

DESIGN GUIDELINES FOR PUBLIC TRANSPORT FACILITIES

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ABSTRACT

1. BACKGROUND

The Design Guidelines For Public Transport Facilities project forms part of the Public Transport Planning, Design and Implementation Programme of the City of Cape Town. This programme is intended to form the basis of the a approach and aimed ultimately to effect the fundamental restructuring of public transport networks, services and facilities (the Mobility Strategy). This strategy was focused on the transformation and restructuring of public transport in Cape Town, with particular emphasis on:

- Placing public transport, people and quality of life first
- Integrating of all modes of public transport – rail, bus, mini-bus taxis, non-motorised transport (NMT) and not excluding cars, freight and business
- Pursuing sustainable transport through investment in low cost forms of mobility

The Design Guidelines for Public Transport Facilities project has set the following objectives:

- Develop a practical guide for the process of designing facilities;
- Establishing an approach towards public transport interchange or facility design which considers it in its total urban context;
- Take into account the requirements of recapitalisation vehicles;
- Learn from the performance of recently constructed facilities, to build on positive, and avoid negative experiences; and
- Focus on the needs of pedestrians as the basic functioning component at public transport stops and interchanges.

2. THE NATURE OF INTERCHANGE

2.1 The urban meaning of interchange

While interchanges play an important functional role in transportation management, they are also very important elements of urban structure and need to be used structurally to improve the performance of the city.

From a design perspective, they have a number of characteristics which need to inform their conceptualisation:

- They are **people places**: they are significant places of gathering and the generation of pedestrian flows.
- They are **places of waiting**: comfort is therefore a central design issue.

- They are **places of movement 'switch'**. A characteristic of equitable cities, is that people have 'access to access': they can change direction and mode of transport quickly and easily. Only when this is allowed do all people have access to the fuller range of urban opportunities. Interchanges are a primary mechanism which allows this switching to occur.

2.2 The relationship of interchanges with urban structure

Because interchanges result in flows of people and traffic, they have strong generative qualities, i.e. they attract or repel other activities. As a general principle, interchanges should:

- always be located in places of high accessibility;
- always be associated with public space;
- be considered good locations for public facilities;
- make provision for informal trading and markets (especially larger facilities);
- be reinforced by high density housing;
- be associated with facilities of convenience, such as ablution facilities;
- be places of human safety, security and comfort.

In short, transport interchanges should be viewed not only as a form of movement infrastructure but as 'seeds' for the emergence of intensive, vibrant, urban modes and as important elements of place-making.

The concept of interchange is a strongly hierarchical one - two dimensions of hierarchy can be differentiated:

Hierarchy of mode. Movement involves a variety of modes including pedestrian, bicycle, motorcycle, taxi, bus and train, which can occur in different combinations.

Hierarchy of size. Generally, there is a broad correlation between these hierarchical forms: the more modes involved in the interchange, the greater the capacity and the greater the propensity to attract other activities. In this study, five hierarchical forms are demonstrated.

- i) An on-street pick-up or drop-off point for taxis and/or buses;
- ii) An on-street facility (stop) with embayments for taxis and/or buses;
- iii) An off-street facility (interchange) for taxis and/or buses as an origin point mainly during the AM peak period;
- iv) An interchange as an origin, destination and/or transfer point. These include combinations of taxis, buses and trains, and are operational during AM and PM peak periods;
- v) Like (iv) but mostly as a destination and offering transfer facilities, and located in higher order urban centres with more intensity and on-going activity.

3. OVERALL DESIGN PHILOSOPHY AND APPROACH

Four sets of requirements need to be brought into alignment in the design of interchanges:

- The totality of the pedestrian experience. Central to this is capturing the performance qualities of, inter alia: safety and security; comfort; convenience and dignity.
- Efficiency of vehicular movement, stacking and holding.

- Urban integration: the way in which the interchange is integrated with its urban surroundings, capitalisation of potentials and minimisation of negative impacts.
- Integration of interchange elements and activities: interchanges comprise a complex network of activities which need to be brought into harmonious alignment with each other. This involves holistic and creative thinking. *In this, it is optimising the performance of the whole, rather than maximising the performance of any one part, element or activity, which is the central issue.*

Considerations and requirements for stops are more basic than those for interchanges, which are complex and increase with the hierarchy of interchanges. The basic considerations for, and elements of, that contribute to the interchange type is organised in Figure 1. This forms a conceptual framework to be used for evaluation purposes, as well as for the formulation of the design guidelines.

4. EVALUATION OF PUBLIC TRANSPORT FACILITIES

The evaluation of public transport facilities was undertaken on the basis of an overall framework, under the main headings as follows:

4.1 Urban Structure

- Transport Planning Context
 - Modal operations and interchange functions
 - Transport operational aspects
- Urban Design Context
 - Urban design considerations

4.2 Interchange Components

- Vehicular Layout
 - Vehicular access & circulation
 - Interchange operations
- Pedestrian Space, Circulation & Facilities
 - Pedestrians and bicycle facilities
 - Shelters
 - Building structures and accommodation
 - Hard & soft landscaping
 - Street furniture
- Trading
 - Formal & informal trading
- Signage/ Management
 - Information/ Communications
 - Management

4.3 Summary of Findings

- Increasing share of taxis of the public transport market means that most off-street facilities are provided for taxis, with buses mostly accommodated on-street. Only in isolated cases do buses share off-street facilities with taxis.

Figure 1: Evaluation Framework for Public Transport Facilities

PLANNING CONTEXT :

TRANSPORT, SPATIAL AND LAND-USE

URBAN DESIGN :

PLACE-MAKING, FLOOR / GROUND SURFACE, EDGES, SPACE(S) AND SHELTER

THE TOTALITY OF THE PEDESTRIAN EXPERIENCE : SAFETY, COMFORT, CONVENIENCE AND DIGNITY

INTERCHANGE COMPONENTS :

VEHICULAR LAYOUT	PEDESTRIAN SPACE, CIRCULATION AND FACILITIES	TRADING SPACE	SIGNAGE	MANAGEMENT
<ul style="list-style-type: none"> • Access and Circulation • Interchange Operations • Civil Infrastructure 	<ul style="list-style-type: none"> • Pedestrian Circulation Areas and Spaces • Passenger Loading • Shelters • Building Structures and Accommodation • Hard and Soft Landscaping • Street Furniture • Lighting 	<ul style="list-style-type: none"> • Formal, dedicated sheltered and lock-up space with flexibility in layout • Refuse Storage • Informal trading accommodated in relation to main pedestrian flows and public spaces 	<ul style="list-style-type: none"> • Information/ Communications 	<ul style="list-style-type: none"> • Management • Rank Marshals • CCTV Equipment • Disaster Control • Maintenance • Cleaning • Refuse Storage and Collection

LANDSCAPE AND LIGHTING:

THEME AND LANGUAGE

- The mooted recapitalisation initiative would have a significant impact on the layout of interchanges, which in many instances, will require substantial overhaul.
- Natural shifts in demand need to be providing for by building in flexibility in designs of interchanges, to accommodate increases or decreases in the number of passengers, vehicles or routes.
- Interchange designs need to be self-enforcing as far as possible, so as to assist management of operations.
- Special needs passenger provision should be considered in totality, i.e. universal access considerations require all locations in interchange area to be physically accessible, where feasible.
- Form should follow function in terms of architectural design of canopies and roofs, to ensure that maximum protection is provided against the elements, especially rain.
- Building frontages (and other walls) should be incorporated into shelter provision, and hence loading lane design where possible to provide maximum protection (implication for loading points: linear as opposed to parallel).
- Attention needs to be given to the accommodate scale and range of activities made provision for, to prevent either under-provision (which leads to operational problems) or over-provision (which has capital and maintenance cost implications).
- Location of formal trading outlets should always be considered in relation to major movement flows.

In general, interchange performance varies widely, which in part derives from a wide and sometimes inconsistent range of “design templates” for interchange design. There is generally also a strong requirement for management oversight to ensure the proper use of interchange facilities. Higher levels of self-enforcement in design is required to facilitate this management role, which result in the creation of more robust facilities.

5. PUBLIC TRANSPORT FACILITY CATEGORIES

The categorisation of public transport facilities was done in order to identify facility attributes for the various categories. The categories correspond with the hierarchy of stops and interchanges identified in Section 2.

5.1 Category A

Provides terminal facility at existing and emerging high-order urban centres for public transport users of all modes (rail, bus, taxi), from where places of employment, public facilities, educational institutions etc. can be reached.

5.2 Category B

Provides terminal and/or transfer facilities at middle -order urban centres for public transport users of a range of modal combinations, from where destinations can be reached or other public transport services accessed.

5.3 Category C

Provides terminal and/or transfer facilities mainly in residential areas as points of origin or on route from where public transport users access buses or taxis to travel to their destinations.

5.4 Categories D & E

Provides public transport stops on *major* (D); *major* or *minor* (E) routes where buses and/or taxis pick up or drop passengers off who transfer from other services, or walk from/to their points of origin/destination.

6. FORMULATION OF DESIGN GUIDELINES

The design guidelines were developed on the basis of a number of planning, transportation and urban design principles.

6.1 Planning, Transport & Urban Design Principles

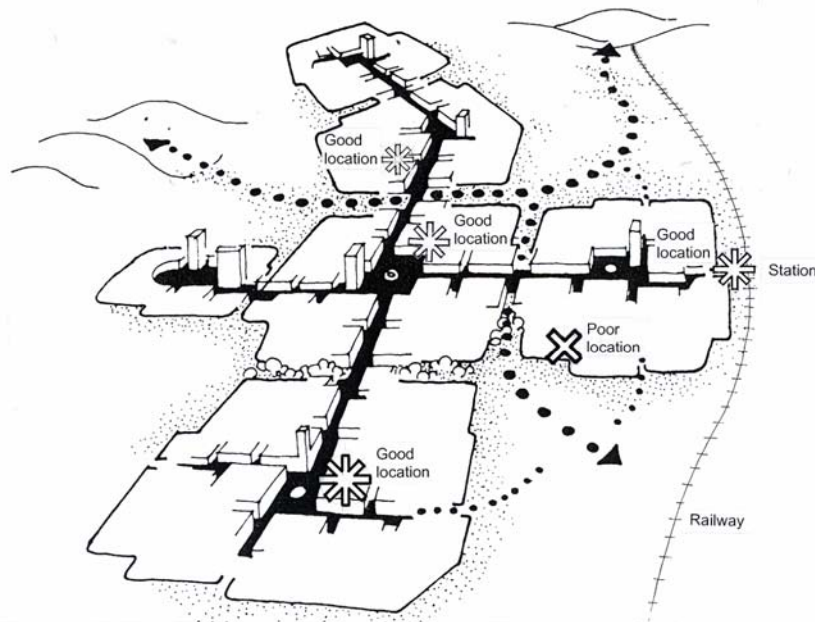


Figure
Examples of good and bad locations for interchanges in relation to urban and spatial structure of urban development.

Figure 2: Locational considerations

Planning principles

- Sustainability
- Variety
- Robustness
- Urban Structure
- Pedestrians as Basic Unit
- Activity Patterns
- Interchange Management
- Consultation
- Robust Interchange Components

Transportation Principles

- Function and Role
- Total travel experience
- Range of Public Transport Modes
- Access to the greatest possible number of people
- Supply of and demand for facilities
- Flexibility to changes in operating environments
- Efficient functioning
- Self-enforcement in design

Urban Design Principles

- Place –making
- Integration
- Urban upgrading
- Permeability
- Legibility
- Appropriateness
- Richness
- Robustness
- Robust interchange components
- “Safe City”
- Universal Access

6.2 Design guidelines

6.2.1 Urban Design Guidelines

Some of the urban design guidelines are illustrated in the figures in the following pages.

Integrate the interchange facility to the maximum degree possible with existing movement, urban activities and spatial and path systems.

Promote and provide clear built and/or planted edges to the precinct space which incorporates the interchange facility. Reinforce existing edges and/or create new edges.

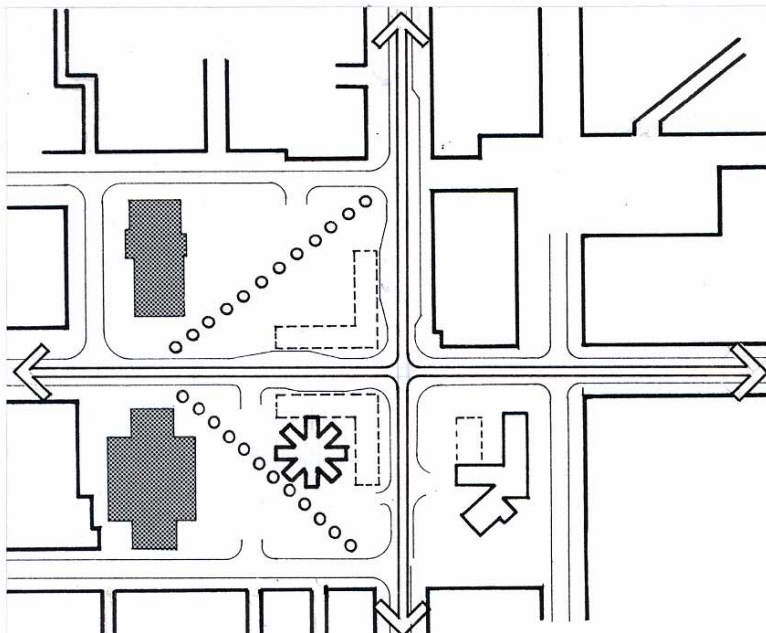


Figure 3: Facility integration

Use buildings, roofed shelters (colonnaded arcade), tree-alignments, low walls and lighting poles, or combinations thereof to define space and/or a system of spaces.

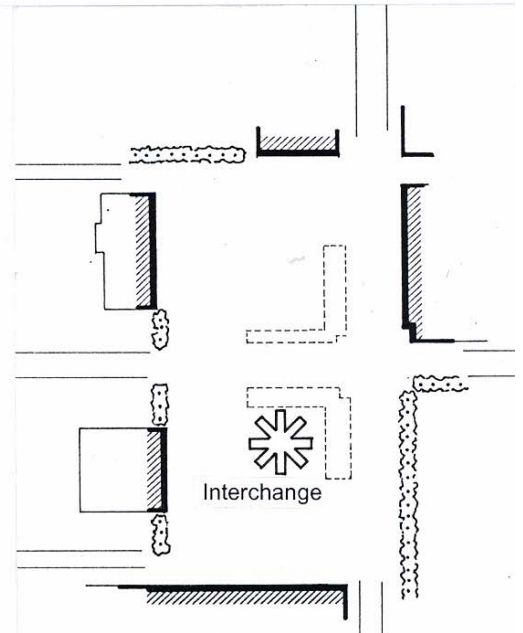


Figure 4: Clear boundary definition

Provide textured and paved thresholds across the access routes at the entry points into the interchange precinct to create a sense of arrival and gateway expression. If technically feasible, structured pedestrian crossing points could coincide with these thresholds.

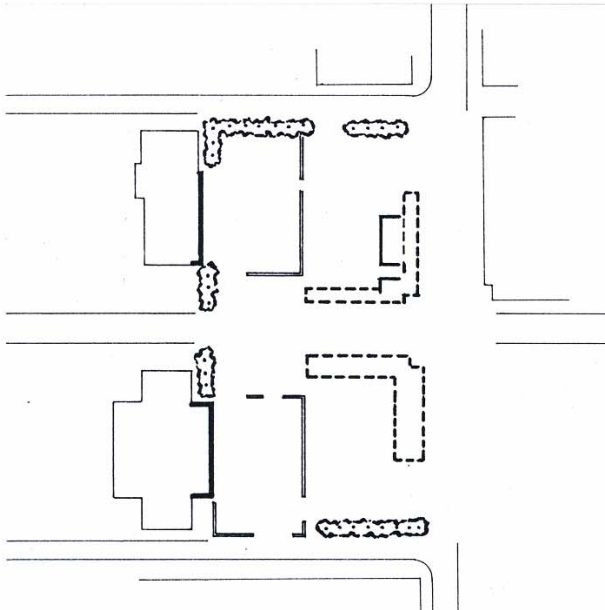


Figure 5: Space defining elements

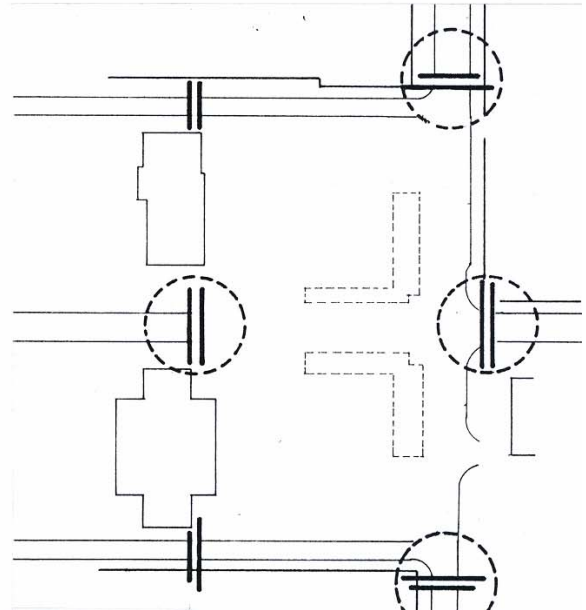


Figure 6: Accentuating arrival points

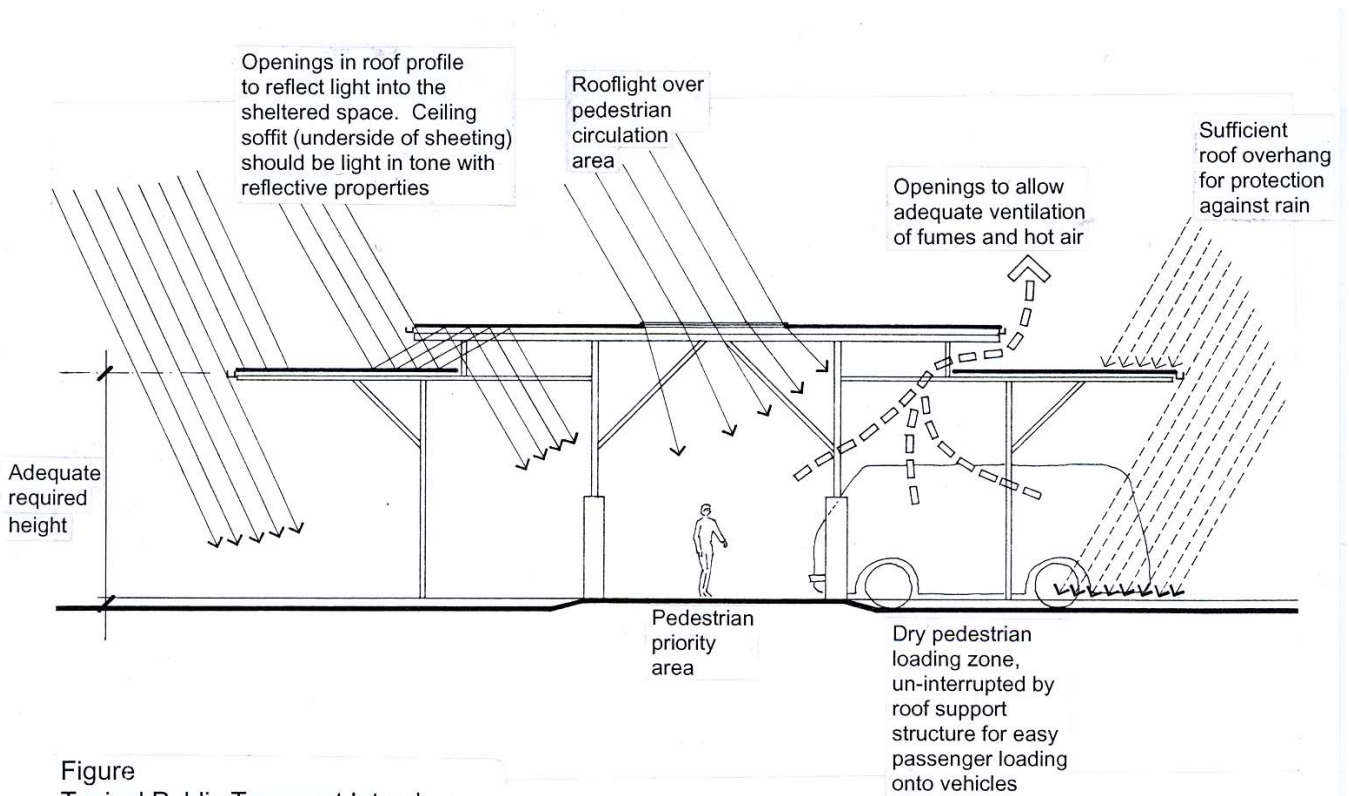


Figure
Typical Public Transport Interchange

Figure 7: Roof shelter considerations

6.2.2 Design guidelines for facility components

In this section, the facility components comprising interchanges or stops are considered individually. While technical requirements for each of the components have been identified as part of the study, only the broad guidelines for the components are outlined in this paper.

Traffic & Access

Broad Guidelines
<ul style="list-style-type: none">• Dedicated access should be provided for Category A and B facilities; Category C facilities can share access with other land uses.• On- and off-street facilities should generally be located along Class 3 or 4 roads.• Road access spacing guidelines should be adhered to¹.• Appropriate traffic control measures should be considered, including possible signalisation for Category A or B facilities.• Sight distance requirements should be satisfied (important especially with off-street bus facilities).• Location of entry and exit points should facilitate one-way circulation through interchange.• On corner sites, entry points should be considered on the minor street.• In case of 4 lane undivided frontage road, access location should preclude possible right turn movements.• Turning radii at entry and exit points should make allowance for possible use by recap vehicles, e.g. 35-seater vehicles could be in use at Category A and B facilities.

Vehicular circulation

Broad Guidelines
<ul style="list-style-type: none">• A circulating lane should be provided to allow unimpeded vehicular movements through interchange.• Circulation through interchange should be one-way to avoid two-way movement conflicts and enhance pedestrian safety.• Circulation should facilitate forward vehicular movements as far as possible, and restrict reverse movements.• Clockwise or anti-clockwise circulation should be selected based on main direction of approach, turning movements and the location of loading points.• Circulating lane should be physically separated from parallel loading lanes, but could accommodate linear loading operations.• With combined off-street facilities for taxis and buses, circulation of vehicle types should at least partially be separated.

Off-loading & parking facilities

Broad Guidelines
<ul style="list-style-type: none">• Embayments should be provided at Category D facilities; Category E facilities can be on-street.• Embayed off-loading bays should be located along circulating lane in close proximity to loading area.• Additional on-street off-loading bays should be provided where “stop-and-drop” operations are prevalent, at e.g. transfer stations.• Consideration should be given to the fact that in reality, off-loading is likely to occur in stacking area.• On-street kiss-and-ride bays should be provided in close proximity to loading area• The possibility of shared kiss-and-ride use with taxi off-loading bays should be considered.• Off-street kiss-and-ride bays should generally be avoided.• General parking bays should be provided on site for interchange and taxi managers, service providers, etc., and should not be used by public transport vehicles.

Loading lanes

Broad Guidelines
<ul style="list-style-type: none">• Dedicated loading bays per destination or route should be provided.• Flexibility in demand accommodation is facilitated by providing linear loading bays with a passing lane, to allow for independent arrivals and departures.• Consideration should be given to both parallel and linear loading configurations.• Loading lanes should be physically separated from loading islands by means of kerbs (one- or both sides) or through the placement of railings, bollards, etc.• The width of loading lanes should not exceed desirable values to promote space efficiency and facilitate boarding of passengers.• Not all loading lanes should make provision for 35-seater vehicles.• Loading lanes should generally be parallel to the long side of a site.• Loading lanes should provide clear extensions into stacking lanes.• Length of loading lanes: should provide space for 2 loading taxis.

Stacking lanes

Broad Guidelines
<ul style="list-style-type: none">• Stacking lanes should be clearly oriented towards loading lanes.• Stacking area should be clear of obstacles e.g. kerbs or bollards, i.e. should be uninterrupted open spaces.• Use of painted lines to differentiate stacking lanes should only be considered where vehicle movements are unambiguous, to prevent “fanning” movements.• The use of stacking area for holding operations should be considered at destination terminals and transfer stations.• Stacking area capacity can be increased by designing for double rows of vehicles feeding into single loading lanes.• On sites where it is possible to make use of gradients, down-sloping grades (appr 2% grade) in stacking area should be provided, to allow vehicles to roll forward without starting their engines.

Holding areas

Broad Guidelines
<ul style="list-style-type: none">• Provision should be made for holding operations at destination terminals and transfer stations.• An interchange should accommodate 1 bay for every 3 permit-holding vehicles operating from the interchange, which includes holding, loading and stacking areas.• Holding demand can be accommodated on-site in stacking area, partially or in total, with overflow demand accommodated elsewhere on-site or in remote holding area.• Remote holding area should be as close as possible to interchange to facilitate vehicular interaction and limit operational delays.• Small land parcels in vicinity of interchange should be investigated for holding operations, especially in urban areas with space constraints and premium land values.• Activities associated with holding operations, e.g. vehicle washing, minor vehicle repairs and drivers resting should be accommodated in holding area, where appropriate.

7. CONCLUSION

This paper essentially provides an overview and extracts from the Design Guidelines for Public Transport Facilities report as part of the City of Cape Town's Public Transport Planning, Design and Implementation Programme. The basic approach of these guidelines is that technical requirements for facility design should provide the underpinning of a series of considerations of how public transport facilities could positively contribute to broader urban place-making.