop since they are not always readily permitted to rejoin the traffic.

FIGURE 5.10 | THREE DESIGNS FOR AN ON-ROAD CYCLE TRACK PASSING A BUS STOP OR BUS LAY-BY



5.3.3 Bus stops on the carriageway

When to apply

When traffic volumes are low (<6.000 pcu per 24 hours), buses can stop on the carriageway. Motorised traffic and cycle traffic can either overtake a stationary bus or wait behind it.

In general, this should only be applied on roads with a maximum speed limit of 50 km/h.

Specification

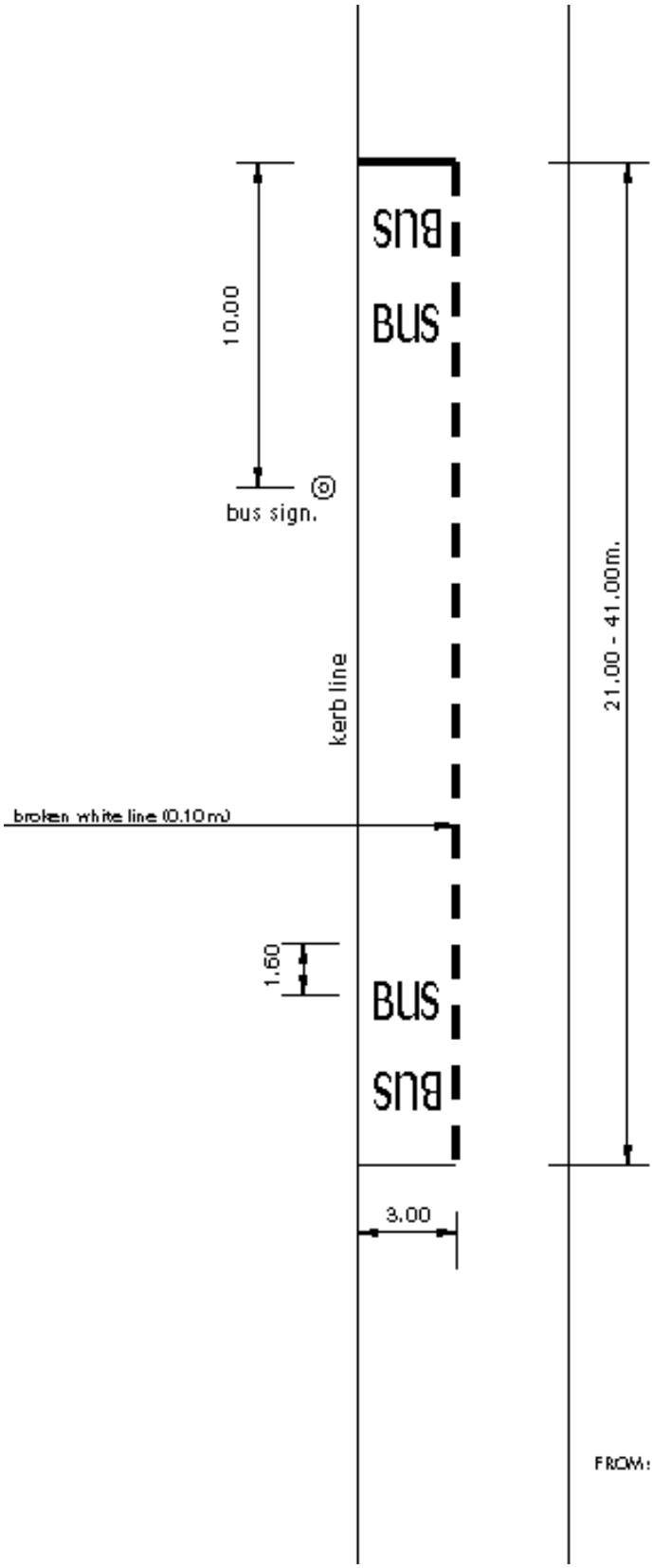
- No specific cycle facilities are provided on the carriageway.
- The bus stop is indicated by a bus sign whether or not in combination with a bus shelter. Bus stop road markings may also be provided (figure 5.11).

Dimensions

- The width of the carriageway must be at least 3.50m for one way traffic. This will allow cyclists to overtake the bus at the bus stop.
- The width of the carriageway at a bus stop on a road with two way traffic is preferably 6.60m.

General comments

- When cycle volumes are high, it is advisable to create segregated cycle facilities around the bus stop.


BUS
BUS
10.00
bus sign.
kerb line
21.00 - 41.00m.
broken white line (0.10m)
1.60
BUS
BUS
3.00
FROM: "TRAFFIC SIGNS MANUAL"

Cycle Track passing a bus stop (Holland)

5.4 Bike 'n' ride

Where to apply

Both cycle and public transport use can be enhanced if good cycle parking facilities are provided.

It is recommended that parking facilities be provided at the (main) bus stops of long distances coaches, fast express bus services, LRT-stations and at railway stations. Cycle routes should be planned to serve these bus stops or stations.

Specification

The quantity and quality of cycle parking facilities will vary according to the type of bus stop, or station and the function of the area. At bus or train stations, secure parking facilities are an option, while at bus stops an uncovered rack might be sufficient.

Parking facilities should be located:

- as close as possible to a bus stop or public transport facility;
- on the approach route to a bus stop or station and not beyond it.

Parking facilities should be of sufficient quality to give:

- adequate provision to lock the bicycle frame safely to the rack;
- shelter to keep the bicycle dry, particularly at locations with a high parking demand.

Dimensions

The required room for parking facilities strongly depends on the shape of the parking facility (e.g. a rack, a fence or a sheltered facility).

The following few basic dimensions are given:

- length of a parked bicycle is 2.00m (plus the 2.00m manoeuvring space for the users, therefore in total 4.00m is needed);
- the width of a parked bicycle is 0.70m;
- if the bicycles are parked with the handlebars "one down one up" a width of 0.40m is sufficient.

General comments (fig 5.12)

- Cyclists will always find a place to park their bicycles. However proper facilities will greatly encourage Bike 'n' Ride.
- Randomly parked bicycles near bus stops or stations are a clear indication of the need for parking facilities.
- Even though parking facilities for bicycles at bus stops or stations are not mandatory at present, it is strongly recommended that these facilities be considered in large cities as travel distances can be too far for cycling.
- Congestion along the cycle routes to the (main) bus stops or stations must be minimised. These cycle routes should be safe and direct. Crossing facilities (such as a middle island) at busy main roads will greatly improve the quality of the cycle route.
- At locations where there is a high volume of parked bicycles, secure parking can be an option. When secure bicycle parking is combined with other sales activities this business can be profitable.
- The attractiveness of cycle parking facilities can be further improved by providing good lighting, and additional facilities such as telephones, information panels, repair and bicycle part sales, lockers for clothes, possibilities for bicycle renting, etc.

FIGURE 5.12 | MEASURES FOR PARKING SHEDS AT BUS STOPS