[NOTA]

1. UJIAN-UJIAN FORENSIK KEMALANGAN JALAN RAYA
2. SUKATAN PEPERIKSAAN

SUBJEK	: KESELAMATAN JALAN
KOD	: JTA05
NAMA PENGGUBAL SUKATAN	: Ir. ROHAIDA BINTI RASHID

UJIAN-UJIAN FORENSIK KEMALANGAN JALAN RAYA

British Pendulum Skid Test

Tujuan: Mengukur nilai rintangan gelinciran (Skid Resistance Value, SRV) permukaan pavemen

- Dilaksanakan sebanyak 10 titik (5 titik sebelum kawasan kemalangan dan 5 titik selepas kawasan kemalangan) secara diagonal
- Halakan alat ke arah pergerakan trafik
- Alat pendulum dilaraskan sebelum ujian dijalankan
- Lengan pendulum dilaraskan sehingga panjang gelinciran yang dikehendaki diperolehi
- Permukaan jalan dibasahkan sebelum lengan pendulum dilepaskan
- Suhu diambil pada permukaan pavemen yang basah
- Lengan pendulum perlu disambut untuk mengelakkan daripada rubber slide rosak
- Bacaan nilai SRV dicatatkan

Sand Patch Method

Tujuan: Mengukur kedalaman tekstur permukaan pavemen

- 10 titik ujian sand patch (5 titik sebelum kawasan kemalangan dan 5 titik selepas kawasan kemalangan) dilakukan secara diagonal
- Dilaksanakan secara bersama dengan ujian rintangan gelinciran permukaan pavemen - British Pendulum Skid Test

Reflectometer - Papan tanda

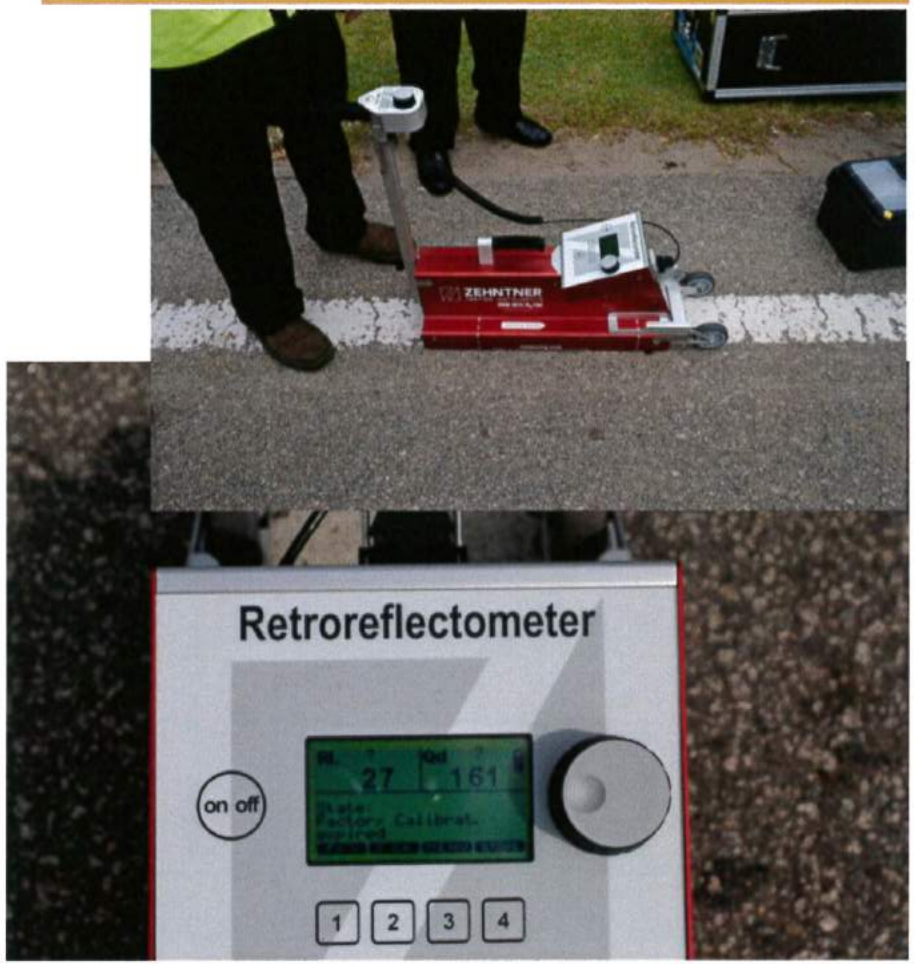
Tujuan: Mengukur nilai pantulan cahaya papan tanda

- Menguji nilai pantulan cahaya papan tanda dalam unit $C_d/I_x/m^2$

Reflectometer - Garisan jalan

Tujuan: Mengukur nilai pantulan cahaya garisan jalan

- Menguji nilai pantulan cahaya garisan jalan dalam unit $MC_d/I_x/m^2$
  - Retroreflection luminance, R_L (malam)
  - Diffuse Illumination, Q_D (siang)



Ball Bank Indicator

Tujuan: Menentukan halaju selamat (advisory speed)

- Letakkan alat ball bank di atas dashboard
- Pandu kenderaan pada had laju semasa
- Apabila tiba di selekoh, bacaan maksimum ball bank diambil
- Halaju selamat diperolehi menggunakan geraf Ball Bank Angle vs Advisory Speed (km/h)

Pro-Laser Gun

Tujuan: Mencerap halaju kenderaan untuk kajian halaju setempat (spot speed study)

- Laser gun dihalakan kepada kenderaan yang sedang bergerak pada sudut yang tetap (0°-40°) pada arah aliran lalulintas
- Apabila bunyi 'beep' dikeluarkan, bacaan laju kenderaan pada panel laser gun dicatit
- Plot geraf Cumulative Frequency (5) vs Speed (km/h)

Laser Tru Pulse

Tujuan: Mencerap kecerunan (gradient) dan kesendengan (superelevation)

- 5 bacaan kecerunan dan kesendengan di ambil di selekoh

Tru Meter dan GPS

Tujuan: Mencerap jejari selekoh dan jarak penglihatan

Bil	Accident Pattern	Probable Course	Possible Countermeasures
1	Left turn, head-on	Large turn volume	Create one-way street Add lane Provide left-turn signal phase Prohibit turn Rerouute left-turn traffic Provide adequate channelization Install stop sign Revise signal-phase sequence Provide turning guidelines for multiple left-turn lanes Provide traffic signal
		Restricted sight distance	Provide left-turn signal phase Provide adequate channellization Remove signal Provide turn lane Install or improve warning sign Reduce speed limit
		Amber phase to short	Adjust amber phase Provide all red phase
		Absence of left-turn phase	Provide left-turn signal phase
		Excessive speed	Reduce speed limit
2	Rear-end at unsignalized intersection	Large turn volume	Prohibit turn Provide turn lane Increase curb radii
		Excessive speed	Reduce speed limit
		Driver unaware of intersection	Install or improve warning sign
		Slippery surface	Reduce speed limit Overlay pavement Provide adequate drainage Grove pavement Provide 'slippery when wet' sign
		Inadequate roadway lighting	Improve roadway lighting
		Lack of adequate gaps	Provide traffic signal Provide stop sign
		Crossing pedestrians	Install or improve pedestrian crosswalk TDCs
3	Rear-end at signalized intersection	Large turn volume	Provide left-turn signal phase Prohibit turn Provide turn lane Increase curb radii
		Slippery surface	Reduce speed limit Overlay pavement Provide adequate drainage Grove pavement Provide 'slippery when wet' sign
		Inadequate roadway lighting	Improve roadway lighting
		Crossing pedestrians	Install or improve pedestrian crosswalk TDCs Provide pedestrian signal
		Poor traffic control device (TDC) visibility	Remove signal Install or improve warning sign Reduce speed limit Install overhead signal Install 12-inch signal lenses Install signal visors Install signal back plates Relocate signal
		Inadequate signal timing	Adjust amber phase Provide all red phase Provide progression through a set of signalization
		Unwarranted signal	Remove signal

Bil	Accident Pattern	Probable Course	Possible Countermeasures
4	Right angle at signalized intersection	Restricted sight distance	Provide adequate channelization Remove signal Install or improve warning sign Reduce speed limit Restrict parking near coner/cross walk/drive Provide markings to supplement sign
		Excessive speed	Reduce speed limit Adjust amber phase Install rumble strips
		Inadequate roadway lighting	Improve roadway lighting
		Poor traffic control device (TDC) visibility	Install or improve warning sign Install overhead signal Add signal head Install iluminated street name sign
		Inadequate signal timing	Retime signal Adjust amber phase Provide all red phase Provide progression through a set of signalization Install multidial signal controller Install signal actuation
		Inadequate advance intersection warning signs	Install or improve warning sign
		Large total intersection volume	Add lane Retime signal
5	Right angle at unsignalized intersection	Restricted sight distance	Provide adequate channelization Provide traffic signal Remove signal Install or improve warning sign Reduce speed limit Provide stop sign Restrict parking near coner/cross walk/drive Provide markings to supplement sign Install yield sign Install limit lines
		Excessive speed	Reduce speed limit Adjust amber phase Install rumble strips
		Inadequate roadway lighting	Improve roadway lighting
		Inadequate advance intersection warning signs	Install or improve warning sign
		Large total intersection volume	Provide traffic signal Reroute through traffic
		Inadequate TCDs	Upgrade TDCs Increase enforcement
6	Pedestrian-vehicle	Restricted sight distance	Remove signal Install or improve pedestrian crosswalk TDCs Restrict parking near coner/cross walk/drive Reroute pedestrian path
		Excessive speed	Install or improve warning sign Reduce speed limit Increase enforcement Install pedestrian barrier
		Inadequate roadway lighting	Improve roadway lighting
		Lack of adequate gaps	Provide traffic signal Install or improve pedestrian crosswalk TDCs Provide pedestrian signal
		Inadequate signal timing	Retime signal
		Inadequate TCDs	Provide pedestrian signal
		Inadequate pedestrian protection	Install pedestrian barrier Install pedestrian refuge island
		School crossing area	Use crossing guard at school crossing area
		Driver have inadequate warning of frequent midblock crossing	Install or improve warning sign Reduce speed limit Install pedestrian barrier Prohibit parking
		Inadequate or improper pavement marking	Install thermoplastic markings Provide signs to suppliment markings

Bil	Accident Pattern	Probable Course	Possible Countermeasures
7	Wet pavement	Slippery surface	Reduce speed limit Overlay pavement Provide adequate drainage Grove pavement Provide 'slippery when wet' sign Improve skid resistance
		Inadequate or improper pavement marking	Improve or install pevement markings
8	Ran off roadway	Excessive speed	Reduce speed limit
		Slippery surface	Reduce speed limit Overlay pavement Provide adequate drainage Grove pavement Provide 'slippery when wet' sign
		Inadequate roadway lighting	Improve roadway lighting
		Poor traffic control device (TDC) visibility	Increase sign size
		Inadequate roadway design for traffic condition	Widen lane Relocate island Close curb lane Install guardrail
		Inadequate delineation	Install or improve warning sign Improve or install pevement markings Improve or install delineation
		Inadequate shoulder	Upgrade roadway shoulder
		Inadequate channelization	Provide adequate channelization
		Inadequate pavement maintenance	Repair road surface
9	Fixed object	Excessive speed	Reduce speed limit
		Slippery surface	Provide adequate drainage Provide 'slippery when wet' sign Widen lane Improve skid resistance
		Inadequate roadway lighting	Improve roadway lighting
		Inadequate or improper pavement marking	Improve or install pevement markings
		Inadequate roadway design for traffic condition	Install or improve warning sign Provide proper superelevation
		Fixed object in or too close to roadway	Install guardrail Remove fixed object Install barrier curb Install breakaway posts Install crash cushioning device
		Inadequate TCDs and guardrail	Paint or install reflectors on obstruction
10	Parked or parking vehicle	Driver unaware of intersection	Reduce speed limit
		Inadequate or improper pavement marking	Mark parking stall limits
		Inadequate parking clearance at driveway	Restrict parking near coner/cross walk/drive
		Angle parking	Convert angle to parallel parking
		Illegal parking	Increase enforcement Prohibit parking Create off-street parking
		Large parking turnover	Create one-way street Reroute through traffic
11	Sideswipe or head on	Excessive speed	Reduce speed limit Install median barrier Remove constriction such as parked vehicle
		Inadequate or improper pavement marking	Improve or install pevement markings
		Inadequate roadway design for traffic condition	Create one-way street Widen lane
		Inadequate shoulder	Upgrade roadway shoulder
		Inadequate channelization	Provide adequate channelization Provide turn lane Install acceleration or deceleration lane
		Inadequate pavement maintenance	Repair road surface
		Inadequate signing	Install iluminated street name sign Install advance guide sign

Bil	Accident Pattern	Probable Course	Possible Countermeasures
12	Driveway -related	Large turn volume	Provide turn lane Increase curb radii Restrict parking near coner/cross walk/drive Widen lane Install median barrier Increase driveway width
		Restricted sight distance	Remove signal Reduce speed limit Add signal head Restrict parking near coner/cross walk/drive
		Excessive speed	Reduce speed limit
		Inadequate roadway lighting	Improve roadway lighting
		Improperly located driveway	Regulate minimum driveway spacing Regulate minimum corner clearance Move driveway to side street Install curb to define driveway location Consalidate adjacent driveway
		Large through traffic volume	Reroute through traffic Move driveway to side street Construct a local service road
		Large driveway traffic volume	Provide adequate channelization Provide traffic signal Install acceleration or deceleration lane
13	Train-vehicle	Restricted sight distance	Remove signal Install or improve warning sign Provide stop sign Reduce grade Install train-actuated signal Install automatic flashers or flashers with gates
		Excessive speed	Reduce speed limit
		Slippery surface	Improve skid resistance
		Poor traffic control device (TDC) visibility	Improve roadway lighting Increase sign size
		Inadequate or improper pavement marking	Provide markings to supplement sign Install limit lines Improve or install pevement markings
		Improper traffic signal preemption timing	Retime signal
		Improper signal or gate warning time	Retime automatic flashers or flashers with gates
		Rough crossing surface	Improve crossing surface
		Sharp crossing angle	Rebuild crossing with proper angle
14	Night	Poor traffic control device (TDC) visibility	Install or improve warning sign Improve roadway lighting Improve or install delineation
		Inadequate delineation	Install or improve warning sign Improve or install delineation Provide raised markings
		Inadequate channelization	Install or improve warning sign Improve or install pevement markings Improve or install delineation Provide raised markings
		Inadequate signing	Upgrade TDCs Provide illuminated sign