Welcome back to the CAREC "Road Safety Engineering" Workshop

- for professionals in Turkmenistan

Module 6

- SIGNS, LINES AND DELINEATION

- SAFETY AT ROAD WORKS

- SAFER RURAL ROADS

Thursday 28th April 2022

Module Six: Signs, road works, and rural roads.

Outlining key issues for you to think about with road signs and delineation

Detailing how to make your road work sites safer for all.

Outlining key safety issues for rural roads

Hi . Welcome back. I wonder who will count correctly today?

A road safety audit is……
"a formal, systematic and detailed examination of a road project by an independent and qualified team of auditors that leads to a report listing the potential safety concerns in the project."

(CAREC 2018)

Road Safety Audit

Prevention is better than cure

Engineers are problem solvers

Auditors need to be problem finders!

Decide

Select audit team

Pre-audit communication

Desktop audit

Inspect site

Table 1: Key Steps in the Road Safety Audit Process

Road Safety Audit Step	Responsibility
1. Determine if an audit is needed.	Project manager
2. Select an audit team leader, who then engages the audit team.	Project manager and road safety audit team leader
3. Draft the pre-audit communication to provide information (drawings and design reports) about the project to the team leader, outlining the project and discuss the audit ahead.	Designer (via project manager) and road safety audit team leader
4. Assess the drawings for safety issues (the "desktop" audit).	Audit team
5. Inspect the site both during daytime and nighttime.	Audit team
6. Write the audit report and send to the project manager.	Team leader with assistance from audit team
7. Discuss the key safety issues and clarify outstanding matters during post-audit communication.	Project manager (plus designer) and road safety audit team leader
8. Write a response report, referring to each audit recommendation.	Project manager
9. Follow up and implement agreed changes.	Project manager (and designer)

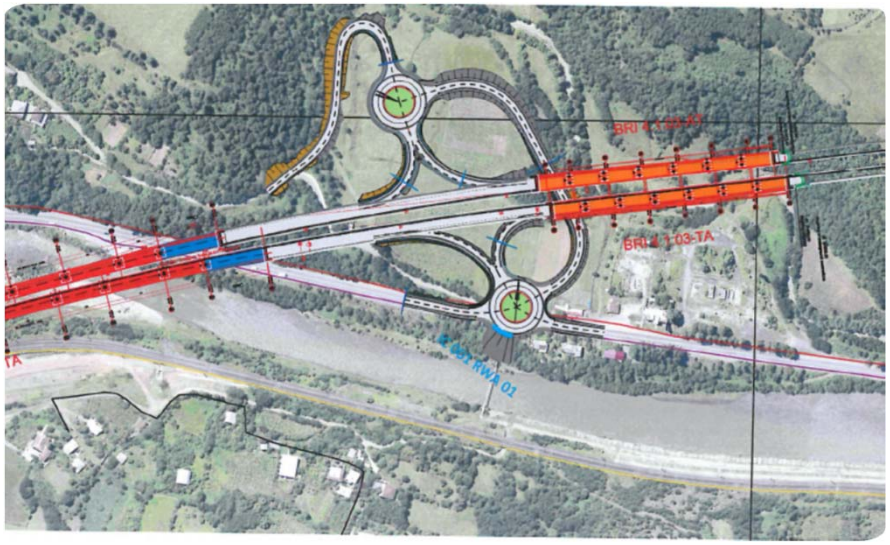
Write audit report

Post-audit communication

Respond to the report

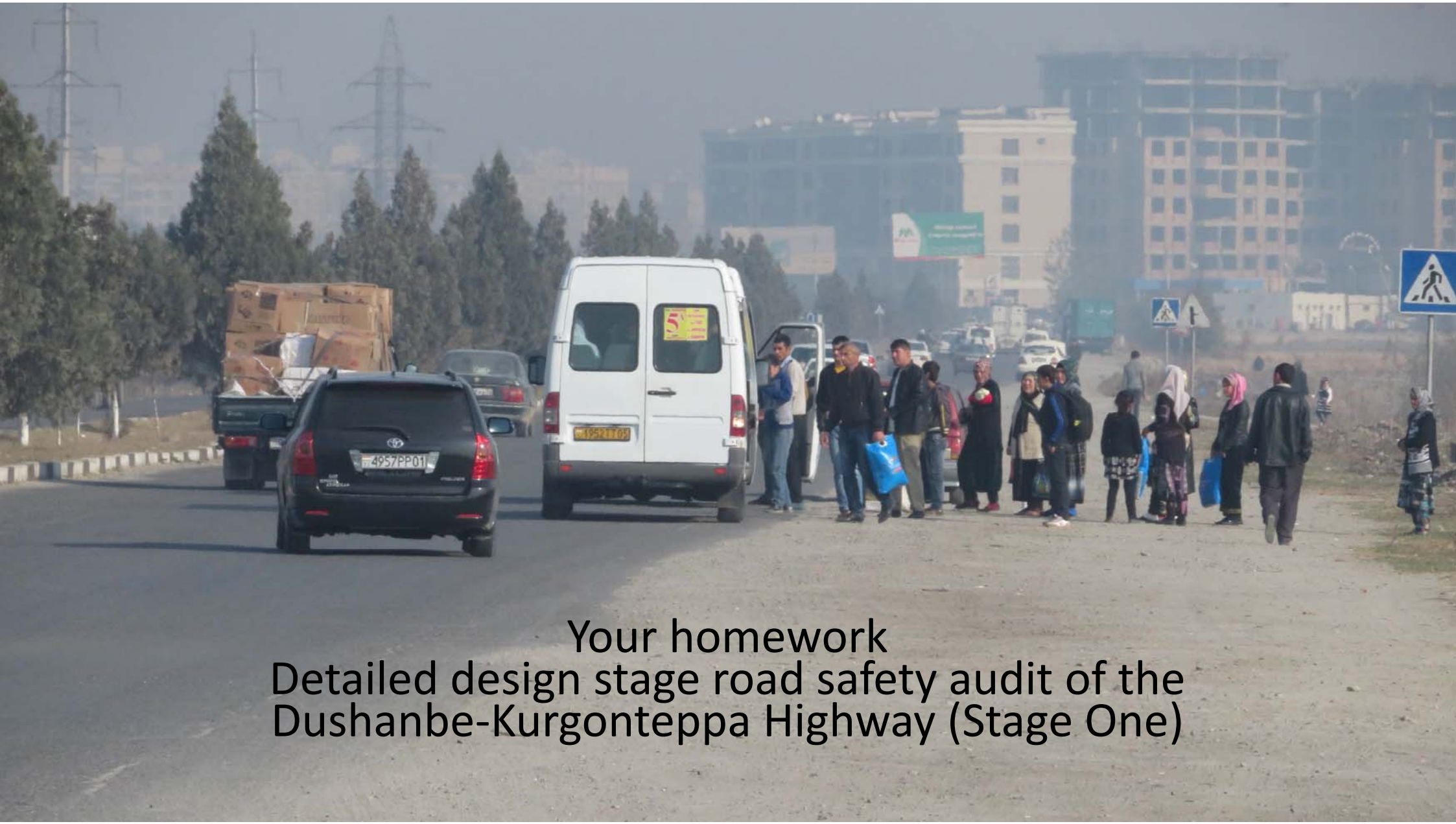
Implement

The 6 international stages of road safety audit



- Planning
- Preliminary design
- Detailed design
- Traffic management
- Pre-opening
- Existing road (called road safety inspections)

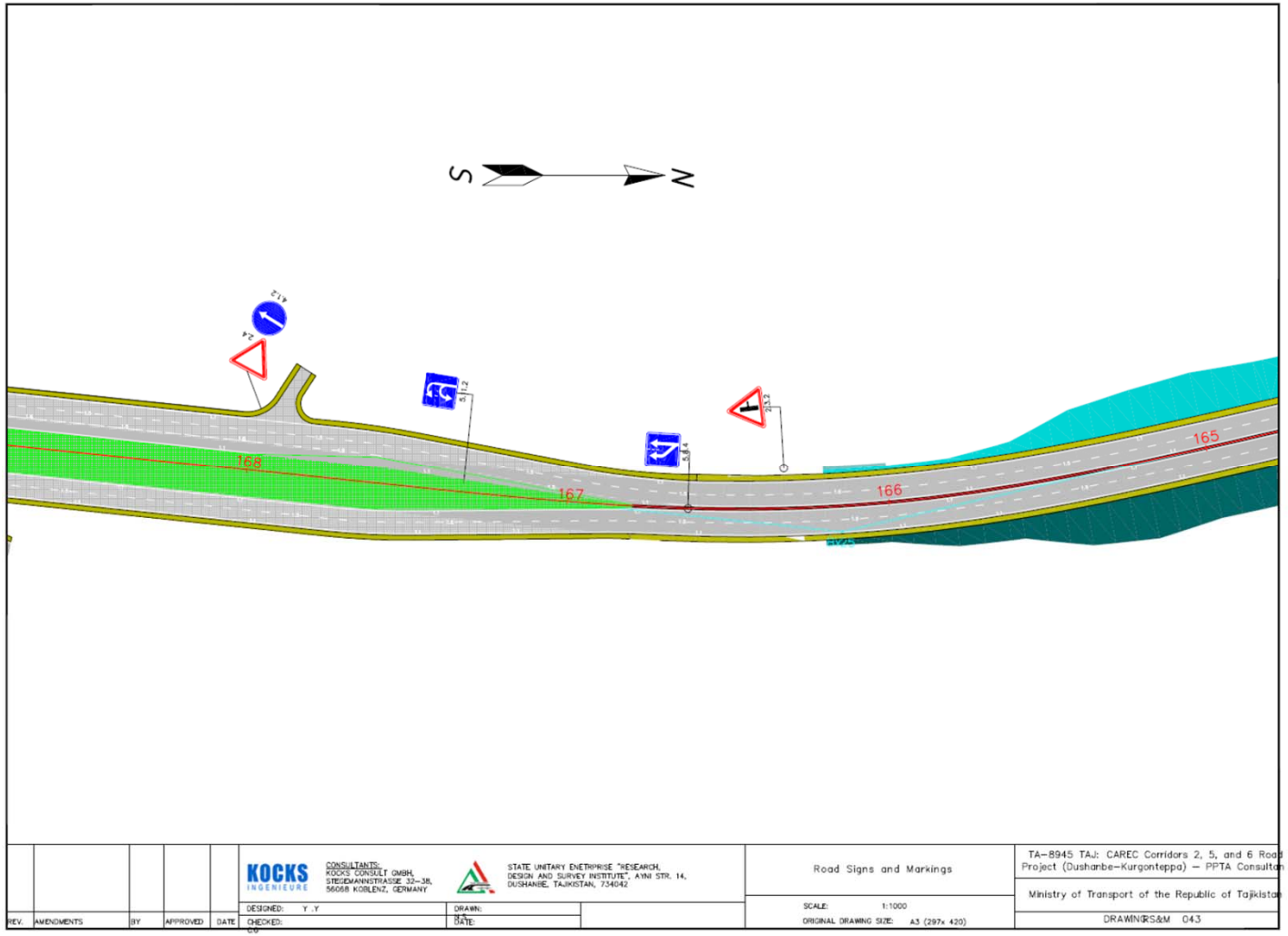
Road safety audit - the earlier, better - safer, cheaper

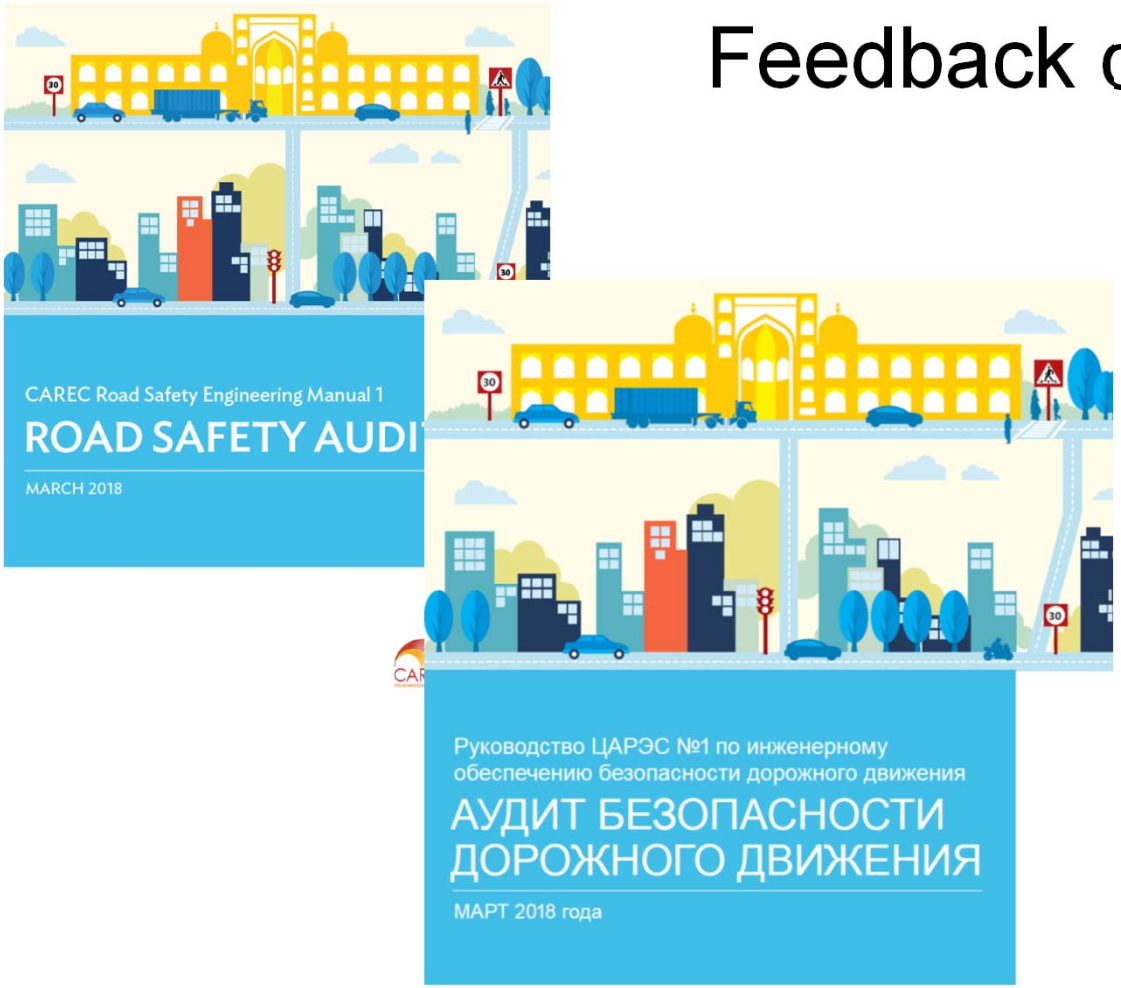


Your homework
Detailed design stage road safety audit of the Dushanbe-Kurgonteppa Highway (Stage One)

Dushanbe – Kurgonteppa Highway Stage 1

A typical plan and profile drawing. For your audit





Feedback on your road safety audit homework

- Great work all!
- Enthusiasm to build safety into the drawings of a new road is an essential first step

CAREC ADB

YOUR ROAD SAFETY AUDIT HOMEWORK

We wanted you to :

- Look at the drawings – try to imagine the finished road.
- Look for safety concerns in the drawings.
- Ask - how will the future road users use it – safely?

- An auditor looks for safety problems in the ***design.***

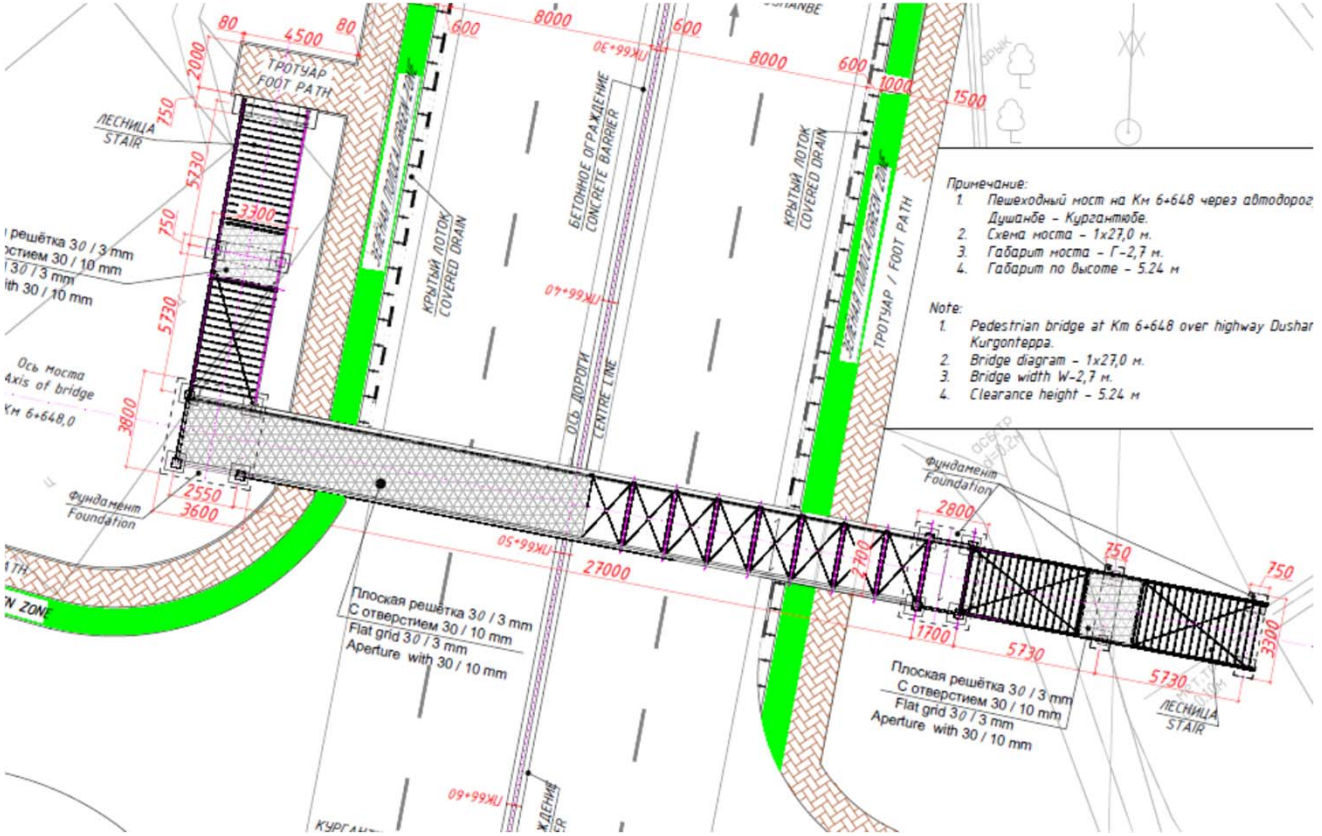
- PS It's not easy undertaking a RSA without a site visit.
- In a country you may never have been to!

This stage (detailed design) is the last time changes can be made easily to the geometry. The last chance for safety to be included!

Generally moving along the chainage from near 0+00 towards 33+00

Generally moving along the chainage from near 0+00 towards 33+00


Village of Ovi Shivu
Km 6.5

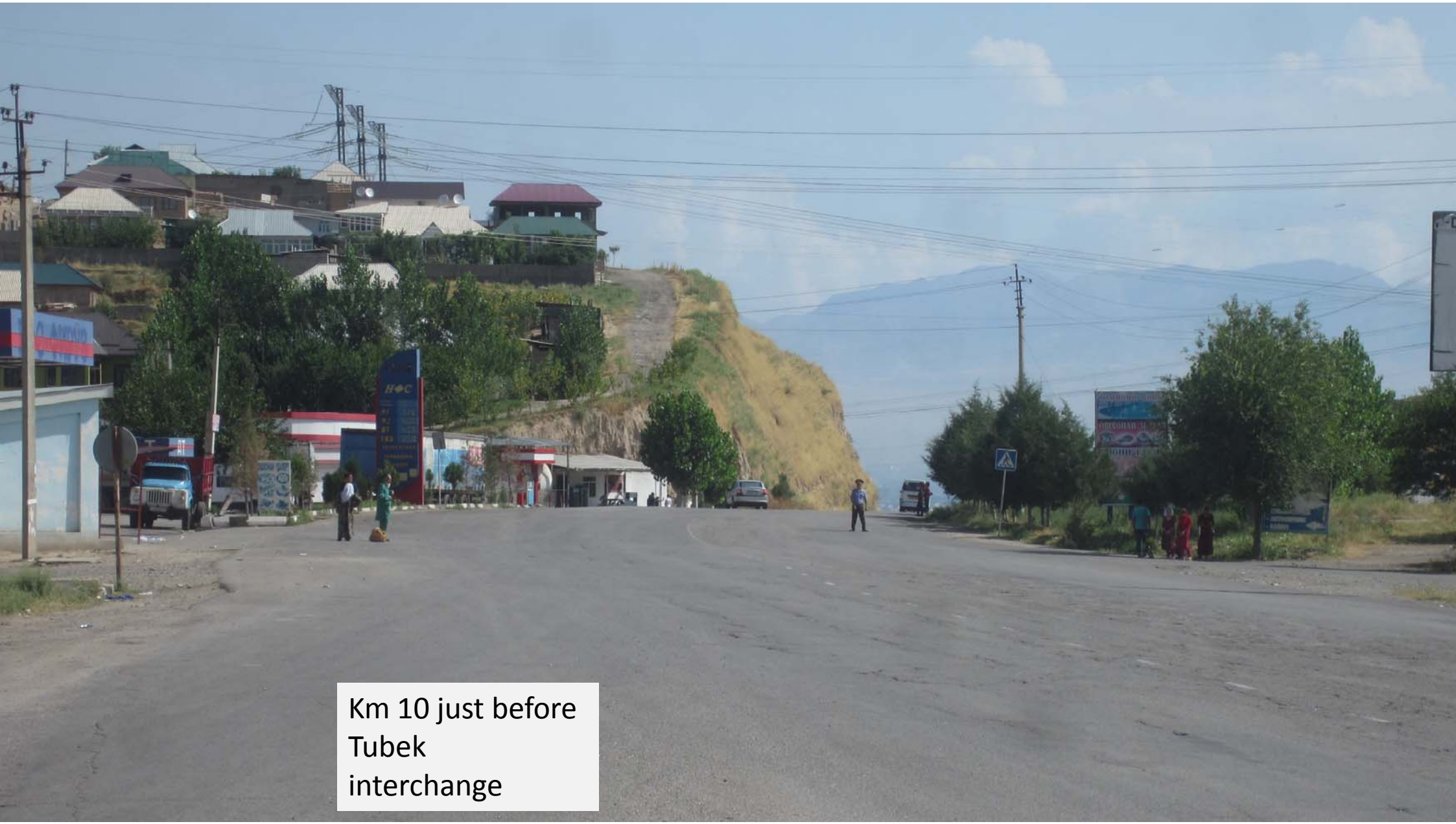


There is a proposed pedestrian overpass in Ovi Shivu but will it offer much service to the pedestrians of the village.
Think of the disabled, or those with loads. It is located to serve school children. It will have 32 steps up and 32 steps down.

Km 6.5

The village of Ovi Shifu!

Will that overpass be as useful as this one?



Km 10 just before Tubek interchange


Tubek
interchange

Beyond Stage 1 – outside the scheme near Km 36

Participants offered safety concerns and comments in two ways:

- They made a useful road safety observation (such as the absence of Zebra markings). But they recommended painting the Zebra markings.
  (Remember – there must be no Zebras across 2 lanes of high-speed highway!)

- Or they made useful safety comments and followed these up with reasonable and practical recommendations. That's the way audits must be!

- But sometimes the safety concern was more about "doing things differently"

Participants commented mainly on:

- Signs – that they thought were missing, or signs that were poorly placed, or wrong!

- Is it unsafe to allow U-turns from opposing directions?
- Is it unsafe to keep intersections “open” (ie. no median) while permitting U-turns? (If it is, is it safer for a driver to travel the wrong way? How far to the next U-turn?)

- These are some of the reasons we must inspect the site – to see the local situation

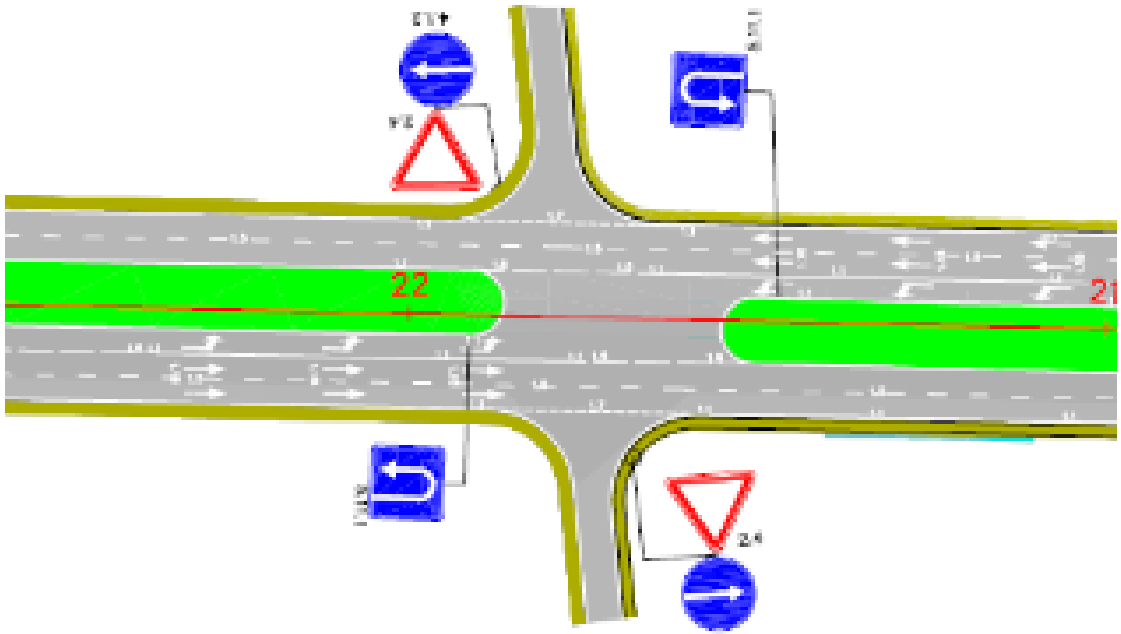
IS THIS UNSAFE?

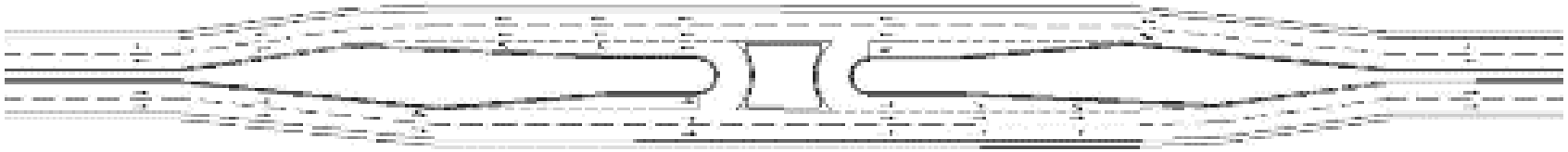
IS IT SAFER TO BLOCK INTERSECTIONS AND SEND DRIVERS TO U-TURNS?

At many locations where the side roads join the main highway, U-turn has been proposed in front of side roads.

Vehicle on the side roads have to cut cross multiple lanes to join opposite carriageway of main road or cross the highway.

This arrangement increases the risk of conflict between vehicles and side impact collisions which may result in injuries to the vehicle occupants.





PROPOSED U-TURN FACILITY

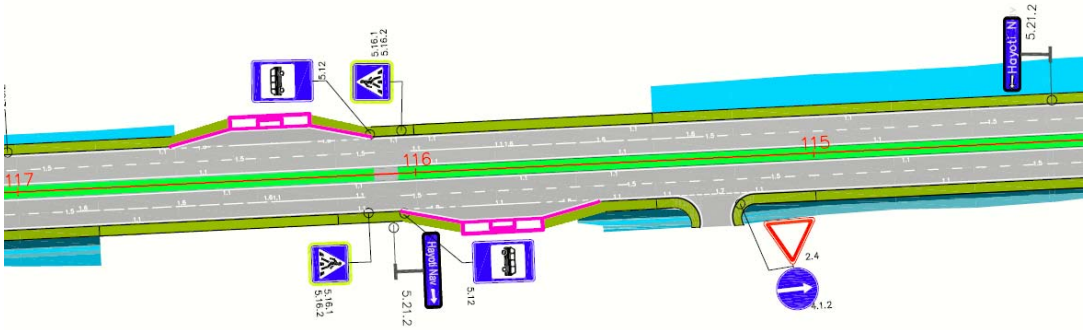
ARE ACCCELERATION LANES “SAFER” THAN NO ACCELERATION LANES?

UNLESS WE HAVE PROVEN KNOWLEDGE OF THIS, IS THERE A DANGER THAT WE ARE SIMPLY LOOKING TO MAKE THINGS FASTER, SMOOTHER, MORE LIKE WE THINK THEY SHOULD BE?

WHY PLACE ZEBRA CROSSINGS ACROSS THIS NEW ROAD?

ARE THEY SAFER THAN NOTHING?

WILL DRIVERS COMPLY? AT 100KMH?



Lack of zebra crossing for pedestrian on the main road, next to bus stops even the traffic sign is available, which might cause pedestrian accident

KM	SAFETY CONCERN	RISK	PHOTO	RECOMMENDATION	CLIENT RESPONSE
5+450	This cross-road intersection is one of the busiest along the highway in Phase One. It serves as one of two access roads into a large town east of the highway (the other access is the local road running through the interchange (near 9+850). The intersection is proposed to be a simple junction with a wide opening in the median. The numbers of vehicles turning into and out of the eastern is high. Chanelisation of the intersection, especially the eastern side, is desirable.	LOW		- Re-design the intersection. Provide a splitter island along the centre line of the eastern side road. - Construct sheltered turn lanes in both directions on the highway. - Minimise the opening in the median to minimise "double stacking". The opening must be wide enough for turning trucks but no more than the minimum.	
5+450	There is a small service road on the eastern side of the highway. It is to be retained but the access into it will be very close to the newly widened intersection. A vehicle accessing this road may be at risk of rear end collisions from vehicles turning off the highway.	LOW		- Review the design and try to move the service road entrance as far east as possible. - Make sure the traffic control signs (regulatory and warning) are adequate to manage this short length of side road.	
Km 6+200 to 6+800	This section of road passes through the village of Ovi Shivu. Traffic speeds will be high when the road is duplicated and, as there are numbers of pedestrians in this village, they will be at increased risk. Despite this road being a national highway, the risk to the pedestrians is such that this village is recommended for "Traffic Calming" – with a 40km/h speed limit and road humps.	VERY HIGH		- Traffic calm this village. - Install a "gateway" on both approaches to this village. - Install three flat topped road humps at spacing's of approx. 100m through the village. Ensure that humps are well signed, marked and lit. - NOTE: Locations for seven road humps were agreed on-site by the auditor and the PPTA Consultant. These need locations now need to be reduced to three humps following Ministerial approval on 18th November 2016.	

KM	SAFETY CONCERN	RISK	PHOTO	RECOMMENDATION	CLIENT RESPONSE
Km 6+650	A pedestrian overpass is proposed to assist school children to cross the highway here. While it is unlikely that the overpass will be used by many pedestrians, there are no safety objections to it provided its piers are located outside the 4m clear zone. Disabled pedestrians should be accommodated in the design of this overpass. Most of them, plus some elderly pedestrians, will not be able to climb the 32 step in the design.	**LOW**		- If installed, ensure the overpass allows for disabled pedestrians. Ramps will be required. - Ensure it is covered (from sun, snow and rain – to encourage pedestrian usage. - Ensure the traffic calming is installed through the village. The overpass is NOT a substitute for the traffic calming.	
At Km 6+000 and Km 6+900	The central median is proposed to change here from a Type 3A to a narrow Type 4 cross section. However, recent discussions have agreed that a 1.6m wide median be constructed through the village of Ovi Shifu. It is important that: • The median is continued through Ovi Shifu to assist pedestrians to cross. Not all pedestrians will decide to cross on a road hump (even if Pedestrian Crossings are installed on them) and few pedestrians are likely to use the overpass. A physical median will offer them the safest crossing option. • Any concrete barrier median does not have a blunt end which will become a roadside hazard	**HIGH**		- At any change of cross section involving Cross Section Type 4, ensure the blunt end of the barrier is well delineated and "ramped" to minimise consequences of an impact. - Delineate the change of cross section well. - Provide a consistent physical median through Ovi Shivu. - Do not install barrier on this median. - Keep it open for use by pedestrians as a refuge - The village is recommended for traffic calming, and a speed limit of 40km/h	
Km 9+450	There is a significant bus/taxi stop near some commercial premises on the right-hand side of the highway here. There is a similar but less busy stop on the left side as well. It is anticipated that this will continue to be a busy spot for passengers after the highway is duplicated. They need assistance here.	**MED**		- Install "Pedestrian" warning signs here. - Seal the shoulders to encourage taxis/mini buses to pull off to pick up or set down passengers. - Add two street lights on each side of the highway (4 in total) for night time awareness of the likely presence of pedestrians. - Consider installing a shelter nearby (both sides) for waiting pedestrians.	

I hope you have learnt that:

- Audits take time – far more than a few hours
- Audits take effort, good drawings and full information.
- Audits demand a site visit! (Not just photographs)
- Auditors are problem finders.

A copy of the full detailed design RSA report for this case study has been placed on the Cloud Drive.

SIGNS & DELINEATION

Objectives:

- the categories of signs
- the 6 C’s of good signage
- encourage good delineation

We need to assist road users with their decision making
(to make correct decisions, quicker)

Use standard applications where possible

- Follow your country's standards and guides
- But always question whether "standards" are safe
- Judgment

Be consistent across the road network

- Consistent use of signs and symbols
- Consistent level of signage: not too little or too much

Put yourself in the shoes of the road user

- Help them in the driving task
- Consider the unfamiliar driver
- Do not forget pedestrians & bicyclists

3 categories of road signs

1 Regulatory (mandatory)

2 Warning (cautionary)

3 Guide (information)

- Direction
- Tourist
- Services
- Traffic instruction
- Traffic information

Guide (Tourist) Signs

Guide (Services) Signs

Guide (information)
Direction
Tourist
Services
Traffic instruction
Traffic information

The 6C's of good signs

Conspicuous - easily seen
Clear - legible, able to be read in time
Concise - as few words as possible
Comprehensible – understandable
Credible – believable
Correct – must be the correct sign


• Conspicuous
• Clear
• Concise
• Comprehensible
• Credible
• Correct

- Conspicuous
- Clear
- Concise
- Comprehensible
- Credible
- Correct

- Conspicuous
- Clear
- Concise
- Comprehensible
- Credible
- Correct

- Conspicuous
- Clear
- Concise
- Comprehensible
- Credible
- Correct

- Conspicuous
- Clear
- Concise
- Comprehensible
- Credible
- Correct


• Conspicuous
• Clear
• Concise
• Comprehensible
• Credible
• Correct

- Conspicuous
- Clear
- Concise
- Comprehensible
- Credible
- Correct

Longitudinal Separation

Locate signs a minimum 0.6 x design speed apart

Urban areas: 0.6 x 50 km/h: 30 m

Rural areas: 0.6 x 80 km/h: 48 m

Freeways/highways: 0.6 x 100 km/h: 60 m

Advance Sign Placement

Place advance warning signs before the hazard/ action point:

Urban (50 km/h) :	80 to 120 m
Rural (80 km/h):	120 to 180 m
E’ways/h’ways (100 km/h):	180 to 250 m


Maintenance of signs is important

Delineation is essential – and best when it is consistently applied along a route

- Better to have 3-star delineation consistently, than a mix of 1 star and 5-star sections.
- Theft, vandalism, natural damage (landslides).
- Decide if it is better to use more robust (less forgiving) devices in your country. Motorcycles?
- Some countries have many pedestrians and small numbers of vehicles in rural areas; some have the opposite.

Delineation

- Guideposts

- Raised Reflective Pavement Markers (cats' eyes)
- Hazard Markers

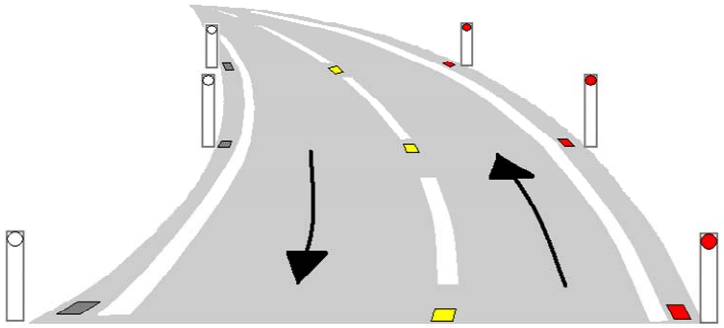
- Chevron Alignment Markers (CAMs)

- Reflective Width Markers

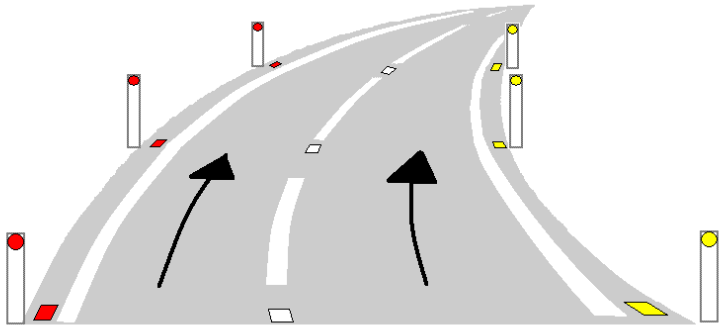
Guideposts

- White post 1 metre high, 100 mm wide
  - Double sided on a two-way road
  - Retro-reflective delineator
  - Red on the driving side
  - White on the opposite side
  - Lateral placement:
    - 150 mm clear of outer edge of shoulder
    - 1.2 to 3.0 m from edge of traffic lane
    - Keep the lateral space consistent

RRPM and guidepost delineator colours

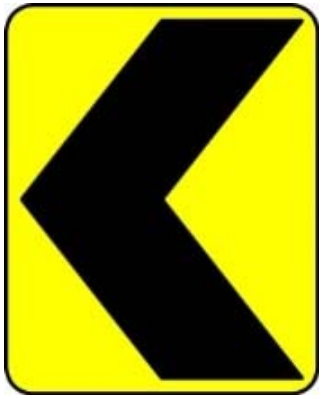


Two-way roadway



One-way roadway

Chevron Alignment Markers (CAM's)



- Keep CAMs for substandard curves only
- Only place on outside of curve

- Always show CAM's for both directions
- Minimum of 3 CAMs in each direction

- Drivers should be able to see 3 CAMs at all times
- Space them evenly (avoid driveways, lanes, obstructions)

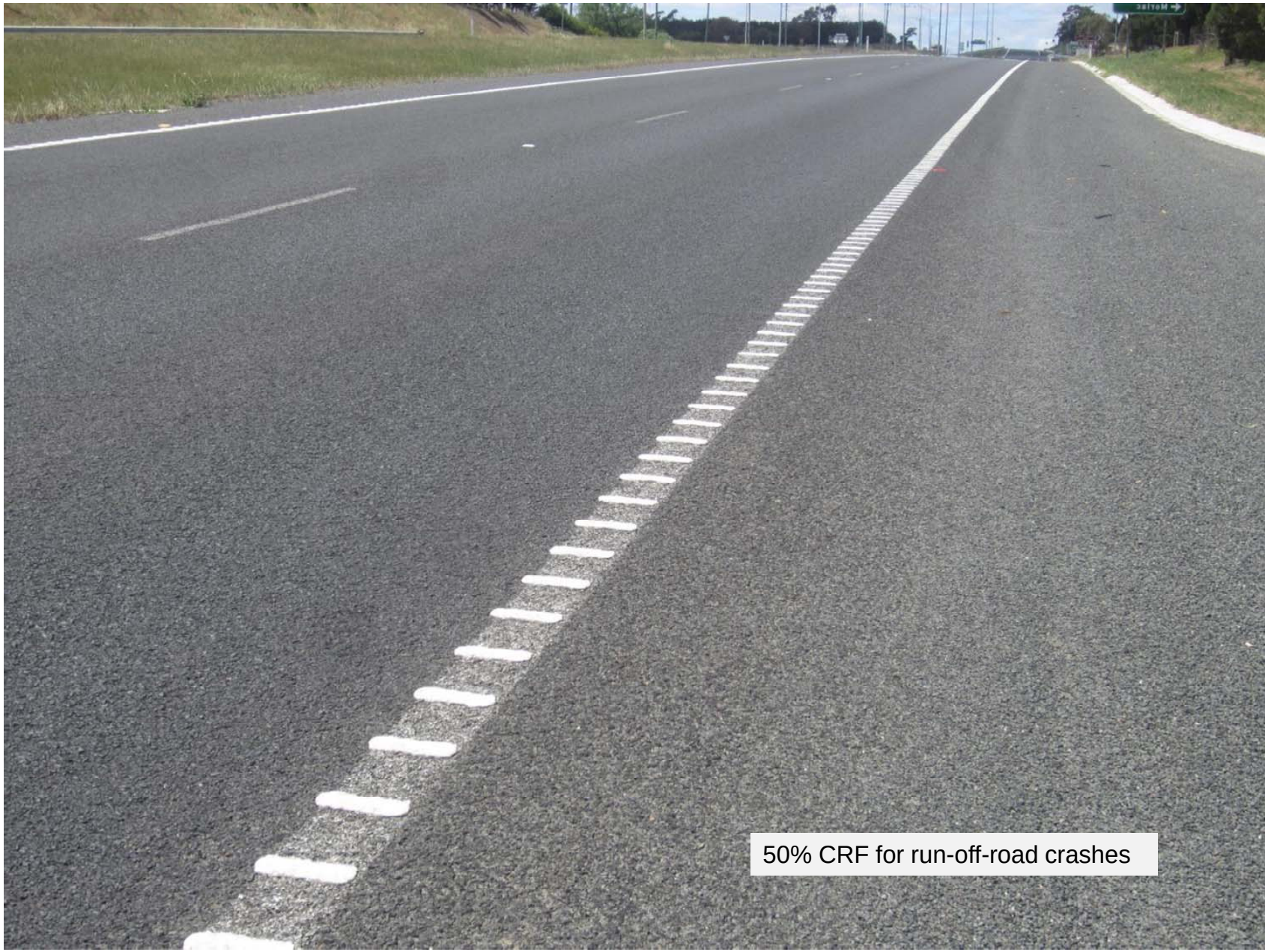
Chevron Alignment Markers (CAM's)


005 B 257


CAMs are for use around the outside of curves – not on inside!

Tactile edge lines help to alert drivers when they start to drift off high speed roads.

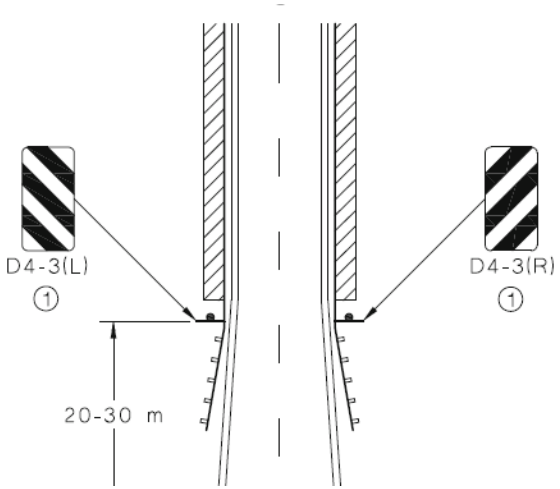
They reduce run-off-road crashes by 50%

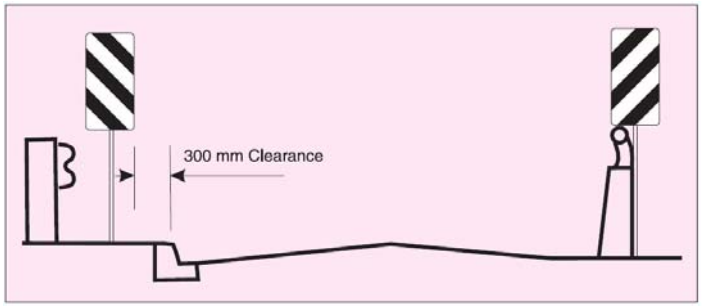


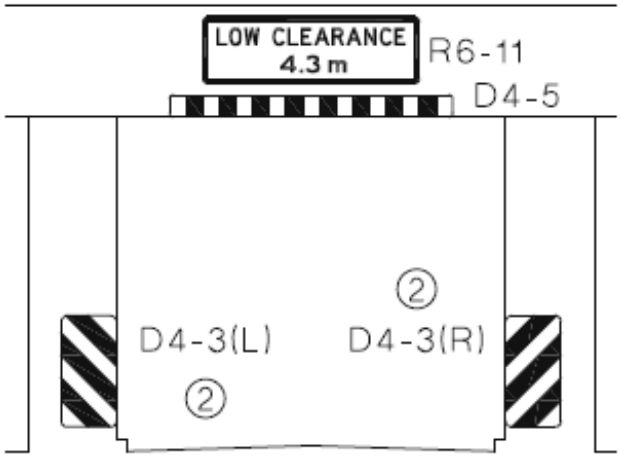

If snow ploughs will damage thermoplastic bars, use “impressed markings”
50% CRF for run-off-road crashes

Width Markers

- Culverts
- Bridge piers
- Bridge end posts
- Railway level crossings







Conclusion – signs and delineation

- Signs and markings are important to regulate, warn and guide road users

- Remember the 6 C's:
  Conspicuous, Clear, Concise, Comprehensible, Credible and Correct

- Keep your signs "positive" - tell drivers what they can/must do (rather than what they cannot do!)

- Bad signing can lead to driver distraction, lack of warning, and then misunderstanding – and sometimes, crashes.

Road safety at road works

CAREC

Central Asia Regional Economic Cooperation Program

Objectives:

- To explain why safety at road works is important.
- To outline essential points for improved safety at road works.

HOW MANY PEOPLE ARE INJURED OR KILLED IN ROAD CRASHES AT ROAD WORKS IN YOUR COUNTRY EACH YEAR?

Unfortunately, we do not know for sure……


30

Road crashes at road work sites are a serious problem

1. Road users have three times the risk of a serious crash in a road work zone compared with other parts of the road network (USA)

2. Studies in Finland and Slovenia showed that ‘motorists are up to five times as likely to be injured when travelling through a work zone’

IMPROVING WORKER SAFETY THROUGH BETTER VISIBILITY

Agota Berces,
Technical, Regulatory and Business Development Manager
3M Traffic Safety Systems Division, Sydney, NSW, Australia

Road crashes at road work sites are a serious problem

3. German research has shown that approximately one quarter of collisions happening on national routes occur at work zones.

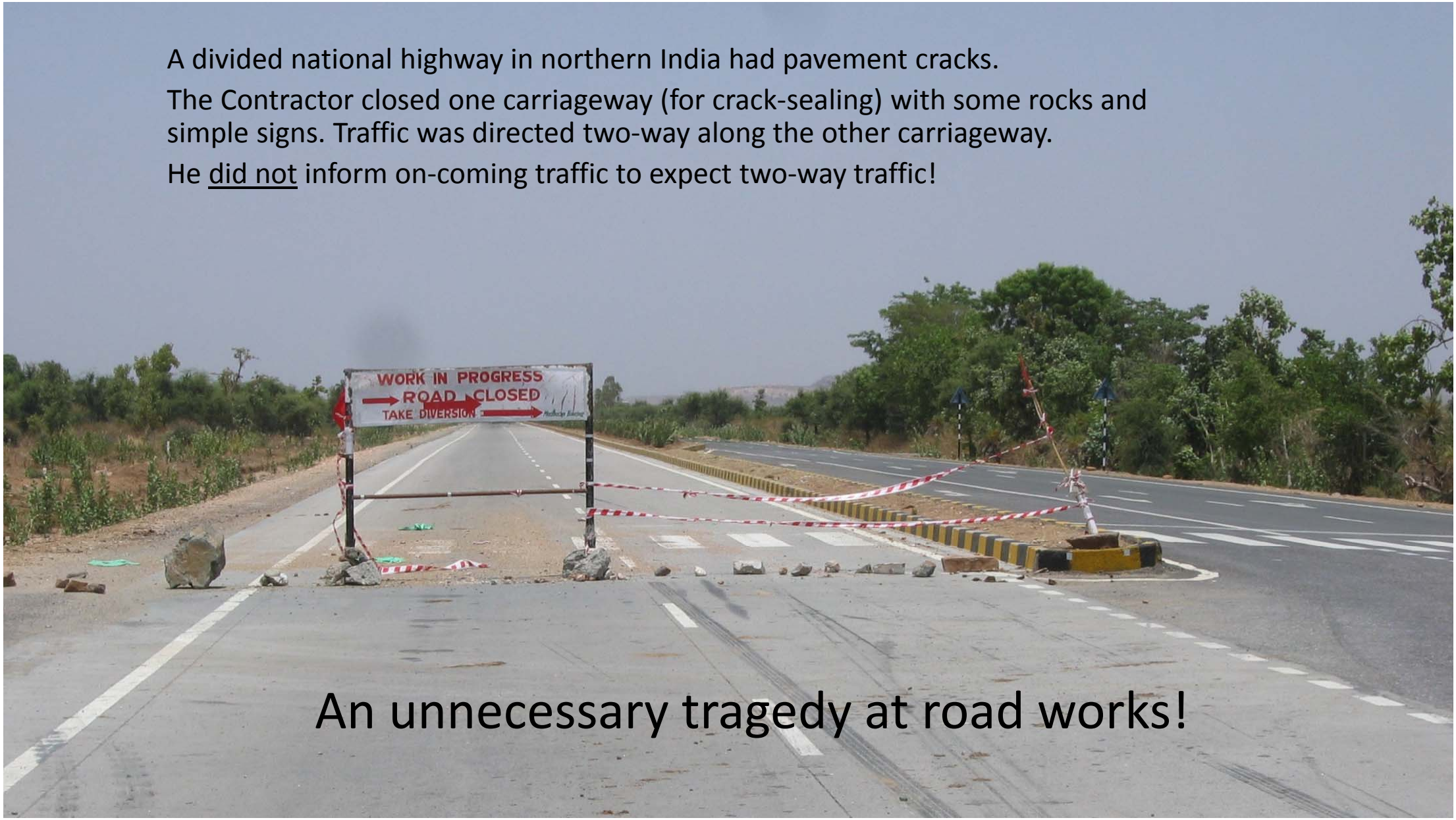
4. Research has also identified that road works that take longer and extend over longer distances have lower crash rates as opposed to short term works in short length zones.

IMPROVING WORKER SAFETY THROUGH BETTER VISIBILITY
Agota Berces,
Technical, Regulatory and Business Development Manager
3M Traffic Safety Systems Division, Sydney, NSW, Australia

A divided national highway in northern India had pavement cracks.

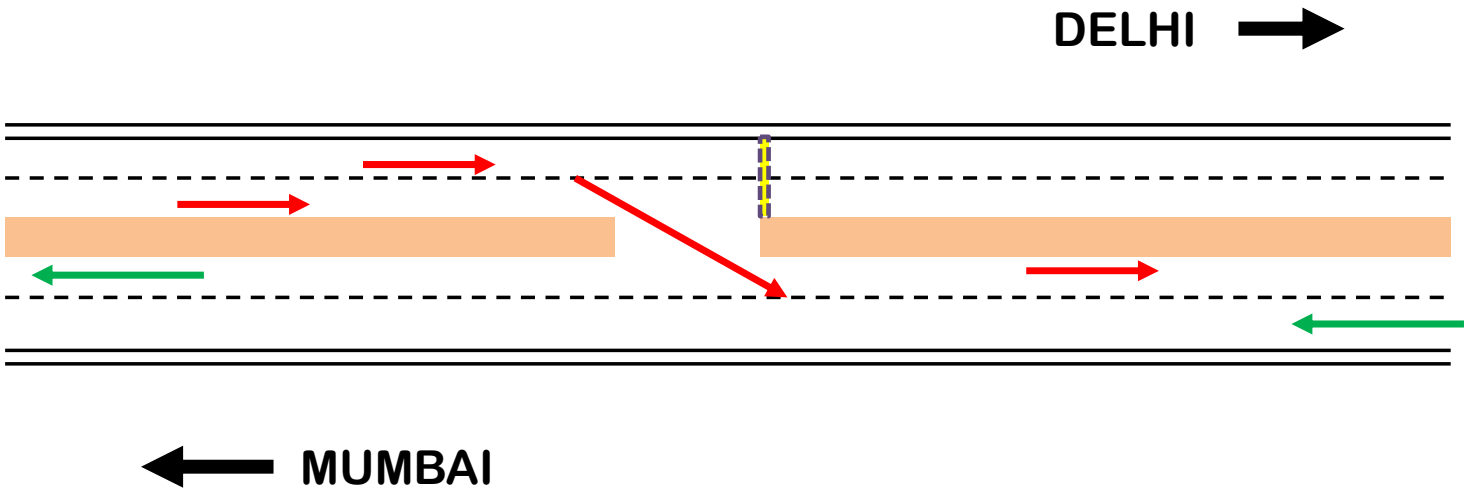
The Contractor closed one carriageway (for crack-sealing) with some rocks and simple signs. Traffic was directed two-way along the other carriageway.

He <u>did not</u> inform on-coming traffic to expect two-way traffic!



An unnecessary tragedy at road works!

A tragedy waiting to happen……



The NH 76 was a divided highway (2 carriageways). A contractor had closed the Delhi bound carriageway for maintenance (crack sealing).


DIVERSION
AHEAD
200 M
GO SLOW
Madhucon Binapuri JV
NH
76


WORK IN PROGRESS
ROAD CLOSED


WORK IN PROGRESS
ROAD CLOSED
TAKE DIVERSION


What is missing?


EXPRESS SERVICE
What is missing?


What happened?

A fatal head-on collision


HO RN PLE ASE
USE DIPPER AT NIGHT
TELCO
STOP


Five men killed

A few days later…signs placed to face the truck's direction of travel. Too late to prevent five deaths!

Could a similar situation exist on one of your highways?

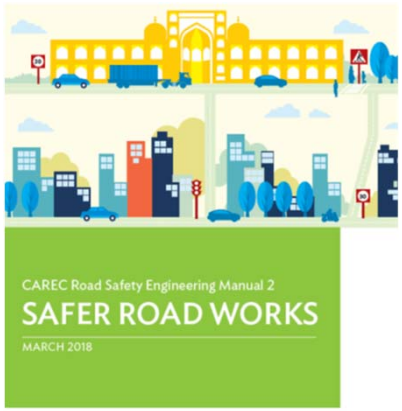
Work sites are planned and managed by engineers.

Any safety concerns at a road work site have been created by engineers!

It is up to engineers to make their work sites safe for workers and road users.

Always look at your road works through the eyes of the drivers/riders – not just as an engineer!

Road works <u>should</u> not surprise any driver or rider!

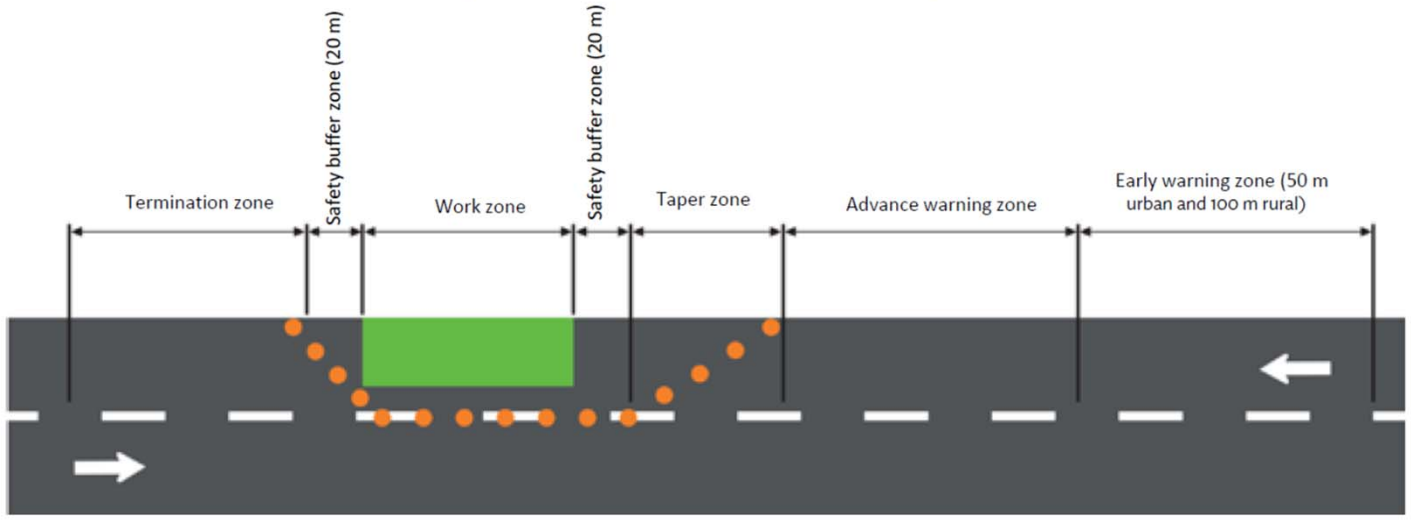


What is a TMP?

A traffic management plan (TMP) shows clearly all the signs, barriers, barricades, and other devices to be installed and maintained at a worksite for the duration of the works. If work has several stages, there should be a TMP developed for each stage expected to last longer than 1 week.

THE SIX ZONE CONCEPT

Figure 4: The Six-Zone Concept



m = meter.

Note: The traffic management plan is for one direction of travel only.

Source: Asian Development Bank.

The "Zone Concept" is a method of breaking a work site down into **6** individual zones.

The Six Zone Concept

1 Early Warning Zone – the first zone, in which signs are placed to alert approaching drivers/riders of the presence of road works ahead.

2 Advance Warning Zone – alerts drivers/riders of the Work Zone ahead. It uses advance warning signs and regulatory signs to warn users of the Work Zone ahead, and to regulate their behavior.

3 Taper Zone – is used if motorists are required to move from their lane to pass around a Work Zone.

4 Safety Buffer Zone - is a longitudinal safety buffer immediately in advance of, and beside, the work area. It is to be at least 20m in length; it is kept free of equipment, materials and workers.

5 Work Zone – is the area in which the works are carried out; it is set aside for workers, equipment and materials.

6 Termination Zone – is the zone where traffic resumes normal operations after passing the Work Zone (the last of the six zones).

THE LENGTH OF EACH ZONE IS DETERMINED BY THE MAXIMUM OPERATING SPEED ON THE ROAD WHERE WORKS ARE TAKING PLACE.

Refer to the Tables in the
CAREC manual

Advance warning zones

Table 5: Minimum Length of Advance Warning Zones

Approach Speed (km/h)	Length of Advance Warning Zone (m)	
	Desired Speed at the End of the Advance Warning Zone	
	40 km/h	0 km/h (STOP)
50	30	75
60	60	100
70	120	160
80	170	225
90	200	295
100	250	370

The taper zone length is based on:

- width of lane to be closed is typically 3.5 m,
- diverge taper length is equivalent to 1.0 m lateral shift,
- merge taper length equivalent to 0.5 m lateral shift, and
- use the operating speed of traffic to guide the taper length.

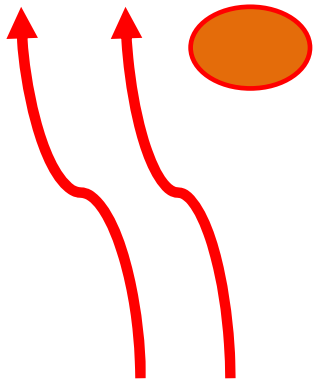
Table 6: Recommended Lengths of Taper (Transition) Zones

Approach Speed Entering the Taper Zone (km/h)	**Diverge Taper** (m)	**Merge Taper** (m)
40	50	90
50	50	100
60	60	120
70	70	140
80	80	160
90	90	180
100	100	200

Two types of taper zones

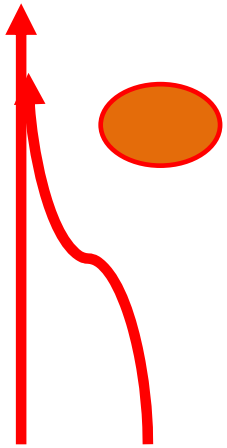
DIVERGE

Where traffic moves sideways to the left or right to pass the Work Zone



MERGE

Where two lanes of traffic combine (merge) into one to pass the Work Zone




SLOW

Use a 40 km/h speed limit through work sites – but only when workers are on-site and within 1.5m of traffic

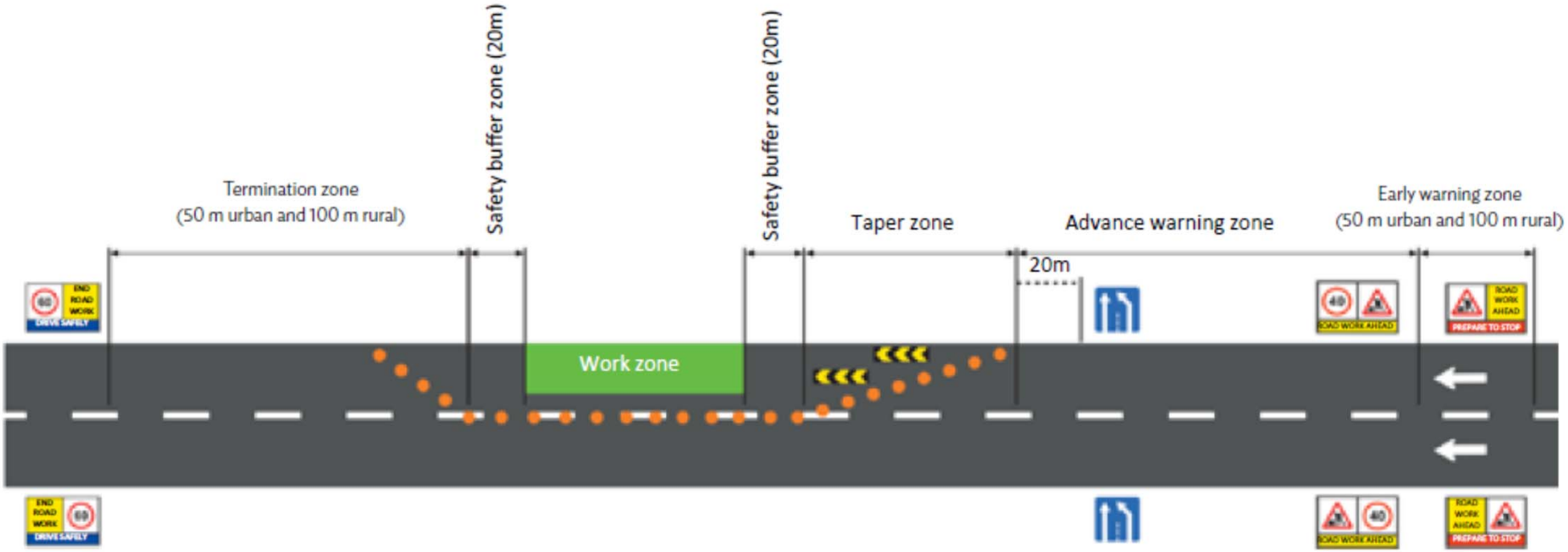
Figure 13: A Reduction in the Available Road Width but with Sufficient Width for Two-Way Traffic

m = meter.

Note: The traffic management plan is for one direction of travel only.

Source: Asian Development Bank.

Figure 17: Closure of the Right-Hand Lane of a Multilane Carriageway



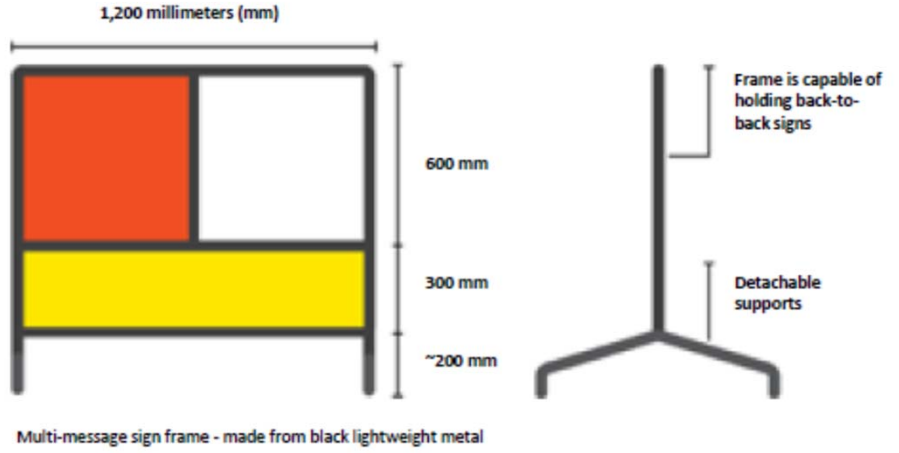
m = meter.

Note: The traffic management plan is for one direction of travel only.

Source: Asian Development Bank.

Multi message signs are useful for road works. Lightweight. Quick to change. Consider these.

Figure 10: Modular Multimessage Frame



Multi-message sign frame - made from black lightweight metal

Source: Asian Development Bank.


40
PREPARE TO STOP


Heads of Camberwell
9882 7600
MG TRAFFIC
ON SIDE ROAD

INSTRUCTIONS FOR TRAFFIC CONTROLLERS

A Traffic Controller is the person on a work site who is responsible for the safety of traffic and pedestrians to pass through the work site safely (and with minimal delay).

The Traffic Controller sets up the TMP zones also.

Instructions for Traffic Controllers


STOP

Road signs

Signs at road work sites should comply with the 6C’s of good signage.

Road safety on rural roads

CAREC

Central Asia Regional Economic Cooperation Program

There are many different types of rural roads

- Expressways
- Highways
- Secondary roads
- Tourist roads
- Farm accesses

And there are many different rural road environments

- Flat
- Undulating
- Hilly
- Mountainous
- Desert
- Coastal
- Jungle
- Farmland

- Divided/undivided roads
- Different speed environments
- Existing roads, rehabilitation and duplication projects, and new road projects


KAZAKHSTAN


VIETNAM
200 m


TAJIKISTAN


JORDAN


LAOS
Ntoos Xyooj
27
2018


KAZAKHSTAN


GEORGIA

INDIA


प्रधानमंत्री ग्राम सड़क योजना
योजना का नाम - इसलामपुर राजगीर रोड से बैरा तक पथ निर्माण
पथ की लम्बाई - 4.123 K.M
कार्य प्रारम्भ की तिथि - 26.03.201
संवेदक का नाम - मेसर्स कुमार
ग्रामीण विकास मंत्रालय, भारत स
कार्यकारी एजेन्सी- कार्यपा
प्रधानमंत्री ग्राम सड़क योजना
सड़क का नाम - इसलामपुर राजगीर रोड से बैरा तक पथ निर्माण
सड़क पेवमेंट का विवरण

Consistency is a key message!

Rural roads may have poor safety records – often due to high speeds coupled with poor maintenance.

How can I cover “safety” for so many different rural roads?

There are 8 safety issues that tend to be common on most of the rural roads I have worked on.

Consistency (no surprises)

Better to provide 3-star consistency along an entire route, than 5-star mixed with 1-star sections!

Always think of your “customers”.

Safety on rural roads

- Cross sections
- Alignments
- U-turns on divided highways
- Speed management
- Delineation
- Bridges
- Roadside hazards
- Villages, pedestrians, bus stops

Message 1 – keep cross sections as consistent as possible, and provide wide *paved* shoulders

- Shoulders should be 1.5m and *paved.*
- Some people say paved shoulders encourage “rash overtaking”. (Police enforcement can address this)
- Some people say pedestrians must be provided with an off-road footpath. (Great but not always possible)

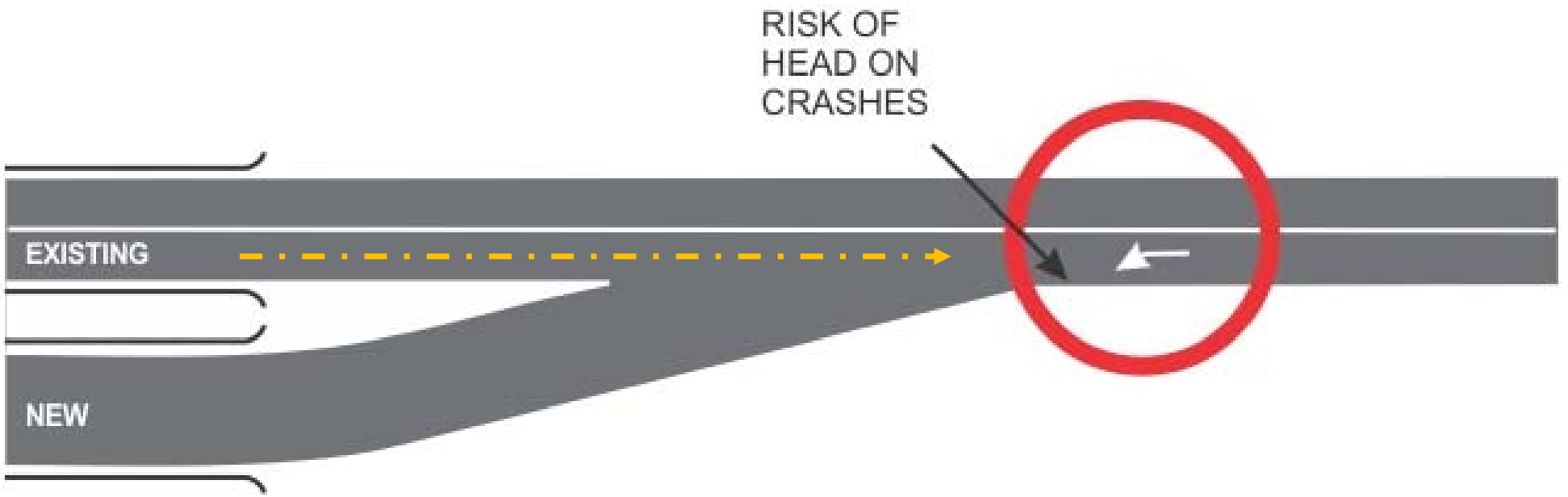
A donor funded international highway, with operating speeds around 100kmh, 2.5m shoulders of which only 0.5m is paved. Why?

Safety on rural roads

- Cross sections
- Alignments
- U-turns on divided highways
- Speed management
- Delineation
- Bridges
- Roadside hazards
- Villages, pedestrians, bus stops

Message 2 – keep H and V alignments as consistent as possible, and watch intersection layouts

- Topography and existing road reserve will impose constraints
- Think about the design speed adopted – if it is too low compared with the practical operating speeds then crash risk will increase. Especially where long straights occur.
- Look at all the intersections along the route.
- No Y-junctions!
- Look carefully at locations where medians end.


RISK OF
HEAD ON
CRASHES
EXISTING
NEW

Where a divided section ends, drop one lane (the slow lane) well before the median ends. Bring traffic back into a single lane, using signs and lines, before the undivided section.

Where a divided section ends, drop one lane (the slow lane) well before the median ends. Bring traffic back into a single lane, using signs and lines, before the undivided section.


RECOMMENDED

An acute Y-junction

A REAL PHOTOGRAPH

ALL SIDE DRIVING!!

Y-junctions are dangerous and must be eliminated from our roads

© 2020 Google
Google Earth

Safety on rural roads

- Cross sections
- Alignments
- U-turns on divided highways
- Speed management
- Delineation
- Bridges
- Roadside hazards
- Villages, pedestrians, bus stops

Message 3 – all medians need to be wide enough to provide sheltered turn lanes

- The existing road reserve will impose constraints – there is generally a reluctance to take more land.
- A narrow median (say 1m) will block turns, intersections and U-turns. It may assist as a pedestrian refuge. But it will not be sufficient for signs or lighting. It will increase rear-end collision risk at openings as turns will be made from the “high speed” lane.
- Keep intersections open along the route – except if there will be sight restrictions. Blocking too many intersections with a median, and sending all side road traffic to new U-turns, is fraught with difficulties. Wrong way movements!
- Look carefully at locations where the median ends.

Provide sheltered turn lanes – essential on high-speed roads

- These reduce risk of rear end collisions
- Gives safe storage area
- Need a median that is at least 4m+ wide (prefer more)
- Needs sufficient length

High-risk median opening

High-risk median opening

Low risk sheltered turn lane (if maintained and used correctly)

Safety on rural roads

- Cross sections
- Alignments
- U-turns on divided highways
- Speed management
- Delineation
- Bridges
- Roadside hazards
- Villages, pedestrians, bus stops

Message 4 Gain driver/rider trust. Use regulatory speed restriction signs consistently but NOT for individual curves, crossings, bridges or other locations

- Gain driver respect for the speed management regime in your country.
- Can you rely on drivers to know the speed limit – 90 rural, 60 urban?
- I don't – so apply signs consistently, and in pairs.
- Maybe 100kmh, or 80kmh on rural roads, 40kmh or less in villages.
- Ensure all hazards and crossings and bridges are adequately signed with warning signs and good delineation.
- Do NOT use regulatory signs for a "warning" – it brings them into disrepute.


30


30

Advisory speeds can be used on supplementary plates to guide drivers.
The regulatory speed limit here is 80kmh, but this advisory sign suggests 25kmh for this bend.

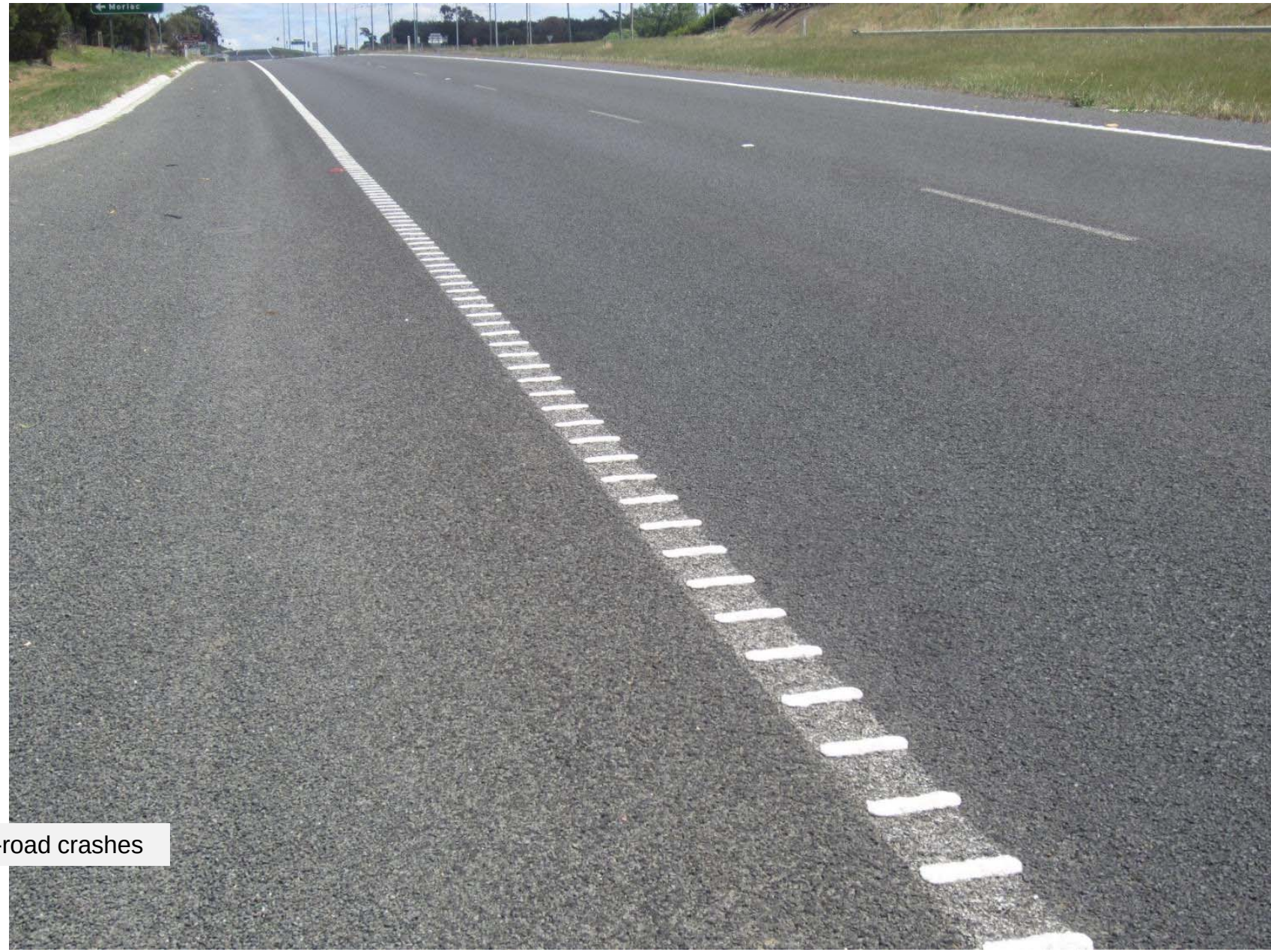
Safety on rural roads

- Cross sections
- Alignments
- U-turns on divided highways
- Speed management
- Delineation
- Bridges
- Roadside hazards
- Villages, pedestrians, bus stops

Message 5 Delineation is essential – and best when it is consistently applied along a route

- Better to have 3-star delineation consistently, than a mix of 1-star and 5-star sections.
- Think of theft, vandalism, natural damage.
- Discuss and decide if it is better to use more robust (but less forgiving) devices in your country. How many m/c do you have?
- Some countries have many pedestrians and small vehicles in rural areas; some have very few.


OK for delineation but
unsafe for motorcyclists!



50% CRF for run-off-road crashes

Safety on rural roads

- Cross sections
- Alignments
- U-turns on divided highways
- Speed management
- Delineation
- Bridges
- Roadside hazards
- Villages, pedestrians, bus stops

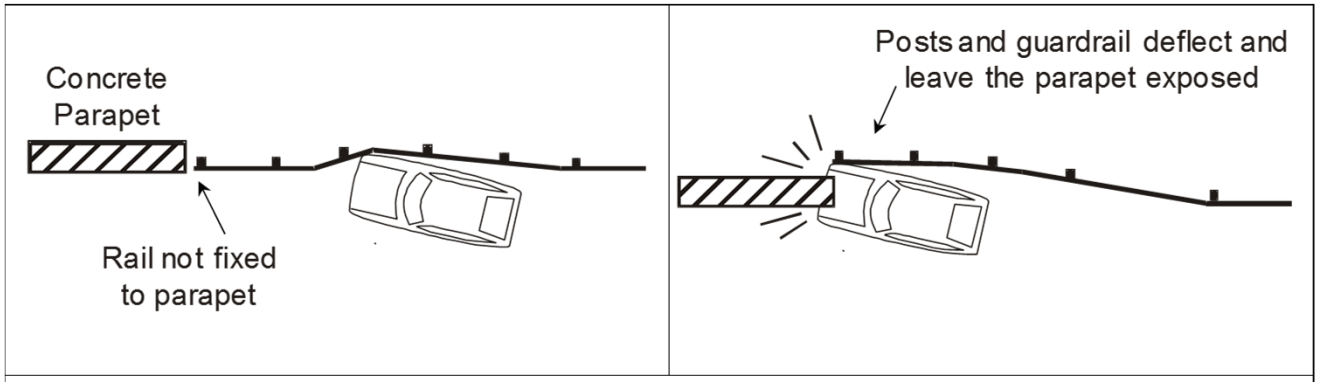
Message 6 Bridges should be “just another part of the road”

- Bridges are more expensive than other sections of road.
- Engineers try to save $$ by making them as narrow as possible.
- But at what crash cost?
- How will pedestrians and small vehicles safely cross the bridge?
- We don’t want the bridge to be a “squeeze point” for pedestrians, two and three wheelers, or animals.

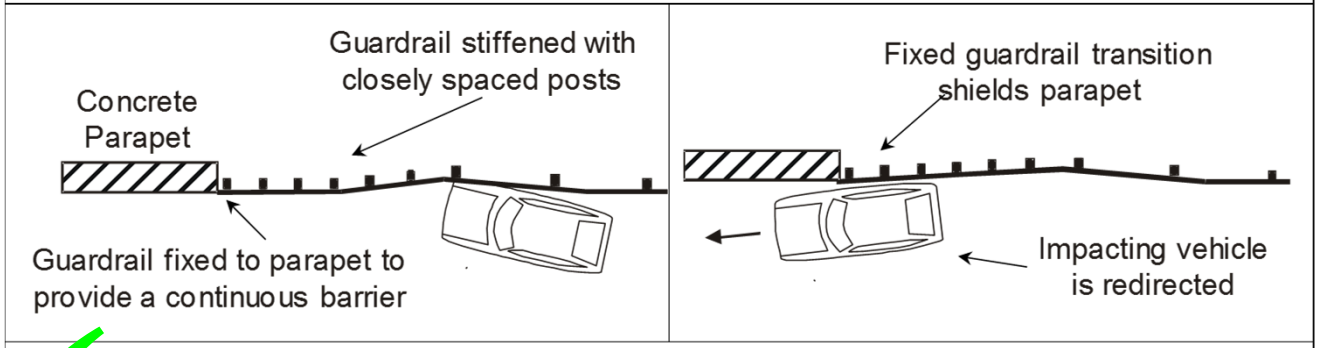
Message 6 Take the full shoulder width across new bridges, and provide a protected/separate bridge for pedestrians

- Take a full width shoulder across every new bridge.
- Install adequate safety barrier on all four parapets and secure it.
- Install reflective Width Markers to highlight the bridge parapets.
- Explore ways to help pedestrian/ small vehicle safety.
- Is a raised “footpath” safer than nothing? How wide should it be? How will m/c access it?


The shoulder has
“disappeared” at the bridge
Be alert for this in
design drawings



Performance without guardrail / bridge barrier connection



Performance with guardrail / bridge barrier connection

Why have raised footpaths on the bridge – but none either side of the bridge?

These 3-wheelers are not able to stay out of traffic

Bridges must safely serve all “customers”

In such cases, pave the shoulders – at least 200m approaching the bridge.

Then hatch out the final 50m with bold white hatching to alert riders of the hazard ahead. And also construct a ramp onto the raised path.

Bridges must safely serve all “customers”


This is a “standard” design in Georgia – but it is unsafe.
Prevention is better than cure

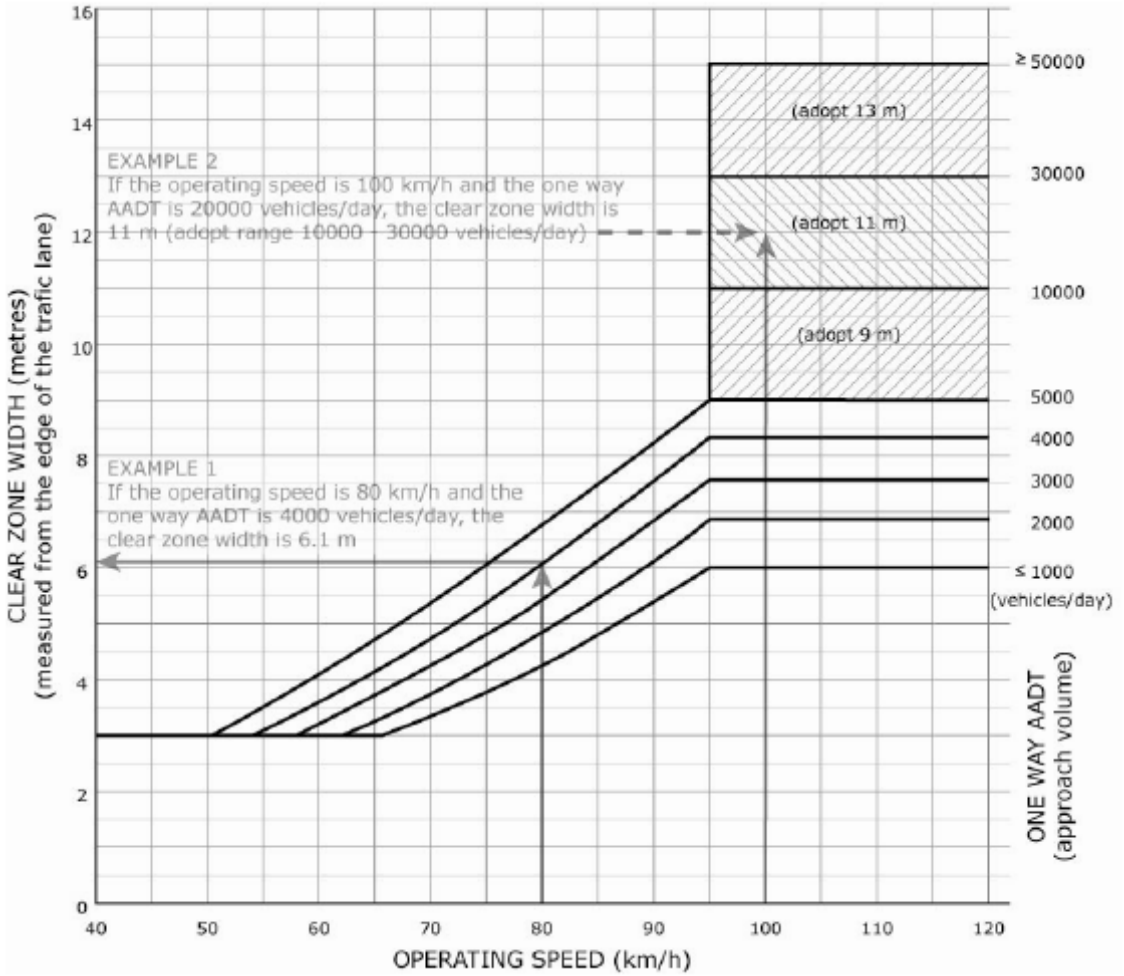
This “standard” design is highly unsafe.

Safety on rural roads

- Cross sections
- Alignments
- U-turns on divided highways
- Speed management
- Delineation
- Bridges
- Roadside hazards
- Villages, pedestrians, bus stops

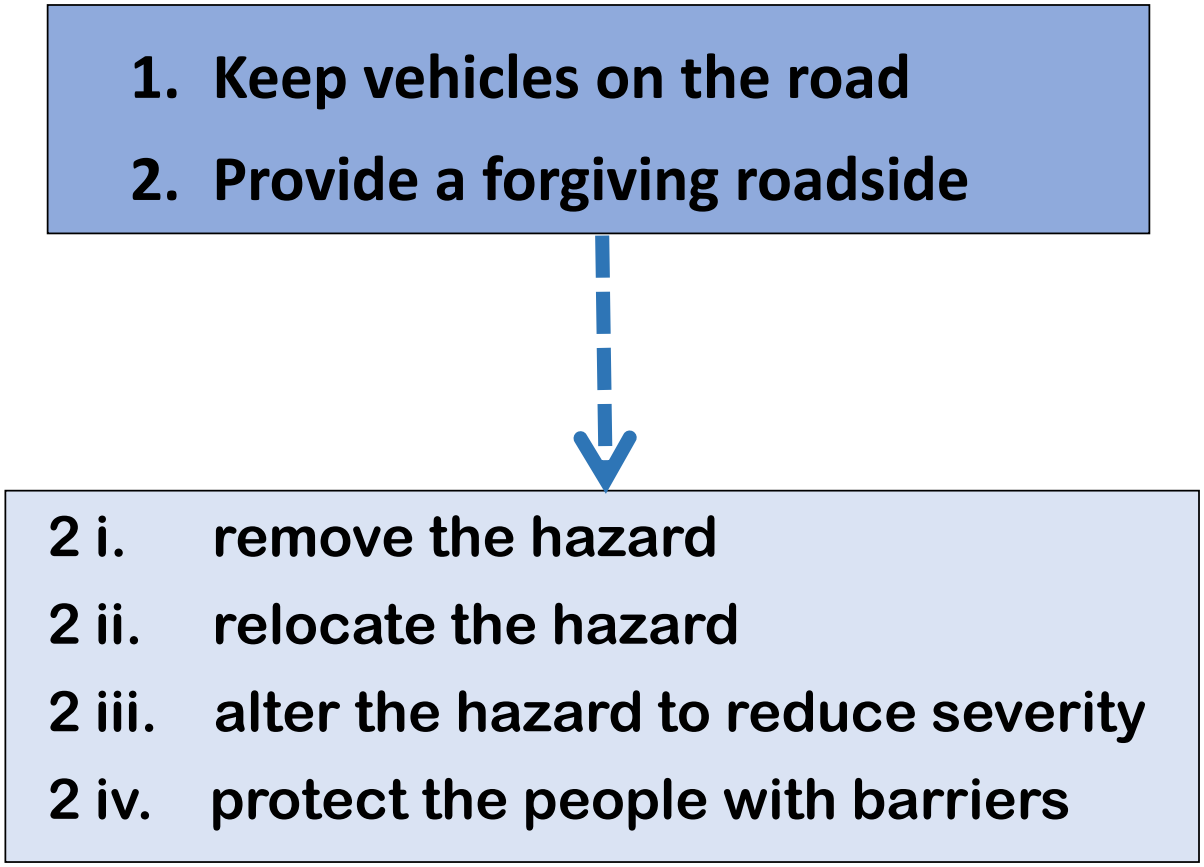
Clear Zone Chart

Figure V4.1: Basic Clear Zone Widths on Straights – All Roads

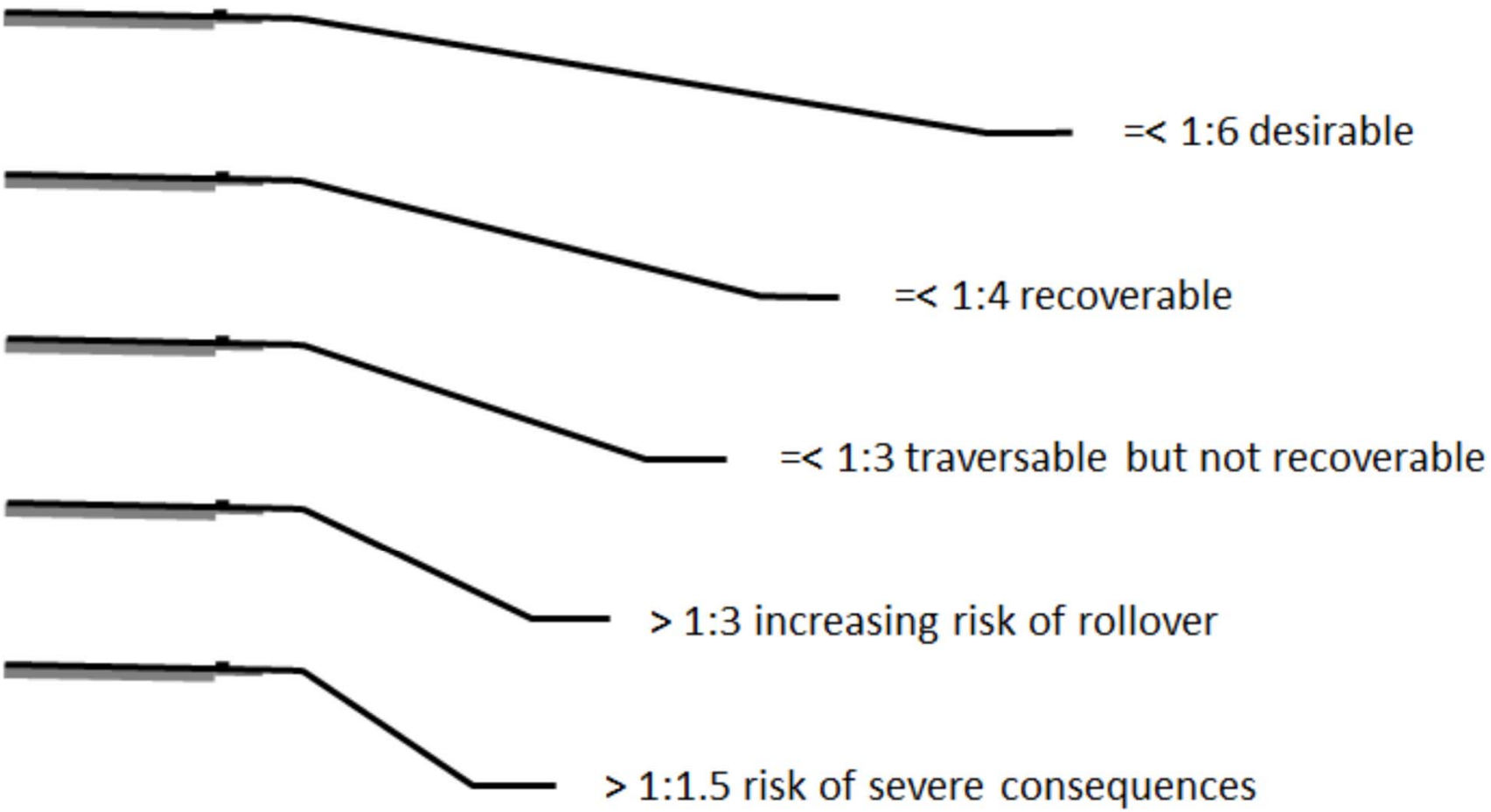



3000-СОЛАГИН ХИСОР МУБОРАК

Use the Roadside Hazard Management strategy




Remember – an auditor tries to foresee such crashes while the road is still in the design stage
Prevention is better than cure


=< 1:6 desirable
=< 1:4 recoverable
=< 1:3 traversable but not recoverable
> 1:3 increasing risk of rollover
> 1:1.5 risk of severe consequences

Safety on rural roads

- Cross sections
- Alignments
- U-turns on divided highways
- Speed management
- Delineation
- Bridges
- Roadside hazards
- Villages, pedestrians, bus stops

Message 8 Traffic calm villages

- Gateway treatments should become “standard”.
- Decide a suitable speed limit for the village and post adequate signs.
- Ask - will it be enforced by Police?
- If not – what are your options – road humps work best, followed by roundabouts and chicanes and raised junctions.
- *DO NOT* accept that the villagers must “pay the price” when a rural road is rehabilitated.

Visual impacts due to line marking

“Gateway”


BANRAEABA
40
How Fast Are You Driving?
BANRAEABA
40
Iraua Ngkai Butim?

Vertical displacement

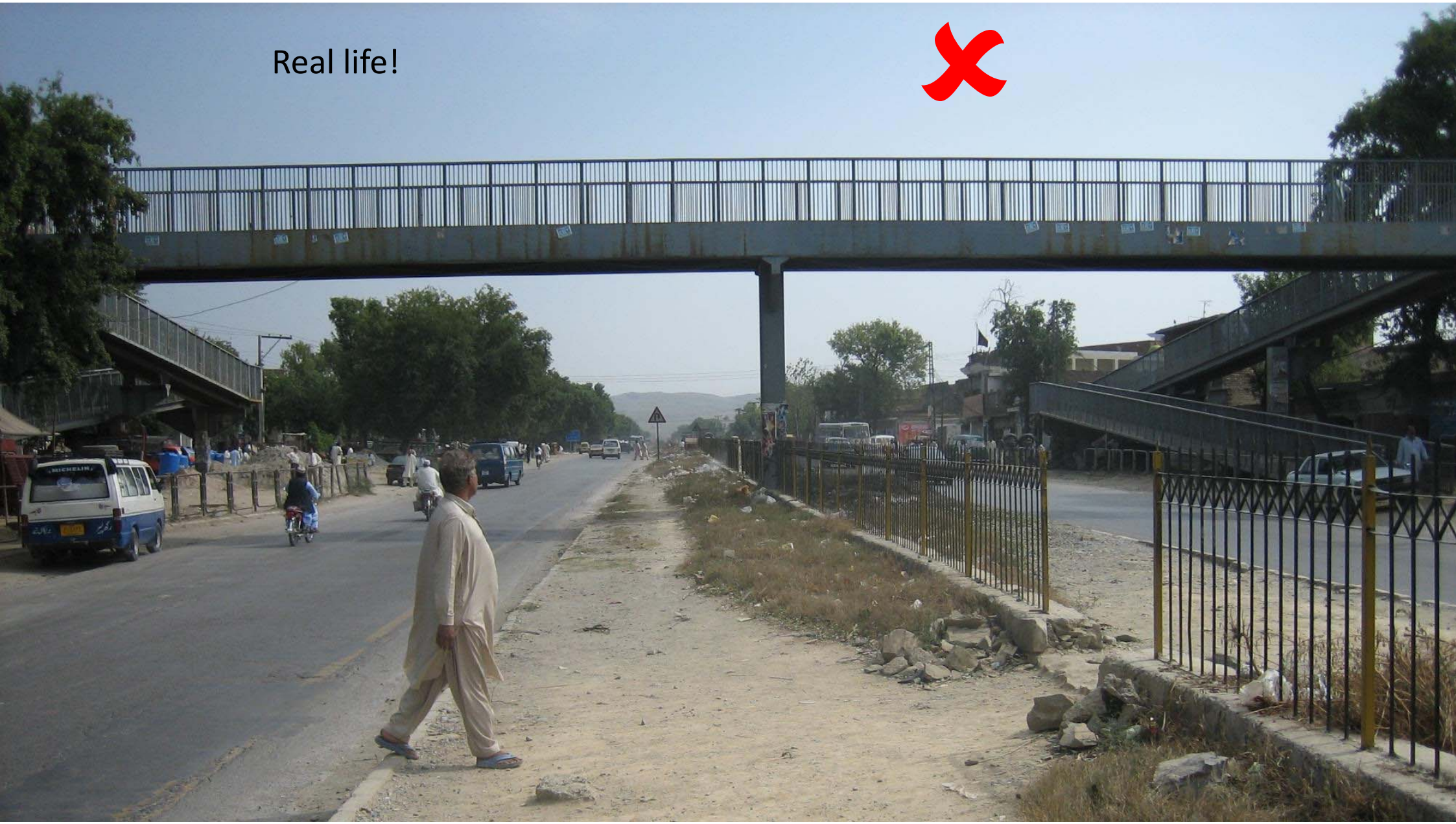

Vertical displacement


WOULD YOU INSTALL ROAD HUMPS, OR HUMPED PEDESTRIAN CROSSINGS ON THIS NEWLY CONSTUCTED ROAD?

One good safety initiative on the Dushanbe-Turzunade Road – a median, without barrier, serving as a pedestrian refuge in one large town!

Pedestrians are legitimate users of rural roads

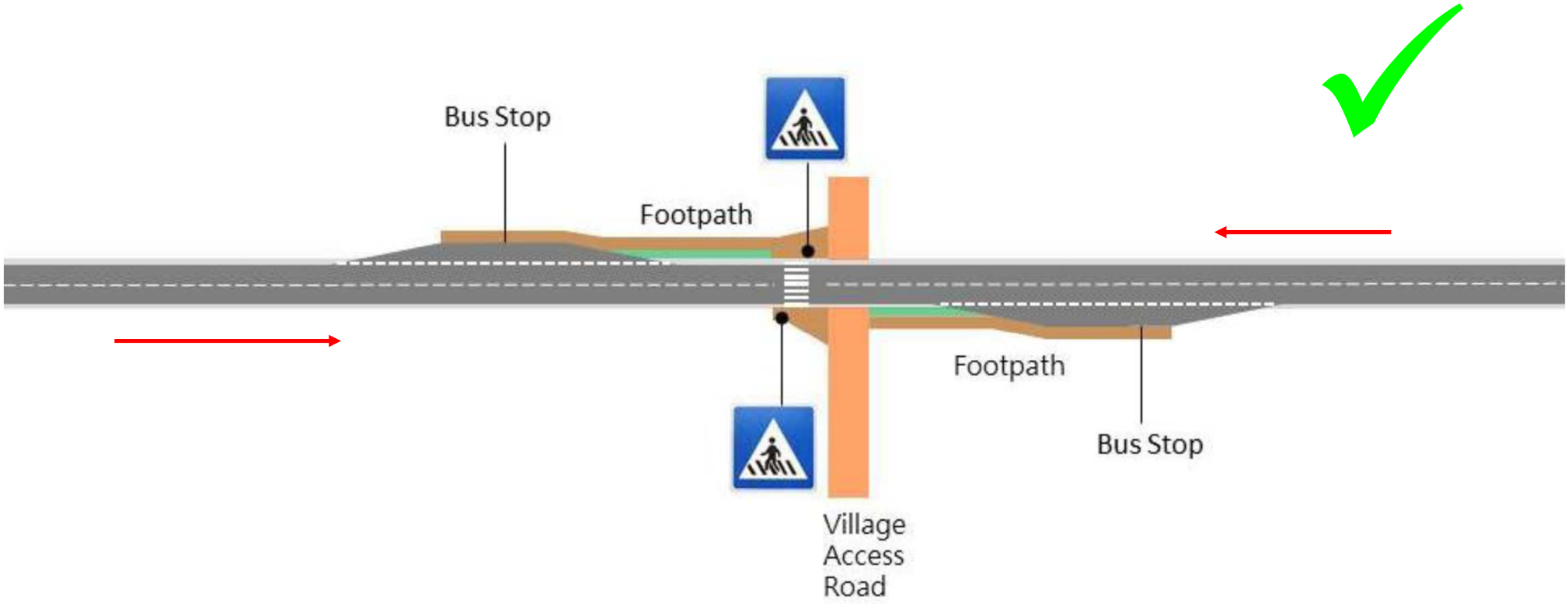
- They walk on/beside most rural roads in most countries - day and night
- If we cannot offer an “off-road” path, then we must offer wide paved shoulders.
- There should be no squeeze points (culverts, or bridges) as they walk along a road.
- Do NOT use Zebra Crossings (or signals) in rural areas.
- They do not command driver respect in high-speed areas.
- Warning signs, good sight lines, medians and lighting are better options.


Real life!


Do NOT place Zebra Crossings in high speed areas, or over multi-laned roads
International highway, in a rural area, speeds around 110kmh

Best to have a paved stopping area off the road, and best NOT to place Zebra Crossings in high-speed areas, or over multi-laned roads


Best to NOT place Zebra Crossings in high
speed areas, or over multi-laned roads



Driving on right side. With this configuration, a stopped bus will not obscure sight lines to/from a pedestrian on the crossing. But still, do not place a Zebra crossing in high-speed zones!

Most important messages from this workshop

Engineers ***are*** important in road safety.

Put the ***ROAD*** into road safety!

YOU can save lives - design, build, manage safer roads.

- Fix blackspots
- Use audits to ensure new designs will be safe
- Remember pedestrians and roadside hazards

Treat road safety as a business.

Look and plan “long term”

This is a big challenge in *all* countries

- TREAT ROAD SAFETY AS A BUSINESS

Then ask what can you do – effectively - at low cost?
Blackspot investigations and treatments
Road safety audits – change while still a “mouse click on the computer”.
Pedestrian facilities – kerb extensions, ped refuges. NOT only overpasses!

Some may say – not enough $$$$$

There was enough money to build this overpass!

You can see that it gets little use.

“Road safety” doesn’t happen overnight

In 1970 - Victoria had fatality rates higher (>30) than your rate today.

Since then, my state has achieved world class rates. Your country can too.

It takes:

- Time.
- Co-operation with stakeholders.
- Resources.
- Some champions (like some of you)

You can save lives

- Put yourself into the shoes of your “customers” – the road users.
- You can make your roads safer for all.
- The world needs more road safety engineers.
- I wish you well in your careers.

Hi . Who counted correctly?

17 wombats today

Thank you.
Your questions are welcome

phillip.jordan@roadsafetyinternational.com