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INSTITUTE OF TRANSPORT SCIENCE AND TECHNOLOGY

The rutting situation on the asphalt pavements of Vietnam

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Tokyo, 30-31/10/2013

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I. ASSESSMENT OF THE RUTTING ON THE ASPHALT PAVEMENTS OF VIETNAM

- In recent years, rutting has occurred widely on some main roads in Vietnam.
- Assessment of causes and solutions of rutting and proposal of rutting test are first step.

I. ASSESSMENT OF THE RUTTING ON THE ASPHALT PAVEMENTS OF VIETNAM



Some pictures of rutting in Vietnam

I. ASSESSMENT OF THE RUTTING ON THE ASPHALT PAVEMENTS OF VIETNAM

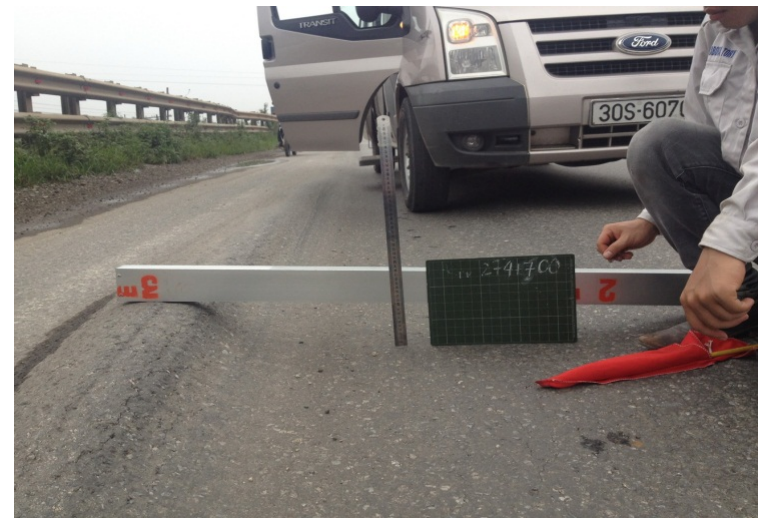
HIGHWAY N01 (HA NAM – THANH HOA SECTION)

Causes of rutting:

- Estimation of traffic volume, axle load for designing structure of pavement is unsuitable. The actual traffic volume and axle load greater than forecast.
- The actual thickness of pavement and base course lower than the design.
- Management of construction quality is not good.

I. ASSESSMENT OF THE RUTTING ON THE ASPHALT PAVEMENTS OF VIETNAM

HIGHWAY N01 (HA NAM – THANH HOA SECTION)



I. ASSESSMENT OF THE RUTTING ON THE ASPHALT PAVEMENTS OF VIETNAM

THANH TRI BRIDGE PROJECT

Causes of rutting:

- The actual traffic volume and heavy axle load greater than forecast.
- High air temperature in recent year.
- Asphalt mixture for rutting resistance has not mentioned.

I. ASSESSMENT OF THE RUTTING ON THE ASPHALT PAVEMENTS OF VIETNAM

THANH TRI BRIDGE PROJECT



I. ASSESSMENT OF THE RUTTING ON THE ASPHALT PAVEMENTS OF VIETNAM

HIGHWAY N05

Causes of rutting:

- The actual traffic volume and heavy axle load greater than forecast.
- Asphalt mixture for rutting resistance has not mentioned.

I. ASSESSMENT OF THE RUTTING ON THE ASPHALT PAVEMENTS OF VIETNAM

HIGHWAY N05



II. STUDY OF RUTTING IN VIETNAM

Research situation on rutting:

- Before 2009 almost no study on rutting.
- In 2009, ITST has implemented a project study about rutting.
- Since 2009, some testers of rutting have imported to Vietnam (only Hamburg Wheel-Tracking type).
- National standard TCVN 8819:2011 for conventional asphalt concrete has issued, rutting has mentioned. But need to update.

II. STUDY OF RUTTING IN VIETNAM

Rutting test for some kind of asphalt mixture have conducted in Hamburg Wheel Tracking Device:

No	Type of specimen	Rut depth at 10000 passes (mm)	Rut depth at 20000 passes (mm)	Marshall stability (KN)	Marshall flow (mm)	Note
1	BTNC15-1					From NH5 site
2	BTNC15-2					From NH5 site
3	BTNC15-3	20.01	-	10.20	2.95	From Lab
4	BTNC25	18.97	-	12.00	3.10	From Lab
5	BTNC12,5-1	17.63	-	9.92	3.36	From Lab

II. STUDY OF RUTTING IN VIETNAM

No	Type of specimen	Rut depth at 10000 passes (mm)	Rut depth at 20000 passes (mm)	Marshall stability (KN)	Marshall flow (mm)	Note
6	BTNC12,5-2	19.43	-	9.92	3.36	From Lab
7	BTNC12,5-3	16.66	-	10.42	3.22	From Lab
8	BTNC12,5-4	19.69	-	10.42	3.22	From Lab
9	BTNP 12.5	10.99	-	17.80	3.87	From Lab
10	BTNP 19	5.75	13.23	17.40	4.80	
11	SMA9.5	4.03	7.08	9.15	3.12	From Lab
12	SMA12.5	5.93	9.99	9.32	3.56	

II. STUDY OF RUTTING IN VIETNAM

Comment of rutting test :

- Marshall stability value of all samples is higher than requirement
- Maximum rut depth of conventional asphalt concrete is highest, polime asphalt concrete is lower and SMA is lowest.

III. DISCUSSION OF METHODOLOGY AND CRITERIA FOR RUTTING TEST IN LABORATORY FOR VIETNAM

1) Device of rutting test

- In the world there are many different types of devices for rutting test.
- In Vietnam, only small Hamburg Wheel Tracking type is available. Small Hamburg Wheel Tracking type is selected.

III. DISCUSSION OF METHODOLOGY AND CRITERIA FOR RUTTING TEST IN LABORATORY FOR VIETNAM



III. DISCUSSION OF METHODOLOGY AND CRITERIA FOR RUTTING TEST IN LABORATORY FOR VIETNAM

2) Standard Method of Test

- AASHTO T324-04: Standard Method of Test for Hamburg Wheel-Track Testing of Compacted Hot Mix Asphalt (HMA):
 - Laboratory specimens with 152mm diameter
 - Core drill specimens with 250 mm diameter
 - or slab specimens (32x26x5) cm.
 - Test condition: In immersion.
- Europe standard EN 12697-22:
 - Cylindrical specimens with 200mm (or 300mm) diameter
 - or slab specimens (30x30x5) cm
 - Test condition: In air or immersion
- ***Propose Europe standard EN 12697-22 for Vietnam or other?***

III. DISCUSSION OF METHODOLOGY AND CRITERIA FOR RUTTING TEST IN LABORATORY FOR VIETNAM

3) Condition and temperature of rutting test

- Propose temperature of rutting test for Vietnam:

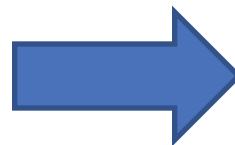
NO	Contents	Air	Water
1	Temperature, °C	60	50
2	Type of test wheel	Rubber coated test wheel	Steel wheel test

- *What's your opinion about condition and temperature of rutting test?*

III. DISCUSSION OF METHODOLOGY AND CRITERIA FOR RUTTING TEST IN LABORATORY FOR VIETNAM

4) Selection of rutting criteria

- Standard of Germany:
 - Rut Depth (RD) – mm
 - Proportional Rut Depth (PRD) - %
 - Wheel-Tracking Slope (WTS) - mm/10³
- EN 13108-1 Bituminous mixtures - Material specifications - Part 1, 2, 3:
 - Maximum wheel tracking slope mm per 10³ load cycle
 - Maximum proportional rut depth (%)
 - Maximum wheel tracking rate μm/cycle
 - Maximum rut depth (mm)
- AASHTO T324-04:
 - Maximum rut depth (mm)
 - Stripping inflection point



Propose criteria of Maximum rut depth (mm) for Vietnam.

III. DISCUSSION OF METHODOLOGY AND CRITERIA FOR RUTTING TEST IN LABORATORY FOR VIETNAM

5) Selection of specimen preparation method

■ Laboratory:

- Slab specimens: Standard EN 12697-33 (preparation by roller compactor)
- Cylindrical specimens: Standard EN 12697-31 (preparation by gyratory compactor) or AASHTO T312

■ Site specimens: Cutting specimens as slab or cylinder

■ The specimen size :

- Slab: 260x320mm and 300x300mm
- Cylinder: 150mm diameter
- Cores from site: minimum 200mm diameter

III. DISCUSSION OF METHODOLOGY AND CRITERIA FOR RUTTING TEST IN LABORATORY FOR VIETNAM

6) The limited value of rut depth

■ Conventional asphalt concrete :

- In immersion: The load on the wheel is 700 N, test temperature is 50°C, wheel runs 10000 passes. Max rut depth =12.5mm
- In air: Not identified. ***What's your opinion***

■ Polime asphalt concrete:

- In immersion:
 - PMBI: The load on the wheel is 700 N, test temperature is 50°C, wheel runs 15000 passes. Max rut depth =12.5mm;
 - Nhựa PMBII, PMBIII: The load on the wheel is 700 N, test temperature is 50°C, wheel runs 20000 passes. Max rut depth =12.5mm;
- In air: Not identified. ***What's your opinion***

What's your opinion: What road class have to test rutting?

IV. DISCUSSION OF TYPE OF HOT MIX ASPHALT AND PAVEMENT STRUCTURE FOR RUTTING RESISTANCE

1) Type of hot mix asphalt:

- Standard TCVN 8819:2011 including 03 types of HMA (using normal bitument) used for asphalt pavement in Vietnam:
 - BTNC9.5 (NMA=9,5 mm) for leveling
 - BTNC12.5 (NMA=12,5 mm) for wearing course in normal
 - and BTNC19 (NMA=19 mm) for binder course in normal
- ***What's your opinion:***
 - In normal, BTNC12.5 (NMA=12,5 mm) for wearing course. Could use BTNC19 for wearing course ?
 - Using polyme asphalt concrete to resist rutting on pavement, What conditions?.
 - Using other material as SMA may be the effectiveness?
 - What's about Porous Asphalt?

IV. DISCUSSION OF TYPE OF HOT MIX ASPHALT AND PAVEMENT STRUCTURE FOR RUTTING RESISTANCE

2) Structure of pavement:

- In normal, structure of pavement in Vietnam is designed:
 - Subgrade with density 95%-98%
 - Base course: Granular crushed aggregate, thickness from 20-45cm.
 - 02 asphalt concrete layers, thickness from 5-7cm (wearing course) and 7-8cm (binder course).

As structure of pavement above, some roads have occurred rutting soon.

- ***What's your opinion:***

Structure of pavement resist rutting in Vietnam?



*I would like to receive your opinion
from you.*

Thank you for your attention!