

**MINISTERIAL UNDERSTANDING
ON THE DEVELOPMENT OF
THE ASEAN HIGHWAY NETWORK PROJECT**

WE the undersigned, attending the Fifth ASEAN Transport Ministers Meeting held in Hanoi, Vietnam on 15-16 September 1999;

RECALLING the following policy directives enunciated by the ASEAN Heads of State and Government :

1. Manila Declaration of 1987 signed on 15 December 1987, which provided that the existing transportation system shall be strengthened to ultimately form an overall ASEAN transportation network;
2. ASEAN Vision 2020 adopted in Kuala Lumpur, Malaysia on 15 December 1997, which resolved, inter alia, the development of an integrated and harmonized trans-ASEAN transportation network;
3. Hanoi Plan of Action adopted on 15 December 1998, which provided for intensifying cooperation in the development of the trans-ASEAN transportation network as the trunkline or main corridor for the movement of goods and people in ASEAN, consisting of major road (interstate highway) networks, among others, and the development and implementation of the ASEAN Highway Network Project; and
4. Hanoi Declaration of 1998 signed on 16 December 1998, which called for the development and strengthening of ASEAN regional infrastructure through the expansion of transport links and the provision of efficient and quality infrastructure.

RECALLING FURTHER our resolve under the Ministerial Understanding on ASEAN Cooperation in Transportation signed in Bali, Indonesia on 18 March 1996, to establish and develop a harmonized and integrated regional transportation system, promote interconnectivity and interoperability of national networks and access thereto, and strengthen and enhance existing cooperation efforts in the development of transport infrastructure;

NOTING the steady progress of the ongoing cooperation activities of the ASEAN Highway Experts and the Senior Transport Officials Meeting in the development of the ASEAN Highway Network Project;

REAFFIRMING our commitment at the Second ASEAN Transport Ministers Meeting held in Chiang Mai, Thailand on 28 February 1997, to jointly develop a complete system of highway network to link ASEAN Member Countries together and where technical standards of design and road traffic safety are compatible; and

RECOGNIZING that the ASEAN Highway Network Project is a critical infrastructural support facility necessary for the greater and closer integration of the ASEAN region, as well as in the facilitation of regional trade, investment and tourism opportunities;

DO HEREBY AGREE THAT :

Article 1

OBJECTIVES

The objectives of this Ministerial Understanding on the Development of the ASEAN Highway Network Project are :

- (a) To provide the institutional mechanism to formalize the strategic route configuration and the uniform technical design standards of the ASEAN Highway Network, being the major road (interstate highway) component of the overall trans-ASEAN transportation network;
- (b) To formulate the ASEAN Highway Infrastructure Development Plan consisting of priority highway projects of regional significance, for funding and implementation through Official Development Assistance (ODA), project financing by the private sector or by joint public-private sector arrangement, or by the individual ASEAN Member Countries, as may be necessary;
- (c) To promote cooperation with other international and regional organizations, so as to ensure technical compatibility of ASEAN's road standards and road safety requirements and create stronger road transport links and connections within ASEAN and those with neighboring or adjoining regions; and

- (d) To intensify cooperation in the facilitation of international road traffic throughout the ASEAN region.

Article 2

ASEAN HIGHWAY ROUTE CONFIGURATION AND TECHNICAL REQUIREMENTS

- (1) Member Countries shall adhere to the route configuration of the ASEAN Highway Network, the network details and designations of which are described in Annex “A”, which forms an integral part of this Ministerial Understanding, for the coordinated improvement and upgrading of their national road (interstate highway) routes of the ASEAN Highway Network.
- (2) Member Countries shall conform to the recommended technical design standards and requirements set out in Annex “B”, which forms an integral part of this Ministerial Understanding.

Article 3

DEVELOPMENT STRATEGY FOR THE IMPLEMENTATION OF THE ASEAN HIGHWAY NETWORK PROJECT

To foster the integrated and coordinated development and implementation of the ASEAN Highway Network Project, Member Countries shall intensify cooperative arrangements at the national, subregional and regional-levels through better management and optimum use of existing road transport infrastructure. Equal emphasis shall be accorded to adopting measures to improve the operational efficiency and reliability of international road transport. In this regard, Member Countries shall be guided by the following implementation arrangement.

- (a) Member Countries shall endeavour to improve or upgrade their designated national road (interstate highway) networks, in line with the phased development timeframe, as follows :

<u>Phase</u>	<u>Tentative Completion Year</u>	<u>Technical Requirement</u>
Stage 1	2000	Network configuration and designation of national routes to be completed.
Stage 2	2004	Road signs for all designated national routes to be installed. All designated national routes upgraded to at least Class III standards. All missing links to be constructed. All designated cross-border points to be operational.
Stage 3	2020	All designated national routes upgraded to at least Class I or Primary Road standards. For low traffic volume non-arterial routes, the Class II standards are acceptable.

- (b) Member Countries shall cooperate in the formulation of the ASEAN Highway Development Plan, to serve as the coordinated program for the medium-to long-term implementation of the ASEAN Highway Network Project;
- (c) Member Countries shall regularly exchange information on the implementation status and technical details of their designated national routes, route traffic volumes and forecasts, and other related road development plans and/or studies; and
- (d) Member Countries shall jointly adopt harmonized measures to improve intermodal transport interconnectivity, interoperability and efficiency and to facilitate international road traffic in the ASEAN Highway Network.

Article 4

INSTITUTIONAL COORDINATION

1. The Senior Transport Officials Meeting shall be responsible for the efficient and effective coordination and implementation of this Ministerial Understanding. Progress of implementation of this Ministerial Understanding shall be regularly submitted to the ASEAN Transport Ministers Meeting, for further action.

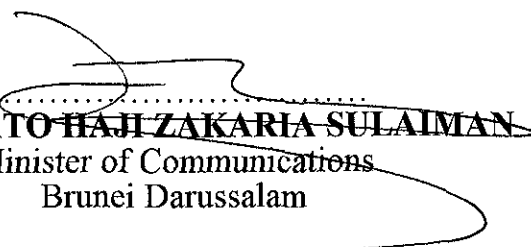
2. The Senior Transport Officials Meeting shall also be responsible for providing the necessary institutional mechanism to encourage greater participation of the private sector, ASEAN dialogue partners, international and multilateral organizations, etc., to ensure the successful development and implementation of the ASEAN Highway Network Project.
3. The ASEAN Secretariat shall assist the Senior Transport Officials Meeting in the discharge of the above responsibilities, including technical support in the management, coordination, review and monitoring of cooperation programs and activities which may arise from the implementation of this Ministerial Agreement.


Article 5

FINAL PROVISIONS

1. This Ministerial Understanding shall enter into force on the date of signature.
2. This Ministerial Understanding may be amended by consent of all the ASEAN Member Countries.
3. This Ministerial Understanding shall be deposited with the Secretary-General of ASEAN who shall promptly furnish a certified copy thereof to each ASEAN Member Country.

DONE at Hanoi, Vietnam, this 15th day of September 1999, in a single copy in the English language.


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PEHIN DATO HAJI ZAKARIA SULAIMAN
Minister of Communications
Brunei Darussalam


.....
KHY TAINGLIM
Minister of Public Works and Transport
Kingdom of Cambodia



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ANWAR SUPRIJADI
 Secretary General
 Ministry of Communications
 Republic of Indonesia

W. Anwar

.....
PHAO BOUNNAPHOL
 Minister of Communication, Transport, Post and Construction
 Lao People's Democratic Republic

Perio

DATO' SERI DR. LING LIONG SIK
 Minister of Transport
 Malaysia

HLA MYINT SWE

MAJ. GEN. HLA MYINT SWE
 Minister of Transport
 Union of Myanmar

Vicente C. Rivera, Jr.

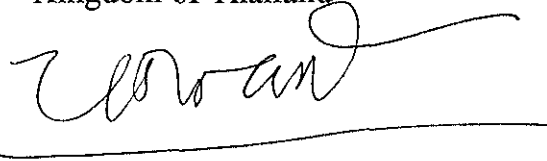
VICENTE C. RIVERA, JR.
 Secretary of Transportation and Communications
 Republic of the Philippines

Yeo Cheow Tong

YEO CHEOW TONG
 Minister for Communications and Information Technology
 Republic of Singapore



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SUTHEP THAUGSUBAN
Minister of Transport and Communications
Kingdom of Thailand



.....
LE NGOC HOAN
Minister of Transport
Socialist Republic of Vietnam

Annex A

ASEAN Highway Network

The overall route configuration of the ASEAN Highway Network is shown in Figure 1. The highway network comprises 23 routes involving some 38,400 kilometers is also in Figure 2a and 2b. Details of each highway route are presented in Table 1.

The route numbering system in this Annex is tentative and presented for reference purposes only. Finalization of the route numbering system will be undertaken in due course, following the guidelines adopted in the Fourth ASEAN Highway Expert Meeting (4th AHEM) held in Hanoi, Vietnam on 20-21 August 1999.

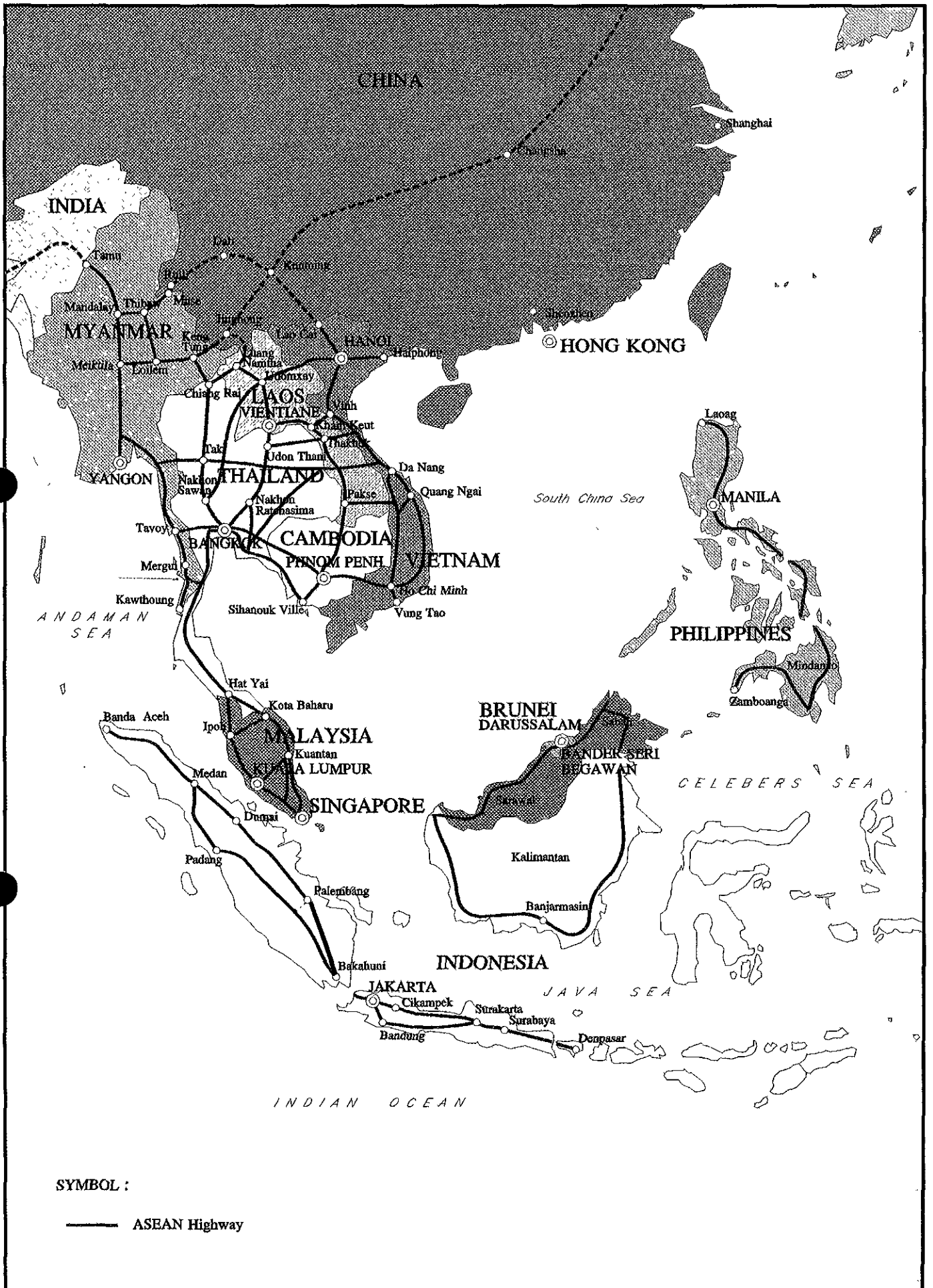


Fig. 1 ASEAN HIGHWAY NETWORK

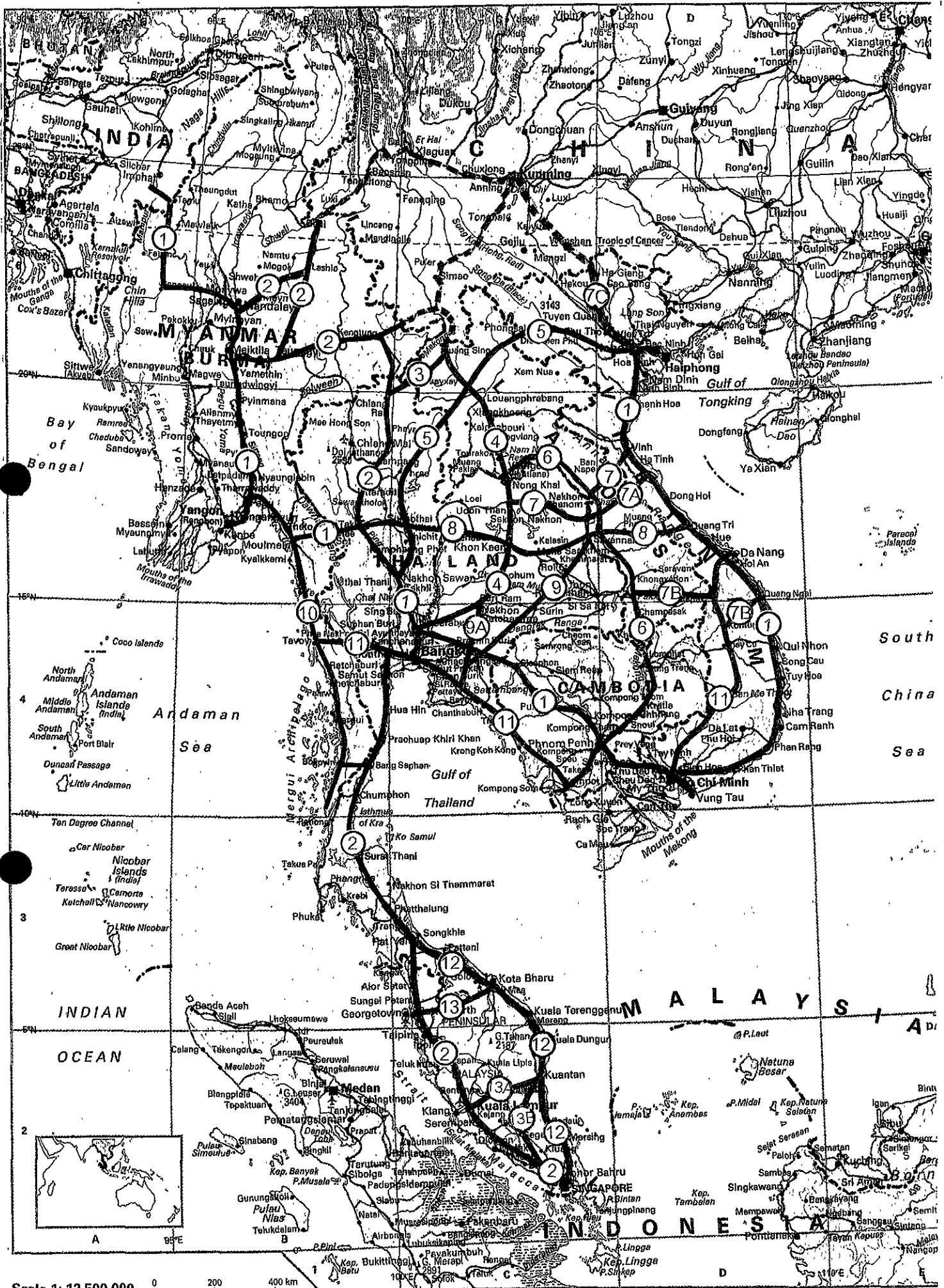


Fig. 2A ASEAN HIGHWAY NETWORK (Mainland)

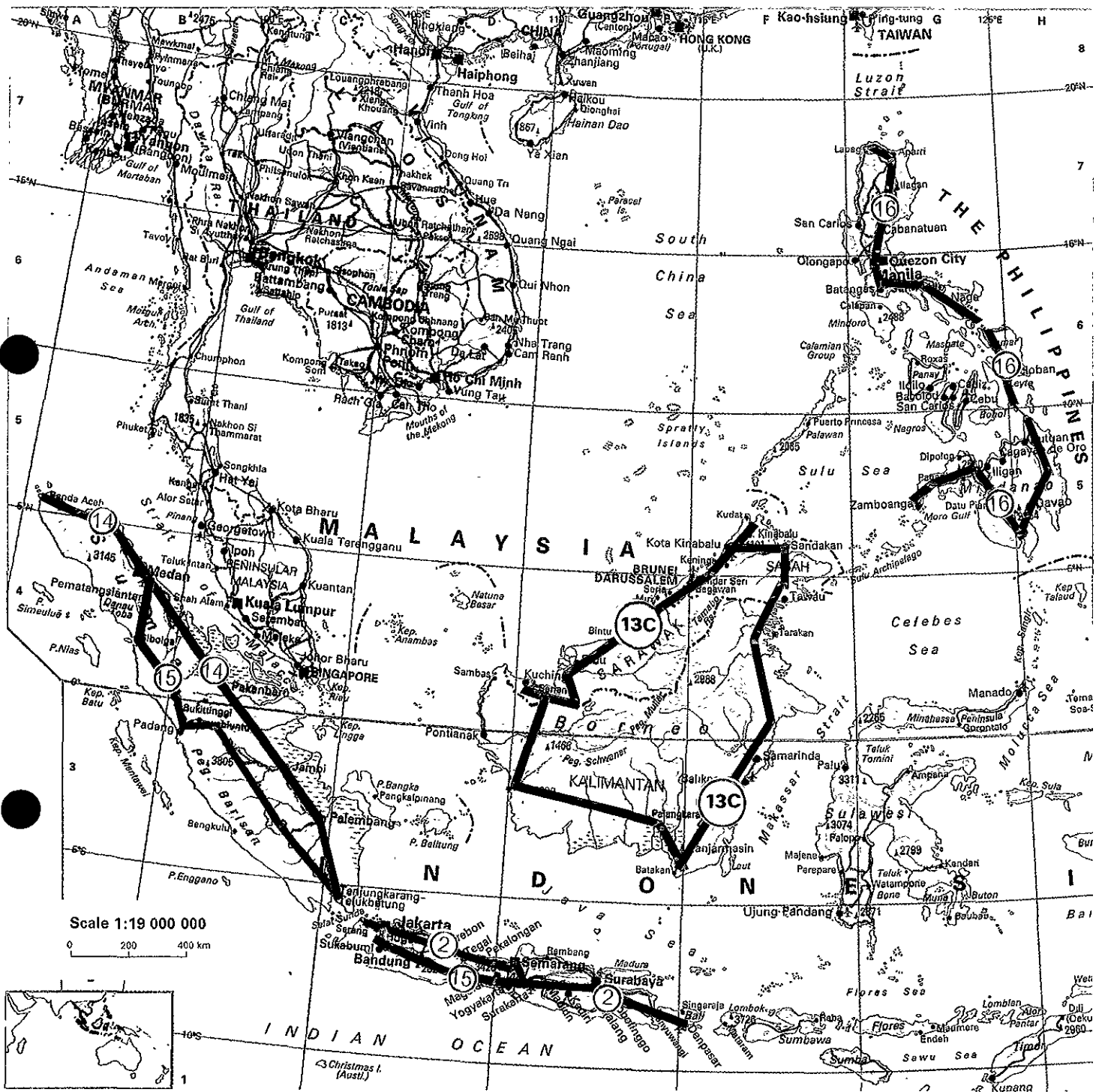


Fig. 2B ASEAN HIGHWAY NETWORK (Islands)

Table 1**ASEAN Highway Network**

No.	Origin - Destination	Criteria
1	Tamu (Myanmar / India Border) - Mandalay - Payagyi (Including Payagyi - Yangon) - Myawadi / Mae Sot (Myanmar / Thailand Border) - Tak - Bangkok - Aranyaprahet / Poi Pet (Thailand / Cambodia Border) - Sisophon - Phnom Penh - Bavet / Moc bai (Cambodia / Vietnam Border) - Ho Chi Minh City (Including Dong Nal - Vung Tau) - Danang - Hanoi - Haiphong	Capital - Capital
2	Muse (Myanmar / China Border) - Thibaw - Mandalay - Meiktila - Loilem (Including Loilem - Thibaw) - Keng Tung (Including Keng Tung - Monglar) - Thackileik / Mae Sai (Myanmar / Thailand Border) - Tak - Bangkok - Chumphon - Hat Yai - Sadao / Bukit Kayu Hitam (Thailand / Malaysia Border) - Ipoh - Kuala Lumpur - Seremban - Tanjung Kupang/ Tuas (Malaysia / Singapore Border 2 nd link) (Including Johor Bahru - Malaysia / Singapore Border 1 st link) - Singapore - (Ferry Service) - Jakarta (Indonesia) - Semarang - Surakarta - Surabaya - Denpasar	Capital - Capital
3	Boten (Lao PDR / China Border) - Luang Namtha - Huai Sai / Chiang Khong (Lao PDR / Thailand Border) - Chiang Rai	Linkage to China
4	Natrey (Lao PDR) - Oudomsay - Luang Phrabang - Vientiane - Thanalaeng / Nong Khai (Lao PDR/Thailand Border) - Khon Kaen - Saraburi - Bangkok	Capital - Capital
5	Hanoi (Vietnam) - Tay Trang / Deo Tay Chang (Vietnam / Lao PDR Border) - Oudomsay - Pak Beng - Muang Ngeon / Huaikon (Lao PDR / Thailand Border) - Nan - Phitsanulok - Nakhon Sawan	Seaport - Capital

No.	Origin - Destination	Criteria
6	Vientiane (Lao PDR) - Savannakhet - Muang Khong/Veun Kham (Lao PDR / Cambodia Border) - Streng Treng - Phnom Penh - Sihanoukville Port	Capital - Capital
7	Vinh (Vietnam) - Keo Nua/Nape (Vietnam/Lao PDR Border) - Laksao - Ban Lao - Thakhek / Nakhon Phanom (Lao PDR / Thailand Border) - Udon Thani	Seaport - Major City
7A	Vung Ang Port (Vietnam) - Mu Ghia (Vietnam / Lao PDR Border) - Thakhek	Seaport - Major City
7B	Quang Ngai Port - Kontum - Ban Het (Vietnam / Lao PDR Border) - Attapeu - Pakse	Seaport - Major City
7C	Hanoi (Vietnam) - Lao Cai (Vietnam/China Border)	Capital - China
8	Tak (Thailand) - Khon Kaen - Mukdahan / Savannakhet (Thailand / Lao PDR Border) - Lao Bao (Lao PDR / Vietnam Border) - Dong Ha	Major City - Seaport
9	Savannakhet / Mukdahan (Lao PDR / Thailand Border) - Yasothon - Buriram - Sakaeo - Phanom Sarakham - Sattahip	Seaport - Seaport
9A	Phnom Sarakham - Kabinburi - Pakthongchai - Nakhon Ratchasima	Seaport - Lao PDR
10	Thaton (Myanmar)-Mawlamyine - Tavoy - Mugu - Lenya - Kawthong (including Lenya-Khlong Loy (Myanmar/Thailand Border) - Bang Saphan)	Country's back bone - port
11	Tavoy (Myanmar) - Sinpyutang/Bong Ti (Myanmar/Thailand Border) - Kanchanaburi - Bangkok - Laem Chabung - Maptaput - Hat Lek/Koh Kong (Thailand/ Cambodia Border) - Sre Ambel - Ho Chi Minh City - Kontum - Danang	Seaport - Seaport

No.	Origin - Destination	Criteria
12	Hat Yai (Thailand) - Pattani - Narathiwat - Sungai Kolok / Rantau (Thailand/Malaysia Border) - Kota Bharu - Kuala Terengganu - Kuantan - Mersing - Johore Bahru (Malaysia/Singapore Border) - Singapore	International linkages Major City - Major City
13	Kota Bharu (Malaysia) - Sungai Patani (Malaysia)	Country's back bone
13A	Port Klang (Malaysia) - Kuala Lumpur - Kuantan (Malaysia)	Seaport - Seaport
13B	Kuantan (Malaysia) - Segamat - Yong Peng (Malaysia)	Major City - Major City
13C	Kuching (Malaysia, Sarawak) - Serian - Bintulu - Miri - Sg. Tujoh (Malaysia/Brunei Darussalam Check Point) - Brunei Darussalam - Kuala Lurah (Brunei Darussalam/Malaysia Check Point) - Limbang / Puni (Malaysia / Brunei Darussalam Check Point) - Brunei - Labu (Brunei / Malaysia Check Point) - Lawas - Sindumin - Kota Kinabalu - Sandakan - Lahad Datu - Tawau - Serudong/Nunukan (Malaysia, Sabah / Indonesia Border) - Samarinda - Banjarmasin - Palangka Raya - Pontianak - Entikong/Tebedu (Indonesia/Malaysia, Sarawak Border) - Serian	Major City - Capital City in Pan Borneo Island
14	Banda Aceh (Indonesia) - Medan - Dumai - Palembang - Bakahuni	Country's back bone
15	Tebingtinggi (Indonesia) - Padang - Bakahuni - (Ferry Service) - Merak - Jakarta - Bandung - Jogjakarta - Surakarta (Indonesia)	Major Cities-Major Cities
16	Laoag City (Philippines) - Manila - Matnog - (Ferry Service) - San Isidro - Taeloban City - Liloan - (Ferry Service) - Lipata - Surigao City - Davao City - General Santos City - Zamboanga City (Philippines)	Country's back bone

ANNEX B

ASEAN HIGHWAY STANDARDS

Table I ASEAN Highway Standards

Highway classification		Primary (4 or more lanes) (control access)			Class I (4 or more lanes)		
Terrain classification		L	R	M	L	R	M
Design speed (km/h)		100-120	80-100	60-80	80-110	60-80	50-70
Width (m)	Right of way	(50-70) ((40-60))			(50-70) ((40-60))		
	Lane	3.75			3.50		
	Shoulder	3.00		2.50	3.00		2.50
Min. horizontal curve radius (m)		390	230	120	220	120	80
Type of pavement		Asphalt/cement concrete			Asphalt/cement concrete		
Max. superelevation (%)		(7) ((6))			(8) ((6))		
Max. vertical grade(%)		4	5	6	5	6	7
Min. vertical clearance (m)		4.50 [5.00]			4.50 [5.00]		
Structure loading (minimum)		HS20-44			HS20-44		

Highway classification		Class II (2 lanes)			Class III (2 lanes)		
Terrain classification		L	R	M	L	R	M
Design speed (km/h)		80-100	60-80	40-60	60-80	50-70	40-60
Width (m)	Right of way	(40-60) ((30-40))			30-40		
	Lane	3.50			3.00[3.25]		
	Shoulder	2.50		2.00	1.50[2]		1.0[1.5]
Min. horizontal curve radius (m)		200	110	50	110	75	50
Type of pavement		Asphalt/cement concrete			Double bituminous treatment		
Max. superelevation (%)		(10) ((6))			(10) ((6))		
Max. vertical grade(%)		6	7	8	6	7	8
Min. vertical clearance (m)		4.50			4.50		
Structure loading (minimum)		HS20-44			HS20-44		

Note: 1. Abbreviation : L = Level Terrain M = Mountainous Terrain R = Rolling Terrain
 2. () = Rural (()) = Urban 3. [] = Desirable Values
 4. The right of way width, lane width, shoulder width and max. superelevation rate in urban or metropolitan area can be varied if necessary to conform with the member countries design standards.

ASEAN HIGHWAY DESIGN CRITERIA

1) Classification

ASEAN Highways shall be classified as shown in table 2

Table 2
Classification
(Based on Asian Highway Standards by ESCAP 1995)

Classification	Description	Pavement Type
Primary	Access controlled motorway	Asphalt or cement concrete
Class I	4 or more lanes highway	Asphalt or cement concrete
Class II	2 lanes	Asphalt or cement concrete
Class III	2 lanes (narrow)	Double bituminous treatment

"Primary" class in the new classification is the access controlled motorway. Access controlled motorway shall be used exclusively by automobiles. Access to motorway shall be done at grade-separated interchanges only. Motorcycles, bicycles and pedestrians shall not be allowed to enter motorway in order to ensure traffic safety and the high running speed of automobiles except when domestic legislation and regulation allow. At-grade intersections shall not be designed on motorway, and carriageway shall be divided by median strip. This class was newly included in the classification in view of the recent development of motorways in the member countries.

Class III can be used only when the funding for the construction and/or land for road is limited. The type of pavement should be upgraded to asphalt concrete or cement concrete as soon as possible in the future. Since Class III is also regarded as the minimum desirable standard, upgrading of any road sections below Class III to comply with the Class III standard should be encouraged.

Future traffic volume projected for 20 years after completion of road construction/ improvement (called Projected daily traffic volume hereinafter) should be used to determine the class of road as described below.

It is recognized internationally that the presence of heavy vehicles and slow-moving vehicles greatly influence the design of a highway. Therefore, in this classification, it is proposed to use the approach of "Passenger Car Unit (pcu)" which is widely used for design purposes in Asian countries. The flow coefficients shown in table 3 are used to convert vehicles into "Passenger Car Unit":

Table 3
Flow coefficients

Vehicle type	Flow coefficient
Bicycles	0.5
Motorcycles	0.5
Light, commercial motor vehicles (gross weight 10 tons)	1
Passenger cars	1
Trucks and buses	2
Semi-trailers and trailers	3

The traffic volume of light vehicles does not need to be taken into account if exclusive lanes for light vehicles are provided. Flow coefficients for heavy vehicles can be increased if the road is located in a mountainous area.

Class of road is determined as follows using "pcu" as an index representing traffic volume:

- i) Determine "PDT" or "projected daily traffic volume (pcu/day)" using projected traffic volume by vehicle type (vehicle/day) and flow coefficients.
- ii) Determine "K value" which is the ratio of the 30th highest hourly traffic volume over one year (pcu/hour) to annual average daily traffic (pcu/day). Traffic count data on a road section which has similar characteristics to planned road can be used. K value is usually around 0.10.
- iii) Determine "D value" which is the ratio of heavy directional- peak hour (30th highest) traffic volume (pcu/hour) to both directional peak hour (30th highest) traffic volume (pcu/hour). D value usually ranges from 0.55 to 0.60.
- iv) Calculate "PPHT" or "planning peak hour traffic volume (pcu/hour)" using a formula $PPHT = PDT \times K \times D$. PPHT represents projected heavy directional 30th highest hourly traffic volume (pcu/hour).
- v) Divide PPHT (pcu/hour) by 1,800 (pcu/hour) which is widely recognized as standard capacity per one lane and round up the calculated value to determine number of lanes in one direction. Multiplying by 2 gives the required number of lanes (both directions).
- vi) Determine the class according to the required number of lanes determined in step v). "Primary" class can be used if the development of access controlled motorway is needed.

2) Terrain classification

Terrain classifications shown in table 4 shall be used.

Table 4
Terrain classification

Terrain classification	Cross Slope
Level (L)	0 to 9.9%
Rolling (R)	10 to 24.9%
Mountainous (M)	25 or more than

3) Design speed

The relation between design speed, highway classification and terrain classification is shown in table I Design speed of 120 km/h shall be used only for Primary class (access controlled motorways) which have median strips and grade separated interchanges. Recommended design speed in **urban** shall be used :

<i>Class Primary</i>	<i>80 - 100 k.p.h.</i>
<i>Class I</i>	<i>60 - 80 k.p.h.</i>
<i>Class II</i>	<i>50 - 60 k.p.h.</i>
<i>Class III</i>	<i>40 - 50 k.p.h.</i>

4) Cross section

The dimension, such as right of way width, lane width, shoulder width, for each highway classification are shown in table I.

It is highly recommended that pedestrians, bicycles and animal-drawn carts be separated from through traffic by provision, where practical, of frontage roads and/or sidewalks for the sections where smooth traffic is impeded by the existence of this local traffic.

5) Horizontal alignment

Horizontal alignment shall be consistent with the topography of the terrain and should provide for safe and continuous operation at a uniform design speed. Horizontal alignment must afford at least the minimum stopping sight distance for this design speed.

In the design of highway curves it is necessary to establish the proper relation between design speed and curvature and also their joint relations with superelevation and side friction

Radius of curvature is calculated from

$$R = \frac{v^2}{127.5 (e + f)}$$

Where
 v = Design speed (Kph.)
 e = Rate of roadway superelevation m / m
 f = Side friction factor
 R = Radius of curve (m.)

Table 5
 Recommended side friction factor

Design speed (Kph.)	40	50	60	70	80	90	100	110	120
Side friction factor	0.16	0.16	0.15	0.15	0.14	0.13	0.13	0.12	0.11

The minimum curve radius is a limiting value of curvature for a given design speed and is determined from the formula above using the maximum superelevation rate suggested and the related side friction factor. Minimum curve radius shall be applied only when necessary and shall be used in conjunction with transition curve which is also recommended for longer curve, the values larger by so to 100 percent should be considered as the design normal curve radius.

The widening along the horizontal curves should be provided which is based on the design speed, the pavement width the radius of curve and the dimension of the standard truck.

Minimum horizontal curve radius in Urban recommended:

<i>Class Primary</i>	230 m.
<i>Class I</i>	120 m.
<i>Class II</i>	75 m.
<i>Class III</i>	50 m.

6) Vertical Alignment

The vertical alignment of any highway shall be as smooth as it is economically possible, that is, there shall be a balance of cutting and filling to eliminate the rolling nature of land. In the use of the maximum vertical gradient, it shall be kept clear in the mind of the designer that, once constructed to a given vertical grade, the highway cannot be upgraded to a lesser gradient without the loss of the entire initial investment. The maximum vertical grade shown in table I shall be used. The minimum vertical curve length shall be based on the algebraic difference in grades, the design speed and the minimum stopping sight distance.

The critical length of gradient section for the provision of a climbing lane is recommended to highway classifications Primary and Class 1, as shown in table 6

Table 6
Critical length of gradient section for the provision of a climbing lane

Terrain Classification	Primary	Class I
Level (L)	3% - 800 m	3% - 900 m
	4% - 500 m	4% - 700 m
Rolling (R)	4% - 700 m	4% - 800 m
	5% - 500 m	5% - 600 m
Mountainous (M)	5% - 600 m	5% - 700 m
	6% - 400 m	7% - 400 m

It is desirable to provide a climbing lane to the up-gradient highways with heavy truck traffic where the length of gradient exceeds the above values.

7) **Pavement**

Carriageways should be paved with cement or asphalt concrete. Only in cases where the anticipated traffic volume is quite low will bituminous treatment be adopted as surfacing. It is also recommended that the shoulders be paved with cement or asphalt concrete or be surfaced with bituminous materials.

However, as road pavement is designed taking into account i) maximum wheel load which should be based on the standard trucks ii) traffic volume iii) Design life iv) qualities of materials to be used.

8) **Bridge**

Bridges and culverts should be built as permanent structures. For minor bridge shorter than 50 meters, the full roadway width should be carried through including the width of shoulders. The minimum width between curbs for a major bridge longer than 50 meters should be one half meter greater than the width of the pavement approaching it. Walk way should be provided at one meter wide but for long spans can be limited to one side of the bridge only.

9) **Structure loading**

Increasing heavy traffic, particularly container traffic, requires properly designed load capacity (maximum axle load). In order to prevent serious damage to road structures, and also to reduce maintenance costs, the ASEAN and the Asian Highway network, as an international road network, should have high design load capacity.

The minimum design loading of HS20-44, which is the international standard corresponding to full-size trailer loading, shall therefore be used for design of structures.

10) Vertical clearance

Minimum vertical clearance shall be 4.5 m, which is the requirement for safe passage of standard ISO containers. However, in cases where sufficient clearance cannot be secured because of the high cost of rebuilding existing structures such as bridges, goose - neck trailers with low vehicle bed clearance could be used. Generally the desirable vertical clearance should be 5.00 m.