CJ TECHNICAL UPDATES

Bulletin on:
ROAD SAFETY

Theme of the month:
ROAD SAFETY BARRIER

Issue No.
3
3/2019

JKR 20400-0232-19 Website: http://www.jkr.gov.my ISSN 2231-7988

ROAD SAFETY BARRIER

1.0 INTRODUCTION

The purpose of a roadside safety barrier is to redirecting errant vehicles and to provide high levels of safety during and after impacts. Safety barriers are designed to provide a safe environment for movement of vehicles on roads in order to prevent them from running off the roadway and collide with fixed objects such as trees, poles, steep slope or cliffs and redirect the errant vehicles back to the travel lane in a safe manner so as to minimise occupant injury. If a car off the road for one reason or another, the best thing that can happen is for that car to come to rest unimpeded.

Safety barrier must only be installed where it can be clearly determined that the impact on the barrier would result in less accident severity than if an accident happened without it. However, prior to deciding on the use of the barrier, consideration should be given to the following actions (in their order of precedence):

1. Eliminate or remove the hazard;
2. Relocate the hazard;
3. Make the hazard breakaway or yield on impact;
4. Finally if the above actions fail, then shield the hazard.

However, it is noted that the installation of the barrier itself forms a road hazard as the system is usually an elongated target which is located closer to the roadway than the object itself. For this reason, the designer should make every effort to design without guardrail. This can be done by:

a) Providing wide shoulders, verges and medians;

b) Providing adequate clearances to structures;

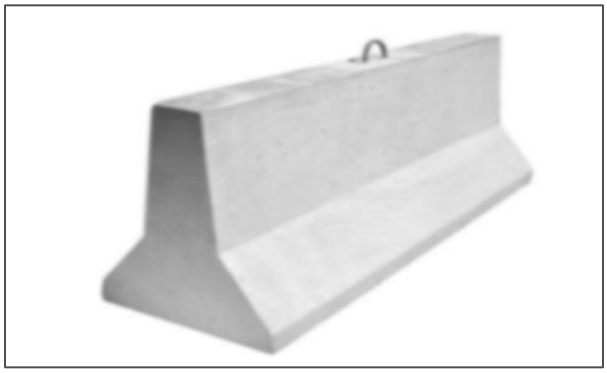
c) Flattening embankment slopes with firm even surfaces;

d) Clearing the roadside of fixed objects.

It may be necessary to consider the provision of safety barriers where the above measures cannot be applied or are considered impracticable.

2.0 TYPE OF BARRIER

a) Rigid Barrier



Concrete barrier is a rigid type of longitudinal traffic barrier which not deflect upon impact. The basic function of concrete barrier is to redirect a vehicle that hits it.

Test Level (TL) : 4 & 5

Figure 1: Concrete Barrier

b) Semi Rigid Barrier

W-Beam guardrail is a semi-rigid barrier system which can be used in areas where small to moderate deflection is acceptable (maximum deflection of 1.2m)

Test Level (TL) : 3 & 4

Figure 2: Guardrail

c) Flexible Barrier

Wire rope safety barrier is a flexible type of longitudinal traffic barrier which utilises the energy management principle. It absorbs the dynamic impacting kinetic energy through the post, anchors and pre-tensioned wire ropes whereby the posts are designed to collapse progressively on impact.

Figure 3: Wire Rope

3.0 SHAPE OF BARRIER

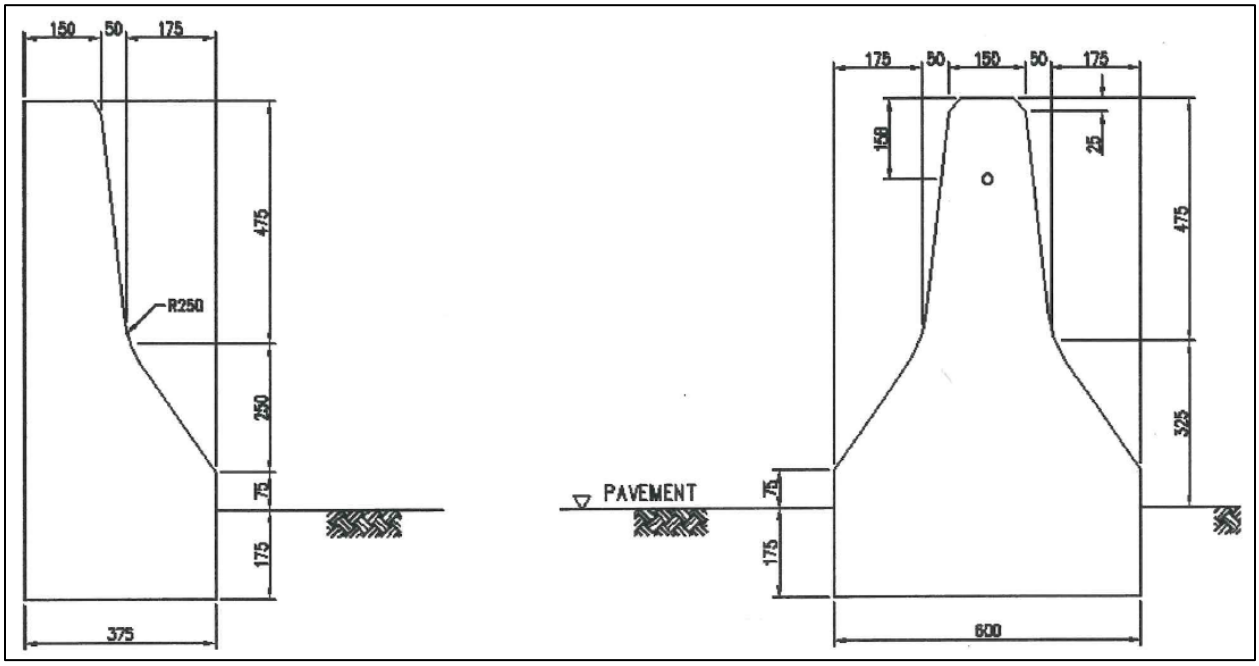


Figure 4: New Jersey-Shape Concrete Barrier (NJB)

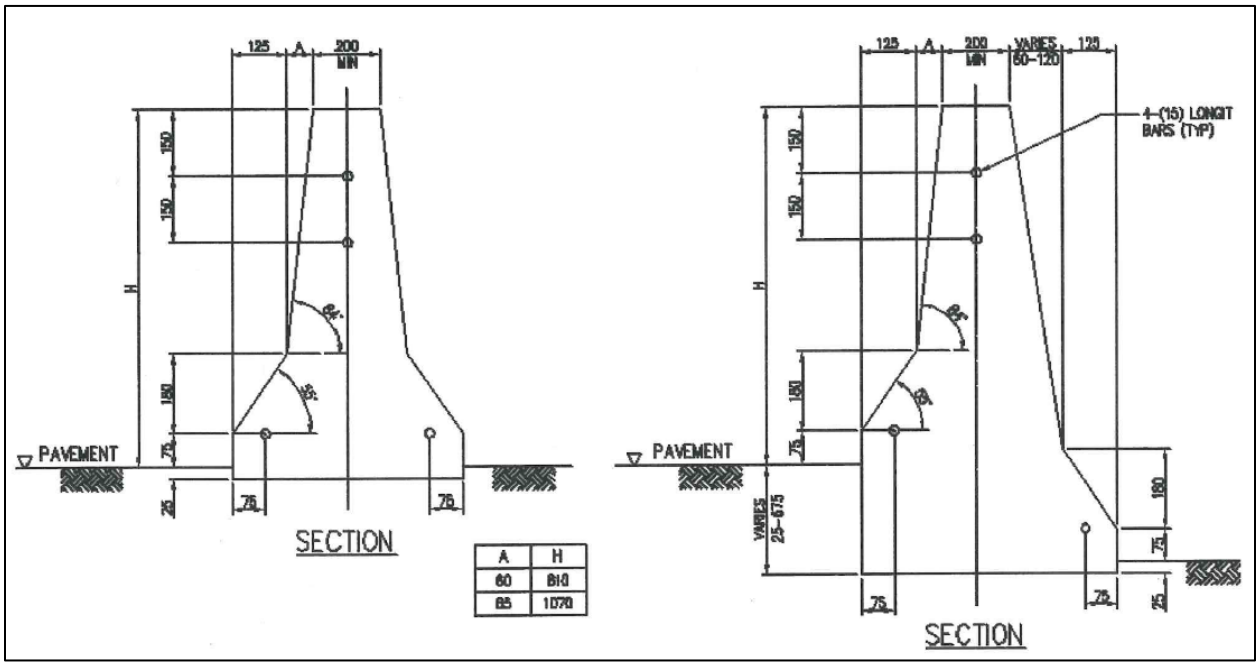


Figure 5: F-Shape Concrete Barrier (FS)

NJB and FS barriers have met the Test Level 4 and Test Level 5 requirements in the NCHRP Report 350. However, in term of safety performance, the FS performs better than the NJB for small vehicles with respect to vehicle rollover.

4.0 END TERMINAL OF GUARDRAILS

In line with the instructions from Ketua Pengarah Kerja Raya Malaysia(KPKR) on 2nd Mei 2017 (Surat Arahan KPKR BIL. 23/ 2017), JKR has stopped from using fish-tail terminal end guardrail in all road projects and maintenance works. All stakeholder are required to strictly avoid using fish-tail terminal end guardrail as to avoid any unwanted accident relating guardrails piercing into the vehicle's compartment which may cause serious injury or death.

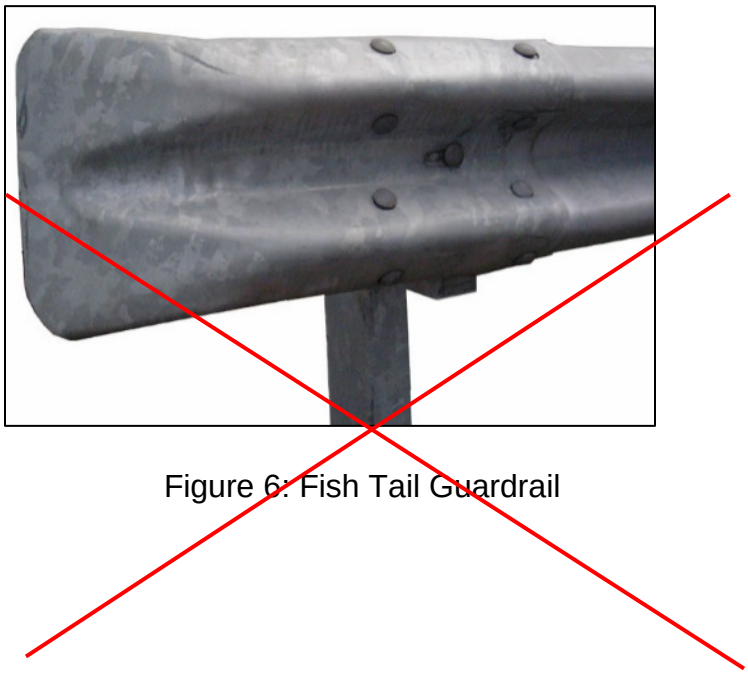
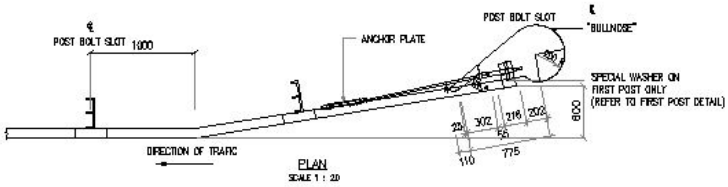
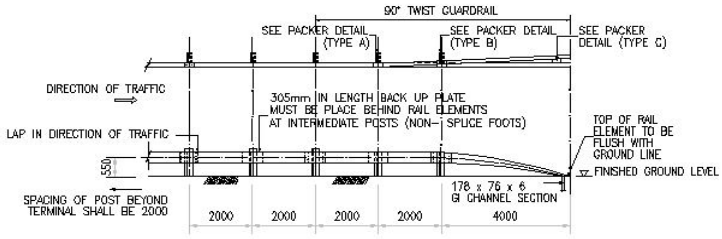
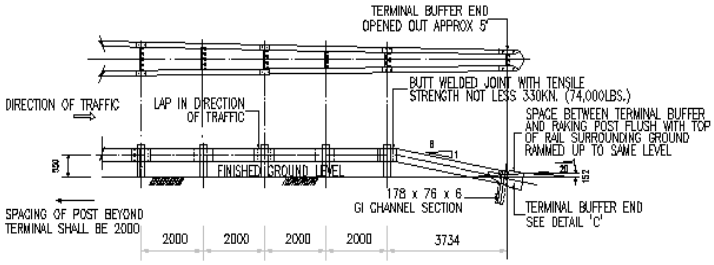


Figure 6: Fish Tail Guardrail

5.0 WHAT TYPE OF END TERMINAL OF GUARDRAIL CAN BE USED?

No	Type	Picture	Installation location
1	Terminal Anchorage Unit - Bullnose & Flare (Type 2)		Arrival /Departure
2	Terminal Unit 90° Twist (Type 3)		Departure
3	Terminal Unit Rammed (Type 4)		Departure

6.0 GUARDRAIL TRANSITION AT BRIDGE, HOW?

While connecting a semi-rigid guardrail barrier to a rigid barrier installed on a bridge provides barrier continuity, the transition between the two barrier types requires careful consideration. The transition area must gradually increase the lateral stiffness of the semi-rigid guardrail barrier and reduce the potential for vehicle pocketing at the connection with the rigid concrete barrier.

The transition area shall provide the gradual increase in stiffness by reducing the spacing between supporting posts and together with the end of the W-Beam rigidly connected with the bridge parapet as shown in Figure 7.

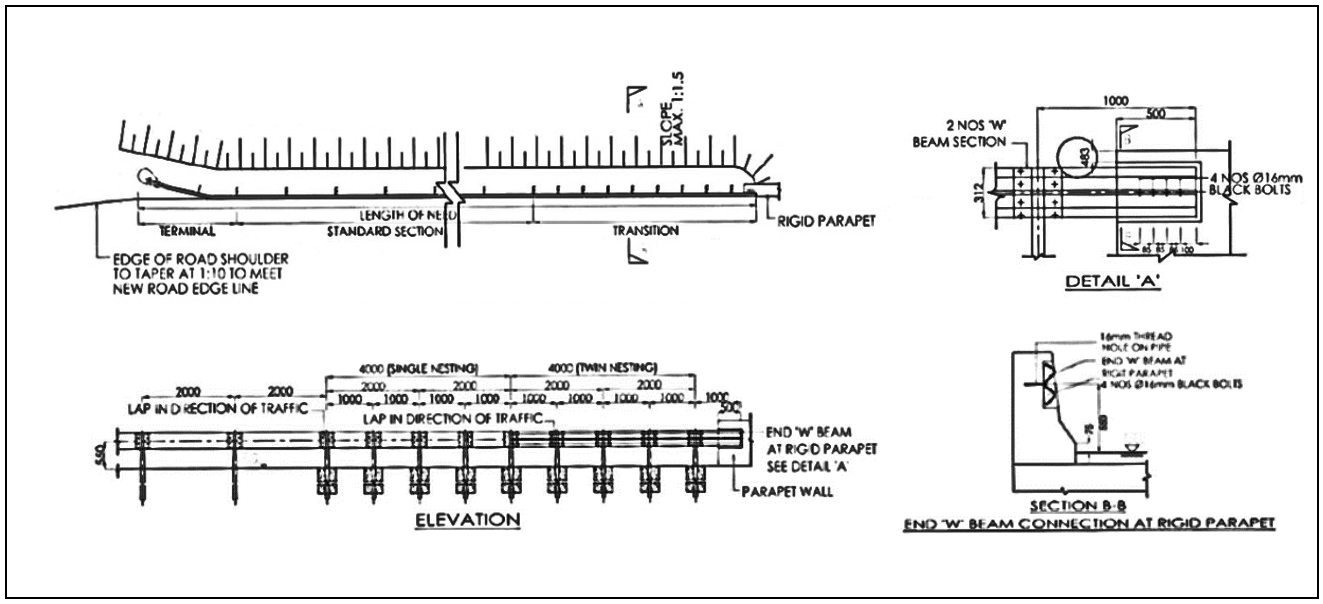


Figure 7: Layout for Bridge Approach

7.0 ISSUE's REGARDING GUARDRAIL

When a vehicle impacted the approach end of a guardrail with a fish tailed terminal, the rail very often will first penetrate the grill, wheel well, or side door of an impacting automobile and then pass through the passenger compartment. Any passenger sitting in the path of the piercing rail can be either lacerated, or impaled, or sometimes even decapitated. Figure 8 shows several photos of the accidents involving vehicles impacting the terminal ends of guardrail on Malaysia roadways.

Figure 8: Accident vs Guardrail

Why does this happened?

Such accidents may be caused by one or more of the following reasons :

a) Guardrail is not proper installed during construction;
b) The guardrail overlapping issue;
c) Material is not comply with specification;
d) Improper guardrail terminal end;
e) No flaring of the terminal end.

8.0 THE WAY FORWARD

Recently, fatal accidents involving W-beam guardrail barrier system have become one (1) of the hottest topic accupying the front page of most newspaper. Therefore, as a custodian of Federal Road , Cawangan Jalan JKR Malaysia need to investigate and analyse the causes these accidents and come out with the best amicable solutions, by considering the following actions such as:

a) Revised on the Guidelines on Design and Selection of Longitudinal Traffic Safety Barrier according to current issues;
b) Using new or any innovative, or road forgiving products for safety purpose.

REFERENCES

1. Manual on Design Guidelines of Longitudinal Traffic Barrier by Cawangan Jalan, JKR
2. Guidelines on Design and Selection of Longitudinal Traffic Safety Barrier, Interim Guide, 2006 by REAM
3. Road Facts 2010, Reference Guide on Roads in Malaysia by Cawangan Kejuruteraan Jalan dan Geoteknik, JKR

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