PENGHADANG JALAN LONGITUDINAL TRAFFIC SAFETY BARRIER

Sumber:
REAM GL 9/2006 : Guidelines on Design and Selection of Longitudinal Traffic Safety Barrier

30- 31 MAC 2021 (SELASA- RABU)

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PENGENALAN

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Apa itu penghadang jalan (traffic barriers)?

Penghadang jalan merupakan sistem penghadang keselamatan jalan bertujuan untuk memastikan pengguna selamat dengan menghalang kereta dari keluar ke trek bertentangan atau kereta bergeser sesama sendiri.

PENGENALAN

Apa itu penghadang jalan (traffic barriers)?

Traffic Barriers

Traffic barriers are used to minimize the severity of potential accidents involving vehicles leaving the travelled way. Because barriers are a hazard in themselves, emphasis should be on minimizing the number of such installations. **Latest edition of REAM GL 9/2006: Guidelines on Design and Selection of Longitudinal Traffic Safety Barrier** should be used for the design of longitudinal traffic barriers.

Sumber:
ATJ 8/86 (Pindaan 2015): A Guide on Geometric of Roads

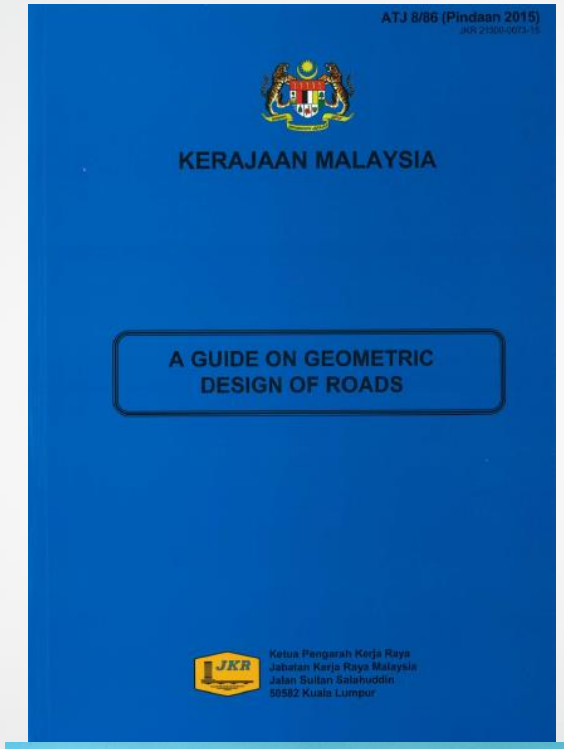
Longitudinal traffic safety barriers are highway features designed primarily to reduce the severity of run-off-road accidents, prevent out-of-control vehicles from crossing the median, and decelerate errant vehicles. These features include guardrail, concrete barrier and wire rope fence.

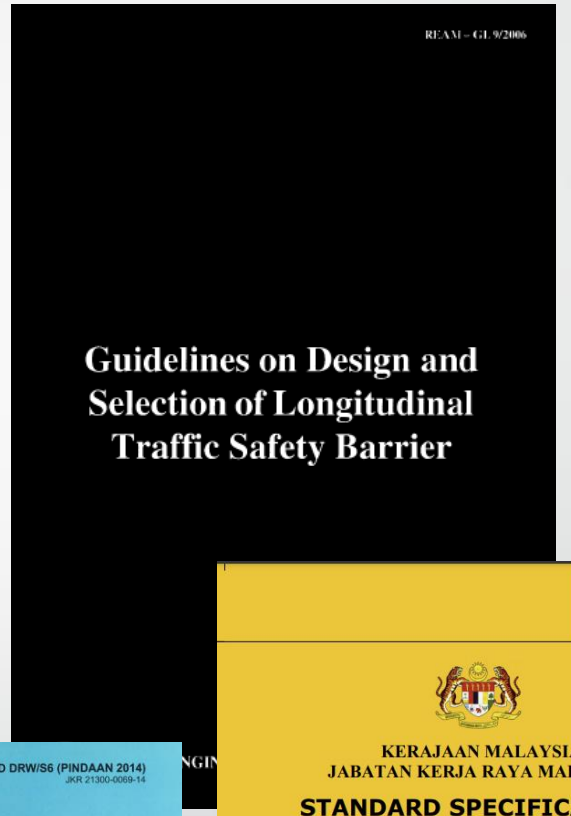
Sumber:
REAM GL 9/2006 : Guidelines on Design and Selection of Longitudinal Traffic Safety Barrier

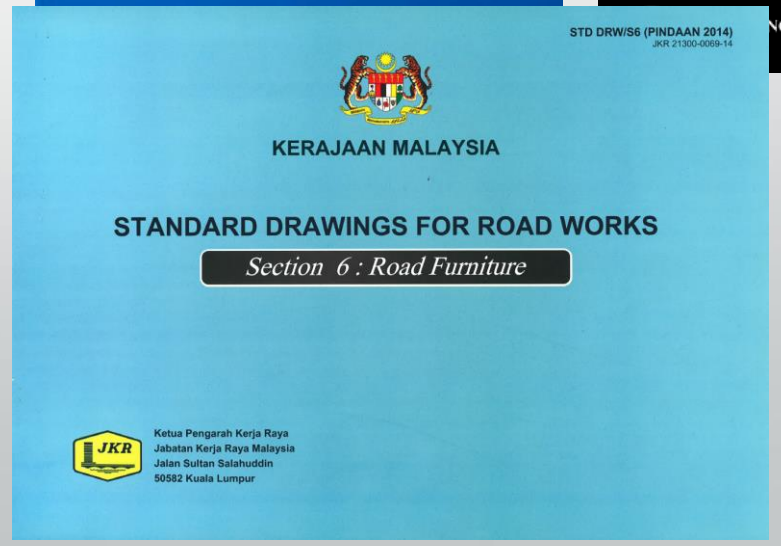
STANDARD PIAWAI YANG DIGUNAKAN

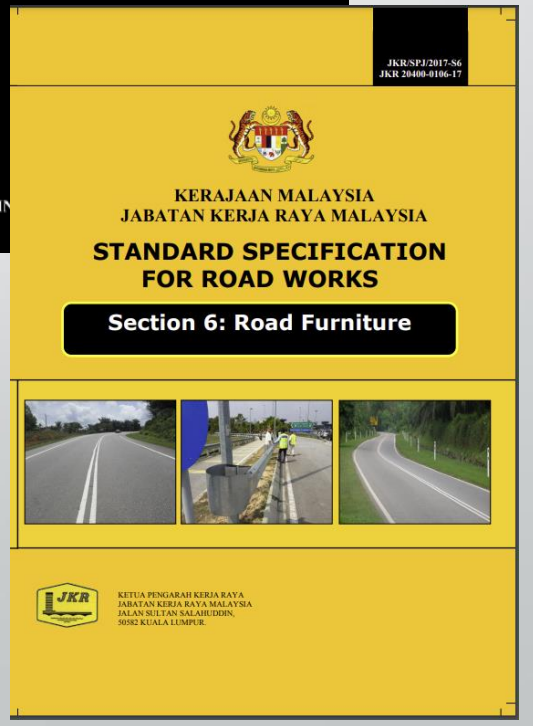
Rekabentuk – Dokumen terlibat

- ATJ 8/86 (Pindaan 2015): A Guide On Geometric Design of Roads
- REAM GL 9/2006: Guidelines on Design and Selection of Longitudinal Traffic Safety Barrier
- Standard Drawings for Road Works Section 6: Roadside Furniture (Pindaan 2014)
- Standard Specification for Road Works Section 6: Road Furniture (Pindaan 2017)









FUNGSI PENGHADANG JALAN

FUNGSI

- Mengembalikan kenderaan yang telah hilang kawalan ke laluan asal
- Mengurangkan risiko kenderaan terbabas dari jajaran

JENIS-JENIS PENGHADANG JALAN

JENIS-JENIS PENGHADANG JALAN
(SAFETY BARRIER)

RIGID BARRIERS ~ NEW JERSEY BARRIER (NJB) ~

Defined As A Barrier That Do Not Deflect Upon Impact

SEMI RIGID BARRIERS

~ GUARDRAIL ~

Defined As A Barrier Where Small To Moderate Deflection Is Acceptable (Max 1.2m)

FLEXIBLE BARRIERS

~ WIRE ROPE~

Defined As A Barrier Which Relies On Large Dynamic Deflection By Using The Energy Management Principle

PENGHADANG TEGAR *(RIGID BARRIER)*

- **Lokasi Cadangan Pemasangan**
  - **Jalan dengan tambakan tinggi (>10m)**
  - **Pemisah jalan dengan median yang sempit (<2.5m)**

- **Ketinggian Pemasangan**
  - **810 mm – jalanraya dengan kelajuan <100km/j & peratusan kenderaan berat rendah**
  - **1070mm – jalanraya dengan kelajuan >100 km/j & peratusan kenderaan berat yang tinggi**

PENGHADANG SEMI TEGAR *(SEMI RIGID BARRIER)*

- **Digunakan untuk deflection yang kecil ke sederhana (small to moderate) (max deflection of 1.2m) dan boleh dikategori kepada dua iaitu:**

a) Strong Beam / Weak Post

The posts near the point of impact are purposely designed to break away so that the force of impact is distributed by beam action to a relatively larger number of posts. Attributes of this system are

- Barrier performance is independent of impact point at or between posts and of soil properties, and
- Vehicle snagging on a post is virtually eliminated.

b) Strong Beam / Strong Post

The posts near the point of impact are purposely designed to only deflect moderately and the force of impact is distributed by beam action to a smaller number of posts. This is to be considered when:

- Minimal deflection is required.
- Transitioning to rigid objects such as bridge parapets.

PENGHADANG SEMI TEGAR *(SEMI RIGID BARRIER)*

- Lokasi Cadangan Pemasangan
  - Pokok-pokok besar (diameter > 1500mm)
  - Tiang lampu
  - Pier / abutment jambatan
  - Saliran air dengan kedalaman > 0.5m
  - Cerun (cut / fill slope)

- Ketinggian Pemasangan
  - Ketinggian yang dibenarkan adalah 710mm + 20mm dari aras tanah

FLEXIBLE BARRIER (WIRE ROPE)

- **Lokasi Cadangan Pemasangan**
  - **Penghadang tengah jalan**
  - **Penghadang tepi jalan dengan rizab tepi jalan yang lebar**
  - **Penghadang keselamatan bagi laluan kecemasan**
- **Ketinggian Pemasangan**
  - **Kabel paling atas : 600 mm ± 10 mm**
  - **Kabel paling bawah : 500 mm ± 10 mm**

PERFORMANCE REQUIREMENTS

- NCRHRP (National Cooperative Highway Research Program) Report 350 is a guideline for testing both permanent and temporary road safety features and it recommends performance evaluation criteria to assess the test results.
- The obj. of the testing is to determine the manner in which a road safety feature performs during a vehicle crash situation, for typical site and traffic conditions.
- Table below shows, there are six test levels and each defined by impact conditions, speed, angle of approach, mass and vehicle type.

PERFORMANCE REQUIREMENTS

Minimum-major roads (R4 & U4)

TL-1	a) 820kg Car (20°) b) 2000kg pickup truck (25°)	50km/hr
TL-2	a) 820kg Car (20°) b) 2000kg pickup truck (25°)	70km/hr
TL-3	a) 820kg Car (20°) b) 2000kg pickup truck (25°)	100km/hr
TL-4	a) 820kg Car (20°) b) 2000kg pickup truck (25°) c) 8000kg single unit truck (15°)	100km/hr 100km/hr 80km/hr
TL-5	a) 820kg Car (20°) b) 2000kg pickup truck (25°) c) 36000kg tractor/van trailer (15°)	100km/hr 100km/hr 80km/hr
TL-6	a) 820kg Car (20°) b) 2000kg pickup truck (25°) c) 36000kg tractor/tank trailer (15°)	100km/hr 100km/hr 80km/hr

Table 2.1: 6 Tests Levels (TL) for longitudinal barriers established in NCHRP Report 350 (Source: FHWA)

KRITERIA PEMILIHAN

TABLE 3.1: Selection Criteria for Roadside Barriers (Source: AASHTO)

Criteria	Comments
1. Performance Capability	barrier must be structurally able to contain and redirect design vehicle.
2. Deflection	expected deflection of barrier should not exceed available room to deflect.
3. Site conditions	slope approaching the barrier, and distance from traveled way, may preclude use of some barrier types.
4. Compatibility	barrier must be compatible with planned end anchor and capable of transition to other barrier systems (such as bridge railing).
5. Cost	standard barrier systems are relatively consistent in cost, but high-performance railings can cost significantly more.
6. Maintenance	
a. routine	few systems require a significant amount of routine maintenance.
b. collision	generally, flexible or semi-rigid systems require significantly more maintenance after a collision than rigid or high-performance railings.
c. materials storage	the fewer different systems used, the fewer inventory/items/storage space required.
d. simplicity	simpler designs, besides costing less, are more likely to be reconstructed properly by field personnel.
7. Aesthetics	occasionally, barrier aesthetics is an important consideration in its selection.
8. Field Experience	the performance and maintenance requirements of existing systems should be monitored to identify problems that could be lessened or eliminated by using a different barrier type.

SAFETY BARRIERS WARRANTS

SAFETY BARRIERS WARRANTS

a) Embankments Safety Barriers

The primary contributors to the severity of over-embankment accidents are the height and slope of the embankment or side hill. Safety barrier is a fixed object and should be installed only at locations where going off the embankment would be more severe than hitting the safety barrier (Figure2.3) and there has been a history of over-embankment accidents.

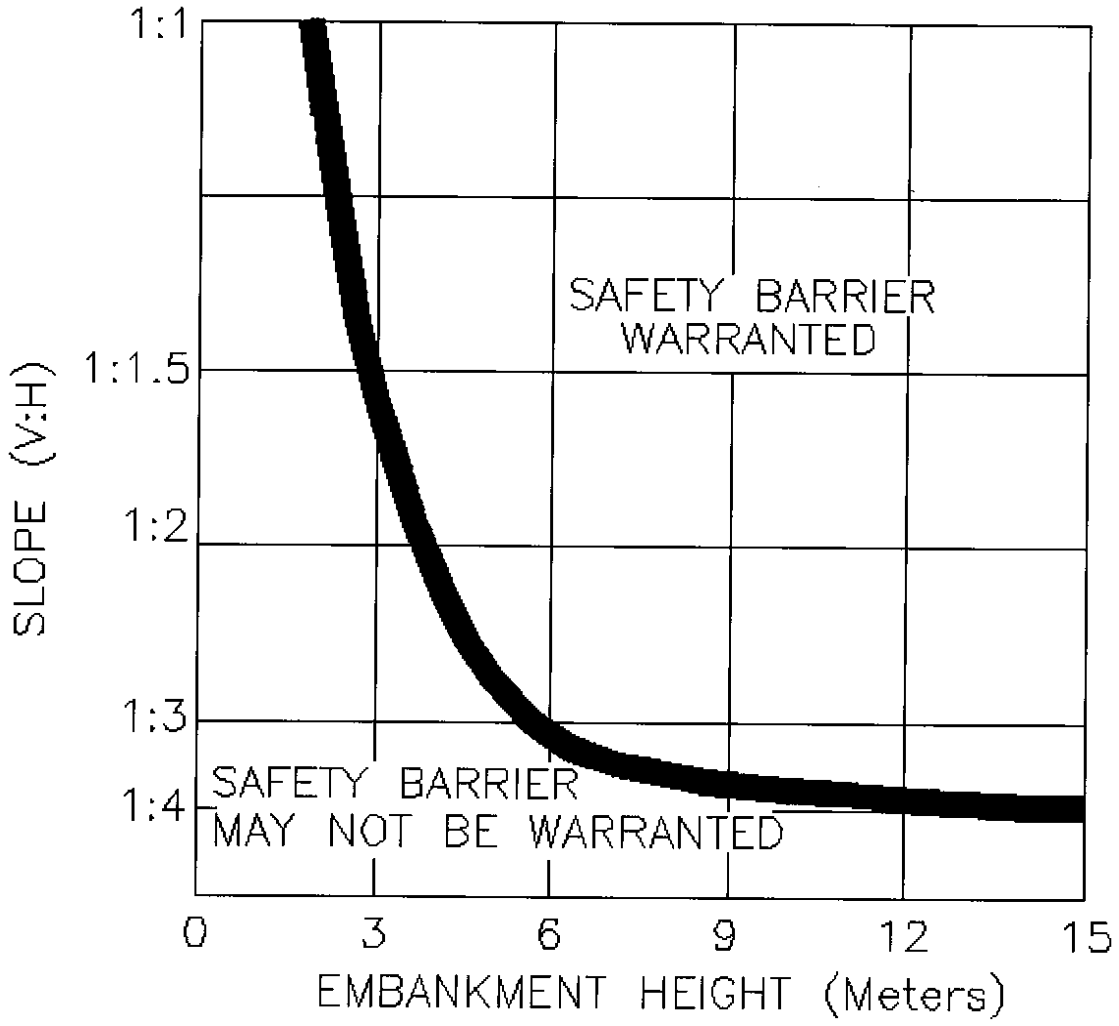
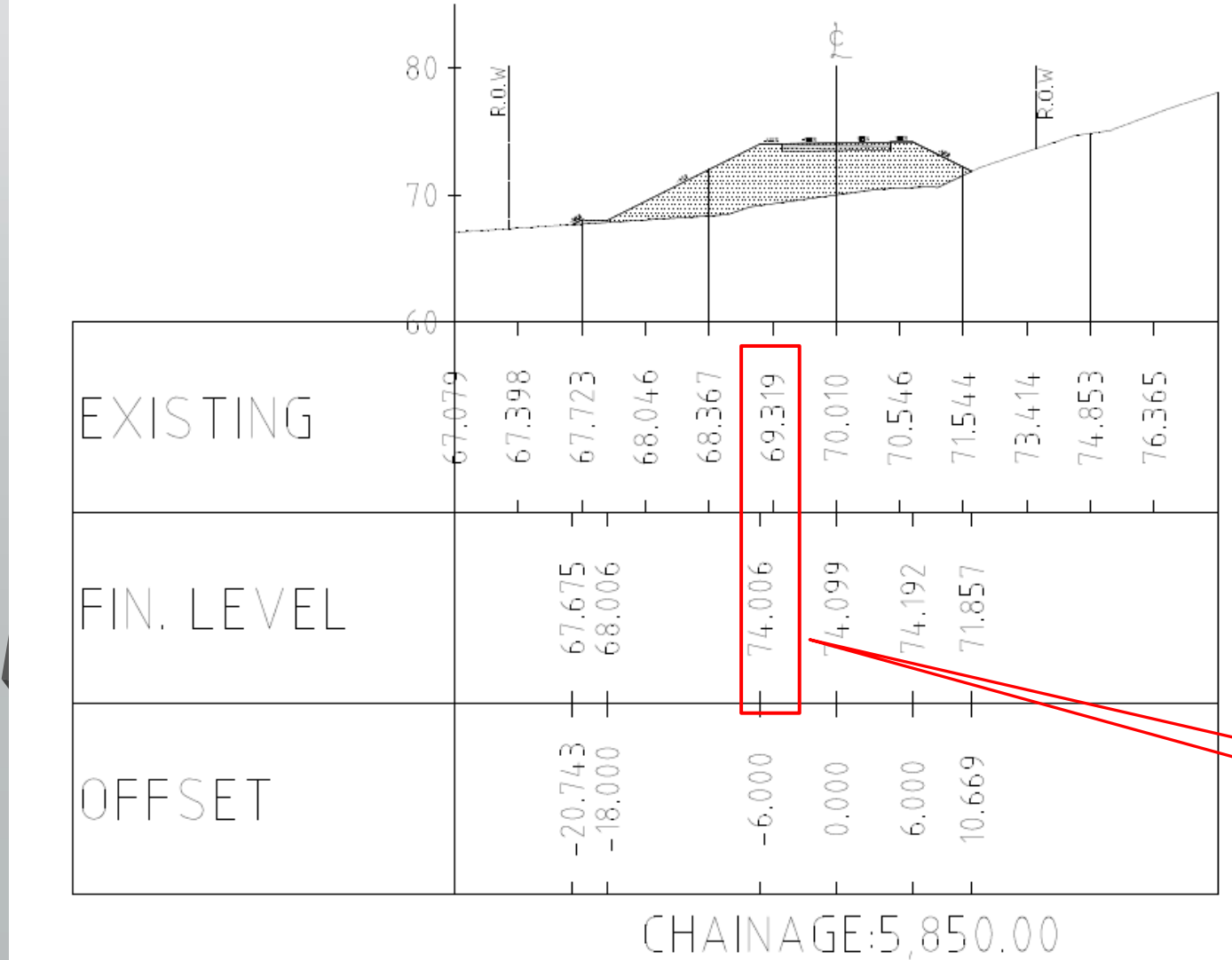
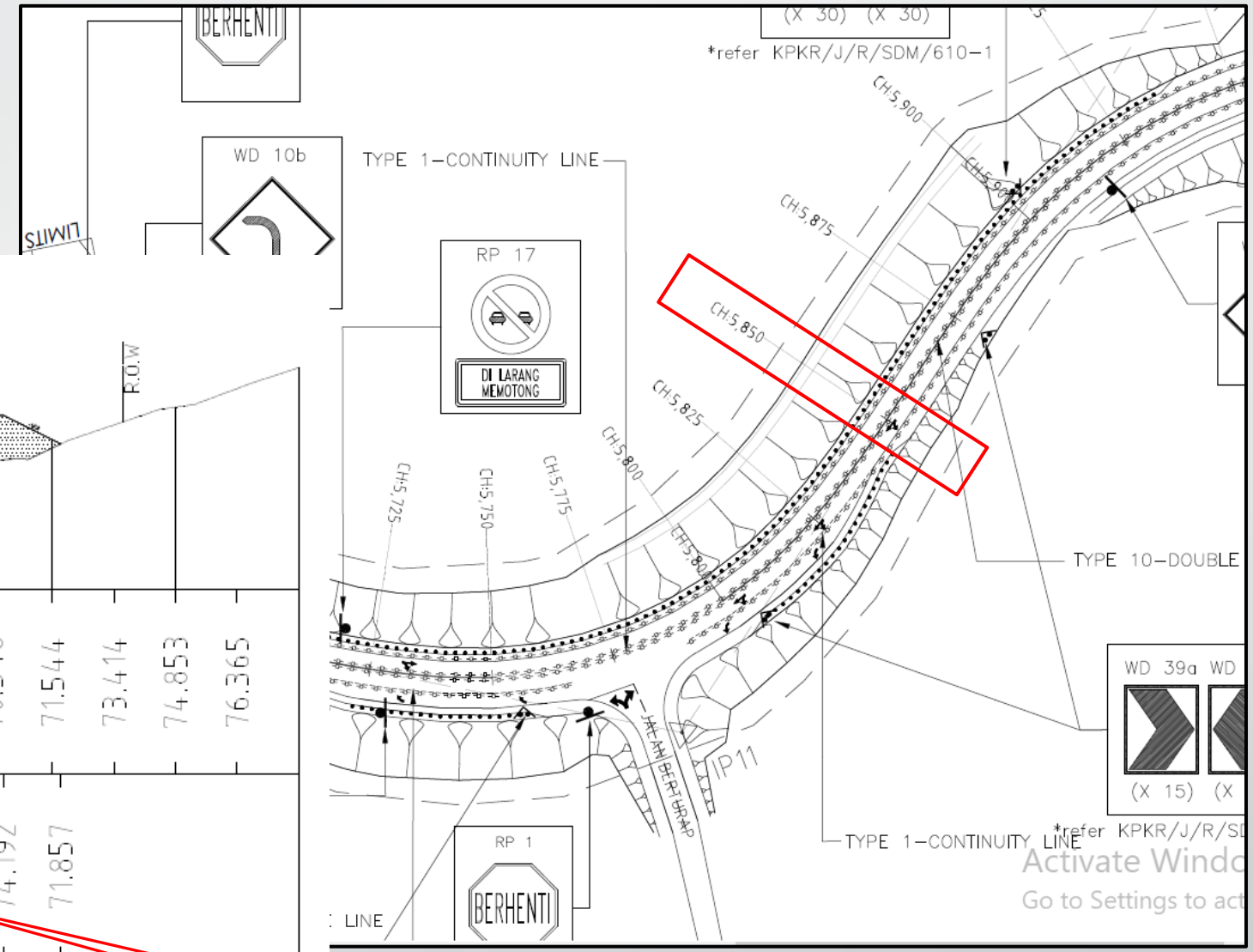


Figure 2.3: Equal Severity Curve

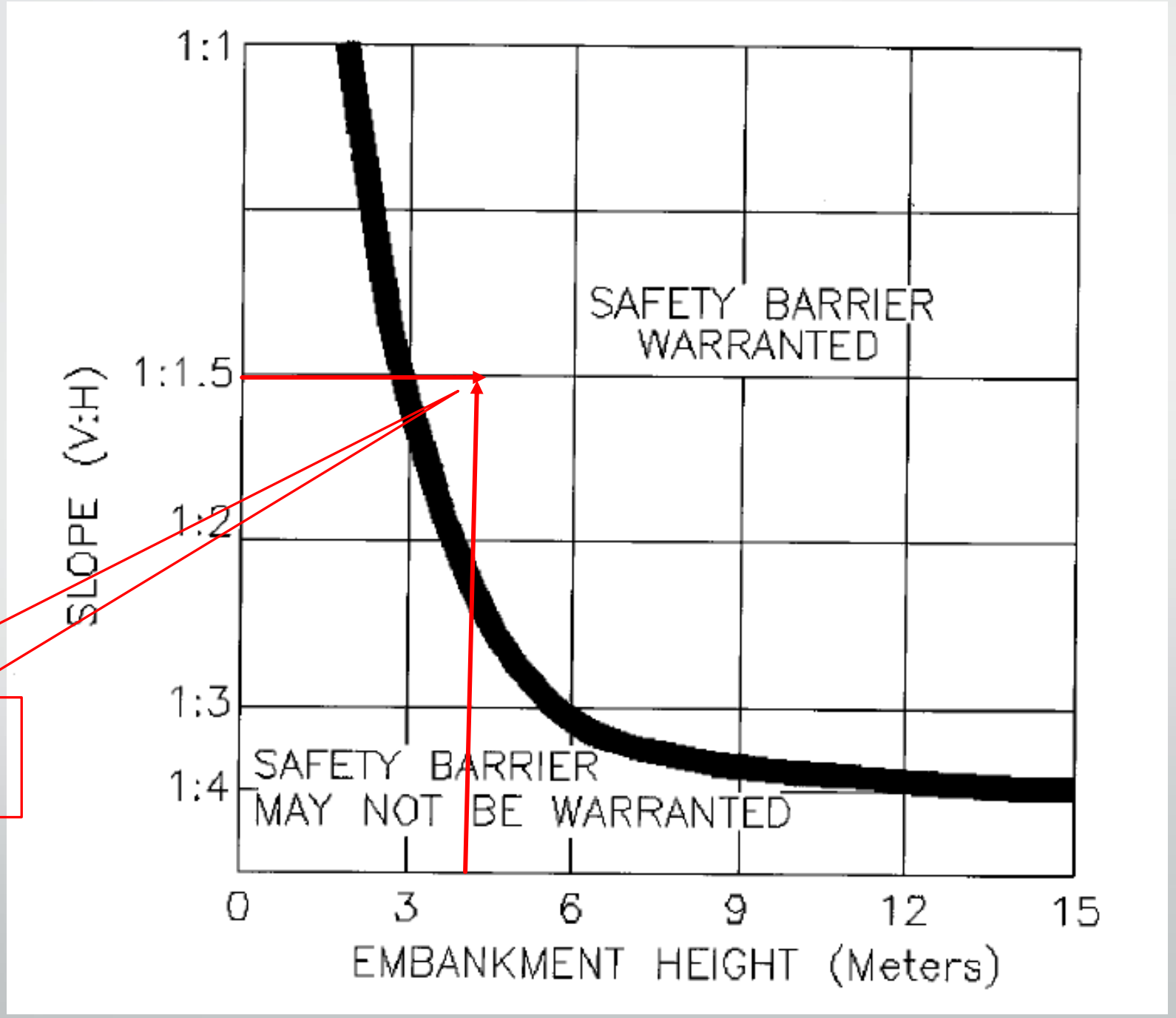
CONTOH BAGI MENENTUKAN KEPERLUAN PENGHADANG JALAN (*SAFETY BARRIERS*)





Beza FRL – EGL : 4.687m

PERLU?


1:1
1:1.5
1:2
1:3
1:4
SLOPE (V:H)
SAFETY BARRIER
WARRANTED
SAFETY BARRIER
MAY NOT BE WARRANTED
0
3
6
9
12
15
EMBANKMENT HEIGHT (Meters)

SAFETY BARRIERS WARRANTS

b) Safety Barrier at Fixed Objects

Longitudinal traffic safety barrier should be considered at all fixed objects that are accessible to traffic and within the clear recovery zone. Objects with slip-bases or breakaway features and those that yield because of their small size are not considered fixed objects for this application. Non traversable and fixed objects which normally warrant shielding are listed below:

a. Rough rock cuts

b. Large boulders

c. Permanent bodies of water with depth of > 600 mm

d. Line of large trees (matured diameter > 200 mm)

e. Bridge piers and abutment at underpasses

f. Retaining walls and culvert headwalls

g. Culvert end or wing walls forming abrupt drops greater than about 1.0m in height

h. Gap between twin bridges

i. Narrowing of roadway (loss of shoulder) over structure

j. Street lighting poles

k. Traffic sign poles in particular gantry signs or butterfly signs

l. Railway tracks

SAFETY BARRIERS WARRANTS

b) Median Safety Barrier

2.5.3 Median Safety Barrier

Median safety barrier should ideally function to:

a) **Reduce the risk of an out-of-control vehicle crossing the median and colliding with opposing traffic.**

b) **Reduce the risk of deflection back into the traffic stream of a vehicle colliding with the barrier.**

c) **Decelerate the errant vehicle within tolerable limits.**

d) **Improve safety through access limitations.**

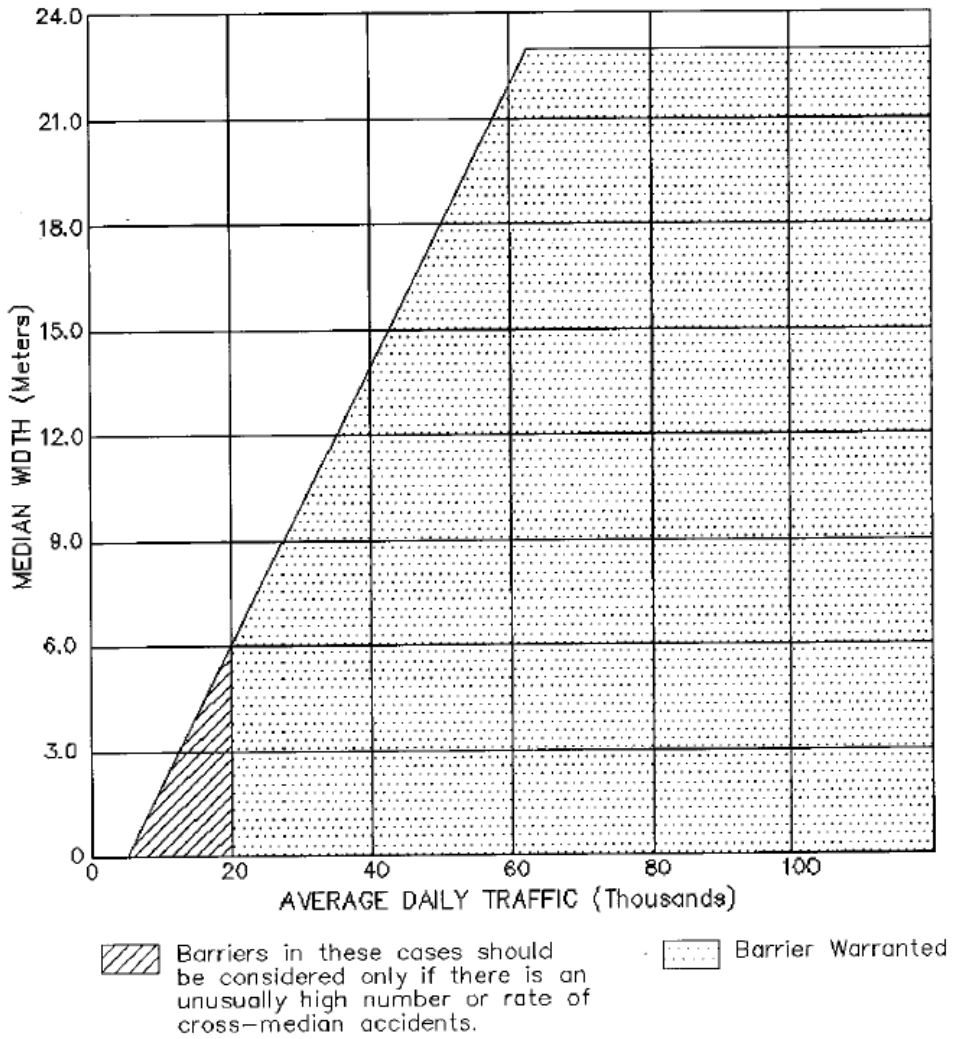


Figure 2.6: Median Barrier Study Warrants

KEADAAN DAN PEMASANGAN DI TAPAK

KEADAAN DI TAPAK

- The choice of barrier type will often be influenced by conditions at the site.
- The distance from the edge of travelled way, if too great, may preclude the use of rigid barrier.
- If the barrier is to be placed on a slope steeper than about 1(V) : 10(H), a flexible type should be used.
- In wide medians, where the slopes area steeper than 1(V): 10(H) but not steeper than 1(V) : 6(H), cable barrier placed near the center of the median is preferred.
- Placement of beam guardrail requires that the barrier be placed at least 3.6m from the slope break
- Do not use concrete barrier at locations where the foreslope into the face of the barrier is steeper than 1(V) : 10(H)

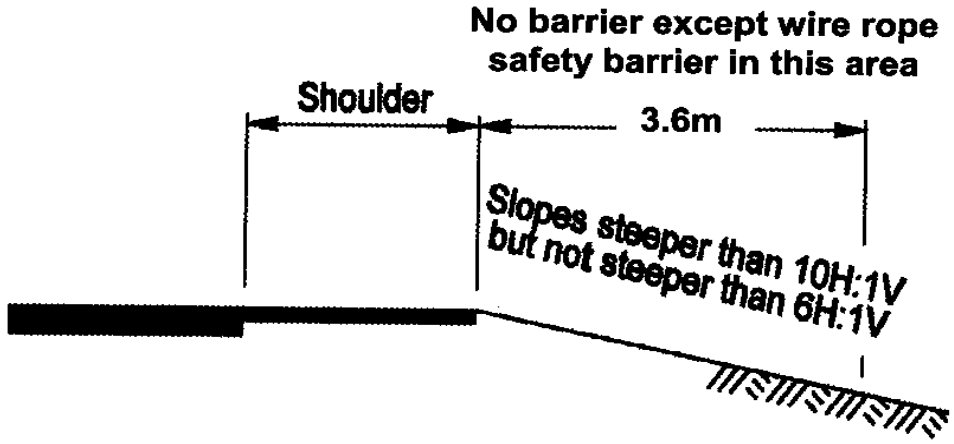


Figure 3.1: Barrier Location on Slopes
(Source: Washington State Department of Transportation)

APLIKASI PENGHADANG JALAN DALAM REKABENTUK

KEADAAN DI TAPAK

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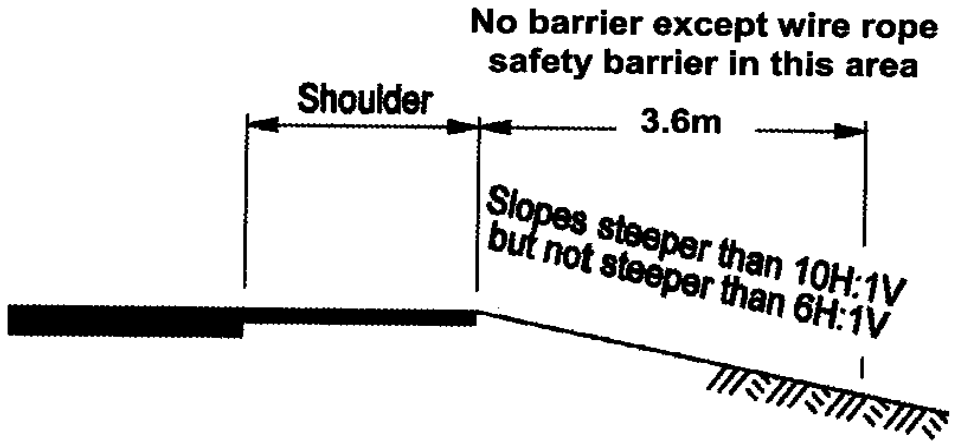
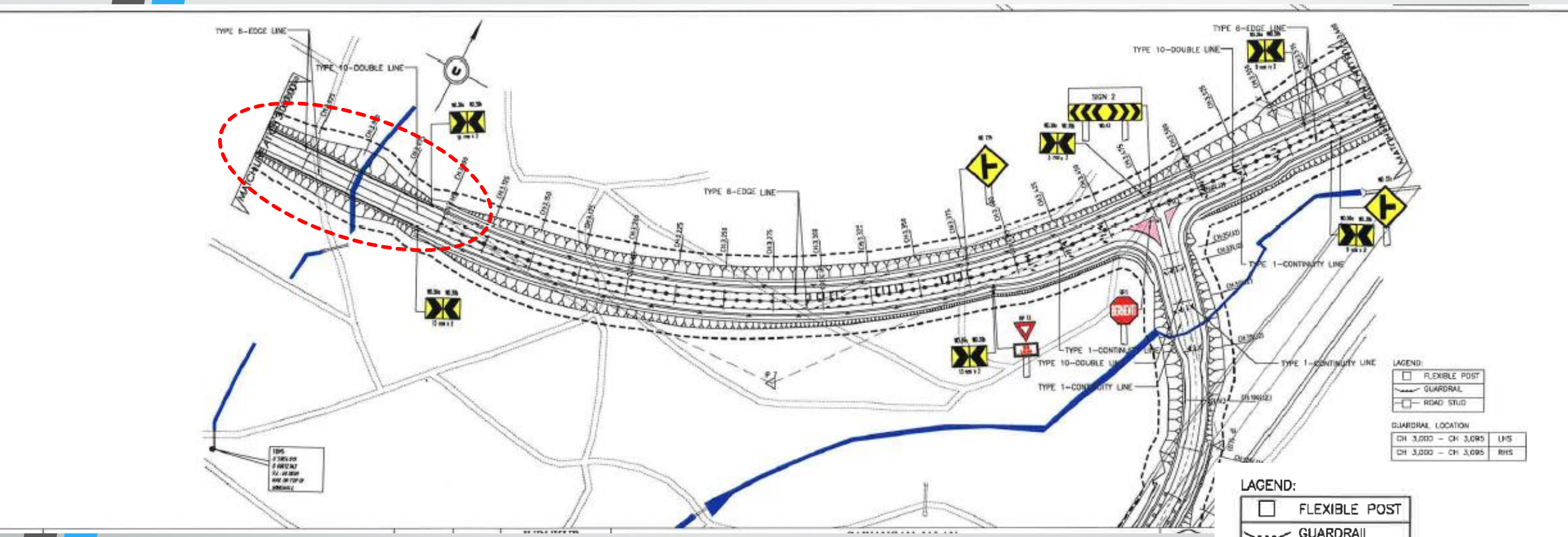


Figure 3.1: Barrier Location on Slopes
(Source: Washington State Department of Transportation)

PENGHADANG JALAN



LAGEND:

FLEXIBLE POST
GUARDRAIL
ROAD STUD

GUARDRAIL LOCATION

CH 3,000 – CH 3,095	LHS
CH 3,000 – CH 3,095	RHS

NOTES:

1)ALL TERMINAL ANCHORAGE UNIT : TYPE 2

2)THE MINIMUM PERFORMANCE LEVEL FOR ROAD SAFETY BARRIERS (ROADSIDE & MEDIA IS NCHRP 350 TEST LEVEL 3(TL-3)

TEKNOLOGI/ PRODUK BARU DALAM REKABENTUK

TEKNOLOGI/PRODUK BARU DALAM REKABENTUK

ROAD FURNITURE : POWDER COATED W-BEAM GUARD RAIL

What is PG Powder Coated Guardrail

PG Powder coated guardrail is guardrail with highly corrosion-resistant powder coating technology over zinc-galvanized steel (HGI) and comes with colors that can be customized according to environment. When raining, rain water cleans pollutants on the rail surface.

PG Powder Coated Guardrail Vs Zinc Galvanized Guardrail

Color Available

Yellow (pattern no. EE065K)

White (pattern no. NW015K)

Green (pattern no. EC024K)

Grey (pattern no. NK00K)

Advantages Over Coventional Guardrail

- **Durability**
  Double protection compare to conventional zinc-galvanized guardrail (whereby corrossion normally starts after 3~6 months).
- **Visibility**
  Better visibility compare to conventional guardrail due to possibility of coloring different zones.
- **Uniformity**
  After maintenance/repair work, there will be no two tone coloration.
- **Better Implementation**
  No whitening phenomenon (white dust) effect during storage in warehouse
- **Self Cleaning**
  Maintains good visibility as rain water can wash away dirt and maintain good colour
- **Possible Road Theming**
  Different zone can identify quickly by road user

Example:

School/Hospital | Forest/Park | Petrol Station/ Coastal Road | Normal

Comparison between Powder Coated Guardrail and Zinc-galvanized Guardrail

Powder Coated Guardrail on Zinc-galvanized Steel	Comparison Description	Zinc-galvanized Steel Guardrail
No discoloration and corrosion detected after 1000 hours	Salt Water Spray Test (Corrosion Test)	Discolored and corroded after 96 hours
Excellent	Visibility	Deteriorated after 3 - 6 months installed with discoloration and corrosion
Uniformity with non-glossy rail is mingled with existing guardrails	After being maintained/replaced	Glossy rail with lacks unity with existing guardrails
Longer storage duration with no whitening phenomenon even after a few years in open-storage	Storage	Shorter storage duration due to whitening phenomenon and become non merchantable quality after 3 months
Color theming possibility. Various colors are able to manufacture upon request	Color	Single Colored
Easy to keep and manage. Able to keep stock and distribute immediately upon ordering	Lead Time	Unable to keep for longer lead time. Guardrail need to replenish upon ordering

Product Pictures Comparison

General Zinc Galvanized Guardrail Pictures After Few Years Installation

General Powder Coated Guardrails Pictures After More Than 10 Years Installation

SEKIAN TERIMA KASIH

Q & A