

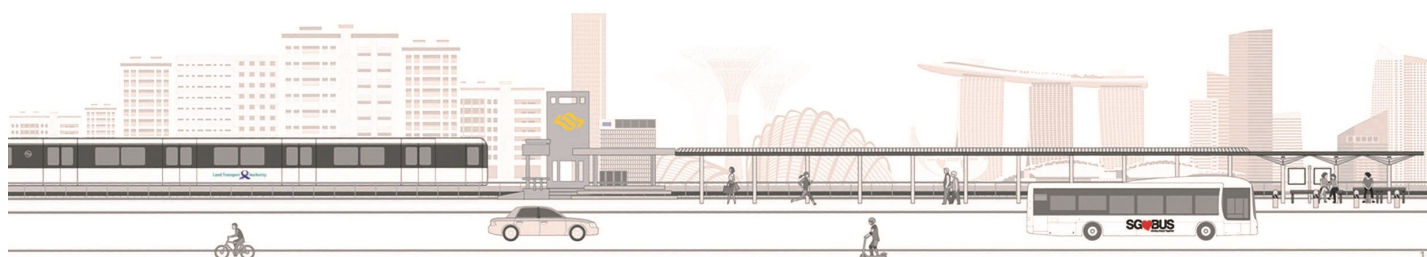
Development and
Building Control Division

Land Transport Authority
We Keep Your World *Moving*

CODE OF PRACTICE

Street Work Proposals Relating to Development Works

Version
2.0
Apr 2019



Introduction

This Code of Practice sets out the requirements of the Street Works Act (Private Street Regulations) for the street work proposals relating to development works. It outlines the essential submission procedures and technical requirements pertaining to the design and construction of street works.

The submission procedure has been digested as a single chapter as, “Overview of Submission Process for Street Works Related to Development Works”. With the re-arrangement of chapters and sections, users will appreciate a more sequential approach of submissions required for street works carried out in relation to development works.

The Code of Practice has also been updated to include the new road typologies, the revised scope of the Transport Impact Assessment and the expanded scope of the Walking and Cycling Plan (WCP).

Enhancements to our public transport network and changes in land use policies have removed the need for SURS. The chapter on Engineering Works within Singapore Underground System (SURS) Tunnel Protection Reserve has thus been removed as it is no longer valid with the de-safeguarding of SURS.

A new chapter on Declaration of Public Streets has been introduced to provide guidance in the preparation of a road declaration plan for submission to LTA before the road is declared as public and handed over to LTA.

Many useful features are included in this code to facilitate easy reading and quick retrieval of information. Throughout the code, colored spots are used to flag relevant codes and standards. Hyperlinks to these codes and standards are provided where available. The entire set of diagrams have been enhanced to ensure legibility and important sections of the diagrams have been highlighted to bring the reader’s attention to the features that are relevant to the topic. Please refer to the User Guide on page 2 for more on this.

The list of key changes to the Code of Practice is given below.

April 2019 Edition

No	Chapter	List of key changes in COP
1	Chapter 1	Inclusion of DC lodgement guidelines
2	Chapter 2	Revised road cross-section details of safeguarded roads
3	Chapter 3	Revised scope of Traffic Impact Assessment (TIA) and Walking & Cycling Plan (WCP)
4	Chapter 4	Refinement to the Residential, Commercial, Industrial and Service Access Arrangement
5	Chapter 7	Insertion of new chapter on Declaration of Public Streets
6	COP Version 1.2 Chapter 11	Removal of Chapter on Engineering Works within Singapore Underground System (SURS) Tunnel Protection Reserve

Contents

List of the topics within each chapter that displays where each topic can be located. e.g.

Chapter 1 Overview of Submission Process for Street Works Related to Development Works

1.1	Introduction	10
1.2	Layout Plan Stage	11
1.3	Layout Plan lodgment	13
1.4	Submission of Street Plans	16
1.5	Lodgement of Street Plans	18
1.6	Requirements For Works on Public Streets	19
1.7	Development Proposal Above/Below Road Structures and Adjacent to/Within Public Streets	20
1.8	Procedure For Notification Of Opening Of New Street(s) to Traffic	26
1.9	Site Inspection of Completed Street Works	28

Numbering System

The page number is located on the top of the 'cross-hair' and in bold type. The chapter number is located on the bottom of the 'cross-hair' and in light type. i.e.

Facing Pages



Glossary

Can be found at the start of most sections to explain some commonly used technical terms.

Spot References

Throughout this code colored spots are used to flag relevant codes and standards. Hyperlinks to these codes and standards are provided where available.



Architectural Design Criteria



Standard Detail of Road Elements



Civil Design Criteria

Figures

The reader's attention is drawn to the features that are relevant to the topic by showing them in colour. The rest of the background information is grayed out.

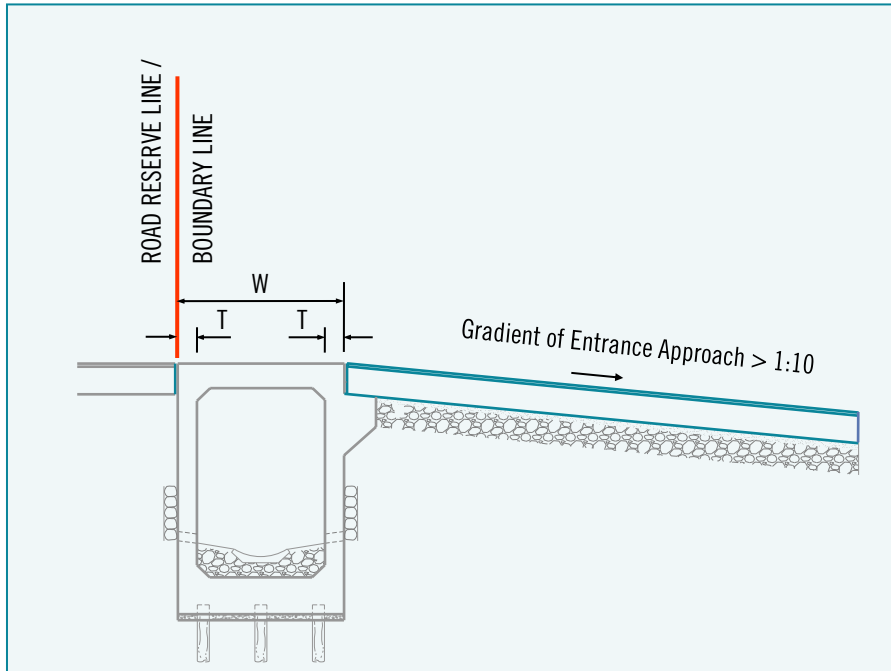


Figure 5.14 Typical Section of Entrance Culvert

Downloads



Documents that can be downloaded are identified easily by this icon.

References

SWA

[Street Works Act](#)

An Act relating to the construction, improvement, repair, maintenance and management of streets and back-lanes and other matters connected therewith, and the prevention of obstruction of five footways and private footways.

ADC

[Architectural Standards](#)

These standards set out the architectural design and the materials and workmanship specifications.

CDC

[Civil Design Criteria](#)

Contains the requirements for the design and detailing of all Civil Engineering Works for the construction of the roads and rail system.

SORE

[Standard Details of Road Elements](#)

These standards includes details of common road elements such as drains, kerbs and pavement for use as a reference for road construction.

MWS

[Materials and Workmanship Specifications](#)

Sets out the basic standard for the quality of materials and workmanship required by the Land Transport Authority.

WPS

[Code Of Practice for Works on Public Streets](#)

This Code of Practice sets out the procedures and requirements for carrying out works on public streets.

TCWZ

[Code of Practice for Traffic Control at Work Zone](#)

This Code of Practice sets out the guidelines and procedures for traffic control at work zones.

RSSZ

[Guide to Carrying Out Engineering Works within Road Structure Safety Zone and Engineering Activity on Land adjoining Public Streets](#)

This guide sets out the procedures and requirements for carrying out engineering works within road structure safety zone and engineering activity on land adjoining public streets.

SPS

[Guidelines for Placing Skips on Public Streets](#)

These guidelines provide the necessary requirements for the proper placement of skips along public roads to ensure safety and minimise obstructions and inconvenience to road users.

CP10

[SS CP 10](#)

Code of Practice for Installation and Servicing Electrical Fire Alarm Systems



[OIC Search](#)

This search allows you to find out the Officer-in-Charge of a certain road or Mukim/Township in Development & Building Control Division by keying in the road name or Mukim/Township no.

Chapter 1 Overview of Submission Process for Street Works Related to Development Works

1.1	Introduction	10
1.2	Layout Plan Stage	11
1.3	Layout Plan lodgment	13
1.4	Submission of Street Plans	16
1.5	Lodgement of Street Plans	18
1.6	Requirements For Works on Public Streets	19
1.7	Development Proposal Above/Below Road Structures and Adjacent to/Within Public Streets	20
1.8	Procedure For Notification Of Opening New Street(s) To Traffic	26
1.9	Site Inspection of Completed Street Works	28

Chapter 2 Safeguarding of Road Reserve Lines

2.1	Introduction	39
2.2	Information on Road Reserve Lines	39
2.3	Criteria for Safeguarding Road Reserve Lines	40
2.4	Cross-Section of Road Reserves	42
2.5	Cul-De-Sacs	44
2.6	Junction Layout	44
2.7	Setback of Development Boundary	44

Chapter 3 Traffic Impact Assessment (TIA)

3.1	Introduction	63
3.2	Purpose of a TIA	63
3.3	When is a TIA submission required?	64
3.4	Who Prepares a TIA?	64
3.5	The TIA Process	64
3.6	Pedestrians and Cyclists Assessment	69
3.7	Public Transport	76
3.8	Road Traffic	80
3.9	Transport Improvement Measures	84
3.10	Other Assessment Issues	89
3.11	TIA Submissions and Reports	91

Chapter 4 Access Arrangements

4.1	Introduction	136
4.2	Location of Vehicular Access Point	136
4.3	Service Accesses	136
4.4	Access Arrangement for Landed Residential Developments	137
4.5	Design of Entrance Access	138
4.6	Width and Turning Radius of Vehicle Accesses	141

Chapter 5 **New Street Proposals**

5.1	Introduction	145
5.2	References	145
5.3	Adequate Provision of Roads	146
5.4	Planning Permission & Certified Plan	147
5.5	Utility Services Plan	147
5.6	Co-ordinated Utilities Plan (CUP)	148
5.7	Street Works Deposit	148
5.8	Reduction of Street Works Deposit	149
5.9	Maintenance of New Street	149
5.10	Service Roads	149
5.11	Street Plan Presentation Standards and Requirement	150
5.12	Site Plan	150
5.13	Longitudinal Section Plan	157
5.14	Cross Sectional Plans	161
5.15	Types of Road Pavements	167
5.16	Details of Frontage Improvement to Development	170
5.17	Examples of Various Plans to be Submitted	174
5.18	Plan Presentation for Traffic Layout Plan	176
5.19	Details of Road Reserve / Key Plan / Scale	177
5.20	Street Lights	177
5.22	Traffic Lights	177
5.23	Typical Traffic Layout Plan Related to Development With Street Works	177
5.24	Application for Temporary Crossings	187

Chapter 6 **Declaration of Public Streets**

6.1	Introduction	192
6.2	Submission	192
6.3	Draft Declaration Plan	192
6.4	Final Declaration Plan	193
6.5	Colour Scheme	194
6.6	Plan Samples	195

Chapter 7 **Expunction of Public Streets**

7.1	Introduction	199
7.2	Reference	199
7.3	Expunction of Existing Public Street	199
7.4	Application by Private Developer or Government Agency	199
7.5	Approval	200
7.6	List of Authorities to Seek Clearance for Expunction of Public Street	202

This chapter sets out the key considerations of the LTA at the Layout Plan Stage and the extent of information required to be shown in the proposal plans to obtain clearance.



Chapter 1

Overview of Submission Process for Street Works Related to Development Works

Glossary

Access Point

Generally refers to the vehicular entrance to a development.

Commuter Facilities

All forms of road related facilities (includes covered or open linkways, pedestrian overhead bridge, underpass, bus shelter and footway) connected to various transport nodes to cater to the needs of pedestrians and commuters.

Defects Liability Period

In relation to any works which have been carried out on a public street or a street intended to be a public street, means the defects liability period as specified in the Code of Practice in respect of that type of works.

RSSZ

Engineering Activities/ Works

Please refer to the definition in Guide to Carrying out Engineering Works within Road Structure Safety Zone and Engineering Activity on Land adjoining Public Streets.

Glossary

Latent Defects	Defects caused by failures in design, workmanship or materials that may not be apparent or readily detectable (even with the exercise of reasonable care) until many months after the completion of construction.
Layout Plan	A set of plans that represents the way streets, buildings, open spaces etc are placed or laid out on the ground in relation to each other.
Lodgement	A process of self-declaration by a Qualified Person (QP) who prepares the Layout Plan/Street Plan and declares compliance with the Street Works Act and its Regulations when he lodges the Layout Plan/Street Plan with LTA.
New Street	Includes: <ul style="list-style-type: none"> • the continuation of an existing street; • the widening or alteration of any existing street and • the adapting of a street, made for foot traffic only, for carriage traffic.
Public Street	Any street over which the public has a right of way and which has become vested in the Government under the Street Works Act or any other repealed Acts.
Qualified Person (QP)	Means a person who is registered either as: <ul style="list-style-type: none"> • an architect registered under the Architect Act or • a professional engineer registered under the Professional Engineers Act.
Road Related Facility	Includes any traffic sign, directional sign, street name sign, traffic light, bus shelter, place for the parking of bicycles, power-assisted bicycles or personal mobility devices, railing, lighting apparatus and any optical, electronic, communication, monitoring or computerised equipment necessary for the control and management of traffic, and any other road related structure and facility maintained by the Authority.
Road Structure	Includes any bridge, underpass, tunnel, earth retaining wall and ancillary buildings.
Road Structure Safety Zone	Part of the land or area which is 20m from the outer edge of any part of a road structure.
Street Furniture	Street features such as streetlights, kerb, roadside drain, etc placed along the street.
Street Plan	Refers to the plan relating to the construction of a new street as referred to in Section 18 of the SWA.
Street Reserve Plot	Part of the development that is required for future road widening or to make up standard features of a road.

Glossary

Street Works

Refers to works of levelling, paving, metalling, flagging, kerbing, channelling, draining, lighting, laying of cables and mains, other utility services and otherwise the making good of a street or part of the street.

Traffic Layout Plan

A plan showing existing and proposed traffic markings, traffic signs and arrow/lane markings, etc.

Utilities

Includes water pipes, gas pipes, sewer pipes, drainage facilities, electricity cables, telecommunication cables and any other pipes, cables and their related apparatuses.

Overview of Submission Process

1.1 Introduction

There are 3 major stages where approval is required from LTA for any proposed development, namely Layout Plan (also known as Development Control Plan), Street Plan (also known as Building Plan) and Certificate of Statutory Completion (CSC). The approval process is shown in [Appendix 1A](#).

The Qualified Person (QP) has to obtain LTA's clearance at the various stages when development proposals involve the following but not limited to:

- Construction of new street as defined in the Street Works Act.
- Alteration of an existing street including relocation/widening of existing access point(s) to the development.
- Alteration of an existing street including street furniture and traffic marking/traffic signs within the road reserve.
- Construction of new access point(s) to the development.
- Development proposal that is affected by the line of road or tunnel reserve.
- Development that is located above, below and near (as defined by the Road Structure Safety Zone) to road structures.
- Development that involves basement works. ie. involves excavation adjacent to the road reserve.

The list of developments exempted from obtaining LTA's clearance is given in [Appendix 1B](#).

1.1.1 References

In preparing the necessary plans at the various stages, the QP shall make reference to the relevant chapters in the following publications and comply with the requirements stated therein:



- Street Works Act (Chapter 320A) & Street Works (Private Street Works) Regulations



- Civil Design Criteria for Road & Rail Transit Systems



- Architectural Design Criteria for Road & Rail Transit Systems



- LTA Standard Details of Road Elements



- Materials & Workmanship Specification for Civil & Structural Works



- Materials & Workmanship Specification for Architectural Works

QPs are advised to refer to the LTA/Corenet e-info websites for the most updated version of the publications.

1.2 Layout Plan Stage

The layout plan stage is the stage where LTA will evaluate if the proposal can meet the requirements of traffic operations and safety. This is the stage which has a significant impact on the overall layout of the development.

1.2.1 Key Evaluation Areas at Layout Plan Stage

The following key areas are evaluated in this stage:

Key Considerations

Walk Cycle Ride (WCR) friendly developments

As part of the Walk Cycle Ride (WCR) SG Vision, LTA aims to make walking, cycling and riding public transport the way of life for Singaporeans and a means of enhancing liveability in Singapore.

Developers are required to consider the safety, connectivity and accessibility for pedestrians and cyclists in the design of the development.



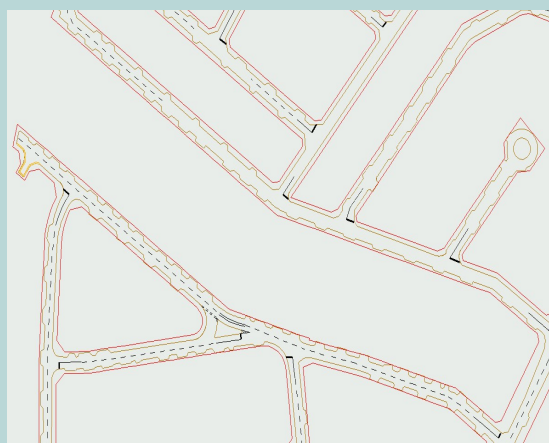
Suitability of access points

Access points shall be suitably located to ensure smooth flow of traffic on roads. Access points are to be located along local access roads and at a safe distance from road junctions, road bends, pedestrian crossings, bus-stops, existing access points etc. Access points shall be located along the lowest hierarchy of roads if there is more than one road category fronting the development site.



Adequacy of new road proposed

The new road proposed shall serve the various plots of developments adequately with each plot directly accessible from a public street. The proposed road reserve widths shall be determined based on the type and intensity of development.



Key Considerations

Extent of frontage improvement

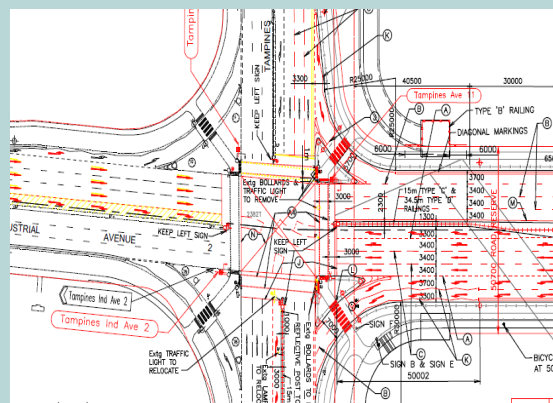
The extent of frontage improvement including upgrading of open drains to covered drains for safety of pedestrians and to serve as footpaths is determined at this stage for the details to be worked out by the Professional Engineer.

Existing street lights and/or its related facilities such as overground (OG) boxes may be required to be relocated to give way for proposed access points.



Improvement needed to existing traffic scheme

Any improvement to the existing traffic scheme including introduction of yellow boxes, relocation of arrow markings, relocation of hump etc are determined at this stage.



Requirement for a Traffic Impact Assessment (TIA)

TIA studies are required for developments exceeding certain threshold development intensity. The purpose of a TIA is to identify the impact of a development on the surrounding transport network and the necessary measures to mitigate these impacts. This is also the stage where the walking and cycling needs of the development is studied and the necessary infrastructure is designed for. If the development is located in an area with already high traffic volume, LTA will advise the applicant on whether a TIA is required.



Adequacy of commuter facilities

Some types of developments may require commuter facilities to adequately serve those who patronise these developments. These include pedestrian overhead bridges, bus stops or bus-bays, taxi stands, linkways, etc.



1.2.2 Follow-up Submission After Obtaining Layout Plan Clearance

Once the layout plan clearance for the proposed development is obtained, the QP (Civil) shall submit the Street Plan to obtain BP clearance. The Street Plan shall be prepared based on the approved layout plan and prevailing specifications, standards, guidelines and codes of practice.

The QP (Civil) shall lodge the street plans with LTA if the proposal falls within the lodgement criteria. This is further explained in the sections below.

1.2.3 Additional Information

The QP would also evaluate if a proposed development would affect an existing road or a road structure during the course of construction and implement suitable measures to ensure the safety of the public. Additional information is required to be submitted if a development:

- is above, below or near to road structures (refer to Section 1.7);
- involves works that are adjacent to or within an existing public street (refer to Section 1.7)

1.3 Layout Plan Lodgement

Under the layout plan lodgement scheme, the QP shall prepare the layout plans and declare compliance with LTA's requirement stipulated in the prevailing code of practice, standards and guidelines.

All **Landed House Developments** qualify for lodgement **except** those that involve the following :

- (a) the construction of a new street;
- (b) the continuation of an existing street;
- (c) the adaptation of a street made for foot traffic only into a street for carriage traffic;
- (d) the construction of any new road related facility or modification of any existing road related facility;
- (e) the construction of a new covered linkway or relocation of any existing covered linkway;
- (f) a landed house development with street reserves cutting into the legal boundary of the development;
- (g) a landed house development that consisting of more than 2 dwelling houses;
- (h) relocation of a vehicular access to another street;
- (i) works carried out within the road structure safety zone; or
- (j) works that are carried out within 50 metres the of either edge of a street reserve of a road tunnel.

1.3.1 Making an Application

- Under the layout plan lodgment scheme, the QP shall ensure and self-declare that the proposal is in compliance with LTA's requirements stipulated in the prevailing code of practice, standards and guidelines.
 - The QP shall lodge the layout plans via CORENET.
 - In the CORENET form, the QP is required to select the scope of proposed works:
 - (i) Development With NO proposed external work;
 - (ii) Developments With proposed external work
 - After the successful submission of the plans in Corenet, the QP will receive an auto-acknowledgement letter containing either one of the following advices:
 - (i) Submission of the building plan to this Division for BP and CSC clearance is not required as there are no proposed works within the road reserve.
- OR
- (ii) The PE is required to lodge the street plan submission with Land Transport Authority together with a set of approved layout plans and a copy of written permission from URA. CSC clearance is necessary for the proposed development.

1.3.2 Documents to Submit

- Completed application form "LTA_DBC_Road.xfd"
- One set of layout plans duly endorsed by the QP including:
 - Site plan
 - Floor plans
 - Section plans (including road features)
 - Elevation plans
- Topographical plan (shall clearly indicate any encroachment of existing structures on the road reserve/state land.)
- Latest site photos (with date stamp) showing the existing frontage of landed house (Date of photos taken shall not precede the date of layout plan lodgement by more than a month.)

1.3.3 Audit Checks on Layout Plans Lodged with LTA

LTA would carry-out audit checks on the layout plans that have been lodged. If details of the street works do not comply with LTA's requirements, LTA would issue a written direction to the QP to amend the proposal. However, if any deviation is discovered during CSC inspection, the QP will have to rectify the situation or demolish the completed works if necessary and reconstruct the street works according to LTA's requirements.

QPs can refer to the [Lodgement Guide Book](#) prepared to assist them in lodgement schemes.

1.3.4 Existing Lamp Post and Overground (OG) Box Affected by Proposed Street Works

For layout plan submissions involving the relocation of existing street lamppost and/or OG boxes, the QP (Architect) shall advise QP (Civil/M&E) to forward the proposal for approval with a cut out plan of the affected streetlights, lighting control boxes and proposed positions with the inventory ID (lamppost no.) and road name to:

Engineer-In-Charge,
Lighting & Facilities Dept,
Commuter Facilities & Systems Management Division,
71 Chai Chee Street
Block 3, Level 3
Singapore 468981

The QP (Architect) shall also co-ordinate with all other technical agencies on whether the new lamppost location are acceptable to all parties. The proposed relocation of the lamppost shall comply with LTA's requirement and the developer/owner shall bear the cost of lamppost relocation.

1.4 Submission of Street Plans

The QP (Civil) is required to submit the Street Plans to LTA at the street plan stage. Submission of Building Plans at the Layout Plan stage by the Architect is not required.

1.4.1 Submission Requirements

Submission of Street Plan for approval by the QP (Civil) shall include the following:

- Detailed plan showing the proposed street works, including details of entrance access, positions of public street lights, sign posts and any other street related facilities.
- Traffic scheme plan, where applicable.
- Design calculations of the proposed structures, if structural design differs from LTA's Standard Details of Road Elements.
- Utility Services Plan (USP), if applicable (please refer to section 5.5).
- Coordinated Utility Plan (CUP), if applicable (please refer to section 5.6).

1.4.2 Submission of Mechanical and Electrical (M & E) Details in Relation to Proposed Street Works

Where applicable, details of mechanical and electrical design/installation in relation to the proposed street works, such as installation of public street lights, beacon lights, installation of escalators and lifts to pedestrian overhead bridge and underpass etc. shall be submitted to LTA for clearance before the commencement of the M & E installation works.

Unless otherwise stated in LTA's written direction to the Street Plan submission, all M&E details can be submitted separately from the Street Plans submission.

The developer and QP(s) shall be informed that if the proposed M&E details are not acceptable to LTA and require amendment that may affect the overall street proposal layout, the Street Plans that may have been approved separately shall be re-submitted for regularisation/re-endorsement.

Details of the M & E design and installation for commuter facilities such as pedestrian underpass and bus shelters are also required to be submitted for clearance by a QP (M & E).

The M & E design and installation shall comply with the specifications given in the Architectural Design Criteria for Road & Rail Transit Systems. Please refer to [Appendix 1C & 1D](#) for the M&E submission checklist.

1.4.3 Submission of Public Street Lighting Proposal (For New Streets)

A QP (Electrical) shall follow up to submit the following with regards to the provision of street lighting:



- [Checklist for street lighting design submission](#)
- location plan showing the proposed development
- a copy of approved street layout plan
- Plan / document showing:
 - i) position of proposed poles
 - ii) underground cable routing
 - iii) lighting control boxes location
 - iv) lighting simulation
 - v) electrical single line diagram
 - vi) design electrical load calculation
 - vii) pole concrete foundation design & calculation with QP (Civil) endorsement
 - viii) manufacturer's information / catalogue on the lamp, lantern, gears, cables, cut-out unit, control box, its accessories and concrete base, HD UPVC pipe, cable warning slab, fuse, earthing accessories including country of origin.
- The following Photometric Data relevant to each luminaire type shall also be provided:
 - i) Isolux Diagram
 - ii) Utilization Factor Curves
 - iii) Polar Curves
 - iv) Downward Light Output Ratio
 - v) Downward and Upward Flux Fractions

CDC

All design pertaining to provision of public street lighting shall comply with the specifications/requirements stipulated in Chapter 21 of LTA's publication - Civil Design Criteria for Road & Rail Transit System.

The QP (Electrical) shall also:

- comply with all written law, bylaws, rules, regulations and Code of Practices of any government ministries, statutory boards or other public authorities which are applicable or relevant to the execution of the services;
- conduct site visits to investigate and propose feasible design to suit the actual site condition for installation of new poles, or relocation of poles, etc.;
- arrange for a licensed cable detection worker to carry out detection of underground services.

1.5 Lodgement of Street Plans

Under the lodgement scheme, the QP(Civil) shall prepare the street plans in accordance with the Street Works Act and its Regulations, and declare compliance with the Act and the Regulations when he lodges the street plans with LTA. LTA will issue a letter to acknowledge receipt of the lodgement.

Street Plan lodgement scheme is applicable for all types of development except **commercial** developments and **mixed-use** developments.

The lodgement scheme is **NOT** applicable for all developments that involve the following types of works:

- construction of a new street
- continuation or widening of an existing street
- conversion of streets meant for foot traffic to vehicular traffic and vice versa
- modification of any existing traffic scheme or introduction of new traffic scheme
- introduction or modification of any road related facilities, such as bus stop and pedestrian overhead bridge, covered linkway etc

1.5.1 Making an Application

Under the lodgement scheme, the PE has to ensure and make a self-declaration that the street plans submitted are in compliance with the Street Works Act and its Regulations.

The PE shall lodge the street plans via CORENET after the Layout Plan clearance has been obtained from LTA. Details of the street plans shall follow the approved Layout Plan.

PE will receive an auto-acknowledgement through CORENET .

The PE shall apply for Certificate of Statutory Completion (CSC) clearance upon completion of the street works.

1.5.2 Documents to Submit

- Completed Application Form “LTA-DBC_Roads.xfd”
- A copy of the URA’s Written Permission together with the approved plan
- Set of street plans
 - Site plan
 - Longitudinal section plans
 - Cross section plans
- A copy of LTA’s Layout Plan clearance letter/layout plan lodgement acknowledgement letter

1.5.3 Audit Checks on Street Plans Lodged to LTA

LTA would carry out audit checks on the Street Plans that have been lodged. If details of the street works do not comply with LTA's requirements, LTA would issue a written direction to the QP (Civil) to amend the proposal. If however, any deviation is discovered during CSC inspection, the QP will have to demolish the completed works and reconstruct the street works according to LTA's requirements.



QPs can refer to the [Lodgement Guide Book](#) prepared to assist them in lodgement of Street Plans.

1.5.4 Existing Lamp Post and Overground (OG) Box Affected by Proposed Road Works

For street plan submissions involving relocation of existing street lampposts and/or OG boxes , the PE shall forward the proposal with a cut out plan of the affected streetlights, lighting control boxes and proposed positions with the inventory ID (lamppost no.) and road name attention to:

Lighting & Facilities Dept,
Commuter Facilities & Systems Management Division,
71 Chai Chee Street
Block 3, Level 3
Singapore 468981

The PE shall also co-ordinate with all other technical agencies on whether the new lamppost locations are acceptable to all parties. The developer/owner shall bear the cost of the lamppost relocation. The proposed relocation of the lamp post shall comply with LTA's requirement.

1.6 Requirements For Works on Public Streets

QP shall ensure that an application for a permit to carry out works on public streets is submitted via the LTA.PROMPT website: <https://prompt.lta.gov.sg> before carrying out any external works. A copy of the street plan clearance should be attached together with the application. QP shall ensure that no works on the public streets are carried out until a permit has been issued.

Development Proposals Above / Below Road Structures and Adjacent to / Within Public Streets

1.7 Development Proposals Above / Below or Near Road Structures

Development proposals above or below road structures and those adjacent to or within existing public streets are of special concern to LTA as they may affect the structural integrity of the nearby road structures or public streets.

The developer shall engage a qualified person for supervision of structural works, QP (Civil), to obtain the Authority's clearance at Layout Plan stage. This chapter provides guidelines to the QP (Civil) to obtain Layout Plan clearance for development proposals under this scenario.

The QP (Civil) shall identify and verify the presence of all road structures affected by the development proposal and indicate them in his Layout Plan application. The following figures illustrate the Road Structure Safety Zone for above-ground and underground structures.

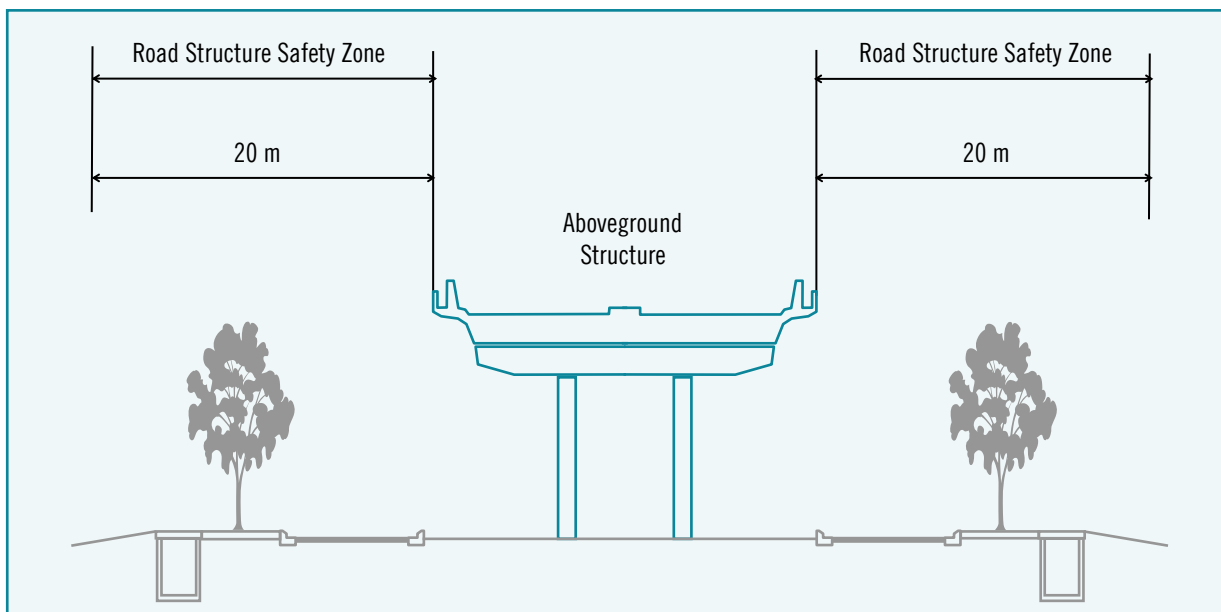


Figure 1.1 Road Structure Safety Zone for Structures Above Ground Structures

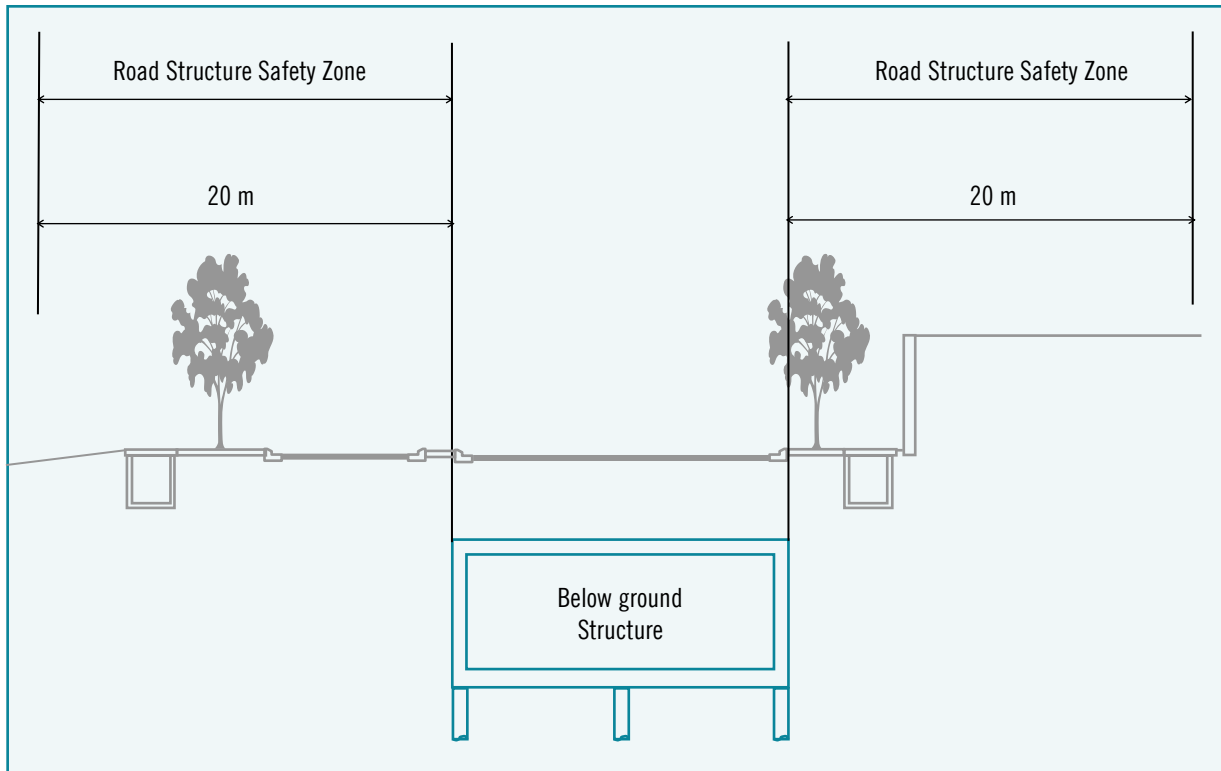


Figure 1.2 Road Structure Safety Zone for Structures Below Ground Structures

1.7.1 Documents for Submission at Layout Plan Stage

To facilitate the approval process, the QP (Civil) shall submit the proposed development plans for Layout Plan clearance.

Generally, the plans shall comply with clauses 1.7.2, 1.7.3 and 1.7.4 where applicable in relation to the road structure; existing ground levels; and below ground structure outline (if any).

The Authority reserves the right to impose any additional requirement deemed necessary to safeguard the road structures.

1.7.2 Development/Building Works Above Road Structures

1.7.2.1 General Conditions

All proposed building (or development) works shall not affect the structural integrity of any road structures. They shall not in anyway interfere with the Authority's routine inspection and maintenance work on road structures.

Utilities should not be affixed on any parts of the road structures. All parts of the road structure shall be kept accessible at all times.

1.7.3 Development/Building Works Under Road Structures

(Read in conjunction with Figure 1.3 and 1.4)

1.7.3.1 General Conditions

- The design, occupancy and use of any development under bridges shall be such that neither the use, safety, appearance, nor the enjoyment of the road and bridge is adversely affected;
- Any temporary or permanent change in alignment or profile of the existing roads and bridges shall not be allowed;
- No structure of any kind shall be allowed to be built around or enclose any bridge columns/piers/abutments. Structure shall be at least 5m away from any bridge columns/piers/abutments. All parts of the bridge shall be kept accessible at all times;
- Utilities should not be affixed on any parts of the road structures. All parts of the road structure shall be kept accessible at all times;
- The ingress to and egress from the development shall not interfere with the major flow of the road traffic. This ingress shall be located away from traffic junctions, bus stops and pedestrian crossings;
- Pedestrian access to the development shall be provided with proper footpath and lighting; and
- The development shall be designed to allow the Authority to carry out maintenance and inspection of bridge bearings at all times. A vertical clearance of not less than 2.5m from the lowest point of the beam soffit/girders/slabs/bridge viaducts to the roof of development shall be provided.
- All categories of development shall be of low risk. The development shall have no basement. The roof of the proposed development shall be designed to carry a minimum live load of 5kN/m². The Authority shall reserve the right to order temporary closure of the business operation for the routine inspection and maintenance of the road structures.

1.7.3.2 Fire Safety Requirements

CP10

- Automatic fire alarm system in compliance with SS CP10 shall be provided. The fire alarm system shall be connected to the fire station via an approved alarm monitoring station in accordance with SS CP10; and
- Roof and external walls of the development including window openings/ventilation openings located within 6m from exterior of viaduct structure shall have 2 hours fire resistance rating as shown in Figure 1.3. If sprinklers are provided, the fire resistance rating can be reduced to 1 hour.

1.7.3.3 Aesthetic Treatment

- The development shall blend well into the surroundings and pre-consultation with the Authority and other relevant authorities on the aesthetic treatment is required; and
- Commercial or non-commercial signage or signboard shall not be placed on or installed on any parts of the bridge. However, independent signage or signboard may be installed on the ground with approval from the Authority and other relevant authorities.

1.7.3.4 Parking Space

- Flame detectors compliance with SS CP10 shall be provided for open parking spaces. The fire alarm system shall be connected to the fire station via an approved alarm monitoring station in accordance with SS CP10;
- Hose reel shall be located such that all parking spaces are accessible; and
- Car park shall only be used for passenger cars and motorcycles. If parking spaces are opened for light good vehicles or lorries, 2 hours fire rated enclosed structure shall be provided.

1.7.3.5 Maintenance

- The developer/owner of the development shall be fully responsible for the proper maintenance of the building/facility occupying the space so as to assure no interference with the functions and operations of the bridge.

1.7.4 Design for Structures Near Road Structures

Building near bridges and viaducts shall be at least 6m clear or the separation distance calculated for unprotected opening in accordance with the Code of Practice for Fire Precaution in Building, whichever is greater, from the outermost edge of the road structure.

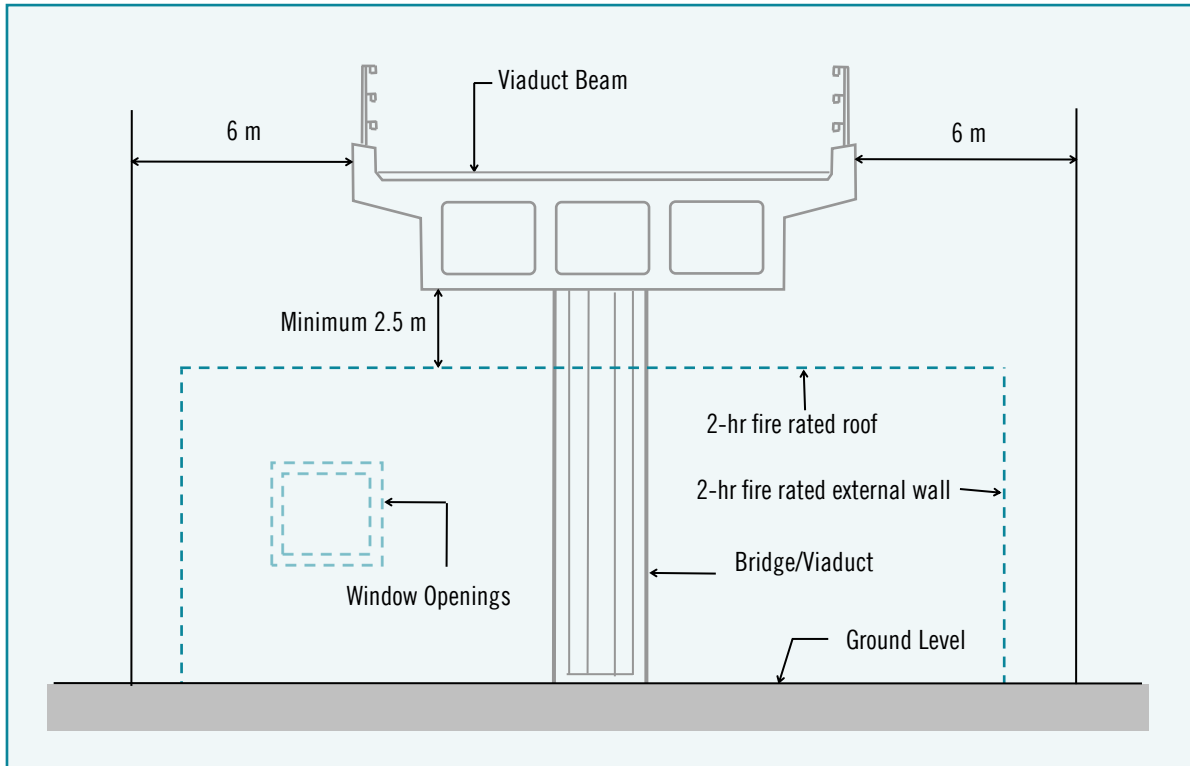


Figure 1.3 Clearance of Building Roof below Bridge/Viaduct (Cross Section)

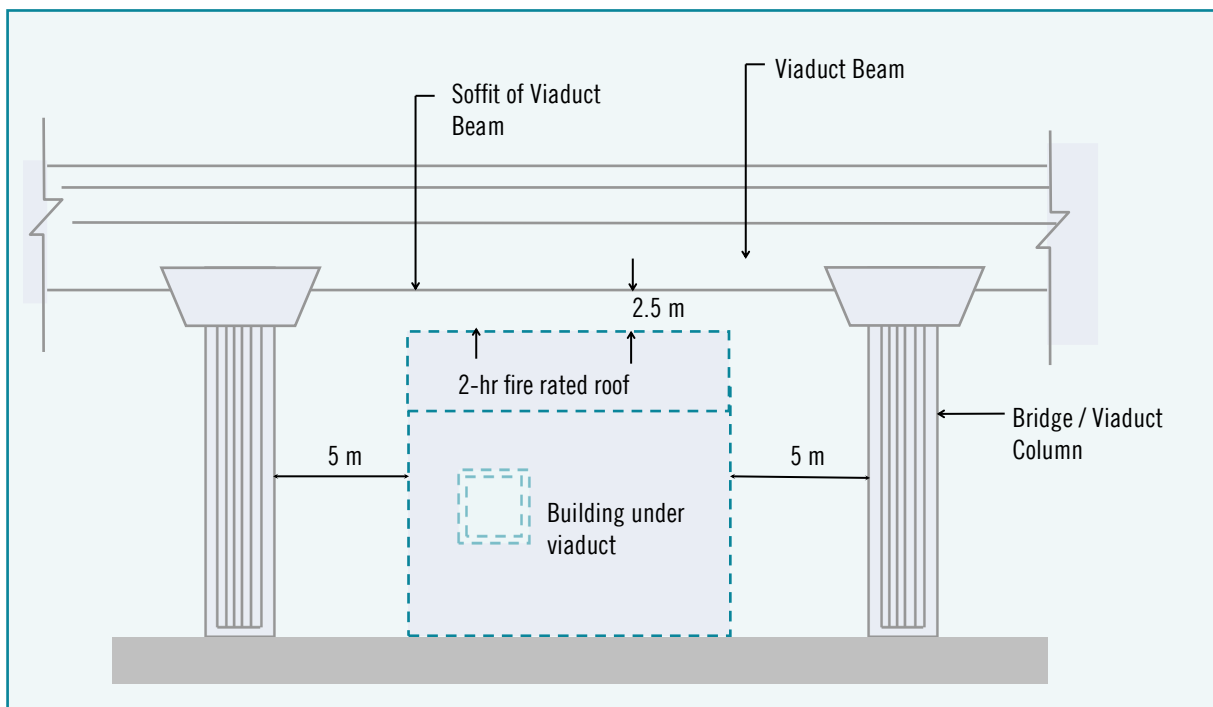


Figure 1.4 Clearance of Building Roof Below Bridge/Viaduct (Longitudinal Section)

1.7.5 Development Proposals Adjacent to / Within Public Streets

This may include excavation works adjacent to the road reserve of an existing public street or installation of ground stabilization measures (e.g ground anchors) within an existing public street. When such works are not appropriately designed and supervised, it may pose a hazard to the surroundings, such as slope failure, subsidence or collapse of adjacent road etc.

Other than carrying road traffic, roads in Singapore also house many utility services. Any collapse of a road due to adjacent excavation work will disrupt traffic movement and utility services which poses a great inconvenience to the general public.

It is therefore very important for the QP (Civil) to ensure that any such works are appropriately designed, supervised and executed at all times. If the proposed development works (including Earth Retaining and Stabilizing System) encroaches into the Road Reserve, they shall be stated and shown clearly on plans.

1.7.6 Granting of Layout Plan Clearance

The Authority will grant the Layout Plan clearance for the development proposal if the Authority is satisfied that:

- QP (Civil) has complied with the requirements of sub-sections 1.7.1 to 1.7.5 and that all submissions are in order; and
- QP (Civil) has declared and confirmed that the Engineering Works and Engineering Activities are to be carried out without affecting the structural integrity and safe operation of the road structures and the public street and the requirements in the “Guide To Carrying Out Engineering Works within Road Structure Safety Zone and Engineering Activity on Land Adjoining Public Streets” will be complied with during the submission for approval to commence Engineering Works and notification of Engineering Activities.

1.7.7 Follow Up Submission After Obtaining Layout Plan Clearance

The QP (Civil) shall note that the Layout Plan clearance given by the Authority at this stage does not automatically allow the developer and his appointed builder/contractor to carry out the Engineering Works.

A separate application shall be made to the Authority:

- (i) for Approval to commence Engineering Works within RSSZ.
- (ii) for Notification to carry out Engineering Activities on land adjoining public streets

RSSZ

Please refer to “Guide To Carrying Out Engineering Works within Road Structure Safety Zone and Engineering Activity on Land Adjoining Public Streets” for more details.

The overview of the process of submission for proposals within Road Structure Safety Zone & Adjacent To Public Street is given in Fig 1.5.

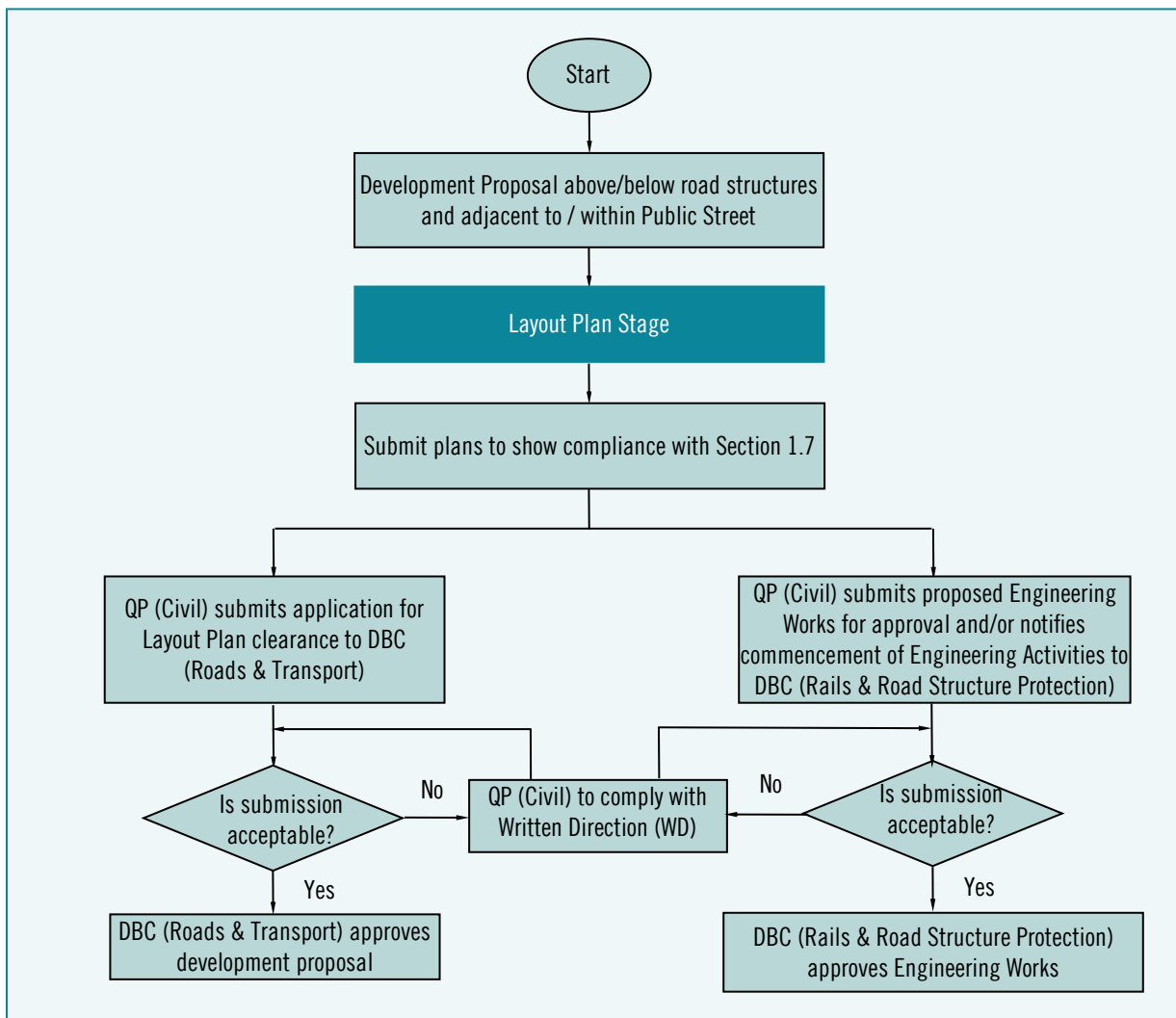


Figure 1.5 Overview of Process For Development Proposals above / below Road Structures And Adjacent to / Within Public Street

1.8 Procedure For Notification Of Opening Of New Street(s) To Traffic

All notification of opening of new street(s) to traffic shall be made via e-corenet. This is to ensure a more systematic approach to information and records management. It also allows LTA to make necessary follow-ups such as issuing a road announcement in one-motoring website (if applicable) and allowing map providers to update their maps.

- The notification of opening of street(s) to traffic shall be submitted at least **4 weeks** (for roads without cycling path) or **8 weeks** (for roads with cycling path) before the street is open to traffic.

1.8.1 Documents to Submit

1.8.1.1 The documents to be submitted for roads constructed by HDB shall be as follows. (the stipulate file naming convention is given in brackets):

- Cover Letter stating clearly the road opening date (Cover_Letter.pdf)
- Street and Building Names Board (SBNB) Approval Letter of Street name (Street_Name_Approval_Letter.pdf)
- Certificate of Supervision by PE ([Certificate_of_Supervision.doc](#))
- Road Test Result (Road_Test_Result.pdf)
- Checklist for Opening of New Street(s) To Traffic ([Checklist_of_completed_work.pdf](#))
- Photographs of Completed Work (Photographs_of_completed_work.pdf)

1.8.1.2 The documents to be submitted for roads constructed by other than HDB shall be as follows (the stipulated file naming convention is given in brackets):

If CSC has been issued for the street works:

- Cover Letter stating clearly the road opening date (Cover_Letter.pdf)
- Street and Building Names Board (SBNB) Approval Letter of Street name (Street_Name_Approval_Letter.pdf)
- Approved Traffic Layout Plan (Approved_Traffic_Layout_Plan.dwg)

If CSC has **not** been issued for the street works:

- Cover Letter stating clearly the road opening date (Cover_Letter.pdf)
- Street and Building Names Board (SBNB) Approval Letter of Street name (Street_Name_Approval_Letter.pdf)
- Approved Traffic Layout Plan (Approved_Traffic_Layout_Plan.dwg)
- Certificate of Supervision by PE ([Certificate_of_Supervision.doc](#))



Note:

If the subject road(s) are opened in phases, please include a key plan to highlight the roads that are to be opened in the current phase.

Inspection For CSC Clearance And/Or Handing Over of Completed Street Works

1.9 Site Inspection of Completed Street Works

When the street works of any development proposal is completed, the QP shall request for a CSC inspection before the completed street works can be handed over to LTA. Generally, this process is associated with the issuance of Certificate of Statutory Completion (CSC) by the Building and Construction Authority, in which the CSC is granted when the relevant technical agencies have cleared and accepted the completion of works approved by them earlier. In this regard, LTA continues to use the caption of CSC clearance in its clearance letter to the QP on the acceptance of completed street works.

Upon request by the QP, LTA officers will inspect the completed works to check if the works were carried out in accordance with approved plans and whether they meet the material and workmanship specifications of LTA. If the completed works includes a new street, underpass or pedestrian overhead bridge (POB), a joint site inspection with the project QP will be arranged.

CSC clearance will be issued to the QP when:

- the street works are carried out according to the approved plans and have met the material and workmanship specifications of LTA, and
- relevant documents as stipulated in section 1.9.3 are duly submitted and accepted by the LTA.

1.9.1 Maintenance Period (MEP) (For New Street, Underpass And Pedestrian Overhead Bridge)

In civil engineering construction works, latent defects of the constructed works do not normally surface immediately upon completion of the works. It is common in engineering contract to impose defect liability period for such latent defects to safeguard the interest of the developer and whoever is maintaining the works in due course.

Likewise in the construction of new streets, pedestrian underpass and overhead bridge a one year maintenance period (MEP) commencing from the date of CSC Clearance will be imposed on a development where the new street(s) is to be handed over to LTA for maintenance. During the 1-year MEP, the developer shall be responsible for the maintenance of the new street and all the related street furniture.

Developments that comprises only the construction/alteration of accesses, and frontage/localised street improvement works are not subjected to MEP. Such works are considered to be taken over for maintenance by the LTA once CSC clearance is issued.

1.9.2 Commencement of Maintenance Period

The MEP commences when LTA notifies the QP of the CSC clearance of completed street works. For better management of the completed street during MEP, the initial inspection of street works for commencement of MEP should be arranged in such a manner that the start of the MEP can coincide with the defects liability period (DLP) of the main building works.

Towards the end of the MEP, the QP shall write to LTA for a final joint site-inspection. If the inspection reveals no major latent defects to be rectified and that the required documents stipulated in section 1.9.3 below are duly submitted, LTA will arrange to declare the new street as a public street and will take over the street for maintenance.

1.9.3 Documents to be Submitted Before The Issue of CSC Clearance And The Handing Over of The Completed Street Works

Before the LTA/QP joint site inspection is held, the following relevant documents are to be submitted to LTA for the handing over of the completed street works.

1.9.3.1 For Developments That Include Only The Widening And Alteration of Existing Street Fronting The Development Site And/or Widening/Relocation of Accesses to The Development (Without New Street)

- E-Form for CSC application, the declaration by the QP on his supervision shall be part of the declaration clauses in the e-form.
- As-built drawings prepared by a Registered Surveyor in digital format (dgn, dwg or dxf). The drawings shall be in true co-ordinates.

Approved subdivision plan with Written Permission (WP) from the URA and Certified Plan (CP) if road reserve plot (s) is required to be vested to the State after the CSC Clearance is issued.

1.9.3.2 For Developments That Include Construction of New Streets

- E-Form for CSC application.
- As-built drawings prepared by a Registered Surveyor in digital format (dgn, dwg or dxf). The drawings shall be in true co-ordinates.
- Approved land subdivision plan with Written Permission and Certified Plan (CP) for the new road to be vested to the State upon handing over.
- Confirmation letter from Street and Building Names Board (SBNB) on the approved street names of the constructed new street.
- Road testing results.

1.9.3.3 Documents to be Submitted for Proposed Street Work With New Street, Underpass And POB Before The Taking Over



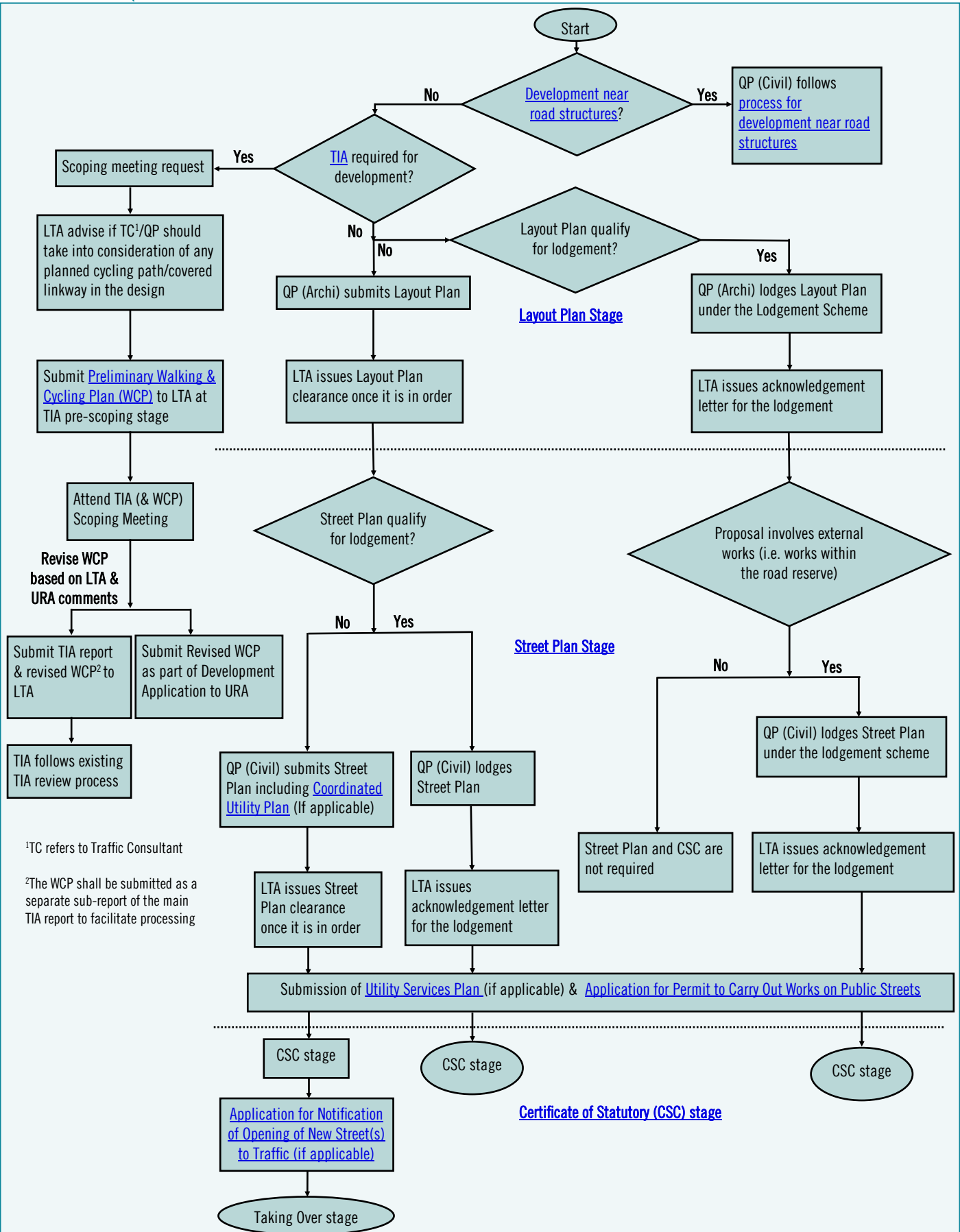
- [Road Data Form](#).
- Asset Master Input Form ([Summary](#) & [Details](#)) .
- 12 copies of declaration plan.
- Taking over letters from the PUB (Drainage), NParks and National Environment Agency (NEA).

1.9.3.4 Submission of Documents for Handing Over of Public Street Lighting in Hardcopy

- 1 set of as-built installation of the street lampposts and control boxes with labeling and underground cable routing endorsed by QP.
- 1 set of Electrical Single Line diagram with QP endorsement.
- 1 set of Statement of Turn On and Test Report from SP Services for the new control box.
- 1 set of Letter of Supervision on the electrical installation endorsed by Licensed Electrical Worker (LEW).
- 1 set of Letter of Supervision on the lampposts installation endorsed by PE (Structural).
- 1 set of underground cable insulation resistance test report endorsed by LEW.

Note: Submission of documents under sections 1.9.3.3 and 1.9.3.4 can be made anytime during the one year Maintenance Period .

Appendix 1A—Approval Process for Street Works Related to Developments



Appendix 1B—Proposed Works Exempted From Submission to Roads & Transport Section

The following development works which involve **no proposed works within road reserve** and **not affected by the road structure safety zone** are exempted from obtaining LTA's Development & Building Control Division (Roads & Transport) clearance:

- A&A works within Parks with no change of use;
- Continued use/renewal of ancillary workers dormitory with no increase in the number of workers housed in the dormitory;
- Conversion of HDB void deck to other uses.

The following agencies projects are also exempted from obtaining LTA's Development Building Control Division (**Roads & Transport**) clearance:

Works	Remarks
LTA's in-house projects	QP is required to seek relevant LTA divisions' clearance through the LTA project team
PUB's drain/canal upgrading works involving upgrading of existing road bridges, new cross culvert below road etc	Application to Road Asset Regulation & Licensing Division via LTA Prompt is applicable
PUB road raising projects	
URA's enhancement works of existing road involving realignment and paving of footway & carriageway etc	
Town Council Estate upgrading works (EUP) with no proposed works within road reserve	
HDB lift upgrading works with no proposed works within road reserve	
NParks park connectors/cycling path within and outside road reserve	Application to Active Mobility Group using the Active Mobility e-form is applicable
	Application to Road Asset Regulation & Licensing Division via LTA Prompt is applicable for the proposed works within road reserve
Demolition of existing buildings that does not require planning permission from URA	Application to Road Asset Regulation & Licensing Division via LTA Prompt for sealing of redundant access is applicable

Table 1.1 Agencies projects exempted from obtaining LTA's Development Building Control Division (Roads & Transport) clearance

Appendix 1C—M&E Checklist for Bus Shelter, Taxi/Passenger Pick-up Shelter, Pedestrian Overhead Bridge (POB) and Covered Linkway



Project: _____

(√) Tick the appropriate box for all items

Standard Requirements	Yes	NA	Remarks
1. General			
1.1 Drawings are in A1 series.			
1.2 Site plan, location plan and layout plans showing road reserve line and LTA's maintenance boundary are Included.	<input type="checkbox"/>		
1.3 The proposed installations provided are within LTA's maintenance boundary.	<input type="checkbox"/>		
1.4 Electrical installations above PUB drains are complied with PUB's requirements.	<input type="checkbox"/>		
1.5 Design Calculations with design parameters and acceptance criteria are included	<input type="checkbox"/>		
1.6 Technical data, catalogues, relevant test certificates / certificates of compliance from accredited testing facilities for proposed equipment, cables, materials and accessories are included.	<input type="checkbox"/>		
1.7 All electrical drawings, documents and design calculations are endorsed by Licensed Electrical Worker (LEW).	<input type="checkbox"/>		
1.8 All lightning protection system drawings, documents and design calculations are endorsed by Electrical Professional Engineer (PE).	<input type="checkbox"/>		
1.9 Responses to LTA's previous comments are attached.	<input type="checkbox"/>	<input type="checkbox"/>	
1.10 All additions/deletions/amendments are clouded.	<input type="checkbox"/>	<input type="checkbox"/>	
1.11 Commuter facilities M&E requirements stated in LTA's Architectural Design Criteria (ADC) Section 4 are complied with.	<input type="checkbox"/>		

Standard Requirements	Yes	NA	Remarks
2. Electrical Distribution			
2.1 Design of the electrical distribution is complied with LTA's ADC requirements and drawings.	<input type="checkbox"/>		
2.2 Single line diagrams for OG box and/or distribution board are included.	<input type="checkbox"/>		
2.3 Electrical loading and cable sizing calculations are included.	<input type="checkbox"/>		
2.4 OG box details showing plan view, front view, back view, internal view, external view, sections and elevations are included.	<input type="checkbox"/>		
2.5 Type B MCB are provided for all outgoing circuits.	<input type="checkbox"/>		
2.6 Surge protection devise is provided as per LTA's ADC requirements.	<input type="checkbox"/>		
2.7 SPPG approved OG Box location complete with the route of SPPG incoming cables are included.	<input type="checkbox"/>		
2.8 OG Box is not in the path of commuter walkway and line line of sight of commuters looking at the oncoming traffic (e.g. obstructing the sight of arrival bus).	<input type="checkbox"/>		
2.9 HD uPVC pipes for installation of armoured cables from the OG Box to the proposed commuter facilities are provided with straight run or with gradual bends.	<input type="checkbox"/>		
2.10 HD uPVC pipes complete with draw wires with straight or with gradual long bends are provided for advertisement panel for bus shelters.	<input type="checkbox"/>		
3. Lighting Design and Light Fittings			
3.1 No up-lighters are to be provided.	<input type="checkbox"/>		
3.2 Lighting level simulation reports with lux plots (one meter apart) and dimensions of simulated areas correspond to the lighting layout plans are included.	<input type="checkbox"/>		
3.3 Lighting levels and uniformity ratio measured at the ground level complies with LTA's ADC requirements.	<input type="checkbox"/>		
3.4 The maximum allowable power budget is complies with LTA's ADC requirements.	<input type="checkbox"/>		
3.5 LED type light fittings of weatherproof IP65, vandal proof minimum IK06, ultra-violet (UV) stabilised and colour rendering index of 80 to 89 with colour temperature between 2700K and 3000K are provided	<input type="checkbox"/>		
3.6 Lighting layout plans and sections with detailed cable routes from the OG Box to the respective light fittings are included.	<input type="checkbox"/>		

3.7 The layout arrangement of light fittings are generally in line with LTA's ADC drawings.	<input type="checkbox"/>		
3.8 Alternate lighting circuits are provided.	<input type="checkbox"/>		
3.9 High covered linkway lighting circuits are complied with LTA's ADC drawings.	<input type="checkbox"/>		
3.10 Covered POB is provided with intelligent lighting detection system as complied with LTA's ADC requirements.	<input type="checkbox"/>		
3.11 Cross-sectional mounting details of the proposed light fitting to demonstrate ease of maintenance is provided.	<input type="checkbox"/>		
4. Lightning Protection System			
4.1 The lightning protection system is designed in compliance to SS 555 and SS 551.	<input type="checkbox"/>		
4.2 Lightning protection layout plans, sections and installations details, such as lightning bonding, earth pit, etc. are included.	<input type="checkbox"/>		
4.3 Minimum 10mm thick aluminium honey comb roof panels complete with minimum 1mm thick top panel are provided as air termination system for the lightning protection system.	<input type="checkbox"/>		
4.4 The roofs are bonded to the support posts and support posts are connected to earth pits as per LTA's ADC drawings..	<input type="checkbox"/>		
4.5 Commuter facilities M&E requirements stated in LTA's Architectural Design Criteria (ADC) Section 4 are complied with.	<input type="checkbox"/>		
4.6 All metal structures are bonded to the rebar of the floor slab by means of purpose made clamp or weld. location of bonding and typical bonding details are provided.	<input type="checkbox"/>		
4.7 Each commuter facilities structure for POB, covered linkway, bus shelters, etc. are provided with an independent lightning protection system, including earth pits.	<input type="checkbox"/>		
4.8 The lightning protection system between two or more commuter facilities structures such as POB, covered linkway, bus shelters, etc. are bonded and electrically continuous.	<input type="checkbox"/>		
4.9 Earth pits are not in the path of commuter walkway.	<input type="checkbox"/>		

5. Earthing System and Equipotential Bonding			
5.1 Earthing requirements is provided in accordance to SS 551.	<input type="checkbox"/>		
5.2 Equipotential bonding are provided in accordance to SS CP5 for all exposed metal parts and metallic street furniture.	<input type="checkbox"/>		
5.3 Equipotential bonding layout plans, sections and cable route to OG Box are included.	<input type="checkbox"/>		

Qualified Person (QP)

Date

Note: Please tick in appropriate box for all items.
 This checklist is to be submitted for every submission/re-submission.

Appendix 1D – M&E Checklist for Covered Linkway



Project: _____

(√) Tick the appropriate box for all items

Standard Requirements	Yes	NA	Remarks
1. General			
1.1 Summary list of proposed items, with brand & model, to be used on site.	<input type="checkbox"/>		
1.2 Electrical and lightning protection system installations embedded in slab of PUB drains complies with LTA's requirements (if applicable).	<input type="checkbox"/>		
1.3 Consult LTA's Commuter Facilities & Systems Management if the roof alignment of the covered linkway affects any existing Street Lights.	<input type="checkbox"/>		
2. Electrical Distribution			
2.1 Power supply source is standalone i.e. supply source does not come from building switch board or share with building system.	<input type="checkbox"/>		
2.2 The control switches/MCB for the different facilities are independent e.g. control switch for covered linkway only control the lightings within covered linkway.	<input type="checkbox"/>		
2.3 The OG Box shall be located adjacent to the covered linkway and shall not in any way obstruct the view of motorists/road users.			
3. Lighting Design and Light Fittings			
3.1 The mounting details of the light fittings to the covered linkway beams/columns are included.	<input type="checkbox"/>		
3.2 The light throw of the light fittings is not affected by beams/columns i.e. minimise the discrepancy between the simulated lux and completed site measured lux.	<input type="checkbox"/>		

Qualified Person (QP)

Date

Note: Please tick in appropriate box for all items.

This checklist is to be submitted for every submission/re-submission.

[illegible]

Safeguarding of Road Reserves

Designed to be useful or practical.

Safeguarding of Road Reserves

2.1 Introduction

Road reserves also known as street reserves, indicate the extent of the existing or future road and includes space required for related facilities such as footpaths, cycling paths, bus-bays, covered linkways and other commuter facilities. The road reserve also includes necessary space required for services and tree planting verge and road side drain.

Road reserves can be safeguarded for -

- widening or extending existing roads; and
- constructing future roads, e.g. expressways, arterial roads, road interchanges, traffic junctions, etc.

2.2 Information on Road Reserve Lines

Information on road reserve lines is available to the public via the Road Line Plan (RLP). The extent of road reserve lines affecting a particular land lot is shown in the RLP. The RLP may be purchased from the convenience of home or office via the internet.

You may visit LTA's website at <http://www.lta.gov.sg> or Integrated Land Information Service (INLIS) website at <http://www.sla.gov.sg/INLIS/#/home> to make a purchase.

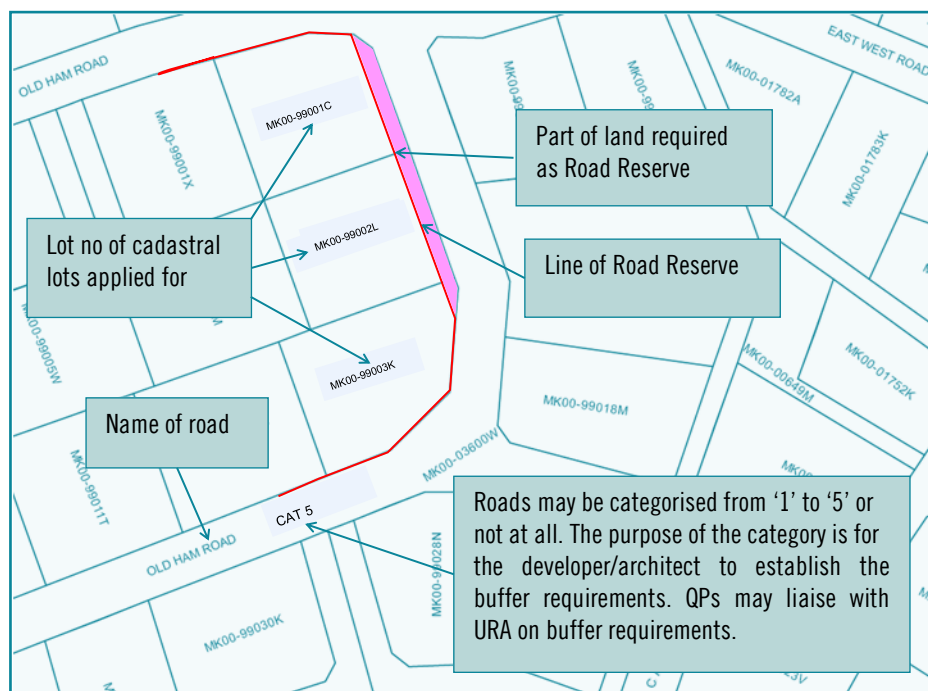


Figure 2.1 Sample of a Road Line Plan

2.3 Criteria for Safeguarding Road Reserve Lines

Generally, the future demand for road space depends on the generated traffic volume, which in turn depends on the scale, intensity and type of land use. Besides catering for the driving demand, sufficient space shall also be safeguarded for important mobility options such as walking and cycling. The width of road reserves to be safeguarded are as stated in the following sections.

2.3.1 Road System & Classification

Roads in Singapore are classified into 5 categories based on the function of roads as shown in Table 2.1 below. The Urban Redevelopment Authority (URA) makes use of the road categories to establish the buffer requirements of proposed buildings from the road. You may obtain more information on buffer requirements from the URA.

Category	Function
1	Expressway forms the primary network where all long distance traffic movements should be directed. It is planned to optimise long distance mobility from one part of the island to another
2	Major Arterial predominantly carries through traffic from one region to another, forming principle avenues of communication for urban traffic movements. It interconnects expressways and minor arterial as well as with other major arterial roads.
3	Minor Arterial distributes traffic within the major residential and industrial areas. It is planned to optimise circulation within the area and facilitate through traffic between adjacent towns.
4	Primary Access forms the link between local accesses and arterial roads. It provides access to developments and through traffic is discouraged. However, where a development is also accessible by a local access road, the access shall be located at the local access road.
5	Local Access gives direct access to buildings and other developments and should connect only with primary access.

Table 2.1 Road Categories

2.3.1 Safeguarding of Private Residential Estate Roads and Service Roads

The road reserve width of roads within private residential estates is generally 16.0m as shown in Table 2.2 below. The details of the 16.0m road reserve shall follow row C of Table 2.5. The standard cross-section details for existing roads that have been constructed based on a 15.4m, 14.2m or 12.2m road reserve can be found in [Appendix 2A](#). This is made available for reference only and all newly safeguarded local access roads in private estates shall follow the 16.0m road reserve. The road reserve width of service road shall be either 7.6m or 10m depending on its location.

Function	Development Type	Width of Road Reserve
Landed Housing Local Access Road	Detached / Semi-Detached / Terrace	16.0m
Service Roads	(i) All types	7.6m
	(ii) Within central area* * Refers to URA definition of central area	10m

Table 2.2 Road Reserve Width For Residential Estate Roads And Service Roads

2.3.2 Safeguarding of Expressways, Road Interchanges and Junctions

Notional alignments of expressways and locations of road interchanges are formulated in land use and transportation studies. An expressway reserve is either 45.5m wide for a dual three-lane expressway or 52.9m wide for a dual four-lane expressway. At expressway interchanges and junctions, the required road reserve varies and is dependant on the design layout.

2.3.3 Safeguarding of Splay Corners

A splay corner is required at the intersections of roads so that motorists’ view of the oncoming traffic, pedestrians and cyclists will not be obstructed and vice versa. Provision of a splay corner shall be as follows:

Type of Roads	Dimension of Splay Required
Roads in industrial area	9m x 9m
Roads in residential area meeting Cat 4 roads or higher	6m x 6m
Other roads in residential area	3m x 3m
Service roads and backlanes	3m x 3m

Table 2.3 Dimension of Splay Corner For Various Road Types

2.3.4 Safeguarding of Active Mobility Elements & Commuter Facilities

Active mobility elements encompasses footpath, cycling path and covered linkway. Generally, all road reserves will have a minimal provision of footpath. Where cycling path, covered linkway and other commuter facilities such as bus bay, pedestrian overhead bridge and underpass are to be catered for, the road reserve lines would include the additional land area required.

2.4 Cross-Section of Road Reserves

Generally, road reserves consist of a carriageway, centre median, tree-planting strip, verge for services, commuter facility/path cum drain as shown in Figure 2.2. Footpath is the default commuter facility provided in all road cross-sections. A list of cross-sections for the various types of road reserves are shown in [Appendix 2A](#) and [2B](#).

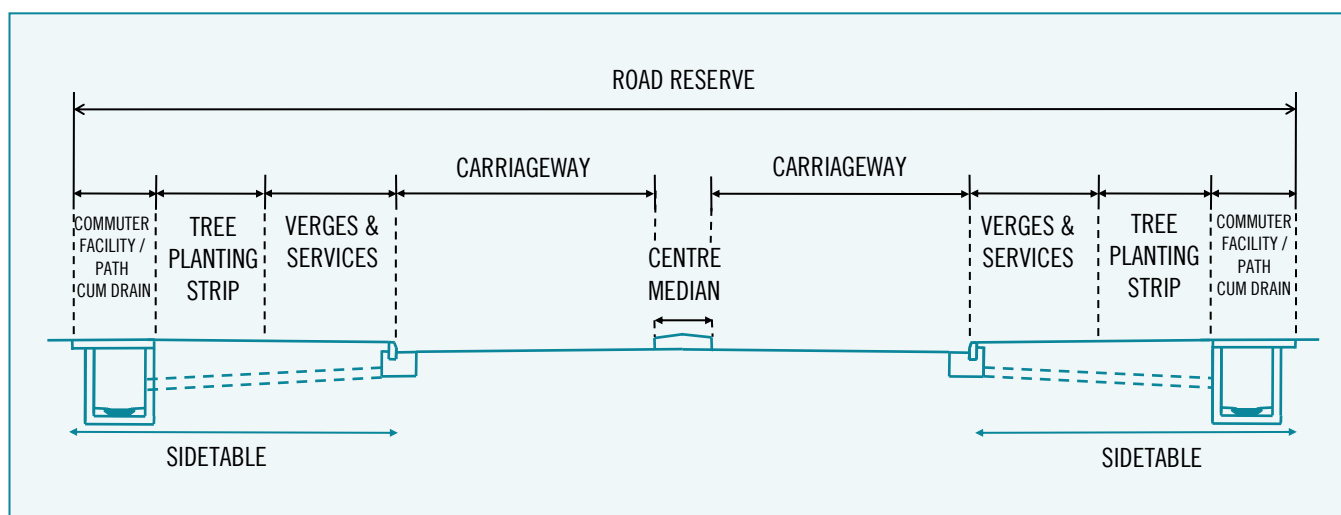


Figure 2.2 Typical Dual Carriageway Cross – Section

2.4.1 Cross-Section of Sidetable

Various combinations of commuter facilities within the sidetable are shown in Table 2.4 and Figure 2.3. The provision of commuter facility on either sidetables of a road can be similar or different. The developer shall consult LTA if there is uncertainty on the type of sidetable typology to be adopted.

Type	Commuter Facilities	Standard Width (m)
1 (Default)	Footpath only	1.8
2	Footpath + Cycling Path	$1.5 + 2.0^*/2.5^{\#}$
3	Covered Linkway	2.4/3.6^
4	Covered Linkway + Cycling Path	$2.4 / 3.6^{\wedge} + 2.0^*/2.5^{\#}$

*Intra-town cycling paths facilitate short utilitarian distance trips within the town and connect cyclists to the major public transport nodes.

#Inter-town paths facilitates commuter, recreational and longer distance trips. They are designed for seamless travel with minimal stops and detours.

^Covered linkways near MRT Stations where this is high pedestrian traffic

Table 2.4 Width of Commuter Facilities

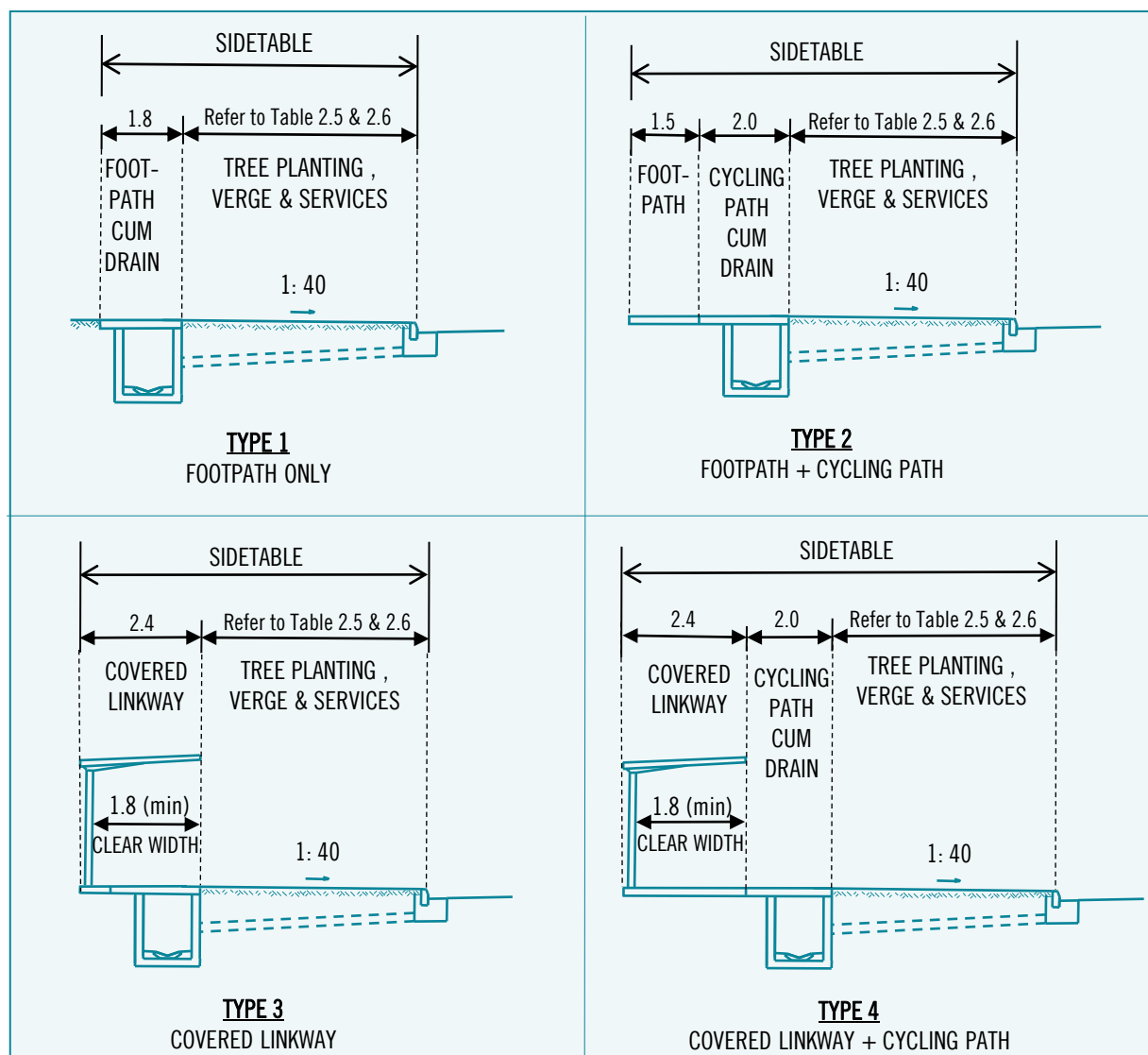


Figure 2.3 Illustrations of Sidetable Typologies

2.5 Cul-De-Sacs

At the end of a no-through road (dead-end), a cul-de-sac may be provided to facilitate turning for long vehicles such as refuse trucks. Generally, a cul-de-sac has to be provided for all industrial roads. The various types of cul-de-sacs are shown in [Appendix 2C](#) & [2D](#).

2.6 Junction Layout

A typical arrangement of the various types of junction layout are shown in [Appendix 2E to 2I](#).

2.7 Setback of Development Boundary

Where a development proposal is affected by Road Reserve Line, the developer is required to setback his development boundary. The developer is also required to reconstruct the culvert and roadside drains to abut the Road Reserve Line. This would minimise disruption to his property when the relevant authorities carry out any improvement works in the future.

For proposals involving minor additions and alterations works only (without rear extension), the developer will not be required to setback his boundary. However, no new structures will be allowed within the road reserve.

In addition, the developer is required to vest the affected portion of land to the State without the State or the LTA making any payment or giving any consideration whatsoever for the same with vacant possession and free from encumbrances prior to the issue of the Certificate of Statutory Completion (CSC). For the purpose of vesting the affected portion of land, the developer is required to submit a copy of the approved Subdivision Plan issued by URA and a copy of the Certified Plan issued by SLA before handing over the completed street works within the road reserve plot to LTA and other relevant agencies.

LTA will defray private property owners for the cost involved in the subdivision of land from road reserve, subject to a cap. The costs that qualify for defrayment is limited to the fees payable to :

- (i) URA for processing the land subdivision application,
- (ii) SLA for allocation of new land lot numbers, inspection of survey and approval of the Certified Plan (CP) and
- (iii) Registered Surveyor (RS) for carrying out the surveys required for submission to URA and SLA.



The actual amount to be defrayed will be determined by LTA. All applications shall be submitted within 6 months from the date of CSC clearance by LTA. The application shall be made with the prescribed forms ([LTA/RT/CS-1](#)) together with the necessary supporting documents. The required supporting documents are mentioned in the above-mentioned form.

Appendix 2A - Safeguarded/Approved Road Reserves (Typology Based on COP Version 1.2)

Table 2.5 shows the revised typology for safeguarded/approved road reserves based on Code of Practice for Street Work Proposals relating to Development Works Version 1.2. The kerb-side lane width and inner-lane width have been revised from 3.7m to 3.5m and 3.5m to 3.2m respectively. For roads that are already safeguarded based on this typology, the lane width savings shall be distributed equally to the footpath on the sidetables unless otherwise advised by the LTA. The reduced lane widths is not applicable to undivided 2-ways roads to facilitate traffic movements in the event of kerbside parking or vehicle breakdown and also turning of long vehicles such as fire engines, school buses, rubbish trucks etc.

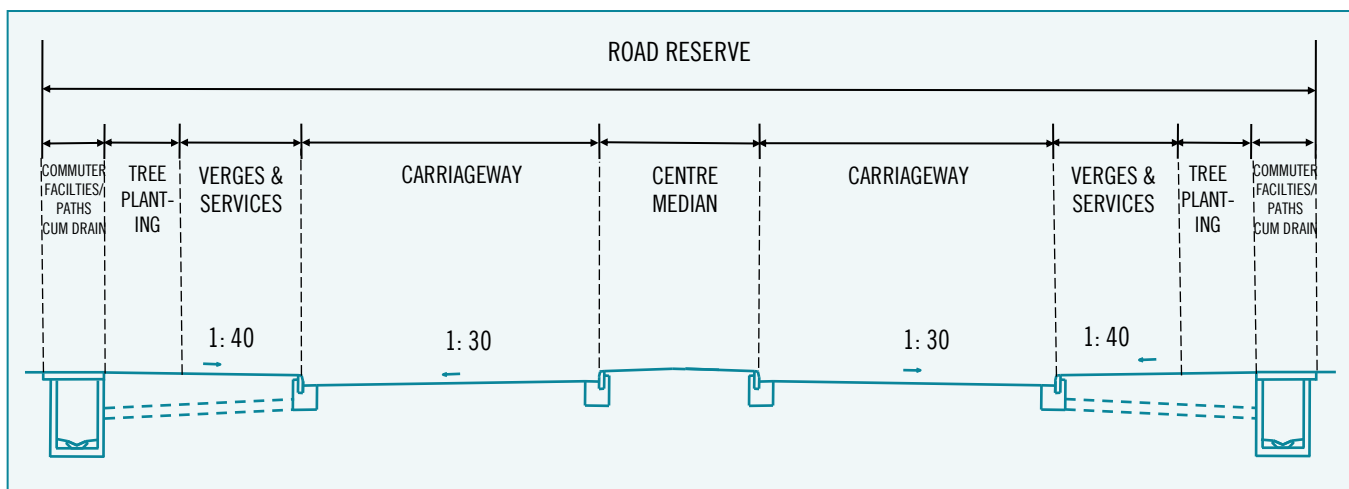


Figure 2.4 Typical cross-section for safeguarded/ approved road reserves

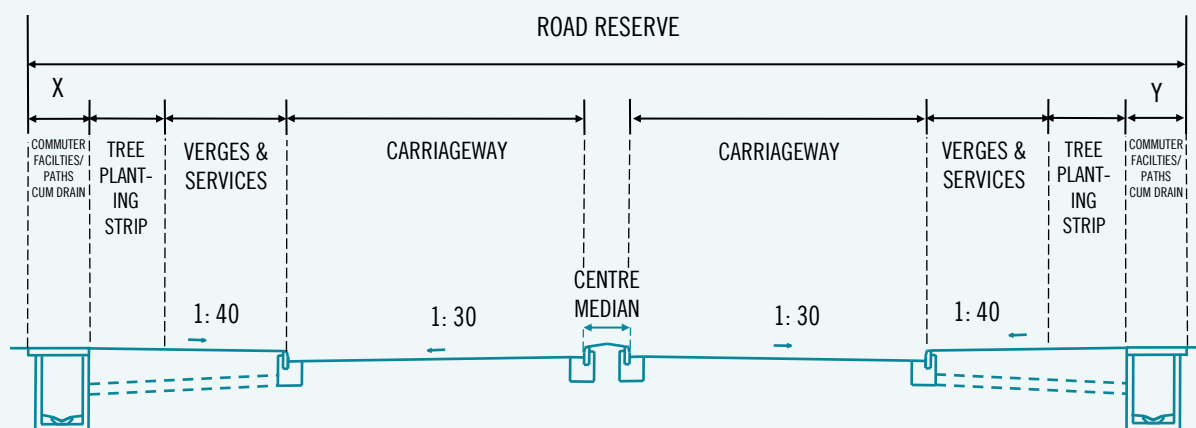
SAFEGUARDED/APPROVED ROAD RESERVES BASED ON VERSION 1.2 OF THE CODE OF PRACTICE FOR STREET WORK PROPOSALS RELATING TO DEVELOPMENT WORKS									
	S/N	Number of Lanes	Commuter Facility/Paths Cum Drain [Left Hand Side] (m)	Centre Median (m)	Carriageway (m)	Verge & Services (m)	Tree Planting (m)	Commuter Facility/Paths Cum Drain [Right Hand Side] (m)	Road Reserve (m)
Service Roads	A	1	0.75 (drain)	-	6.1	-	-	0.75 (drain)	7.6
	B	1	1.3 (drain)	-	7.4	-	-	1.3 (drain)	10.0
Landed Housing Local Access Road	C	2	1.5	-	7.4	-	2.5 x 2	1.5	15.4
	D	2	1.2	-	7.4	-	2.2 x 2	1.2	14.2
	E	2	1.2	-	6.6	-	1.6 x 2	1.2	12.2

SAFEGUARDED/APPROVED ROAD RESERVES [BASED ON VERSION 1.2 OF THE CODE OF PRACTICE FOR STREET WORK PROPOSALS RELATING TO DEVELOPMENT WORKS]									
	S/N	Number of Lanes	Commuter Facility Cum Drain [Left Hand Side] (m)	Centre Median (m)	Carriageway (m)	Verge & Services (m)	Tree Planting (m)	Commuter Facility Cum Drain [Right Hand Side] (m)	Road Reserve (m)
Local/Primary Access Undivided two-way road	F	2	1.5	-	10.0	-	2.5 x 2	1.5	18.0
	G	2	1.5	-	10.0	2.2 x 2	2.0 x 2	1.5	21.4
Primary Access Road	H	4	1.8	0.8	7.0 x 2	1.9 x 2	2.0 x 2	1.8	26.2
One-way traffic road	I	2	1.7	-	7.0	2.2 x 2	2.0 x 2	1.7	18.8
	J	3	1.9	-	10.3	2.2 x 2	2.0 x 2	1.9	22.5
	K	4	2.2	-	13.4	2.2 x 2	2.0 x 2	2.2	26.2
	L	5	2.4	-	16.7	2.2 x 2	2.0 x 2	2.4	29.9
Industrial Roads	M	2	1.5	-	10.0	2.2 x 2	2.0 x 2	1.5	21.4
	N	4	2.2	-	13.4	2.2 x 2	2.0 x 2	2.2	26.2
	O		1.9	4.0	7.0 x 2	3.0 x 2	2.0 x 2	1.9	31.8
Major Arterial Road	P	4	1.9	4.0	7.0 x 2	3.0 x 2	2.0 x 2	1.9	31.8
	Q	6	2.1	4.0	10.2 x 2	3.0 x 2	2.0 x 2	2.1	38.6
	R	8	2.3	4.0	13.4 x 2	3.0 x 2	2.0 x 2	2.3	45.4

Table 2.5 Typology for safeguarded/approved Road Reserve [based on Version 1.2 of Code of Practice for Street Work Proposals relating to Development Works]

Appendix 2B - New Road Reserves

The new road reserves are safeguarded based on a footpath width of 1.8m, kerb-side lane width of 3.5m, inner-lane width of 3.2m, and additional width for cycling path and covered linkway (if any). Table 2.6 shows the typology for Road Reserve safeguarded for new roads and shall be read in conjunction with Table 2.4 for the provision of commuter facilities such as covered linkway etc.



X & Y = variable additional width required for cycling path and/or covered linkway

For example, if covered linkway of 2.4m width and cycling path of 2.0m width are safeguarded only on the L.H.S of the carriageway:

Then X is computed by = 2.4m (covered linkway width) + 2.0m (cycling path width) = 4.4m;

Y = 1.8m footpath width

Overall Road Reserve = 34.4 + 4.4 + 1.8 = 40.6m

Figure 2.5 Typical cross-section for New Roads

New Road Reserves

	S/N	Number of Lanes	Commuter Facility Cum Drain [Left Hand Side] (m) Refer to Table 2.4	Centre Median (m)	Carriage-way (m)	Verge & Services (m)	Tree Planting (m)	Commuter Facility Cum Drain [Right Hand Side] (m) Refer to Table 2.4	Road Reserve (m)
Service Roads	A	1	0.75 (drain)	-	6.1	-	-	0.75 (drain)	7.6
	B	1	1.3 (drain)	-	7.4	-	-	1.3 (drain)	10.0
Landed Housing Local Access Road	C	2	X	-	7.4	-	2.5 x 2	Y	12.4+X+Y

New Road Reserves									
	S/N	Number of Lanes	Commuter Facility Cum Drain [Left Hand Side] (m) Refer to Table 2.4	Centre Median (m)	Carriage-way (m)	Verge & Services (m)	Tree Plant-ing (m)	Commuter Facility Cum Drain [Right Hand Side] (m) Refer to Table 2.4	Road Reserve (m)
Local/Primary Access Undivided two-way road	D	2	X	-	10.0	-	2.5 x 2	Y	15.0+X+Y
	E	2	X	-	10.0	2.2 x 2	2.0 x 2	Y	18.4+X+Y
Primary Access Road	F	4	X	1.2	7.0 x 2	1.9 x 2	2.0 x 2	Y	23.0+X+Y
One-way traffic road	G	2	X	-	7.0	2.2 x 2	2.0 x 2	Y	15.4+X+Y
	H	3	X	-	10.2	2.2 x 2	2.0 x 2	Y	18.6+X+Y
	I	4	X	-	13.4	2.2 x 2	2.0 x 2	Y	21.8+X+Y
	J	5	X	-	16.6	2.2 x 2	2.0 x 2	Y	25.0+X+Y
Industrial Roads	K	2	X	-	10.0	2.2 x 2	2.0 x 2	Y	18.4+X+Y
	L	4	X	-	13.4	2.2 x 2	2.0 x 2	Y	21.8+X+Y
	M		X	4.0	7.0 x 2	3.0 x 2	2.0 x 2	Y	28+X+Y
Major Arterial Road	N	4	X	4.0	7.0 x 2	3.0 x 2	2.0 x 2	Y	28.0+X+Y
	O	6	X	4.0	10.2 x 2	3.0 x 2	2.0 x 2	Y	34.4+X+Y
	P	8	X	4.0	13.4 x 2	3.0 x 2	2.0 x 2	Y	40.8+X+Y

X = variable additional width required for footpath/ cycling path and/or covered linkway on the L.H.S of the road.
Y = variable additional width required for footpath/ cycling path and/or covered linkway on the R.H.S of the road.

Table 2.6 Typology for New Road Reserve

Appendix 2C- Cul-de-sac for Industrial Roads

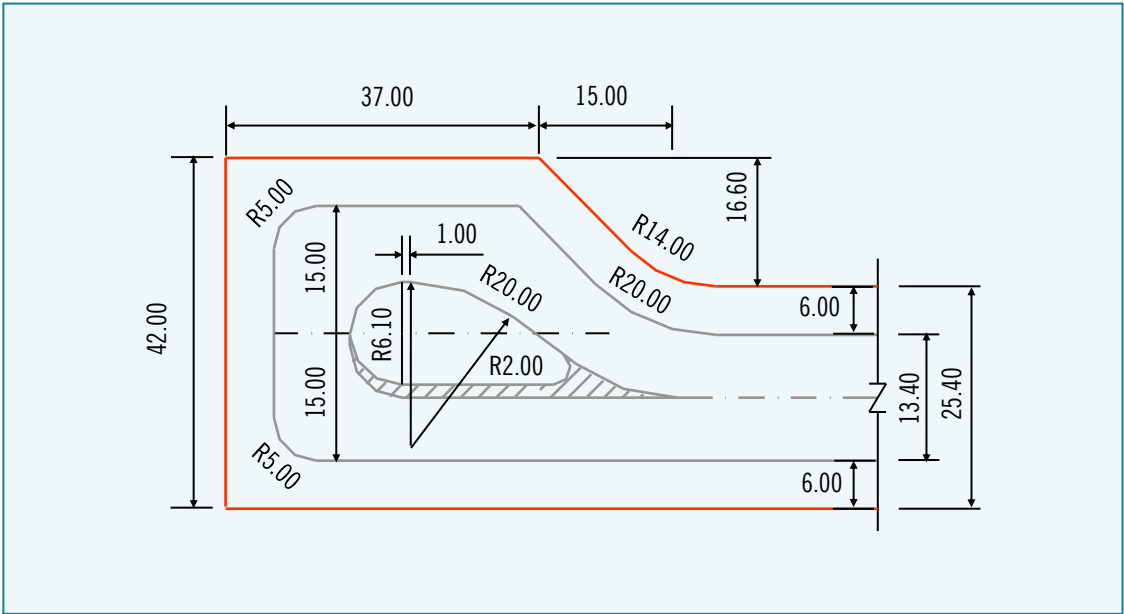


Figure 2.6 Cul-de-sac for 25.4m wide Road Reserve (refers to row L of Table 2.6 with X = 1.8m & Y = 1.8m)

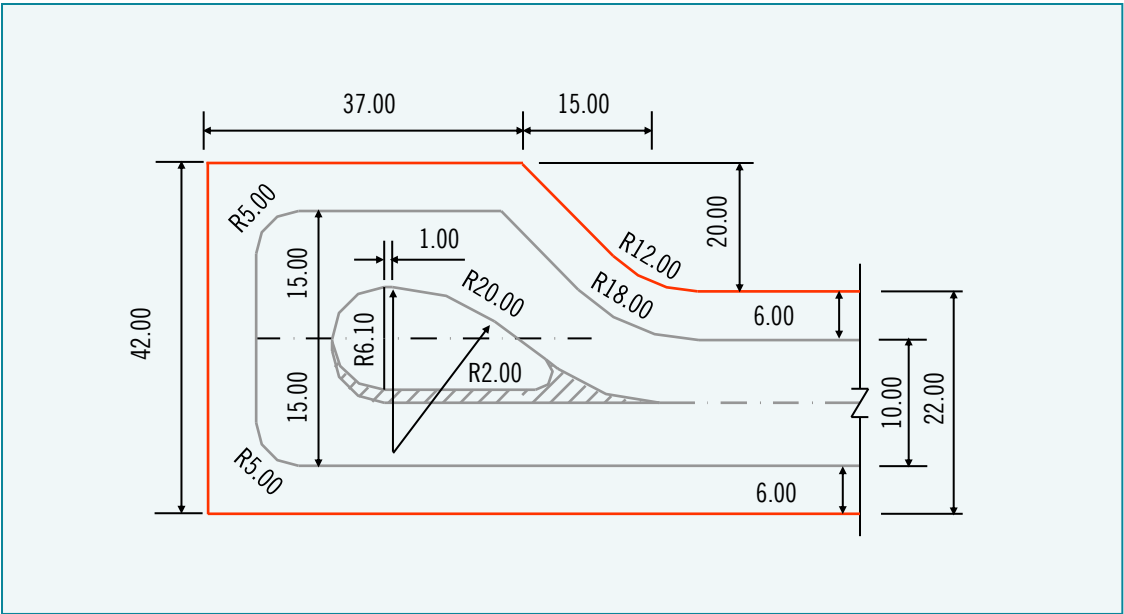


Figure 2.7 Cul-de-sac for 22.0m wide Road Reserve (refers to row K of Table 2.6 with X = 1.8m & Y = 1.8m)

Appendix 2D - Cul-de-sac for Landed Housing Local Access Road

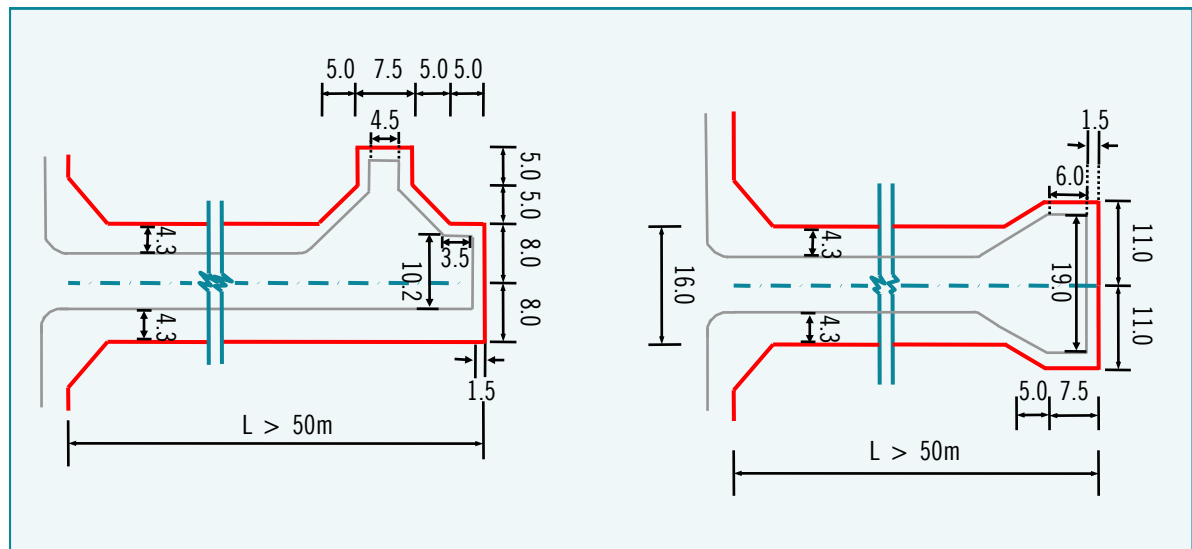


Figure 2.8 Cul-de-sac for 16.0m wide Road Reserve (refers to row C of Table 2.6 with $X = 1.8\text{m}$ & $Y = 1.8\text{m}$)

The cul-de-sac layout in Figure 2.8 is also applicable for 12.2m, 14.2m and 15.4m wide Road Reserves.

Appendix 2E - 18.6m Road Reserve at Junction

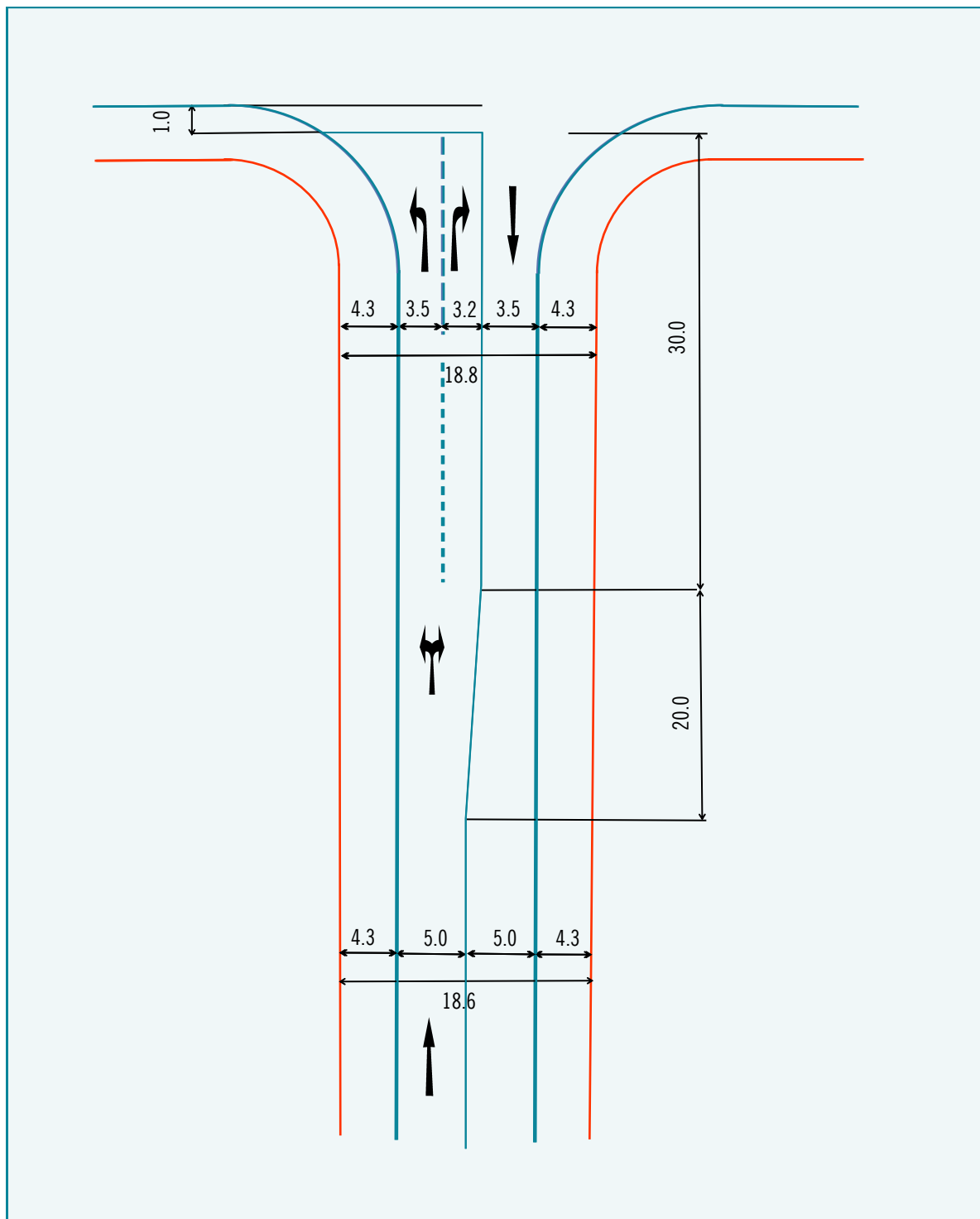


Figure 2.9 18.6m Road Reserve at Junction

The above cross-section is meant for a safeguarded 18.6m Road Reserve with only footpaths on the sidetables. Appropriate additional Road Reserve would be safeguarded at the junction based on the provision of other commuter facilities such as the cycling path, covered linkway, etc.

The cross-section of existing roads that have been safeguarded based on 18.0m road reserve is given below. All newly safeguarded dual-one, undivided two-way roads shall follow the 18.6m road reserve.

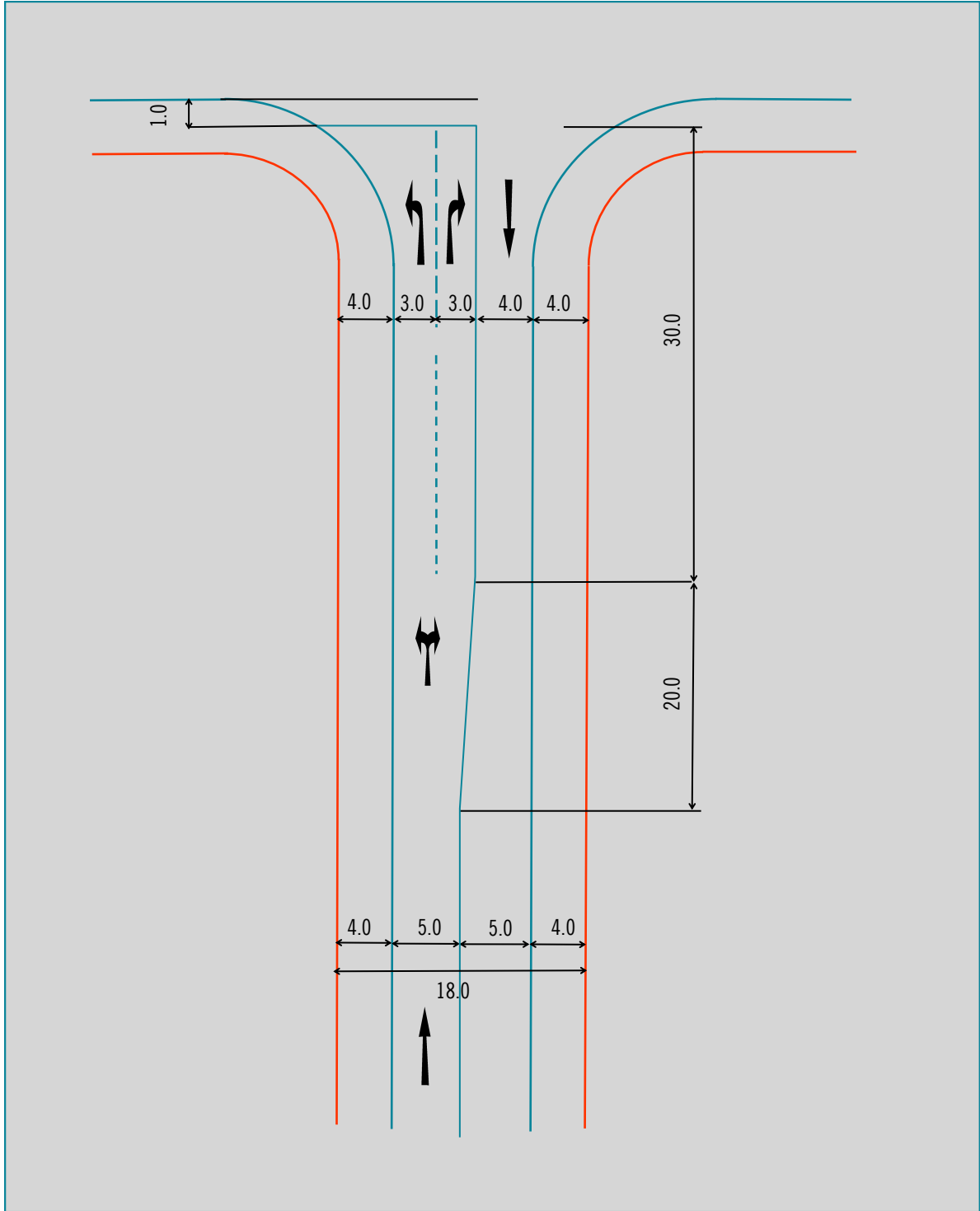


Figure 2.10 18.0m Road Reserve at Junction

Appendix 2F—26.6m Road Reserve at Cross Junction (With Slip Roads)

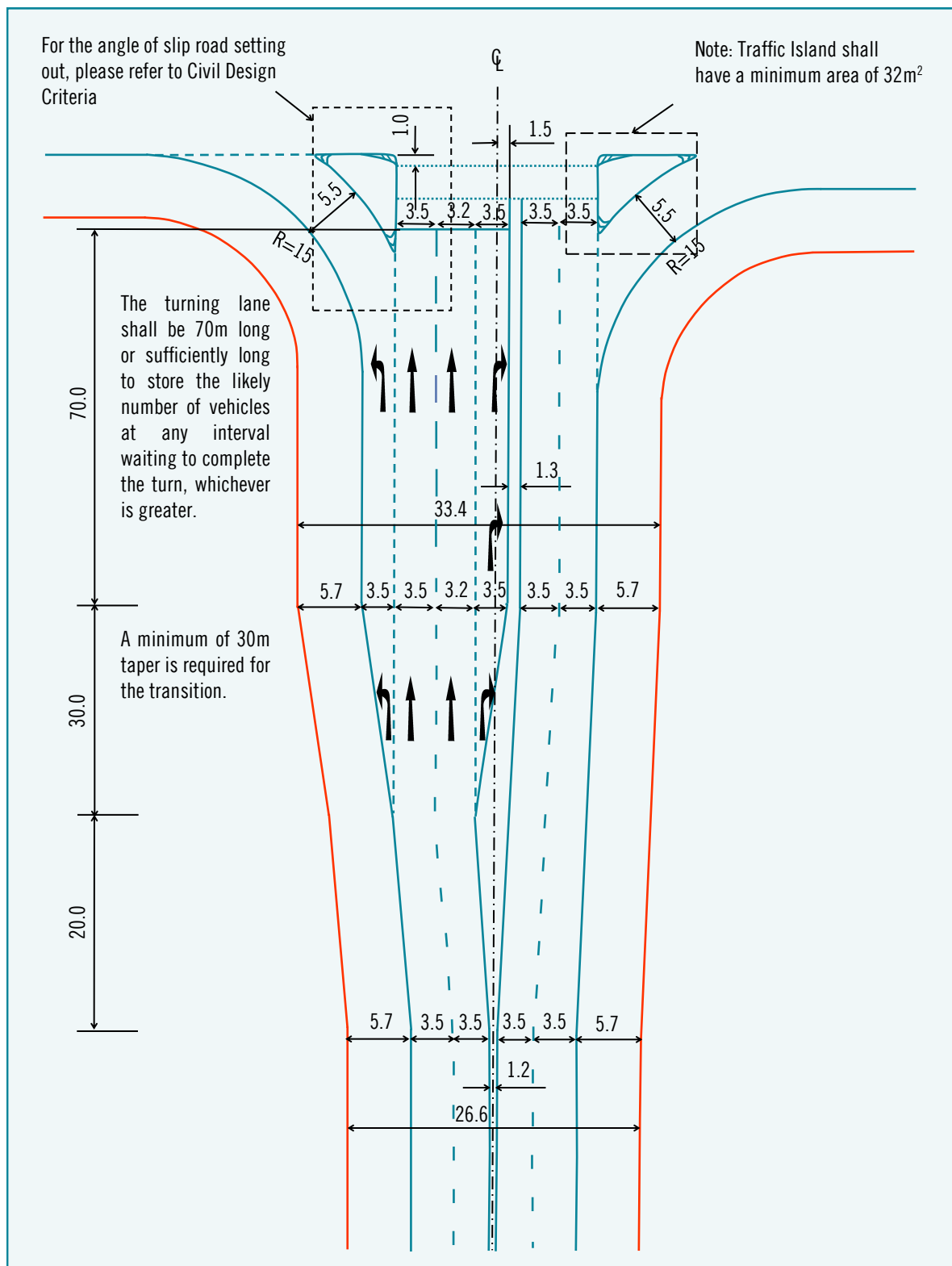


Figure 2.11 26.6m Road Reserve At Cross Junction (With Slip Roads)

The above cross-section is meant for a safeguarded 26.6m Road Reserve with only footpaths on the sidetables. Appropriate additional Road Reserve would be safeguarded at the junction based on the provision of other commuter facilities such as the cycling path, covered linkway, taxi stand etc.

The cross-section of existing roads that have been safeguarded based on 26.2m road reserve shall follow the revised lane and sidetable widths given below. All newly safeguarded dual-two roads shall follow the 26.6m road reserve.

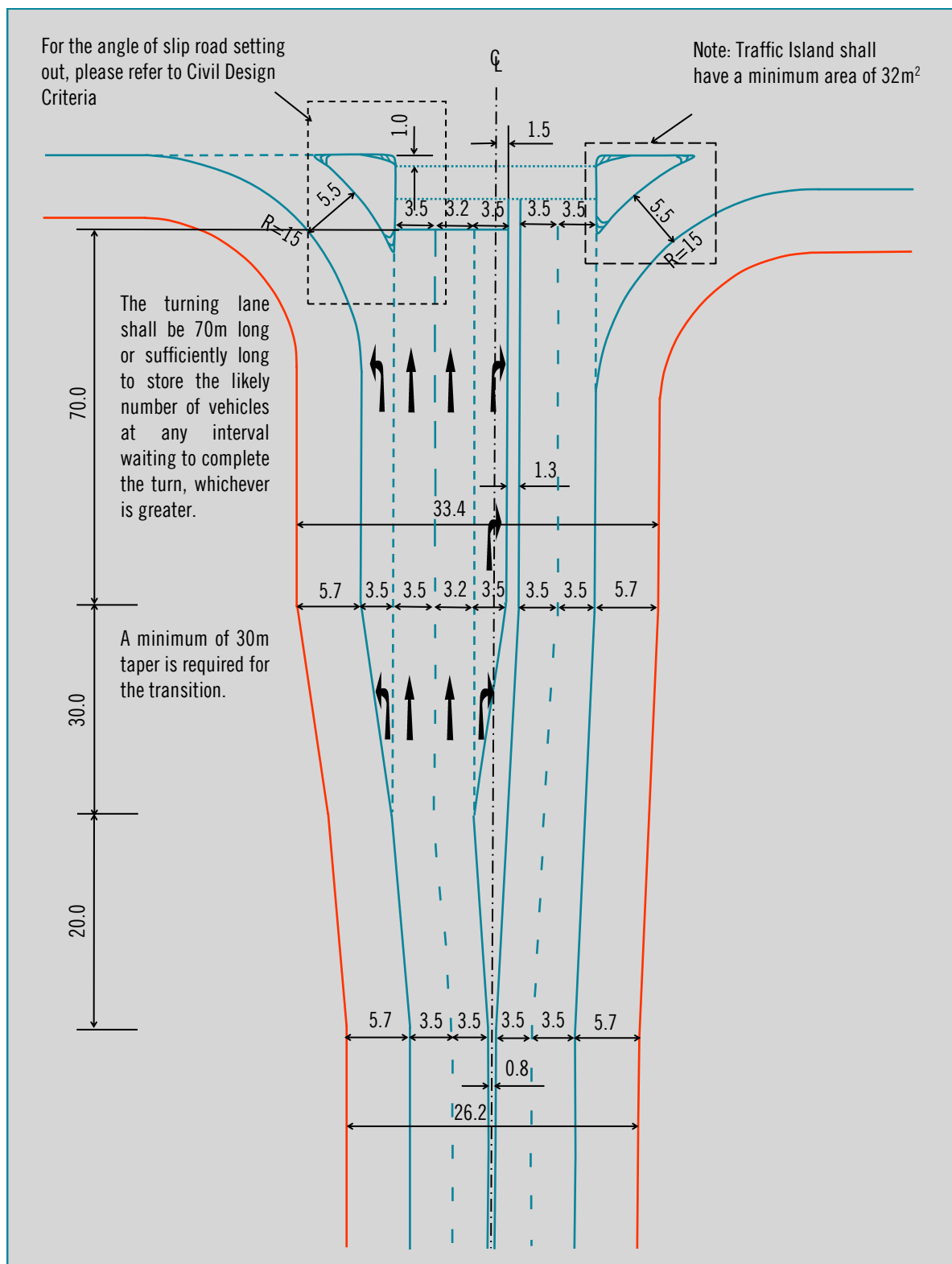


Figure 2.12 26.2m Road Reserve At Cross Junction (With Slip Roads)

Appendix 2G -26.6m Road Reserve at Cross Junction (Without Slip Roads)

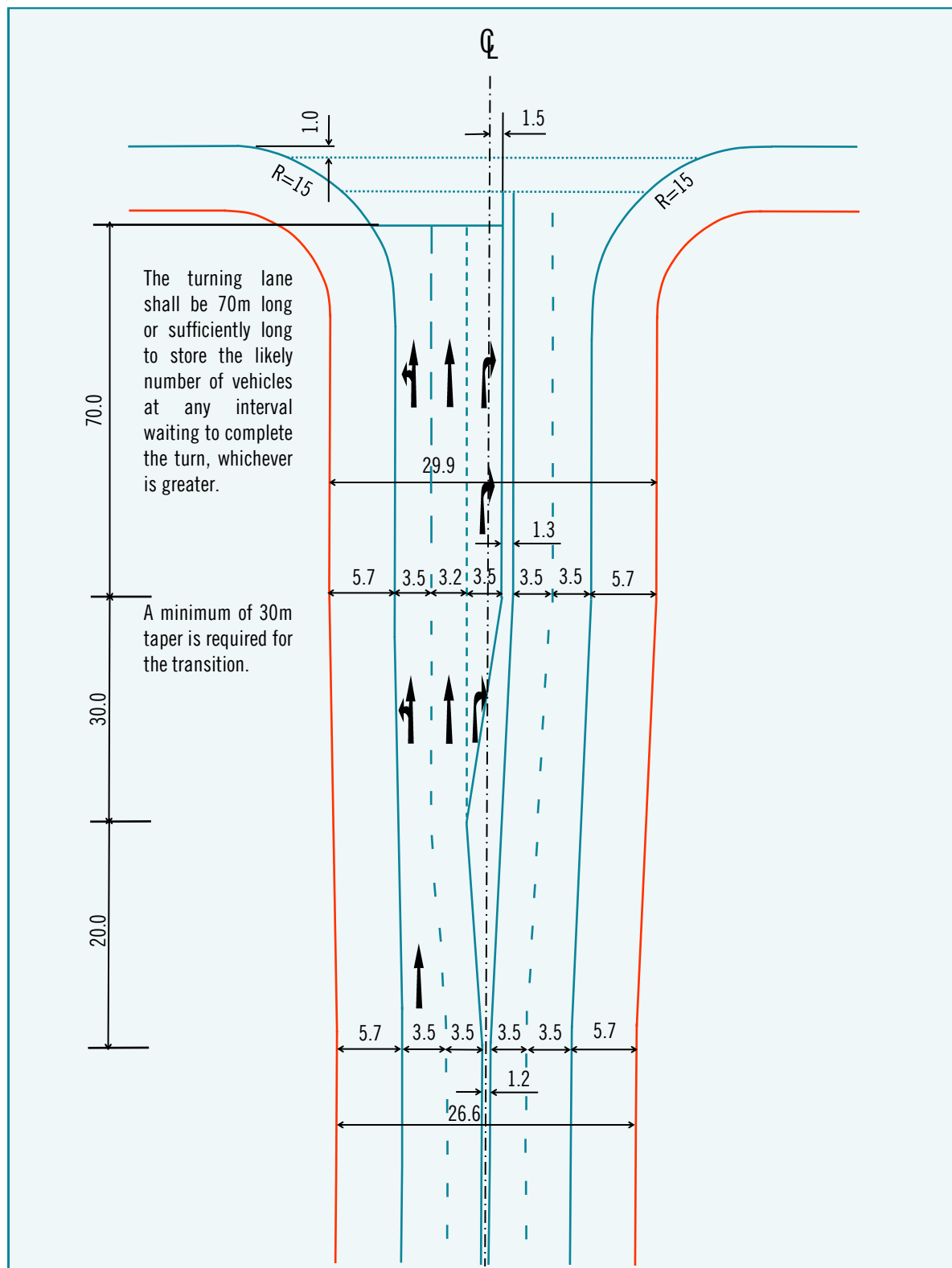


Figure 2.13 26.6m Road Reserve At Cross Junction (Without Slip Roads)

The above cross-section is meant for a safeguarded 26.6m Road Reserve with only footpaths on the sidetables. Appropriate additional Road Reserve would be safeguarded at the junction based on the provision of other commuter facilities such as the cycling path, covered linkway, taxi stand etc.

The cross-section of existing roads that have been safeguarded based on 26.2m road reserve shall follow the revised lane and sidetable widths given below. All newly safeguarded dual-two roads shall follow the 26.6m road reserve.

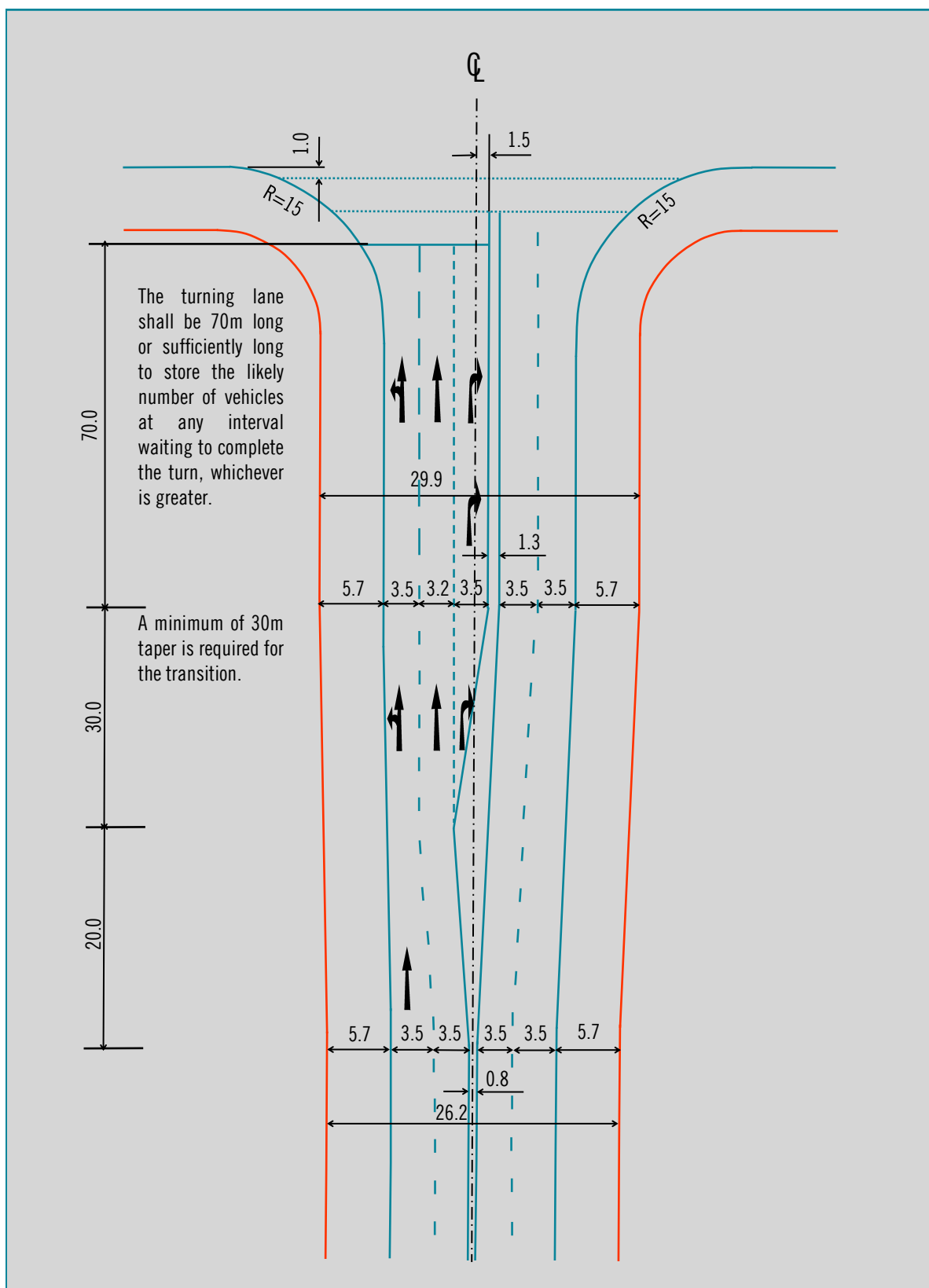


Figure 2.14 26.2m Road Reserve At Cross Junction (Without Slip Roads)

Appendix 2H –31.6m Road Reserve at Cross Junction (With Slip Roads)

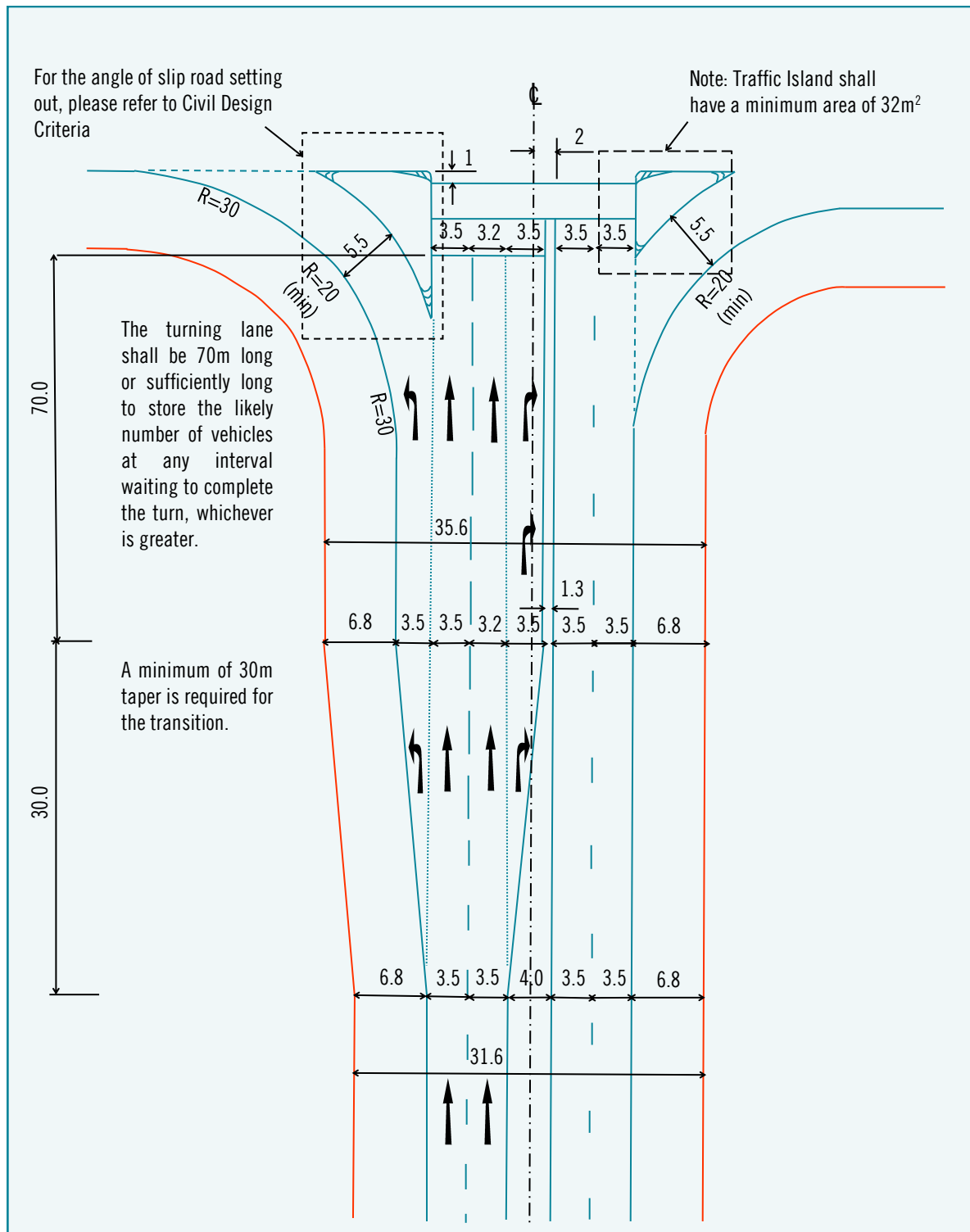


Figure 2.15 31.6m Road Reserve At Cross Junction (With Slip Roads)

The above cross-section is meant for a safeguarded 31.6m Road Reserve with only footpaths on the sidetables. Appropriate additional Road Reserve would be safeguarded at the junction based on the provision of other commuter facilities such as the cycling path, covered linkway, taxi stand etc.

The cross-section of existing roads that have been safeguarded based on 31.8m road reserve shall follow the revised lane and sidetable widths given below. All newly safeguarded dual-two roads shall follow the 31.6m road reserve.

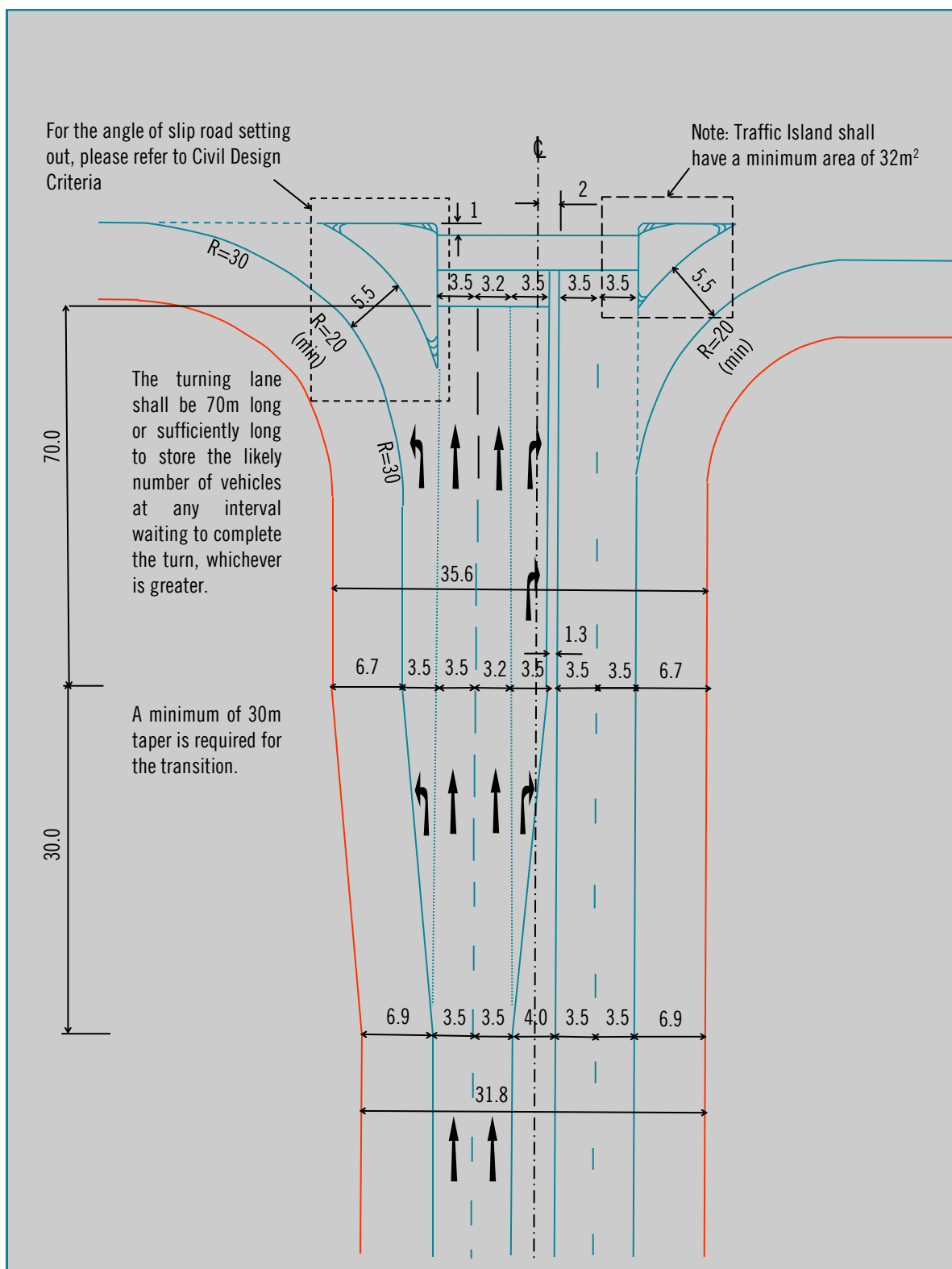


Figure 2.16 31.8m Road Reserve At Cross Junction (With Slip Roads)

Appendix 2I -38.0m Road Reserve at Cross Junction (With Slip Roads)

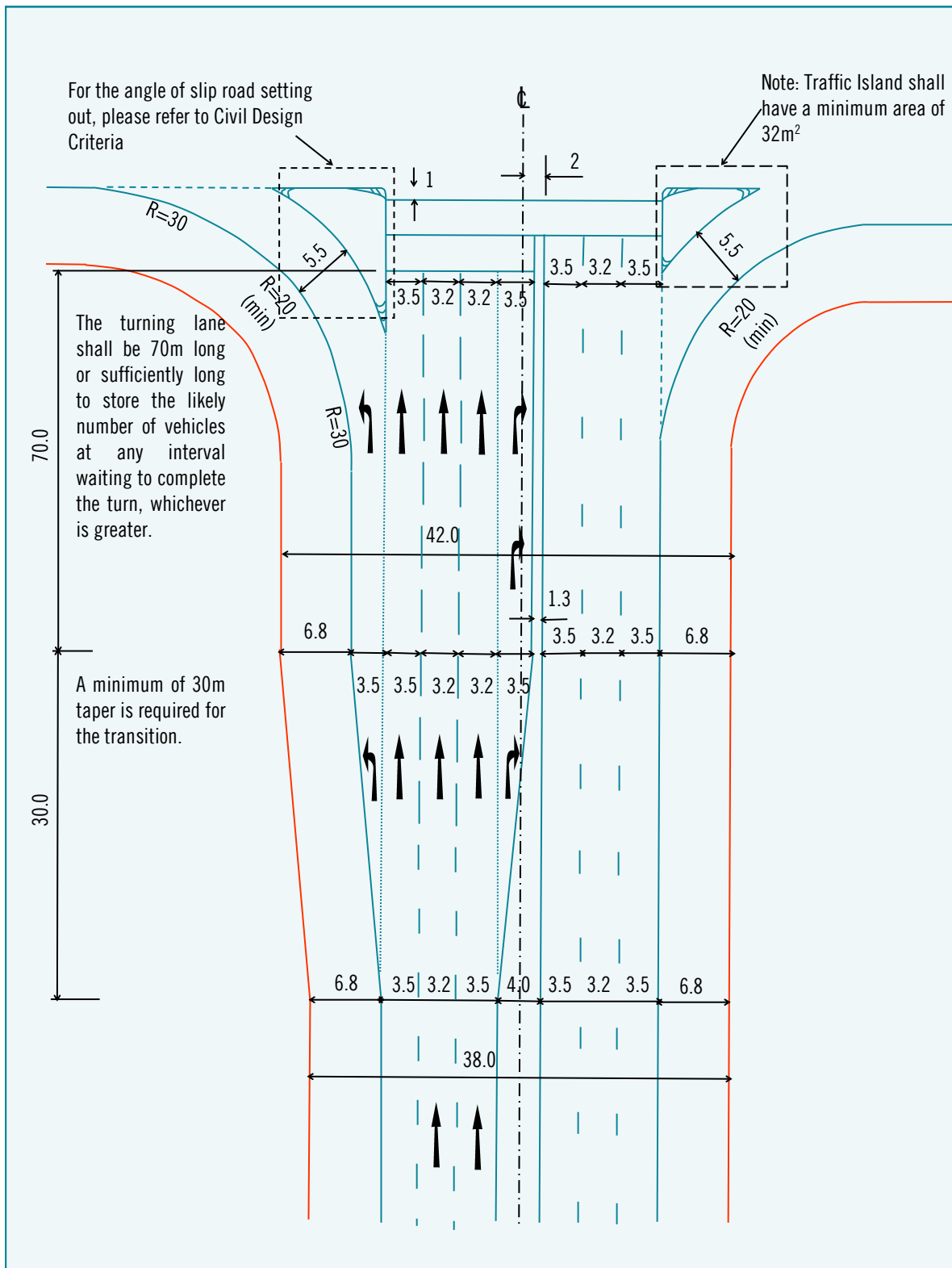


Figure 2.17 38.0m Road Reserve At Cross Junction (With Slip Roads)

The above cross-section is meant for a safeguarded 38.0m Road Reserve with only footpaths on the sidetables. Appropriate additional Road Reserve would be safeguarded at the junction based on the provision of other commuter facilities such as the cycling path, covered linkway, taxi stand etc.

This chapter provides a guide to developers and transport professionals on the requirements of a Transport Impact Assessment (TIA).



Chapter 3

Transport Impact Assessment (TIA)

Glossary

Back of Queue

the distance between the stop line of a signalized intersection and the farthest reach of an upstream queue. The vehicles previously stopped at the front of the queue are counted even if they begin moving.

Delay

the amount of time it takes to traverse a given road facility minus the amount of time it would take to traverse that road facility at the posted speed limit if there were no interference.

Passenger Car Equivalent PCE

a metric used to assess traffic-flow rate. A PCE is essentially the impact that a mode of transport has on traffic variables (such as headway, speed, density) compared to a single passenger car.

Glossary

Peak flow factor

the ratio of the average demand flow rate in the total flow period to the demand flow rate in the peak flow period.

Public Transport Accessibility Level (PTAL)

is a measurement of a combination of how close PT services are from a given point (walking time) and the frequency of those services (waiting time).

Saturation flow rate

the maximum volume of vehicles from a lane group that would pass through in one hour under the prevailing traffic and roadway conditions if the lane group was given a continuous green signal for that hour. This assumes that there is a continuous queue of vehicles with minimal headways.

Walking & Cycling Plan (WCP)

is an in-depth study of the pedestrian and cyclist accesses and routes. The WCP helps the developer consider the pedestrian and cycling connectivity in the upfront design of the development.

Chapter 3

Transport Impact Assessment (TIA)

3.1 Introduction

The Land Transport Authority (LTA) has developed this set of Guidelines to assist those preparing a Transport Impact Assessment (TIA) report for submission to the LTA. These Guidelines (i) specify when a TIA is required to be submitted as part of a development application, and (ii) sets out the standards and general technical requirements for the preparation of TIA reports.

This set of guidelines replaces the previous *Guidelines for Preparation of Traffic Impact Assessment Reports* (also known as the TIA Guidelines), which was introduced in 2002 and subsequently updated in 2007, 2011 and 2016¹.

It includes a number of amendments to ensure that the Guidelines are up to date with on-going conditions and take into account feedback gathered from the industry. Furthermore, the LTA has embarked on a strategy to reduce reliance on cars, and to promote walking, cycling and public transport as the choice modes under the banner of Walk Cycle Ride Singapore (WCR SG). The main objective of these Guidelines is to strengthen the application of the WCR SG strategy on new development and redevelopment projects. As such, these Guidelines are to serve as a guide for developers to work closely with the LTA to develop transport connectivity plans centred on Walk, Cycle and Ride to serve their respective development or redevelopment projects.

The purpose of this document is therefore to:

- Assist developers (and transport professionals who are engaged) by outlining the requirements and the level of detail required for the TIA studies; and
- Provide greater clarity and maintain uniformity and consistency in the preparation and evaluation of TIA studies in order to expedite the approval of development applications.
- Identify the development's impacts on the surrounding transport network and recommend necessary measures to mitigate its negative impacts.

3.2 Purpose of a TIA

In summary, the objectives of a TIA study are to:

- Determine the transportation requirements of a new development / redevelopment, and propose adequate and appropriate design features, facilities, and infrastructural improvements to meet future transport demand;
- Enhance the development's overall active mobility and mass transport connectivity, accessibility and convenience in relation to the wider transport network with a focus on promoting walking, cycling and public transport ridership; and
- Identify the development's impacts on the surrounding transport network and recommend necessary measures to mitigate its negative impacts.

Given the above objectives, TIAs shall focus on: 1) putting forth proposals to achieve higher mass transport and/or active mobility mode shares, and 2) where possible, to prioritise mass transport and active mobility modes over private transport modes while at the same time striking a balance with overall traffic efficiency.

¹ Walking and Cycling Plan was introduced in July 2016, as part of TIA submission.

TIA studies help in the early identification of potential provision / design issues and can thus help avoid expensive remedial actions if the issues are addressed upfront in tandem with the implementation of the development. In addition, a TIA assists the LTA to better plan and design the wider transportation system by enabling it to anticipate incremental changes in transport demand for each new development.

3.3 When is a TIA submission required?

Generally, a TIA submission is required if the type and size of the proposed development meets one or more of the criteria stipulated in [Appendix 3A](#). The size of a given development is correlated with the additional trips that it generates, which in turn determines the likelihood of impact to the surrounding transport network.

Due to the variances in the type, size and location of a development(s), it is not practical to describe a single scope of work that can be applicable for all proposals. As such, while this document is intended to serve as a guide, developers and Traffic Consultants are still strongly encouraged to discuss and review their scope of work with the LTA before proceeding with their respective TIA studies.

3.4 Who Prepares a TIA?

The TIA report shall be prepared by a professional organisation (referred to as Traffic Consultant in this document) appointed by the developer. The Traffic Consultant should ensure (a) accuracy and validity of all information and assumptions to be used in the study and (b) discuss the project scope with the LTA in advance of commencing the study.

For developments requiring a Walking and Cycling Plan (WCP) submission as part of the TIA, the WCP shall be prepared by the Traffic Consultant together with the Qualified Person (Architect) appointed by the developer. As the architectural design of a development and its connectivity to the surrounding transport network directly affects the user experience of pedestrians and cyclists, it is important for the Qualified Person (Architect) engaged for the development project to work closely with the Traffic Consultant in the preparation of WCP. The Qualified Person (Architect) shall design for safe access and routing of pedestrians and cyclists within the development, between the development and other developments, as well as between the development and the major transportation nodes surrounding it. The content to be included in WCP is summarized in [Appendix 3B](#). A preliminary WCP shall be submitted at the pre-scoping stage to facilitate the discussion at the scoping meeting with the LTA (See [Appendix 3B](#) for the submission procedure of WCP).

3.5 The TIA Process

A typical TIA exercise involves a few stages, from the initial site visit to the receipt of LTA's acceptance of the full TIA report. Figure 2.1 shows a typical TIA process, which will include 3 stages for most TIA studies, and an additional stage if a Post Implementation Review (PIR) is required. The detailed requirements for each of these stages are specified in the subsequent sections of this document.

3.5.1 Pre-Scoping Meeting

The Developer, Architect and Traffic Consultant shall be required to discuss their scope of study, as well as any specific requirements that may apply to the development, with the LTA prior to commencing the TIA study. Such a discussion ensures a common understanding of issues pertinent to the development. Prior to the Scoping Meeting or even before involvement of a Traffic Consultant, the Developer is encouraged to furnish the LTA with the transport information relevant to the development in order to facilitate the scoping exercise.

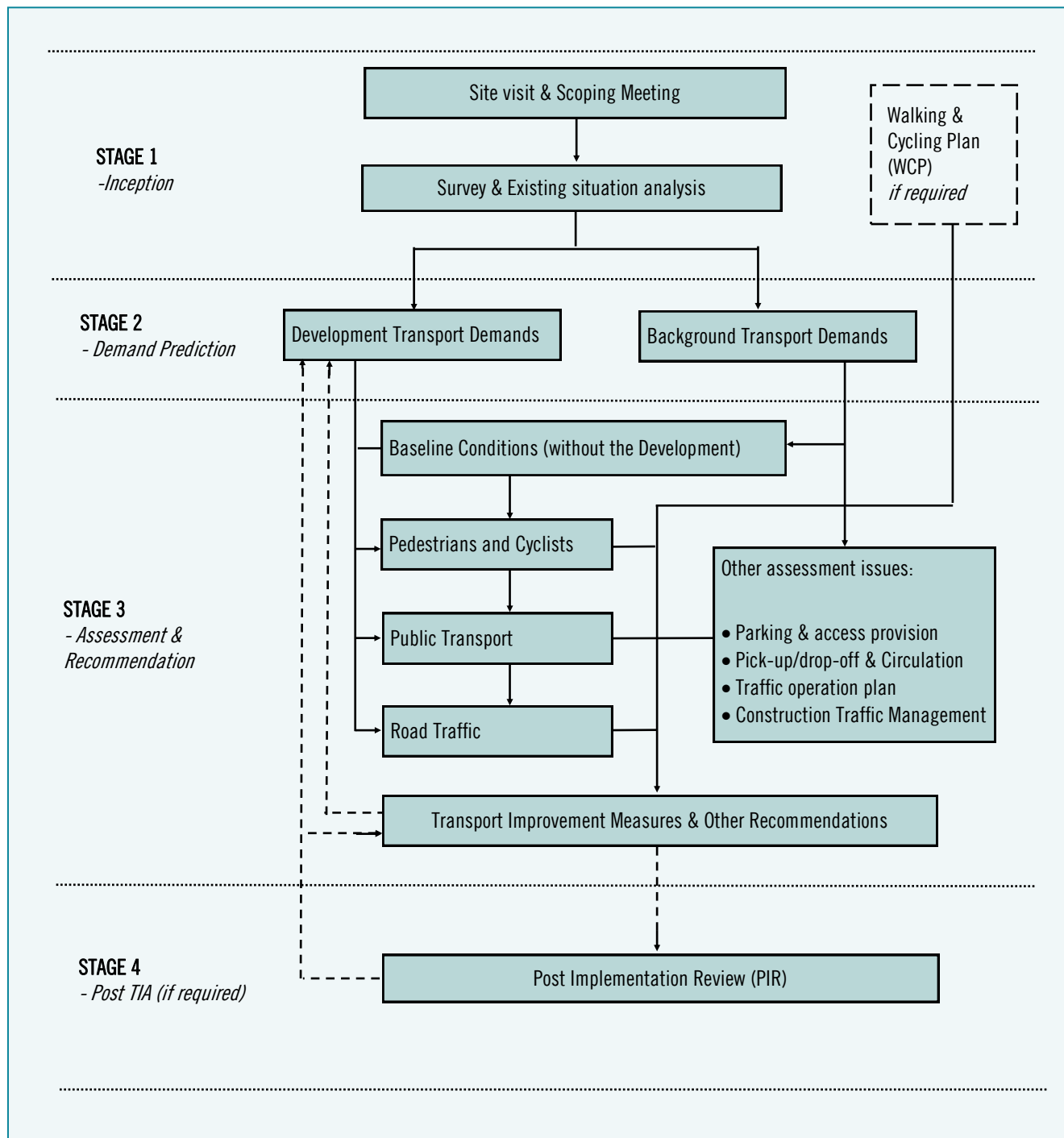


Figure 3.1 Typical TIA Process and Submissions (For Developments)

Where applicable, the LTA will then provide additional transport related information, such as planned cycling path networks in the vicinity of the development. The Developer and/or Traffic Consultant are to submit a preliminary WCP prior to the scoping meeting. In addition, the Traffic Consultant is strongly encouraged to conduct a site visit to gain an appreciation of the existing site conditions, and to provide the LTA with questions/queries before the meeting. Site photos should be provided to support the identification and description of existing transport and/or traffic conditions.



A [checklist](#) is provided in [Appendix 3B](#). The Traffic Consultant is to submit the completed checklist to LTA-DBC_Registry@lta.gov.sg when initiating the Scoping Meeting with the LTA.

3.5.2 Scoping Meeting

The scope of a TIA is dependent on the type, size, and location of the development. As such, studies may vary between localised evaluation of a development's internal transport facilities and access point(s) for smaller developments, to regional transport impact assessment for larger developments.

A senior level representative of the Developer and Traffic Consultant is to attend the Scoping Meeting with the LTA. This is to facilitate clear understanding of the extent of the TIA to be done. Developers and/or Traffic Consultants are advised to submit to the LTA the minutes of the Scoping Meeting based on the agreed timeline and scope discussed at the Scoping Meeting.

Issues typically discussed at the Scoping Meeting include but are not limited to:

- Study purpose and objectives,
- Proposed methodology and assumptions,
- Existing data intended to be used,
- Size of the study area and traffic intersections to be studied,
- Assessment years,
- Forecast background traffic volumes or growth rate to be adopted,
- Type of surveys to be undertaken e.g. trip rate, mode share, junction traffic counts, pedestrian and cyclist counts, travel time, origin-destination, etc
- Relevant peak hour(s) and site(s) for the conduct of traffic surveys,
- Proposed modelling/ assessment tool(s) and parameters to be used,
- Whether microscopic simulation/network assessment and if yes, what are the assessment area(s) and scenario (s) required and the requirements for model calibration and validation,
- Proposed modelling tool(s) and parameters to be used,
- LTA road and/or junction improvement plans for the study area to be taken into consideration as a base in the analysis for corresponding assessment year(s),

- Intended location of development's vehicular, pedestrian and cyclist access point(s), supporting cycling facilities, parking provision and vehicular circulation,
- Whether public transport/pedestrian/cyclist analyses, development traffic operation plans, construction traffic management plans and/or PIR are required are required and to what extent,
- Whether there is a planned cycling path/covered link way abutting the development,
- Whether there is a need for an Inception Report and/or Interim Report,
- Comments and requirements on the preliminary WCP,
- Other requirements if any, that may apply to the proposed development,
- Deliverables of the TIA study and timeline of submissions.

After the scoping meeting, the Traffic Consultant is encouraged to follow up expeditiously with the LTA to finalise the parameters used for the TIA.

3.5.3 Assessment Years

The assessment years generally include the opening year, or when the development is expected to be fully operational. The LTA may request for an assessment to be carried out for a design year, which is typically five years after the opening year. However, LTA may propose a different design year from the typical definition according to respective study needs. For developments that are expected to be opened or completed in phases, a separate assessment representing the expected completion date of each major phase may be required.

Type	Assessment Year
Single phase developments	<ul style="list-style-type: none"> - Anticipated opening year assuming full occupation - Anticipated design year (might be required)
Multiple-phase developments	<ul style="list-style-type: none"> - Anticipated major phases of completion of the development including the first and the last phase - Anticipated design year (might be required)

Table 3.1 – Assessment Years for New Developments/ Redevelopments

If different areas of assessment are required, such as for road traffic, public transport and / or pedestrians / cyclist connectivity, the assessment years may be different. Certain assessment year(s) may be required for some of the assessment areas but not for the rest. Traffic Consultants are to seek the LTA's direction on the assessment year(s) to adopt for case specific development proposals.

3.5.4 Assessment Periods

An assessment of the surrounding transport infrastructure is to be undertaken for the period that is expected to be significantly affected by trips associated with the proposed development. These peak hours to be assessed shall be determined in consultation with the LTA during the Scoping Meeting.

Under circumstances where the development's peak trip generation occurs outside of regular commuting peak hours, the periods to be surveyed and/or studied may include both commuting peaks as well as the development's peak period(s), which may occur in the off-peak periods or at the weekend.

3.5.5 Study Area

The study area will depend on the type, size and transport conditions in the vicinity of the development. Generally, small developments that are not expected to generate high volume of vehicular, cyclist and pedestrian traffic are likely to experience localised impacts only, and as such the area to be studied may include the development's own vehicular, pedestrian and cyclist access point(s) and the immediate intersections. In contrast, larger developments with higher volumes of additional trips may have a wider impact on the surrounding transport network over a longer distance from the development site. As such, a wider study area will be needed. A wider study area may also be applicable for developments situated within an already congested transport network. Traffic Consultants are advised to confirm the extent of the study area with the LTA prior to commencing the study.

3.5.6 Traffic Surveys

The existing transport / traffic condition in the vicinity area of the development shall be well appreciated as it forms the base for the impact analysis. Traffic survey is a common practice to collect basic information to support analysis and understanding of existing conditions.

Generally, for commercial, industrial and residential developments, traffic surveys are conducted in the morning and evening weekday peak periods. Retail developments may require surveys at the weekend as well as weekday. Traffic surveys are commonly carried out in 15 minute intervals and classified by vehicle type to determine the profile of traffic changes within the peak hours. Unless specified, traffic surveys shall be undertaken on a typical weekday, excluding Mondays, Fridays, weekends and public / school holidays, and not be affected by inclement weather. The results of the surveys shall be summarised with the peak hours identified and graphically illustrated within the main body of the report.

For certain locations where there is already or is expected to have high volume of pedestrians / cyclists, surveys shall include pedestrians / cyclists movements. For TIA cases requiring calibration and validation of the existing year models, surveys shall include traffic queue lengths at junctions, travel times along major routes and/or other data as specified by LTA. For surveys used to determine development trip generation rate, Section 3.8 of this Document specifies the requirements.

Traffic Consultants shall agree with the LTA on the intended survey scope, location(s), period(s) and date(s), at least 3 working days prior to the survey. Traffic Consultant is to seek LTA's agreement on any change to the plan at least 1 working day prior to the survey date, unless the change is due to unexpected incidents such as inclement weather or occurrence of a traffic accident at the survey site(s). During the intended survey period(s), LTA officers may selectively undertake survey observations.

The LTA may request for raw data of traffic surveys conducted by Traffic Consultants. Traffic Consultants are to ensure that the survey data are appropriately formatted and the raw data are to be kept for at least six months for LTA's possible audit.

3.5.7 Existing Development Site and Surrounding Transport Condition

The Traffic Consultant is to provide a description and/or analysis of the existing site and transport condition of the proposed development within its vicinity as follows:

- Analysis of contextual site issues e.g. size, current use, vehicular, cyclist and pedestrian access point(s) etc.
- Description of the road geometry, pedestrian routes, cycling paths, bus stops and MRT/LRT stations near the development.
- Appreciation of surrounding land use and environs.
- A map with the location of the proposed development in relation to its surrounding road network and the overall study area is to be included.

An assessment of the transport elements likely to be affected by additional trips from the development during the peak hours is to be undertaken. The scope of assessment should be determined in consultation with the LTA during the Scoping Meeting. Identifications of existing transport problems are to be supported by site survey and photos.

The following sections of this Document will specify the technical requirements of the TIA. The techniques adopted for assessment shall be consistently applied to the various assessment years including the existing year as applicable or unless specified / agreed by the LTA.

3.6 Pedestrians and Cyclists Assessment

3.6.1 Introduction

The Land Transport Authority (LTA) has developed this set of Guidelines to assist Traffic Consultants in designing developments to be walking and cycling friendly, to realise the Walk Cycle Ride vision. This set of Guidelines also stipulates the best practices that Traffic Consultants shall follow as part of their submission of the Walking and Cycling Plan (WCP).

Due consideration shall be given to pedestrian and cyclist² safety and needs at the design stage of all new developments or redevelopments. As part of a Pedestrian and Cyclist Assessment, the Traffic Consultant is to identify major desired pedestrian lines and cycling route(s) to/from the development to MRT, bus stops or existing pedestrian/cycling network (including places of attractions/amenities such as supermarkets, markets, schools, hawker centre, etc.), based on the shortest and/or most convenient route. If there are no existing cycling paths, Traffic Consultants are to assess and propose the provision of cycling paths linking the proposed development to existing/planned cycling paths and MRT/LRT stations nearby, subject to LTA's approval. For more information, the Traffic Consultant can refer to the Walking and Cycling Design Guide³. The location of crossing facilities i.e. at-grade crossings and grade-separated crossings shall match pedestrian movement needs with minimal diversion from the most convenient route. All infrastructure design (e.g. cycling path, footpath, ramp, etc.) within the Road Reserve shall comply with LTA's prevailing Standard Details of Road Elements (SDRE).

² The term "cyclist" here refers to cyclists and PMD users.

³ https://www.lta.gov.sg/content/ltagov/en/industry_innovations/industry_matters/development_construction_resources/active-mobility/walking_and_cycling_plan.html

Pedestrian and cyclist safety in terms of visibility and sight distance at the corners and edges of the development plot, access points to the development and road crossings shall also be addressed. Likewise, pedestrian and cyclist safety and ease of circulation shall also be catered for within the development. These accesses and internal routes will have to meet BCA's barrier free access (BFA) standards according to BCA's prevailing Code on Accessibility In The Built Environment.

The provision of bicycle parking facilities shall be made in accordance with the LTA's guidelines in [Appendix 3E](#). The development is also highly encouraged to provide end-of-trip (EOT) facilities according to the suggested stipulated quantum in [Appendix 3E](#). Proper signage shall be provided to guide cyclist users in the development to the Bicycle Parking and EOT facilities.

3.6.2 Walking & Cycling Plan

The Walking and Cycling Plan (WCP) is an in-depth study of pedestrian and cyclist circulations within and around the development to design a safe and convenient environment for pedestrians and cyclists. The WCP will thus require the developer to consider the walking and cycling connectivity in the design of the development; direct and seamless connection to major transport nodes and related facilities shall be provided for wherever possible.

A WCP is required for developments that meet the Transport Impact Assessment (TIA) criteria stipulated in [Appendix 3A](#). Developments that are not required to conduct a TIA but are located near major transport nodes or are of uses that typically generate high pedestrian and cyclist footfall may also be required to conduct a WCP, including developments within car-lite precincts⁴. Developments that are not required to conduct a WCP will be required to submit a Pedestrian and Cyclist Assessment as described in Section 3.6.1.

For master developer-based proposals which consist of more than one development plot with different staging years, the Traffic Consultant is required to submit an area-based Walking and Cycling Plan at the concept design stage. This area-based WCP will typically entail a brief report that consists of but is not limited to the following:

- Cluster boundary;
- Parcel outline and land use;
- Location of the developments in relation to its surroundings;
- Surrounding transport network and services (MRT stations, bus stops, cycling paths);
- Existing and proposed covered linkway, underground pedestrian network and elevated pedestrian network;
- Development accesses (pedestrian, cyclist and vehicular);
- Through-block links and open spaces;
- Pedestrian and bicycle crossings;
- Cycling route, vehicular route and major pedestrian circulation;
- Walking and cycling network and interactions within the cluster;
- Indicative location of bicycle parking and EOT facilities; and
- Wayfinding master plan.

Thereafter, each individual development within the cluster which meets the respective use threshold will be required to submit a WCP as part of its Development Control submission to LTA. LTA may require the master developer to update the area-based WCP if the subsequent development intention of the individual plots deviates from the area-based WCP.

⁴The car-lite precincts are Bayshore, Jurong Lake District, Kampong Bugis, Marina South and Woodlands North.

3.6.3 General Design Considerations

- Pedestrian and cyclist accesses shall be located along the natural desired routes i.e. the most direct path. For developments that are gated, such as private residential buildings or industrial developments, the placement of pedestrian and cyclist access(es) should provide the most direct route to/from key amenities and transport nodes. Likewise, for large gated developments, the provision of more than one pedestrian/cyclist access is highly encouraged (see Figure 3.2).

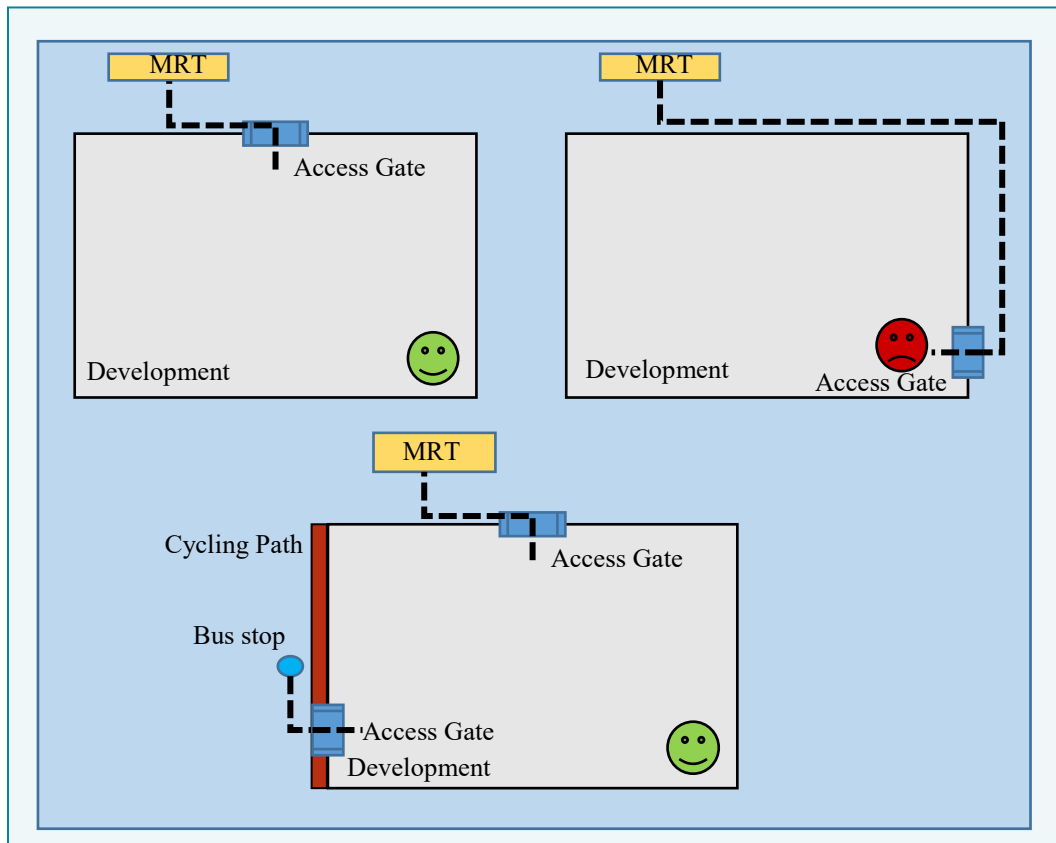


Figure 3.2 Examples of good placement of access(es) to provide direct access

- There shall also be seamless connections between developments and adjacent transport nodes such as MRT stations, bus stops and the existing pedestrian/cycling network as shown in Figure 3.3. Segregated paths for pedestrian and cyclist is preferred. However, shared paths for pedestrians and cyclists can be considered where there are site constraints.



Figure 3.3 Examples of seamless connectivity

- Vehicular access(es) of the developments shall be located away from major pedestrian and cyclist routes, where the site permits. Where pedestrian and cyclist routes intersect with vehicular access points, appropriate measures are to be adopted to safeguard pedestrian and cyclist safety. Hard structures such as concrete boundary walls/fencing/etc. are to be recessed adequately to allow sufficient line of sight between vehicles exiting the development & pedestrians/cyclists using the footpath/cycling path(s) (see [Appendix 3C](#) for more details). Alternatively, the boundary wall/ fencing/etc. shall be constructed with porous materials. The placement of warning signs shall also be considered alongside these design considerations.
- Where existing footpaths/linkways/pedestrian crossings/cycling paths are to be removed upon hoarding of the development site, there should be provision of interim linkages and alternative pedestrian crossings during the construction phase of the development.

3.6.4 Design for Pedestrians

An assessment of pedestrian circulation associated with the development shall be shown in the WCP. In addition to the general considerations in Section 3.6.3, other areas of consideration include:

- Provision of sheltered pedestrian routes to adjacent developments surrounding pedestrian network and major transport nodes e.g. MRT and bus stops where adequate.
- Seamless connection between covered walkways/linkways and open walkways. The levels of the covered walkway/linkway shall not be grade separated with the open walkway where possible. Where there is level difference, it shall be mitigated by ramps instead of stairs (see Figure 3.4) and step free access is highly encouraged at all pedestrian gates.



Figure 3.4 Provision of covered walkway/linkway with ramps

- Provision of current pedestrian counts and assessment of pedestrian numbers, capacity and performance of nearby pedestrian facilities including walkways, stairways and crossings to substantiate the adequacy of the design to accommodate the expected pedestrian volume.
- Enhancement of pedestrian safety - e.g. adequacy of sight distances at crossing facilities, mitigating conflicts at driveways and cycling paths, provision of slow points/ signage/markings to alert pedestrian, cyclist and motorists (see Annex C); extra care and attention shall be given to developments such as hospitals and schools that are frequented by vulnerable groups.

- Provision of wayfinding signs to direct pedestrian to public transport nodes, key activity generating areas, and adjoining buildings within the development as shown in Figure 3.5. The signs shall be well-positioned within the development and integrated with the overall development design. It is also recommended that barrier-free and sheltered routes within and outside the development are clearly shown (see [Appendix 3D](#) for more details on the wayfinding proposal).

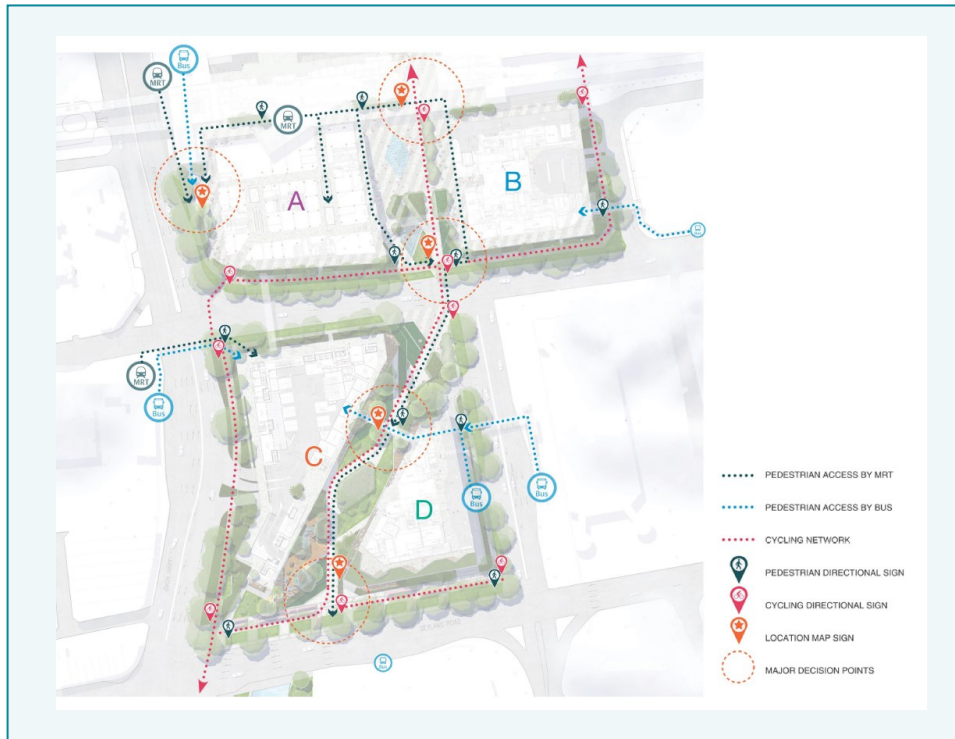


Figure 3.5 Example of a Way-finding Map

3.6.5 Design for Cyclists

An assessment of cyclist circulation associated with the development shall be shown in the WCP. In addition to the general considerations in Section 3.6.3, other areas shall include:

- Construction of cycling path if there is a planned cycling path abutting the development. The developer is required to make good the side table by including a 2m wide dedicated cycling path in addition to the footpath, lane markings and lighting within the road reserve to extend/complete the existing cycling network; details of the cycling path design can be found in LTA's prevailing SDRE. Should the surrounding cycling path network not be ready when the development is completed, the developer shall provide a widened footpath with embedded conduits for the provision of future cycling path lighting according to LTA's prevailing SDRE standards. LTA will complete the cycling path finishing and the network in due course.
- Enhancement of cyclist safety - the finishing of the cycling routes within the development boundary shall be designed to be suitable for cyclist, e.g. comply to cycling skid resistance requirement.
- Provision of proper parking bicycling parking facilities in the building. The development shall provide bicycle parking lots within the development boundary to cater to both tenants/staff and visitors of the development. The bicycle parking guidelines can be found in [Appendix 3E](#).
- Provision of EOT according to the guidelines and design considerations stipulated in [Appendix 3E](#) is also highly encouraged where possible to complement the bicycle parking.

- Provision of cyclist counts and assessment of cyclist numbers, capacity and associated facilities such as shower facilities, lockers, bike sharing facilities to accommodate the expected cyclist demand.
- Provision of cyclist friendly access(es) to and within the development e.g. automated sliding door. If the development is unable to provide a separate access for cyclist from pedestrian gates, the access shall be a step free access (see Figure 3.6).

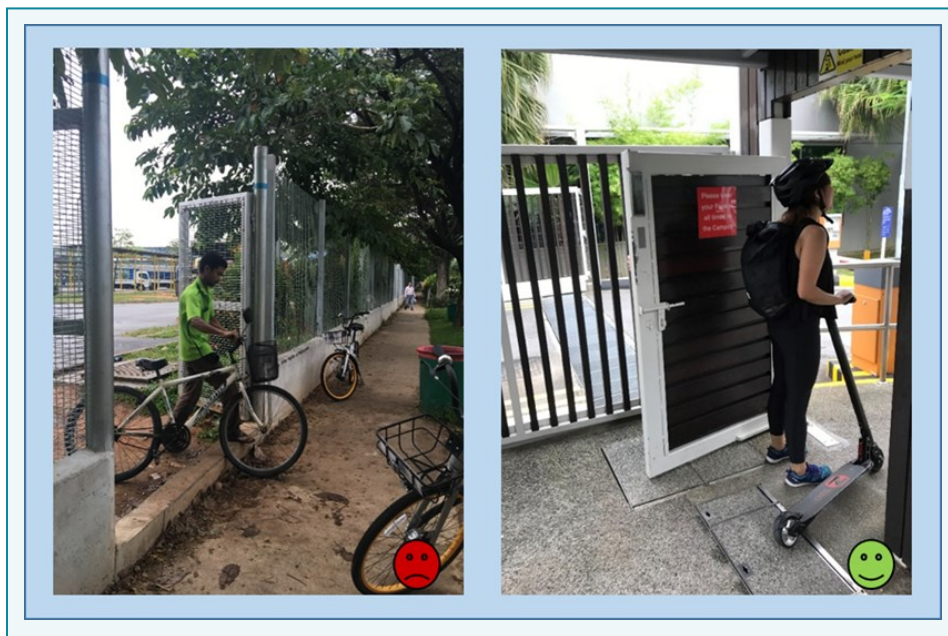


Figure 3.6 Provision of step free access for cyclist

- Enhancing cyclist safety - e.g. adequacy of sight distance at crossing facilities, conflict at driveways, pedestrian paths, provision of slow points etc (see [Appendix 3C](#)); internal cyclist routes to bicycle parking location shall not cut through car parks and internal driveways. Where it is unavoidable, the provision of safe crossing measures is recommended.
- Provision of wayfinding signs to direct cyclist to facilities such as bicycle parking, shower areas, lockers etc. within the development, especially when the facilities are provided at multiple locations. The provision of innovative and artistic signs and/or floor markings with clear information is also encouraged to guide cyclist to bicycle parking spaces and nearby end-of-trip facilities (see Figure 3.7 and refer to [Appendix 3D](#)).

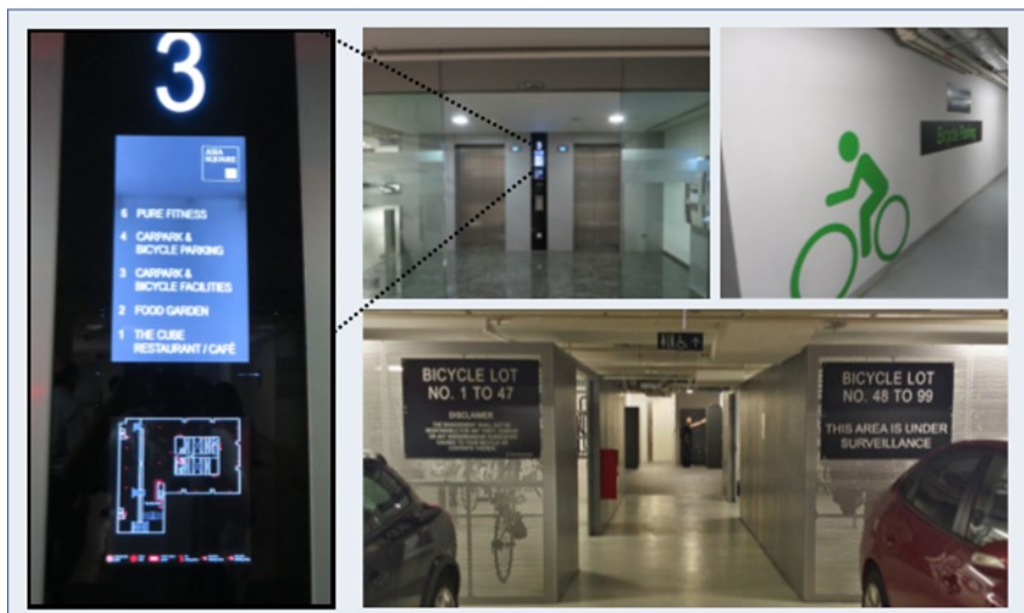


Figure 3.7 Example of Way-finding Signs for Cyclists

3.6.6 Demand and Infrastructure Provision

Where the proposed development is expected to generate high pedestrian and/or cyclist volume, the TIA is to include an assessment of the capacity requirements and performance of the pedestrian and/or cyclist facilities to substantiate the adequacy of the design to accommodate the expected pedestrian and/or cyclist demand. Traffic Consultants are to seek the LTA's advice on the requirements specified for such an assessment.

3.6.7 Walking and Cycling submission requirement

Taking into consideration the design guidelines presented in Sections 3, the aim of the WCP is to ensure that the diverse flows (pedestrian, cyclist and vehicular) within and around the development are gelled into a network to achieve seamless connectivity. It is also a comprehensive approach that attends to all users and ensures that pedestrian and cyclist are a priority.

The rigorous process of the WCP shall be demonstrated and presented in written report form that explains the rationale for the following 5 sets of plans:

- (1) Location and Connectivity Plan
- (2) Circulation Plan
- (3) Conflict Mitigating Plan
- (4) Bicycle Parking and End of Trip Facility Plan
- (5) Wayfinding Plan

The five sets of plans shall find its base in development plans that show good level of details. Traffic Consultants may choose to show them in simplified form within the written report and attach A3 development plans with the relevant circulation markings as the Annexes of WCP report.

The (1) Location and Connectivity Plan situates the development within the wider urban and transportation network, whereas the (2) Circulation Plan highlights the different pedestrian, cyclist and vehicular flows going into the development and within the development. The (3) Conflict Mitigating Plan is then the attempt to manage and de-conflict these flows and circulations in a bid to achieve a smooth network. The (4) Bicycle Parking and End-of-Trip Facility Plan locates the cyclist infrastructure needs and thus highlights the due considerations given to pedestrian/cyclist circulation and ensures pedestrian/cyclist safety. Lastly, all these will be aided by the fifth plan (5) Wayfinding Provision Plan that directs users, with the aim of keeping the different users' circulation neat. For more details, please refer to [Appendix 3B](#).

3.7 Public Transport

3.7.1 Introduction

Emphasis is expected for the following:

- (1) Improved public transport (PT) accessibility of new development
- (2) Measures to encourage future site users to take PT to/from the new development, especially for developments with high PT accessibility.

Specifically, the TIA is to demonstrate that it provides a more multimodal approach in the assessment of the likely travel behaviours of site users to/from the proposed development (e.g. through person-trip generation surveys). Improving PT accessibility and services⁵ is a “win-win” as it not only benefits site users but also enhances the attractiveness of the development. To help quantify PT accessibility, LTA has adapted the London’s Public Transport Accessibility Level (PTAL) methodology and made it relevant to Singapore. All TIA submissions would now need to undertake a PTAL assessment for the proposed development using LTA’s PTAL methodology.

For large-scale developments, an assessment should also be made of the available capacity on the PT network relevant to the development. This is particularly important when considering rail network capacity, which is generally less variable compared to the bus network. Developers/Traffic Consultants should consult LTA on the need for such analysis during the pre-application/scoping stage. LTA will assess such a need and decide on the scope of the study on a case-by-case basis taking the scale, size, use, type and location of the development, as well as network performance into consideration. Upon developments’ request the LTA would help outline the study requirements even before a Traffic Consultant is involved.

3.7.2 Objectives

One of the main objectives of the TIA Guidelines is to make PT an integral part of the development planning process. To this end, developers shall demonstrate that the development would:

- (1) provide safe and efficient access to PT services
- (2) undertake PTAL assessment for the proposed development
- (3) minimise adverse impact on the PT networks and the users of those networks
- (4) promote the use of PT

⁵if demand justifies

3.7.3 Safe and Efficient Access to PT Services

The main issue to be addressed is whether access to nearby bus stops and MRT/LRT stations⁶ from a development is direct, safe, attractive and convenient. Factors that may be considered include:

- Directness of pedestrian routes to nearby bus stops and MRT/LRT stations
- Walk time to/from nearby bus stops in view of whether new bus stops are required or existing ones ought to be relocated
- Ability of pedestrians to cross major roads
- Potential conflicts between pedestrian and vehicular movements along the way leading to nearby PT services
- Minimise walk distance to PT nodes in view of the location of pedestrian entrance (including side gate) and building orientation of the proposed development
- Provision of sheltered walkway
- Standards and conditions of existing PT infrastructure and passenger facilities (comply with prevailing design standards). For example,
 - [Architectural standards](#)
 - [Standard Details of Road Elements](#)⁷
- Convenient and useful information for potential PT users (e.g. directional signs and way-finding maps)

The pedestrian routes to all bus stops/stations within catchment areas is to be well integrated with public footpaths. They are to be well surfaced, well lit, without steep inclines or barriers that are difficult to negotiate, and protected from the weather (if demand warrants). PT passengers from the proposed development should be able to cross the road(s) conveniently to the bus stops on the opposite side, and vice versa. Individuals should not have to cross major traffic flows to reach a bus stop without pedestrian crossing facilities.

For developments served by the MRT, the aim is to provide safe, direct and convenient pedestrian and cycling routes to and from the development. For the purpose of the TIA, the maximum walking distance to bus/LRT and MRT services is 400m (or 5-min walk) and 800m (or 10-min walk), respectively. There are existing websites which can help measure actual walking distance⁸, e.g. <http://sg.mapometer.com/>⁹ or <http://www.onemap.sg/index.html>.

When determining the pedestrian access point(s) of the development site, consideration is to be given to providing direct and high quality access for pedestrians who walk to nearby PT nodes, as well as whether the site has been provided with adequate level of access(es) (both capacity and connectivity) to all nearby PT nodes within the catchment areas. In addition, developers are to consider the needs of individuals with mobility impairments for accessing PT services.

Bus services are generally more accessible and affordable compared with most other PT services. If well planned, they help promote social inclusion and transport equity, and benefit the vulnerable the most. Therefore, greater effort is to be placed on improving accessibility to nearby bus services, as well as their associated facilities wherever possible.

To facilitate LTA's evaluation of TIA, developers should provide the following plans:

- 400m & 800m walk radius and indicative walk time isochrones from the proposed development (See example in [Appendix 3F](#))

⁶Up to 400m (or 5-min walk) for a bus stop/LRT station, and up to 800m (or 10-min walk) for a MRT station.

⁷ These design standards and guidelines will be updated from time to time.

⁸ Actual walking distance should be based on network distance (not 'the crow-flies' distance)

⁹ The LTA take no responsibility for the accuracy of the information provided by the website.

- Pedestrian routes to nearby bus stops and LRT stations (both within 400m walking distance) and MRT stations (within 800m walking distance), as well as cycle routes to nearby MRT stations (within 2km cycling distance) from the development site. For each bus/LRT/MRT service, only the walk route to the nearest bus stops (for both directions)/station entrance would need to be indicated (See example in [Appendix 3G](#)). However, the LTA might also request for additional walk routes (to any bus stops within 400m walking distance) to be included in the plan if there is reason(s) to believe that those bus stops are also likely commonly used by future site users.

Mapping this information where possible will present a clearer picture. Interactive, bus maps, timetable and frequencies of existing services are available at:

- <https://www.transitlink.com.sg/TlDetail.aspx?ty=catart&ld=15>,
- <http://www.mytransport.sg/content/mytransport/home.html#>, and
- <http://www.onemap.sg/index.html>.

Overall, developers are required to clearly describe and indicate the level of access to the site by PT, and identify areas where possible improvements can be made to encourage site users to use PT, and provide the necessary support to those without access to cars.

The requirements above are not exhaustive and further supplementary information may be required to take into account local condition and other material considerations. Equally, TIAs of some developments may not need to meet all the requirements mentioned above. Therefore, it is important that the scope of work is agreed with LTA as early as possible.

3.7.4 Public Transport Accessibility Level (PTAL) Assessment

PTAL is a measurement of a combination of how close PT services are from a given point (walking time) and the frequency of those services (waiting time). The PTAL methodology was developed in 1992 by the London Borough of Hammersmith and Fulham. It was adopted by Transport for London (TfL) about 10 years later, and has now become the most recognised method of measuring a combination of accessibility (or First Last Mile Connectivity (FLMC)¹⁰) and availability of PT services. Some regard PTAL as the density of the PT network.

An appreciation of the level of PT accessibility of a development site would enable developers to maximise the PTAL potential of the site by strategically placing pedestrian access gates nearer to PT service access points without compromising on safety, convenience and accessibility of other road users. The location of pedestrian access gates, put forward by developers, would be considered by the LTA on a case-by-case basis with an objective of balancing the interests of site users, other road users and wider WCR objectives. The PTAL score would also help LTA decide on whether or not improvements to PT services and/or local walking network (and hence, the overall PT and walking connectivity and permeability of an area) are necessary. This has now become all the more important as LTA's current policy is to promote mode shift from car to sustainable modes of transport, like PT, walking and cycling.

PTAL ranges from Levels 0 to 9 where 9 represents a high level (best) of accessibility and 0 a low level (worst) of accessibility. Level 1 has been further subdivided into two sub-levels to provide greater clarity. A location will have a higher PTAL if:

- It is a short walking distance (proximity) to the nearest stations or bus stops
- Waiting times (frequency) for services at the nearest stations or bus stops are short
- More services (choice) call at the nearest stations or bus stops
- Any combination of all the above (Transport for London, 2010).

¹⁰ FLMC is the journey leg that, combined with the services at the PT nodes, often determines if PT is the chosen mode of transport.

As part of the TIA, developers are now required to assess the PTAL rating for the proposed development using the LTA's PTAL methodology (See [Appendix 3H](#)). The point chosen for PTAL calculation should be the centre point or the centre of activities (e.g. a building block) within the development site.

As PTAL is calculated on a point basis, multiple PTAL calculations will be required for a single development if it has more than one building on site which is more than 160m apart (i.e. 2-min walk), or if the site has a large site area where centres of activity are more than 160m apart. As a general guide, PTAL should be calculated at 160m intervals.

If a development has more than one building and they are less than 160m apart (measured from the centre point of each building), the mid-point between these buildings should be used for PTAL calculation. For the avoidance of doubt, developers should agree with LTA on the detailed requirements on PTAL during pre-application/scoping stage of a TIA submission.

As far as PTAL is concerned, the important question that LTA is looking to answer are 1) whether the development will enjoy a reasonable level of PTAL in relation to the scale and type of the development, and 2) whether PT and/or walking improvement measures are required to improve the PT connectivity of the development site.

Developers are not obliged to contribute to local PT improvements simply because of low PTAL rating of their development site. However, the LTA strongly encourages developers and their Traffic Consultants to put forward PT improvement proposals for LTA's consideration. It must however be emphasised that the decision on whether or not to take up any improvement proposals and the level at which the issues identified would be addressed (at local, area-wide or strategic level) is at the discretion of LTA.

3.7.5 Promotion of PT Use

The TIA is considered the most appropriate tool for promoting the use of PT at a development level. Developers are to put forward measures of promoting PT usage as a realistic alternative to private car trips. The purpose is to foster behavioural change and result in increased use of PT.

The key questions to answer here are 1) whether the development has been adequately designed to encourage PT use, and 2) whether the development has put forward reasonable measures (relative to the scale of the development) that would maximise the potential of PT use.

Proposed initiatives/measures are to be in place before site users occupy the new development(s), otherwise the habit of using private cars will become ingrained and the change to PT will be more difficult to achieve. Measures may vary from development to development. Some of these measures are listed in Section 4.9 of the Guidelines.

3.7.6 Development Demand and Impact Analysis

As a general guide for PT impact, developers are required to:

- Estimate the number of person-trips generated by the proposed development by transport mode during the peak development generation period(s);
- Establish (or estimate) future mode share pattern of the proposed development during the peak development generation period(s);
- Establish and address access (e.g. barrier-free, directness) and capacity (e.g. crowding) concerns, if any, along access routes between PT nodes (within catchment areas) and the proposed development;
- Highlight bus or MRT capacity problems, if any, (within catchment areas) through observations (e.g. by including photographs in the TIA report)¹¹.

¹¹ It is at the full discretion of LTA to decide whether the issues would be taken up at a development, area-wide or strategic level.

PT capacity is usually not an issue for individual development applications. Therefore, detailed capacity assessments of the bus and MRT/LRT networks are usually not required by TIA. This is also due to the complex patterns of passenger demand using these networks and the fact that a single development application does not usually warrant such an analysis.

However, this needs to be addressed if a proposed development is expected to generate a significant amount of PT trips. The extent to which capacity analysis would depend on the size and significance of the development. Developers should discuss what the analysis requirements are with LTA prior to commencing the study so that agreement can be reached on what level of analysis is appropriate.

To facilitate TIA evaluation, developers should provide maps showing the catchment areas of a development in 400m & 800m walk time isochrones on maps based on the walking network (i.e. using network distance instead of 'the crow-flies' distance). As the choice of time-bands may vary in response to the use and scale of the development, it is important that further guidance be sought from LTA at the scoping stage.

3.8 Road Traffic

The LTA has embarked on the Walk Cycle Ride (WCR) SG strategy to build a car-lite society. An effective road network is required to facilitate urban mobility, especially to ensure the efficiency and safety for pedestrian, cyclist and bus movements on road elements. Measures are required to make sure that the proposed development / redevelopment has minimal traffic impact to the surrounding road network. This section is to provide a guide on how to assess the development's traffic impacts on the surrounding road network and requirements to mitigate the negative impacts.

3.8.1 Background Traffic Forecast

In general, the future background traffic volume can be estimated using the growth factor method for forecasts from the current year. Typical growth factors between 0% and 0.5% per annum may be considered appropriate. Notwithstanding this, the location and proximity of the development to other major new developments and/or new roads are likely to influence the extent of background traffic. Thus, other growth rates may be more applicable in some circumstances. Traffic Consultants are required to consult with LTA to confirm on appropriate growth rate(s) to be adopted for the estimation of background traffic.

Where applicable (e.g. areas to have significant changes in landuse and/or infrastructure), the LTA may advise on the methodology to estimate the future background traffic.

3.8.2 Development Traffic Forecast

A. Trip Generation

Trip generation rates are to be based on survey(s) of similar development(s) agreeable to LTA. Such survey(s) data shall have a maximum validity of not more than two years prior to the date of the TIA study. The survey information including site(s), location(s), date(s) and time period(s) is to be included in the TIA report to substantiate similarities.

Trip generation rate surveys are commonly classified by vehicle type. For large developments, person-trip rate survey classed by transport mode might be required. Certain types of developments may generate a significant volume of goods vehicles traffic. If necessary, the LTA may require survey to be done at similar developments to identify the goods vehicles' travelling profiles including volume and timing. For developments where a comparable site may not exist, trip generation may be estimated from first principles e.g. employee numbers, number of visitors etc. based on the methodology agreeable to the LTA.

For mixed developments such as retail/office or retail/residential where there may be interaction between various land uses, a portion of the trips will be generated from within the development. The total traffic generation of the development is likely to be lower than the sum of individual uses if the rates are derived from stand-alone developments. A reduction in the development's trip generation rate may be warranted when estimating additional traffic on external roads.

The type, the choice of site(s) and the time of survey(s) to obtain trip generation survey rates, or the intent to use historical trip/traffic generation survey data, shall be discussed at the Scoping Meeting and agreed by the LTA prior to commencing the study.

B. Trip Distribution

A description of the methodology used to distribute traffic is to be provided for LTA's review. For most developments, the distribution of development traffic may be based on the survey of an existing nearby development that is similar to the proposed development. Where such development is unavailable, current travel patterns on nearby links and intersections may be used to distribute traffic to/from the development onto the road network. For larger developments or those likely to attract traffic from further afield, traffic distribution may be based on the area of influence of the development e.g. retail centre catchment area or from an origin and destination study to assign the development's traffic to the appropriate routes.

Diagrams are to be included with clear indications of directional and turning distributions (in percentage) of the proposed development trips onto the road network.

For mixed developments, different trip distribution for different components of the development may need to be adopted to account for different travel behaviour of users.

For certain cases where it is required to project the proposed development/ redevelopment's public transport demand and/or assess on its impacts to the public transport system, the LTA will advise on the methodology to derive the distribution of public transport trips.

C. Modal Split of Development Trips

Developments located away from major public transport nodes are likely to have higher vehicular generation compared to those nearer to public transport facilities. The vehicular trip generation rates shall therefore account for the differences in level of public transport accessibility to ensure relevance. For a same development, the vehicular trip generation rate could also be changed over the years where the transport mode share has a significant change. Adjustments to the vehicular trip rates might be required where the level of public transport accessibility and/or transport situation will be significantly different. Modal split of a similar development in a similarly located site with similar level of public transport service would provide useful information and should be used wherever possible. For those areas the public transport accessibility is expected to be different than today's, the LTA will advise on whether there is a need to adjust the vehicular trip generate rate corresponding to the future mode share.

If required, the TIA shall address alternative modes of travel and the provisions to cater for pedestrians and cyclists' needs (refer to Section 3.6). The methodology being used to estimate the development demand for walking and/or cycling shall be agreeable with the LTA.

D. Development Traffic Assignment and Traffic Forecast Results

The assignment of traffic from the development shall be based on shortest travel time/cost in the peak periods (where appropriate, the LTA may request the inclusion of weekend peak period) and shortest travel distance/cost in the off-peak periods. For larger developments, traffic assignment accounting for travel condition on available routes needs to be considered. The appropriate methodology is first to be accepted by the LTA.

On routes with ERP, the applicable rate is to be converted to generalised time and added to the travel time for that route. The LTA will provide the appropriate values of time for private and public vehicles.

The LTA may require the Traffic Consultant to substantiate the routes chosen for the assignment using field travel time and/or origin-destination surveys.

A diagram with the routes and the assigned volumes (in pcu/hr) is to be included in the report.

3.8.3 Assessment of Development Traffic Impact

A. Priority for Walking , Cycling and Mass Transport

For all developments, developers are strongly advised to consider transport improvement measures which can encourage the use of mass transport, and/or walking and cycling as a mode and hence reduce reliance on cars. These measures would bring down the vehicular trip generation rate of the proposed development/ redevelopment and hence to have less traffic impact on the surrounding road network. A list of transport improvement measures is provided in Section 3.9 of this Document for developers/Traffic Consultants to review if applicable for the proposed development/ redevelopment.

In general, priorities for bus, pedestrian and/or cyclist movements shall be considered and encouraged to ensure these modes of travellers are able to get through roads/junctions with reduced delays where possible. For identified locations, the LTA will guide on specific measures to prioritise buses and/or pedestrians/cyclists.

B. Junction Evaluation Criteria

For individual signalised road junctions, traffic situation in general may be considered acceptable where:

- All the vehicular traffic turning movements are able to clear the individual junction within three (3) traffic light cycles, and
- The additional development traffic does not increase the individual junction's delay by 1 or more traffic light cycles.

For areas where there is significant volume of public buses and/or a higher traffic efficiency is required, the LTA will advise on the possible use of other performance standard(s) – e.g. if all the traffic turning movements are able to clear the individual junction within two (2) traffic light cycles. For junctions without traffic signals, the LTA will advise on the appropriate traffic performance standard, such as the acceptable average delay for vehicles on opposed traffic turning movement(s). Traffic Consultant shall seek the LTA's instruction if there is any uncertainty on the expected traffic performance standard required.

C. Road Junction Analysis

The performance of the affected junctions shall be assessed using a commercially available intersection modelling program. The LTA uses the latest version of the SIDRA software. Generally, intersection assessment outcomes produced by an outdated version of the software will not be acceptable, if there has been a newer version(s) available to users for more than two years. The use of other types of software for analysis is acceptable provided that it can produce results comparable to SIDRA. Traffic Consultants are advised to seek the LTA's approval on the suitable software to be used at the Scoping Meeting.

The LTA road and/or junction improvement plans (if any) for the study area shall be taken into consideration as a base in the analysis for corresponding year(s) assessment. The TIA report shall include intersection and road analyses for each year of assessment, with separate analysis for the scenarios of with and without the development traffic. Changes in the average delay for all vehicles at each of the affected intersections as well as the average travel speed along each of the affected roads (where applicable) due to traffic associated with the proposed development shall be analysed and clearly stated in the report.

The values listed below are provided as a guide for the evaluation of isolated signalised junctions.

- Cycle time: Existing cycle time in peak period for existing junctions, or an optimised cycle time within the range of 90-150 seconds to determine a new or future traffic signal along arterial roads,
- Peak flow factor: 0.95 in general. Lower values are to be used for areas with significant demand peaks e.g. areas for schools, cinema, stadium,
- Basic lane saturation flow rate: 2,000pcu/hr/lane for arterial roads. Lower values are to be used for residential streets and environment with high roadside friction e.g. CBD,
- Queue definition: 95% back of queue. When necessary the LTA may request Traffic Consultants to assess the queue length based on other specified definitions,
- Passenger Car Unit (PCU) factors: as shown in Table 3.2.

Vehicle Type	Passenger Car Unit Equivalent (pcu/veh)
Passenger cars & vans	1.0
Single unit trucks:	
- LGV	1.5
- HGV	2.25-2.75
Buses	
- Small	1.6
- Large	2.5
- Articulated	2.9
Motorcycles	0.7

Table 3.2 – Passenger Car Equivalent Unit Factors

LGV: Light good vehicles with laden weights up to 3 tonnes

HGV: Heavy goods vehicle with laden weights more than 3 tonnes or with 3 or more axles

HGV: Lower pcu value appropriate for arterial roads higher value for expressways

Bus: Small bus includes up to 30 seats. Large bus more than 30 seats

Subject to Traffic Consultants' justification and the LTA's approval, other values for the above parameters can be adopted if they are considered more appropriate to the circumstances. For other parameters which are not defined above, Traffic Consultants shall justify the parameter values adopted if they are different from their defaults provided in the intersection analysis software. For simulating existing traffic situation, the outputs of mean back of queue shall be comparable to the observed average queues or the difference between the two shall be justified.

D. Road Network Analysis

In some cases, though individual junctions may be assessed to perform at a level acceptable to the LTA, traffic queues may be created resulting in a gridlock situation especially where intersections are closely spaced to each other. To prevent such a situation, traffic queue lengths and the impacts are to be assessed specifically. For areas where queues at various intersections are likely to interact and significantly affect traffic, a traffic simulation model may be required for assessing traffic performance at the network level. This can include conducting microscopic traffic simulation for the study area or parts of the study area where queues become a concern.

For cases where the traffic situation is sensitive to driving behaviour parameters, such as complex road layout with many interactions, schemes with special road priorities, etc., very detailed assessment is necessary. Microscopic traffic simulation might hence be most suitable and thus required.

To ensure the accuracy of the traffic simulation model, the LTA will specify the criteria for model calibration / validation based on traffic counts, queue lengths, travel times and/or origin-destination matrices. At the Scoping Meeting, Traffic Consultants shall propose and seek LTA's agreement on the suitable software to be used, the extent of the area(s) to be included in the microscopic traffic simulation model and the requirements on model calibration / validation.

E. Measures to Mitigate Negative Traffic Impact

Developers are to demonstrate best effort to encourage / promote walk / cycle / mass transport modes for trips related to the proposed development / redevelopment. This helps to minimise vehicular traffic generated by the development and its impact on the road network. More stringent transport improvement measures are required to encourage the change of travelling behaviour if the development traffic impact is significant.

If the resultant traffic performance after mitigating measures have been incorporated is still unable to achieve the specified performance standard(s), the Traffic Consultant is to recommend junction/road improvement measures and include them in the TIA report. Where necessary, at-grade widening of roads/junctions within the safeguarded road reserve lines can be considered prior to considering/proposing other infrastructure improvement proposals. In areas where the specified performance standard(s) of road/junction performance are not achievable, the LTA may request the Traffic Consultant to conduct further scenario tests and/or sensitivity analysis as appropriate.

The TIA report is to include relevant tables that clearly explain the summarised assessment of results, including traffic volume, delay, back of queue and/or travel speed as appropriate, of individual transport facilities pertaining to each assessment year. The summary tables are to include separate results for the scenarios with and without the proposed development. If road/intersection improvements and/or additional scenario tests or sensitivity analyses are required, the report is to also incorporate tables with a separate summary of the assessment results. Relevant proposals/assumptions for each scenario are to be clearly listed in the tables.

The LTA generally requires the submission of softcopies of all data files and modelling files for verification of results.

3.9 Transport Improvement Measures

To achieve the TIA objectives, transport improvement measures are required to be applied to new developments/ redevelopments, particularly with the priority to promote walking, cycling and mass transport.

The LTA will advise on the applicable measures for new developments/ redevelopments as listed in the following section. The Traffic Consultant is required to work closely with the Developer and the LTA to go through these measures and adopt those that are applicable to the proposed development/redevelopment.

Apart from the measures advised by the LTA, the Traffic Consultant can also recommend other transport improvement measures that may help the proposed development in the use of more sustainable modes of transport, reduce reliance on private transport and/or change travel patterns to mitigate the development's traffic impact.

3.9.1 List of Transport Improvement Measures

Traffic Consultant is required to duly complete Table I.1 in [Appendix 3I](#) and submit it as part of the TIA report. Explanation/justification is required for measures that are not to be implemented.

A. Walking & Cycling Provision within the Development

M1– Access Consideration

Ensure that access to and around the development is considered in the design process to improve accessibility for non-car users and the disabled, e.g. site and building accesses are laid out to prioritise pedestrians and cyclists.

M2- Design Integration

Ensure that the design of the developments is walking and cycling friendly. (E.g. level difference is mitigated by ramps instead of steps; bicycle parking and related facilities shall be located near cycling path or access points.)

M3– Control Measures

Implement lower speed limits and traffic control measures within the development.

M4- Safety of Pedestrian

Implement traffic management or traffic calming measures to make walking safer, including the provision of new footways, raised pedestrian crossing, speed humps/ cushions and etc.

M5- Way Finding for Pedestrian

Provide way finding maps to nearby amenities such as MRT station, bus stops/ interchange, community spaces, etc.

M6- Bicycle Parking

Provide bicycle parking space that is above and beyond minimum standard.

M7– Bicycle Parking for different users

Provide short term and long term bicycle parking facilities.

M8– Facilities for cyclist

Provide shower, changing, drying, lockers and other end-of-trip facilities.

M9– Bicycle Friendly Access

Provide bicycle-friendly access points to development via lift, auto door and cyclist ramp.

M10– Dedicated Bicycle Routing

Provide demarcated cycling path to link the development to the surrounding cycling path and within development to the bicycle parking and end-of-trip facilities.

M11– Signage for Cyclist

Provide clear location signs to guide cyclists to the bicycle facilities and other end-of-trip facilities.

B. Walking & Cycling Provision surrounding the Development

M12— Connectivity for Pedestrian

Ensure that suitable pedestrian links serve and run through the area and link with existing routes.

M13— Priority for Pedestrian

Give priority to pedestrian circulation and ensure that vehicular circulation is located away from pedestrian circulation.

M14— Accessibility for Non-car Users

Access improvement initiatives, i.e. make it easy to reach the development by public transport, walking or cycling (e.g. connections such as underground/elevated pedestrian links, crossing, covered linkway, cycling path).

M15— Safe Connectivity

Ensure footpaths/cycling paths leading to nearby PT nodes are properly demarcated and well lit.

M16— Cycling at Crossings

Provide wider crossing at road junctions and bicycle crossing at midblock pedestrian crossings (e.g. wider crossing, bicycle box).

M17— cycling Route Maps

Provide maps / map display boards indicating cycling routes of the local area.

M18— Place Making

Implement place-making environment within the ground floor of the development e.g. city room

M19— Share Space Design

Development designed to create a shared space - style atmosphere.

C. Mass Transport

M20-Shuttle Bus Service

Private shuttle bus service is to ferry staff/residents/visitors to and fro the development and provide direct connection to nearby main transport node(s) such as bus interchange or MRT station. Providing this service will greatly enhance the accessibility to the development for public transport users.

M21— Educational Engagement

Engaging and educating staff and residents on the benefits of walking, cycling and taking public transport (PT) and what the developer has provided for easy or improved connectivity will provide awareness on the benefit of public transport and active modes for travelling. (Example: conducting a lunch time talk, activities, games, exhibits, and etc.)

M22-Facility/ Service for Shoppers Taking Public Transport

Being able to shop without worrying on how to bring home bulky items makes trips to shopping malls by public transport more attractive and hassle free. This can be achieved by providing a centralised delivery service for shops/tenants to deliver items bought by shoppers.

D. Programmes / Schemes to Promote Walk Cycle Ride

M23— Promote Early with Walk, Cycle and Ride

Informing potential clients/tenants/residents that the development design considers the needs of cyclists and non-car users with the provision of cycling connections to park connectors, cycling routes and public transport facilities can be a value add to the attractiveness of the development. Promoting walking, cycling and public transport accessibility early through marketing information demonstrates that the development has the added value of an inclusive design for all modes of transportation.

M24— Engage Interest Group to Organise Courses

It is important to ensure that cyclists are aware and well informed on the dos and don'ts when cycling either on the cycling paths, shared paths or on roads. This can be achieved by engaging interest groups to conduct training/induction course/road safety education to educate safe cycling and promote cycling skills.

M25— Encourage Cycling Community

As cycling is increasing as a form of alternative mode of traveling in Singapore, there are situations/locations that may act as a barrier against cyclists. This can be addressed by establishing a Bicycle User Group (BUG) to help overcome barriers to cycling for tenants/staff/residents.

M26— Bicycle Sharing

Travelling to a few places to run errands or to another building in a large development may involve some distance to walk. Generally those with cars will opt to drive. Providing "bikes for sharing" to staff/tenants/residents can reduce the need to use the car or walk long distances.

M27— Events to Promote Cycling

Organising events such as Cycle to Work Day can help to convey awareness on alternative modes to the private car .

E. Demand Management

M28— Parking Provision

The Ranged Based Parking Provision Standards (RPPS) grant developers flexibility to determine the desired level of parking provision within the stipulated range. Providing parking lots close to or at the lower bound of the RPPS can help reduce private car demand to the development.

M29— Daily Season Parking

Instead of applying the monthly season parking charging method, the daily flat rate charging with unlimited use of parking lot gives drivers more flexibility of commuting by public transport.

M30— Reduce Allocation for Season Parking

Reducing the allocation of season parking lots upon benchmarking with similar developments in the vicinity may help in reducing development private car trips.

M31— Delivery and Good Vehicles Management

Developments that generate significant volume of delivery or goods vehicles trips during the traditional peak hours can contribute to congestion. Moving the operations of delivery and/or goods transferring outside of the morning and evening peak periods may help relieve / reduce congestion on the road network.

Developers are also encouraged to work with Urban Logistics (UL) operators to manage deliveries effectively. UL aims to reduce the dwelling time of goods vehicle within the shopping malls by having an assigned UL service provider taking over the goods from the various suppliers and disbursing them to the outlets in the mall. The UL also allows for delivery traffic to be better distributed by the use of pre-booked delivery slots thus resulting in time savings for the suppliers. This would also ease congestion on the roads leading to the shopping malls. More information on the adoption of UL could be obtained from the Info-communications Media Development Authority and Spring Singapore.

M32– Car Club

With the rising cost of owning a private car, an alternative where the cost of utilisation may be shared with others may be an attractive scheme for residential developments. Developing a car club scheme or partnering with one/a few existing car club(s) and allocate dedicated parking lots for car club vehicles, can provide residents the option to use/drive a car when they need/want to.

M33– Car Sharing Parking Allocations

Car club/sharing may be supported by allocating parking spaces near the access, for example allocating parking spaces near to the lift lobby or exit door of the parking area.

M34– Parking Charges

In promoting the use of the public transport, increase in parking charges may dissuade drivers from driving. The additional revenue may be used by the developer to subsidise other measures – for example: to improve end-of-trip facilities for cyclists.

M35– Travel Smart Scheme

Travelling on public transport outside the peak hours may help spread commuter peak demand. This may be achieved by periodically conveying awareness on the LTA's Travel Smart scheme to companies/tenants/staffs/residents.

M36– Adjustment to Working Hour

The use of technology such as tele-conferencing, e-mail and instant messages have made working away from the office desk a possibility. By encouraging companies/ tenants to adopt or permit flexible working hours/compressed working weeks (e.g. 9 working days fortnightly)/teleworking from home for staff, demand for trips can be reduced and collectively may help alleviate traffic congestion.

M37– Onsite Facilities

Having onsite facilities such as child care, healthcare and shopping/home delivery may reduce the need to travel. Developers are encouraged to incorporate a certain number of on-site facilities.

M38– Onsite Services

Services such as cafeteria, convenience shopping, canteen and/or cash dispensers are important to reducing the need to travel. Developers are encouraged to provide a certain number of on-site services to reduce the need to travel.

M39– Home Delivery

As delivery services are becoming more common to Singaporeans, the developer may want to provide tenants/companies with home delivery services so that customers do not have to carry items home when taking public transport.

F. Other Measures

M40-Provide Charging Facility for Electric Vehicle

The use of alternative energy will help in reducing the emission of GHG and carbon footprint. Providing electric vehicle charging points within the development to facilitate charging of vehicles may help encourage drivers to consider eco-friendly private vehicles over conventional combustion engine vehicles.

M41– Eco-Driving Course to Promote Fuel Efficiency

Providing courses on environmentally and climate friendly driving techniques may benefit not only the environment but also improves safety, reduces stress levels and save costs for the driver.

M42– Road/ Junction Improvements

Propose measures to prioritise bus, pedestrian and cyclist movements at roads and junctions, and propose improvements to ensure the traffic performance meets the LTA's standard as specified in Section 3.8.3.

3.10 Other Assessment Issues

A. Parking and Pick-up/Drop-off Provision

The Traffic Consultant shall document the analysis for parking provision. The number of parking spaces and access arrangement of new developments shall comply with the requirements stipulated in “Code of Practice for Vehicle Parking Provision in Developments” and “Street Works Proposals Relating to Development Works”.

The Traffic Consultant shall also consider the potential traffic impact and externalities that may arise as a result of car parking operations, and provide appropriate mitigation measures as necessary. If the proposal is unable to meet the access provision and arrangement requirements or the LTA considers that the development access point warrants detailed evaluation, the Traffic Consultant is to demonstrate the viability of the proposed arrangement.

For different relevant modes, such as taxi, coach, car (including private cars and hired cars such as Grab and GOJEK cars), motorcycle, etc., the Traffic Consultant is to assess whether there is a need to provide dedicated pick-up/drop-off facilities and to estimate the number of bays required and to propose suitable location(s). If the development design is carried out as the TIA is in progress, the Traffic Consultant is to comment on the layout, identify potential traffic problems associated with the proposed pick-up/drop-off facilities and recommend necessary improvements to the plan.

B. Site Access and Traffic Circulation

Provision of good site access and circulation for all users whether for motorists, public transport commuters or pedestrians help towards the successful operation of a development. The ease with which users move to/from the development and nearby areas, roads and public transport facilities is important to the long-term success of the development.

The proposals (access, lay-by, pick-up/drop-off point, pedestrian facility etc.) are to take into consideration the following requirements:

- (a) **Safety** – The location and configuration of the access, lay-by, pick-up/drop-off point, pedestrian facilities etc shall not pose a danger to motorists and pedestrians. Good sight visibility are to be ensured in order not to allow motorists' lines of sight to be obstructed by trees, structures, buildings, etc. Generally, the proposal to locate the development access at major arterial roads may not be supported when there are alternative feasible option(s) available.
- (b) **Capacity of road** – This is to be considered when designing the configuration of the access. For example, a Left-In-Left-Out (LILO) arrangement of an access connecting to a road with heavy traffic may be more appropriate.
- (c) **Queue length** – Sufficient queue space within the development is to be provided at the proposed access, lay-by or pick-up/drop-off point(s) to prevent queues encroaching onto main road carriageways as these can obstruct traffic. The TIA is to include an assessment of entry barrier capacity and queue length to demonstrate that the distance between the development boundary line and the car-park barrier is sufficient to accommodate the expected queue.

- (d) Traffic conflicts – Proposals shall not create conflicts of traffic. Access points are not to be located opposite of each other, near bus stops or traffic junctions.
- (e) Obstruction to traffic – Vehicles manoeuvring into access(es) are not to obstruct traffic along the road carriageway. All vehicles are to enter and exit the site in a forward direction. Reversing of vehicles is not allowed onto a public road.
- (f) Pedestrian/commuter facilities – Should a pedestrian crossing facility be proposed, analysis of its impact on traffic flow is to be done. Depending on pedestrian/traffic volumes, other facilities such as a barrier-free accessible overhead bridge or underpass are to be considered if these are considered to be more appropriate. These facilities are to be made accessible to the public at all times.

Generally, proposals to introduce a traffic signal at the junction of the development access on arterial roads will not be favoured unless it can be justified. If a new traffic signal is proposed, the impact of the traffic signal on the traffic flow along affected roads is to be evaluated as described in Section 3.8 of the Guidelines. This is to demonstrate that the proposed traffic signal will not significantly affect the traffic flow or reduce travel speeds along the roads.

Access, road carriageway and junction improvements are to be designed in accordance with the relevant LTA design standards and specifications. Site constraints are also to be taken into consideration.

C. Development Traffic Operation Plan

For developments expected to have significant surge in traffic (e.g., shopping mall opening stage, school morning arrival peaks, development major events, etc.), the Traffic Consultant may be required to:

- (a) Establish the traffic and pedestrian surge profile;
- (b) Estimate the traffic and pedestrian volumes during the peak hours of the surge periods;
- (c) Assess the impacts of traffic within the proposed development as well as on surrounding public roads during the peaks;
- (d) Develop conceptual traffic operation plans to mitigate the negative impacts. The plans are to cover transport facilities which can potentially create significant traffic concerns due to high traffic demand such as car-park accesses, lay-bys, pick-up/drop-off points, loading/unloading schedules, pedestrian crossings, immediate junctions with traffic approaching the proposed development, pedestrian holding areas, etc
- (e) Recommend whether it is necessary to engage Auxiliary Police Officers (APO) to implement the proposed traffic operation plans.

A diagram indicating the proposed traffic control measures at relevant locations is to be included in the report.

D. Traffic Management During Construction

For developments associated with a significant volume of traffic during the construction period, an assessment of the impact may be required as a separate assessment/submission (not as part of the TIA report). The LTA will advise whether such a study/evaluation is required to be submitted.

Where there are significant impacts caused by the development's construction traffic, the LTA may require the Traffic Consultant to propose measures to mitigate the negative impacts.

E. Post Implementation Review

For large developments or developments with uncertainty on whether certain Transport Improvement Measures are necessary to be adopted, the LTA may require the developer to conduct a Post Implementation Review (PIR) about 12 months after the development's opening. For multi-phase developments, a PIR may be required for the final opening. If relevant, a PIR may also be imposed when the development is partially open.

The objective of a PIR is to review the transport situation with the additional development transport demand and to evaluate the implementation and effectiveness of the Transport Improvement Measures adopted, and if necessary to explore further measures for improvement. For a PIR, the Developer may consider involving the same or a different Traffic Consultant from the one who conducted the development TIA.

The following scope may be required for a PIR:

- Classified vehicular traffic counts and/or pedestrians and cyclists counts associated with the development may be required. This is to determine the demand by transport mode / trip purpose;
- Observation of transport and/or traffic situation and highlighting of issues relating to the surrounding transport network;
- Certain type(s) of traffic and transport survey(s), other than counts, may be required. The main aim is to evaluate the transport and/or traffic situation surrounding the development;
- Transport / traffic assessment using suitable tool(s) may be required to quantitatively evaluate the situation;
- Propose further improvements and/or mitigation measures as necessary.

Prior to commencing the PIR, the developer / Traffic Consultant is to discuss and seek agreement from the LTA to determine the scope and requirements. The Developer is strongly encouraged to seek LTA's advice at an early stage to outline the scope and requirements of the PIR, even before a Traffic Consultant is involved.

3.11 TIA Submissions and Reports

As shown in Figure 3.8, during the course of a TIA, various submissions may be required. These submissions can be in different formats, such as reports, plans, survey data, modelling files, etc. For each meeting with the LTA, Traffic Consultant is required to undertake the minutes of meeting. The Traffic Consultant is advised to confirm with the LTA on the submission requirements during the inception stage. PIR Report may be required for certain developments, and the LTA may be able to advise during the inception stage or at a later stage depending on whether the adoption of Transport Improvement Measures are clear during the TIA exercise.

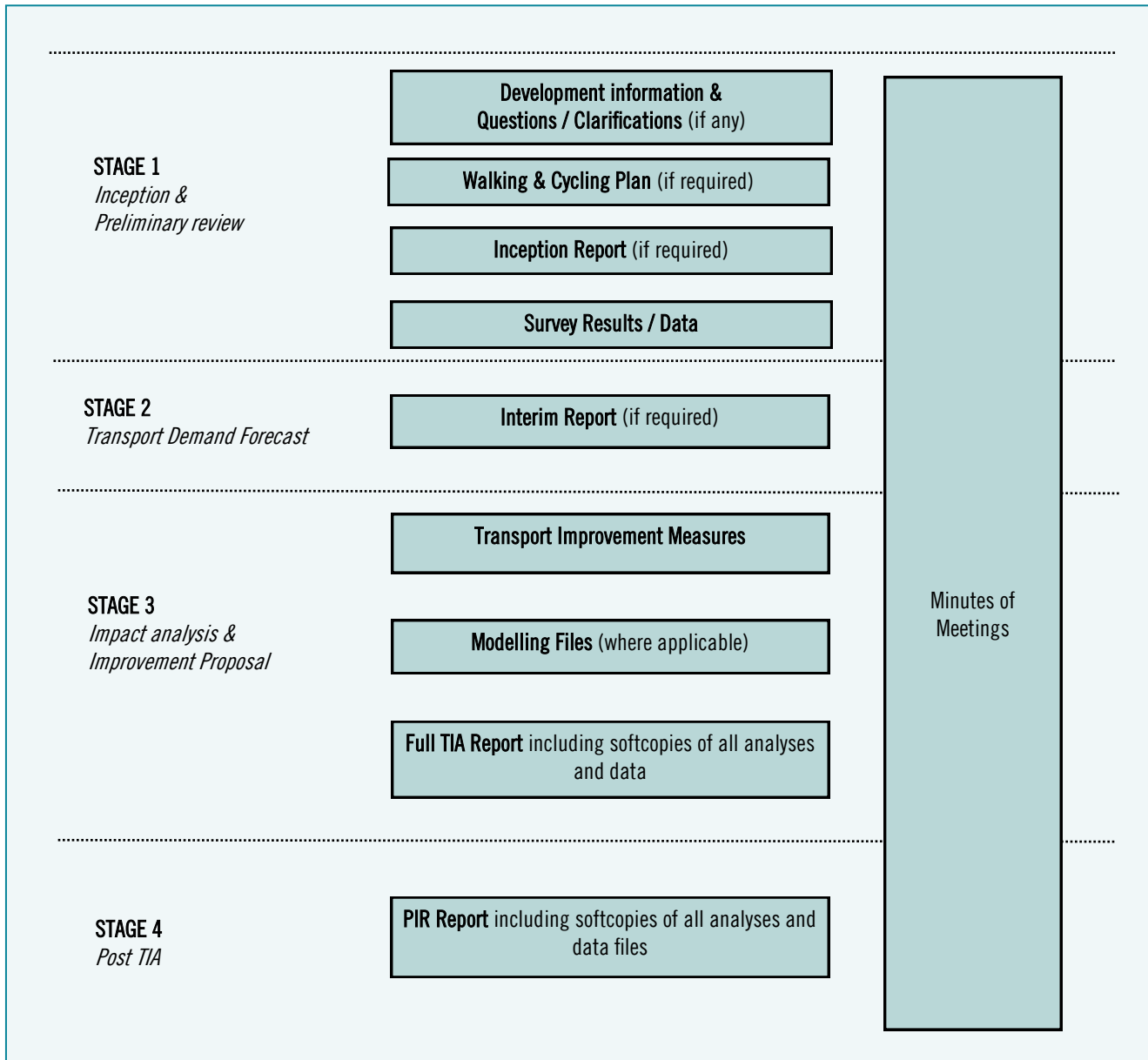


Figure 3.8 TIA Submissions and Reports

3.11.1 Inception Report

Where appropriate especially for large development TIAs, the LTA may require the submission of an Inception Report to ensure that all involved parties are clear about the scope and approach to conduct the analysis. The report may include but not be limited to the following:

- Study objectives and scope of work,
- Description of the proposed development, size, location of vehicular, pedestrian and cyclist access point(s), parking provision and intended circulation, for vehicles, pedestrians and cyclists,
- Study area, roads and intersections,
- Existing land use/transport network nearby,
- Assessment years,
- Study methodology and assumptions,
- Model development approach and calibration/validation target as applicable,
- Survey plan,
- Historical data/overseas data intended for use.

The Traffic Consultant is required to obtain LTA's endorsement of the Inception Report prior to commencing the study.

3.11.2 Interim Report

For large development TIAs, the LTA may require the submission of an Interim Report. The report may include but not be limited to the following:

- Survey(s) conducted and results,
- Progress or results of major tasks such as PTAL, refinements to WCP if applicable, etc.
- Assessment of the existing traffic conditions and/or mode split for similar developments in the area,
- Background traffic forecasts for the assessment years,
- Development vehicular traffic generation and/or person-trip generation where applicable by transport mode (e.g. public transport, walking and cycling),
- Trip distribution (including diagrams as specified in Section 3.8),
- Estimated development's modal split as applicable,
- Traffic / trip assignment.

To avoid delays to the study, the Traffic Consultant is advised to obtain the LTA's endorsement of the Interim Report before further progressing on the study.

3.11.3 Full TIA Report

The TIA report is to be set out logically with clear analyses, conclusions and recommendations. All assumptions and sources of information are to be clearly documented. Inadequate reports are to be returned to the Traffic Consultant for completion or modification as required.

The report is to include an Executive Summary to provide concise and clear information on the study purpose, major findings, conclusions and recommendations. Improvements recommended in the TIA are to be illustrated using appropriate plan(s) with sufficient detail to substantiate their feasibility.

All the analysis files and data related to the study are to be submitted as appendices to the Report for LTA's records.

3.11.4 General Note

This set of Guidelines sets the general technical requirements for the preparation and submission of TIA reports. Some requirements stated in this document may not be imposed for a particular TIA if unsuitable. The Traffic Consultant is to follow the LTA officers' instructions during the course of preparing the TIA. Ambiguities and validity/lack of information are to be resolved with the LTA as early as possible.

Appendix 3A - Conditions When a Traffic Impact Assessment (TIA) is Required

A TIA is required to be prepared at the Development Control stage if one or more of the conditions specified in the following table apply to the development. For retail, commercial, business park and schools meeting the TIA conditions, WCP is required to be submitted. However, if other specific developments are expected to generate high pedestrian and cyclist volume, the LTA will advise the applicant on whether a WCP is required.

Type of Development	Scale of Development
1. Residential 1.1. Landed properties / Condominium Executive HDB housing 1.2. HDB Housing	1.1. ≥ 700 units 1.2. $\geq 1,000$ units
2. Commercial 2.1. Shopping centres / Retail use 2.2. Office development 2.3. Hotel	2.1. $\geq 10,000\text{m}^2$ GFA 2.2. $\geq 20,000\text{m}^2$ GFA 2.3. ≥ 700 rooms
3. Industrial 3.1. Light / General Industry 3.2. Warehousing / Distribution 3.3. Science park / High tech park / Business park	3.1. $\geq 60,000\text{m}^2$ GFA 3.2. $\geq 50,000\text{m}^2$ GFA 3.3. $\geq 40,000\text{m}^2$ GFA
4. Educational 4.1 Primary school 4.2 Secondary school 4.3 International school 4.4 Junior college 4.5 University, polytechnic, ITE campus	4.1. $\geq 1,500$ students (single-session) or $\geq 2,000$ students (double-session) 4.2. $\geq 2,000$ students 4.3. $\geq 2,000$ students 4.4. $\geq 2,000$ students 4.5. TIA required
5. Medical Hospital	$\geq 40,000\text{m}^2$ GFA or ≥ 320 Beds (Whichever is triggered)
6. Recreational Exhibition centre & major tourist attraction	$\geq 30,000\text{m}^2$ GFA

Note:

Generally, for mixed-use residential/retail developments, a TIA is required if the total trip generation of the development exceeds 200pcu/hr either inbound or outbound. However, if the development is located in an area with already high traffic volume, LTA will advise the applicant on whether a TIA or certain part(s) of a TIA submission is required.

Table 3.3 – Conditions When a Traffic Impact Assessment (TIA) is Required

For types of developments not listed in table above and for temporary developments with leases of over 5 years, WCP submission may be required if one of the following conditions is applicable:

- Development is located within car-lite precinct;
- Development is located within 400m (5 minutes' walking time) of key transportation nodes i.e. within Zone 2; or
- Development is retail, office or mixed-use.

Appendix 3B - Checklist to Facilitate TIA Processing at Pre-Scoping Stage

Please provide the required information in the last column. If item is not applicable, please insert "NA".



PART I: Site Information		
Types of information to be submitted at Pre-Scoping Stage	Description of information required	Input by Traffic Consultant
Site Area	To provide site area in square meter (sqm)	
Approved Land Use	To provide Land Use Type as approved in Masterplan	
Quantum Mix	To provide the proposed GFA breakdown of the development e.g. office, retail, residential, etc	
Gross Plot Ratio (GPR)	To provide the proposed and allowable GPR	
Development Type	To state the development type(s) and relevant information as stated below: 1. Residential: To provide number of Dwelling Units 2. Retail/Commercial/Industrial: To provide GFA (in sqm) 3. Educational: To provide Student & Teacher population, Single or double Session 4. Medical/Recreational: To provide number of car parking spaces 5. Hotel: to provide number of rooms	
General Description	Please describe other relevant site information. For schools, please describe whether parents are allowed and/or will be allowed in school compound for drop-off/pickup.	
Observation of Existing Transport Conditions in the Area	Please conduct a site visit and thereafter describe briefly the existing transport conditions in the proposed development site's surrounding area, such as public transport accessibility, provision of walking and cycling facilities, traffic situation (i.e Queue length & no. of traffic light cycles to clear junctions in general), etc.	

PART II : Proposal Information		
Types of information to be submitted at Pre Scoping Stage	Description of information required	Input by Traffic Consultant
Opening Year	To provide the Opening Year of the development	
Phasing Year	To provide the different phases' Opening Years of the development, if applicable	
Operating Hours	To provide the Operating Hours of the development	
Peak Hours	To indicate the estimated Peak Hours of the development traffic	
Trip Rate	For existing development, to provide existing trip rate and future trip rate, if applicable. For new development, to identify an existing development which is comparable to the proposal, and use its existing trip rate and future trip rate, if applicable.	
Proposed Car Parking and Bicycle Parking Provision	To provide the numbers of car parking and bicycle parking lots, specify if it is below or above requirement.	
Software	To indicate what software is proposed to be used for the assessment	

PART III: Relevant Information to be provided by LTA

Where applicable, LTA will provide the following information

Types of information	Input by LTA
Any planned LTA road widening works abutting the development? Tentative start and completion date?	
Any planned covered linkway abutting the development?	
Any planned cycling path abutting the development?	
Other information that could affect development layout	
Whether WCP submission is required for the development?	

PART IV : Supporting Plan		
Types of information to be submitted at Pre Scoping Stage	Description of information required	Input by Traffic Consultant
<p>Location and Connectivity Plan</p> <p>(See Figure 3.9 for an example of a Location Plan)</p> <p>A Location and Connectivity Plan is required to show the development in relation to the surrounding context.</p> <p>Please show an extent of at least 500m – 1km radius from development.</p> <p>Please use different colours to differentiate between pedestrian facilities/ routes, cyclist facilities/routes and vehicular routes.</p>	<p><u>Location of the development</u></p> <ol style="list-style-type: none"> 1. Highlight the development plot; 2. Annotation of road names around the development; 3. Adjacent development name; <p><u>Public Transport Facility</u></p> <ol style="list-style-type: none"> 4. MRT station and entrance(s)/exits(s) (Open/within building/underground); 5. Taxi stand(s); 6. Bus stop(s)/bus interchange; <p><u>Existing and Planned Facilities</u></p> <ol style="list-style-type: none"> 7. Footpath (including those for temporary use); 8. Cycling path abutting the development; 9. Covered walkway / linkway within and abutting development (including those for temporary use); 10. Adjacent pedestrian crossing(s) eg. signalised PC, zebra crossing, informal crossing point, overhead bridge, underpass, underground linkage; 11. Elevated/underground pedestrian network; 12. Through-block links; 13. Vertical circulation areas; 	
	<p><u>Accesses</u></p> <ol style="list-style-type: none"> 14. Proposed pedestrian access(es); 15. Proposed cyclists access(es); and 16. Proposed vehicular access(es). 	

PART V : Walking & Cycling Plan (WCP)

Traffic Consultant to submit WCP (prior to scoping meeting) after receiving information in Part III. (See figure 3.17 for submission flowchart for WCP). The final approved WCP submission is to be included as a sub-report in TIA.

The WCP is to be submitted in the format of a report including a write up accompanying the 5 plans. All plans submitted in the Walking and Cycling Plan shall be submitted with a minimum print size of A3, showing a good level of details.

Types of information to be submitted at Pre Scoping Stage	Description of information required	Input by QP (Architect)
(1) Location & Connectivity Plan	<p><u>Write up on Location and Connectivity Plan</u></p> <ol style="list-style-type: none"> 1. Assessment of existing public transport, footpath (e.g. at grade, elevated link, underpass), cycling path and PCN connectivity to the development; 2. Assessment of the existing cycling facilities (e.g. bicycle parking, EOT facilities) provision around and within the development; 3. Pedestrian and cyclist counts at junctions, footpaths and cycling paths; 4. Photographs (e.g. of existing site conditions or useful examples); 5. Overall vision, goals and strategy of the walking and cycling design for the development; 6. Expected pedestrian and cyclist trips generated from development; 7. Indication of other submissions/ requests in relation to WCP proposals (e.g. GFA exemption, BCA Green Mark); 8. Relevant diagrams and sketches to elaborate on pedestrian/cyclist/traffic issues. <p>The submission of the write up shall be accompanied by the details of Part IV: Supporting Plan in the previous pages.</p>	

Types of information to be submitted at Pre Scoping Stage	Description of information required	Input by QP (Architect)
<p>(2) Circulation Plan</p> <p>The plan finds its base within building plan(s) of the first and other relevant storeys.</p> <p>The plan shows the location of the existing and/or planned foot-paths/cycling paths, bicycle parking, access routes to bicycle parking area, supporting facilities such as showers, lockers and changing rooms.</p> <p>The circulations for pedestrians, cyclists and vehicles shall be represented in different colour overlays in one plan.</p> <p>(See Figure 3.10 for an example of a Circulation Plan)</p>	<p><u>Write up on Circulation Plan</u></p> <ol style="list-style-type: none"> 1. Describe and explain the circulation of pedestrians and cyclists entering into and moving within the development; and 2. Indicate if development is open/porous or gated. 	
	<p><u>Development Boundary Lines</u></p> <ol style="list-style-type: none"> 3. Road Reserve Line 4. Plot boundary line 5. Kerb line 6. Building line 	
	<p><u>Accesses</u></p> <ol style="list-style-type: none"> 7. Proposed pedestrian access(es) 8. Proposed cyclist access(es) 9. Proposed vehicular access(es) 	
	<p><u>Existing and Planned Facilities</u></p> <ol style="list-style-type: none"> 10. Locations of proposed/existing taxi stand, pick-up point, drop-off point 11. Footpath, cycling path, covered walkway and linkway within and abutting development 12. Number of bicycle racks at the proposed location(s), and proposed type of bicycle racks (e.g. single, double tier). Please number the bicycle lots. 13. Location(s) and numbers of other supporting infrastructure e.g. showers, lockers. Please number the lockers. 14. Proposed location and dimension of bicycle lifts/ramps indicated with gradient; 15. Location(s) of the proposed wayfinding signage to bicycle parking, End-Of-Trip facilities, major transport nodes, nearby amenities, and 16. Other pedestrian/cyclist facilities within the development. 17. Indication of public accessible areas and non-public accessible areas (with different colour hatching) 	

Types of information to be submitted at Pre Scoping Stage	Description of information required	Input by QP (Architect)
(2) Circulation Plan (continued)	<p><u>Routes/Circulation</u></p> <ol style="list-style-type: none"> 18. Routes across/to & from development site and any MRT station(s), bus stop (s), taxi stand(s) & adjacent buildings 19. Proposed interim linkages during construction phase of the development where existing footpaths / linkways / cycling paths are affected upon hoarding of the development 20. Barrier-free accessibility (BFA) route (s) within development and how it connects to adjacent public pedestrian footpaths 21. Pedestrian circulation route(s) including through-block link and vertical circulation within development and how it connects to adjacent public pedestrian walkway, nearest bus stop, MRT station and taxi stand 22. Cyclist circulation route(s) from the adjacent cycling path/PCN to the proposed bicycle parking area(s) and EOT facilities 23. Vehicular circulation route(s) within development and how it connects to the adjacent vehicular roads 24. Cyclist/pedestrian conflict area(s) with vehicular traffic (details of treatment to be presented in conflict mitigating plan with relevant write-up) 	
(See Figure 3.11 for an example of a cross section and longitudinal cross section required)	<p><u>Cross Sections and Longitudinal Sections</u></p> <ol style="list-style-type: none"> 25. Showing level difference between development plot and surrounding areas if any 26. Detailed side table cross sections and longitudinal sections if any 27. For cross sections please indicate the width of the footpath, covered linkway, green/service verge, distance from building line to the RRL, as well as level differences across the side-table (if any) 28. For longitudinal sections, please indicate the gradient along the sidetable. 	

Types of information to be submitted at Pre Scoping Stage	Description of information required	Input by QP (Architect)
(3) Conflict Mitigating Plan A conflict mitigating plan shows a zoom in plan of the conflict points identified in the circulation plan, indicating the adequate traffic mitigating measures to enhance safety of pedestrians and cyclists. (See Figure 3.12 for an example of a Conflict Mitigating Plan, Figure 3.13 for an example of an elevation view of the pedestrian gate and Appendix 3C for design guidance.)	<u>Write up on Conflict Mitigating Plan</u> 1. Elaboration of conflict mitigating strategy at each of the conflict points highlighted in the Circulation Plan	
	<u>Details on Conflict Mitigating Measures</u> 2. Detailed plan for the treatment at conflict point(s) 3. Cross section for the conflict point(s) 4. Plan and elevation view of the boundary wall, pedestrian gate(s), vehicular accesses and development corner(s) 5. 3D rendering of conflict point(s) - useful to provide 6. Image to illustrate proposed conflict mitigating measures (e.g. signs, logo)	
(4) Bicycle Parking and End-of-Trip Facility Plan A bicycle parking and EOT facility plan is to show a zoom-in plan at each bicycle parking and EOT facility cluster, to ensure that the facilities are designed to be accessible and convenient for users. (See Figures 3.14 and 43.15 for an example of a Bicycle Parking and EOT Facility Plan, and Appendix 3E for design guidance)	<u>Write up on Bicycle Parking and End-of-Trip Facility Plan</u> 1. Indicate rationale of proposed bicycle parking rack design, as well as types of EOT facilities 2. Operation model of bicycle parking and EOT facilities (e.g. open to public, chargeable)	
	<u>Provision Matrix of Facilities</u> 3. A table indicating the total number of bicycle lots provided, and a breakdown of the total number of bicycle lots per storey and per cluster 4. A table indicating the total number of EOT facilities (e.g. shower, air pump) provided, and a breakdown of the total number of EOT facilities per storey and per cluster 5. Proposed area for GFA exemption	

Types of information to be submitted at Pre Scoping Stage	Description of information required	Input by QP (Architect)
(4) Bicycle Parking and End-of-Trip Facility Plan (Continued)	<u>Layout plan for Bicycle Parking and End-of-Trip Facility Plan</u> <ol style="list-style-type: none"> 6. Bike Parking layout plan with indication of dimension (e.g. spacing of the rack, circulation space, length of the parking lot) and type of bicycle parking 7. EOT cluster layout plan with annotation of each type of End-of-Trip facilities 8. Label and number each bicycle lot, shower stall and locker in the plan 9. Highlight the doors along the internal circulation routes, and their widths. Label if the doors are cyclist-friendly doors (e.g. automatic sliding door). 10. Image or 3D rendering illustrating bicycle parking rack design as well as the proposed End-of-Trip facility cluster 	
(5) Wayfinding Provision Plan <p>A Wayfinding Provision Plan is to show details of the signage proposal, to ensure the wayfinding signage are designed/placed to be clear, concise and intuitive for users.</p> <p>(See Figure 3.16 for an example of a Wayfinding Provision Plan, and refer to Appendix 3D for wayfinding design considerations)</p>	<u>Write up on Wayfinding Plan</u> <ol style="list-style-type: none"> 1. Indicate rationale and principles for wayfinding provision on wayfinding plan write-up <u>Notional Pedestrian/Cyclist Circulation and Wayfinding Plan</u> <ol style="list-style-type: none"> 2. Indicate on floor plans (1st & other storey plan(s) with pedestrian & cyclist facilities) the predicted pedestrian/cyclist circulation corridors from entrances around development from entrances leading to key transport nodes and bicycle parking as well as key activity generating nodes 3. Provide indicative locations of wayfinding signs along main circulation corridors leading to: <ol style="list-style-type: none"> A) Publicly accessible bicycle parking (at-grade), and bicycle lifts for bicycle parking on other levels B) Public transport nodes (MRT stations, bus interchanges, bus stops etc) C) EOT facilities (from entrance and bicycle parking locations) D) Nearby cycling paths and PCNs 	

Types of information to be submitted at Pre Scoping Stage	Description of information required	Input by QP (Architect)
(5) Wayfinding Provision Plan (Continued)	4. Provide indicative locations for Inter-development signage placement and circulation corridor. This is only applicable to development which link to a larger pedestrian network e.g. JWalk/Orchard Road Underground or developments with 24-hour through block links	
	<u>Signage Family (to be submitted at Layout Plan/Street Plan stage)</u> 1. Signage family of internal and external signs, categorized into the types of signage mentioned in Appendix 3D	
	<u>Detailed Pedestrian/Cyclist Circulation and Wayfinding Plan (to be submitted at Layout Plan/Street Plan stage)</u> 1. For all signs proposed during WCP stage, indicate on wayfinding plan all proposed signage locations, types and information as per Appendix 3D 2. Indicate any additional signage that may be required to complete the holistic wayfinding environment 3. Provide relevant section drawings of sidetable abutting the development, showing wayfinding signage in context of development	

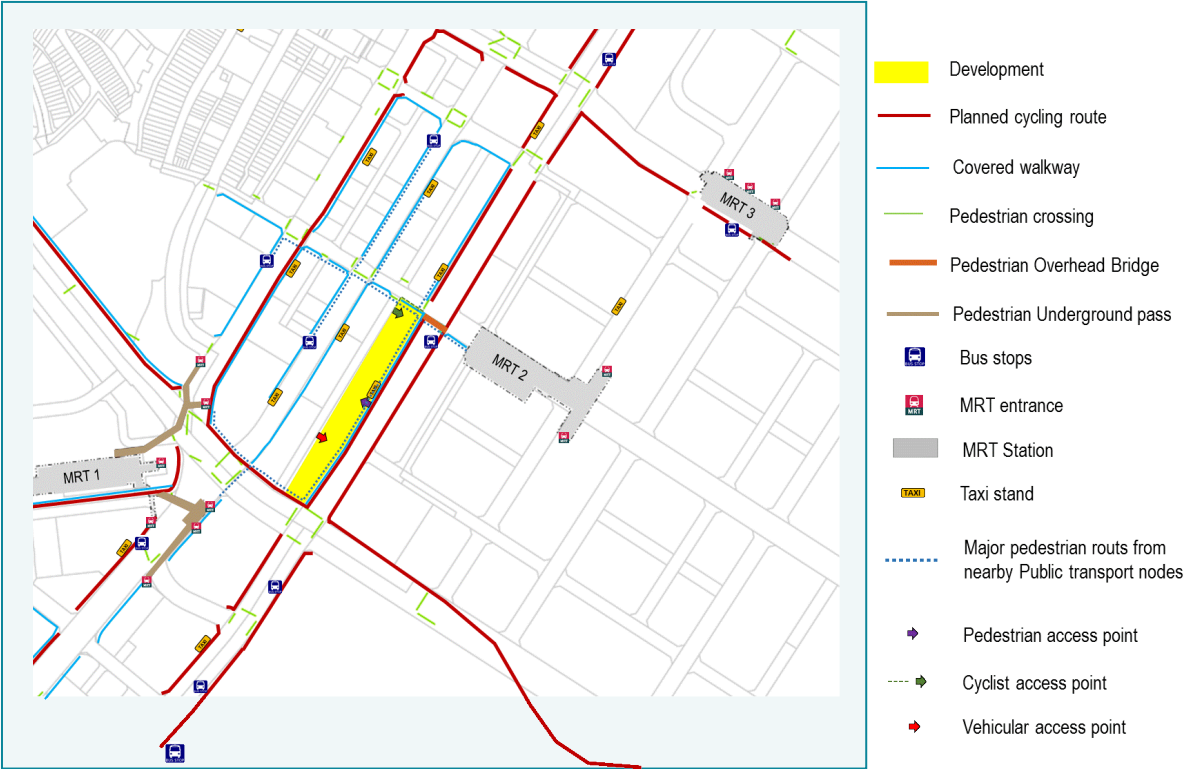


Figure 3.9 – Example of a Location Plan

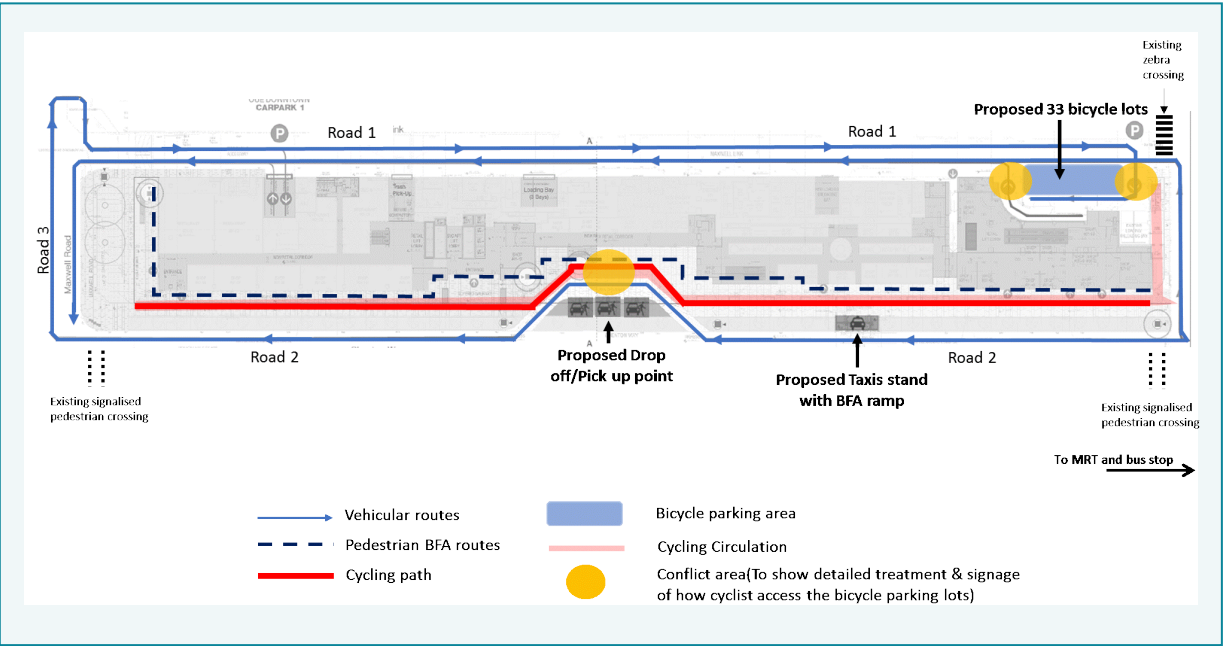


Figure 3.10 – Example of a Circulation Plan

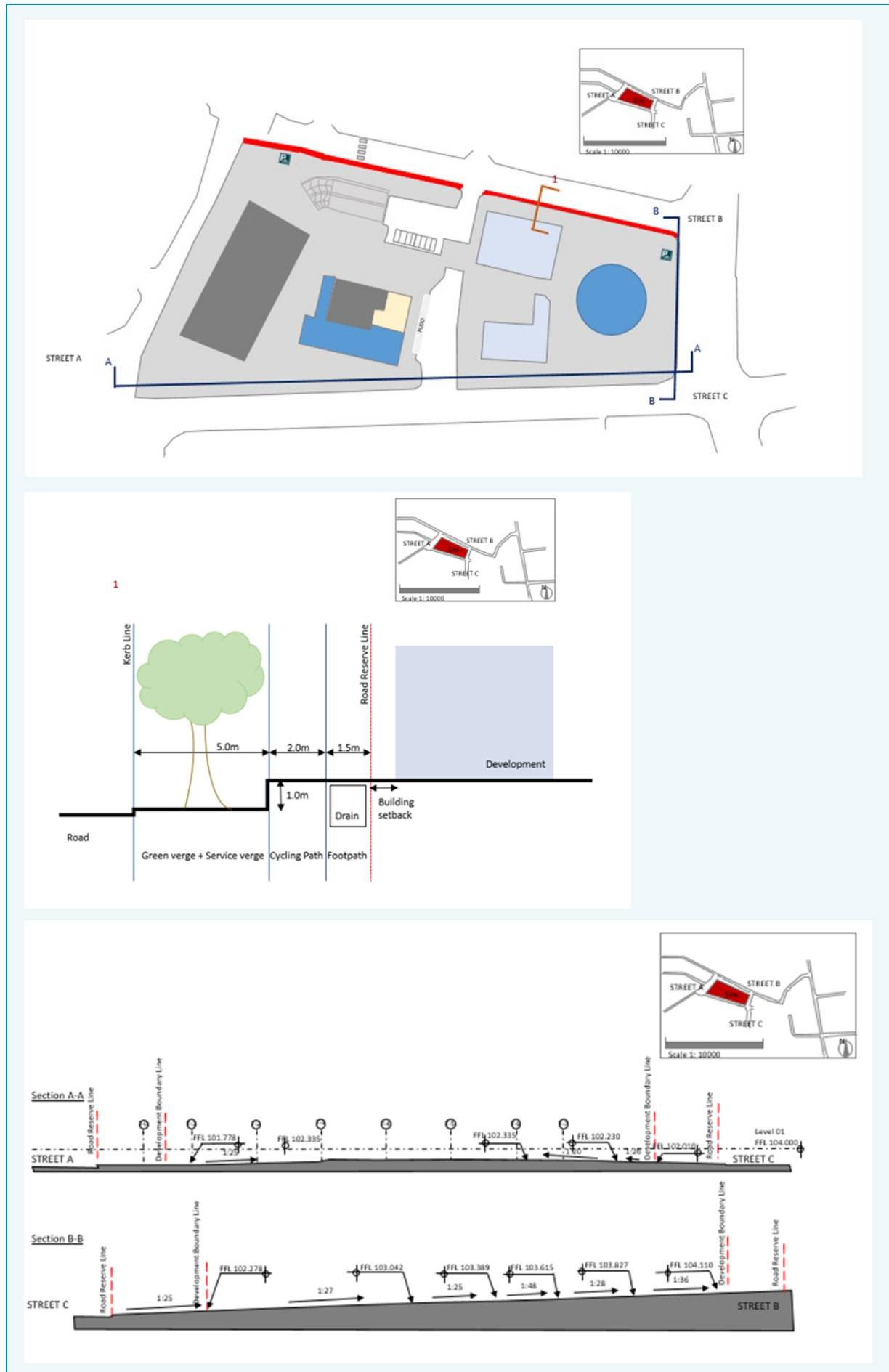


Figure 3.11 – Examples of Longitudinal and Cross Sections

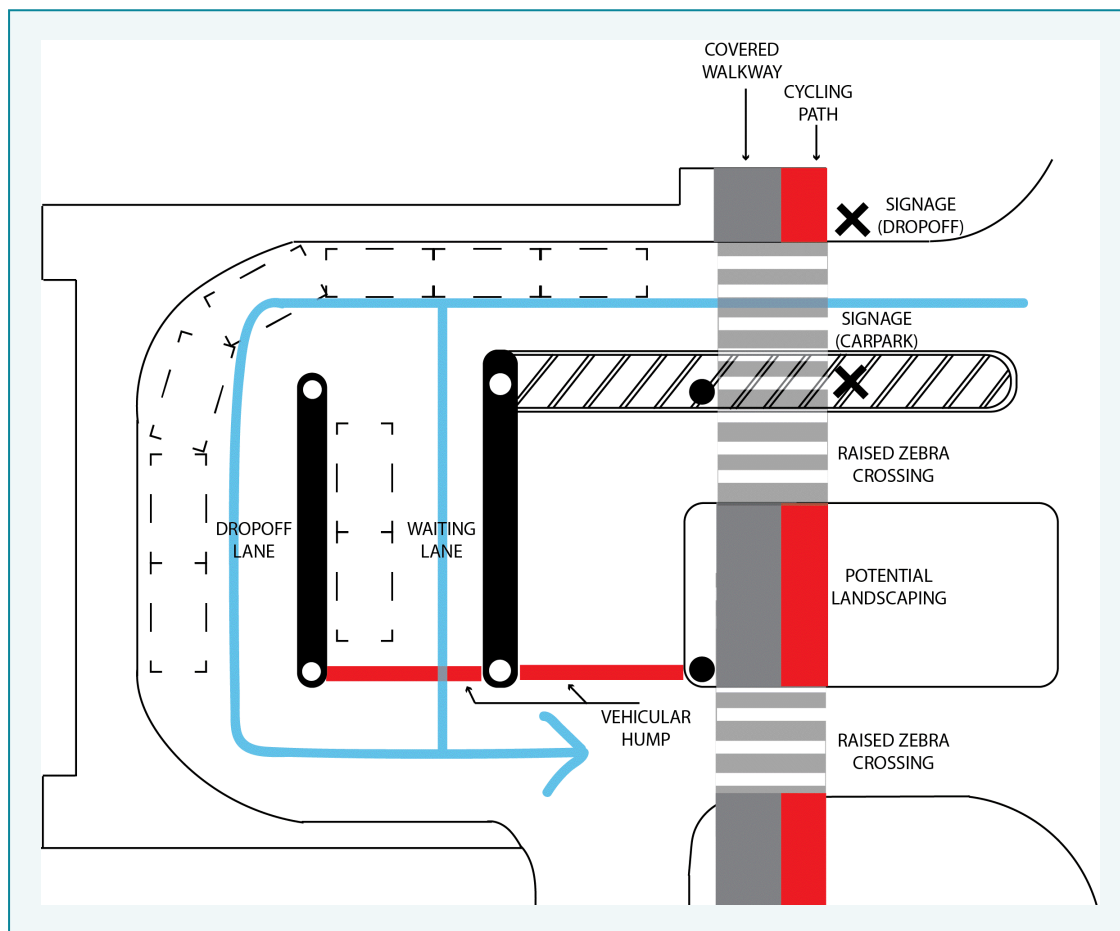


Figure 3.12 – Example of a Conflict Mitigating Plan

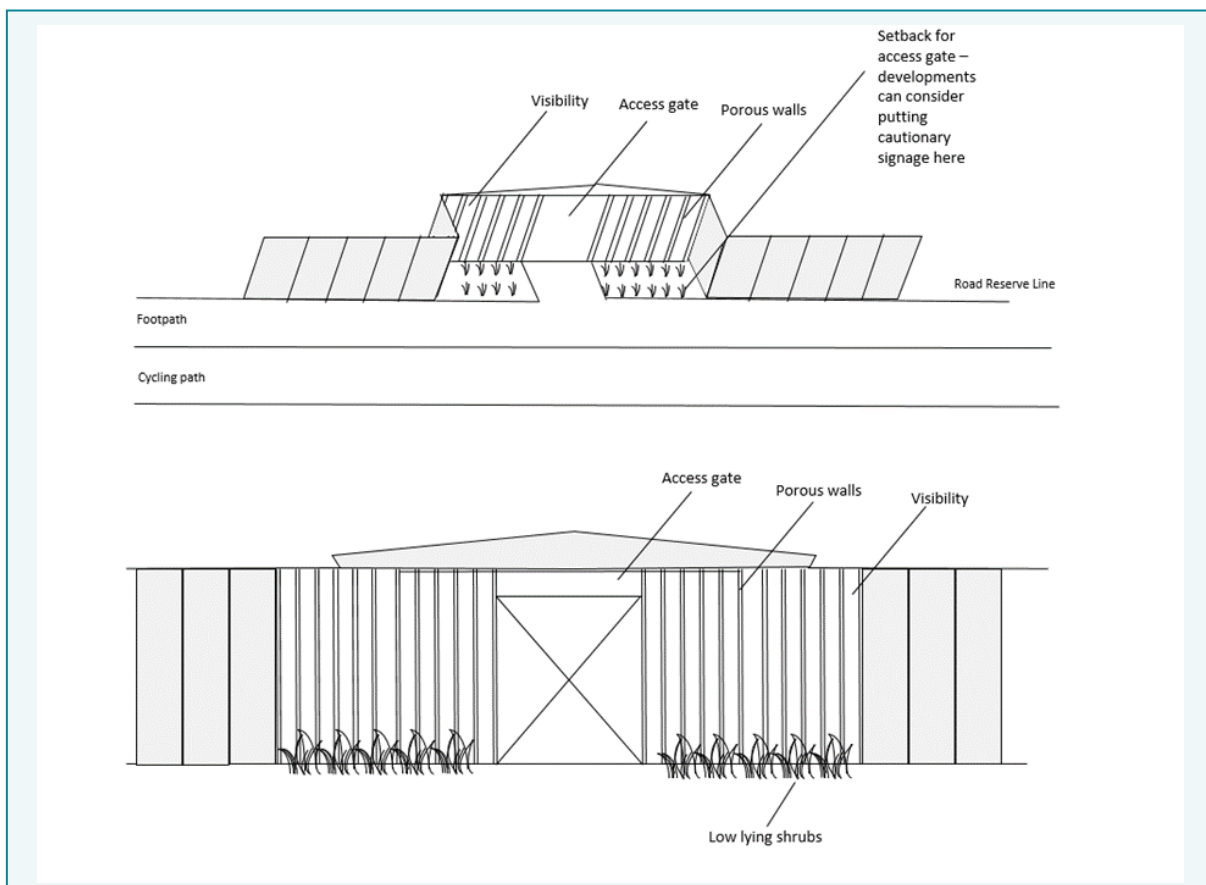


Figure 3.13 – Example of an elevation view of the pedestrian gate

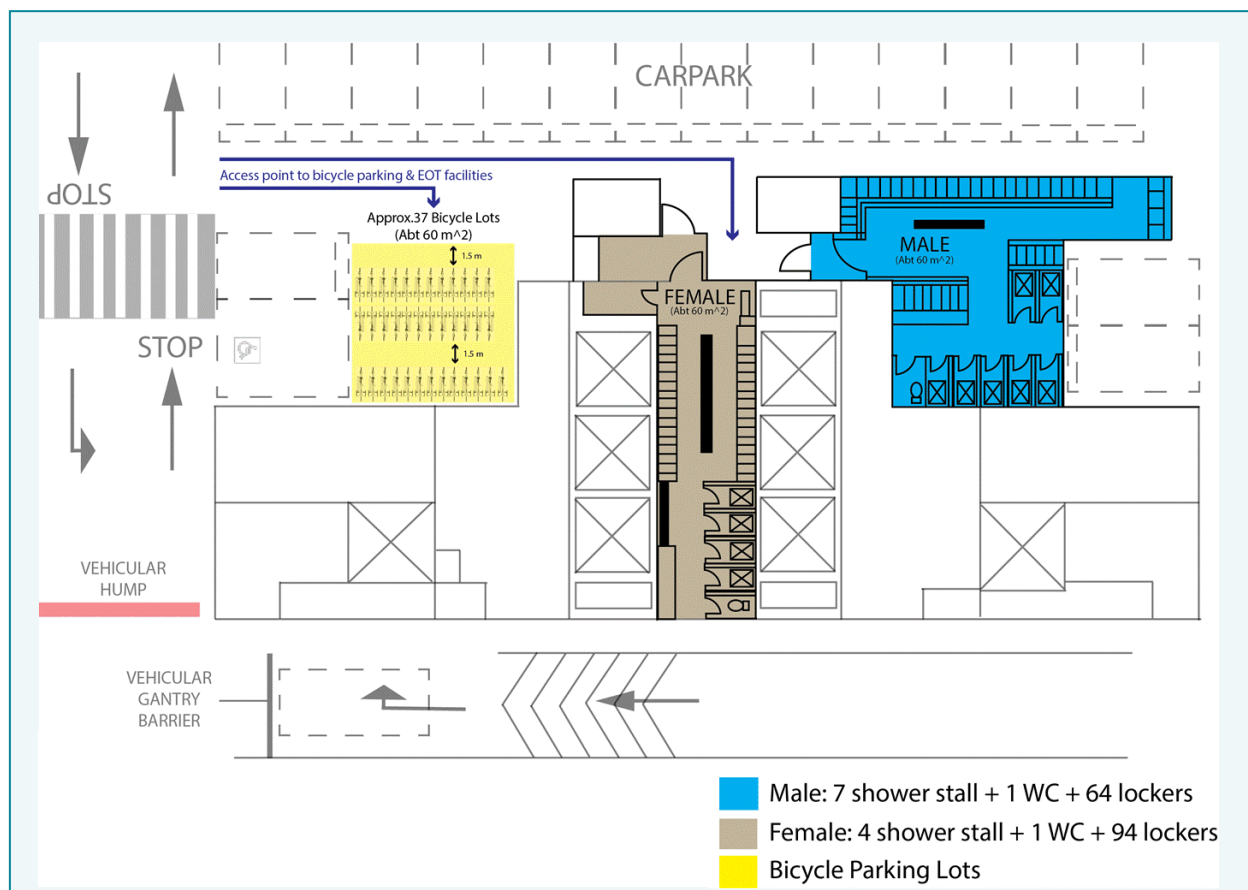


Figure 3.14 – Example of a Bicycle Parking and End-of-Trip Facility Plan

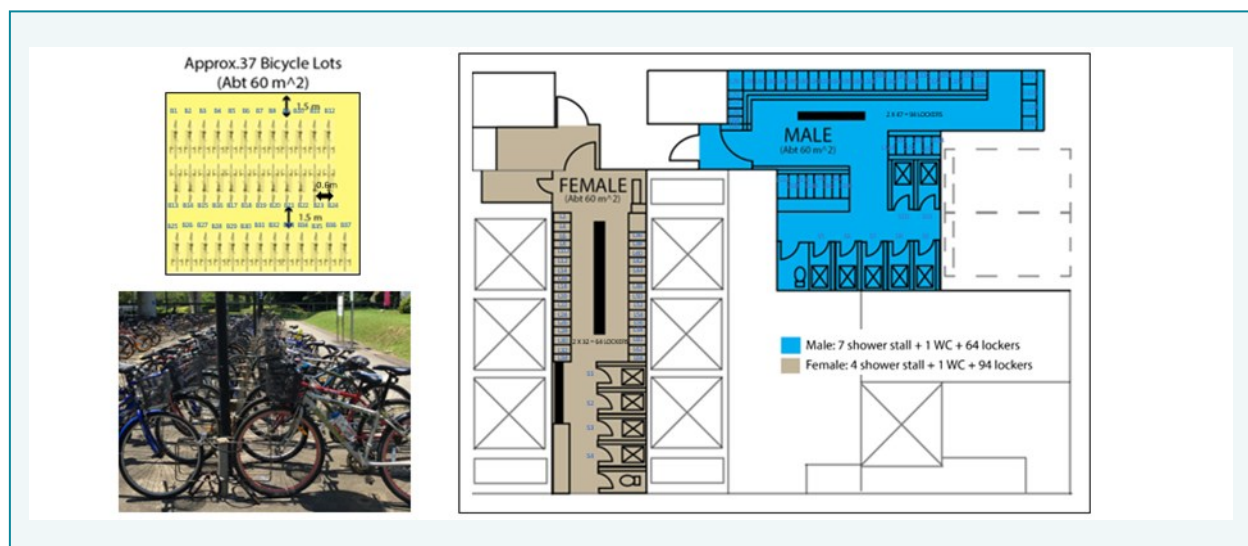


Figure 3.15 – Example of a Bicycle Parking and End-of-Trip Facility Plan - Detailed Zoom-in Plan

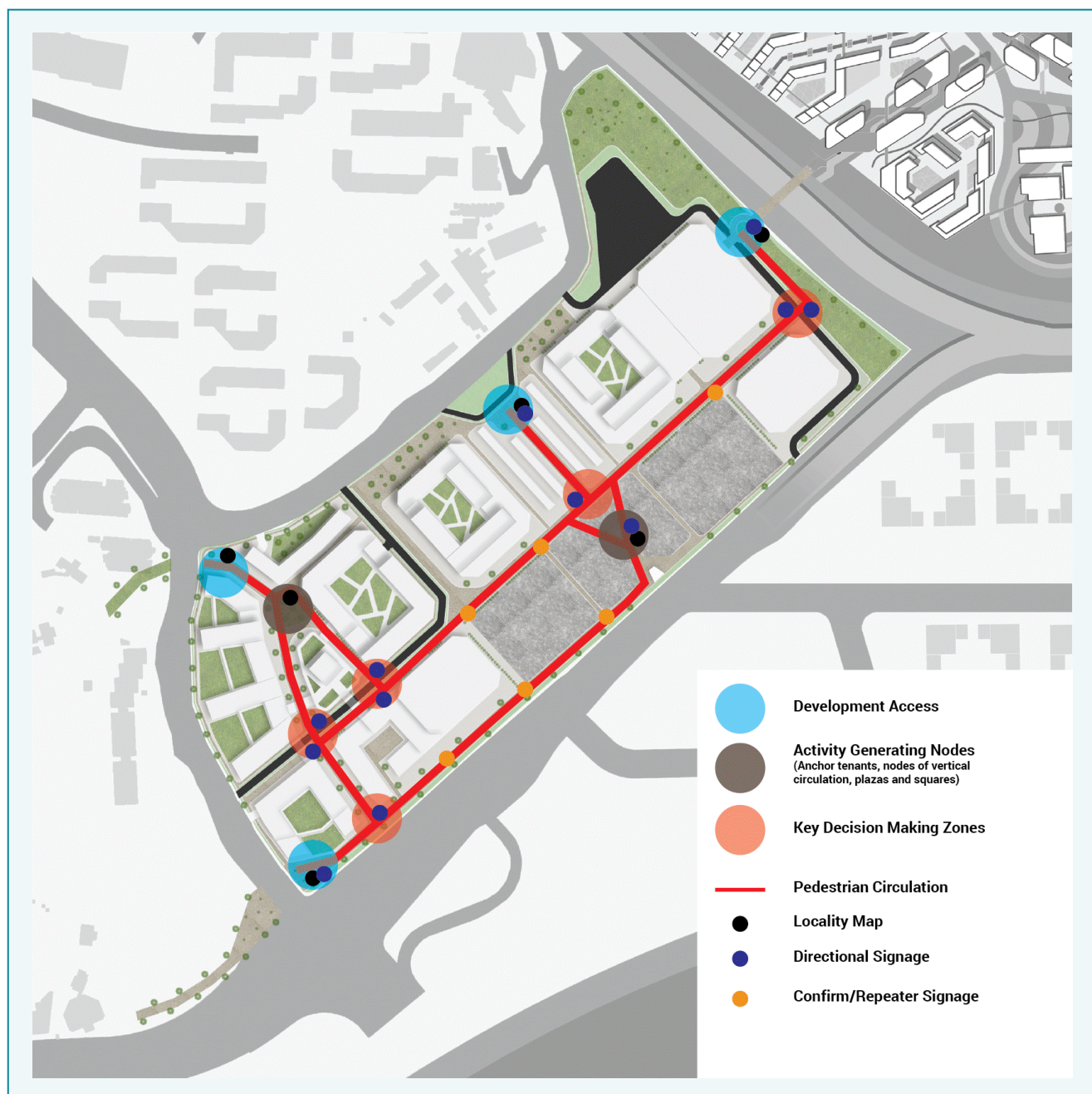


Figure 3.16 – Example of a Wayfinding Provision Plan

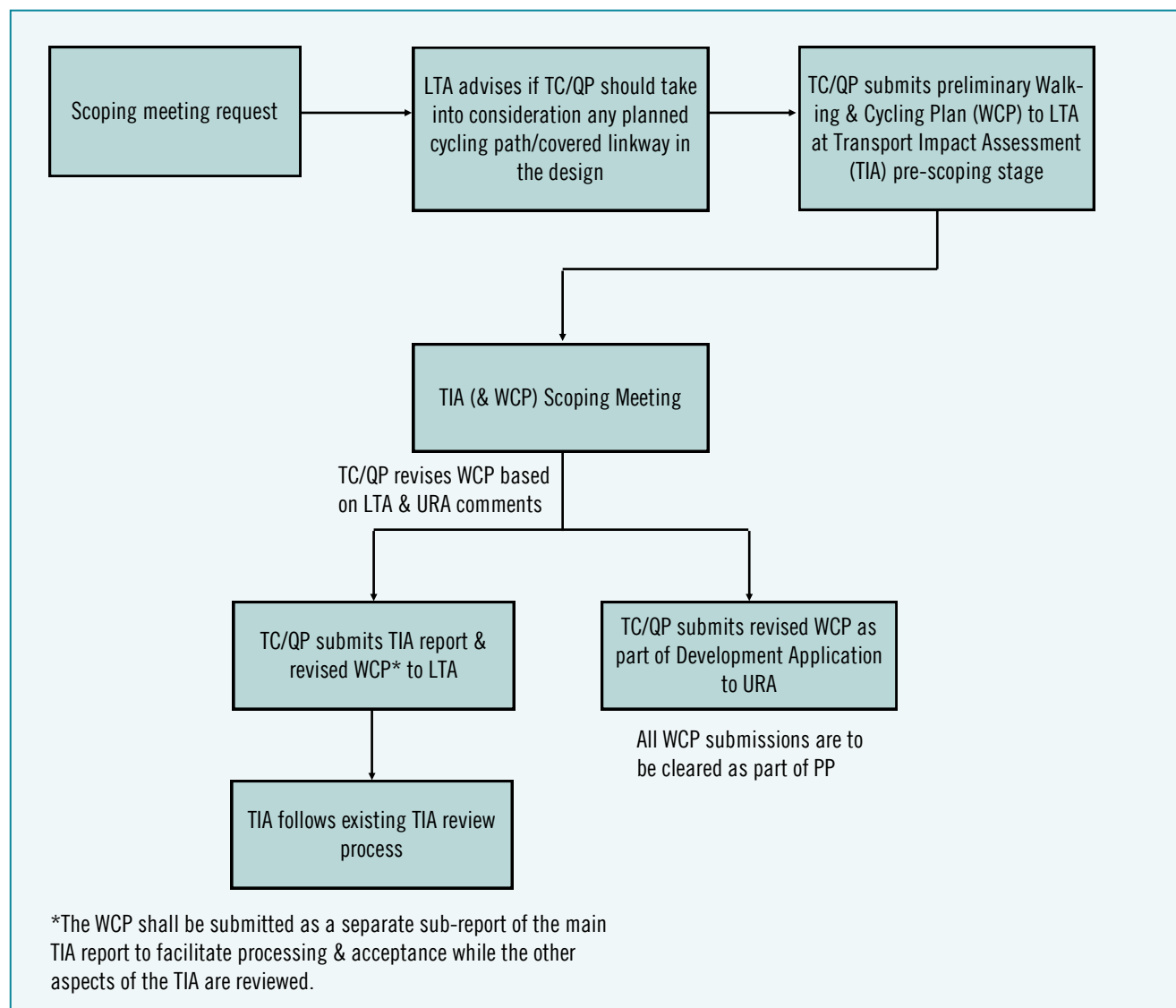


Figure 3.17 – Submission Flow Chart for WCP

Appendix 3C - Guide for Pedestrian Accesses and Conflict Treatments

In designing pedestrian accesses and crossing points at the developments, the Traffic Consultant is to ensure that the facilities are safe and user-friendly. Pedestrian and cyclist routes and accesses shall not conflict with vehicular traffic and shall be clearly seen by all users. Where possible, they shall be de-segregated. This guide serves to include good practices for pedestrian access and conflict treatment design with the objective to meet pedestrians' needs, therefore encouraging proper use of the facilities.

As part of the WCP's conflict mitigating plan ([Appendix 3B Figure 3.12](#)), the development is strongly encouraged to comply with the following guidelines and practices.

A. Creating safe pedestrian accesses

Designers shall take into consideration the potential pedestrian flows from major transport nodes when determining the location for the pedestrian accesses. The pedestrian routes within the development shall be located away from the major vehicular movements.

Designers, as far as possible, shall provide pedestrian access to the building separate from cyclist/vehicular accesses. This is critical for development such as hospitals and schools accessed by vulnerable groups such as the elderly, disabled and young. Markings and signs to alert motorists to give way to pedestrians, and for pedestrians to look out for traffic, shall be provided where conflicts occur between vehicular and pedestrian movements (see Figures 3.18 and 3.19).



Figure 3.18 – No Separate Pedestrian Gate at Development Access

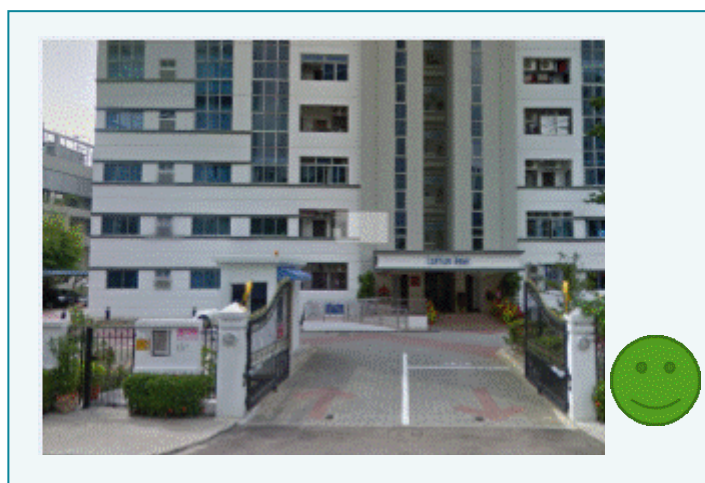


Figure 3.19 – Provision of Separate Access Gate for Pedestrians

B. Providing safe sight distance and traffic calming measures at corners and accesses

There are several measures to increase pedestrian safety within the developments. Where pedestrian and motorist movements conflict at crossing points, the designer shall consider features that highlight pedestrians' presence and warn motorists and cyclists to slow down.

Creating safe sight distances is key in ensuring pedestrian and cyclist safety at vehicular accesses. There shall be enough time for the motorist to react upon seeing a pedestrian/cyclist, especially when exiting from a building access (see Figure 3.20). Measures to be considered include setting back the boundary wall with splayed ends, and using porous materials (see Figures 3.21 and 3.22).

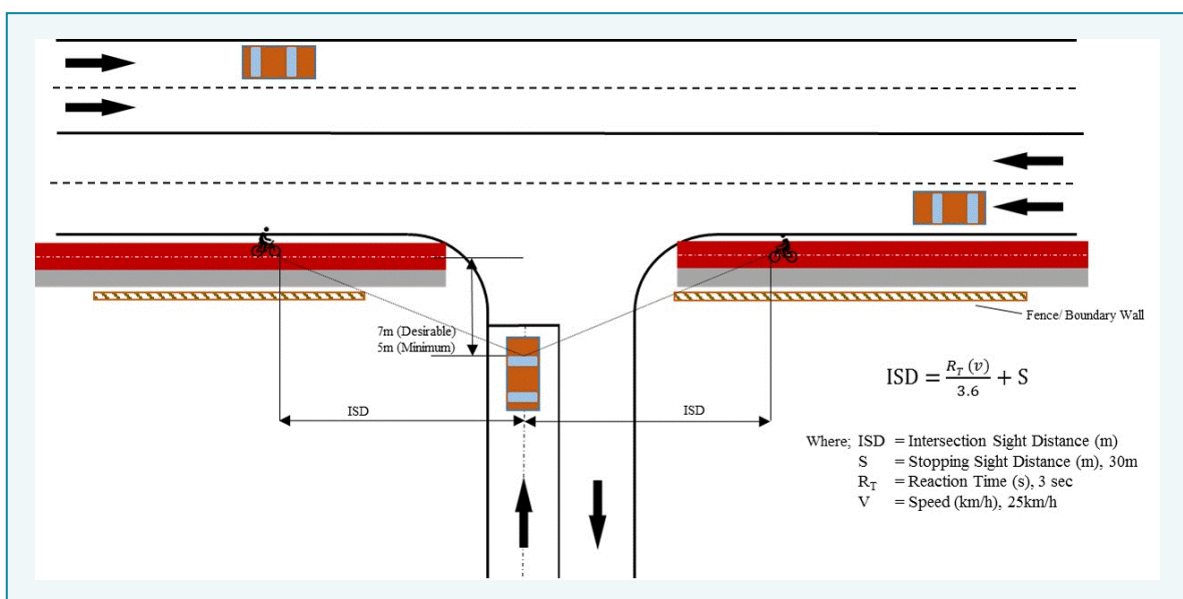


Figure 3.20 – Intersection Sight Distance

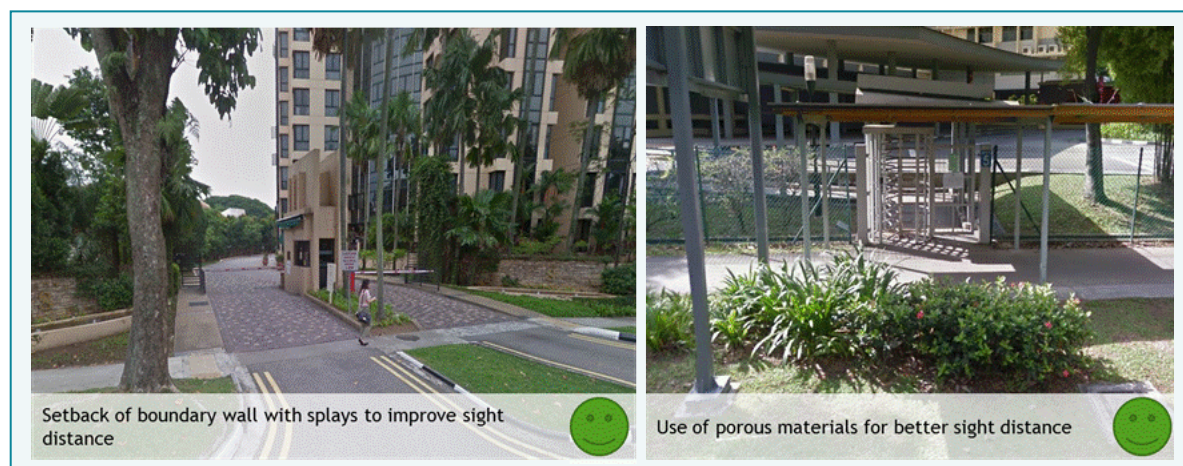


Figure 3.21 – Setback of Boundary Wall with Splays to Improve sight Distance

Figure 3.22 – Negative Example with no clear Line of Sight at Corner Plots



Similar design considerations shall apply to the development's pedestrian access points/gates to ensure sufficient time for pedestrians, cyclists and PMD users to react, especially when pedestrians are leaving the development. Sight distance of cyclists and PMD users are important as they tend to travel much faster than pedestrians; pedestrians risk being hit by oncoming cyclists and PMD users, and the latter risk running into an abrupt out swinging of a gate. Gated developments such as private residences and industrial developments shall take particular care of these potential conflicts. Measures such as the provision of porous walls and gates, and implementation of warning signs, are thus highly encouraged as they allow for safer stopping sight distances (see Figure 3.23). For pedestrian/cyclist access gates that open towards a bus stop, a Pedestrian Priority Zone (PPZ) shall be provided according to LTA's prevailing SDRE markings.

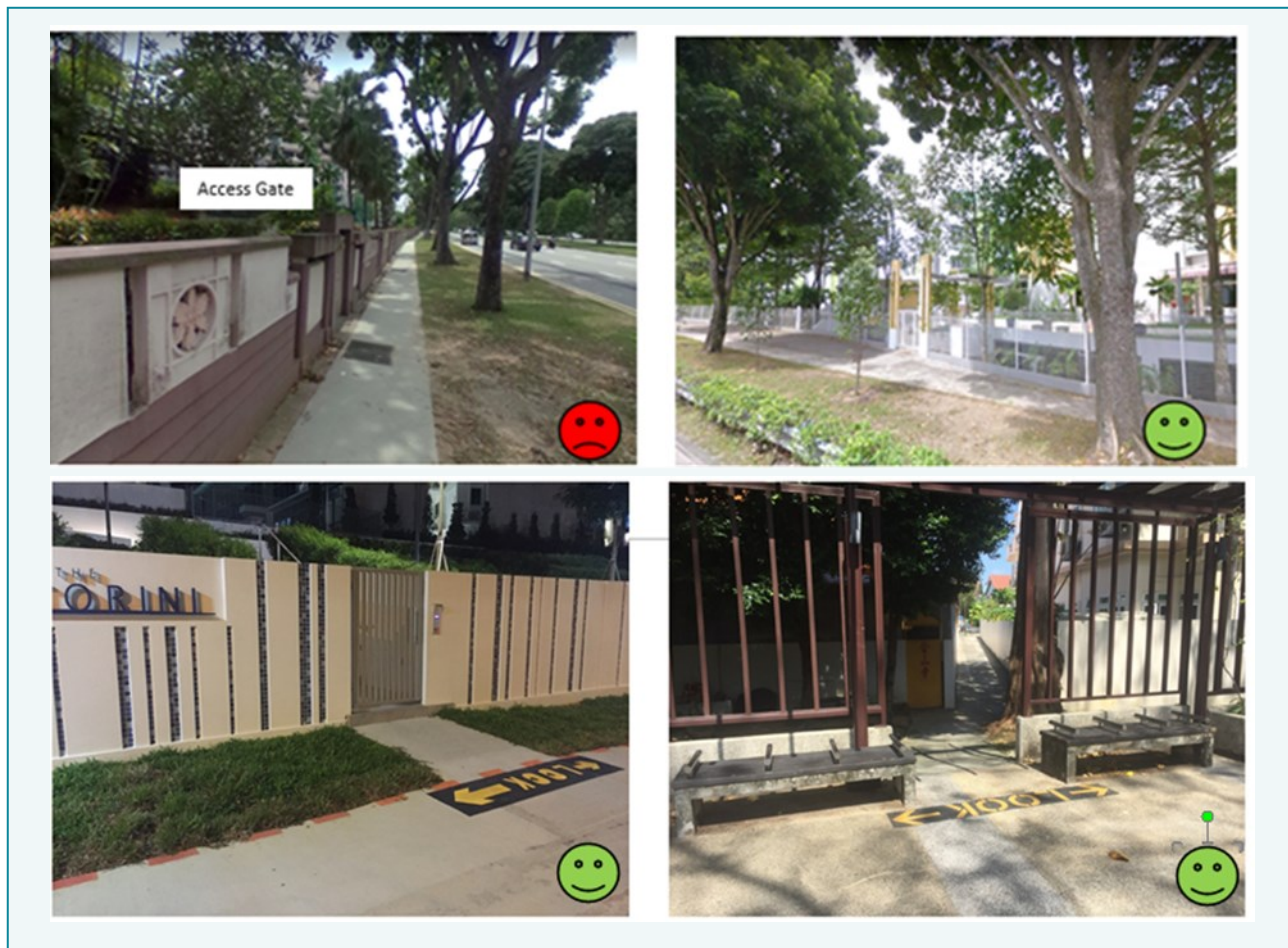


Figure 3.23 – Examples of access gates to create safe sight distances

C. Treatment at Vehicular Driveway and Drop Off Points

The following traffic calming measures can also be used to mitigate conflict between the users (see Figures 3.24 and 3.25):

- Similarly textured pavement for both vehicular driveway and pedestrian walkway
- Raised crossings to enhance visibility of pedestrians to motorists
- Warning markings/signage
- Speed regulating features e.g. humps or a vehicle gantry

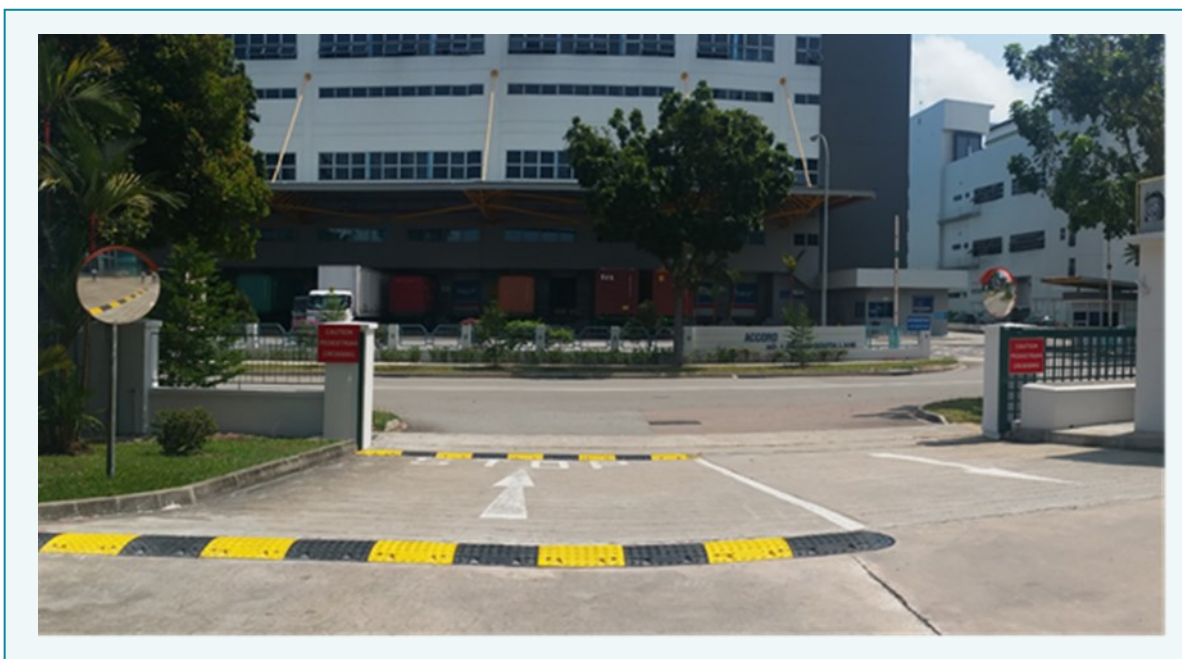


Figure 3.24 – Traffic Calming Measures at Pedestrian and Vehicular Conflict Points



Figure 3.25 – Use of Varying Materials near to Ingress/Egress Points

Appendix 3D - Guide for Adequate Provision of Wayfinding Signage Within Developments

Wayfinding is an integral part of a user's experience during their visit to developments for a safe, direct and comfortable walking or cycling experience. This is especially so if it is the first visit to the development, which is why providing proper signage is of utmost importance. This appendix aims at guiding the designer in providing adequate signage for intra-development wayfinding.

The design of an effective wayfinding environment is more than just the design of the signage system, and should include the physical design of spaces as a visual cue for wayfinding. Therefore, it is encouraged that designers embark on the wayfinding provision journey as early as the planning stage of the project.

As part of the WCP submission, all developments are required to submit a detailed Wayfinding Provision Plan to document the principles they have adopted when designing the wayfinding system. Refer to [Appendix 3B Figure 3.16](#) for more details. The designer is strongly advised to refer to the following sections below for more details of the signage placement and design principles, as well as different sign types.

A. General Requirements for Wayfinding Signage to Bicycle Parking and End-of-Trip Facilities

As part of Singapore's car-lite vision, developments are required to provide Active Mobility infrastructure within the development, such as bicycle parking and EOT facilities as shown in [Appendix 3E](#). Sometimes, these facilities are not immediately apparent to both long term and short term users. Providing adequate wayfinding signage helps to inform users of the presence of such facilities and in turn supports the take-up of active mobility.

Wayfinding signage to active mobility infrastructure shall be placed along the main cyclist circulation corridor to guide users entering the development from the entrances near key transport nodes and cycling paths/park connectors. If the bicycle parking is not at grade, signs shall be provided directing users from entrances to designated bicycle lifts leading to bicycle parking and EOT facilities. In such situations, indications shall be made on level directories and lift directories to show the provision of bicycle parking and EOT facilities. If there are alternative bicycle parking locations in and around developments, they shall also be shown for the benefit of users.

B. Wayfinding Signage Design Principle for Publicly Accessible and Mixed Use Developments

For publicly accessible and mixed use developments, apart from the requirements mentioned above, more comprehensive design considerations must be taken to ensure the wayfinding system is able to provide clear navigation to the general public.

Proper design and placement principles are important to ensure the design of a holistic wayfinding system that is not only **clear** and **concise**, but **intuitive** for first-time and even regular visitors. These fundamentals shall be covered:

Clear — Easily identifiable and understandable

Concise — To-the-point and comprehensive

Intuitive — Easy to use and instinctive

The development's wayfinding system is to be development based on these principles. This will enable developments to have a better understanding of the goals of the wayfinding system and the steps required to reach these goals. The principles of the wayfinding system are elaborated in the Wayfinding Provision Plan as part of the WCP submission (refer to [Appendix 3B Figure 3.16](#)). The following is a short non-exhaustive list of example considerations the developer may wish to adopt.

Principle	Description	Fulfilled Fundamental
Within pedestrian line-of-sight	For easy identification without the need for excessive effort	Clear Intuitive
At key decision making areas	At junctions and atria where pedestrians are likely to pause to find their bearings	Clear Intuitive
Along pre-determined pedestrian flows	To understand where people are more likely to walk and subsequently require more detailed directions	Clear Intuitive
At consistent and predictable locations	So that users do not need to actively look for signage	Intuitive
Along long passages	For reassurance that users are going in the correct direction	Intuitive
Exclusion zone around signs	Protect from visual clutter	Clear
Appropriate placing of signs	To avoid clustering of signage leading to confusion	Clear

Table 3.4 – Principles for Placement of Wayfinding Signage

Principle	Description	Fulfilled Fundamental
Concise and consistent	use of simple language to avoid confusion	Concise
Avoid visual clutter	use of easy-to-understand icons and pictograms	Clear Concise
Effective and intuitive communication	avoid lengthy labels	Clear Concise
Well-structured and organised	proper categorisation of information	Clear Concise
Standardised nomenclature	adopt a fixed system of naming	Clear Intuitive
Multilingual signage	to avoid misunderstandings due to inability to read signs	Clear
Reinforcement and reassurance	using the same design for peace of mind	Clear Intuitive
Colour coding	for better differentiation of zones and types of information	Intuitive

Table 3.5 – Principles for Design of Wayfinding Signage

C. Types of Wayfinding Signs

Each type of sign is unique in its usage and meaning, even though they are all common in their aim at pointing users to their desired destination and to achieve a walk, cycle, and ride-friendly environment. In total, there are 4 types of signs, identity, directional, informational, and confirmation. These 4 types shall be clearly indicated on submitted plans for clarity.

Identity

Identity signs enable users to know their exact location the moment they see the sign. These signs shall all be according to the same design language for quicker and more precise identification.

Identity signs are used to not only identify buildings, but also various amenities within the building such as zones, key businesses, entrances, rooms, departments, activities/usage, and ancillary amenities. Identity signs may also relate to the branding of places, and shall be sensitive to colour scheme, typeface and graphical layout (refer to Figure 3.26).

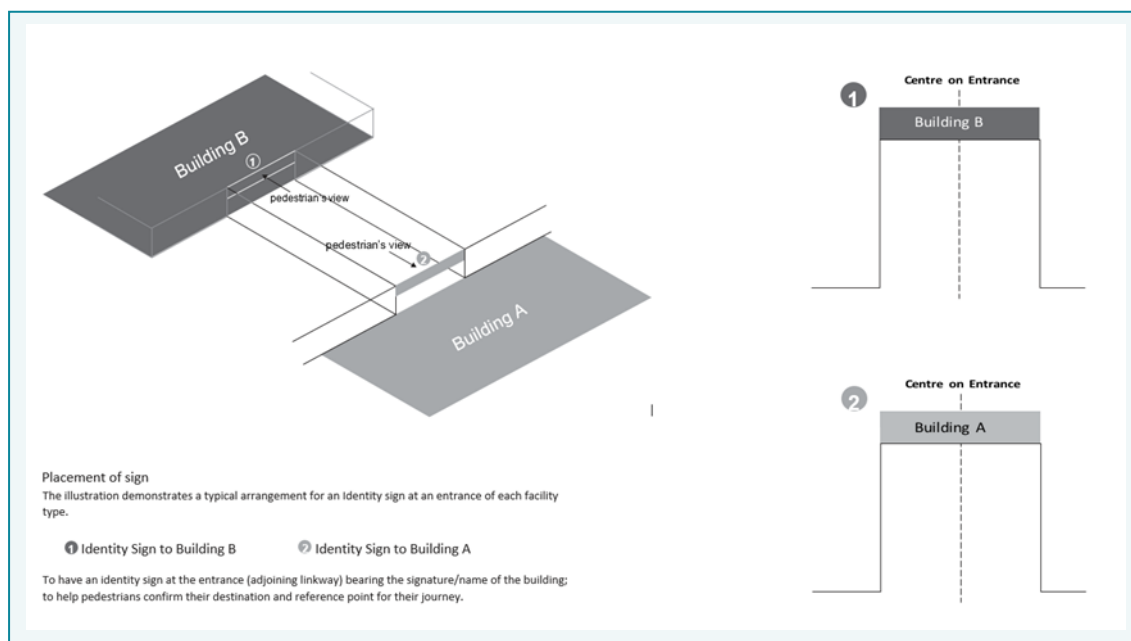


Figure 3.26 – Identity Signage

Directional

Directional signs provide users with the guidance required to lead them to transport nodes, bicycle parking and other related facilities, and their desired destination. Such signage may take the form of overhead signboards, finger-posts, wall mounted signboards etc. Since the purpose of this type of signage is to provide directions, it is vital to keep information simple and easy to read. It shall also stand out from the environment and be easily recognisable while also harmonising with the same design language as the rest of the wayfinding system.

Due care shall also be taken while determining the placement of direction signs. Such signs shall be placed where a user looking for directions will go, such as junctions, along long passages or at corners/bends. Well placed directional signage will greatly enhance user experience as part of the larger holistic wayfinding framework (see Figure 3.27).

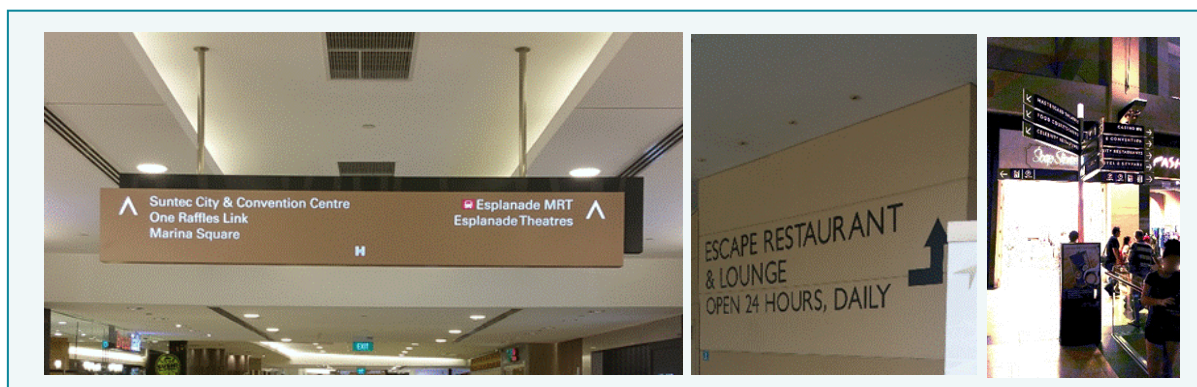


Figure 3.27 – Directional Signage

Informational

Information signs are a supplementary signs displaying information regarding building activity and tenants. This shall take the form of layout maps, plans and floor directories placed at entrances, lobbies, atria, and any points within the development where users stop and congregate. Ancillary amenities, such as vertical circulation, critical links (sky bridges, underpasses, etc.), and cycling facilities (bicycle parking and end-of-trip facilities) should also be displayed.



Figure 3.28 – Informational Signage

Generally, these maps shall be designed for easy updating whenever there are new additions within the development, and take a heads-up approach so that users need not mentally re-orientate themselves. A “you are here” marking shall also be provided for users to quickly locate themselves on the map.

Confirmation

Signs along a long route shall be repeated at a consistent interval (between 20m-30m indoors and 50-100m outdoors depending on path straightness and presence of distractions), serving to remind users whether they are moving along the correct path, until the presence of another decision-making point, where directional signage and information signage will take over. Confirmation and repeater signs need not be newly design, but can instead follow the same design as a directional sign for ease of integration into the wayfinding system. However, the information on these signs shall reflect its nature as a confirmation or repeater sign (see Figure 3.29).

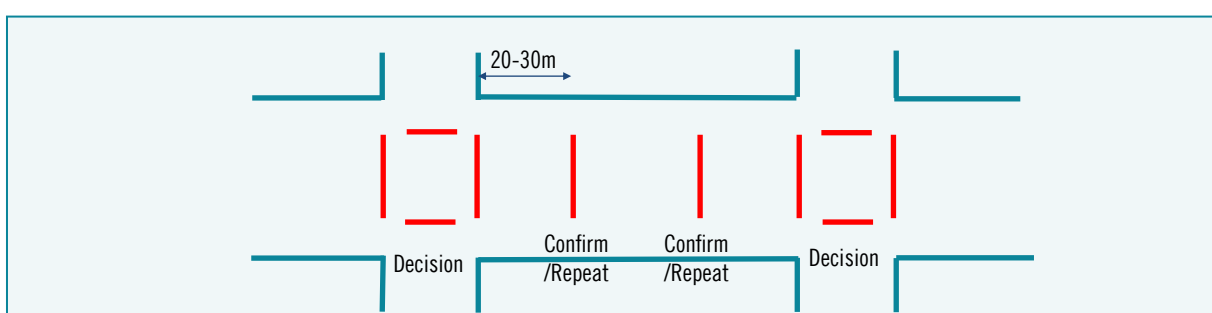


Figure 3.29 – Confirmation / Repeater Signage

D. Other Design Considerations for Wayfinding System Design

- *Developments with nearby Key Transport Nodes (MRT stations, bus interchanges and bus stops)*

For developments within 400m of an MRT station and/or bus interchange, or 50m from a bus stop, it is strongly recommended to provide signs directing commuters to these transport nodes, including underpasses, overhead bridges and walkways, facilitating increased footfall to the development. The wayfinding signage for these transport nodes may be integrated with the development signage according to the guidelines provided in the rest of this appendix. However, the information depicting the key transport nodes shall remain clearly identifiable using standard transit pictograms and associated text. These signs shall be designed to be very prominent.

Proper clear signage shall be provided at the entrances/exits and linkages to the development from key transport nodes identifying and indicating the access to these facilities. Where the existing entrance of the transit facility is modified or subsumed, identification of the transit facility at the interface shall be addressed with signage in accordance with LTA's transit signage guidelines. For developments near stations that are yet to open, provisions shall be made for wayfinding signage within these development to be updated upon future station opening.

These signs shall be included on submitted plans, showing the proposed artwork as well as information provided. Drawing notation shall clearly indicate direction of signage placement for evaluation.

- *Wayfinding provision for inter-development signage*

Developments are to ensure that there are adequate wayfinding signs provided along the main circulation corridor to lead users between linked developments, as well as to key transport nodes not immediately apparent (see Figure 3.30).

In the event that any known adjacent connecting development has not yet been constructed, due consideration is required such that wayfinding signage can easily be updated to reflect connecting developments upon completion. This allows users to better navigate their surroundings, especially in an environment where it is difficult for users to find their bearings.

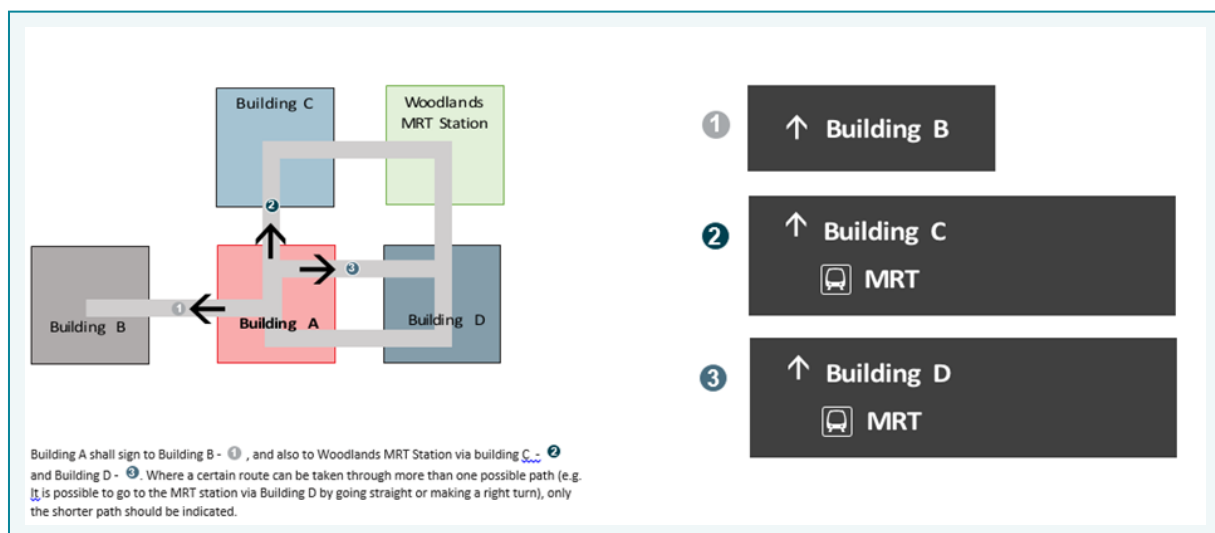


Figure 3.30 – Confirmation / Repeater Signage

- *Signage Design*

Signs shall be easily readable from a distance, with good colour contrast and typography. For easy identification of common facilities such as bicycle parking and EOT facilities, commonly used iconography shall be used (e.g. P with bicycle logo for bicycle parking). Refer to SS599: 2014 (Guide for Wayfinding Signage in Public Areas) for more detailed physical design consideration for wayfinding signage. Developments are encouraged to comply with SS599 to ensure that the wayfinding design is user friendly. Signage design shall also be submitted as part of the WCP submission.

E. Building Design Strategies to Support Wayfinding within Development

Designing a wayfinding system shall go in tandem with the design of the development. By properly laying the ground work during the building design stage, the whole system will look and feel more intuitive and natural. The number of signs to be put up in later stages will also decrease.

Below are some possible development design strategies that designers may wish to consider during the building design phase, which may assist in designing a wayfinding system later. This list is not exhaustive and designers are encouraged to exercise their creativity in coming up with new and innovative strategies.

Providing an Identity for arrival nodes/entrances, zoning of space

Having clear identification of zones gives users a sense of location and hierarchy, enabling them to form a mental map of the development. Integrating easy to remember names and graphics into the overall wayfinding system will also allow users to have a sense of what comes next. Designers may consider the adoption of sculptures, fountains, meeting points, atria and other types of landmarks in the creation of such an identity (refer to Figure 3.31).

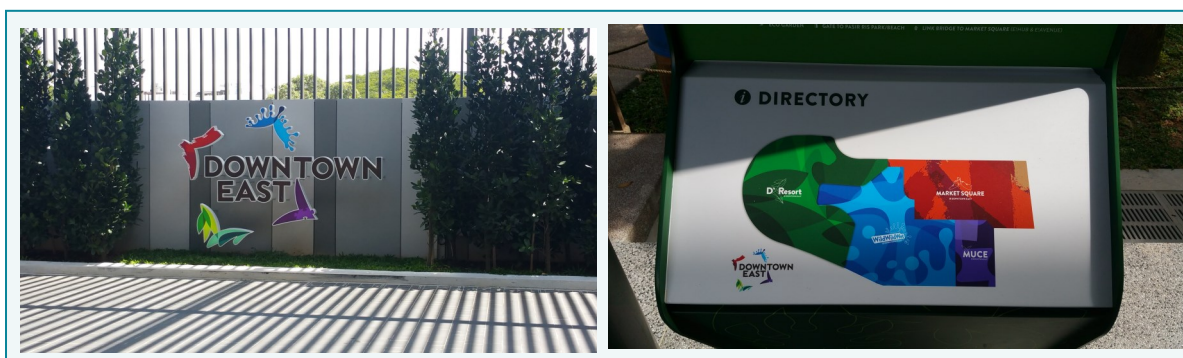


Figure 3.31 – Downtown East: Zoning and Identity using Colours and Icons

Clear and easy-to-identify decision making points

By first identifying where the main pedestrian flow is located, decision making points can be easily identified and placed at nodes along this pedestrian flow for users to stop and find their bearings. Decision-making points are usually located at large cross junctions or areas of vertical circulation. These decision-making points shall be easily distinguishable from one another to avoid getting users lost.

At key decision-making points, a concierge, in the form of interactive directory or a helpdesk, may be placed for users to seek help from.

Material treatment of main pedestrian circulation path

Designers may adopt a different material or colour treatment for the main pedestrian circulation path to differentiate it from other paths. This allows users to instinctively find their way back to the main pedestrian flow should they stray away from it, and for users to follow the path without requiring excessive additional signs. This differential treatment shall follow through if the main circulation flow is split across several stories.

Branding and naming of key pedestrian routes

The naming of pedestrian routes to suit its usage helps to give users a deeper impression of the path taken as a landmark by itself, and eventually instinctively recognise it by name. A local example is JWALK.

Appendix 3E - Guide for Bicycle Parking and Related Facilities

In designing bicycle parking lots and related facilities, the designer shall ensure that the facilities provided are convenient, accessible and user-friendly. This guide serves to include good practices for design of bicycle parking and related facilities with the objective of meeting cyclists' needs and therefore encouraging proper use of the facilities.

As part of the WCP, the development shall submit a Bicycle Parking and End-of-Trip Facility Plan to demonstrate that good design considerations are given in placing and designing the bicycle parking and EOT facilities. Details of the submission are in [Appendix 3B Part V](#).

A. Providing bicycle parking spaces within the development

Shortage of bicycle parking spaces will lead to indiscriminate bicycle parking in the development vicinity. This may lead to an unpleasant streetscape and blockage of pedestrian routes. Developers are required to provide adequate bicycle parking spaces for cyclist building users (Figure 3.32) based on the mandatory provision requirement prescribed in Appendix A of Code of Practice for Vehicle Parking Provision, 2018 Edition.

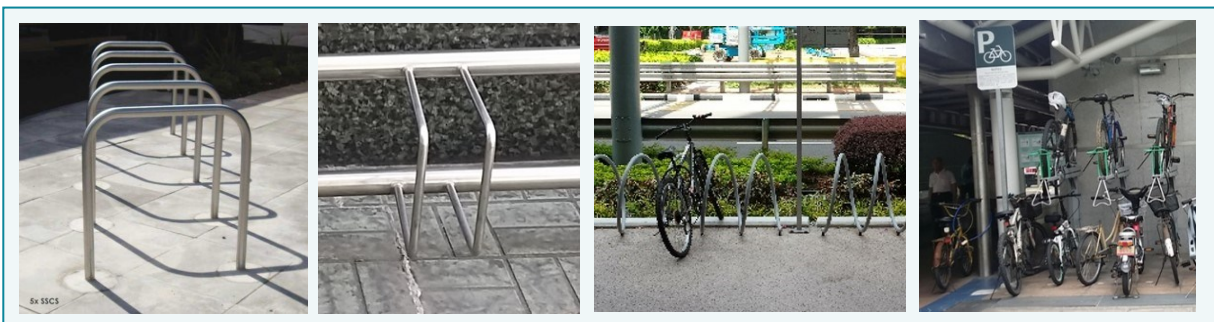


Figure 3.32 – Sample for Bicycle Parking Racks

B. Creating convenient bicycle parking spaces — Long Term and Short Term Parking

Bicycle spaces shall be located at visible and convenient spots, taking into consideration the alignment of the cycling paths in the vicinity. If there are constraints that prevent all the bicycle lots from being consolidated in one location, the QP can propose more than one bicycle parking location. However, the bicycle lots shall not be scattered throughout the development in an ad-hoc manner and shall be ideally concentrated in no more than 2 to 3 areas depending on the development size and needs. The lots shall be well-organised and each bicycle parking area shall accommodate at least 10 bicycle parking lots.

The designer shall also consider whether the bicycle parking spaces are intended for short or long-term parking. Workers, tenants or occupants of a building who are likely to park long-term will require secured and sheltered parking. Visitors and customers usually park for a shorter period and will require a convenient parking location. Short term bicycle parking shall be provided at first story of the development with high visibility and accessibility by the public, while long term bicycle parking can be provided at any level of the developments, accessible by clearly designed internal cycling routes to ensure cyclist safety when accessing the long term bicycle parking lots. Long term and short term bicycle parking quantum requirements can be found in section 4.1.4 of the Code of Practice for Vehicle Parking Provision, 2018 Edition.

For a multi-block development, sufficient bicycle parking spaces shall be provided at the individual blocks to serve the respective users in the development where possible. It is recommended that the bicycle parking provision per block be proportional to its respective blocks' GFA.

C. Provision of complementary end-of-trip facilities:

Complementary EOT facilities provide a convenient and comfortable cycling experience for visitors. Therefore, to improve the viability of cycling as a mode of transport, designers are encouraged to provide supporting facilities close to the bicycle parking spaces, especially for long-term bicycle parking. For large developments with several building blocks, each block shall ideally have its own supporting facilities to serve the block users. Developers/owners/building management committees may consider providing the following facilities within their development:

- Sheltered bicycle parking spaces
- Shower facilities
- Lockers
- Changing Room
- Bicycle repair station
- Security such as CCTV
- Air pump

Recommended provision guidelines of these facilities are shown in Table 3.6.

All toilet and shower facilities shall meet or exceed the National Environment Agency's minimum requirements and comply to the Building & Construction Authority Code on Accessibility in the Built Environment 2013 (https://www.bca.gov.sg/BarrierFree/others/accessibility_code_2013.pdf).

The developer/owner/building management committees shall be responsible for the operation and maintenance of the bicycle parking lots and other related facilities at all times.

Uses	Shower	Locker	Toilet	Other facilities
<u>Residential</u> 1. Residential developments 2. Retirement Housing <u>Civic & Community Institutions</u> 1. Foreign Workers' Dormitories <u>Sports & Recreation</u> 1. Sports Complex, Tennis, Squash, Badminton Courts, Sepak Takraw, Soccer/baseball, bowling Alley, Swimming Pool, Ice/roller Skating Rink, Golf Range and other Sports and recreation facilities	Not Applicable	Not Applicable	Not applicable	Not Applicable
<u>Commercial</u> 5. Cinema, theatre and concert hall 6. Shops and departmental stores 7. Offices 8. Restaurants, night-clubs, coffeeshouses, bars, cafeterias, eating-houses and canteens 9. Conventions and exhibition halls <u>Hotel</u> 10. Hotel 11. Boarding houses and hostels <u>Industrial</u> 12. Factories 13. Business Park, science park, computer software development, distribution services, printing, publishing and allied industries and other Business 1 developments 14. Petroleum, petrochemical, chemical and related industries on Jurong Island <u>Health & Medical Care</u> 15. Nursing homes 16. Clinic, pharmacies, hospitals and other healthcare institutions <u>Civic & Community Institutions</u> 17. Community Centres, Community Clubs, Welfare Houses and other Cultural and Social Welfare Institutions <u>Place of Worship</u> 18. Churches, Mosques, Temples, any Place of Worship and other Religious and Related Institutions	1 shower stall per 10 bicycle lots	5 personal lockers per 6 bicycle lots 1 PMD locker* per 6 bicycle lots	1 toilet per cluster	≤4 m ² per 10 bicycle lots (e.g. bicycle repair station, changing room, fresh towel station)

*PMD lockers should be at least be large enough to accommodate a typical Electric / Kick Scooter, along with personal belongings

Table 3.6 – Recommended provision guidelines for End-Of-Trip Facilities

D. User-friendly access point from outside of development to bike parking and end-of-trip facilities

Access points for cyclists shall be designed to be safe, convenient and user-friendly. If the access is via a ramp, it shall be a dedicated ramp protected with railing, and shall follow anti-skid requirements for footpaths (45BPN). the gradient of the ramp is recommended to be 1:25 max. Routes to bicycle parking spaces shall be separated from vehicular ramps. If this is not possible, cyclists shall be allowed to use passenger lifts. The lifts shall be able to accommodate at least one horizontally standing bicycle. The recommended dimensions for the lift are shown in Figure 3.33. The door access to the lift lobby shall be automated to facilitate easy access for users with bicycles. If the access is via staircase, wheeling ramp is to be provided along the stair case, and its width shall be sufficient for both pedestrians and cyclists.

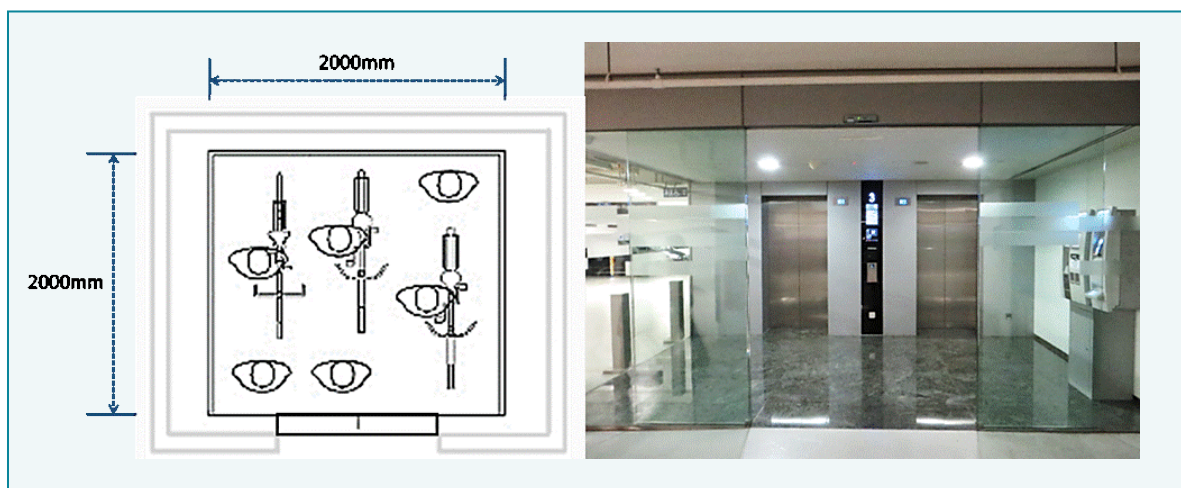


Figure 3.33 – Plan View of the Recommended Lift size to Accommodate 3 Bicycles and 3-4 Standing Persons and Automated Door for Easy Access by User with Bicycle

F. Creating safe bicycle parking spaces and End-of-Trip facilities

Designers shall take into consideration vehicular and pedestrian movements when determining the location for the bicycle parking spaces and EOT facilities. The bicycle parking spaces and EOT facilities within the development shall be located away from major vehicle and pedestrian movements to avoid conflict with other users as mentioned in [Appendix 3C](#). The routes to bicycle parking areas and EOT facilities shall be carefully considered in the overall design of the development. Designers, as far as possible, shall avoid using vehicular ingress and egress for cyclist access to bicycle parking spaces and EOT facilities. Markings and warning signage that indicate cyclists' presence shall be provided where there is inevitable conflict between vehicular and cyclist movements (see Figure 3.34).

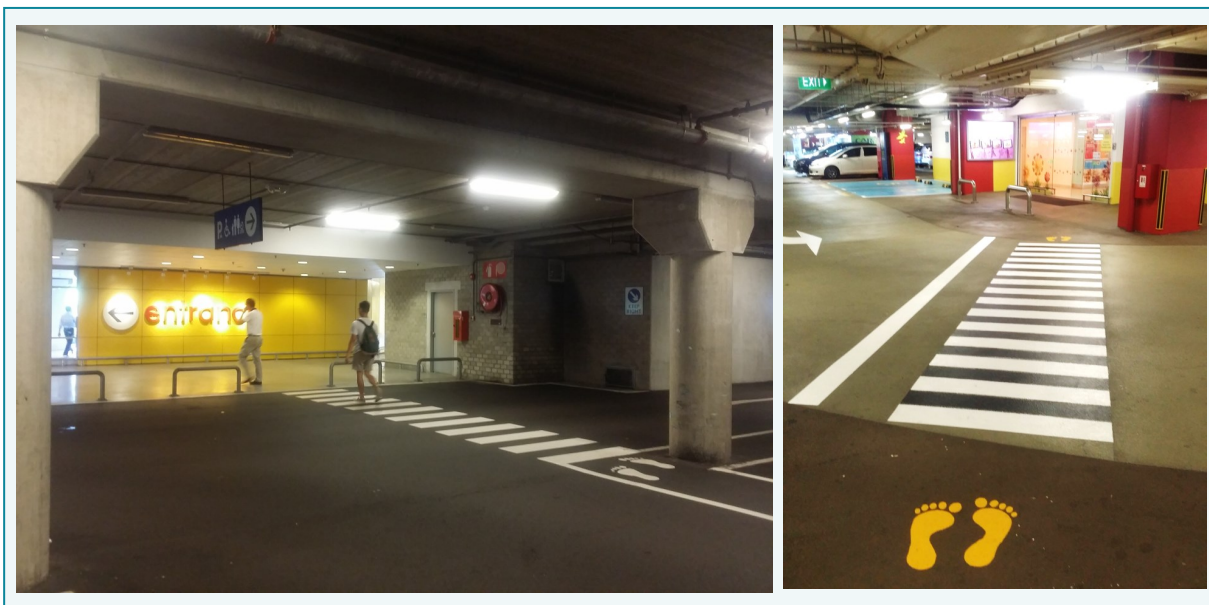


Figure 3.34 – Traffic Mitigating Measures at Vehicular, Cyclist and Pedestrian Conflict

When the cyclist is using the internal vehicular driveway to access the bicycle parking and EOT facilities, a clearly demarcated lane for dedicated pedestrian and cyclist use is highly recommended to avoid potential collisions between cyclists and vehicular users. (Figure 3.35)

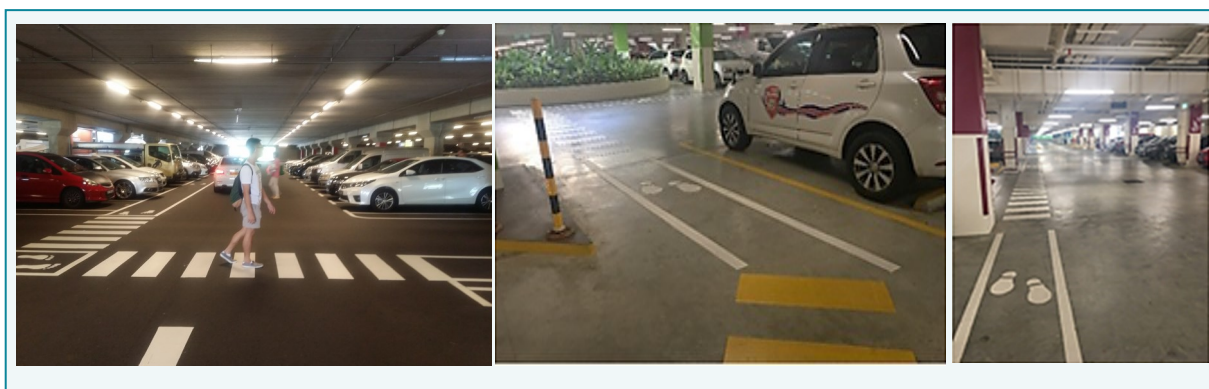
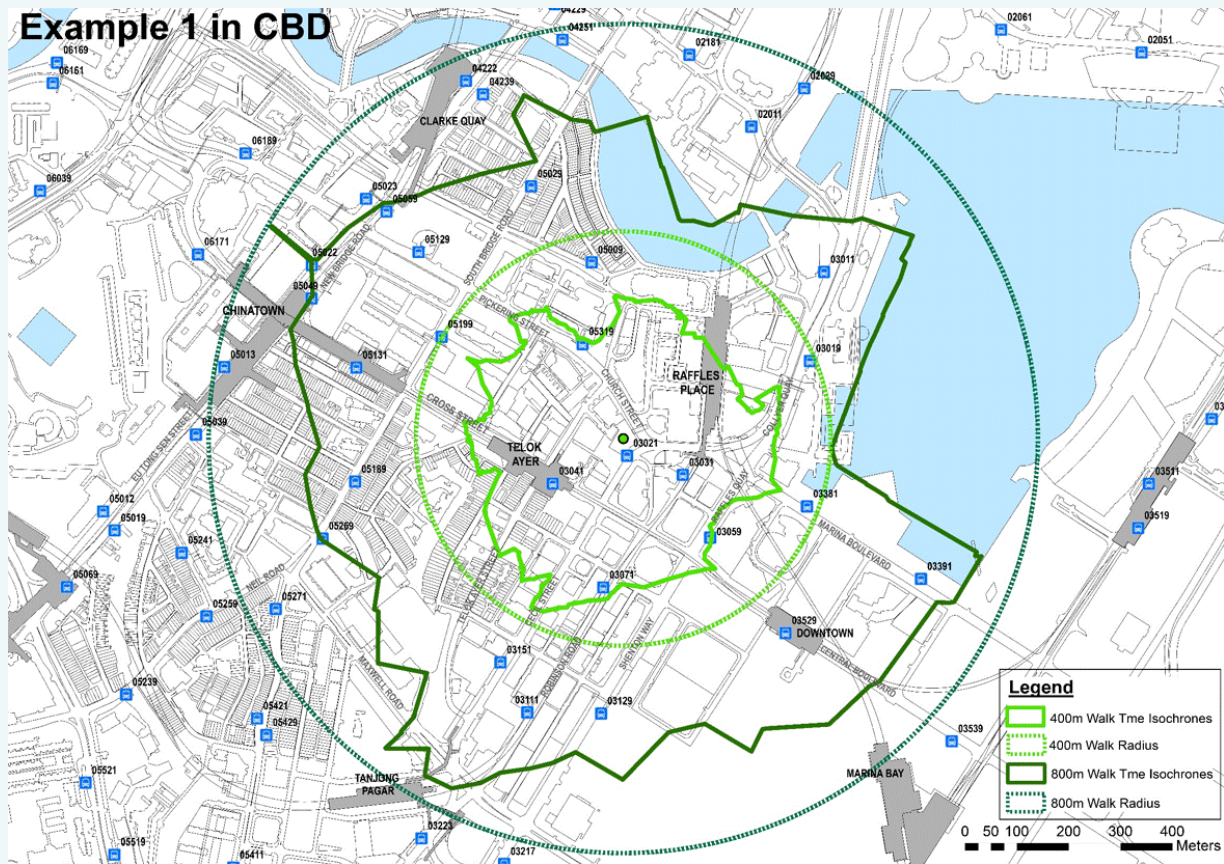


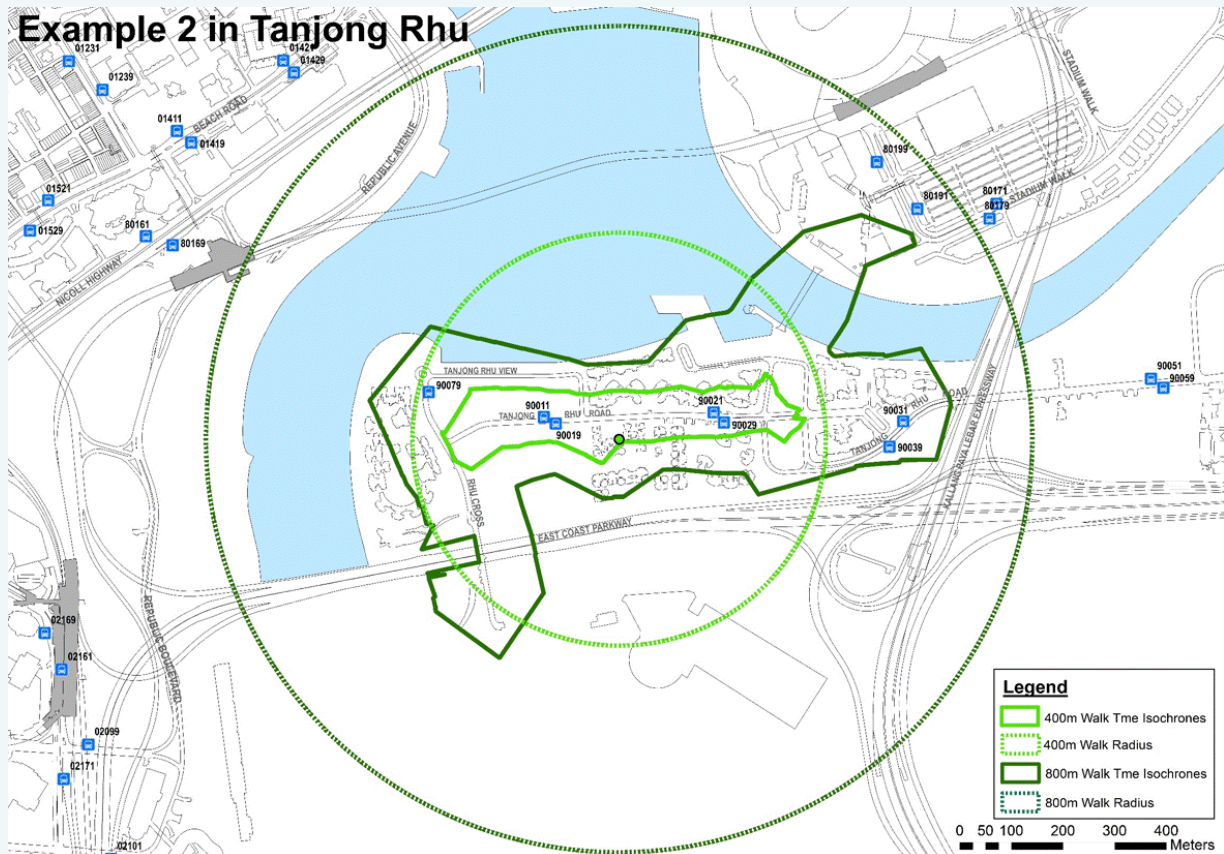
Figure 3.35 – Providing Demarcated Lane for Pedestrians and Cyclists

Appendix 3F - Examples of Walk Radius and Indicative Walk Time Isochrones

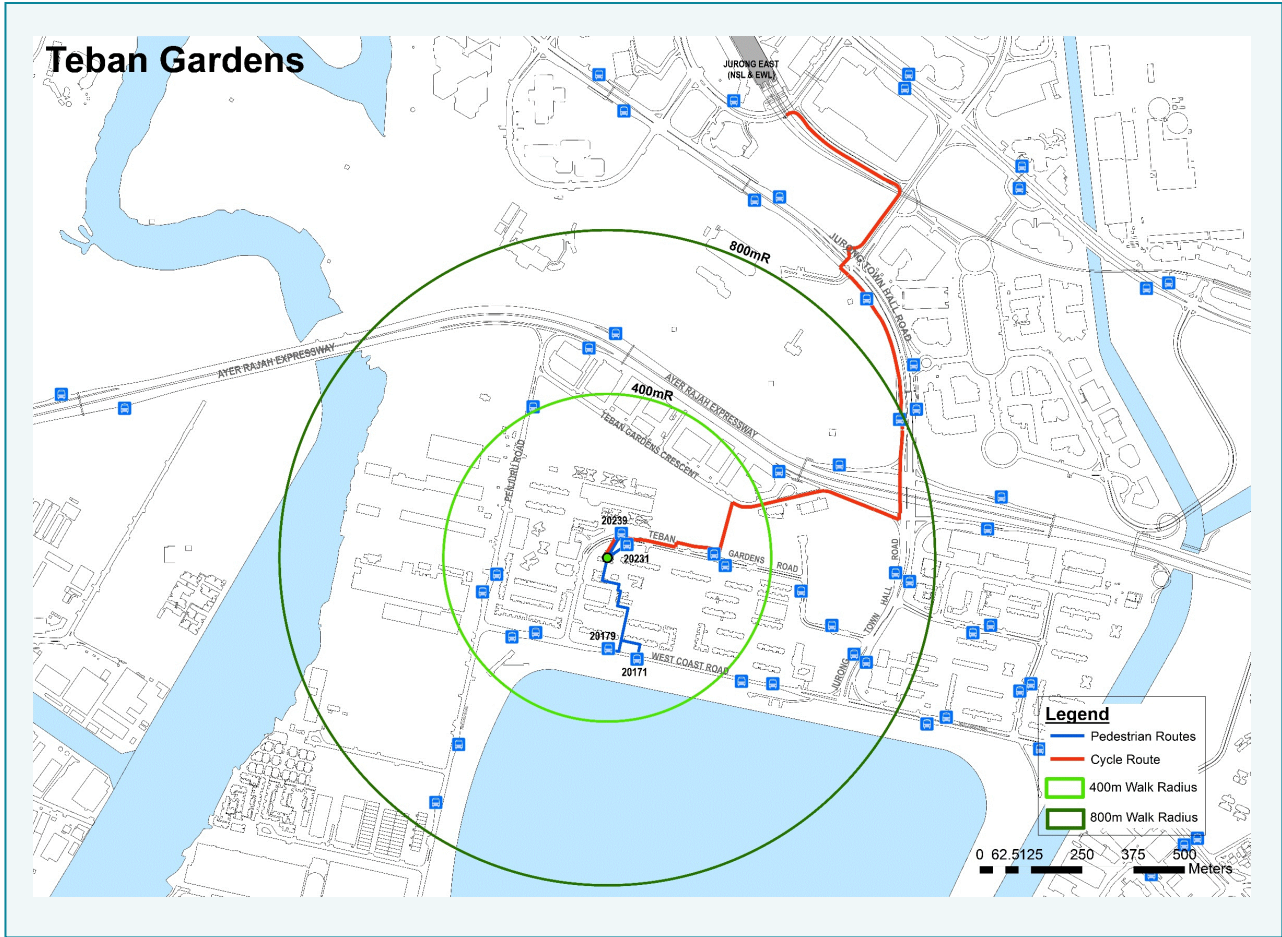
Example 1 in CBD



Example 2 in Tanjong Rhu



Appendix 3G - Examples of Pedestrian and Cycle Routes to Nearby PT Access Points



Appendix 3H - PTAL Calculation Methodology

LTA has adopted the London's PTAL methodology from Transport for London (and adapted it to suit local circumstances) to objectively assess the public transport accessibility level of proposed development in a consistent manner.

This APPENDIX draws heavily on TfL's Assessing Transport Connectivity in London (2015) as this document is a recent, practical and succinct guidance on connectivity assessments.

To calculate PTAL values, the following data/information is required:

1. A walking network in the vicinity (up to 800m walking distance) of the point of interest (POI). This is to calculate the walk time from the POI to all relevant PT Service Access Points (SAPs), i.e. bus stops and MRT/LRT station entrances
2. Location of all relevant SAPs (within 400m for bus stops or LRT entrances, and 800m for MRT entrances) walking distances from the POI)
3. Service frequency of all PT services at the relevant SAPs

The full calculation method for a single location is described below (this needs to be repeated when PTAL is calculated for multiple points):

Step 1 – Calculate **Walking Times (WT)** to all relevant SAPs

- The walking network includes all paved walk paths, including footpaths, alleys, pedestrian crossings, pedestrian overhead bridges (POBs), underpasses, through routes within private/public properties which allow public access during daytime, etc.
- Maximum walking distances to a bus stop/LRT station entrance and a MRT station entrance are assumed up to 400m (5mins) and 800m (10mins), respectively.

Step 2 – Calculate **Service Waiting Time (SWT)** for each service at each relevant SAPs

- The standard PTAL calculation is based on service headway/frequencies during the AM peak, typically between 0800hr and 0900hr on a weekday⁹.
- Service headway can be downloaded from this website: <https://www.transitlink.com.sg/TlIdetail.aspx?ty=catart&Id=15>
- The SWT (in minutes) is estimated as half the time interval between scheduled arrivals of the service at the SAP, i.e. $SWT = 0.5 \times (60/\text{frequency})$. For example, a bus service with a frequency of 12 buses per hour will have an interval of 5mins and a SWT of 2.5mins, which is the average amount of time a passenger who arrives randomly will have to wait.

⁹ AM peak is the basic requirement for all PTAL assessments. Developers may be requested to undertake PTAL assessments for additional time periods (e.g. interpeak, PM peak or off-peak) if their developments have a peak trip generation period outside of the AM peak.

- If a single route has several stops in the catchment area of a point, only the nearest is considered.
- If a service runs in both directions, the nearer direction should be used in the calculation, i.e. each bus service and rail line should only be considered once, regardless of direction.

Step 3 – Calculate Average Waiting Times (AWT) for each service at each relevant SAP

- The AWT (in minutes) is a combination of the SWT and a modal preference value (a time penalty). The latter varies by mode of transport, and reflects the preference of commuters for MRT/LRT over bus.
- LTA recommends modal preference value of 1.5mins and 0.83mins for buses and MRT/LRT, respectively. These values would be reviewed by LTA from time to time.

Step 4 – Calculate Total Access Time (TAT) for each service at each relevant SAP

- The TAT (in minutes) combines the walk time to the SAP with the AWT at the SAP, i.e. $TAT = WT + AWT$

Step 5 – Calculate Equivalent Doorstep Frequency (EDF) for each service at each relevant SAPs

- The EDF (services per hour) converts the TAT back into units of frequency, i.e. $EDF = 0.5 \times (60/TAT)$. It is a measure of what the service frequency would be like if the service was available without any walk time (as if the services are provided at the doorstep).

Step 6 – Calculate Access Index (AI) for each service and Sum of AI for the POI

- Individual AI is calculated by adjusting the corresponding EDF value, i.e. a higher weight (a factor of 1) will be given to the service with the highest EDF for each SAP, and a lower weight (a factor of 0.5) to all other services within the same SAP, before adding them together to get total AI.
- Halving the EDF values for all but the most accessible or dominant route for each SAP compensates for such factors as 1) routes often travel in parallel for some distance, and 2) travellers often have to change routes in order to reach the desired destination – this can add significant delays to the journey.

Step 7 – Convert to a PTAL Score

- The sum of AI is converted to PTAL using the bands specified in Table 3.7 below :

PTAL Score	Access Index (AI) Range	
0 (worst)	0.00	
1a	0.001	2.50
1b	2.51	5.00
2	5.01	10.00
3	10.01	15.00
4	15.01	20.00
5	20.01	25.00
6	25.01	40.00
7	40.01	55.00
8	55.01	70.00
9 (best)	>70.00	

Table 3.7 – The bands are subject to further review by the LTA

Appendix 3I - Transport Improvement

As specified in Section 3.9 of this Document, the QP is required to duly complete the table below and submit it as part of the TIA report.



Measures	Implementing	Explanation if not implementing
Walking & Cycling Provision within the Development		
<u>M1 – Access Consideration</u> <i>Improve accessibility for non-car users and the disabled.</i>	<input type="checkbox"/>	
<u>M2 – Design Integration</u> <i>Walking and cycling friendly design.</i>	<input type="checkbox"/>	
<u>M3 – Control Measures</u> <i>Lower speed limit and traffic control measures.</i>	<input type="checkbox"/>	
<u>M4 – Safety of Pedestrian</u> <i>Make walking safer.</i>	<input type="checkbox"/>	
<u>M5 – Way Finding for Pedestrian</u> <i>Maps to nearby amenities.</i>	<input type="checkbox"/>	
<u>M6 – Bicycle Parking</u> <i>Parking space beyond minimum standard.</i>	<input type="checkbox"/>	
<u>M7 – Bicycle Parking for different users</u> <i>Short/long term parking facilities.</i>	<input type="checkbox"/>	
<u>M8 – Facilities for cyclist</u> <i>End-of-trip facilities.</i>	<input type="checkbox"/>	
<u>M9 – Bicycle Friendly Access</u> <i>Auto-door, cyclist ramps, lifts, etc.</i>	<input type="checkbox"/>	

<u>M10 – Dedicated Bicycle Routing</u> <i>Demarcate cycling paths and link them to surrounding cycling paths.</i>	<input type="checkbox"/>	
<u>M11 – Signage for Cyclist</u> <i>Clear signage to guide cyclists.</i>	<input type="checkbox"/>	
Walking & Cycling Provision surrounding the Development		
<u>M12 – Connectivity for Pedestrian</u> <i>Pedestrian links to existing walking routes.</i>	<input type="checkbox"/>	
<u>M13 – Priority for Pedestrian</u> <i>Give priority to pedestrian</i>	<input type="checkbox"/>	
<u>M14 – Accessibility for Non-car Users</u> <i>Safe crossing points for cyclists.</i>	<input type="checkbox"/>	
<u>M15 – Safe Connectivity</u> <i>Proper demarcation and lighting of pedestrian and cycling paths.</i>	<input type="checkbox"/>	
<u>M16 – Cycling at Crossings</u> <i>Safe crossing points for cyclists.</i>	<input type="checkbox"/>	
<u>M17 – Cycling Route Maps</u> <i>Map of cycling routes in the local area.</i>	<input type="checkbox"/>	
<u>M18 – Place Making</u> <i>Place making environment within development ground level.</i>	<input type="checkbox"/>	
<u>M19 – Share Space Design</u> <i>Designed to create shared space.</i>	<input type="checkbox"/>	

Mass Transport		
<u>M20 – Private Shuttle Bus Service</u> <i>Shuttle service to main Public Transport nodes.</i>	<input type="checkbox"/>	
<u>M21 – Educational Engagement</u> <i>Engage to promote awareness on benefits of walk, cycle and ride PT.</i>	<input type="checkbox"/>	
<u>M22 – Facility/Service for Shoppers taking Public Transport</u> <i>Centralised delivery service i.e. Urban Logistics.</i>	<input type="checkbox"/>	
Programmes / Schemes to Promote Walk Cycle Ride		
<u>M23 – Promote Early with Walk, Cycle and Ride</u> <i>Include development's connectivity to PT and active mode facilities in marketing promotion for development.</i>	<input type="checkbox"/>	
<u>M24 – Engage Interest Group to Organise Courses</u> <i>Conduct trainings/courses for cyclists.</i>	<input type="checkbox"/>	
<u>M25 – Encourage Cycling Community</u> <i>Establish bicycle user group.</i>	<input type="checkbox"/>	
<u>M26 – Bicycle Sharing</u> <i>Provide bike sharing for development.</i>	<input type="checkbox"/>	
<u>M27 – Events to Promote Cycling</u> <i>Organise events to promote cycling.</i>	<input type="checkbox"/>	

Demand Management		
<u>M28 – Parking Provision</u> <i>Providing parking lots close to or at the lower bound of the RCPS</i>	<input type="checkbox"/>	
<u>M29 – Daily Season Parking</u> <i>Daily flat rate charging with unlimited use of parking.</i>	<input type="checkbox"/>	
<u>M30 – Reduce Allocation for Season Parking</u> <i>Reducing the allocation of season parking lots by a significant proportion, say, 30 to 40 percent.</i>	<input type="checkbox"/>	
<u>M31 – Delivery and Goods Vehicles Management</u> <i>Delivery and/or goods transferring outside of the morning and evening peak period.</i>	<input type="checkbox"/>	
<u>M32 – Car Club</u> <i>Car club scheme or partnering with one/ a few existing car club(s).</i>	<input type="checkbox"/>	
<u>M33 – Car Sharing Parking Allocations</u> <i>Allocating favourable parking spaces for car sharing.</i>	<input type="checkbox"/>	
<u>M34 – Parking Charges</u> <i>Increase in parking charges.</i>	<input type="checkbox"/>	
<u>M35 – Travel Smart Scheme</u> <i>Periodically convey awareness on the LTA's Travel Smart scheme.</i>	<input type="checkbox"/>	

<u>M36 – Adjustment to Working Hour</u> <i>Encouraging flexible working hours/ compressed working weeks/teleworking.</i>	<input type="checkbox"/>	
<u>M37 – Onsite Facilities</u> <i>Provide on-site facilities for example: healthcare, childcare, shopping/home.</i>	<input type="checkbox"/>	
<u>M38 – Onsite Services</u> <i>Provide services such as cafeteria, shops, canteen, and/or cash dispenser.</i>	<input type="checkbox"/>	
<u>M39 – Home Delivery</u> <i>Encourage tenants/companies to provide home delivery services.</i>	<input type="checkbox"/>	
Other Measures		
<u>M40 – Provide Charging Facility for Electric Vehicle</u> <i>Provide electric vehicle charging points within the development.</i>	<input type="checkbox"/>	
<u>M41 – Eco-Driving Course to Promote Fuel Efficiency</u> <i>Provide/arrange courses on Eco-driving.</i>	<input type="checkbox"/>	
<u>M42 – Road/Junction Improvements</u> <i>To prioritise bus, pedestrian and cyclist move- ments and to meet the LTA's standard.</i>	<input type="checkbox"/>	

This chapter outlines the considerations for the design, location and arrangement of vehicular access to developments.



Chapter 4

Access Arrangements

Glossary

Sight Distance

The distance from which an object at eye level remains visible to an observer.

Tactile Tiles

Tiles which are placed to warn the visually handicapped of a hazard or to guide them to a destination.

Access Arrangements

4.1 Introduction

LTA regulates the design, position and arrangement of access points of entrance / exit to or from driveways. This is necessary because an access point interferes with the free flow of traffic along the road to which it connects. One of the design considerations is to ensure that ample sight distance is provided for vehicles to maneuver safely in and out of the development. Consideration shall also be given to the impact the access would have on surrounding residential houses or public amenities in the vicinity.

LTA also regulates the number of access points to any development as too many access points make walking and cycling along the development boundary challenging. Unless there are good technical reasons, each development shall be served by only one access point.

4.2 Location of Vehicular Access Point

Generally, vehicular access points shall be suitably located to ensure smooth flow of traffic in roads. In determining the location of an access point, consideration shall also be given to the following:

- direct access from expressways, major arterial roads, slip roads, acceleration or deceleration lanes and bus or taxi bays are not allowed.
- for commercial and shophouse developments, where a rear service road is available or safeguarded, access shall be taken from the rear service road.
- where a development is accessible from two public streets, it shall be designed to take access from the road which is classified as a lower category in the Road Line Plan (RLP).
- access points are to be located at a safe distance (at least 30m) from road junctions, road bends, pedestrian crossing, bus-stops, existing opposite access points etc.

4.3 Service Access

Services access to electric sub-station and bin centre shall be taken from within the site. Separate access directly from the public street is not allowed, especially along major roads. The bin centre shall be designed for refuse trucks to turn around within the development and not to reverse into the site from the public roads or vice versa.

4.4 Access Arrangements For Landed Residential Developments

Access for landed residential developments should be adequately spaced apart and shall not be directly opposite one another. Access locations are required to be at least 6m apart, for the consideration of tree planting and roadside parking requirements (if any). Otherwise, the accesses shall be paired to allow for the 6m separation of access. Figures 4.1 illustrates this.

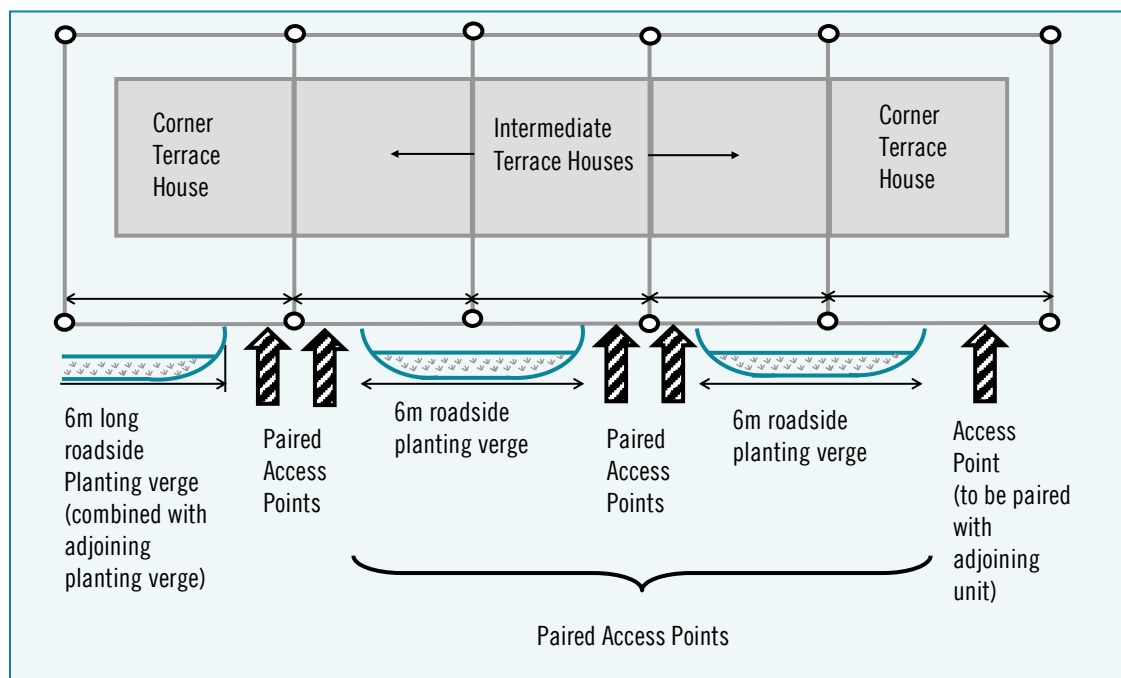


Figure 4.1 Correct Access Arrangement For Landed Houses

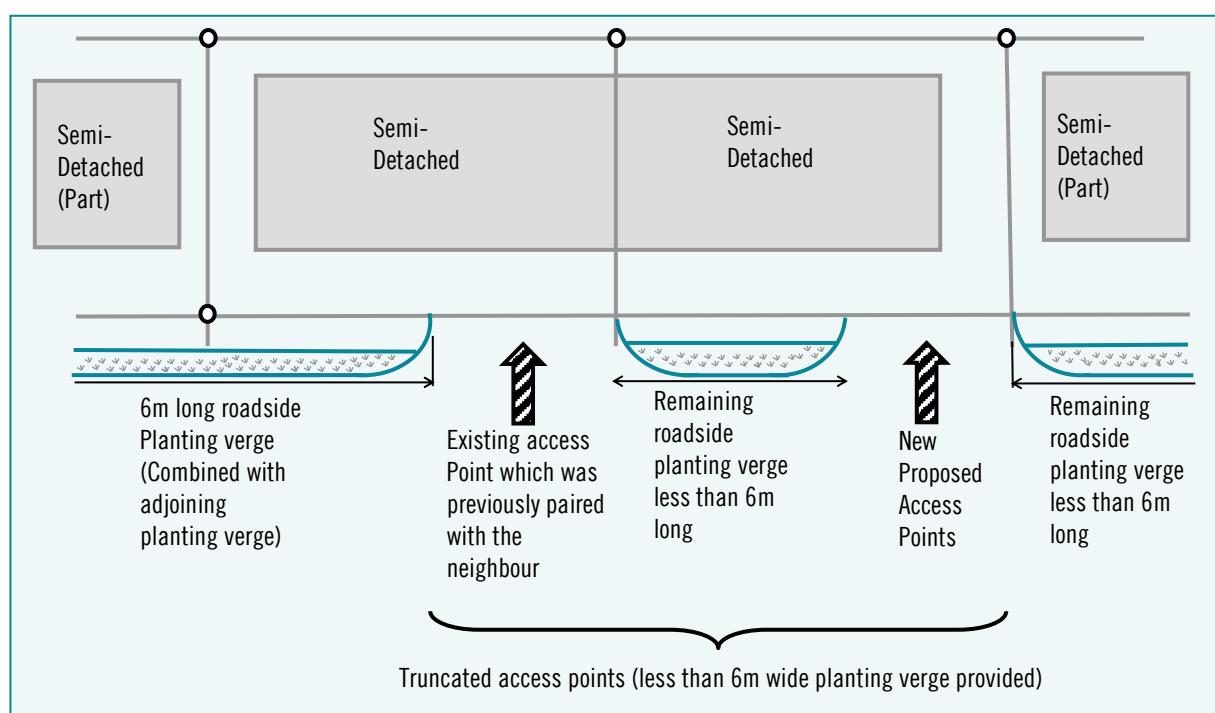


Figure 4.2 In-correct Access Arrangement for Landed Houses

4.5 Design of Entrance Access

Figure 4.3 illustrates the basic components of an entrance driveway. The turning kerb is aligned with the gate post and drop-inlet chambers are provided on both sides at the tangent point of the turning kerb radii. Tactile tiles are provided 300mm from the driveway.

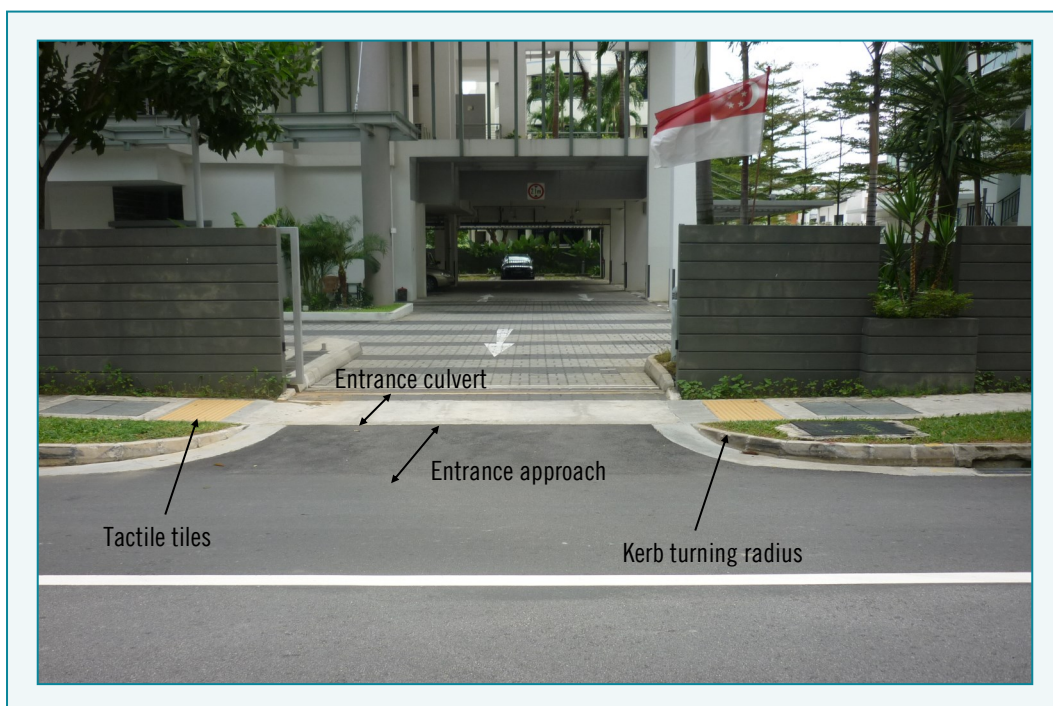


Figure 4.3 Photograph illustrating The Basic Components of an Entrance Driveway

The access shall be designed as follows:

- A separate lane for visitors shall be considered to allow residents to enter the development quickly (Please see Figure 4.4).
- For residential developments exceeding 600 units, an additional access from another road fronting the proposed development can be considered. (Please see Figure 4.5). For developments located in an area with already high traffic volume, LTA will advise if an additional access from another road fronting the proposed development is required.
- The position of drop-barriers / guard posts within the development boundary would also have an impact on the traffic queue on the public street. A bottleneck at the entrance of a development may result in a spill over of vehicles queuing on the main road and could result in collision from the rear. Therefore sufficient storage length shall be provided within the development site before entrance gate / guard house / drop barrier to offset any possible traffic congestion onto the main road.
- For residential developments, provision of a holding bay for a minimum of 2 vehicles within the development shall be considered when there is insufficient space to accommodate minimum 2 vehicle queue space before the drop barrier (Please see Figure 4.6 and 4.7). For commercial developments, the proposed drop-barriers (including those leading to loading/un-loading bays) are to be located away from the access points, at the carpark levels (e.g. basement or 2nd storey levels, whichever applicable).
- Entrance shall be maintained as a Left-In, Left-Out (LILO) arrangement if it is along major arterial road.

- The gradient of the entrance driveway shall not be steeper than 1:10, in order to avoid any damage to the undercarriage of the vehicles.
- The top of the culvert shall be flat in the direction across the culvert to facilitate walking. The culvert and footpath is allowed to follow the longitudinal profile of roads that are sloping. However, additional measures such as railing or footpath finishes treatment may be required for footpath steeper than 1:12. Amendments to the level of culvert for paired access is not allowed as it may lead to water stagnation issues.
- Safe sight distance at crossing points are required to be provided to ensure pedestrian safety, as per Chapter 3 Appendix 3C. Any hard structures such as concrete boundary wall / fencing shall be recessed in adequately to allow sufficient line of sight between vehicles exiting the development & pedestrians / cyclists using the footpath. Alternatively, the boundary wall / fencing shall be constructed with porous material.

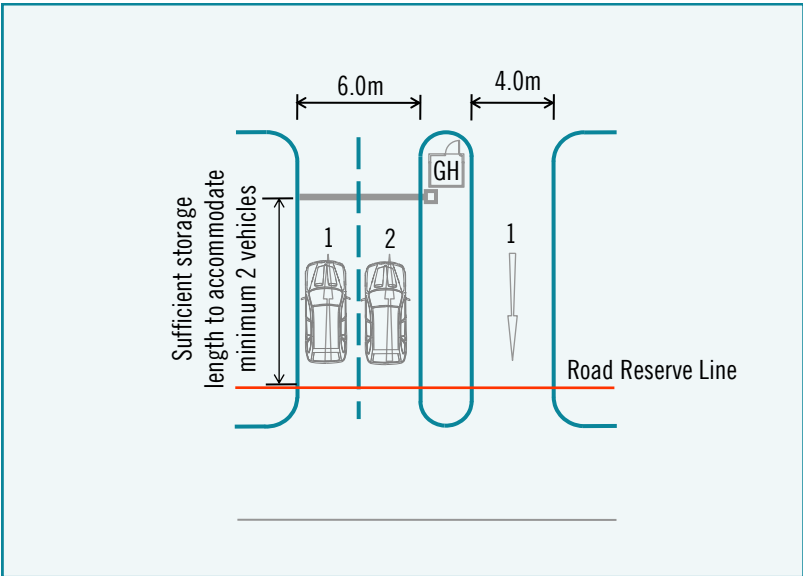


Figure 4.4 Residential development with Separate Lane for Visitor Entry

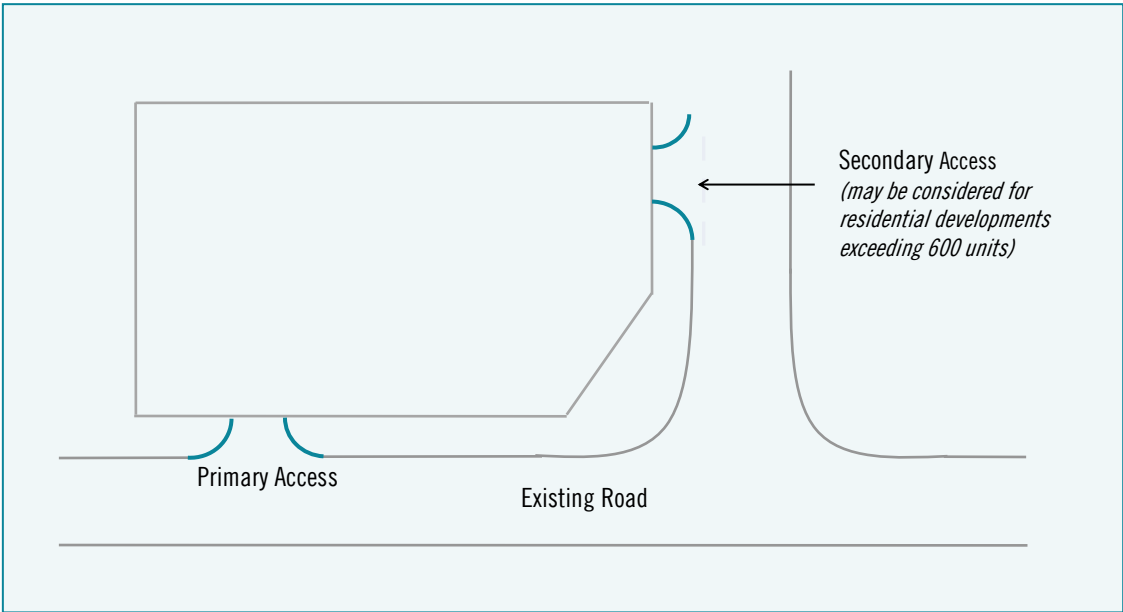


Figure 4.5 Access Arrangement for Residential Developments Exceeding 600 Units - additional ingress/egress could be considered from another road fronting the development site

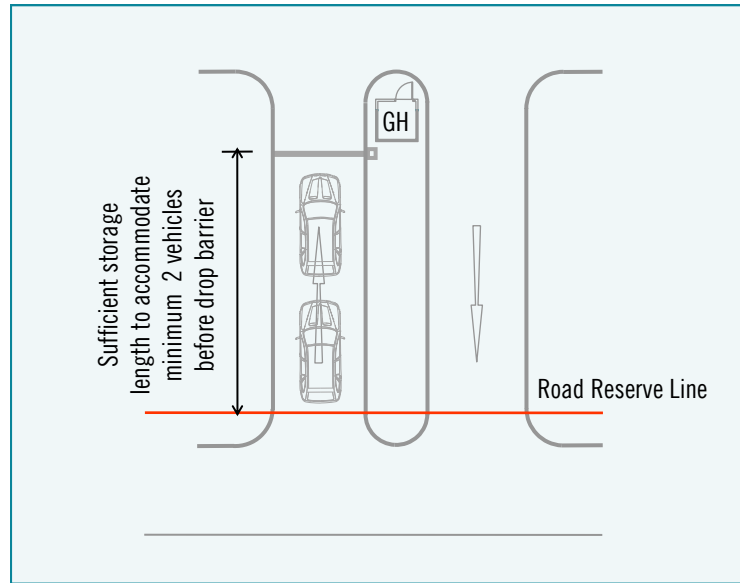


Figure 4.6 Storage Length Provided Within The Development Site

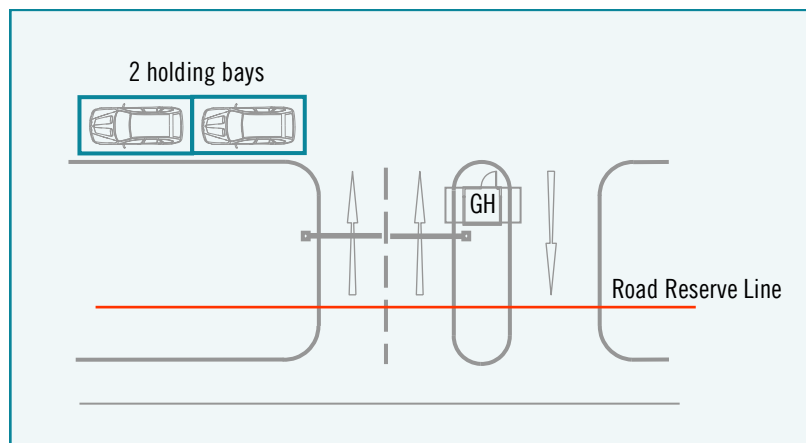


Figure 4.7 Holding Bays Provided Within The Development Site - if there is insufficient space to accommodate minimum 2 vehicle queue space before the drop barrier

- Tactile tiles shall be provided where the footpath meet the driveway for all developments **except landed houses**.
- The driveway should, as much as possible, be connected perpendicular with the road to offer better visibility for turning in/out to/from the development. It shall also be in line with the proposed gate post.
- Meter compartment shall not be located at the common party wall when the accesses are paired to reduce the possibility of impact by vehicles.
- Existing access arrangement for terrace and semi-detached landed housing with paired access shall not be separated as part of redevelopment, if the access arrangement does not comply with scenarios in section 4.4 above.
- For residential developments, the access arrangement shall take into consideration of school buses, refuse trucks and delivery trucks entering and exiting safely.

4.6 Width And Turning Radius of Vehicle Accesses

The recommended width and turning kerb radius of an entrance / exit driveway is given in Table 4.1.

Type of Developments	Recommended Clear Width of Access	Recommended Turning Kerb Radius
Terrace Houses	<u>For Frontage Width <8.0m</u> 3.0m to 4.5m (max.)	1.5m to 3.0m
Semi-Detached Houses	<u>For Frontage Width ≥8.0m</u> 3.0m to 5.5m (max.)	
Detached Houses	Where accesses are separated, a 6.0 m long strip of planting strip / service verge shall be provided between accesses for tree planting and kerbside parking (if any)	
Condominium / Flats/ Public Housing	<u>11.0m-13.0m</u> (separated by 3.0m island for ingress and egress) <u>11.0m</u> (4.0m lane + 3.0m island + 4.0m lane) <u>13.0m</u> (3.0m lane + 3.0m lane + 3.0m divider + 4.0m lane) Please refer to illustration in Figures 4.4 to 4.6 for the various access arrangements which are acceptable.	3.0m to 5.0m
Commercial	6.0m to 10.0m max (two - way operation)	Car 3.0m to 5.0m Lorry 5.0m to 6.0m

Type of Developments	Recommended Clear Width of Access	Recommended Turning Kerb Radius
Public Building, Community Centres	6.0m to 8.0m (4.0m single direction)	3.0m to 5.0m
School (Primary, Secondary and Junior College), Petrol Station		6.0m to 8.0m
Single Access (ingress or egress only)	6.0m (max)	
Combined ingress and egress	10.0m to 12.0m (max)	
Industrial:		6.0m to 8.0m
- Terrace	6.0m	
- Single User	8.0m to 10.0m	
- Multi-User (Warehouse)	10.0m to 15.0m	
- Container Depot	8.0m to 10.0m (1-way)	
All Other Uses:		3.0m to 5.0m
- Sub-Stations	4.0m	
- Fire Engine Access	4.0m	

Table 4.1 Recommended Width and Turning Kerb Radius

This chapter provides guidelines on new street proposals required in conjunction with new developments.



Chapter 5

New Street Proposals

Glossary

Carriageway	Portion of the road formation, including lanes, auxiliary lanes and shoulders set aside for all vehicular traffic.
Enhanced School Zone	Traffic measures introduced on the roads close to existing primary schools to enhance road safety.
Gazetting Table	Table that shows the list of proposed traffic markings and signs forming part of the traffic plan submitted for gazetting under the Road Traffic Act (RTA).
Land Subdivision	The dividing of a single parcel land into two or more parcels each to be given a separate title.
Permanent Government Benchmark	A major reference mark by surveyors to assist them in re-pegging land parcels and extending new surveys.

Glossary

Soffit	The underside of a structural component.
Street Works Deposit	An amount to be deposited for the execution of street works, to be utilized by LTA in the event that the developer is unable to complete the street works, or that works carried out are not to standards approved by LTA. The deposit can be in the form of a banker’s guarantee (BG).
Surcharge Load	Additional loads by other elements.
Temporary Benchmark	A fixed point with a know elevation used for level control during construction works and surveys.

New Street Proposals

5.1 Introduction

CDC

The following information serves as a quick reference only; QPs shall refer to Chapter 10 of the CDC and ensure that all other applicable design considerations have been taken in account in preparing the Street Plans. QPs are encouraged to utilize design software to aid them in their design process.

SWA

Section 18 of the Street Works Act (Chapter 320) stipulates that Street Plans shall be submitted for approval before a road can be constructed to serve a development. This is, however, not applicable for internal driveways where land sub-division is not required e.g. for condominiums, cluster housing or flat developments (Please see Figure 5.1).

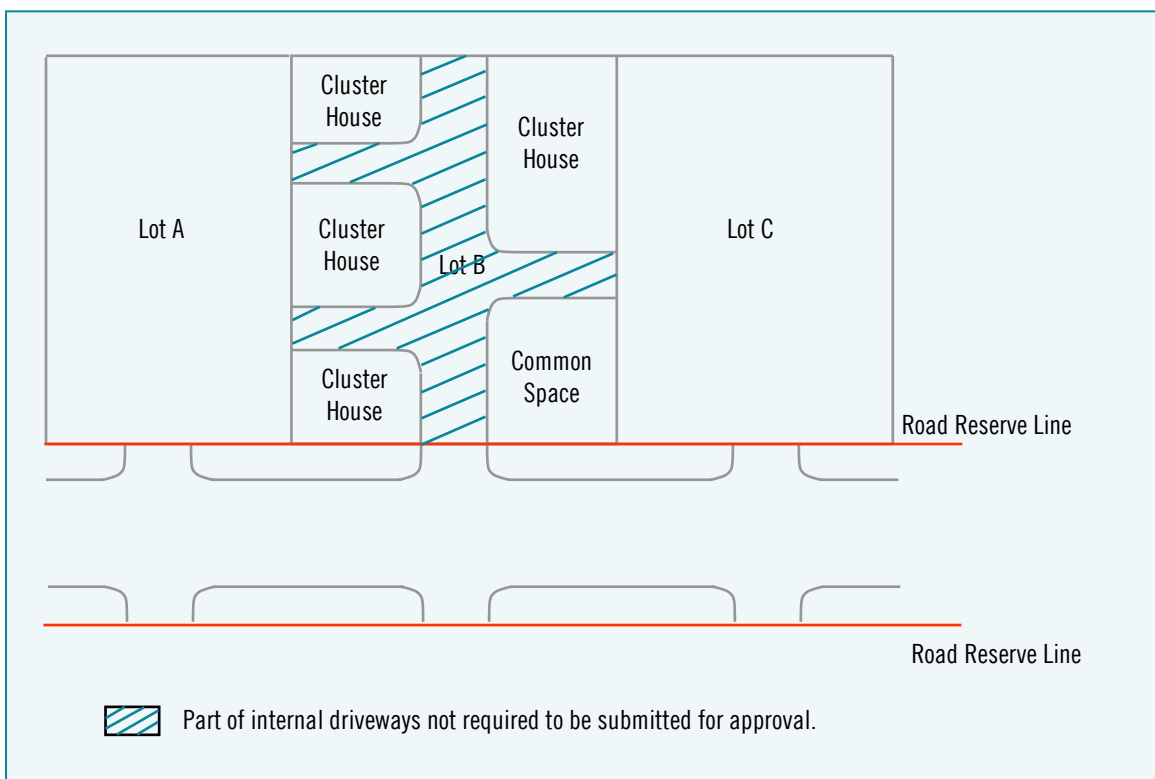


Figure 5.1 Showing Internal Driveways For Cluster Housing (Submission Under New Street Proposals is Not Required)

The design of new streets shall reference the LTA's publications stated in section 1.1.1. The submission requirements for new street proposals are also indicated in section 1.4.1.

5.2 References

CDC

Civil Design Criteria (Chapter 10)

SDRE

LTA Standard Details of Road Elements

MWS

Material & Workmanship Specifications

5.3 Adequate Provision of Roads

The width of a road depends on the type and scale of a development. In general:

- Where the development plot entails land sub-division, access to each sub-divided plot must be available either from an existing public road of acceptable function (Figure 5.2) or a road network created within the development (Figure 5.3)
- The width of the road reserve shall vary with the type and intensity of the development; refer to Chapter 2: Safeguarding of Road Reserve Lines.
- The new road shall be safeguarded as road reserve, constructed in accordance with Section 18 of the SWA and handed over to LTA after expiry of the MEP.

SWA

The developer shall also carry out the necessary improvement works at the connection of the new street to an existing public street.

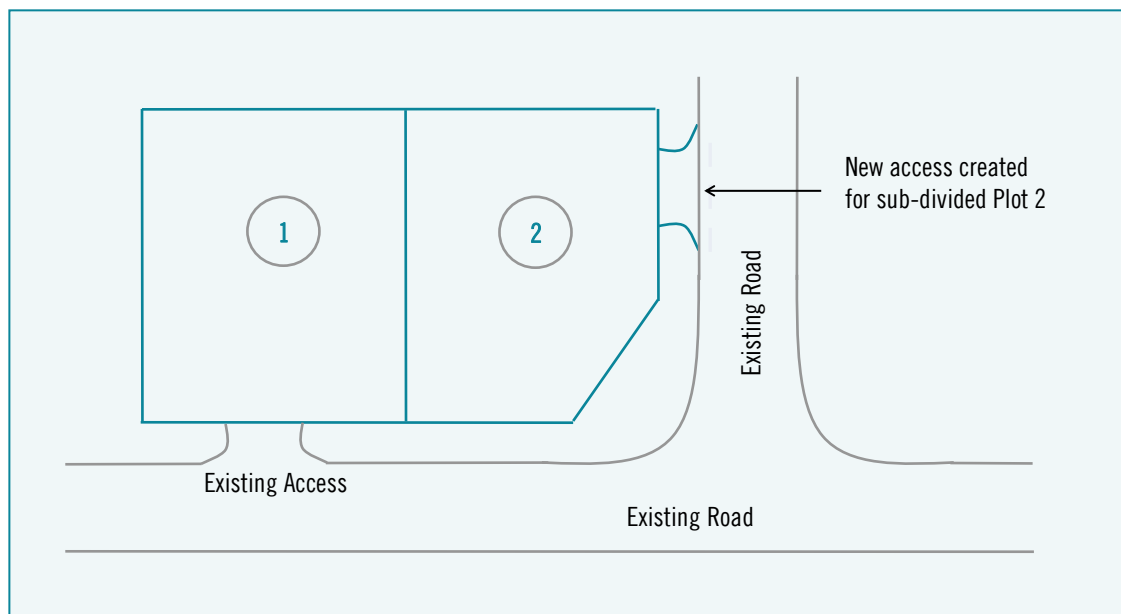


Figure 5.2 Showing Access to Sub-divided Plot Taken From Existing Road Network.

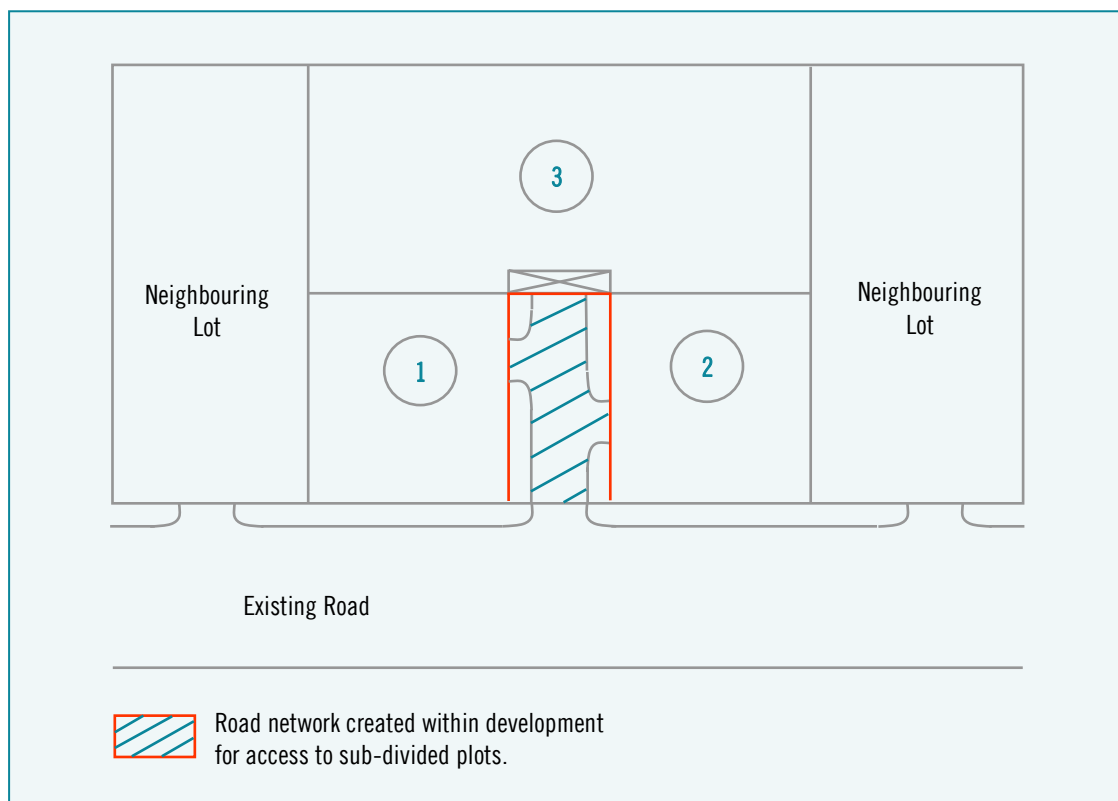


Figure 5.3 Showing a Road Network Created Within the Development to Provide Access to Sub-Divided Lots

5.4 Planning Permission & Certified Plan

The developer shall obtain the necessary permission under the provisions of the Planning Act if he has the intention to hand-over the completed road to LTA for maintenance. Statutory boards and other government agencies would be required to obtain the approval of the Master Planning Committee (MPC).

The developer's appointed surveyor shall then obtain the Certified Plan approved by the Singapore Land Authority. The Certified Plan can be submitted anytime during maintenance period (MEP) before the road is handed over to LTA.

5.5 Utility Services Plan

Utility service connections for services such as water pipelines, power cables, telecommunications lines etc. are an essential part of any development works. Planning and co-ordinating these service connections in advance will improve the timelines of utility service connections and minimize the impact of such utility works on traffic.

As the QPs would have a clear overview of the utilities' requirements for their development projects, they are in a good position to plan the schedules of the various utility service connection works needed.

As part of the Street Plan submission, QPs are required to submit an Utility Services Plan (USP). The USP is a notional plan showing the various service connections required for the development, and a proposed schedule for the laying of utilities. Please refer to [Appendix 5A](#) for a sample of a USP.

5.6 Co-ordinated Utilities Plan (CUP)

The QP shall include a Co-ordinated Utilities Plan (CUP) in the Street Plan submission. All planned utility laying works in conjunction with the external works shall be shown in the CUP, with proposed levels and co-ordinates to be shown (Please refer to [Appendix 5B](#) for a sample of a CUP). All services laid within the road reserve shall comply with the following:

i) No manholes, chambers or valves, new or existing, shall be allowed on the carriageway or the kerb foundation. They shall be placed within or relocated to the service verge.

WPS

ii) If utilities are laid within the carriageway, a minimum clear depth shall be provided as stipulated in Section 6.4.1 of the Code of Practice for Works on Public Streets.

iii) All other applicable requirements in the Code of Practice for Works on Public Streets shall be complied with. The QP shall highlight any non-compliance for approval to avoid abortive works after construction.

The developer is advised to liaise with all services providers who wish to lay their services within the new road. This will minimise the inconvenience of having utilities over-crossing the drain. In addition, LTA imposes a no-opening period for 1 year from the time the new street is handed over to LTA for maintenance.

5.7 Street Works Deposit

For proposals involving construction of a new street, the developer is required to place a street works deposit with LTA as a guarantee for the proper completion of the proposed street works. LTA is empowered to execute street works which are not commenced or executed to its satisfaction. All costs incurred will be recovered from the street works deposit. The deposit may be in the form of a [Banker's Guarantee](#). LTA shall advise the developer on the amount to be deposited based on the street plans submitted and the prevailing fixed schedule of rates by LTA.

Once LTA has reviewed the new street plans and has no further comment, an Order will be served on the developer to furnish the deposit. The deposit shall be furnished within 21 days from the date of service of the Order.

If the developer fails to furnish the deposit on expiry of the 21 days grace period of the Order, a first reminder will be served. This first reminder will give a further grace period of 14 days. On expiry of the first reminder, a second reminder that gives an additional 14 days notice will be served on the developer. This means that the original 21 days grace period is extended for another 28 days, giving a total grace period of 49 days for the developer to furnish the deposit.

On expiry of the second notice served, if the deposit has not been furnished, the approved street plans will be deemed cancelled.

The street works deposit is also applicable for proposed overhead bridges and underpasses across public streets constructed by private developers, as a guarantee for the proper completion of the proposed street works.

5.8 Reduction of Street Works Deposit



Once CSC clearance from LTA is obtained for the new street, LTA retains only a portion of the amount that was deposited to cover works during the maintenance period (MEP). The developer shall prepare a [reduced Banker's Guarantee](#) based on the amount to be retained during the MEP before LTA returns the BG for the original amount deposited.

If the original amount of the street works deposit exceeds S\$1 million, LTA shall retain 5% of the original sum or S\$100,000, whichever is greater.

If the original amount of the street works deposit is less than S\$1 million, LTA shall retain 10% of the original sum or S\$20,000 whichever is greater.

When the road is declared a public street and LTA takes over its maintenance, the reduced street works deposit will

5.9 Maintenance of New Street

A developer may choose to open a street for traffic to ply. The QP shall notify LTA of the intention to open the road for traffic 8 weeks prior to the opening of the road using the prescribed Corenet e-form. In this instance, the developer shall maintain the street in a manner acceptable to LTA and not compromise the safety of the general public. The Street Works Act empowers LTA to require the developer to rectify any defect on the private street so as not to jeopardise the safety of the public. Alternatively, LTA may carry out the repair works and recover the costs from the owner.

LTA reserves the right to evaluate whether or not to take over a road and its related facilities for maintenance. In general, a road that is not safeguarded with an intention to not serve more than one development shall not be maintained by the LTA.

5.10 Service Roads

Service roads are safeguarded to cater for developments' servicing needs such as bin centre, loading/unloading, sub-station etc., and provide access to localised parking facilities of shophouses and commercial buildings.

Currently, there are two standard cross sections of service road being used by LTA. The width of the standard service road reserves are 7.6m and 10.0m. Typical cross sections are shown in [Chapter 2 - Appendices 2A & 2B](#).

If the safeguarded service road has not been widened and is unable to cater for any vehicular traffic, they shall be widened and reconstructed in conjunction with the development to serve the new development. Details on the making up and widening of the backlane to road standard shall be submitted during Street Plan stage. The QP shall ensure that the service road is wide enough and structurally sound to cater for the development.

5.11 Types of Plans to be Submitted For New Street Proposals

The layout view of the CAD drawings shall be presented in a scale of:

- 1 : 20,000, 1: 10,000 or 1: 5,000, for the location plan / key plan
- 1: 100, 1: 500 or 1: 1,000 for the site plans, traffic plans and topographical survey plans
- 1:20, 1:10, or 1:5 for the Cross Sectional plans and detailed plans
- 1:500 or 1:1000 horizontal and 1:50 or 1:100 vertical for Longitudinal Section plans

5.12 Site Plan

5.12.1 Site Plan Details

A Site Plan shall consist of the following standard typical details:

- A Key Plan showing the location of the proposed road, which shall:
 - be placed at the top left-hand corner of the site plan
 - include the surrounding roads names in the vicinity
 - be drawn to scale (Scale of 1:20,000, 1:10,000 or 1:5,000)
- The Road Reserve Line and cadastral boundary;
- The alignment, width and layout of the proposed new road reserve, which are to be in accordance with that shown on the approved Layout Plan;
- Scale of the drawing (1:100, 1:500 or 1:1000, whichever is appropriate);
- All proposed road related features (all existing features and proposed features shall be clearly differentiated);
- The proposed position of footpath, turf, tree planting areas, drop inlet chamber with scupper pipe, pedestrian grating, drains, culverts, drain summit (if any) and sump, to be clearly indicated;
- The gradients and directions of crossfalls (normal/superelevated) according to the following standard:

Types of Crossfall	Standard
Normal crossfall	1:30 sloping from the centre of the carriageway towards the edge of the carriageway.
Superelevated crossfall at the bend	1:30 sloping in one direction towards the inner edge (i.e. smaller arc length) of the carriageway at the bend.

Table 5.1 – Types of Crossfall

- Layout of proposed entrance design/arrangement to respective development sites, which shall consist of:
 - The Road Reserve Line/ boundary line
 - The actual proposed gradients of the entrance driveways to the development site, within road reserve
 - The proposed entrance widths
 - The dimension of carriageway & sidetable etc.

A typical detail of proposed entrance presentation is shown in Figure 5.4.

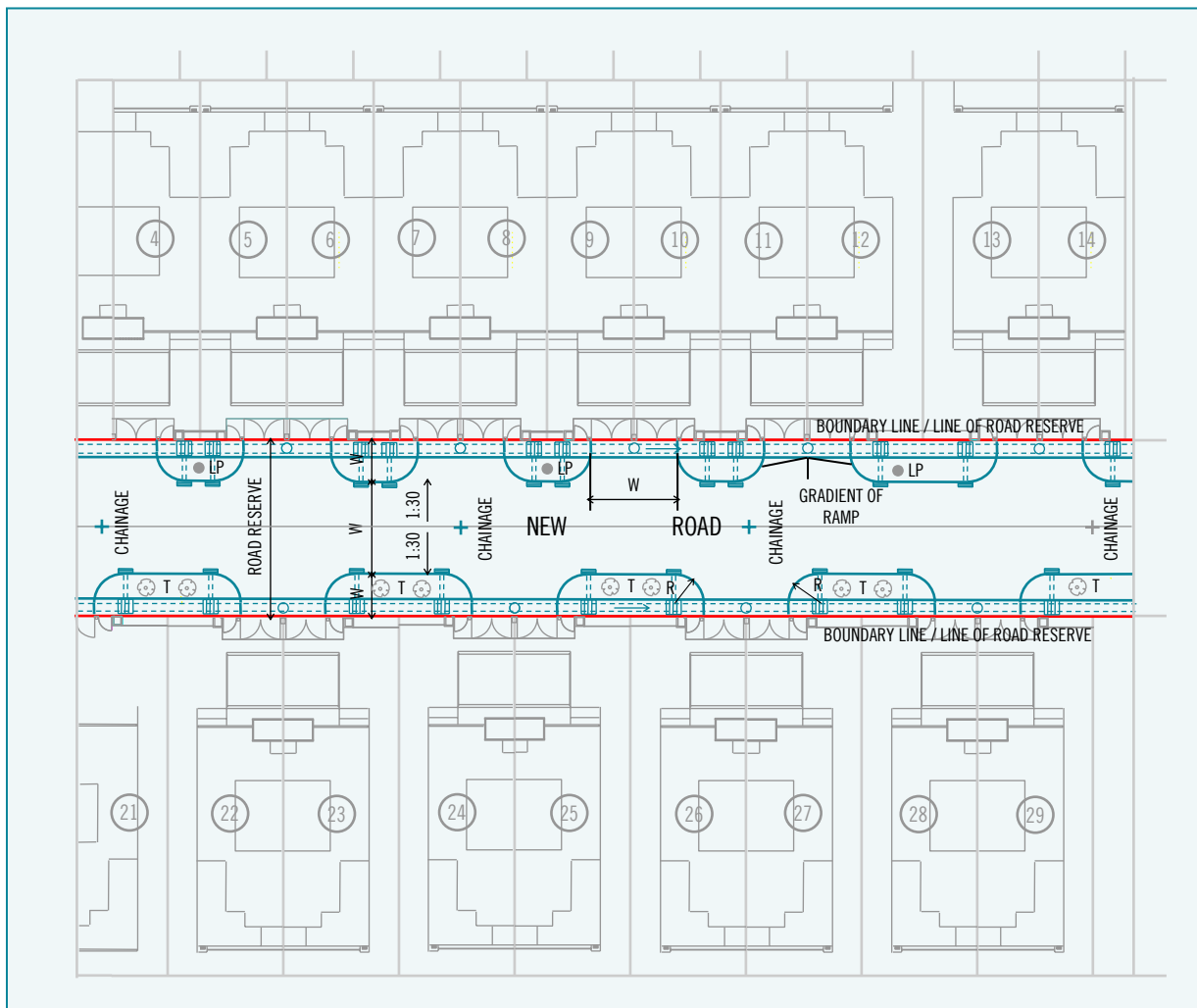


Figure 5.4 Typical Detail of Proposed Entrance

- One nearest permanent government benchmark is to be indicated in the Notes and two temporary benchmarks to be shown on the plans;
- Mode of drainage of the new street, in particular -
 - the positions, levels and dimensions of drains
 - the positions of the summits (if any) and the directions of flow with the same information given in respect of existing drains (if any) into which the new drains are to discharge
 - all existing rivers, streams and drains, showing lines, levels and cross-sections
 - the positions, levels and dimensions of culverts (if any) in the new drains at the intersections or entrances of the proposed streets, with the same information given in respect of culverts across existing and new streets.
- Chainage points to be indicated -
 - along the centre line of the road
 - at 30m intervals for proposed roads more than 100m
 - at 15m intervals for proposed roads shorter than 100m
 - at start and end points of transition length of horizontal curve

(Note - proposed levels are to be indicated at these chainages)

The reference marks (e.g. A, B, C, D) shall be indicated along the sides which the longitudinal sections have been taken.

5.12.2 Details at Road Bend

Local widening of the carriageway around the road bend is usually required to mitigate the effects of centrifugal force subjected on vehicles. The following shall be noted when preparing site plan that includes a road bend:

- The widths of the widened carriageway shall be indicated on plan
- To indicate the width of the carriageway for each lane
- The additional carriageway width could be taken from the sidetable width
- To show transition length and position where the road bend starts and ends
- To indicate the superelevated crossfall sloping down 1:30 towards the inner edge (i.e. smaller arc length) of the carriageway
- To indicate the horizontal curve radius measured to the centre line of road.

A typical layout at road bend is shown in Figure 5.5.

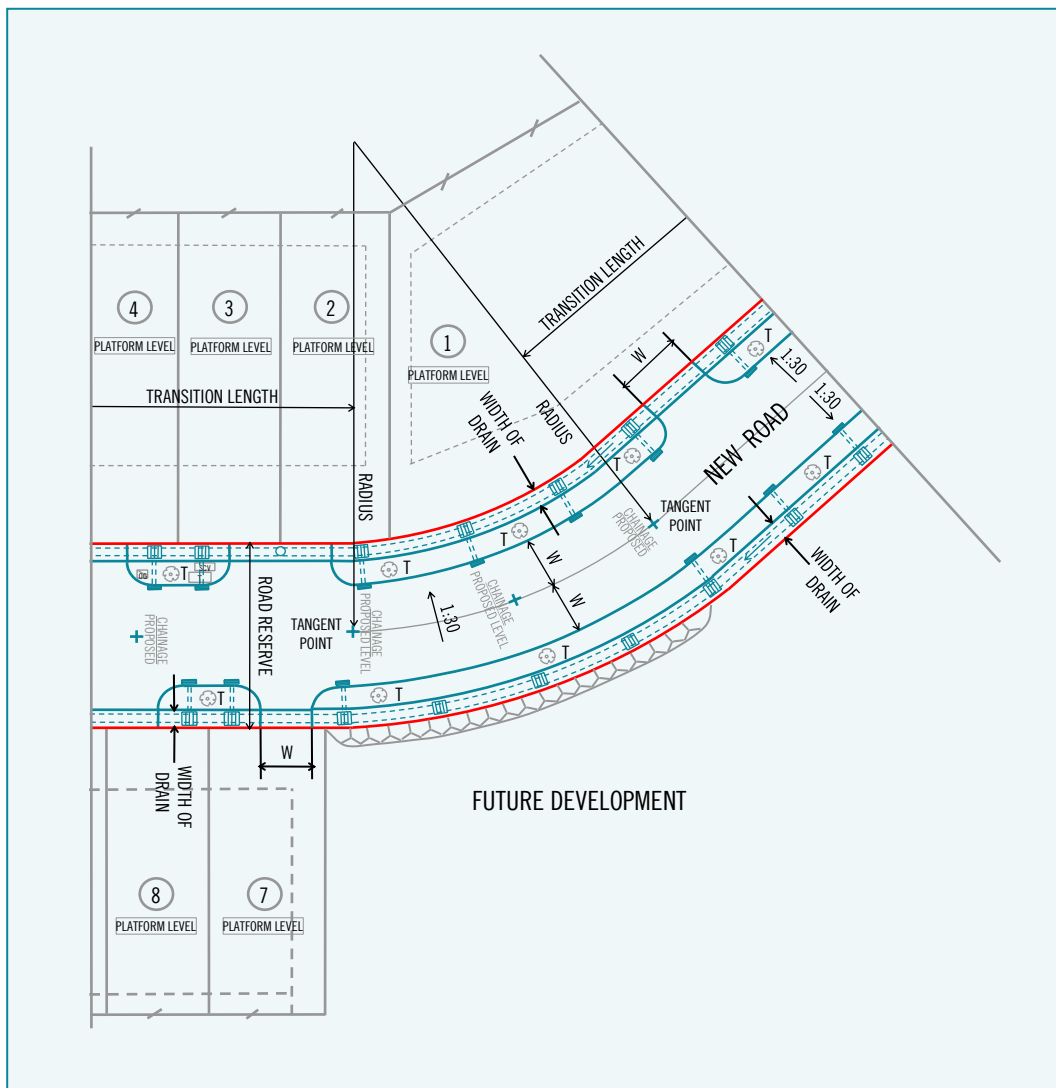


Figure 5.5 Typical Layout of Road Bend

The site plan shall also show the road connection, where the proposed road meets the existing road with the following standards

- There shall be a difference in the colour representation between the existing road (cyan) and the proposed road (magenta);
- The angle at which the new street connects with the existing road should be near to 90 degrees for traffic safety and operation, but no less than 60 degrees;
- Some existing spot levels of the existing road shall be shown in the site plan, in order to match the proposed road levels with the existing road levels;
- The splay corners and the proposed turning kerb radius at the road connection are also to be indicated on plan; (Refer to Section 2.3.3 for details)
- Sufficient design radius and splay corners are to be provided to allow ample sight distance for vehicles to manoeuvre safely into and out of the main road; and to allow pedestrians and cyclists to move safely.
- Proposed footpath ramps for pedestrians shall be indicated at the road junctions to cater for the continuous pedestrian flow.

The diagram illustrates the design of a new road intersection with an existing road. It shows the boundary line, line of road reserve, existing road, and future development area. Key features include:

- BOUNDARY LINE / LINE OF ROAD RESERVE:** Indicated by a red line at the top and bottom of the diagram.
- EXISTING ROAD:** The road on the left and right sides of the intersection.
- NEW ROAD:** The road running vertically through the center of the intersection.
- CHAINAGE PROPOSED LEVEL:** Indicated by blue dashed lines and labels.
- EXISTING SPOT LEVEL:** Indicated by blue dashed lines and labels.
- SUMMIT:** The point where the new road meets the existing road.
- SPLAY CORNER:** The corner formed by the new road and the existing road.
- RADIUS:** The radius of the splay corner, indicated by a dashed line and label.
- PLATFORM LEVEL:** Indicated by a dashed line and label.
- FUTURE DEVELOPMENT:** The area to the right of the new road, labeled "FUTURE DEVELOPMENT".

Figure 5.6 Typical Details of Junction

5.12.4 Other Proposed Commuter Facilities

Where applicable, the site plan shall also show other proposed commuter facilities like bus stop (with / without bay), taxi stand, pedestrian overhead bridges, cycling paths etc.

5.12.5 Right Hand Column on The Site Plan

The right-hand-side column (about 9cm) of the site plan shall show the following:

- Project title
- Job title
- Drawing numbers
- Names of Architects (QP), PE & Owner.
- The Approved layout plan number & the BP number are to be indicated at the top of the column etc.

5.12.6 Bottom Row on The Site Plan

The row at the bottom of the site plan (about 6cm) is for the Notes, the Legends & the Reference to Standard Details of Road Elements.

- a) Notes consist of common sections to be shown in the site plan. A sample is shown below:

Notes
1) Slope embankment to be 2 horizontal to 1 vertical (2H: 1V) unless otherwise stated with approved close turfing on 125 layer of top soil.
2) All dimensions shown are in mm unless otherwise stated.
3) To provide 1 government bench mark and 2 temp bench marks.
4) The gradient of all entrance approaches shall not be steeper than 1:10.
5) No manhole shall be placed within the carriageway including existing side table that is proposed to be converted to carriageway, entrance approach, entrance culvert, and footpath.

Table 5.2 Notes

- b) The Legend columns include colour representations and abbreviations in the site plan. A sample legend is shown below:
















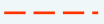



Legend			
	EXISTING BOLLARD		PROPOSED LAMP POST
	EXISTING LAMP POST RETAINED		PROPOSED BOLLARD
	EXISTING LAMP POST REMOVED		PROPOSED TREE
	EXISTING ELECTRICAL BOX		MANHOLE [TAS]
	EXISTING FIRE HYDRANT		MANHOLE [SEW]
	EXISTING TREE RETAINED		GATE
	EXISTING TREE FELLED		TBM
	SIGN BOARD		ROAD RESERVE LINE
	WATER VALVE		SEWER LINE
	SLOPE		

Figure 5.7 Legend Sample

- c) The Reference to Standard Details of Road Elements is also included in the row provided to show the proposed road related features within road reserve.

Reference to 2014 Standard Details of Road Elements Revision B (Sep 2017)		
Note	Description	Drawing no.
1	Flexible Pavement (Type 1)	LTA/SDRE14/1/PAV1B
2	Cast-in-situ Box Culvert	LTA/SDRE14/2/DRA2B
3	Precast Slabbed Over U-Drain	LTA/SDRE14/2/DRA5B
4	Precast Concrete Drop-inlet Chamber	LTA/SDRE14/2/DRA6B
5	K2A Precast Concrete Kerb with Foundation	LTA/SDRE14/3/KER1A
6	Footpath Ramp - Side Road	LTA/SDRE14/3/KER8B
7	Footpath Ramp - Driveway	LTA/SDRE14/3/KER9B
8	Pedestrian Grating - with Mild Steel Plate	LTA/SDRE14/4/GRA2B
9	Pedestrian Aluminium Alloy Railings - Type B	LTA/SDRE14/5/RAL1A
10	Soil Aeration	LTA/SDRE14/12/PNR1A, 2A

Table 5.3 Examples of Reference to Standard Details of Road Elements

- d) North Point

The North Point shall also be indicated on the right hand side in the bottom column.

5.13 Longitudinal Section Plan

5.13.1 Reference Markings

The longitudinal section plan consists of a plan showing the longitudinal sections through the centre line and through each side of the carriageway. This plan illustrates the vertical alignment of the proposed road. It has two presentations of longitudinal sections, one for each side of the carriageway (see sample titles below).

- LONGITUDINAL SECTION ALONG NORTHERN EDGE OF ROAD A-B
- LONGITUDINAL SECTION ALONG SOUTHERN EDGE OF ROAD C-D

All reference marks (e.g. A, B, C & D) shall tally with the reference marks as shown on the site plan. This is to differentiate which side of the carriageway the proposed levels are computed.

5.13.2 Levels to be Shown on Plan

Levels to be shown on plan shall include:

- the datum level
- the proposed level along centre of carriageway
- the proposed level along edge of carriageway
- the proposed top level of drain/culvert
- the invert level of drain/culvert
- chainage points along centre of carriageway

5.13.3 Legend

Every proposed level shall be represented by different types of lines and colour.



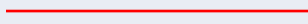

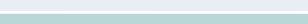
Items	Different Types of Lines And Colour
Datum Level 115.00	
Proposed level along centre line of carriageway	 (Bold Thick Black Line)
Proposed level along edge of carriageway	 (Dashed Red Line)
Proposed top level of drain/culvert	 (Normal Red Line)
Proposed invert level of drain/culvert	 (Normal Black Line)
Existing ground level along centre of carriageway	 (Dotted Black Line)
Chainage in metres along centre of carriageway	

Table 5.4 Legend

The vertical & horizontal scales of the longitudinal sections are to be indicated clearly based on the Street Works Regulations (Scale of 1:500 or 1:1000 horizontal and 1:50 or 1:100 vertical).

5.13.4 Chainage

On the longitudinal section plan, chainages should be indicated at the steeper gradients of the entrance approaches, vertical curves horizontal curves and at reference marks.

5.13.5 Other Details

Other details required to be shown on longitudinal section plan:

- Longitudinal gradient along the new street
- Vertical curve wherever changes of gradients occur (if any) & its length at each side based on the point of vertical intersection (PVI)
- Horizontal curve (if any) with its transition length at both sides and radius
- Clear indications of the proposed entrance culverts to respective plots
- Position of the cross culverts (if any) crossing roads (underneath the proposed road levels)
- Proposed levels and existing level at the road connection with the existing street
- Proposed gradient at top of slab over drain
- Indication of the invert levels of drains and the its gradient
- Boundary lines etc

Please note that the above items are to be indicated at the top of proposed profile of road as shown in Figure 5.8 below.

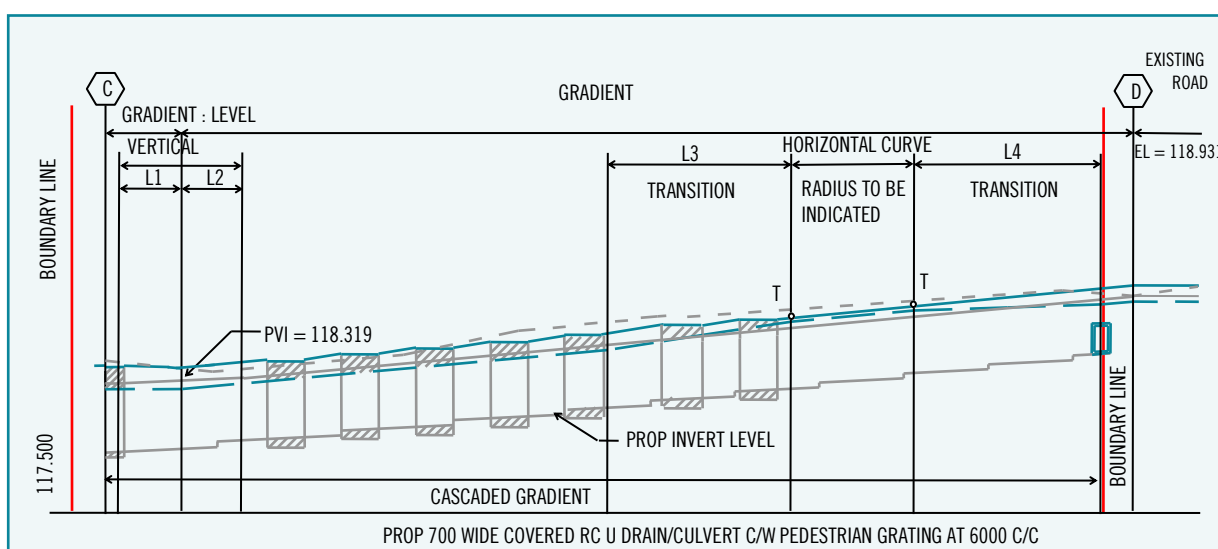


Figure 5.8 Longitudinal Section of a New Street

5.13.6 Horizontal Curve in Longitudinal Section

Horizontal curve shall be provided when there is a change in direction of road. Transition lengths at both sides of horizontal curve and radius are to be shown on plan (see typical presentation shown in Figure 5.9 below).

Details showing horizontal curve on longitudinal section plan shall include:

- Sufficient design radius shall be indicated;
- Along the inner edge of road bend (i.e. the shorter arc length), there shall be no change in the crossfall;
- Along the outer edge of road bend (i.e. the longer arc length), there shall be changes in the crossfall in the following circumstances -
 - Where the transition starts, the proposed edge level of carriageway is increased proportionately till the tangent point (TP). There shall be a point where proposed levels of road edge and centre of road are the same;
 - At the end of the transition, the proposed level of road edge is greater than the proposed level of road centre. (This is the start of the widened carriageway where the crossfall is 1:30 sloping in one direction towards to the smaller arc length of the curve).
 - There shall be another transition length for the super-elevated road to match again with the normal cross-fall road.

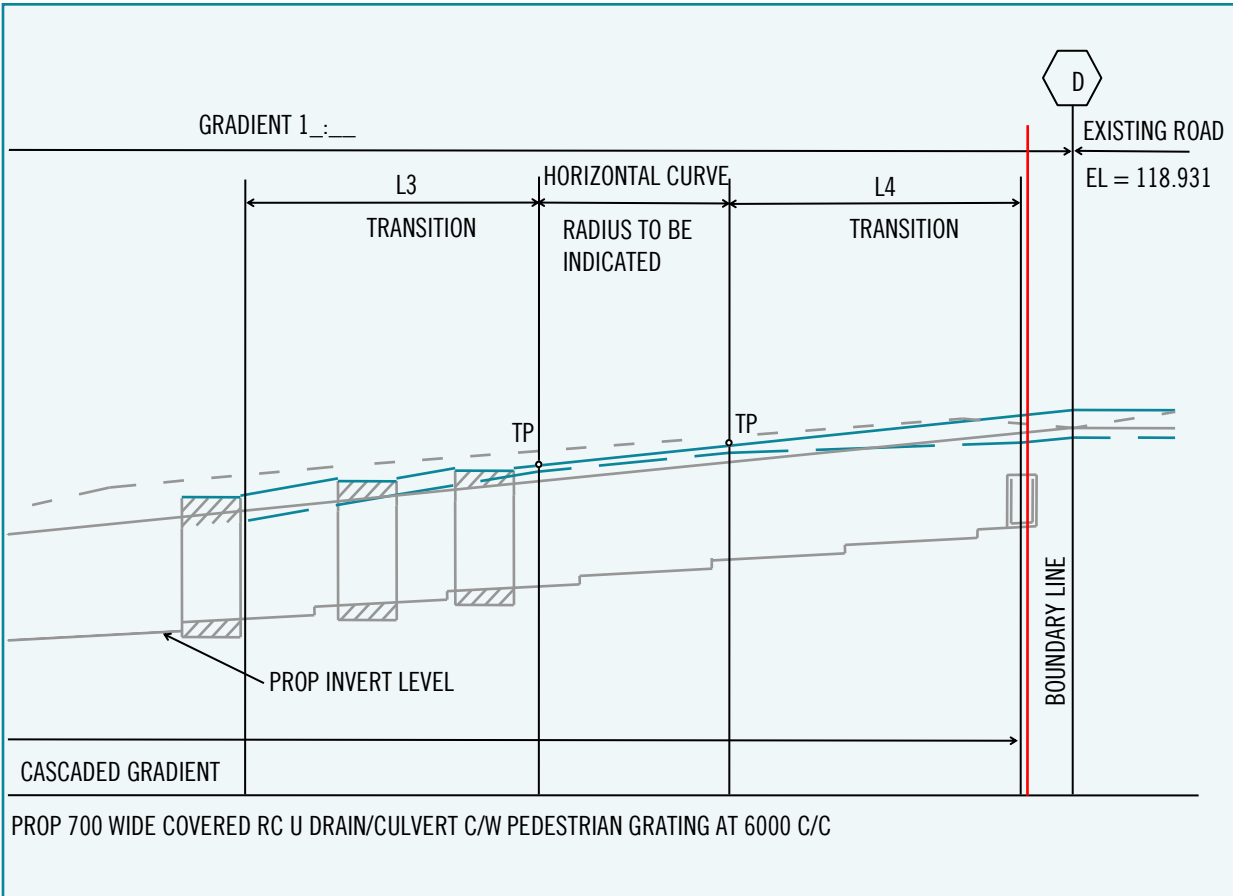


Figure 5.9 Longitudinal Section of Horizontal Curve

5.13.7 Vertical Curve in Longitudinal Section

Vertical curve shall be provided when there is a change in gradient of road; it can be either a vertical hog or sag. A vertical curve details shall show the following:

- length of vertical curve
- point of vertical intersection (PVI)
- tangent points (TP)

A typical detail of vertical curve is shown in Figure 5.10 below.

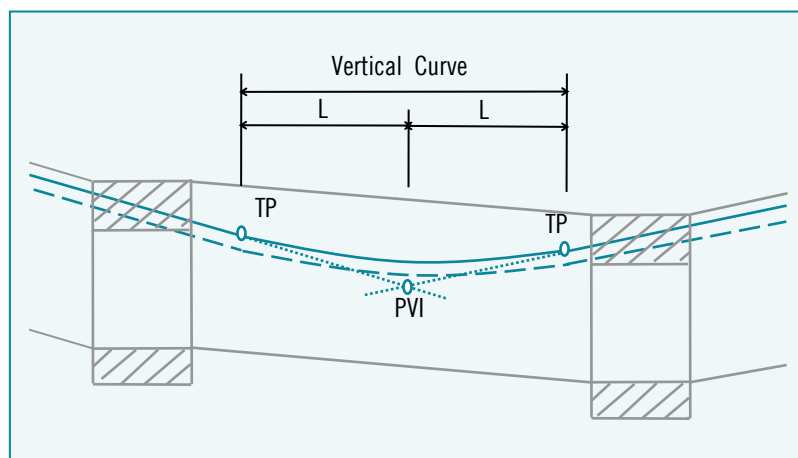


Figure 5.10 Vertical Curve in Longitudinal Section

5.13.8 Longitudinal Gradient

For the longitudinal gradient of road, the minimum longitudinal gradient is recommended to be of 0.4% or 1:250. This is to allow proper drainage of the road carriageway. The desirable maximum road gradient is 6% and the absolute maximum road gradient, as a general rule, shall not be steeper than 8%. If the proposed carriageway is 8% due to site constraints, it shall be constructed with rigid pavement.

When a road with gradient steeper than 1:30 approaches a junction, a minimum length of 10m with a gradient of not greater than 1:50 shall be provided before meeting the junction (see Figure 5.11 below). Otherwise a flat road of 10m shall be provided.

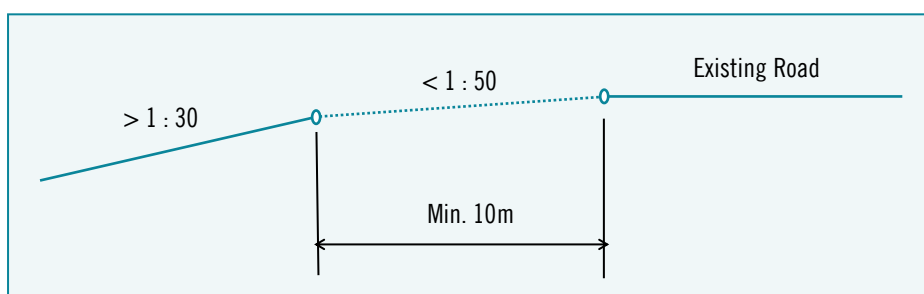


Figure 5.11 Longitudinal Gradient

Notes

A minimum length of 40m rigid pavement should be provided for all roads at the junction of a public residential development (such as HDB roads) and a length of 50m rigid pavement for all roads at the junction of an industrial estate. Rigid pavement shall also be provided along bus stop platforms; refer to the latest LTA SDRE.

The rigid pavement starts at the stop line of the approach roads at junctions.

5.14 Cross Sectional Plans

The Cross Sectional plans, in A1 size drawing setting, shall show the positions, dimensions and details of the construction of carriageway, kerbs, footpath, sidetables, scupper drains and roadside drains etc. within road reserves or the boundaries of the new street.

The Cross Sectional plans shall have a separate right-hand-side column and a bottom row for neater and systematic presentation.

- a) The 9cm wide right-hand-side column is used to indicate the following:
 - Project title
 - Drawing title & numbers
 - Developer's endorsement
 - Professional Engineer's endorsement etc.
- b) The 6-cm wide row at the bottom shall include a Notes table comprising general notes and requirements relevant to the cross-sectional details displayed. A sample is shown below:

Notes	
1.	The design of structure not in accordance to LTA's Standards require PE's endorsement and detailed calculations based on the site conditions.
2.	Pedestrian aluminium alloy safety railing are to be painted grass green in colour paint code is RAL Standard: RAL 5002 grass green.
3.	Surface of interval walls /soffits of the box culvert are to be treated with a coat of anti-carbonate such as Alkyl Silane or Silane Silaxane penetrating sealor 10 to protect against chloride ingress.
4.	<p>The following concrete grades shall be used unless otherwise stated in the LTA's Standard drawings:</p> <p>Reinforced concrete – grade 40</p> <p>Mass concrete – grade 20</p> <p>Lean concrete – grade 15</p>
5.	The last layer of 500mm of sub-grade material shall have a minimum soaked CBR of 5% and shall be compacted to minimum of 95% of maximum dry density. The minimum compaction for sub-base material shall be 95% and for base course material shall be 98% of the maximum dry density using the modified AASHTO compaction test or test 13 of BS 1377.

Table 5.5 Notes

5.14.1 Typical Cross Sections to be Shown

The following types of typical cross sections of proposed roads shall be shown on plan:

- Typical Road Section with Normal Crossfall (Section A)
- Typical Superelevated Road Section (Section B)
- Typical Entrance Culvert Section (Section C), where applicable
- Typical Cul-de-sac Section (Section D), where applicable
- Typical RC Sump Section (Section E)

In each of these typical cross sections, the following information shall be shown:

- drawing title
- scale
- reference section number.
- Proposed details referencing the relevant detail in the Site Plan's SDRE reference table, annotated by pointers like "See Note....."
- line of Road Reserve Line
- a uniform dimensioning and detailing system

5.14.2 Examples of The Various Typical Cross Sections

a) Cross section with normal crossfall

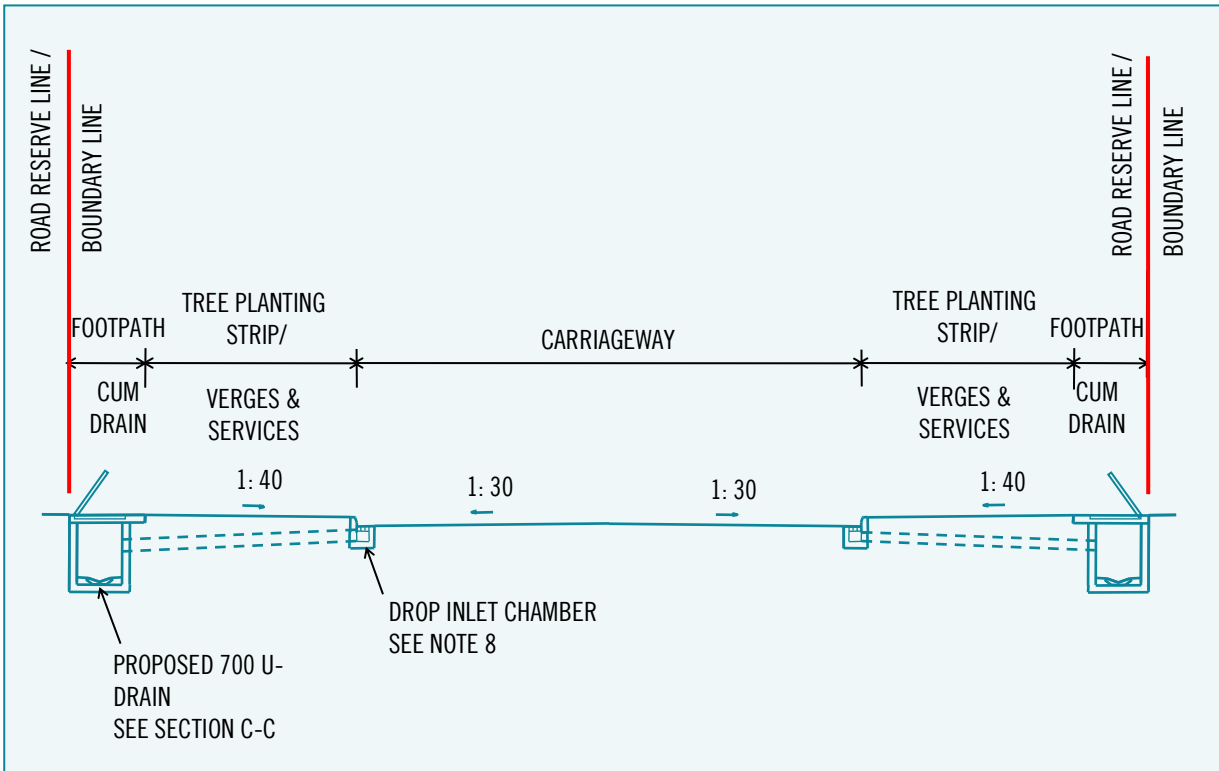


Figure 5.12 Cross Section With Normal Crossfall

- The gradients shall be indicated clearly on the drawings
- The widths of the road sidetable and the road carriageway shall indicated clearly
- Details of the standard road elements such as the drop inlet chambers shall be annotated by pointers as "See Note 8"
- The Road Reserve Lines and boundary lines shall also be indicated clearly on the cross-section.
- The enlarged details of a section could be indicated as 'see other sections'. In the above example, it is indicated as 'see section C-C for details of the proposed 700 U drain'
- Openings are required along the scupper pipe if length of scupper pipe exceeds 5m

b) Typical cross section for super elevated road

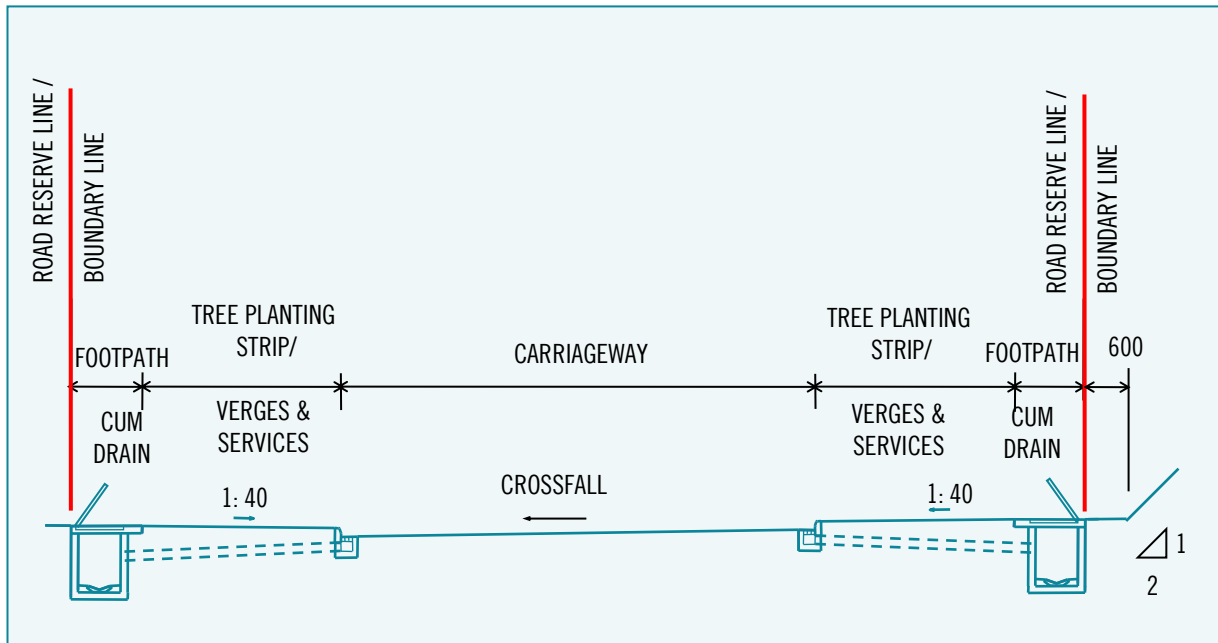


Figure 5.13 Cross Section For Super Elevated Road

The section shows a typical superelevated road cross-section at a road bend. Some of the differences from the typical normal crossfall road are as follows:

- Crossfall is sloping towards the inner curve of the horizontal curve (i.e. the smaller arc length of the road bend). The crossfall for super-elevation depends on the road design speed and the radius of the horizontal curve. Please refer to Civil Design Criteria for details.
- Widths of the carriageway & sidetable are adjusted to allow a wider carriageway width at the road bend. For the above case, the carriageway width is widened by 300mm for each direction and the planting verge width is reduced accordingly.

Note:

For some cases, the width of the road reserve would be increased meaning taking in more land from the adjacent sites for the road widening, therefore retaining the standard sidetable width.

Slope beside proposed covered drains (See Figure 5.13)

- Where the height of cut & fill are 2 metres or more, the slope shall not be steeper than a ratio of 2 horizontal to 1 vertical. Slopes steeper than the above may require soil investigations and analysis by PE before deeming it to be acceptable.
- The 600mm level berm indicated in Figure 5.13 serves as a buffer for any soil erosion from the slope getting directly onto the footpath, which may inconvenience pedestrians.
- Alternatively, the PE may provide retaining wall system outside the road reserve, with permission of the land owner. LTA shall only maintain the retaining wall that is supporting the road.

c) Typical section of entrance culvert

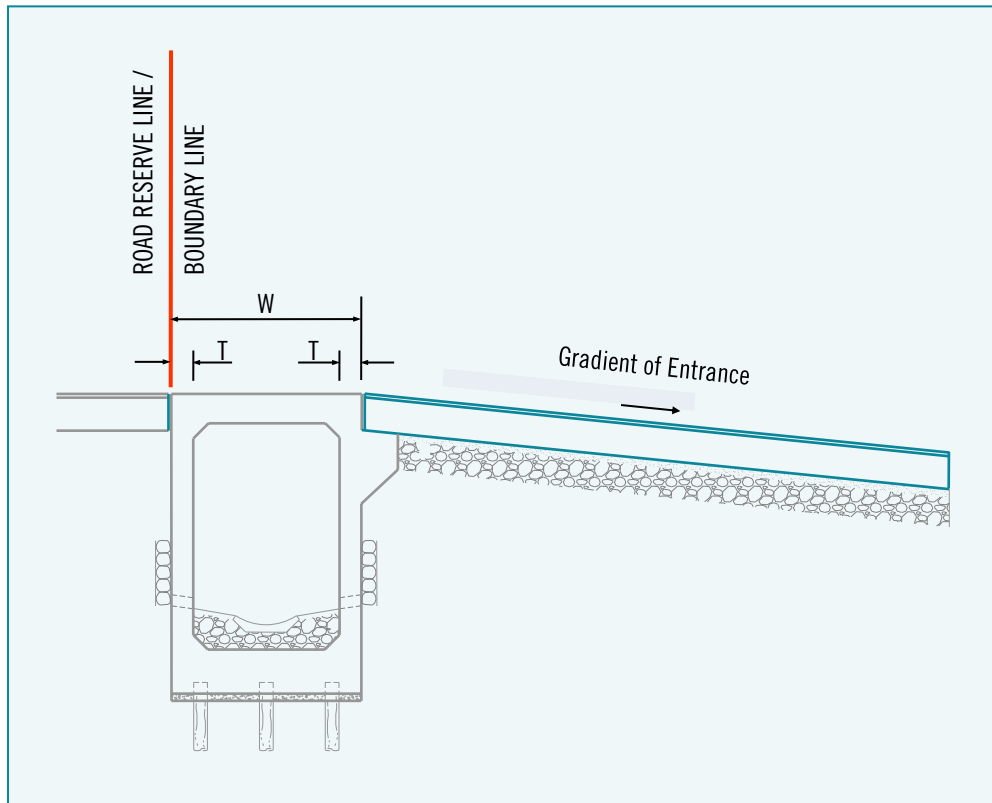


Figure 5.14 Typical Section of Entrance Culvert

The QP could exercise flexibility in the design of proposed road related features within road reserves. The QP shall ensure the structural integrity of all such features with detailed drawings and calculations based on the site conditions. The Standard Details of Road Elements could be used by the QP for the proposed submission or as a guide in QP's design of the proposed road features.

- For this section, the PE shall design the structural details of the reinforced concrete culvert. The widths, dimensions and gradient of entrance approach shall be indicated.
- The corbel details could also follow the standards shown in the Standard Details of Road Elements.

d) Typical section of cul-de-sac

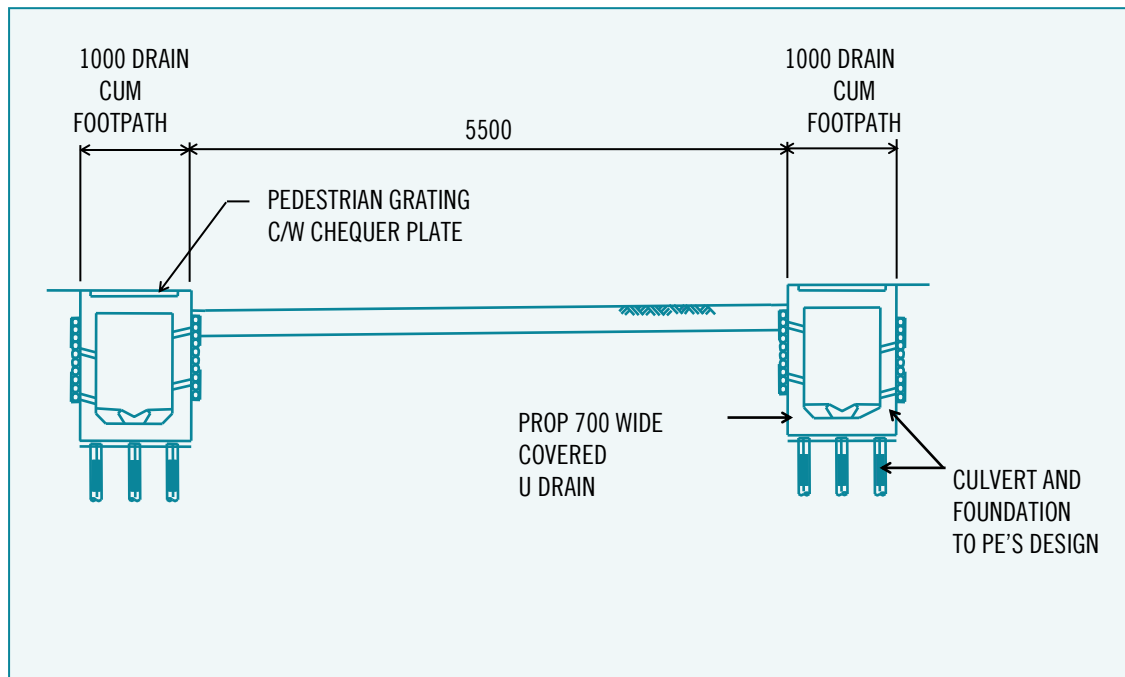


Figure 5.15 Typical Section of Cul-de-sac

Whenever a cul-de-sac is proposed in a site plan, a cross-section detail should indicate the widths of footpaths and carriageway. The above section shows a typical example of a cul-de-sac section.

e) Typical section of RC sump

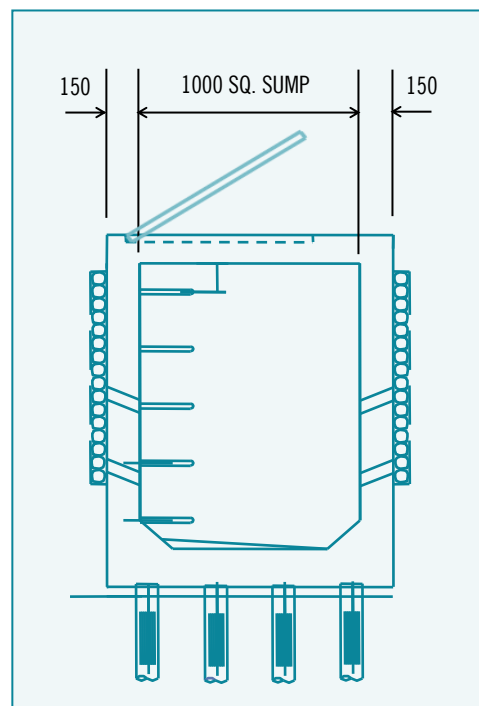


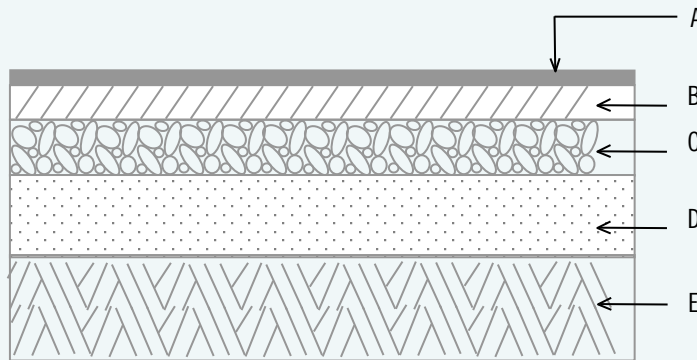
Figure 5.16 Typical Section of RC Sump

- The PE shall also design and show the structural details of the proposed reinforced concrete sump within road reserve.
- The standard aluminium rungs shall also be shown.
- It would be advisable to use geocomposite sub-soil drain to be riveted at 1.2m c/c throughout length of wall (with reference to the LTA Standard Details for Road Elements) rather than to use the hardcore packing throughout the wall length. This is to facilitate the construction works on site.

5.15 Types of Road Pavements

The more common types of road pavements are described below. Please refer to the Standard Details of Road Elements and the Materials & Workmanship Specifications for more information.

- Flexible pavement (Type I) for expressways, semi-expressways, arterial roads or industrial roads



A - 50mm thick bituminous wearing course (mix classification SMA) shall be of 60/ 70 penetration with minimum 4.5% and maximum 5.5% soluble bitumen content (to LTA's standard) and shall be laid with a mechanically spreader. Laying a wearing course is to be included in **Final Premix Surfacing Contract** only.

B - 120mm thick bitumen binder course (mix classification B1) shall be of 60/ 70 penetration with minimum 4.5% and maximum 5.0% soluble bitumen content (to LTA's standard) and shall be laid with a mechanically spreader.

C - 250mm thick base course shall be of graded granite aggregate and shall be laid in 2 layers, each at 125mm thk. The base course material shall be compacted to minimum 98% of the maximum dry density using the modified AASHO Compaction Test or Test 13 of BS 1377.

D - 300mm consolidated thickness of sub-base shall be quarry waste or equivalent shall be compacted to minimum of 95% of the maximum dry density maximum obtained using the modified AASHO Compaction Test or Test 13 of BS 1377 and shall have a minimum soaked CBR of 30%.

E - The last layer of 500mm thick sub-base material of sub-base shall have a minimum soaked CBR of 5% and shall be compacted to minimum of 95% of maximum dry density modified AASHO Compaction Test.

Figure 5.17 Flexible pavement (Type I) for Expressways, Semi-expressways, Arterial Roads or Industrial Roads

- Flexible pavement (Type II) for primary access roads

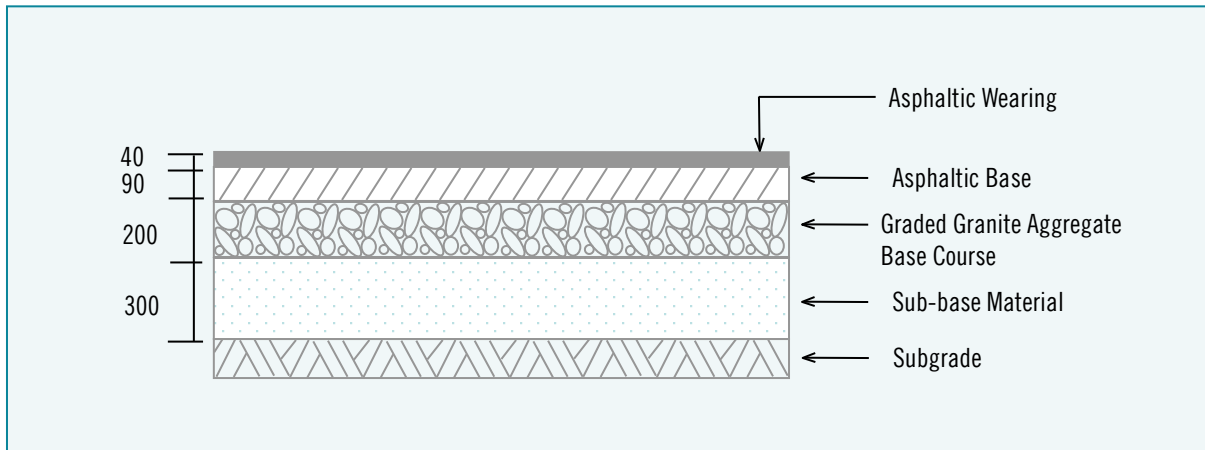


Figure 5.18 Flexible Pavement (Type II) For Primary Access Roads

- Flexible pavement (Type III) for local access roads

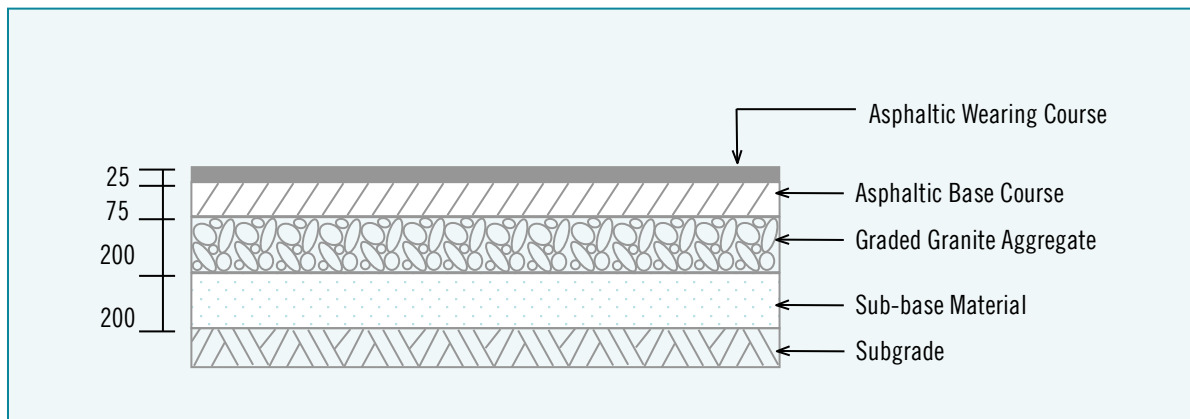


Figure 5.19 Flexible Pavement (Type III) For Local Access Roads

- Rigid concrete pavement for service roads

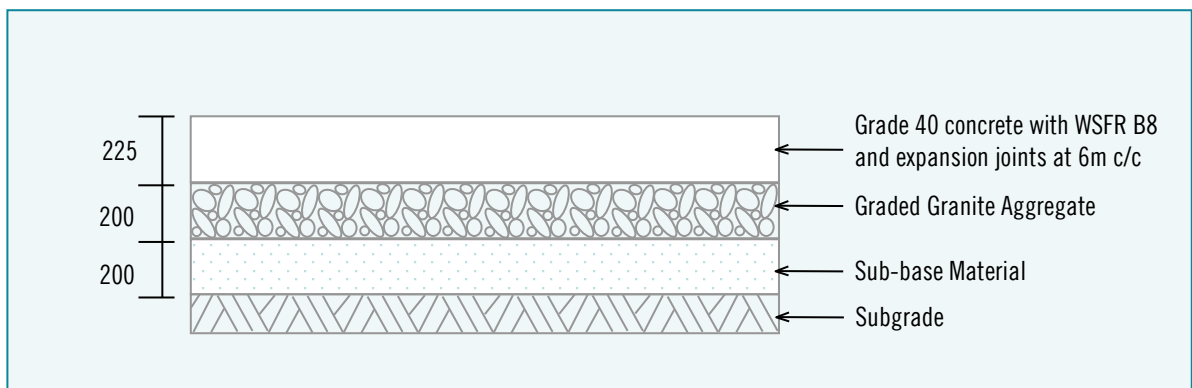


Figure 5.20 Rigid Concrete Pavement For Service Roads

- Reclaimed land

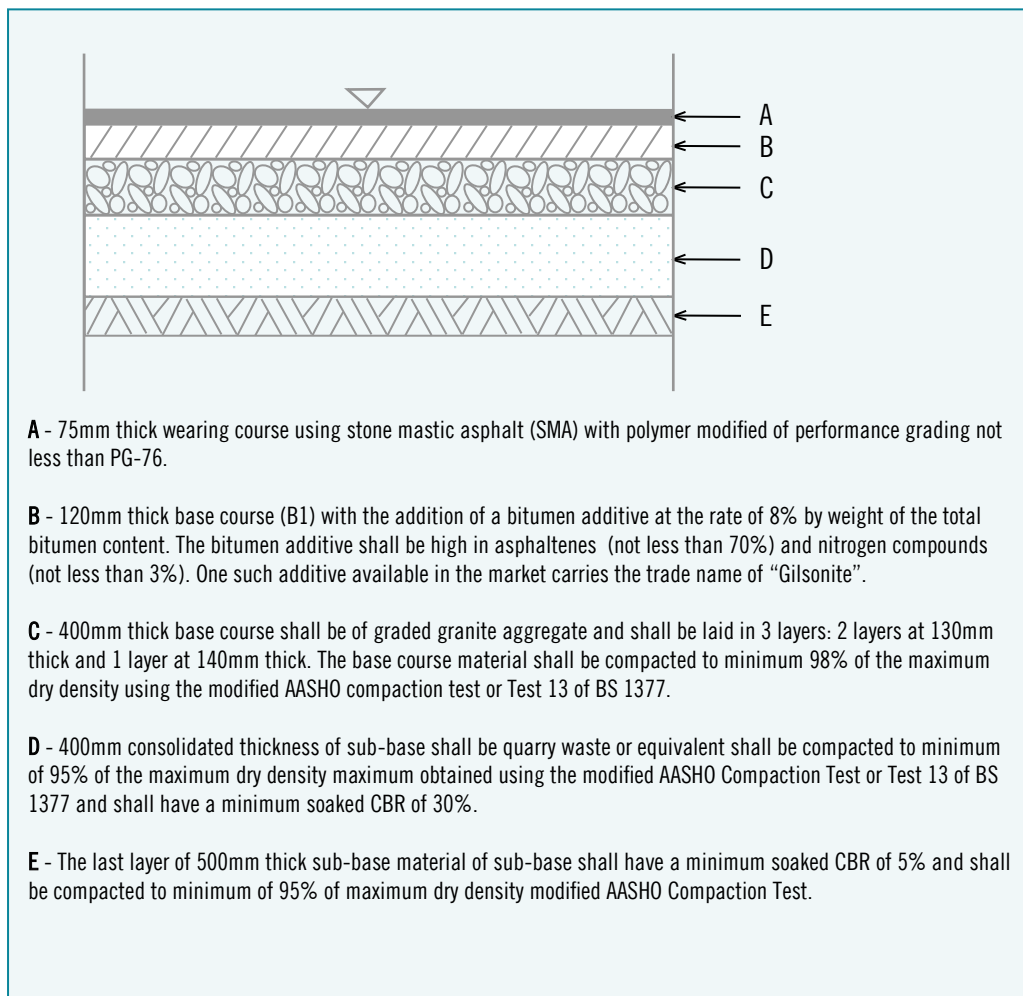


Figure 5.21 Reclaimed Land

5.16 Details of Frontage Improvement to Development

The figures below explains the points to take note when preparing plans for frontage improvement along proposed developments.

- Development Frontage (With Road Widening Plot)

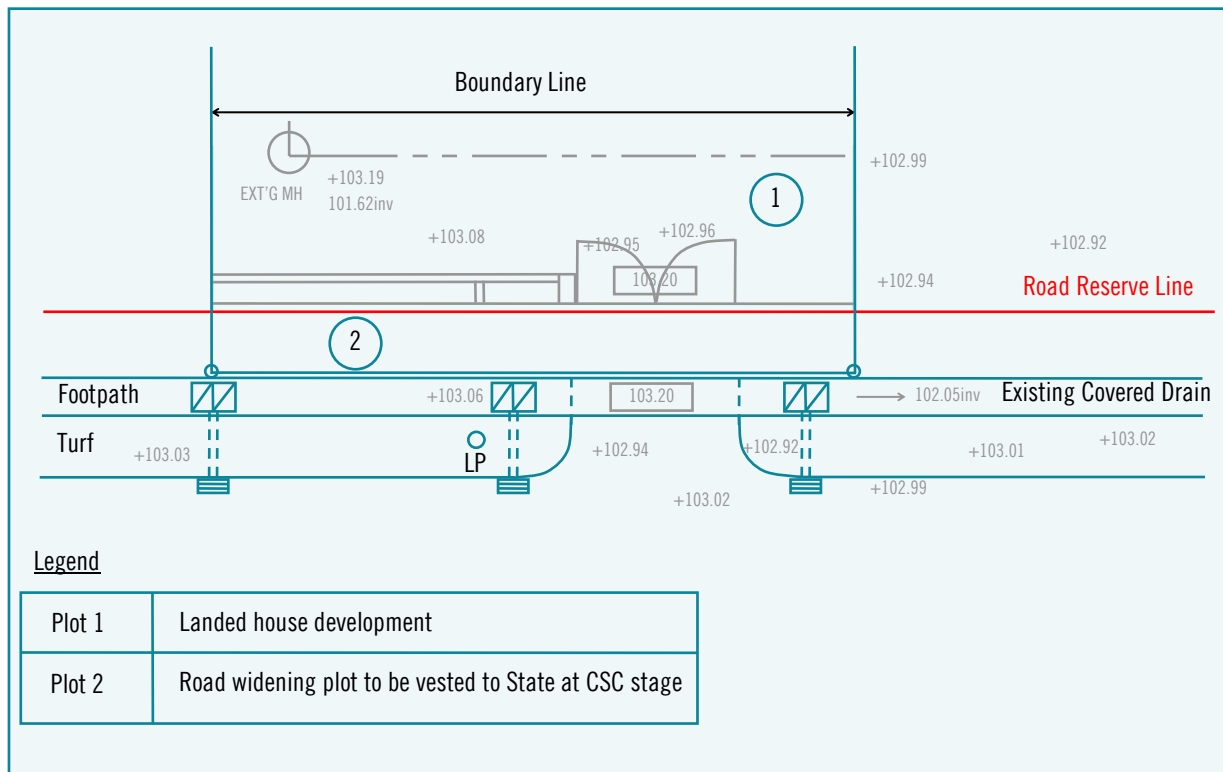


Figure 5.22 Details of Frontage Improvement to Development

- Show boundary line
- Show Road Reserve Line
- Show road widening plot
- Show legend for road widening plot
- Show footpath and kerbline
- Show existing turf area
- Show existing open/covered drains
- Show existing drop inlet chambers
- Indicate existing road levels, proposed culvert & internal platform levels
- Show existing lamp posts, OG box, traffic signs, manholes
- Show existing traffic markings, road hump, zebra crossing

- Development Frontage (With Road Widening Plot)

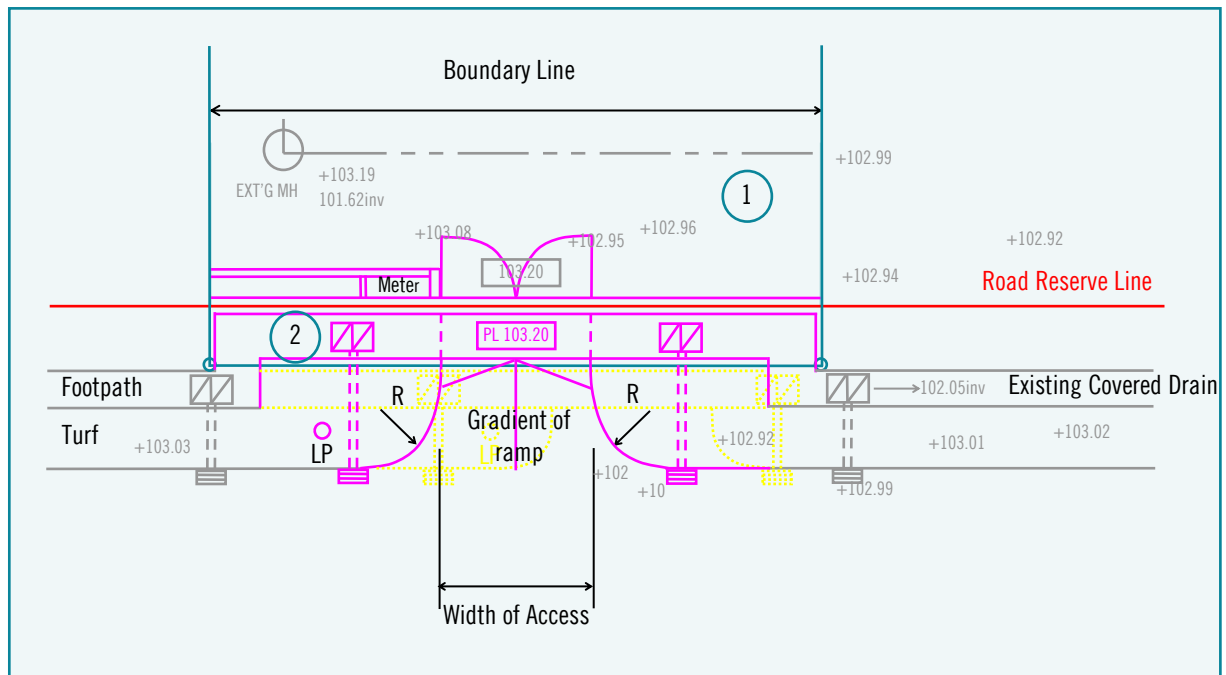


Figure 5.23 Details of Frontage Improvement to Development

- Show road features to be deleted in dotted yellow lines
- Show proposed road features in magenta
- Proposed covered drain to set back and abut road reserve line
- Indicate width of proposed access
- Indicate proposed turning kerb radius
- Show gradient of proposed entrance approach
- Proposed top level of culvert to be higher than road level
- Show location of meter compartment
- Show proposed location of lamp post affected by proposal
- Show proposed drop inlet chamber at tangent points of turning radius
- Show position of side gate, if any

- Development Frontage (Without Road Widening Plot)

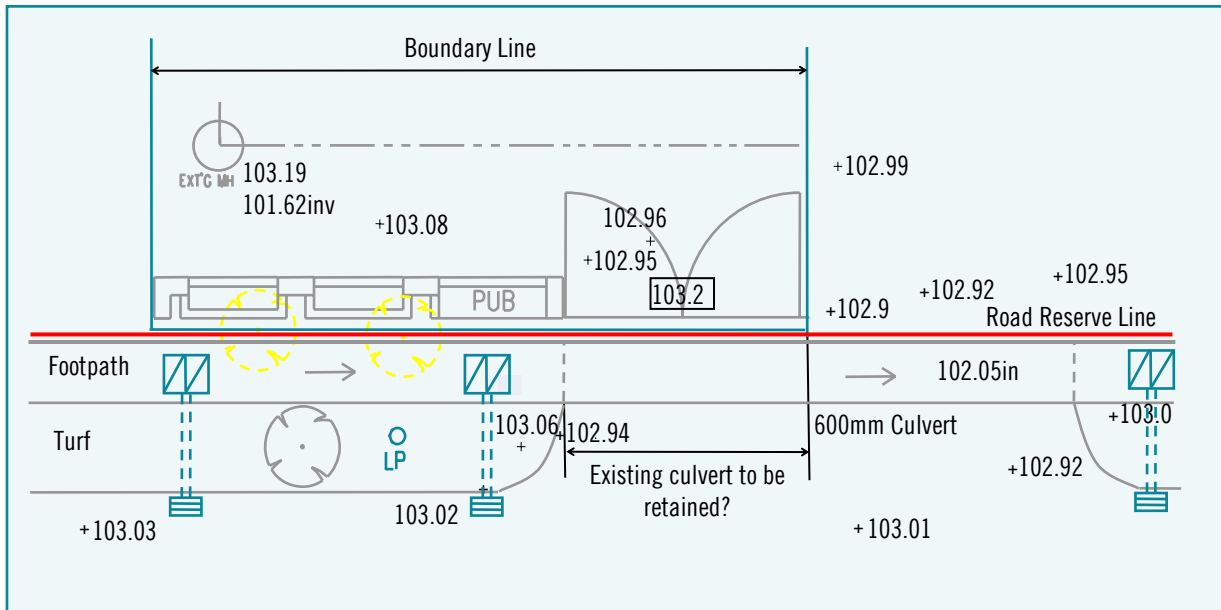


Figure 5.24 Development Frontage (without Road Widening Plot)

- Show boundary line
- Show Road Reserve Line
- Show existing kerblines
- Show existing turf area
- Show existing footpath of adjacent building
- Show existing open/covered drain
- Show existing drop inlet chambers
- Indicate existing road levels, proposed culvert & internal platform levels
- Show existing lamp posts, OG box, traffic signs, manhole & meter compartment
- Show existing traffic markings, road hump, zebra crossing
- Annotate on plan whether the existing culvert is to be retained or is there any proposed works within the road reserve

- Development Frontage (Without Road Widening Plot)

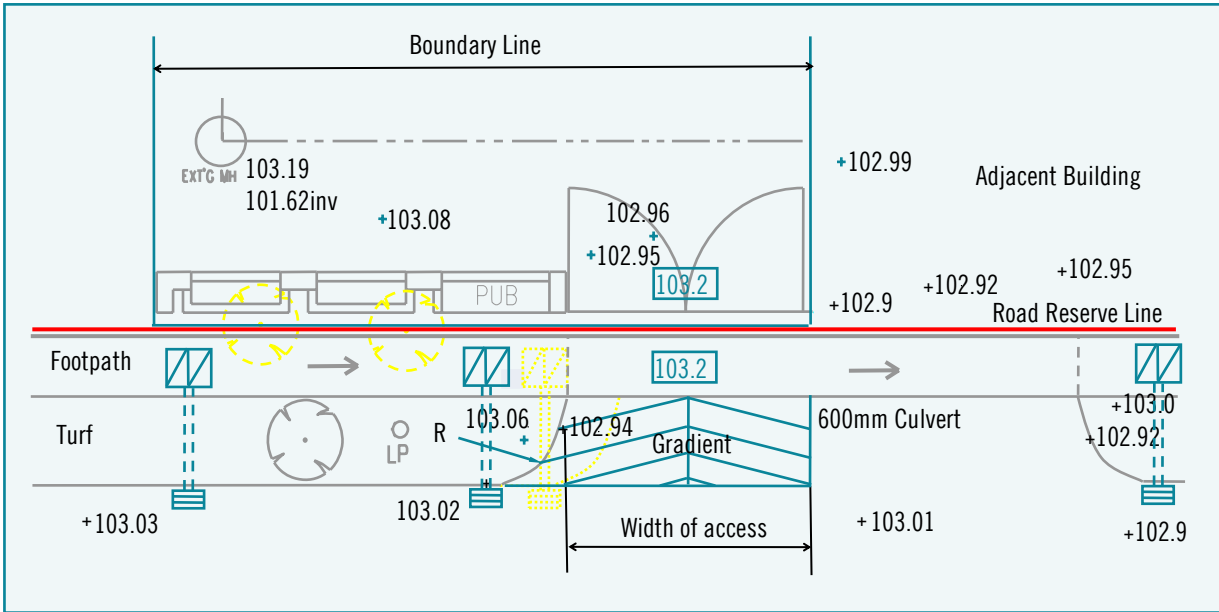


Figure 5.25 Development Frontage (without Road Widening Plot)

- Show road features to be deleted in dotted yellow lines
- Show proposed road features in magenta
- Indicate width of proposed access
- Indicate proposed turning kerb radius
- Indicate the gradient of entrance approach
- Proposed top level of culvert to be higher than existing road level. Otherwise, cut off drain to be provided

5.17 Examples of Various Plans to be submitted

- Site Plan

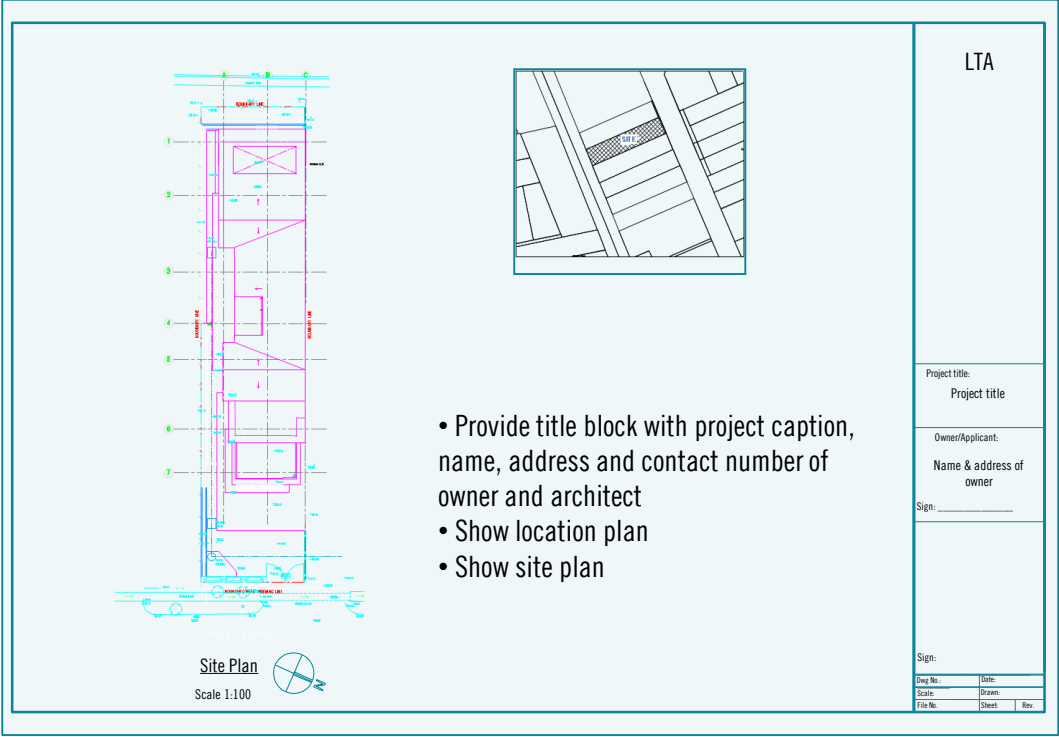


Figure 5.26 Site Plan

- First Storey Plan

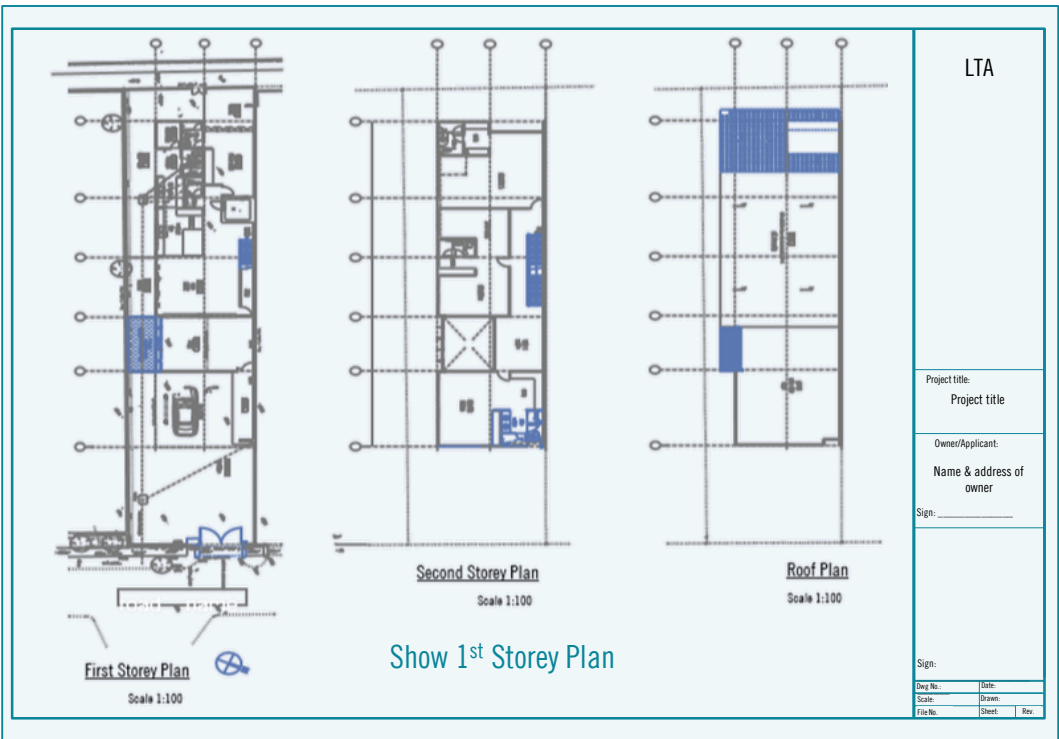


Figure 5.27 First Storey Plan

- Cross-section and Elevation Plans

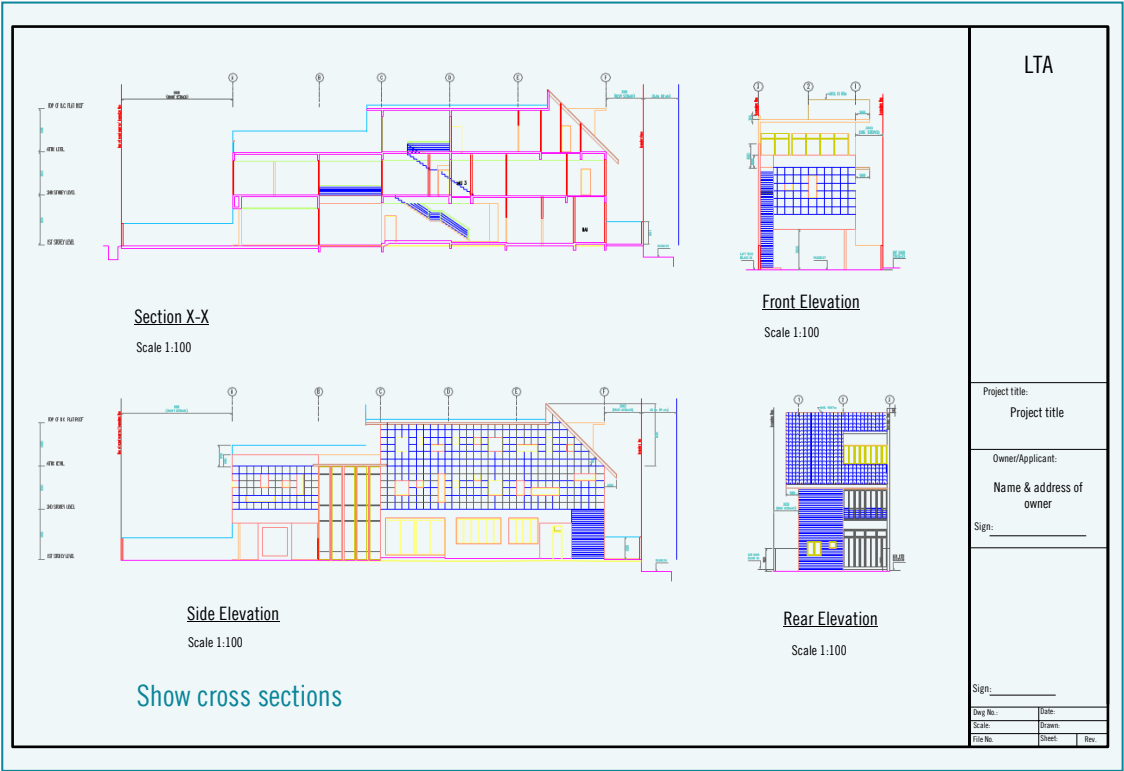


Figure 5.28 Cross-section and Elevation Plans

- Topographical Survey Plan

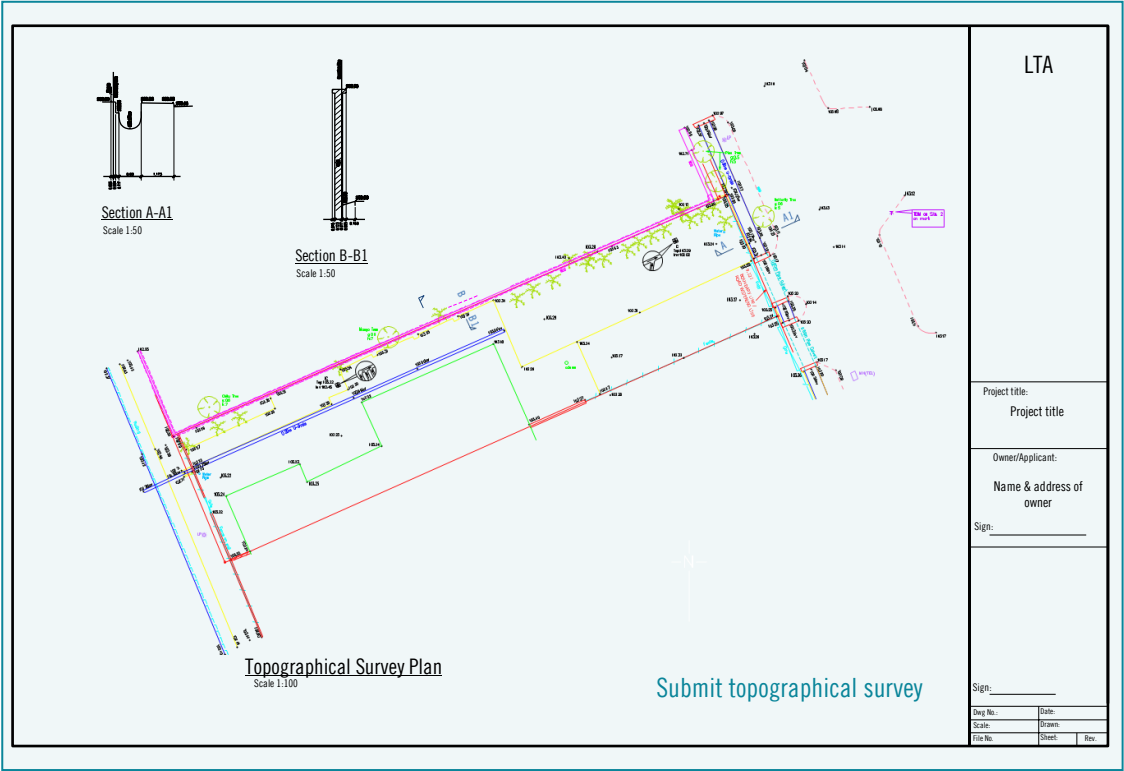


Figure 5.29 Topographical Survey Plan

5.18 Plan Presentation for Traffic Layout Plan

Traffic layout plan is required to be submitted to LTA for approval when there are proposed changes to the current traffic schemes on site or for submission of new street plans connecting to an existing road. This chapter guides consultants to prepare quality traffic layout plans for submission to LTA.

The traffic layout plan shall show the traffic schemes proposed for the new street and the adjoining streets. It is not necessary to show other details not related with the aspects of traffic schemes (i.e. chainages, levels, manholes and other irrelevant details are not require to be shown on a traffic layout plan).

The plan shall be titled as “Traffic Layout Plan” and not as Site Plan, Layout Plan or 1st Storey Plan.

a) The Gazetting Table

The gazetting table below shows the list of proposed traffic schemes to be provided in the new streets.

- (i) All proposed signs/lines/markings, etc to be drawn or placed shall be indicated in the gazetting table according to the road name or proposed road.
- (ii) Traffic scheme details for signs/lines/ markings can be found in LTA Standard Details of Road Elements.
- (iii) All existing signs/lines/markings, etc to be deleted or removed shall be indicated in the gazetting table according to the road name or proposed road.
- (iv) All existing signs/lines/markings, etc to remain shall be highlighted in black in the traffic layout plan.

In some cases, the proposed traffic schemes need to be presented in more than one traffic layout plan. Please note that one table must be drawn for each drawing and all the proposed traffic schemes indicated on the drawing plan must be indicated in that table.

(b) Colour Code

The colour for all proposed, existing and removal of road signs/markings/lines should be in red, black and yellow respectively.

(c) The North Point

It should be indicated at the bottom right corner in the Traffic layout plan.

S/No	Location	Signs To Be Drawn Or Placed	Signs To Be Deleted	LTA File Ref No
1	Proposed Road 1	Arrow markings		
		'Bend' sign		
		'Stop' sign		
		'Slow' sign		
		Single centre white lines		
		Double centre white lines		
		Double yellow lines		
		'Hump ahead' markings		
		'Slow' & 'hump ahead' sign		
2	Proposed Road 2	'Turn left' sign	Double yellow lines	
		Arrow markings		

Table 5.6 Gazetting Table

5.19 Details of Road Reserve / Key Plan / Scale

- (i) The Road Reserve Lines shall be indicated in red in the traffic layout plan.
- (ii) A Key Plan can be indicated on the top left/right hand corner to give a better overview of the location of the proposed road. The key plan shall also indicate development accesses and the names of the surrounding roads in the vicinity.
- (iii) The traffic layout plan and key plan are required to be drawn to scale. (Traffic Layout Plan can be in scale of 1:100, 1:500 or 1:1000 whereas the Key Plan can be in scale of 1:20 000, 1:10 000 or 1:5 000).

5.20 Street Lights

The notional position of street lightings shall be indicated in the traffic layout plan.

5.21 Traffic Lights

Generally traffic lights on public roads are managed by LTA.

- (i) For new traffic lights (if warranted for developer to provide) on public roads/roads that will be handed over to LTA for management in future, the proposed traffic signals will need to be carried out by LTA. This is to ensure that all traffic light installation works satisfy our specification/requirements.
- (ii) The traffic layout plans should also include traffic light poles signals layout, traffic controller/meter and traffic light phasing diagrams.

Note:

- a. After the traffic layout plan is approved by LTA, the Qualified Person (QP) shall liaise with LTA (ITSO) on the payment, installation and the commissioning traffic lights.
- b. The Qualified Person (QP) shall apply/monitor/make direct payments to SingTel and Singapore PowerGrid (SP) Services Ltd for connection of electricity supply and telecom line for installation of new traffic lights. The Qualified Person (QP) shall co-ordinate with PowerGrid, SingTel and any other contractors for the necessary works on the above. They should ensure the services cables connection (electricity supply & telecom line) are ready in time for commissioning of new traffic lights. Generally, this process requires about 3-4 months.
- c. The Qualified Person (QP) shall provide and make available all necessary GI conduit pipes(100mm diameter) and crossings for traffic light contractors to lay the necessary cables for new traffic light installation. GI pipes shall be provided on the carriageway, side table and footpath, leading to traffic light poles, detector pits and controller boxes for new traffic lights installation. Durable red plastic cable slabs shall be placed 200mm above the GI pipes for all trenches dug regardless of the depth to mark their positions. The plastic cable slabs shall be 300mm x 1000mm and marked with the wordings "Traffic Light Cable – 1800 Call LTA – 1800 2255 582.
- d. LTA (ITSO) will thereafter give the final cost estimates for traffic lights installation, which also include Auxiliary Police Officer (APO) CISCO guards on the actual day of commissioning. All payments have to reach LTA (ITSO) The Qualified Person (QP) shall issue cheque payment payable to Land Transport Authority with LTA approved plan at least 4 months prior to the implementation of traffic signals, phasing and commissioning. The cheque payment with approved plan shall forward to following address:

Land Transport Authority
ITS Centre, 181 River Valley Road
Traffic Light Maintenance, Level 4
Singapore 179034
- e. The Qualified Person (QP) shall forward a copy of the official receipt from M/s SP Services Ltd and SingTel to LTA (ITSO) for information and necessary action.
- f. LTA's traffic lights term contractor only carry out physical traffic light installation works. The scope of works does not include all other civil works, installation of traffic signs, lane markings, etc necessary for the proper operation of the new traffic lights.

5.22 Typical Traffic Layout Plan Related to Development With Street works

(i) Stop Line and Sign

The proposed stop line shall be provided at 1m away from the tangent of the kerb line (i.e. edge of the main road). The stop sign shall be provided before the stop line. Refer to Figure 5.30.

In some circumstances, where the sidetable is not wide (Category 5 road with less than 3m sidetable), the stop line at the entrance point can be placed within the private boundary.

It is emphasised that the boundary walls (if any), to be designed such that pedestrians crossing the entrance are able to see motorists exiting from the private development.

- (ii) Arrow markings
 - a. The left-turn arrow marking on the main road should be painted about 10m from tangent point before side road/ service road/access point.
 - b. To provide at least one set of arrow markings before a junction for residential estate roads.
 - c. To provide 2 sets of arrow markings for mid block signalised pedestrian crossing.
 - d. It is not necessary to indicate left/right turn arrow marking on the main road to lead motorists to the access to developments.
- (iii) Removal of existing lines / markings (e.g. double yellow lines etc).
 - a. The deletion of the markings and lines shall be shown in yellow. Refer to Figure 5.31.
 - b. The provision of double yellow lines at the proposed entrance shall be provided up to the edge of entrance culvert.

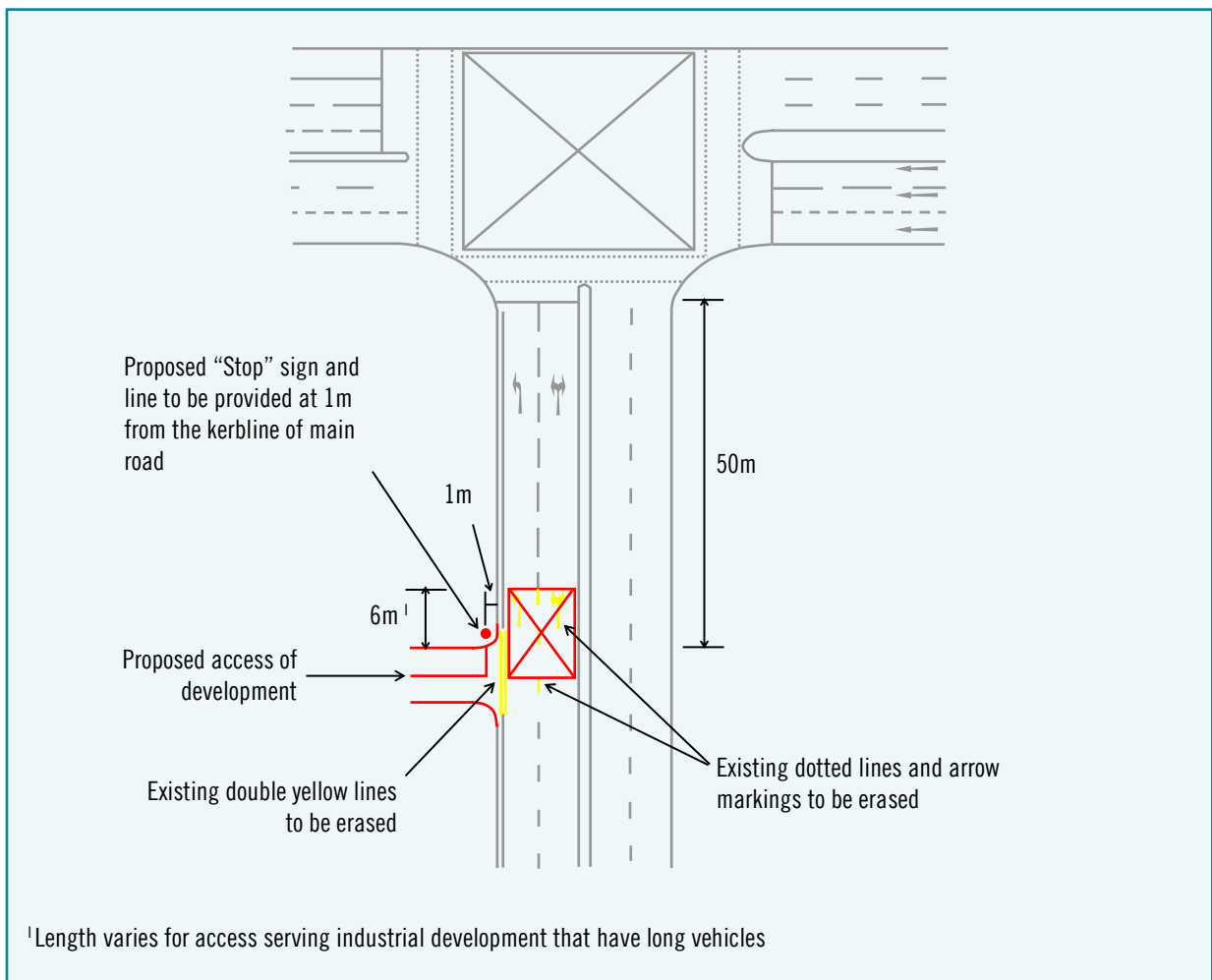


Figure 5.30 Proposed Development Access Meeting a Road near a Junction

- (iv) Proposed lines, markings, signs and other road features (e.g. yellow box, bollards etc).
 - a. The proposed lines/markings/signs are to be shown on plan in red colour. Refer to Figure 5.31.
 - b. The new schemes are to be indicated in the gazetting table.
- (v) Speed calming measures (e.g. humps, bus friendly hump, etc).
 - a. The proposed road hump is usually provided at the residential roads to deter speeding.
 - b. If the proposed entrance is affected by an existing road hump, relocation of the existing road hump and markings to an appropriate location are necessary. The existing hump shall not be allowed to front an access. Refer to figure 5.31.
 - c. Prior to the relocation of the existing road hump, the consultant is required to inform the grassroots organization(s), Citizen Consultative Committee (CCC) of the estate and the immediate residents affected on the new location of the road hump after their traffic study.
 - d. Normal road humps, or round top humps, have been found to be unsuitable for buses as they can cause discomfort or even injuries to standing passengers. For such instances, the bus friendly hump is provided.

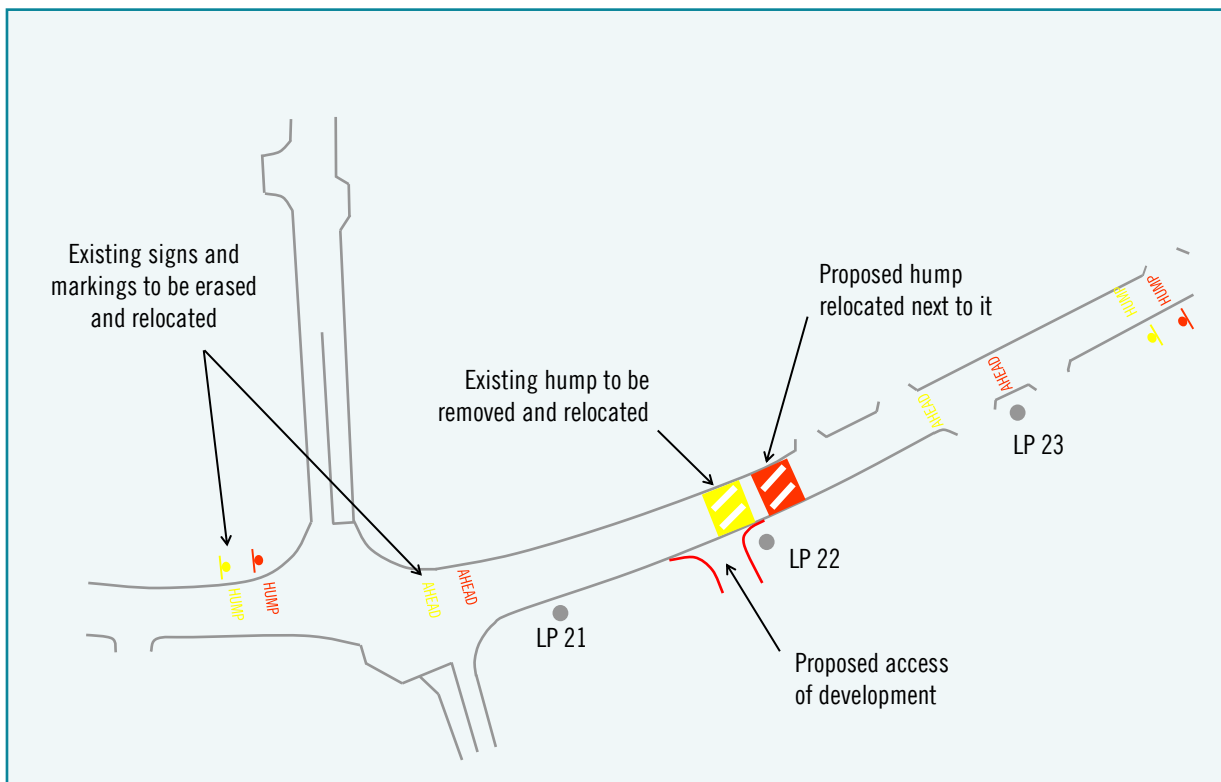


Figure 5.31 Proposed Development Access Affected by the Presence of an Existing Hump

(v) Pedestrian crossing

If the existing pedestrian crossing is affected by the proposed road or new access location, the new crossing and its related lines, markings, signs and traffic lights shall be relocated accordingly.

The cost of the installation of the new traffic signals etc shall be borne by the developer.

Examples of pedestrian crossing facility shown in traffic plan are push button crossing, zebra crossing, pedestrian overhead bridge, pedestrian underpass etc.

(vii) Shared arrow markings (left-turn and straight arrow) before access to development.

Shared arrow markings can be placed prior to:

- a HDB access;
- a condo access with development exceeding 600 units; and
- a dual 2-lane road or 2-lane 2-direction road (10m wide).

These markings serve as a information on the access ahead and alerts motorist to drive at an appropriate speed when approaching these accesses.

(vii) Enhanced School Zone (ESZ) schemes

Road safety for primary school students is a paramount concern for all of us. To improve road safety for primary school children and to increase the visibility of the presence of primary schools, the enhanced school zone (ESZ) schemes was introduced. (Refer to diagrams in next pages).

The key feature of the ESZ scheme is the coloured road pavement, with an aim to alert motorists that they are in the vicinity of a primary school. Motorists should slow down and look out for students especially during school hours.

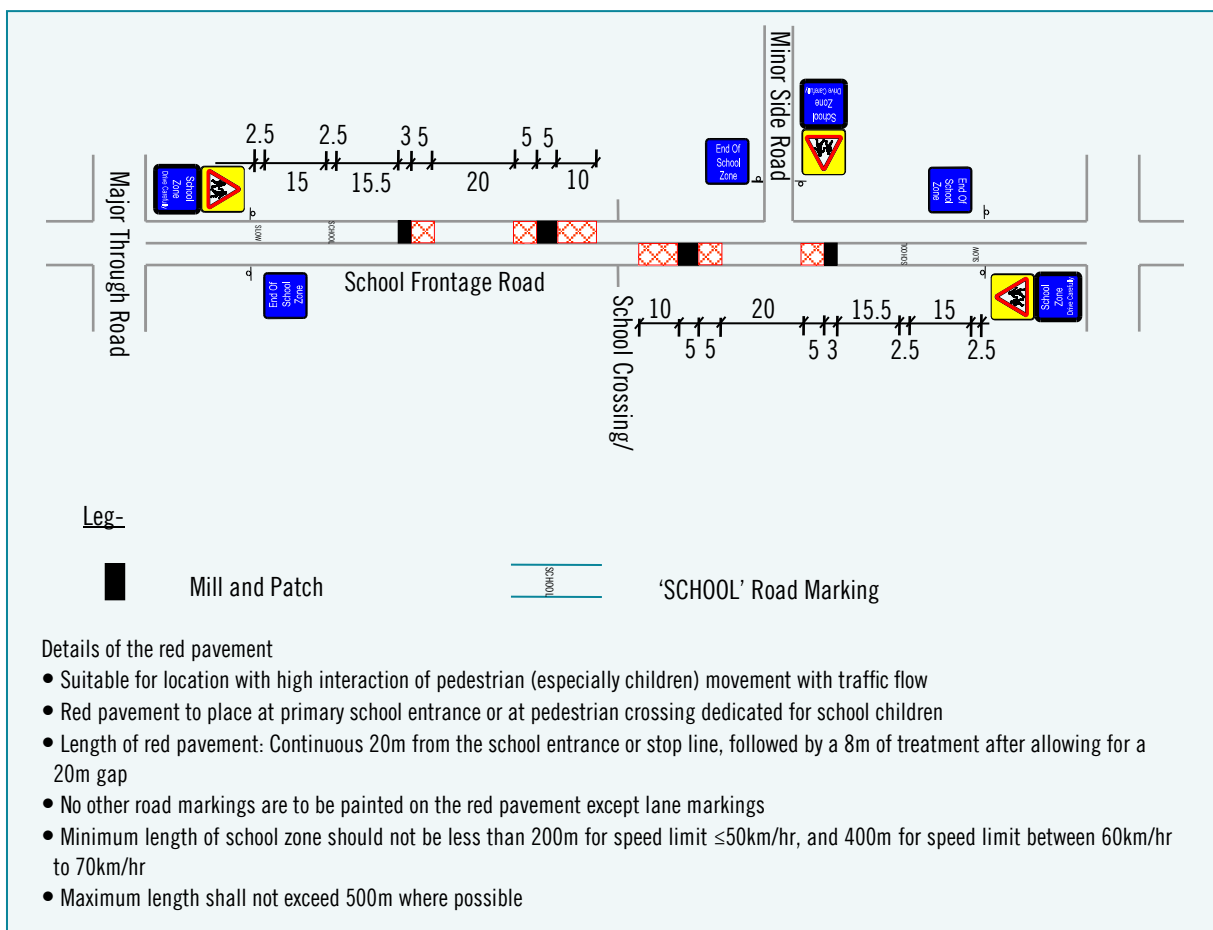


Figure 5.32 Enhanced School Zone Scheme

(ix) Typical Cross and T-junctions

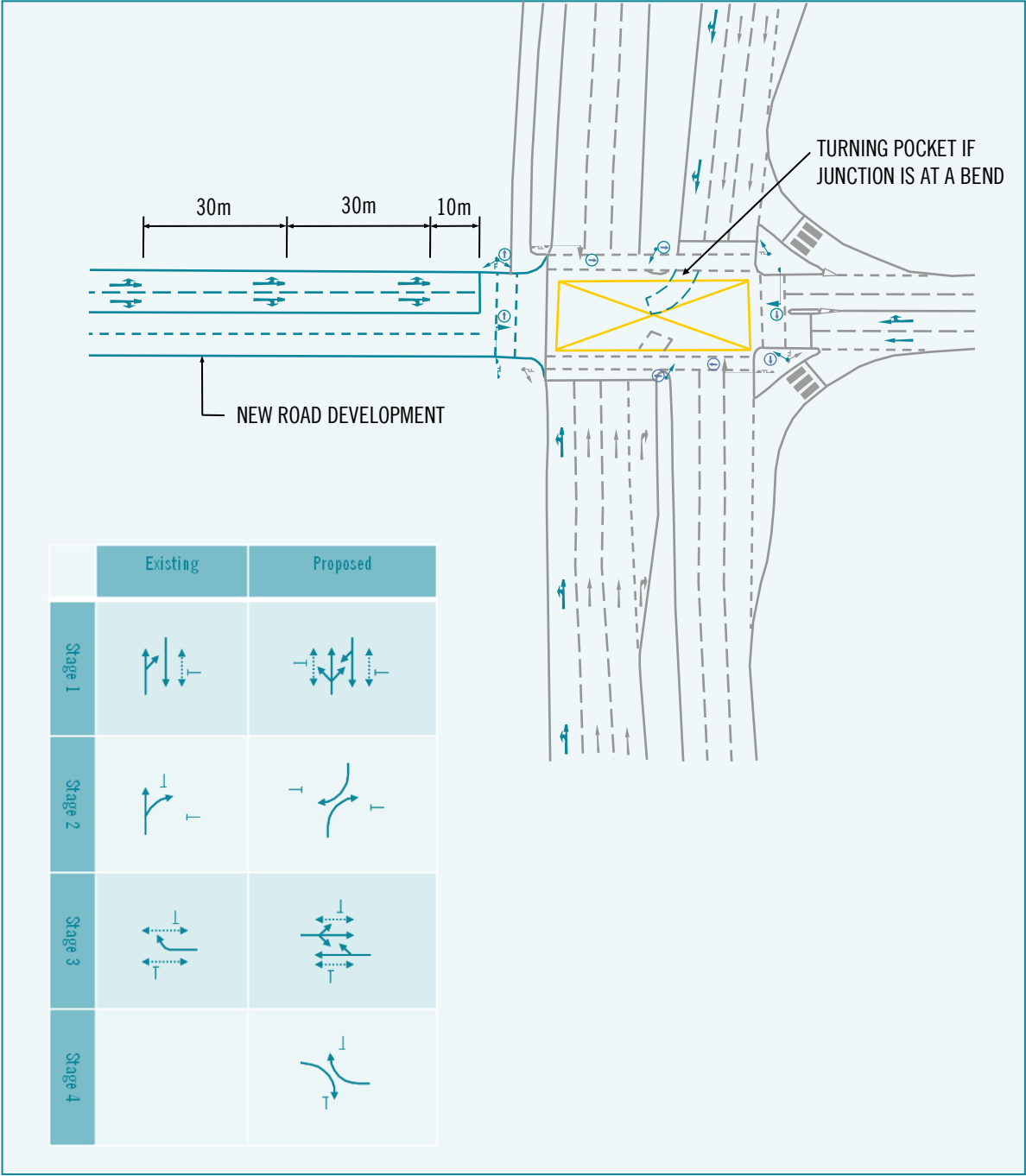


Figure 5.33 Traffic Scheme at Typical Cross and T-junctions

(x) Taxi stand

The following documents are required for gazetting purpose:

- Cover letter or acknowledgement from the development indicating their intension to gazette the taxi stand.
- Completed ADC checklist for taxi stand endorsed by the development (if there is any requirement that cannot be met, developer must provide supporting reasons).
- Floor plan/layout of taxi stand and surrounding traffic scheme.
- Photographs of the completed taxi stand.

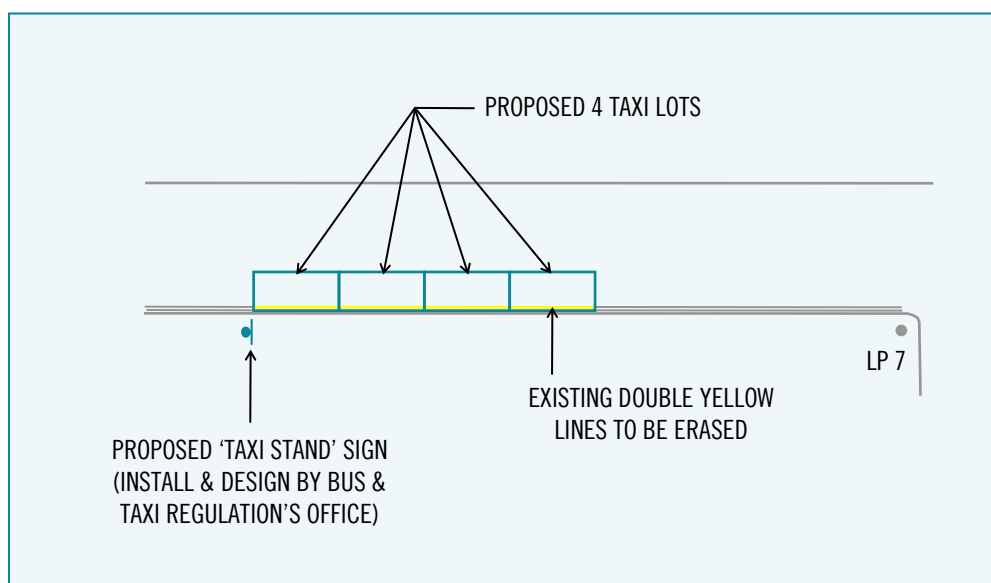


Figure 5.34 Taxi Lots Without Bay

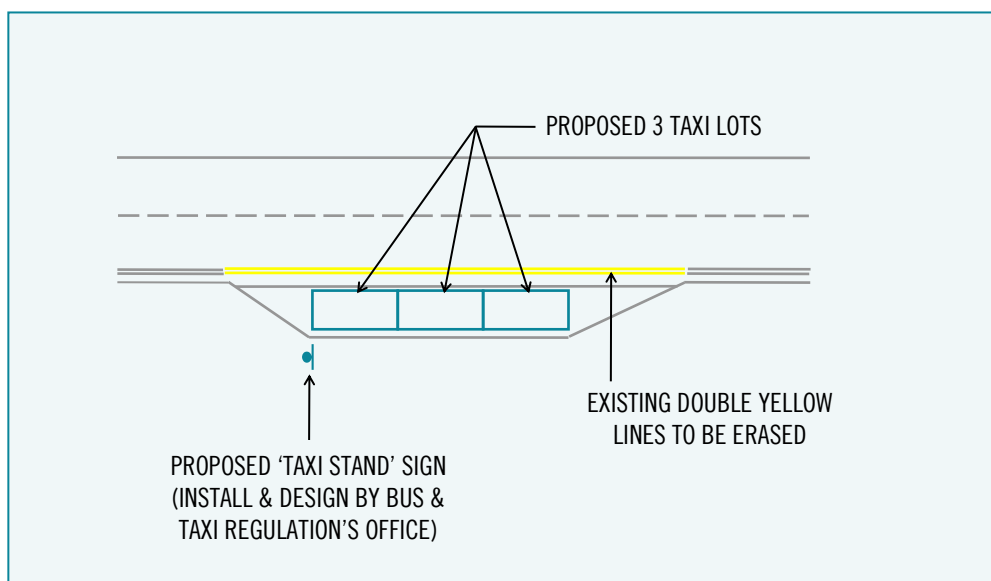


Figure 5.35 Taxi Lots With Bay

Sample Traffic Plans

Samples of quality traffic plans are given below for reference:



Plans	Description
Sample Plan 1	Proposed 26.2m road at a T-junction
Sample Plan 2	Proposed 21.4m road with bus-bay construction
Sample Plan 3	Proposed 18.0m road at a T-junction
Sample Plan 4	Proposed 21.4m road at a T-junction
Sample Plan 5	Proposed 21.4m road at a T-junction

Checklist to Assist in Preparing a Traffic Plan



The following two parts of checklist are designed to assist PE in ensuring that all relevant information for a complete Traffic Layout Plan has been captured in the submission. These checklist shall accompany the Traffic Layout Plan.

Traffic Layout Plan Submission Checklist

Project Title:

Revision No.:

Notes to QP:

1. The Professional Engineer (PE) shall check that the items listed below have been complied and shall indicate it in the box provided. The QP shall state the reasons for not complying with items that are marked " Not Complied"
2. For the subsequent submissions, please attach the "checked copy" Traffic Plan.
3. Please note that the comments for the traffic plan submission shall not be deemed exhaustive and final. Further comments may be applicable depending on the review of the re-submitted plans .
4. Please note that our reply is limited to specific technical considerations under LTA's purview only and it is based on data available at the time of enquiry. The reply is given without prejudice to any changes which may take place subsequently.
5. For details on specific items/features in the checklist, please refer to relevant chapters of this the Code or the Standard Details of Road Elements.

Tick the appropriate box for all items

S/N	Item	Requirements	Complied	Not Complied	Remarks
1	Title	To indicate "Traffic Plan" and not "Site Plan" or "Traffic Scheme Plan".	<input type="checkbox"/>	<input type="checkbox"/>	
2	Project title	To provide description of project in traffic plan.	<input type="checkbox"/>	<input type="checkbox"/>	
3	Key Plan	<ul style="list-style-type: none"> • To indicate "Key Plan" and not "Location Plan" • To include "Key Plan" in the Traffic Plan and place it on the top left hand corner. • The scale can be 1:20,000 or 1:10,000 or 1:5,000 • To indicate access points in the "Key Plan" 	<input type="checkbox"/>	<input type="checkbox"/>	
4	North Arrow	To include North Arrow indicator.	<input type="checkbox"/>	<input type="checkbox"/>	
	Indicator		<input type="checkbox"/>	<input type="checkbox"/>	
5	Legend	To include legend in plan.	<input type="checkbox"/>	<input type="checkbox"/>	
6	Scale and size for traffic plan	1:100 / 1:500 / 1:1000, A3 / A1 size.	<input type="checkbox"/>	<input type="checkbox"/>	
7	Gazetting Table	To include a gazetting table.	<input type="checkbox"/>	<input type="checkbox"/>	
8	PE Endorsement	To include PE Endorsement.	<input type="checkbox"/>	<input type="checkbox"/>	
9	Colour code	The colour for all proposed, existing and removal of road signs / markings / lines should be in red, black and yellow respectively.	<input type="checkbox"/>	<input type="checkbox"/>	

S/N	Item	Description	Complied	Not Complied	Remarks
10	Existing & Proposed road markings	To include all existing or proposed road markings or signs in the Traffic Plan.	<input type="checkbox"/>	<input type="checkbox"/>	
11	Turning Radius	Indicate turning radius of accesses, junctions, etc. in traffic plan.	<input type="checkbox"/>	<input type="checkbox"/>	
12	Road names	All road names to be indicated, including new roads.	<input type="checkbox"/>	<input type="checkbox"/>	
13	Neighbouring Roads	To include neighbouring roads / streets connecting to the development so as to give an overview of the surrounding environment.	<input type="checkbox"/>	<input type="checkbox"/>	
14	Footpath	To indicate footpath in traffic plan.	<input type="checkbox"/>	<input type="checkbox"/>	
15	Street Lights	Notional position of street lights shall be indicated.	<input type="checkbox"/>	<input type="checkbox"/>	
16	Access	Indicate vehicular access, pedestrian access and service access (bin centre, loading/unloading, etc.) clearly in the traffic plan. Where applicable, include visitor lane for building development. This will minimise delay to residents from entering the development.	<input type="checkbox"/>	<input type="checkbox"/>	
17	Railings	To indicate existing / proposed railings in the traffic plan.	<input type="checkbox"/>	<input type="checkbox"/>	
18	Stop line / sign	To indicate "stop" line (1m from kerbline) and /or sign and drop barriers (if any) at the access point.	<input type="checkbox"/>	<input type="checkbox"/>	
19	Barriers	To set back drop barriers of at least two cars' length from the public road.	<input type="checkbox"/>	<input type="checkbox"/>	
20	Lane Widths	To indicate lane widths in traffic plan.	<input type="checkbox"/>	<input type="checkbox"/>	
21	Arrow marking	Please refer to the Section 10.7 for details on provision of arrow markings on public road leading to development access.	<input type="checkbox"/>	<input type="checkbox"/>	
22	Signs	All signs to be installed in a conspicuous manner (not obstructed by structures, trees, shrubs, etc.) and to be indicated clearly in the plan	<input type="checkbox"/>	<input type="checkbox"/>	

Table 5.7 Checklist to Assist in Preparing a Traffic Layout

5.23 Application for Temporary Crossings

5.23.1 Introduction

If an applicant wishes to gain access to his development site during the course of construction other than the approved access, he must apply for a temporary crossing from LTA. Consideration for the location of the temporary access is same as that for a permanent access. (Refer to Section 4.2)

You can submit an application for temporary crossing via the LTA.PROMPT website: <http://prompt.lta.gov.sg>.

The temporary crossing shall be demolished on completion of the foundation / building works and all damages made good to the satisfaction of LTA.

5.23.2 Specifications

The temporary crossing shall not rest directly on top of the drain and shall be independently supported at least 300mm away from the wall of the drain. The soffit shall be elevated at least 150mm clear of the cope of the drains.

Provide measures to protect the drain from any surcharge load exerted by the temporary crossing.

Proper and adequate warning signs etc are to be erected to warn motorists of any danger arising out of the temporary crossing.

Provide ramps between existing footpath / covered drain and temporary crossing so as to allow continuity of pedestrian movement. This is to be clearly shown on the site and cross-section plans.

5.23.3 Plans to be Submitted

- 3 copies of plans
- Submit proper drawings of site plan of 1:500 scale, detailed plan and cross-section in 1:20 scale, of the temporary crossing. All drawings to be incorporated onto A1 size plans.
- Indicate kerb turning radii and width of temporary access
- The following undertaking statement by the owner/developer is to be endorsed on the plans:

"I/We the owner / developer shall be fully responsible for any damage or subsidence, as determined by LTA, to public property such as road carriageway, drain, footpath, kerb and other street furniture caused by or arising out of the usage of temporary crossing and shall take immediate action to rectify / reinstate the road and its appurtenances to the satisfaction of the LTA".

5.23.4 Site Maintenance

The developer, QP and contractor are jointly responsible for the cleanliness of the site. All parties concerned shall ensure that no building materials, equipments or debris are stacked along the footway, the planting verge or the drain so as to cause obstruction to pedestrians and the free flow of the drain. There shall be no loading / unloading of building materials as well as no parking / waiting of construction vehicles along the road.

The developer, QP and contractor are liable for prosecution as stipulated in the Street Works Acts (Obstruction of public streets, five-footways and private footways) if the construction materials pose an obstruction on the public street.

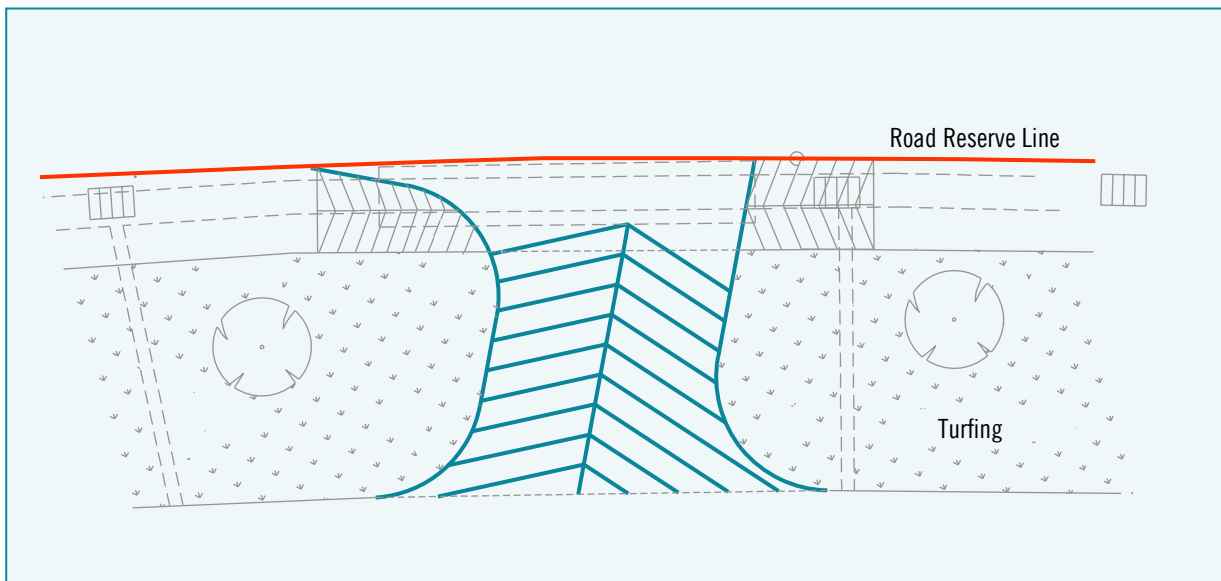


Figure 5.36 Plan of Temporary Access

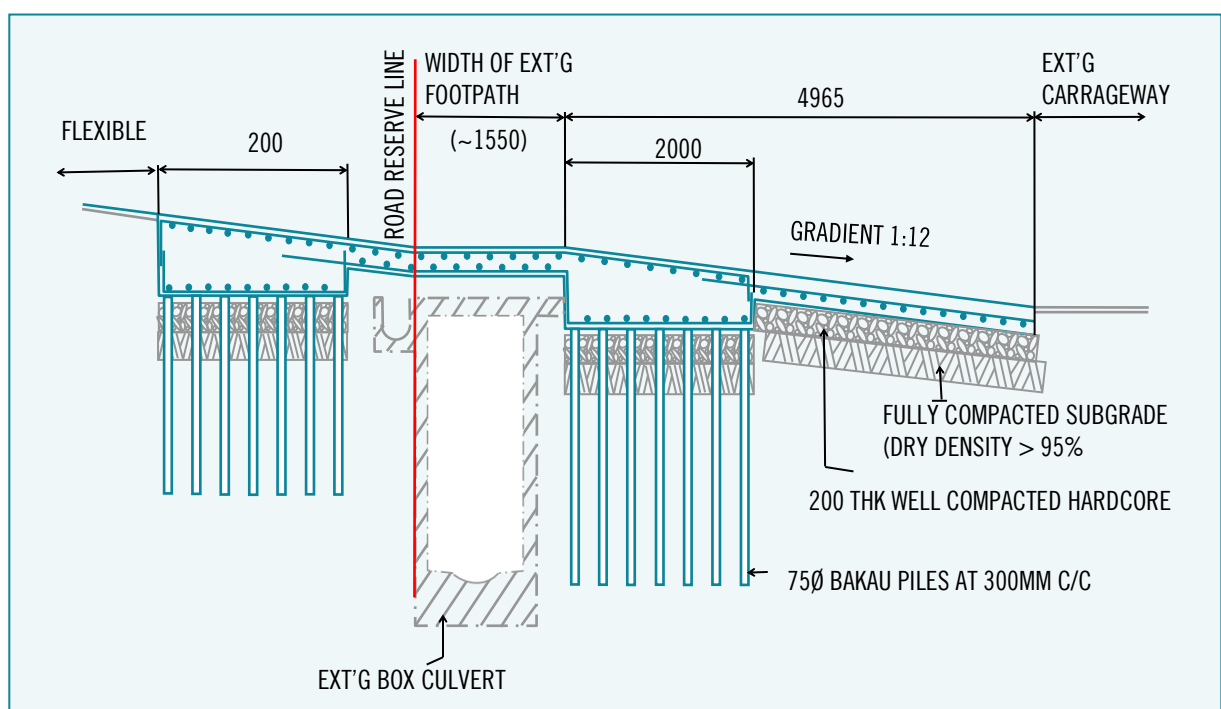


Figure 5.37 Plan Showing Cross Section of Temporary Access

Appendix 5A - USP Guidelines & Conditions

The QP shall submit the Utility Services Plan (USP) required for the development, duly endorsed by the QP and respective utility service agencies for LTA's approval, during the submission or lodgement of the Street Plans.

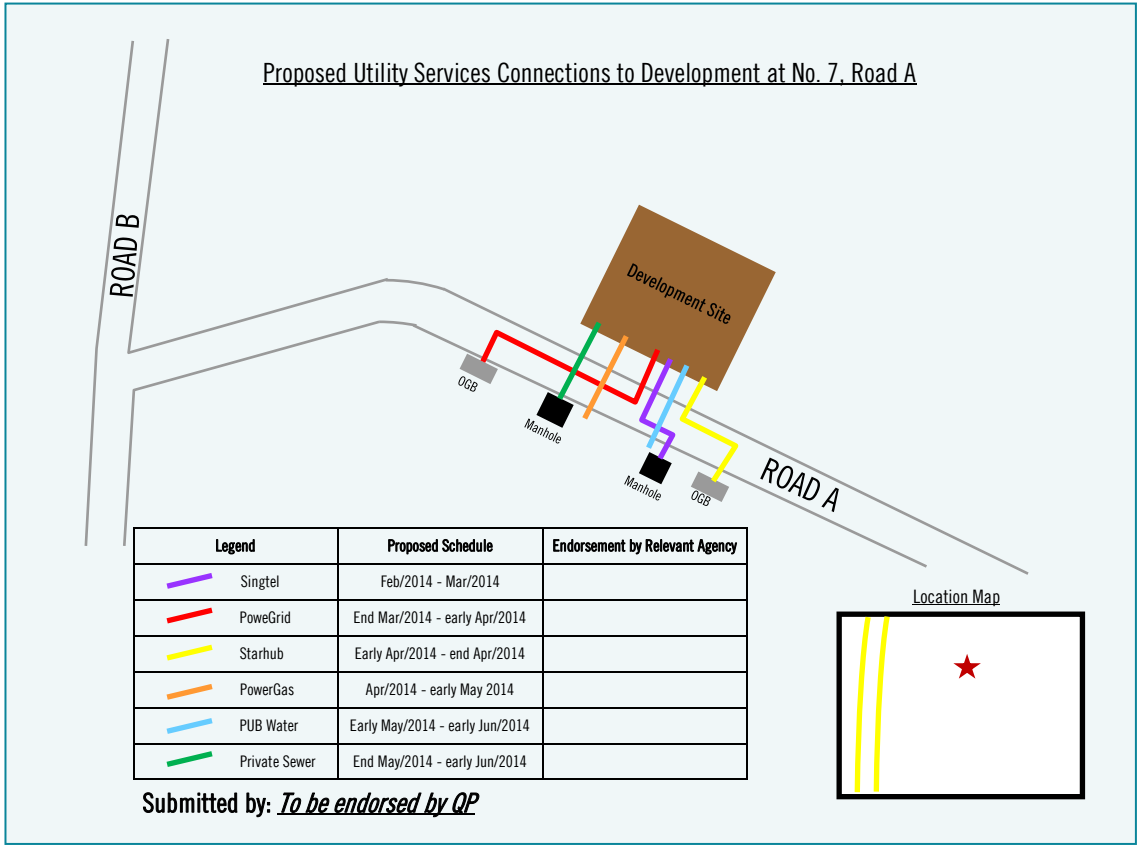
The evaluation criteria shall include, but not limited to, the following:

- a) Routes of utility services with the locations of start and end points that are clearly indicated with a distinct colour for each service on the plan;
- b) Positions of over-ground (OG) boxes and/or manholes are clearly shown on the plan with indication of whether they are existing or proposed;
- c) Works are sequentially staged for each type of utility service with not more than 1 week time lapse in between each type of utility service laying work; and
- d) Endorsement by the QP and relevant utility service agencies of the proposed utility service routes and work schedules on the plan.

If there are any subsequent changes to the approved plan, the QP shall resubmit the USP to LTA for review and re-approval not less than 3 months from the proposed utility work schedule.

The applications for laying of the utility services will be rejected if there are any deviations from the approved USP or if there is no submission of USP to LTA during the Street Plan stage.

QPs are advised to ensure that the USP (including any subsequent amendments) is duly submitted and approved by LTA to avoid any delays at the time of application for the execution of works.



This chapter sets out the key elements of a road declaration plan for submission to LTA before the road is declared as public and handed over to LTA for maintenance.



Chapter 6

Declaration of Public Streets

Glossary

Road Declaration Plan

A plan showing the boundary of road to be declared as a public street.

Declaration of Public Streets

6.1 Introduction

Upon completion of a new road, a road declaration plan shall be prepared and submitted to LTA before the road is declared as public and handed over to LTA for maintenance.

This chapter discusses key elements that should be incorporated in a road declaration plan.

6.2 Submission

There are 2 stages of submission for the declaration plan comprising the draft declaration and the final declaration plans. Once the draft declaration plans have been cleared by LTA, the registered surveyor may proceed to sub-divide the lots occupied by the road based on the Road Reserve Line.

Once sub-divided, the registered surveyor may prepare the final declaration reflecting the sub-divided lots. 12 hardcopy sets of the final declaration plan shall be submitted to the LTA office at 251 North Bridge Road.

6.3 Draft Declaration Plan

The draft declaration plan shall include the following key elements:

- Location plan
- Road name
- Boundary of road to be declared as public street
- Width of Road Reserve
- Width of carriageway
- Road kerb alignment
- Adjacent lot number and house number
- Correct colour scheme for land ownership
- Legend
- Project title containing road name and lot number

The consultant shall also check and confirm that the boundary of road to be declared tallies with the approved street plan and Master Plan Land Use. If there is any discrepancy/change, the consultant shall highlight to LTA and seek to regularise the discrepancy with the relevant agencies.

6.4 Final Declaration Plan

The following are the additional information required in the final declaration plan:

- The lot number shown in the declaration plan shall tally with that shown in the Certified Plan.
- It shall not contain part lot(s) for the road to be declared.
- Project title shall indicate the road name and latest lot number(s).
- Road name shown in the plan shall be approved by the Street and Building Names Board (SBNB).
- Consent is to be obtained from the land owner if the road to be declared contains Statutory Board land eg. HDB land, JTC land etc.

6.5 Colour Scheme

A road to be declared may contain land lots with multiple ownership. The correct colour scheme shall be used for such land lot(s).

Please follow the colour codes in the following table.
















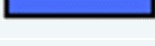
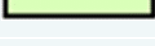




S/N	Fill	Micro-station Colour Number	RGB Values	Land Status
1		140	218, 165, 32	AVA Land
2		28	222, 109, 255	CAAS Land
3		151	0, 255, 222	ENV Land
4		248	245, 170, 170	HDB Land
5		42	185, 182, 255	JTC Land
6		49	255, 168, 218	LTA Land
7		219	175, 175, 0	MINDEF Land
8		36	255, 210, 109	MND Land
9		144	255, 255, 222	MSF Land
10		5	0, 255, 0	NPARKS Land
11		217	221, 221, 0	MOE / NUS / NTU Land
12		9	255, 218, 255	PRIVATE Land
13		121	0, 218, 255	PSA Land
14		40	185, 255, 255	PUB Land / MEWR
15		3	255, 255, 0	STATE Land
16		92	74, 109, 255	SDC Land
17		161	218, 255, 185	SSC Land
18		233	215, 215, 215	TELECOMS Land
19		136	245, 0, 0	MHA Land
20		72	111, 255, 255	MHA Land
21		11	255, 145, 255	MOF / INLAND Revenue Land

Table 6.1 Colour code representation for land ownership

6.6 Plan Samples

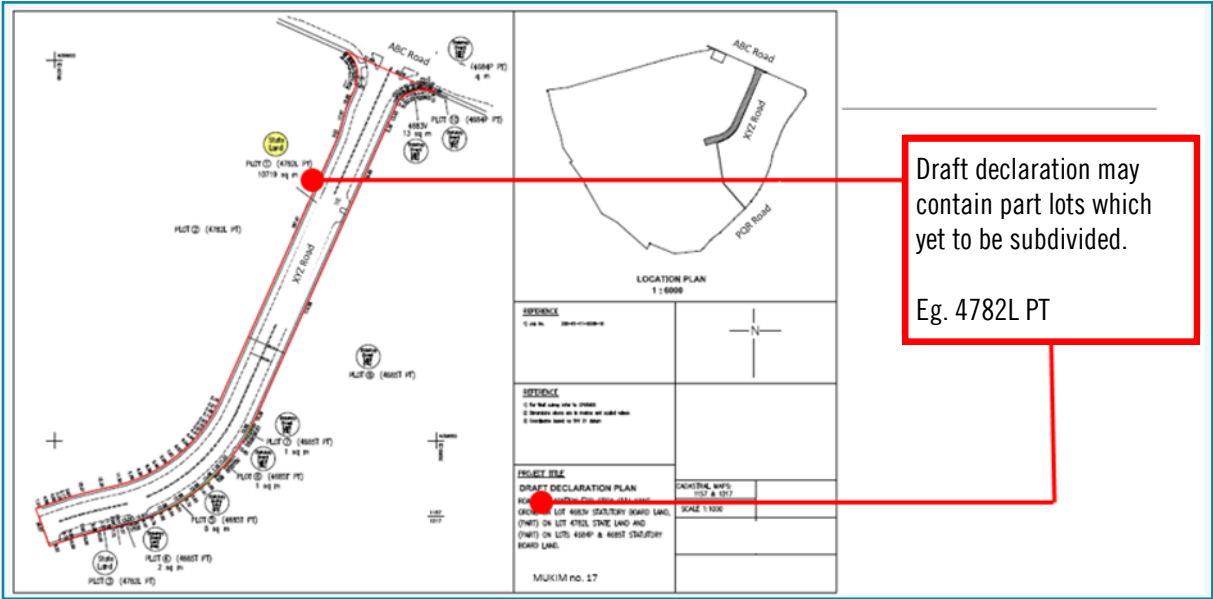


Figure 6.1 Draft Declaration Plan

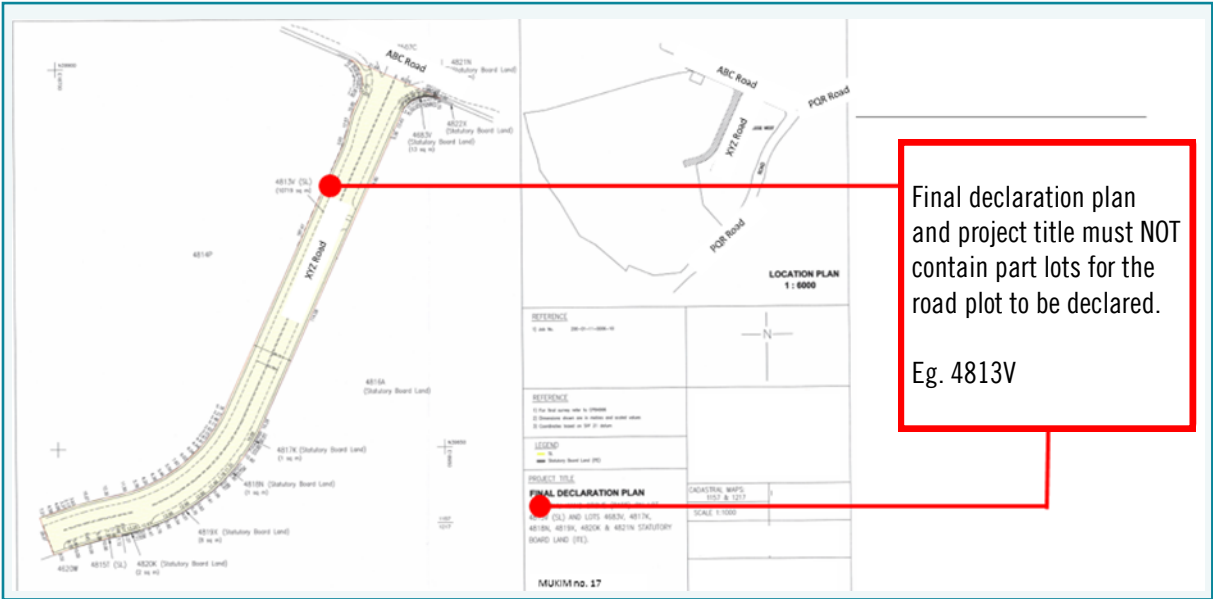


Figure 6.2 Final Declaration Plan

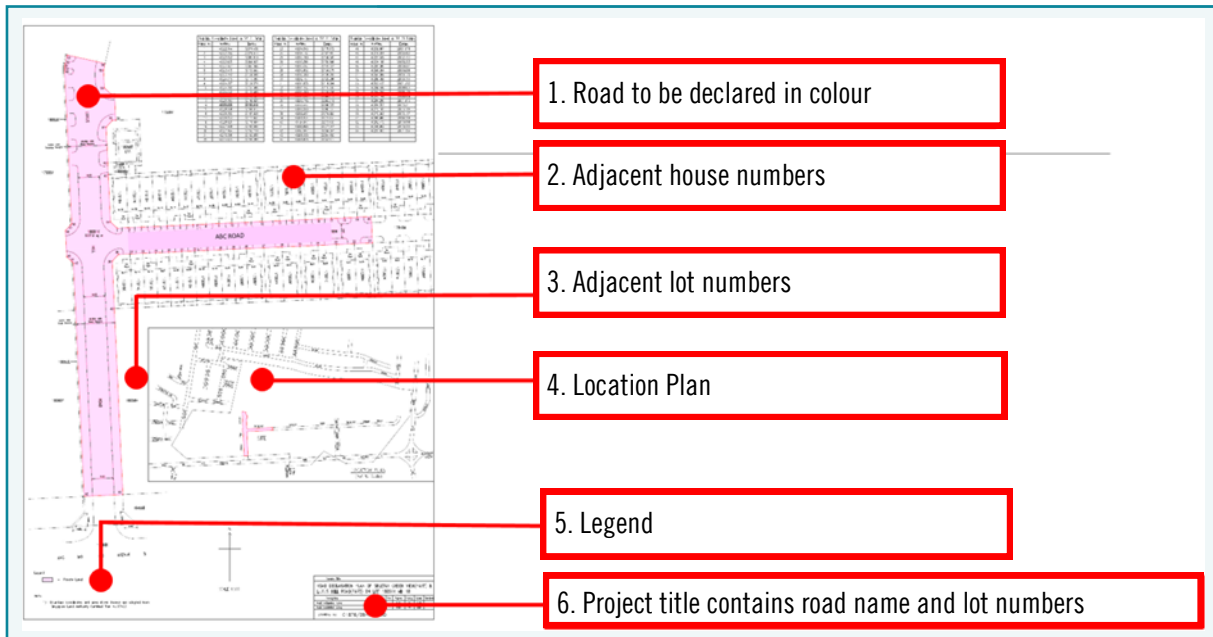


Figure 6.3 Key elements to be reflected

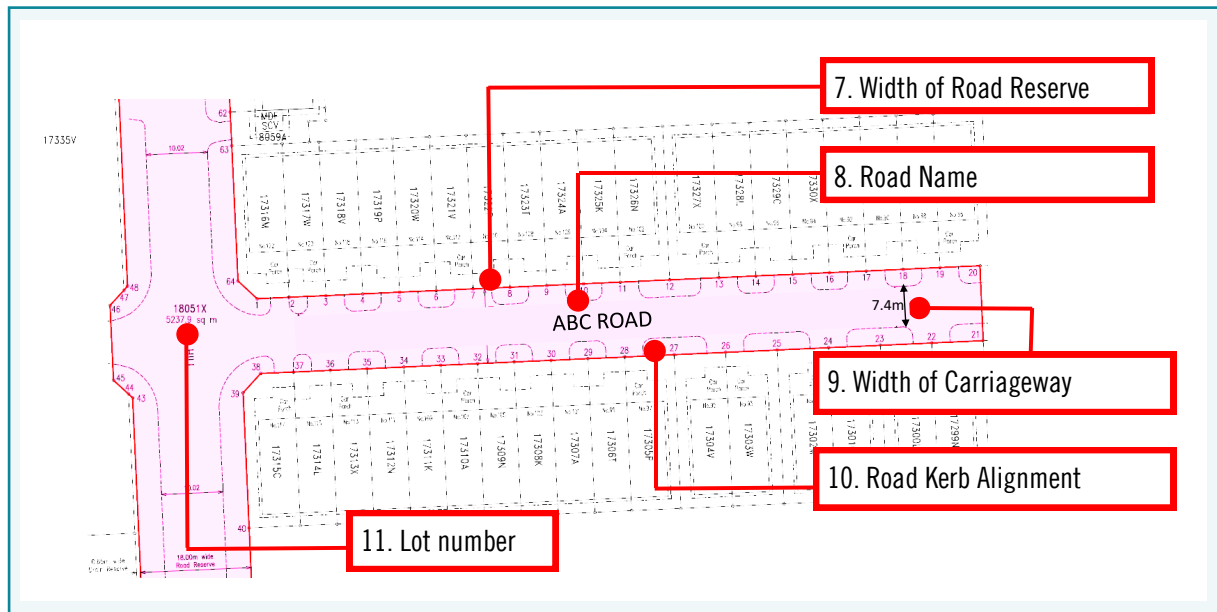


Figure 6.4 Key elements to be reflected

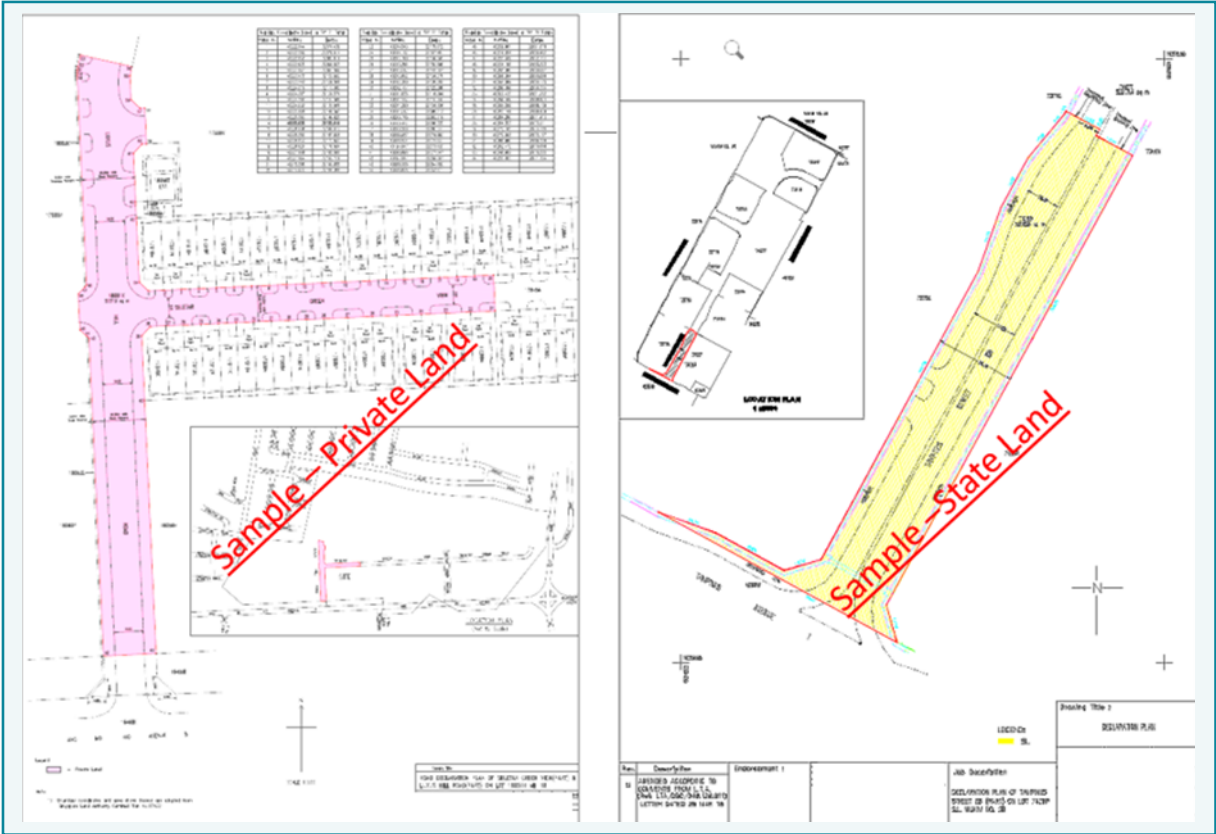


Figure 6.5 Different colour scheme

This chapter sets out the procedure for expunction of public streets that are affected by private or statutory board development proposals.



Chapter 7

Expunction of Public Streets

Glossary

Alienate

The transfer of property or a right into the ownership of another.

Chapter 7

Expunction of Public Streets

7.1 Introduction

This chapter establishes the procedures for the expunction of a Public Street. This applies to development proposals involving a complete removal or part of an existing public street from the road network, by a private developer or a government agency.

7.2 Reference

 SWA

Street Works Act (Chapter 320A)

7.3 Expunction of Existing Public Street

Expunction of a public street refers to the partial or complete removal of any public street from the existing road network. The land containing the road after expunction may be returned to State or alienated to private developers for other landuse development. It is different from the temporary closure of public road to facilitate construction activities or to be used for special events.

Section 5 of the Street Works Act stipulates that any expunction of a public street shall be approved by the Minister for Transport. If the existing traffic circulation is affected by the proposal, the developer must provide an alternative route prior to the physical closure of the affected street and undertake any other modification works necessary to support the road expunction.

The process involved in the expunction of public streets is outlined in Figure 7.2.

7.4 Application by Private Developer or Government Agency

Any proposals to alienate a piece of State Land, which contains a public street, to form part of a private development shall be made to the Singapore Land Authority (SLA). Under the SLA's land alienation process, the SLA would in turn consult various government agencies having an interest in the State Land. Eventually, when the applicant accepts SLA's offer to alienate the State Land containing the public street, he would have to work closely with LTA to follow through to obtain approval to expunge the public street.

The applicant shall furnish a letter indicating the reasons for the expunction of the road and propose any alternative access arrangement if the existing traffic circulation is affected by the proposal. The applicant shall also identify any possible affected parties / stake-holders and seek consent from the affected parties / stake-holders for the expunction.

Once the applicant obtain SLA's in-principle approval, the private developer is advised to obtain clearances from the various authorities as shown in the "List of Authorities to Clear for Expunction of Public Streets" in Section 8.6. LTA will assist to obtain the comments from the MP for the Constituency and the Chairman of Citizen Consultative Committee for Constituency (CCC) for private expunction requests by private developers.

For projects by government agencies (i.e. JTC, HDB, URA, MOE, etc), they will seek the comments directly from the MP for the Constituency and the Chairman of Citizen Consultative Committee for Constituency (CCC) with their Master Plan approval.

The following are the documents that are required to support the proposed expunction of a public street:

- Clearances from the various authorities as shown in Section 7.5 “List of Authorities to Seek Clearance for Expunction of Public Street”.
- Written Permission / Master Planning Committee approval on the use of the State Land occupied by the expunged road proposed to be, or Landuse Plan/rezoning of landuse;
- In-principle approval from the Singapore Land Authority on the alienation of land;
- A plan (A4 size) showing the extent of the existing road to be expunged.
- Applicant’s / QP’s confirmation that all residents / tenants affected by the proposed expunction have vacated.

7.5 Approval

When Minister’s approval for the expunction of the public street is obtained, the applicant will be required to carry out the following:

To erect temporary information signs along the road to be expunged informing motorists of the impending closure at least 4 weeks before the physical closure of the road. (Please refer to figure 7.1) The temporary information signs and revised traffic scheme of the connecting roads shall be submitted to LTA (DBC) for approval.

Upon closure of the road, existing street name plates, road signs etc, which are made redundant have to be removed. Affected existing traffic signs are to be amended as necessary. Applicant shall also carry out the modification to all road facilities (e.g. street lighting, pavement, kerb, traffic light, vehicular impact guardrail, bus shelter etc.) affected by the expunction.

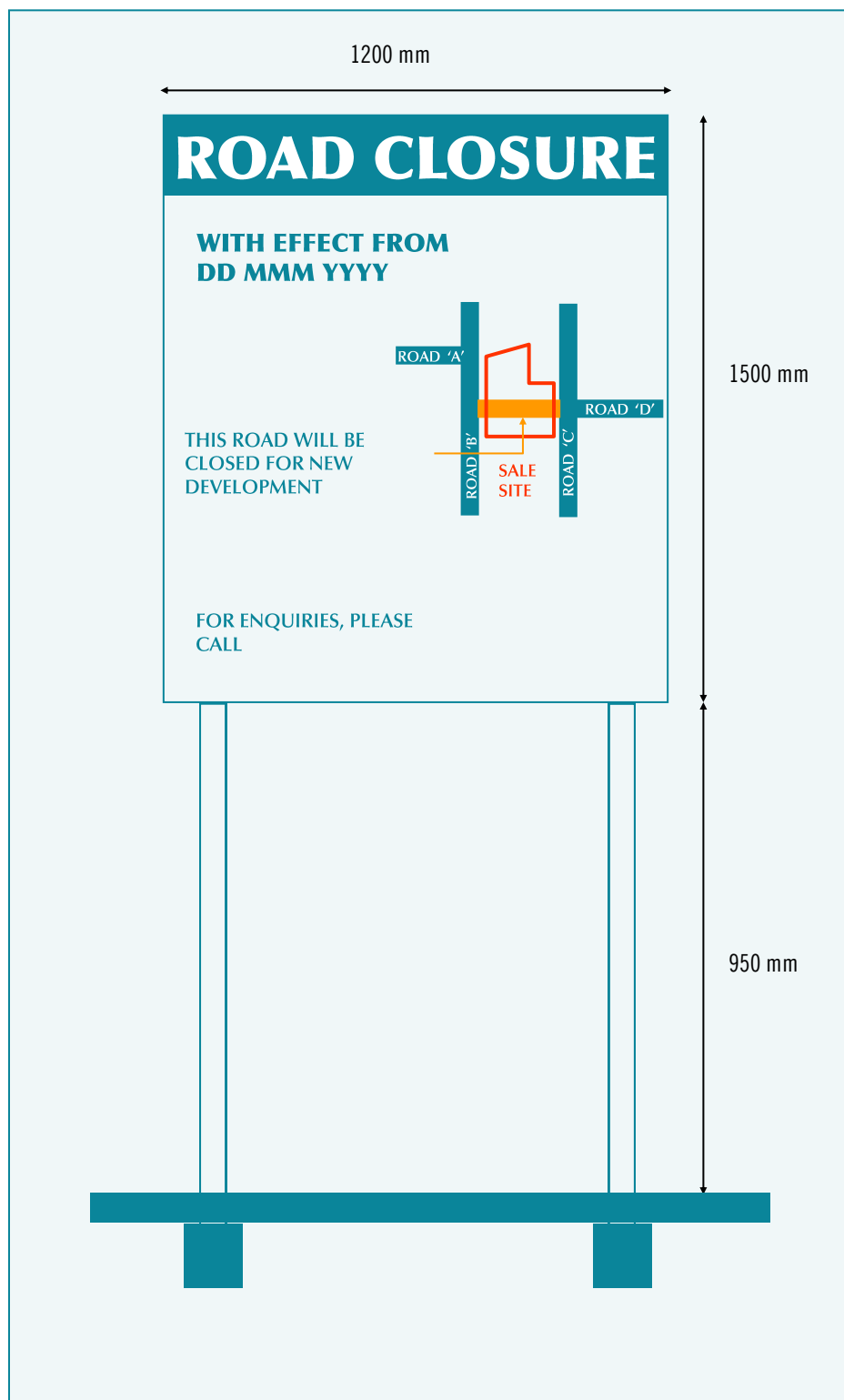


Figure 7.1 - Sample of Information Signs to be Erected

7.6 List of Authorities to Seek Clearance for Expunction of Public Street



Please [click here](#) for the list of authorities to seek clearance for expunction of public street.

Flowchart of Expunction Process

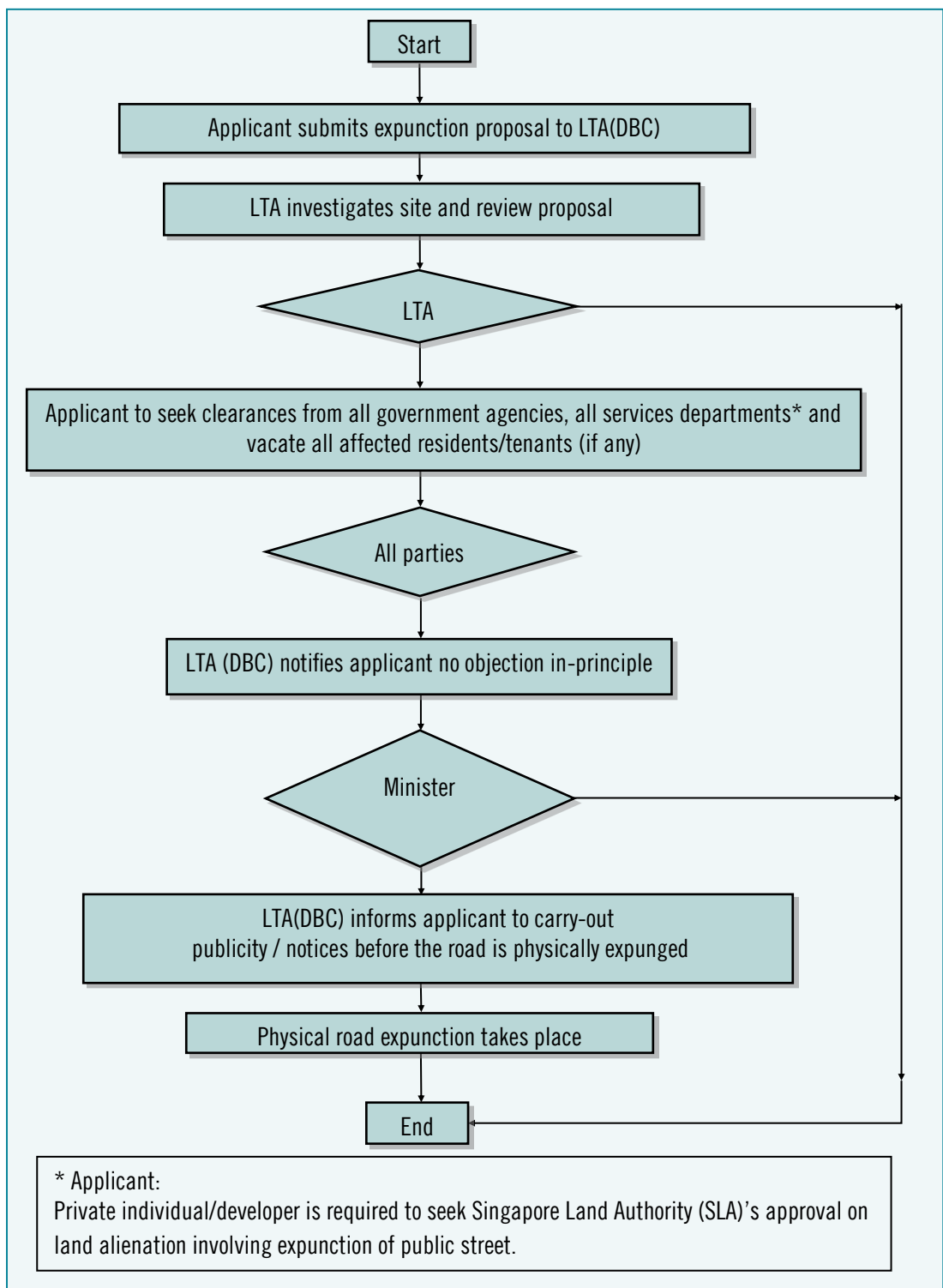


Figure 7.2 Expunction Process of Public Street