4. Guided Bus Explained
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1 Introduction

The Report

1.1 This document describes how kerb guided bus works. It is the fourth in a series of downloadable documents describing the London Guided Busway project and providing background material.

1.2 The full list of documents is as follows:

1. Executive Summary
2. The Scheme
3. Consultation Report
4. Guided Bus Explained
5. Guided Bus in Action
6. Implementing Guided Bus
7. Choosing Transit Mode

Structure of this report

1.3 This report continues with a description of the concept of kerb guided bus in Chapter 2.
2 Kerb guided bus

Overview

2.1 During the last decade, Bus Rapid Transit (BRT) has become increasingly recognised as a highly effective way of providing high quality public transport. BRT(UK), an association “dedicated to the sharing of information about evolving bus-based rubber-tyred rapid transit technology”, describes BRT as “a high profile rapid transit mode that combines the speed, image and permanence of light rail with the cost and flexibility of bus” (Buses as Rapid Transit brochure, BRT(UK), 2007).

2.2 Buses can achieve as much or more than light rail at a significantly lower cost if they can be segregated from the negative effects of traffic congestion through the allocation of road space for their exclusive use. BRT schemes can be implemented more quickly than light rail schemes and the ‘go anywhere’ capability of buses means that they are not confined to their priority alignment in the way that light rail vehicles are restricted by the extent of the rail network. Buses can operate on street where traffic is free-flowing and need to have segregated infrastructure provided only where it is necessary to bypass congestion or to provide a speedy route to be competitive with the car.

2.3 BRT schemes implemented world-wide show that the modern bus can be an attractive, comfortable and fully accessible travel option if the adverse impact of congestion on reliability and journey times can be overcome.

2.4 Segregation has been identified as one of the key factors in the development of successful road-based mass transit systems. Bus guidance is a form of BRT that can be applied in particular situations to create a segregated route for buses where space is limited and to provide a self-enforcement mechanism to ensure that segregation of buses from other categories of traffic is totally effective.

2.5 In this chapter, we explain the principles of kerb guidance.

Kerb guidance

The technology

2.6 Guided bus technology is simple and applies a form of mechanical guidance that removes the need for the driver to steer the bus. Conventional buses can be operated on specially-built tracks using small horizontal guide wheels fitted to bus axles to engage with concrete or metal kerbs on both sides of the bus. When on normal highway, buses are driven normally with drivers controlling acceleration, steering and braking.

2.7 Guideway width is determined by the width of a bus (normally 2.50 or 2.55 metres) and the additional width needed to accommodate the guide wheels, giving a total carriageway width between kerbs of 2.6 metres.

2.8 On kerb-guided buses small guide wheels are attached to the bus, and these engage vertical kerbs on either side of the trackway. Away from the guideway, the bus is steered in the normal way. The start of the guideway is funnelled from a wide track to the normal width. The trackway allows for high-speed operation on a narrow guideway as well as precise positioning at boarding platforms, facilitating close and level access for elderly and disabled people.
2.9 Figures 2.1 And 2.2 show a bus in guideway and a close-up of the guide wheel fitted immediately behind the front axle of a bus.

**Figure 2.1 Bus in guideway showing guidewheel**

![Bus in guideway showing guidewheel](Source: Author)

**Figure 2.2 Bus guidewheel close-up**

![Bus guidewheel close-up](Source: Wikipedia Commons)

2.10 The guided bus ‘track’ consists of three main components – the roadway, raised kerbs on both sides of the roadway and the entry ‘funnel’ at the commencement of each length of guided busway:
• The roadway usually takes the form of two strips of concrete 2.6 metres apart to support the bus wheels – the area between the two concrete strips does not have any weight-bearing function and can therefore either be filled in with concrete or take the form of a grassed strip. The running surfaces need to be smooth in order to give a comfortable ride for passengers.

• The vertical kerbs on both sides of the guideway are usually formed of a concrete and are around 18 centimetres in height – higher than a normal roadside kerb. The design must be sufficient to cater for the lateral pressures produced by buses in the guideway.

• An entry funnel is needed to enable buses to enter the kerb guideway at low speed – the usual practice if for the funnel to narrow from between 3.2 and 3.5 metres to 2.6 metres at the entry to the guideway over a distance of 18-20 metres. This enables drivers to steer their buses at low speed to engage with one of the kerbs in order to achieve a smooth entry to the guideway. The guideway exit taper is short and must be designed to ensure that both guide wheels disengage at the same time. A variety of methods of guideway construction have been used – the first systems in Essen and Adelaide used prefabricated ‘L-shaped’ concrete panels fixed to prefabricated concrete ‘sleepers’ whilst more recent systems have used pre-cast complete track panels or reinforced concrete laid in situ. The Cambridgeshire guided busway has been constructed using prefabricated sections consisting of two ‘L’ shaped beams of 15 metres in length joined by three cross-members.

2.11 A typical cross section of a two-way guided busway is illustrated in Figure 2.3, whilst Figure 2.4 provides diagrammatic layouts of a guided busway entry and a pedestrian crossing. Short breaks in the guideway to accommodate pedestrian crossings or intersections with bridle paths are sometimes described as ‘burst through’ crossings as their short length enables the bus to pass through without the driver resuming control of the steering.

**Figure 2.3 Typical cross section of two-way guided busway**

![Typical cross section of two-way guided busway](source: Author)
Figure 2.4 Guided busway entry kerb layout

The photographs in Figures 2.5 and 2.6 illustrate the entry funnel at one of the intermediate stopping places on the northern section of the Cambridgeshire Busway and a pedestrian crossing on the guideway near Trumpington on the southern part of the Cambridgeshire Busway. The first photograph shows the ‘car trap’ designed to prevent incursion onto the busway of unauthorised vehicles.

Figure 2.5 Guided busway entry funnel – Cambridgeshire Busway
The benefits

2.13 The primary reason for adopting kerb guidance in preference to constructing a buses-only roadway is the reduction in space needed to accommodate a kerb guideway. A minimum land take of 3.2 metres is needed to accommodate a single lane guideway. The minimum requirement for a two lane, two way guideway is 6.3 metres.

2.14 In comparison, a two-way busway needs to have a width of about 7.3 metres, the same as a conventional two-lane, two-way highway, in order to allow buses travelling in opposite directions to pass safely. The minimum acceptable width for a single lane busway is 3.5 metres, but greater width would be needed for higher speeds.

2.15 The saving in alignment width resulting from the adoption of kerb guidance can be critical if space is restricted. A two-way guideway can easily be fitted on the formation of a former double track railway or in the central reservation of a dual carriageway that was formerly used to accommodate a double track tram route. There may be space for a single lane guideway alongside an existing road where there would not be room for a single lane busway or a with-flow bus lane.

Limitations

2.16 The ability of buses fitted with kerb guide wheels to operate anywhere on the local highway network in steered mode gives a high degree of route flexibility that overcomes most of the potential constraints on the use of kerb guideway. The main limitation of the system is the need for guide kerbs with a height of 18 centimetres if buses are to operate in guided mode. Although there is no difficulty in creating short gaps of up to six metres in guideway to accommodate pedestrian crossings, it is not possible to use guideway in areas where there is a high level of pedestrian or cyclist activity.