TRAFFIC SAFETY IN 2-LANE EXPRESSWAY ON MOUNTAINOUS AREA

Case study: in the North of Vietnam

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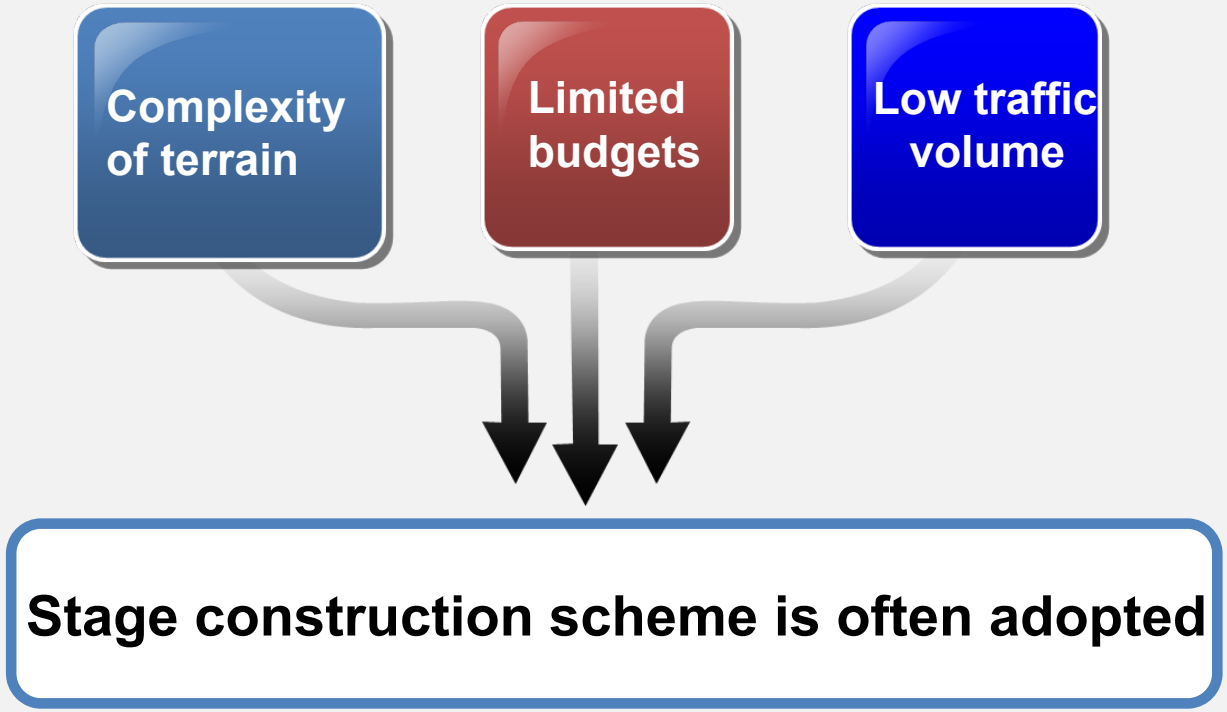
Overview

- **Master Expressway Nerwork Planning in Vietnam until 2020 will complete more 2,500 Km of expressway.**



Overview

- In the first longest expressway (Noi Bai-Lao Cai expressway) occurred more than 70 accidents, 5 deaths, 67 injured during a haft of operating year.
- These accidents may be caused by:

Not a lot experience in expressway design

No current specification for designing 2-lane expressay segment

Geometric and traffic control & managements unreasonable

Necessary to propose some recommendations to increase safety for drivers.

2-lane expressway in Vietnam

- Definition: [According to current Vietnam Expressway Designing]

A 2-lane expressway is an expressway with only one lane by each direction, and usually no center strip.

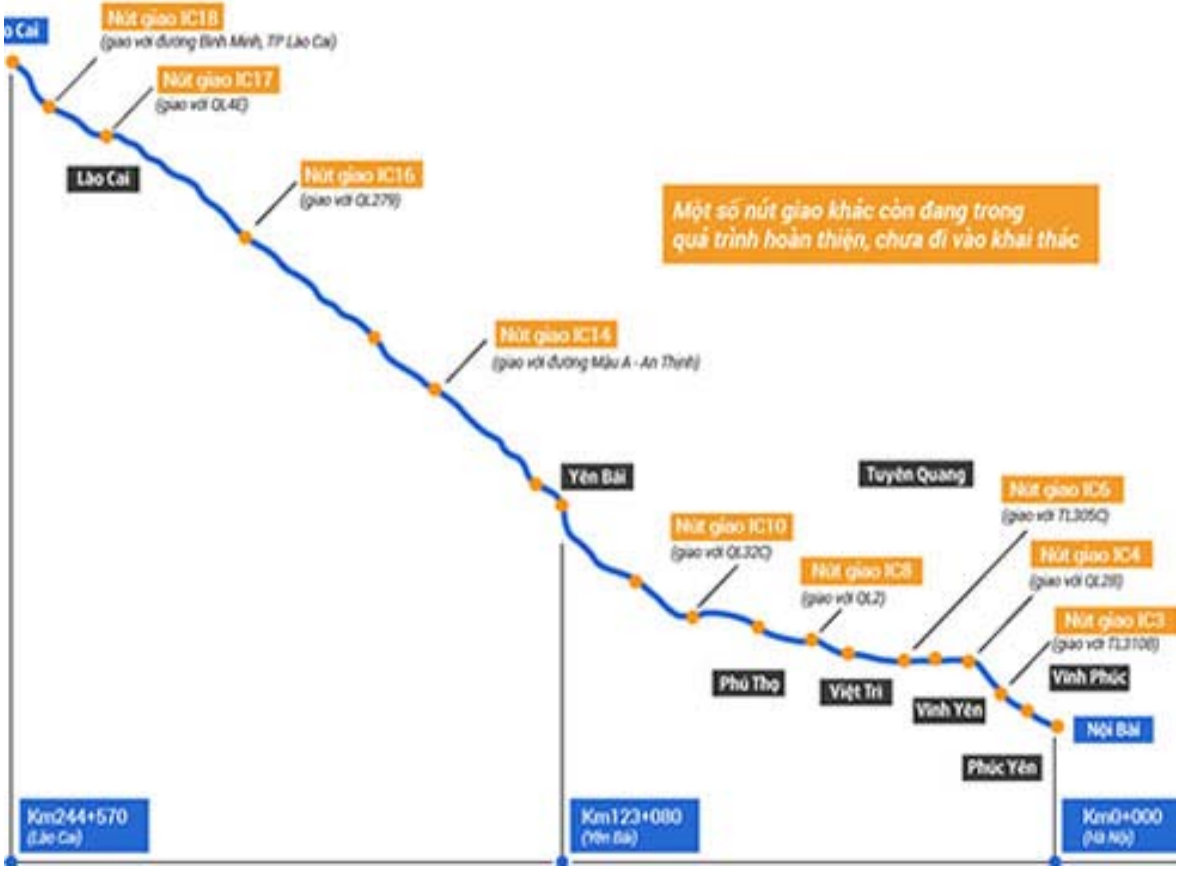
- Classification:

+ Class 100: V_{tk}=100 km/h, for delta area.
+ Class 80: V_{tk}=80 km/h, for low hill area.
+ Class 60: V_{tk}=60 km/h, only for hill and mountainous area.

2-lane expressway in Vietnam

- Location: Ha Noi city-Lao Cai province
- Total of Length: 244km
- Through 5 provinces: Ha Noi, Vinh Phuc, Phu Tho, Yen Bai, Lao Cai
- Reducing from 7 hour to 3.5 hour travel time.

Factors	Segment 1	Segment 2
Number of lane	4	2
Design Speed	100 km/h	80 km/h
Lane width (m)	3.75	3.5
Carriageway width (m)	15.0	7.0
Shoulder width (m)	3.0	2.5
Roadbed width (m)	20.5	12.0
Median strip width (m)	1.5	-



Noi Bai-Lao Cai Expressway

Potential unsafety in NB-LC expressway

1. Geometric factors:

Unsatisfy sight distance

Insufficient width of lane

S-sharp curves

Potential unsafety in NB-LC expressway

2. Traffic safety systems:

Center strip to be confusing for drivers

Not effective warning system:

Potential unsafety in NB-LC expressway

3. Human factor:

-Driver tends to operate with high velocity, jaywalking behavior.

-The awareness of residents in nearby expressway is still low such as stealing bolts in barrier, grazing on the expressway.

Proposals to improve traffic safety

1. Transition section arrangement between 4-lane section and 2-lane section

- Transition section should be arranged to avoid sudden changing about different in width of 4-lane segment and 2-lane segment.
- Length of transition section should be calculated based on difference between width of 2-lane and 4-lane section. It should be enough for the driver to adapt to changes of geometric factors.
- The width of cross section at least is enough for a higher speed lane and lower speed/emergency lanes (still 4-lances in the fact) to be enable for vehicles overpassing if necessary or stop in case of emergency.

Proposals to improve traffic safety

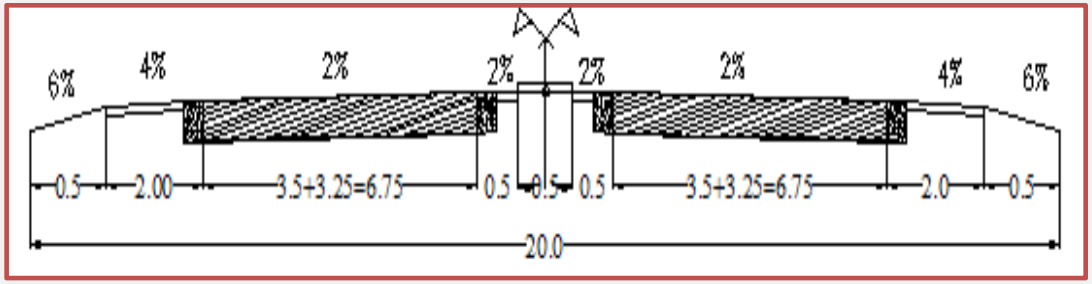
1. Transition section arrangement between 4-lane section and 2-lane section

- Table of cross section factors:

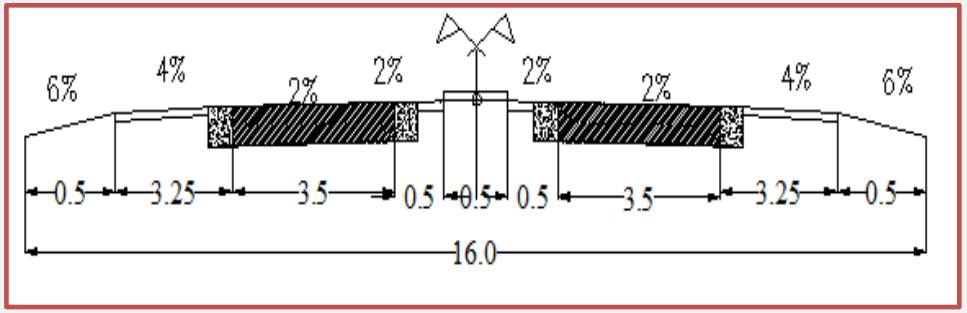
Factors	4-lane section	Transition section	2-lane section
Lane width (m)	3.5x4	(3.5+3.25)x2	(3.5+3.25)x2
Shoulder width (m)	2.5x2	2.5x2	0.75x2
Median strip width (m)	0.5x2+0.5	0.5x2 + 0.5	0.5x2+0.5
Roadbed width (m)	20.05	20.0	16.0

Proposals to improve traffic safety

1. Transition section arrangement between 4-lane section and 2-lane section

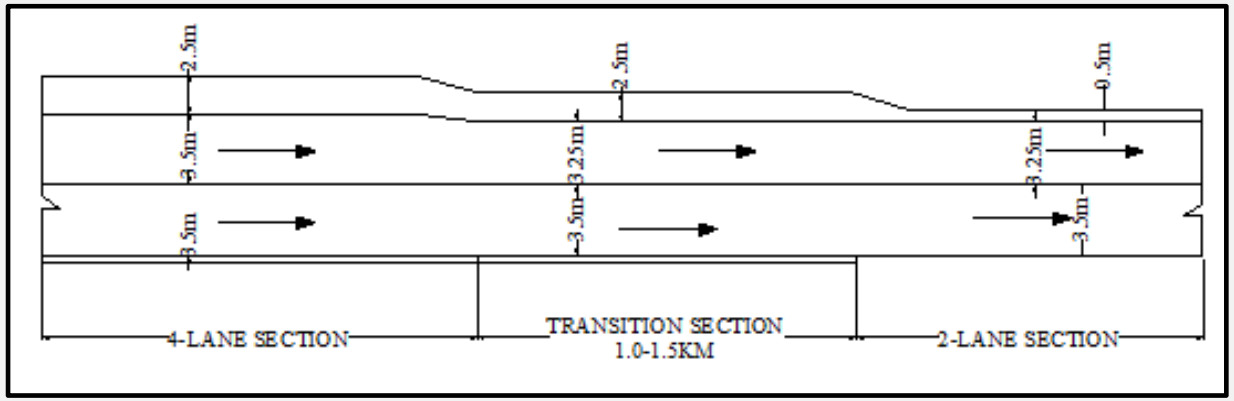


Cross section at transition section



Cross section at 2-lane section

Plan view with transition section



Proposals to improve traffic safety

2. Passing lane arrangement

- "Percent time delay" is the percentage of their cumulative travel time that drivers on a particular roadway section spend following in platoons behind other vehicles.
- Based on "percent time delay" of vehicle running on road, the authorities give the optimum distance between each passing lane to reduce maximum percentage of time delay and construction cost. When going on passing lane, slower vehicle have to actively drive on passing lane to other vehicle enable overtake them.

Proposals to improve traffic safety

2. Passing lane arrangement

- Table of Interval and length of passing lane:

ADT (vehicle/day)		Length of passing lane (Km)	Distance between each passing lane (Km)
Delta area	Hilly area		
≤ 2,800	≤ 2,350	1.3 ÷ 1.8	6.5 ÷ 8.0
≤ 3,150	≤ 2,650	2.0 ÷ 2.4	6.0 ÷ 7.2
≥ 3,550	≥ 3,000	2.4 ÷ 3.2	5.6 ÷ 6.4

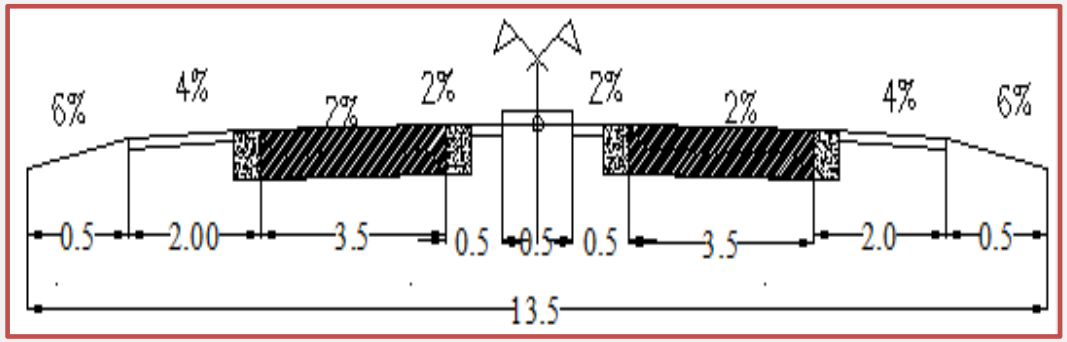
- Table of cross section factors:

Factors	Passing lane	No Passing lane
Lane width (m)	3.5x2+3.25x2	3.5x2
Shoulder width (m)	2.5x2	2.5x2
Median strip width(m)	0.5x2+0.5	0.5x2+0.5
Width of roadbed (m)	20.00	13.50

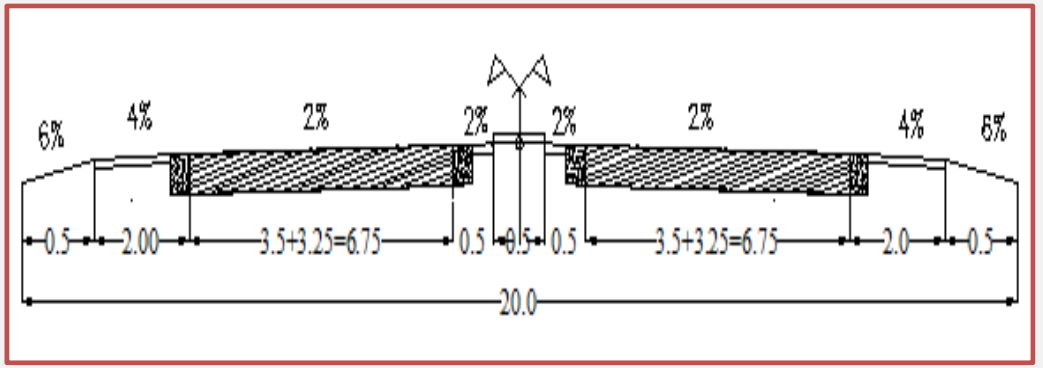
Proposals to improve traffic safety

2. Passing lane arrangement

- Cross section without passing lane:

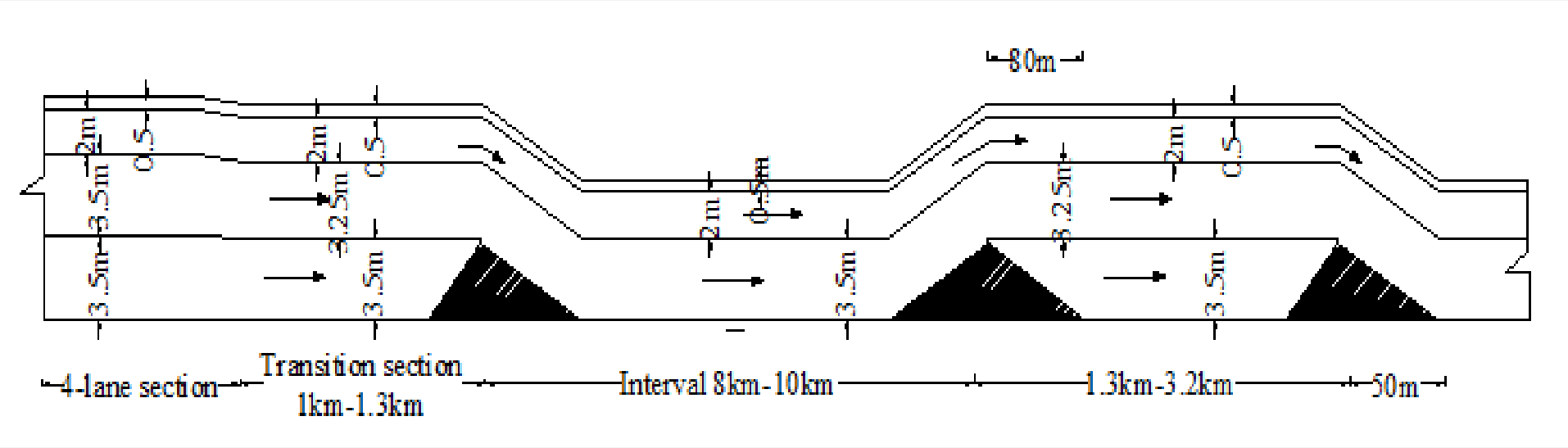


- Cross section with passing lane:



Proposals to improve traffic safety

2. Passing lane arrangement



Plan view with passing lane

Proposals to improve traffic safety

3. Indoctrination and raising awareness of people

- Government have to actively indoctrination and education to raise people's awareness as people drive on 2-lane expressway.

- Participants have to be aware that two- lane expressway is not "true" expressway to have behaviors the same with ordinary Highway.

Hence, they absolutely obey traffic regulations for traffic safety when they drive on these expressway.

Conclusion

- 2-lane expressway on mountainous area **could be constructed** and **applied** for the **complexity of terrain**, **low traffic volume** as well as **limited investment budgets.**
- It is strongly clear that the authorities should calculate and prepare for a **long-term development plan** to expanded expressway in the future.
- To secure safety for people, the authorities obtained **reasonable design solutions** in term of **geometrical** and **traffic control & management** correspoding these solutions as arrangement **transition section** and **passing lane**.

Conclusion

- The **concrete barrier** should be designed for the median for protection from head crash.
- Raising consciousness of participants should carry out to make them understanding that they are **not driving in ordinary expressway** to have **reasonable driving maneuver**.
- The **fee on 2-lane expressway** should be **lower than 4-lane expressway** in order to meet participant's satisfy.
- It is clear that the conventional 2-lane expressway may be called "**divided HIGHWAY**".

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Thank you for your listening!