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Highway & Traffic Engineering

Road Classification and Design Standard in Malaysia

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Chapter Description

Aims

This chapter provides students on the understanding on the classification of road network with emphasis on the design standard being used in Malaysia

Expected Outcomes

- Describe type of highway within road network system in Malaysia
- Identify the concepts and principles of a functional hierarchy of roads based on design standards

Contents

- Roads Classification According to Administration
- Roads Classification According to Function
- Malaysia Road Design Standard
- Access Control

Roads for Mobility and Accessibility

Efficiency of the road network system is related to the mobility and connectivity.

- Mobility – movement of people, materials and supplies from one place to another which can be described in terms of speed or travel time
- Accessibility – ability to reach all potential destinations

Increased of travel mileage or speed (mobility) and well connected road network (accessibility) improved the quality of life, generally reflected by the reduction of time and money by giving people more route options to reach destinations.

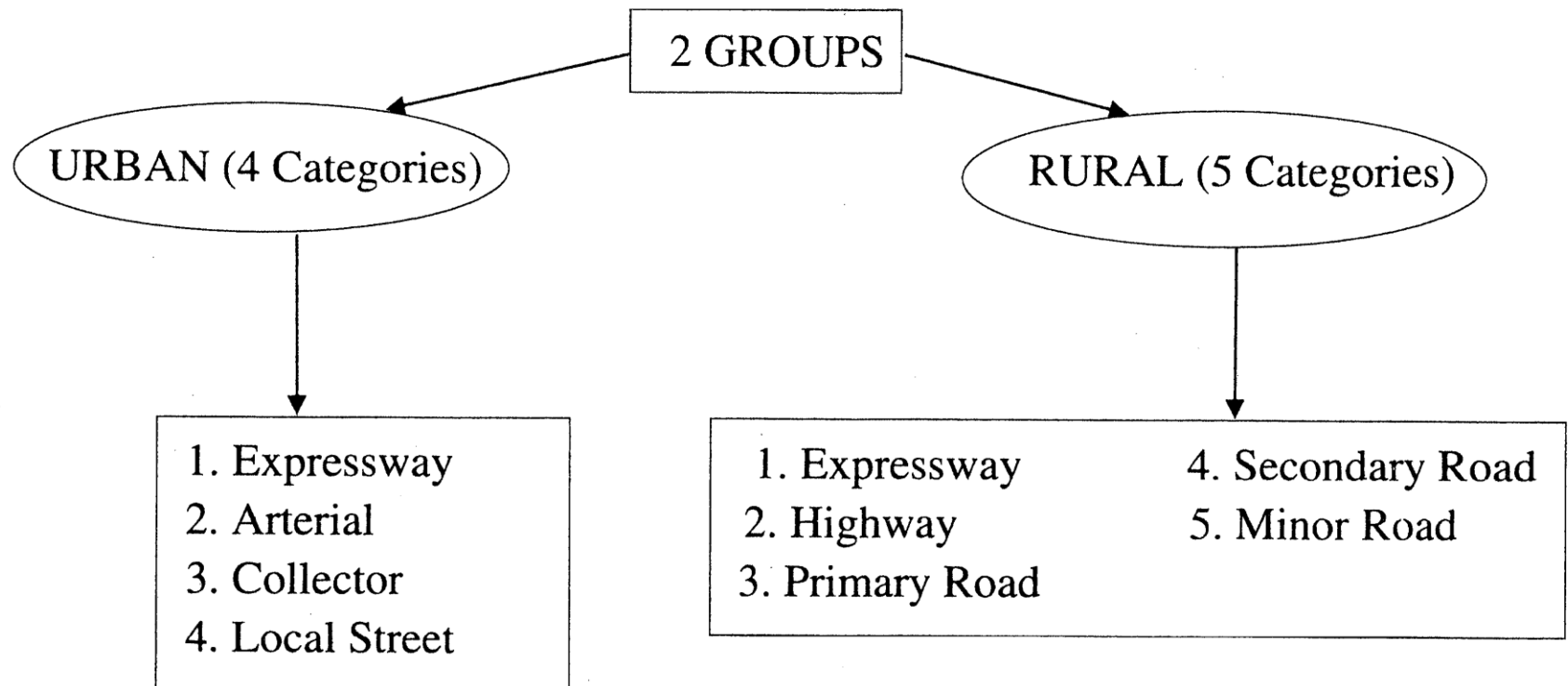
Road Classification

- it is common basis for establishing policy and general plans
- categorized based on the administration and function of each road

Road Classification According to Administration

Administration	Description
Federal Roads (labeled with numbers)	Roads that gazette under Federal Road Ordinance and linking the state capital and international border crossing
Privatization/Toll Road (labeled with alphabet E followed by numbers)	Alternative to the Federal Road which are built and maintained by concession company
State Road (labeled with alphabet according to the state designated car registration number followed by numbers)	Roads within state and also provide linkage of intra state
Local Authority Road	Intra town movement that provide access and circulatory roads in land development including residential areas
Other Road	Roads those directly under the jurisdiction of District Office

Road Classification according to Function



Source: P. 2, REAM

Function of Roads in Rural Area

Expressway

- divided highway for through traffic with full control access and all intersections are grade separated
- apply to the ***interstate*** highways for ***through traffic*** that make basic framework of National road transportation
- serve ***long trips*** and provide ***higher speed of 110 km/hr***

Function of Roads in Rural Area

Highway

- ***interstate*** national network that link up directly or indirectly the Federal Capitals, State capitals and points of international border crossing .
- compliment the expressway network.
- Serve ***long to intermediate trip lengths*** with ***high to medium speed***
- ***partial access control.***

Function of Roads in Rural Area

Primary Road

- **major roads** network **within a state** that usually link up the State Capitals and District Capitals or other Major Towns
- Serve **intermediate trip lengths** and **medium traveling speeds**.
- **partial access control**.

Function of Roads in Rural Area

Secondary Road

- Road network ***within a District*** or Regional Development Areas.
- Serve ***intermediate trip lengths*** with ***partial access control***.

Minor Road

- local traffic with ***short trip lengths*** and are usually with ***partial or no access control***.

Function of Roads in Urban Area

Expressway

- divided highway for through traffic with full control of access and all intersections are grade separated
- **basic framework** of road transportation system in urbanized area for **through traffic**.
- serve relatively **long trips** and **high speed** that complement the Rural Expressway.

Arterial

- Major road with **partial access control** for through traffic within urban area.
- Serve **intermediate trip lengths** and **high to medium traveling speeds**

Function of Roads in Urban Area

Collector

- serve as a road on a collector or distributor of traffic between the arterial and the local road system.
- ***partial access control***

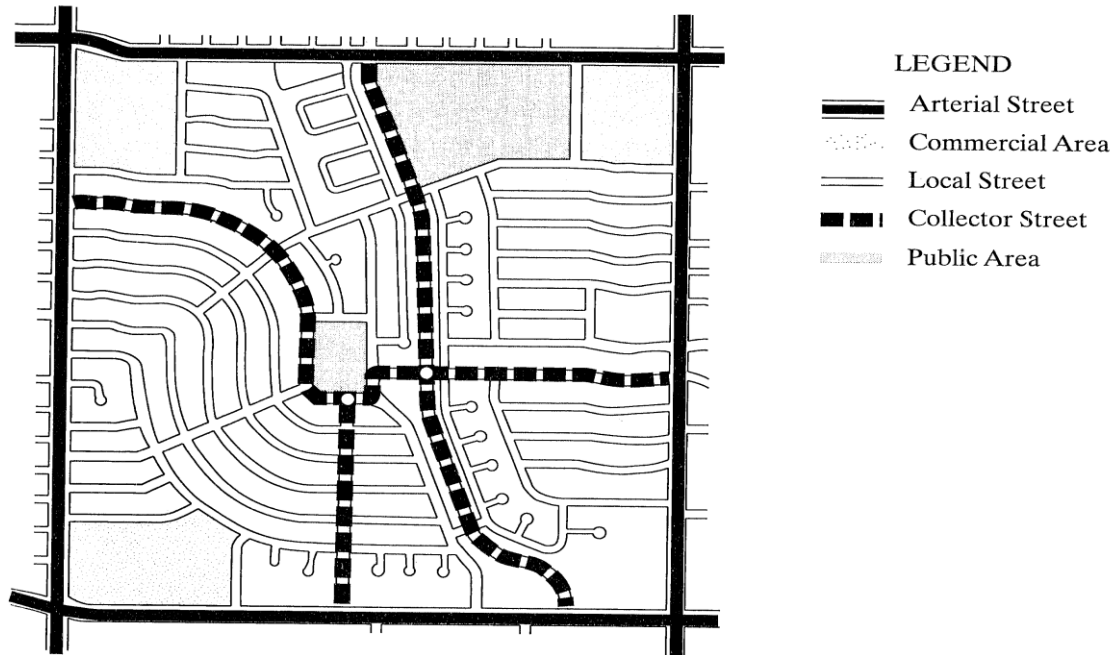
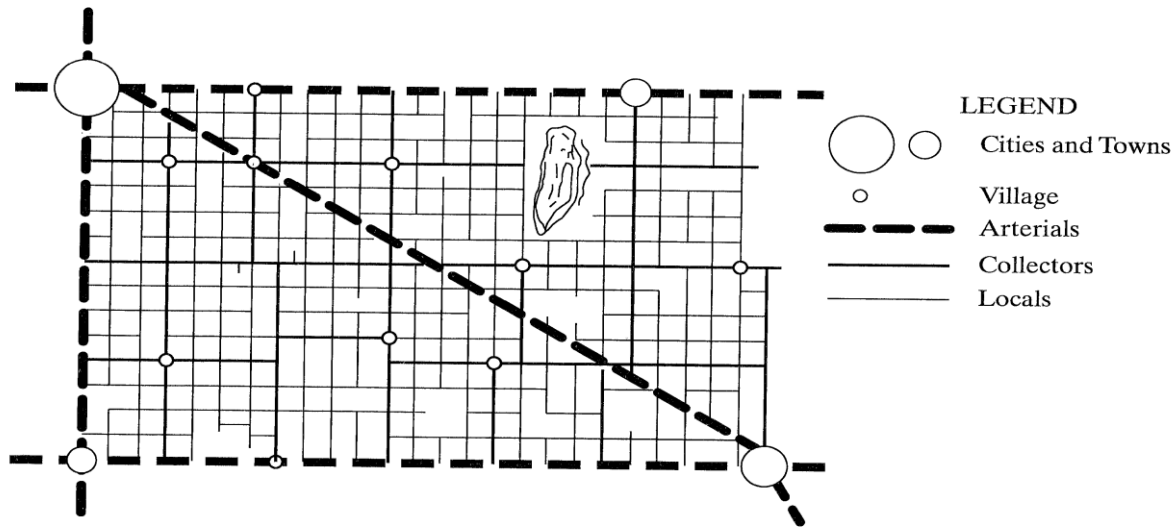
Local Street

- The basic road network ***within a neighborhoods*** that provide links to the collector road
- serve ***short trip lengths.***

Characteristics of road categories

AREA	ROAD CATEGORIES	Trip Length			Design Volume			Speed			NETWORK
		Long	Med	Short	High	Med	Low	High	Med	Low	
RURAL	Expressway	█			█			█			National network
	Highway	█			█			█	█		National network
	Primary Road		█		█				█		State network
	Secondary Road			█		█				█	District network
	Minor Road			█			█			█	Supporting network
URBAN	Expressway	█			█				█		National network
	Arterial		█		█				█		Major links to Urban centres
	Collector		█			█			█		Major streets within urban centres
	Local Street			█			█			█	Minor streets/town network.

Source: Table 2-1, p. 4, REAM



Source: Figure 2.4.2, p. 45, Papacostas and Prevedouros (2001).

Design Standards for Roads

- To provide uniformity in the design of road based on the performance requirements
- To ensure safe and reliable road facilities for traffic movement
- As a guidance for less subjective decisions on road design

Standards Application

- Higher design speeds for roads that provide long distance travel.
- Lower design speeds for roads that serve local traffic, where the effect of speed is less significant.
- Higher standard for roads with heavier traffic.

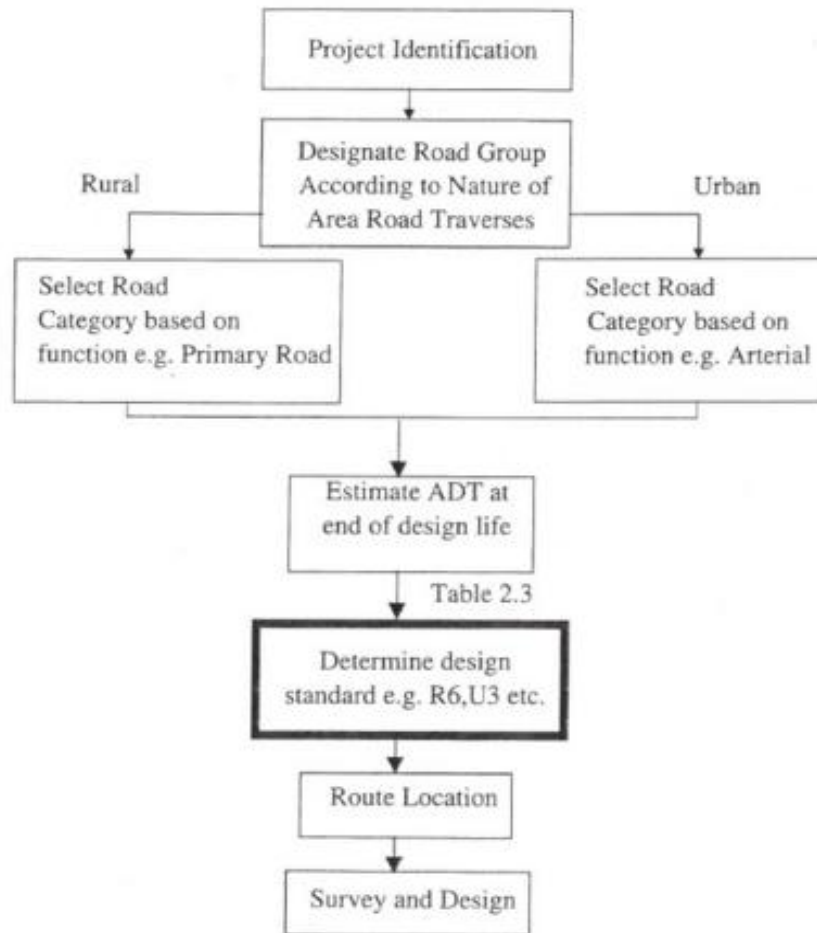
Malaysia Road Design Standard

Design Standard (Rural)	Categories	Design Standard (Urban)	Categories
R6	Expressway	U6	Expressway
R5	Highway, Primary Road	U5	Arterial
R4	Primary Road, Secondary Road	U4	Minor Arterial, Major Collector
R3	Secondary Road	U3	Collector, Major Local Streets
R2	Minor Roads	U2	Local Streets
R1	Chances of two way flow is low	U1	Chances of two way flow is low
R1a	Local access to low cost housing areas	U1a	Local access to restricted areas

Design Standard Classification

No.	Standard	Remarks
1.	R6 / U6	highest geometric design; long trips with high traveling speed of ≥ 90 kph; divided carriageways with full access control.
2.	R5 / U5	high geometric design standards; long to intermediate trips with high to medium traveling speed of ≥ 80 kph; sometimes designed with divided carriageways with partial access control.
3.	R4 / U4	medium geometric design standards; intermediate trips with medium traveling speed of ≥ 70 kph; partial access control..
4.	R3 / U3	low geometric design standards; local traffic with speed of 60 kph. partial or no access control.
5.	R2 / U2	low geometric design standards for local traffic of low commercial traffic volumes only and usually with speed of 50 kph; no access control.
6.	R1 / U1	lowest geometric design standards with speed of ≤ 40 kph; volumes of commercial vehicles are very low in comparison to passenger traffic.

Flow Chart for Selection of Road Design Standards



Source: REAM

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Selection of Design Standard

Area	Projected ADT	All traffic volume	>10,000	10,000 to 3,000	3,000 to 1,000	1,000 to 150	<150
	Road category						
RURAL	Expressway	R6	-	-	-	-	-
	Highway	R5	-	-	-	-	-
	Primary road	-	R5	R4	-	-	-
	Secondary road	-	-	R4	R3	-	-
	Minor road	-	-	-	-	R2	R1/R1a
URBAN	Expressway	U6	-	-	-	-	-
	Arterial	-	U5	U4	-	-	-
	Collector	-	-	U4	U3	-	-
	Local street	-	-	-	U3	U2	U1/U1a

(source: JKR AT (JALAN) 8/86, page 11)

Access Control

- Access control - condition where the use of road is restricted fully or partially by public authority.
- Type:
 - ◆ Full Access Control - preference only for through traffic by providing access connecting with selected public roads only and not allow crossings at grade
 - ◆ Partial Access Control - preference for through traffic to access connection with selected public roads where at-grade intersections should be minimized and allowed only at certain locations
 - ◆ Non-Access Control – no limitations of access

Selection Of Access Control - Rural

Design Standard Road Category	R6	R5	R4	R3	R2	R1
Expressway	F	-	-	-	-	-
Highway	-	P	-	-	-	-
Primary Road	-	P	P	-	-	-
Secondary Road	-	-	P	P	-	-
Minor Road	-	-	-	-	N	N

Source: REAM

- ◆ F - Full Access Control
- ◆ P - Partial Access Control
- ◆ N - Non-Access Control

Selection Of Access Control - Urban

Design Standard Road Category	U6	U5	U4	U3	U2	U1
	Expressway	F	-	-	-	-
Arterial	-	P	P	-	-	-
Collector	-	P	P	P	-	-
Local Street	-	-	N	N	N	N

Source: REAM

- ◆ F - Full Access Control
- ◆ P - Partial Access Control
- ◆ N - Non-Access Control

Selection of Access Control

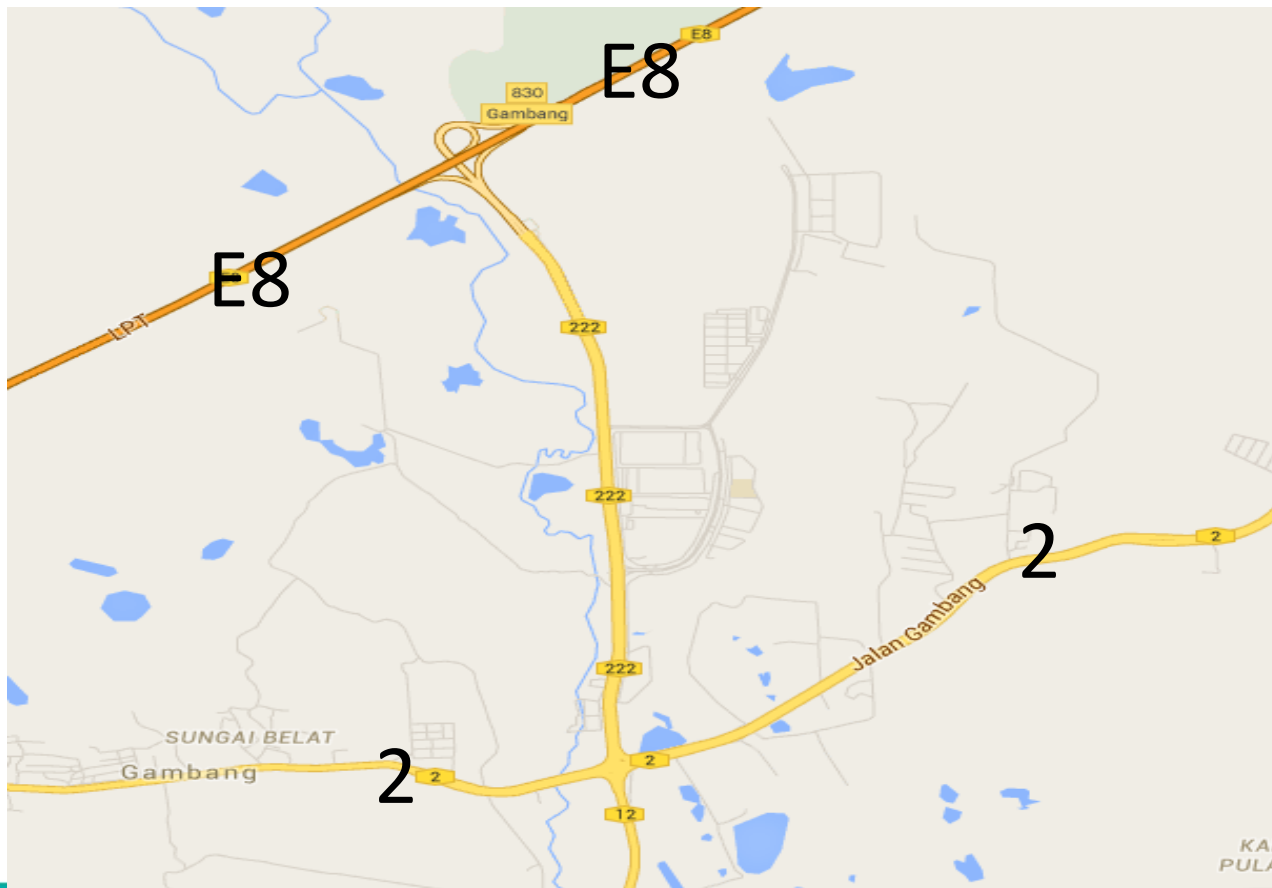
- Important to maintain the roads as built capacity and to improve safety
- selection depends on traffic volume, the road function and road network around the area
- Two important aspects in determining the control:
 - a) Consideration of existing development during time of design
 - b) Consideration of future development after completion of the road

Conclusion of The Chapter

- Conclusion #1
 - Road network system in Malaysia can be categorized according to administration and function of the road.
 - 5 categories under administration which are Federal Road, Privatization/toll Road, State Road, Local Authority Road and Other Road meanwhile under function divided based on urban and rural area.
 - The characteristics of the road categories under urban and rural area can be explained base on trip length, speed, access control and network coverage
- Conclusion #2
 - Malaysian designs standard is classified road into six groups (in descending order of hierarchy): R6, R5, R4, R3, R2 and R1 for rural areas, and U6, U5, U4, U3, U2 and U1 for urban areas
 - The higher design standard of the road apply to heavier traffic with long distance travel

EXAMPLE

Malaysia's road system can be classified according to their administration, area and function. These are to ensure their coordination, planning and operation of the entire system. Based on the figure below, explains the characteristics for routes seen on the map in terms of their function and administration. State also the design standard for routes.



ANSWER

Types of road	Administration	Function
E8 (Expressway/LPT)	<ul style="list-style-type: none"> • Built and maintained by concession company. (Malaysia Highway Authority) • Alternative to the Federal Road which are built and maintained by concession company 	<ul style="list-style-type: none"> • divided highway for through traffic with full control of access and always with grade separations at all intersections. • serve long trips and provide higher speed of traveling.
2 & 222 (Federal Road)	<ul style="list-style-type: none"> • Under administration of Public Work Department (PWD) • Roads that gazette under Federal Road Ordinance and linking the state capital and international border crossing 	<ul style="list-style-type: none"> • Serve intermediate trip lengths and medium traveling speeds. • partial access control. • link up the State Capitals and District Capitals or other Major Town

References

- Road Engineering Association of Malaysia, A GUIDE ON GEOMETRIC DESIGN OF ROADS, REAM-GL 2/2002, 2002.
- C.S Papacostas and P.D Prevedouros, TRANSPORTATION ENGINEERING AND PLANNING, Prentice Hall, 2001.