Kursus Rekabentuk Turapan Jalan
(Flexible Pavement)
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KAEDAH PENILAIAN JALAN

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Cawangan Jalan

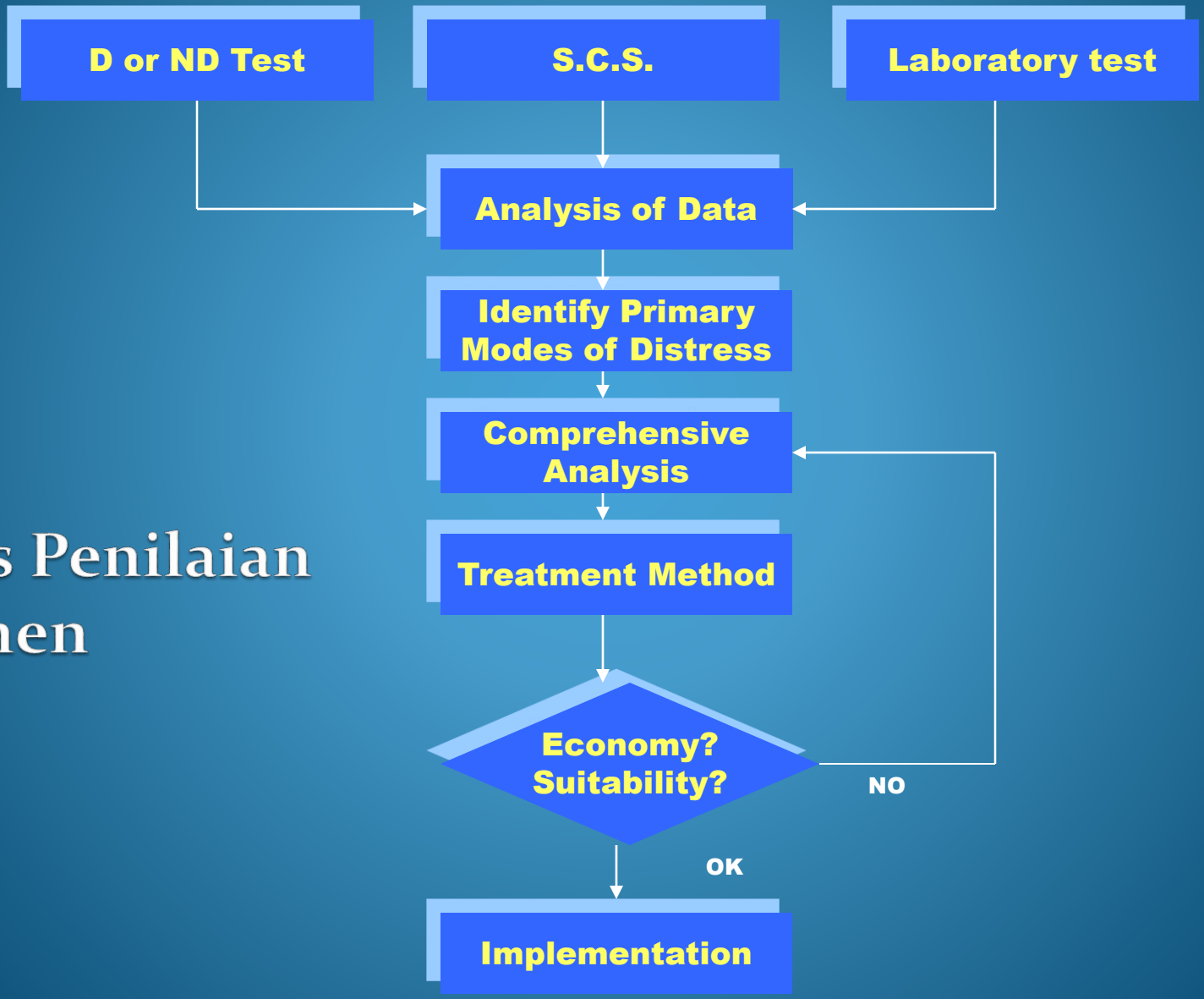
PENGENALAN

Penilaian jalan ialah satu prosedur kerja untuk :

- membuat pemerhatian di tapak
- melakukan ujian tapak dan makmal
- membuat data analisis
- membuat rekabentuk pembaikan
- mencadangkan kaedah pembaikan

Penilaian Pavemen

Proses Penilaian Pavemen



LAWATAN TAPAK

- Satu prosedur kerja yang penting untuk mengetahui :
  - Apa?
  - Bagaimana?
  - Bila?
  - Mengapa? Sesuatu kerosakan jalan berlaku.

- Perlu dilakukan pada masa yang sesuai atau tertentu bagi mengetahui punca sebenar kerosakan

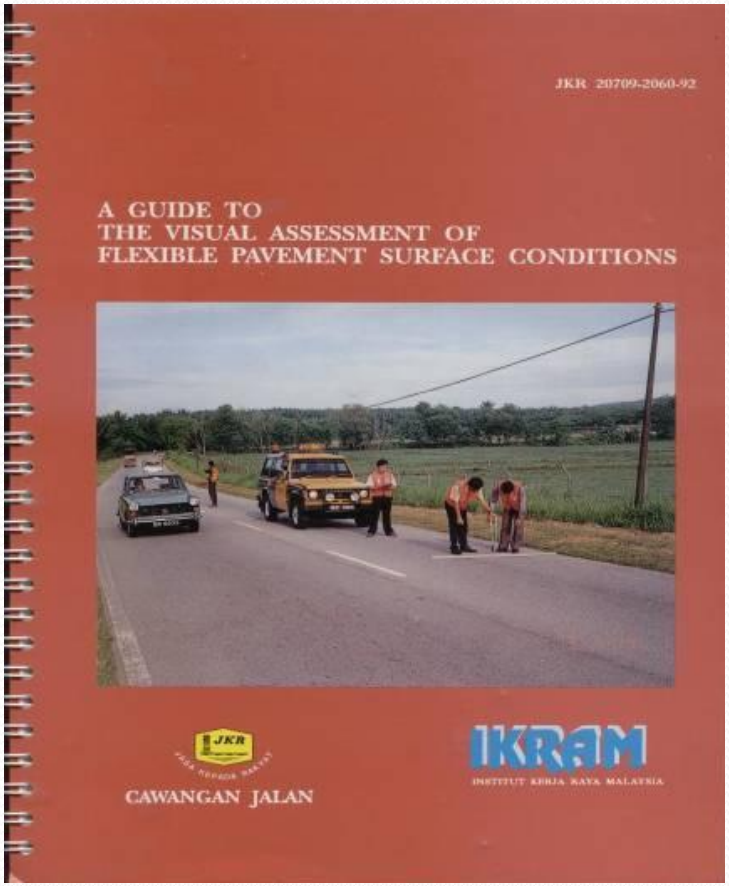
- Penemuan perlu direkodkan bagi menganalisis bagaimana untuk membaiki kerosakan yang dikenalpasti.

PEMERHATIAN DI TAPAK

Perkara yang perlu diperhatikan semasa lawatan tapak :

- Keadaan pada permukaan jalan, rosak?
- Keadaan bahu jalan
- Keadaan weephole dan longkang jalan
- Pengaliran air larian permukaan
- Keadaan lalulintas

Kerosakan pada jalan



Jenis kerosakan jalan dan punca-punca kerosakan boleh dirujuk kepada “A Guide To The Flexible Assessment of Flexible Pavement Surface Conditions”

Keadaan Bahu Jalan

- Flushed?
- Bertakung?
- Irregularities?
- Lebih tinggi dari permukaan jalan?

Keadaan Weephole dan Longkang Jalan

- Longkang berfungsi?
- Weephole tak tersumbat?
- Air dapat mengalir?

Pengaliran Air Larian Permukaan

- Adakah air larian permukaan dapat dialirkan ke longkang jalan?
- Bertakung?

Keadaan Lalulintas

Jika perlu, laksanakan banci lalulintas dan kutipan data beban gandar

Hasil Lawatan Tapak

- Perkara di atas adalah perkara yang perlu diperhatikan apabila membuat lawatan tapak dan direkodkan.

- Catatan, ukuran dan gambar adalah hasil daripada lawatan tapak tersebut yang perlu dimasukkan dalam laporan lawatan tapak.

Alatan Yang Diperlukan Semasa Lawatan Tapak

pita pengukur

roda pengukur

Kamera

Borang kerosakan

jaket keselamatan

UJIAN TAPAK

Ujian Tapak

- Dilaksanakan dengan menggunakan peralatan tertentu untuk mendapatkan beberapa parameter jalan bagi tujuan analisis dan rekabentuk pembaikan.
- Dilaksanakan berdasarkan “JKR Interim Guide to Evaluation and Rehabilitation of Flexible Road Pavement”

Ujian Tapak

Coring Test

Dynamic Cone Penetrometer
(DCP Test)

Deflection Test
(Falling Weight Deflectometer)

Surface Condition Survey

Ujian Tapak

- Dijalankan untuk mendapatkan data kerosakan jalan.
- Melibatkan data permukaan jalan (IRI, Rutting, Texture, Defects Map) dan data struktur jalan (Thickness Layer, Modulus Value, CBR Value, Types of Material)
- Memudahkan membuat analisis dan rekabentuk pembaikan.

Penilaian Pavemen

Manual Surface Condition Survey (SCS)

Purpose :

To determine the category and extent of crack, surface defects, drainage condition etc.

Methods :

Walking along the road and recording at 50m block interval.

Penilaian Pavemen

ROAD SURFACE PROFILER

Used to determine pavement functional condition and road geometry using laser technology and Global Positioning System (GPS)

Multi Laser Profiler (MLP)

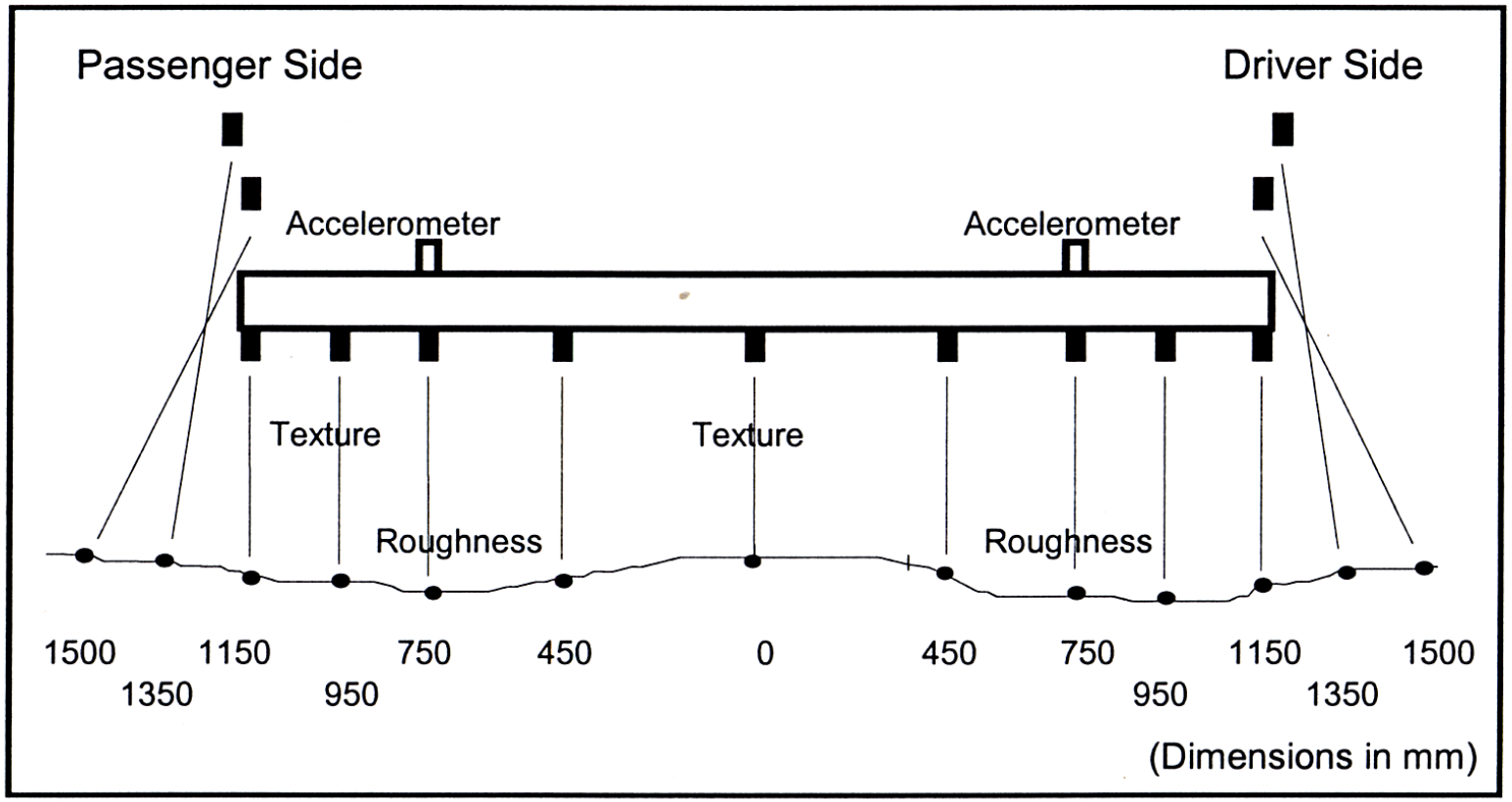


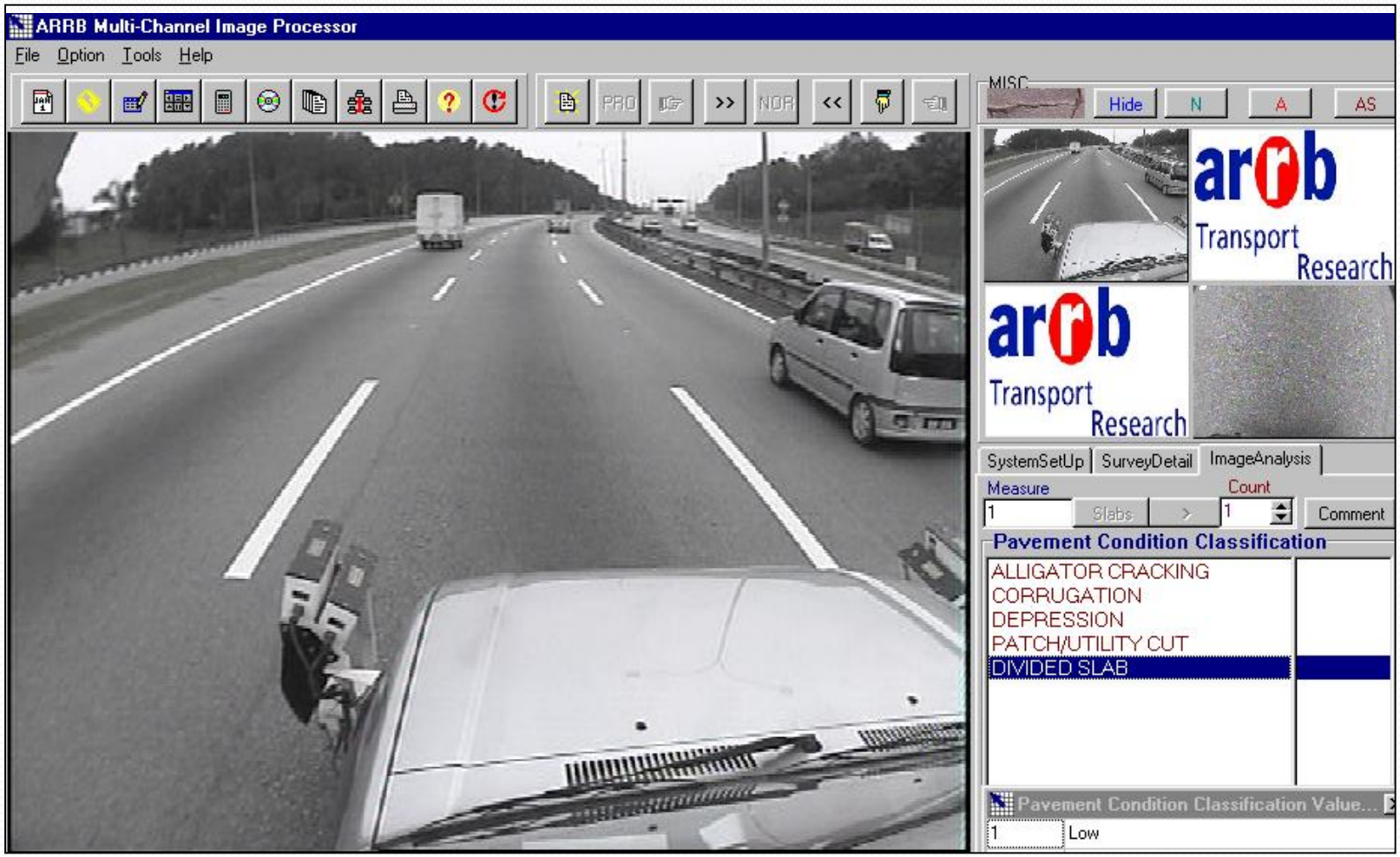
Fig: Typical configuration of Non-Contact Sensors

Multi Laser Profiler (MLP)

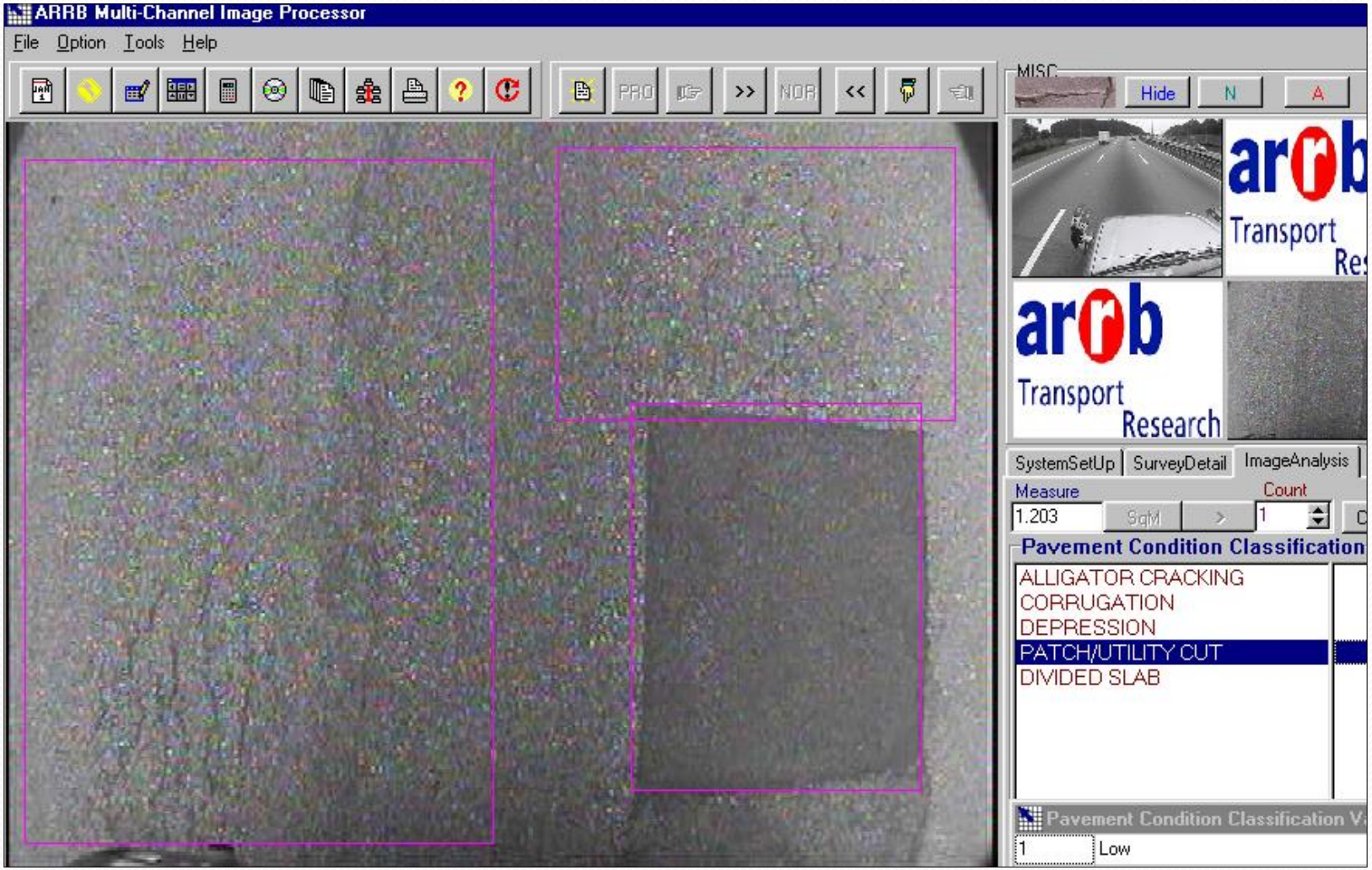
Functional data indicator

Parameter	IRI	Rutting	Texture (mm)
Good	< 2.0m/km	< 5 mm	> 0.5 mm
Fair	2.0 – 3.0 m/km	5.0 – 10.0 mm	0.5 – 0.3 mm
Poor	3.0 – 3.8 m/km	10.0 – 20.0 mm	< 0.3mm
Bad	> 3.8 m/km	> 20.00 mm	nA

Sample Image from IRS



Typical IRS Image Processing



Penilaian Pavemen

Falling Weight Deflectometer Test (FWD)

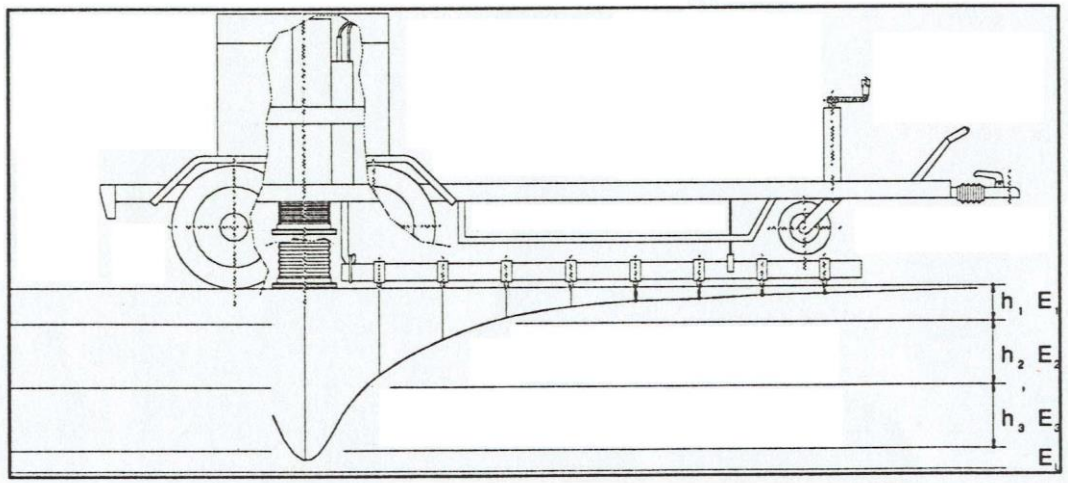
Purpose:

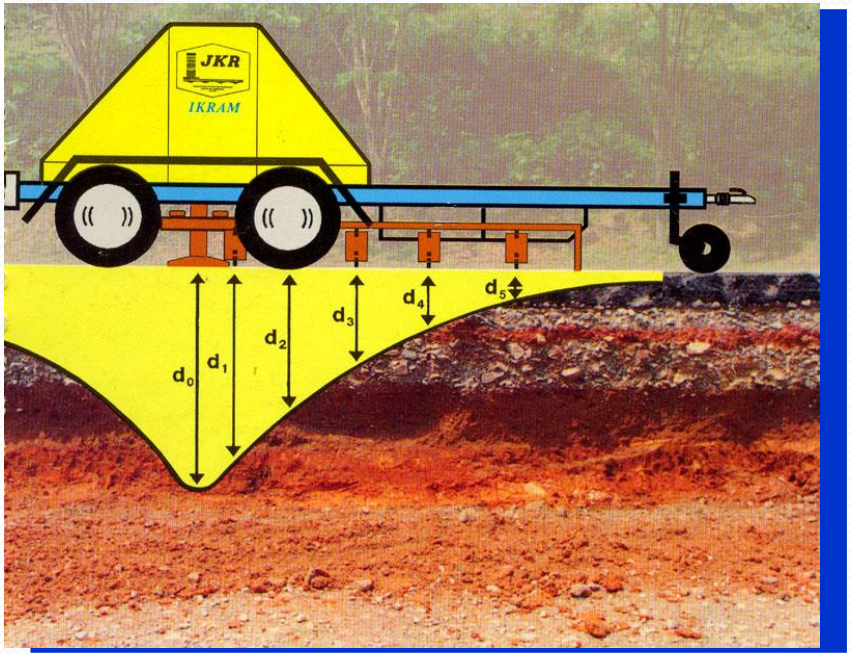
To determine pavement structural condition

Methods :

Applying a load of 700kPa and measuring the deflection bowl

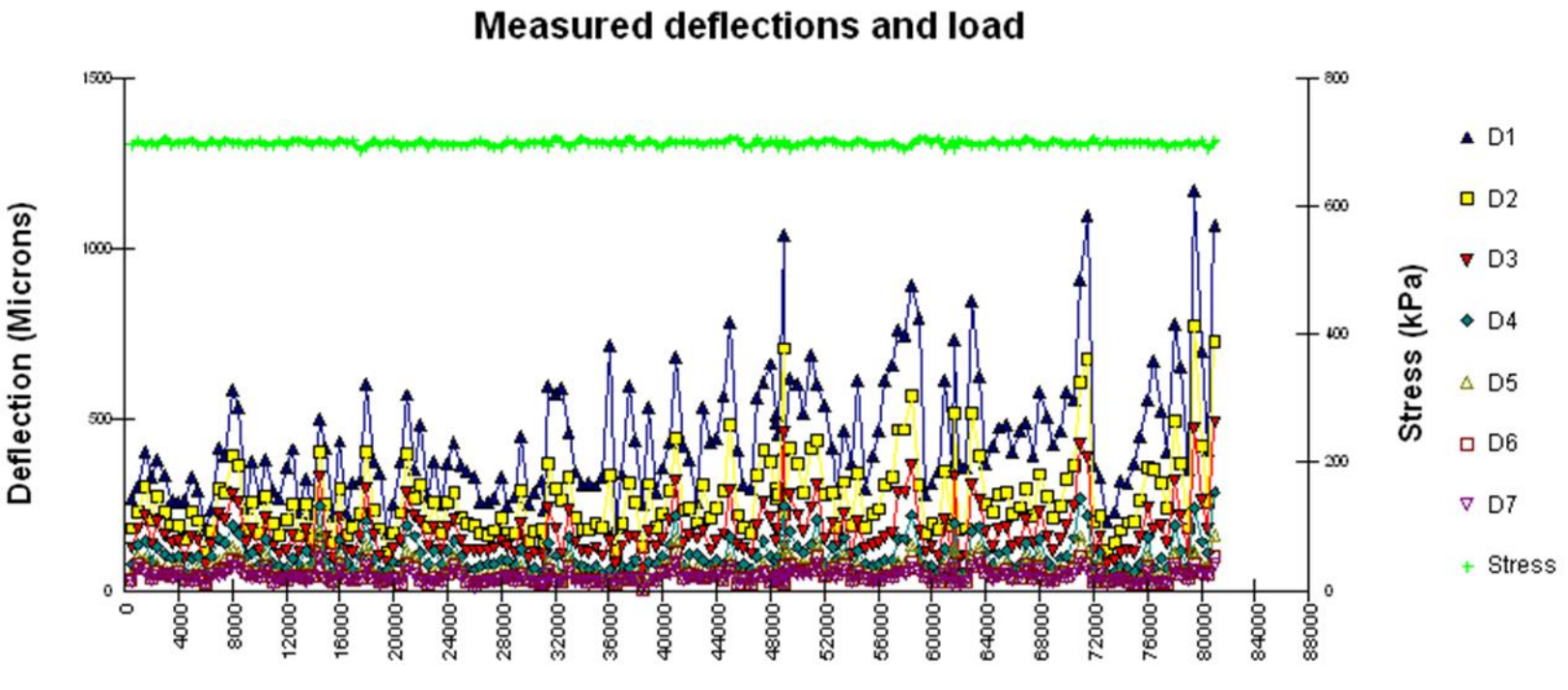
Penilaian Pavemen





Penilaian Pavemen

TYPICAL FWD DEFLECTION RESULTS



* Deflection more than 400 micron, initial sign for a weak structure

Penilaian Pavemen

INITIAL READING OF DEFLECTION

Deflections	Indicators
Central deflection, s1	Indication of the overall pavement response
Deflection difference (s1-s2); s2 is the deflection at 300mm	Indication of the response from the uppermost layer (bituminous layer)
Deflection difference (s2-s4); s4 is the deflection at 900mm	Indication of responses from the road base granular layer (wet mix)
Deflection difference (s3-s5); s3 is deflection at 600mm, s5 is the deflection at 1200mm	Indication of response from sub-base layer
Outside deflection s6; s6 is the deflection at 1500mm	Indication of sub-grade response

* Deflection more than 400 micron, initial sign for a weak structure

Penilaian Pavemen

MATERIAL CONDITION INTERPRETATION

PAVEMENT LAYER	STRENGTH INDICATION	RATING	ESTIMATED STRUCTURAL COEFFICIENT
Subgrade	CBR <5% (50MN/m2) 5 – 10 % > 10 % (100 MN/m2)	Poor Satisfactory Sound	0.1 0.20 0.23
Sub-base	Modular ratio (E3/Esg) < 1 1 – 1.5 > 1.5	 Poor Satisfactory Sound	 0.23 0.30 0.32
Granular Base	Modular ratio (E2/Esg) < 1.5 1.5 – 2.0 > 2.0	 Poor Satisfactory Sound	 0.25 0.30 0.32
Bituminous Surfacing	Modulus value (MN/m2) < 1500 1500 – 2500 2500 – 3500 > 3500	 Very poor Poor Satisfactory Sound	 0.6 0.7 0.85 0.95

Interim Guide To Evaluation and Rehabilitation of Flexible Road Pavements

Penilaian Pavemen

Asphalt Coring

Purpose:

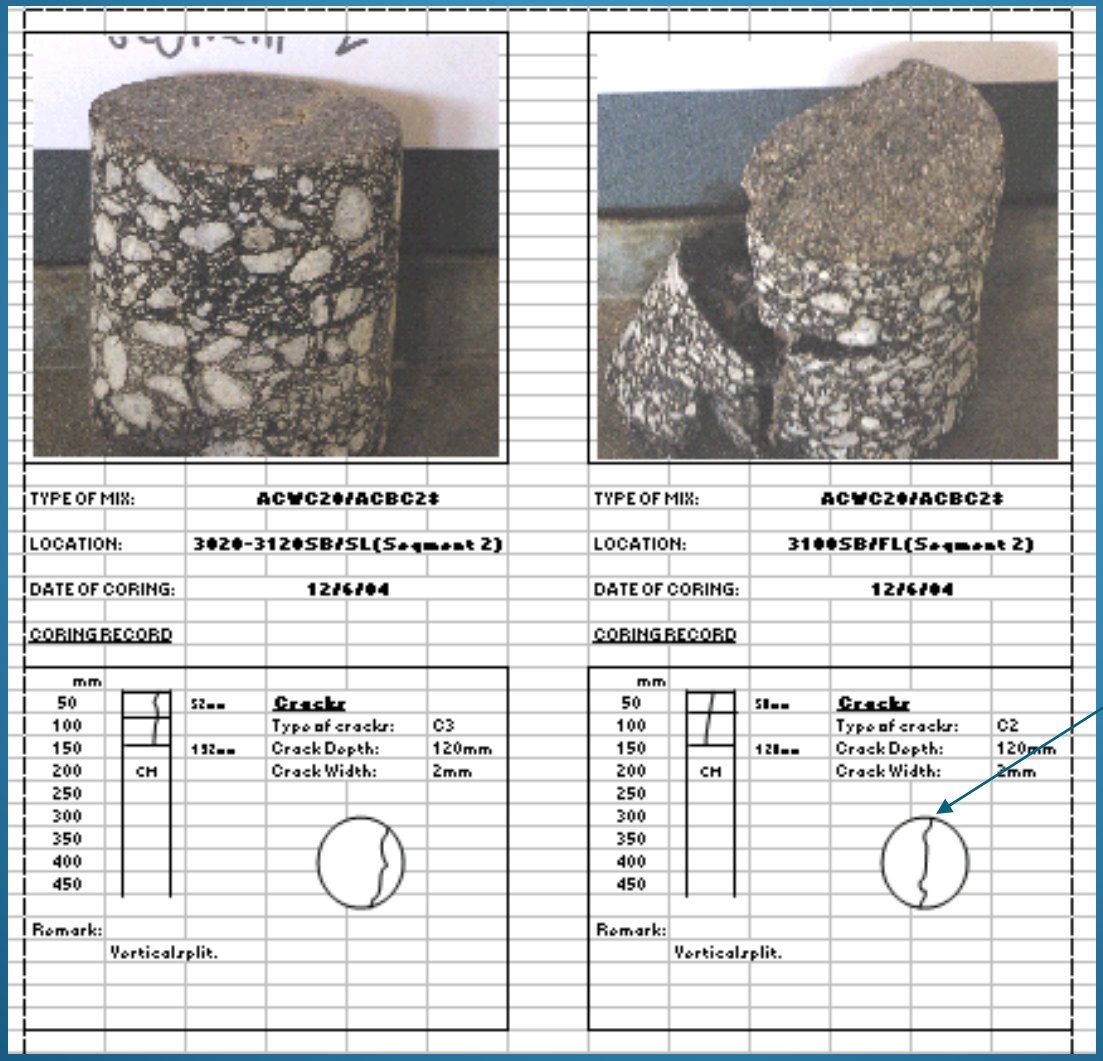
To determine asphalt layer thickness and crack depth

Methods :

Extract core samples using a rotary coring machine

Penilaian Pavemen

Typical Core Log



TYPE OF MIX:	ACWC20/ACBC2‡
LOCATION:	3020-3120SB/SL(Segment 2)
DATE OF CORING:	12/6/04

CORING RECORD

mm: 50, 100, 150, 200, 250, 300, 350, 400, 450 — CH

52mm — 132mm

Cracks

Type of cracks:	C3
Crack Depth:	120mm
Crack Width:	2mm

Remark: Vertical split.

TYPE OF MIX:	ACWC20/ACBC2‡
LOCATION:	3100SB/FL(Segment 2)
DATE OF CORING:	12/6/04

CORING RECORD

mm: 50, 100, 150, 200, 250, 300, 350, 400, 450 — CH

51mm — 128mm

Cracks

Type of cracks:	C2
Crack Depth:	120mm
Crack Width:	2mm

Remark: Vertical split.

Record crack depth

Penilaian Pavemen

Dynamic Cone Penetrometer (DCP)

Purpose:

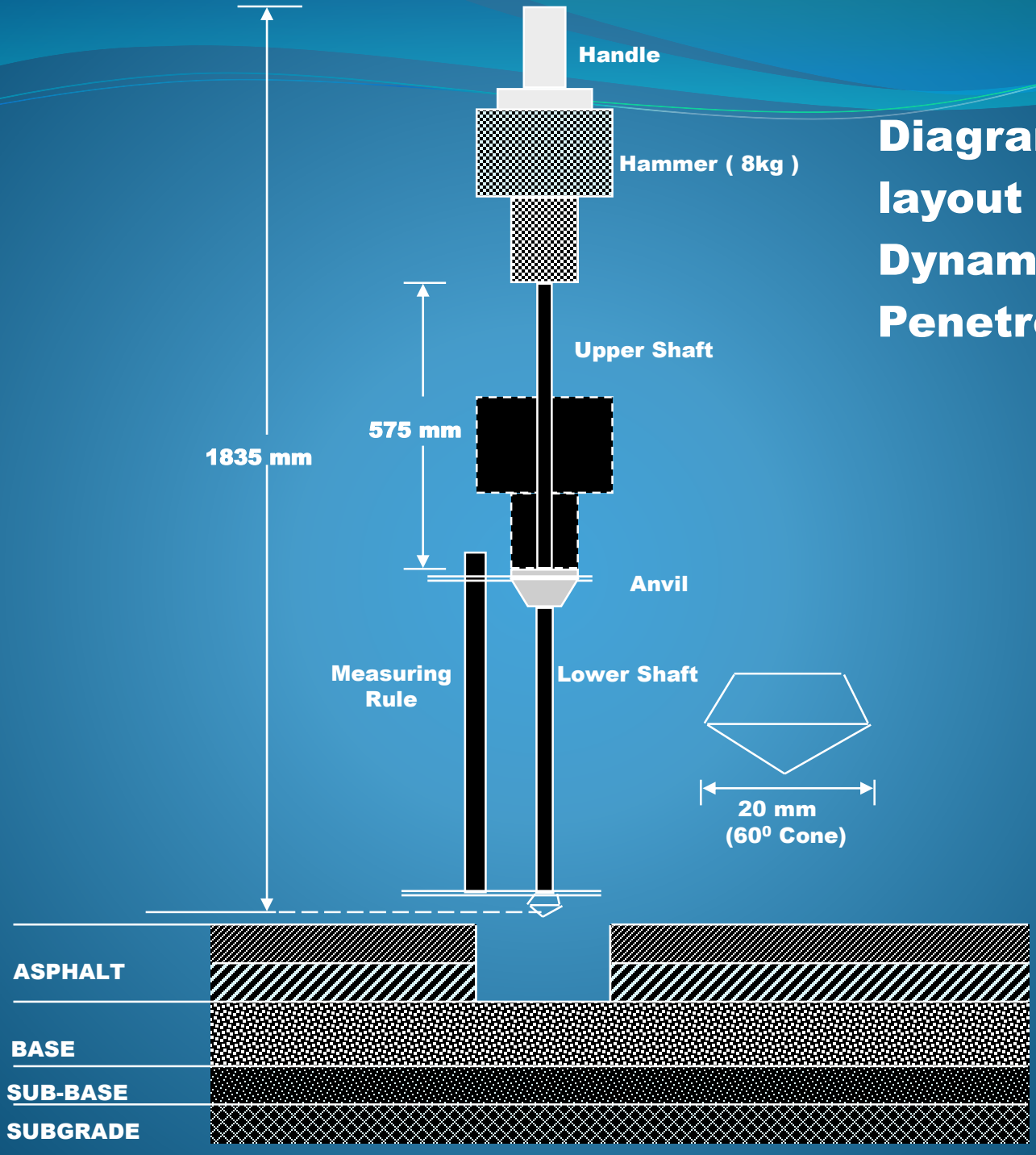
To determine pavement layer thickness

Methods:

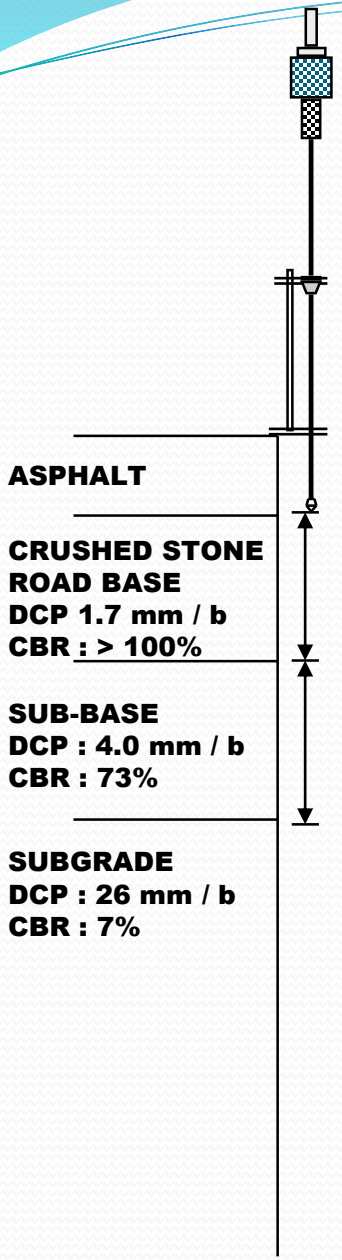
Releasing a standard weight onto the anvil and measuring the rod penetration into the ground

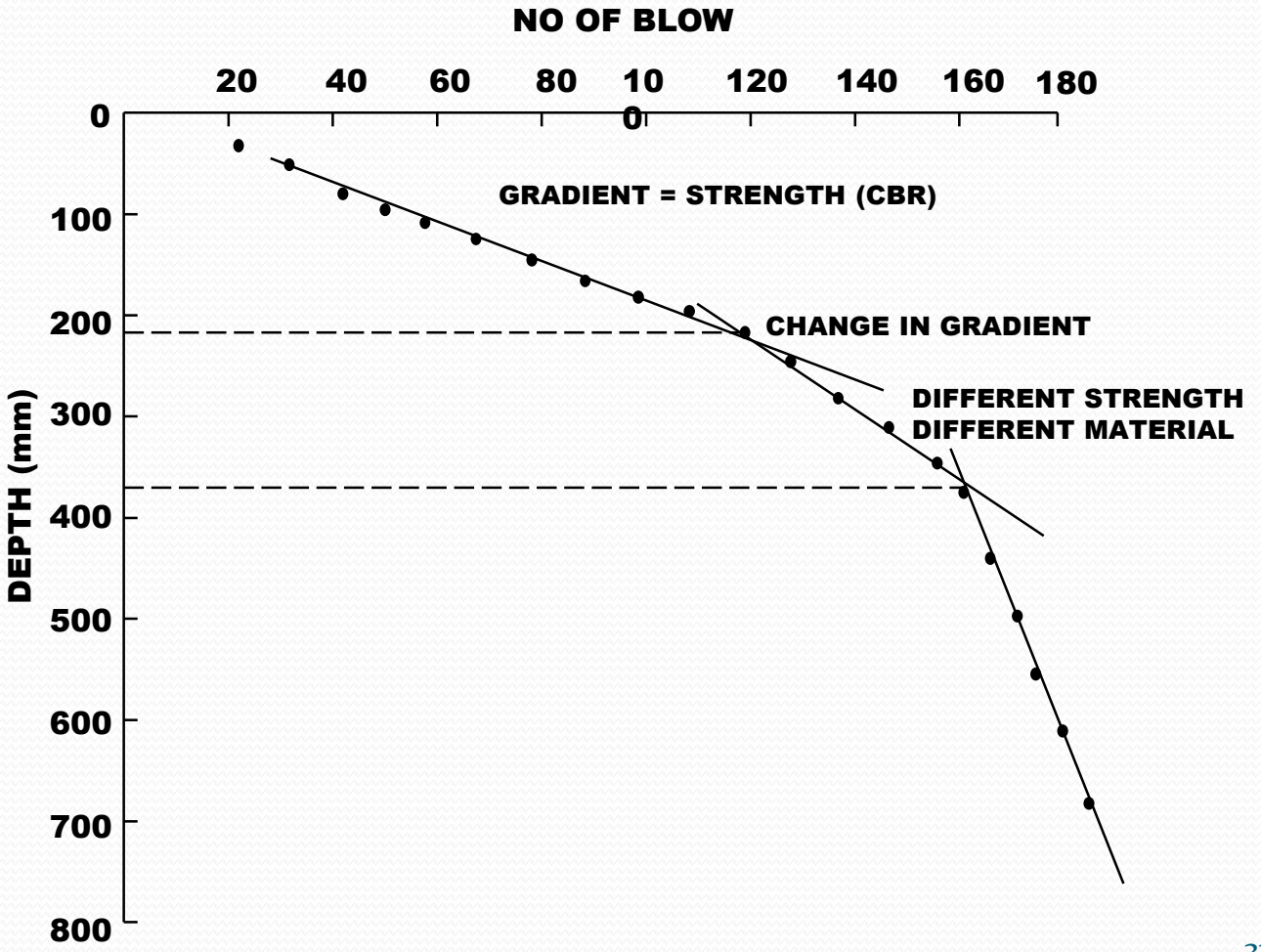
Plot graph Penetration Vs cumulative blows

Diagramatic layout of the Dynamic Cone Penetrometer.



DCP TEST PLOT





Penilaian Pavemen

Trial Pit

Purpose :

To closely inspect pavement condition & to collect samples

Methods :

Cutting and removing materials layer by layer

Traffic and Axle Load Survey

Purpose:

To determine the damaging effect (E.F) of commercial vehicles

Methods:

Weigh vehicles using portable weigh-in motion weighing system

UJIAN MAKMAL

- Laboratory Testing
- Mixture / Binder
  - Binder content
  - Grading
  - Penetration (when necessary)
  - Resilient modulus
- Crushed Aggregate
  - Grading
  - Percentage of fine (silt content)
- Soil
  - Classification Test
  - CBR
  - Density

LAPORAN

- Laporan Penilaian Pavemen
  - Ringkasan Eksekutif – penerangan ringkas kerja penilaian yang dilaksanakan (5W1H)
  - Keterangan Jalan (Pemilik jalan, lokasi jalan, panjang jalan, bilangan Lorong, Bilangan Persimpangan, keadaan trafik dan lain-lain)
  - Kaedah Kutipan Data Jalan (Peralatan dan kenderaan)
  - Program kerja dan pasukan projek
  - Analisis perbincangan data (unjuran beban trafik, unjuran kerosakan pavemen, unjuran jangka hayat pavemen, perisian@sistem)

LAPORAN

- Laporan Penilaian Pavemen
  - Analisis perbincangan data (unjuran beban trafik, unjuran kerosakan pavemen, unjuran jangka hayat pavemen, perisian@sistem)
  - Cadangan penambahbaikan (jangka pendek, jangka panjang, rekabentuk pavemen)
  - Cadangan kewangan, kos kerja
  - Lampiran dan raw data

SEKIAN, TERIMA KASIH