



ERPUG 2024, Equipment evaluation at duraBASt

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# Plans for next years conference

- ERPUG conference 2024, Cologne 16-18 October
- Combined with an “Evaluation of measurement systems”, 14-15 October
- Target groups – traditional measurement vehicles, lidar-based measurement techniques, connected vehicles, smartphone techniques
- Test track – duraBAST operated by BAST (Federal Highway Research Institute) in Germany.
- We need financiers to be able to go through with the planning of this event.
- DuraBAST will provide the test track for free.  
ERPUG will support with surpluses from previous conferences.

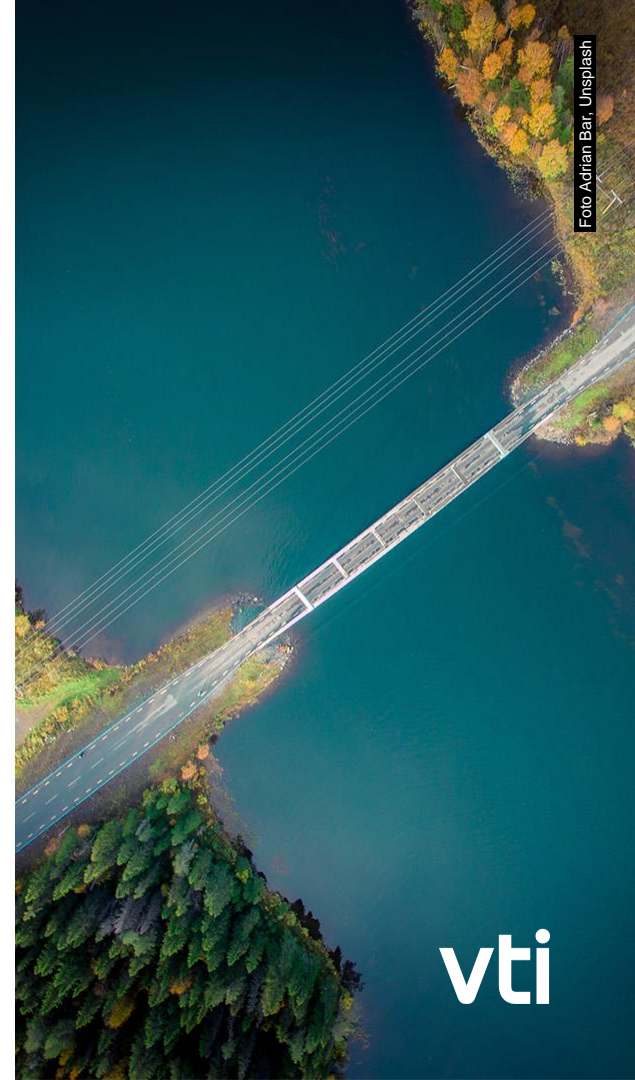


Foto Adrian Bar, Unsplash

duraBASt ([www.durabast.de](http://www.durabast.de))



Picture: [www.durabast.de](http://www.durabast.de)

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# duraBAST – reference sections

1. **Longitudinal evenness**
2. **Transverse evenness**
3. **Skid resistance**
4. **Surface defects, cracks**
5. **Texture**
6. **Road markings**



Picture: [www.durabast.de](http://www.durabast.de)

# The test

- The supplier will do 10 runs on each sections.
- 5 in low speed and 5 in higher speed.
- We will give the participating operators instructions how to position the vehicle lateral.
- Start of the measurement should be automatized, for example by photocell and reflector. Optional a coordinate could be used.

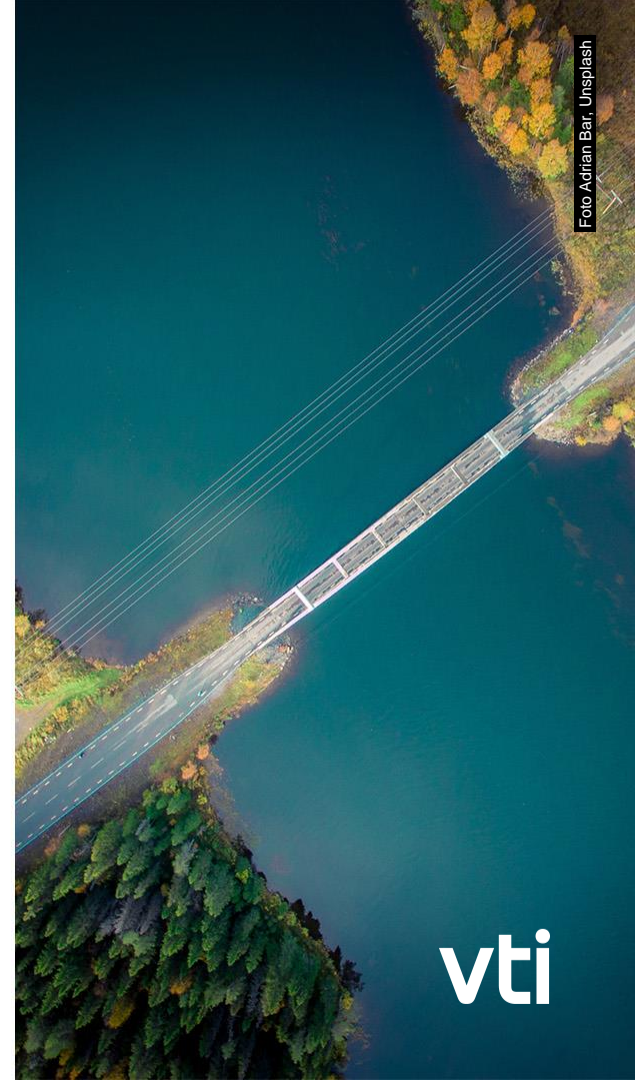


Foto Adrian Bar, Unsplash

# Reference methods at the test

1. Dedicated reference measurements
  2. Average of the data from the tested equipments  
(Outliers will be excluded, use only the 50 % closest to the median.)
- VTI will do reference measurements and calculate the tested variables according to current standards.

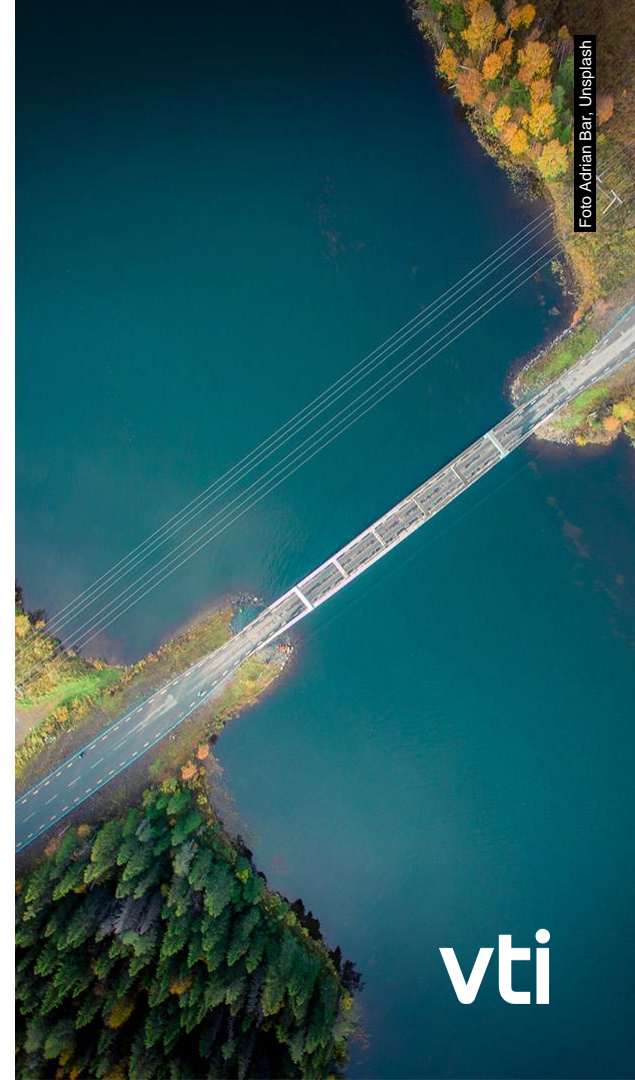
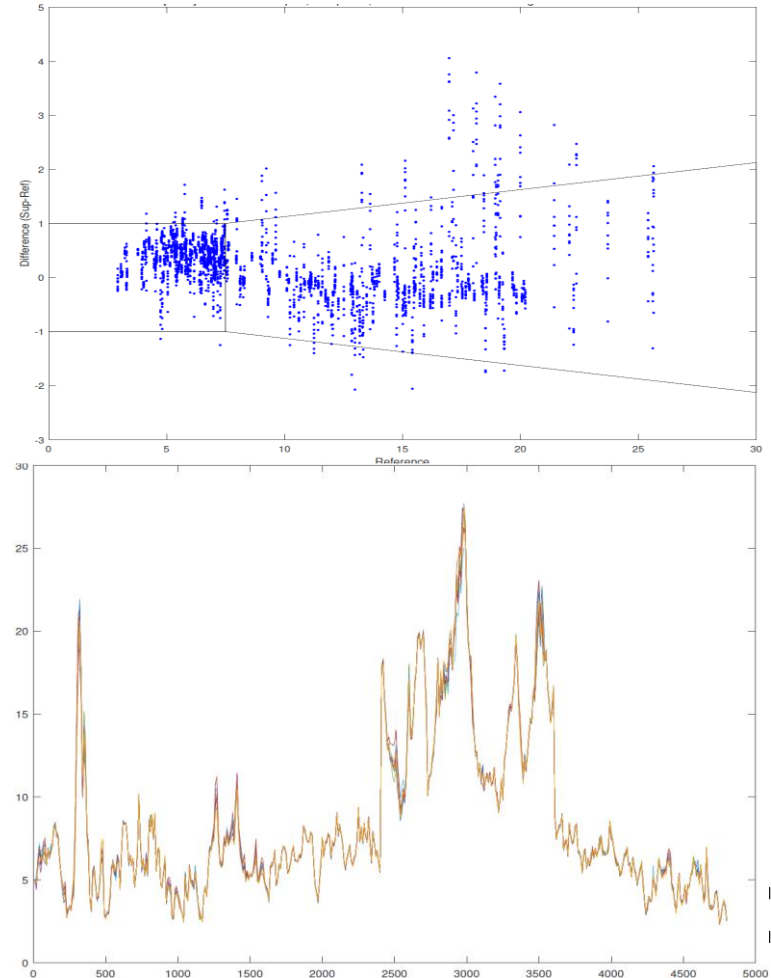


Foto Adrian Bar, Unsplash

# Test methods

- **Validity**, the difference between the tested vehicle and the reference is tested with a predefined interval. Percent of the difference within the interval is presented as a measure of validity.
- **Repeatability**, 10 repetitions will be done. The standard deviation on 20 m level will be used as a measure of the repeatability.



# Reference, transverse profile and crossfall

The reference for transverse profiles will be measured by VTI XPS (Cross Profile Scanner).

A device using seven Gocator line lasers to characterize the transverse profile and slope.

The device is also equipped with an OXTS Survey+ unit from which the slope of the transverse profile is determined.

Data is used to calculate the indices for transverse evenness.





## Reference for transverse evenness

- The reference is adapted to the tested equipment
- This means, the measurement supplier will give a description of the setup of the vehicle before the test. The reference will use the same setup as the tested vehicle to enable an adequate comparison.

# Transverse indices

The following indices can be calculated from the reference

- Transverse profile accuracy
- Rut depth total (surface wire method), measurement width 3.2 m
- Sliding wire rut depth, wire width 2 m, measurement width 3.2 m
- Rut depth, left and right, measurement width 1.92 m (within 3.2 m)
- Water depth, measurement width 3.2 m
- Water area, measurement width 3.2 m
- Rut width, left and right
- Distance between rut bottoms
- Rut area, measurement width 3.2 m

# Reference, longitudinal profile

The reference for longitudinal profiles will be measured by VTI Primal + Total Station

**VTI Primal** – A laser guided device will measure 10 m segments of the longitudinal profile.  $Dx=4$  mm

**Total Station** – A Total Station will measure the 10 m start/stop points used by the Primal to create a “true” longitudinal profile



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# Longitudinal indices

The following indices can be calculated from the reference

- Longitudinal profile accuracy (wl 0.5 m to 100 m)
- IRI, International Roughness Index
- RMS, wavelength bands
- WLP, Weighted Longitudinal Profile

## Reference, texture

The reference for the texture profile will be measured by VTI PTT (Portable Texture Tester).

**PTT** – A trolley equipped with a pulse transducer and a point laser.

Collecting a texture profile with selectable dx.  $Dx = 0.5 \text{ mm}$  will be used in the test.



Photo: Mats Gustavsson, VTI

# Texture indices

The following indices can be calculated from the reference

- MPD, Mean Profile Depth
- Megatexture, RMS
- Optional, texture spectra

## Position, coordinates

The position will be measured with a stationary GPS receiver corrected by a local base station.

The accuracy will be better than 1 cm.

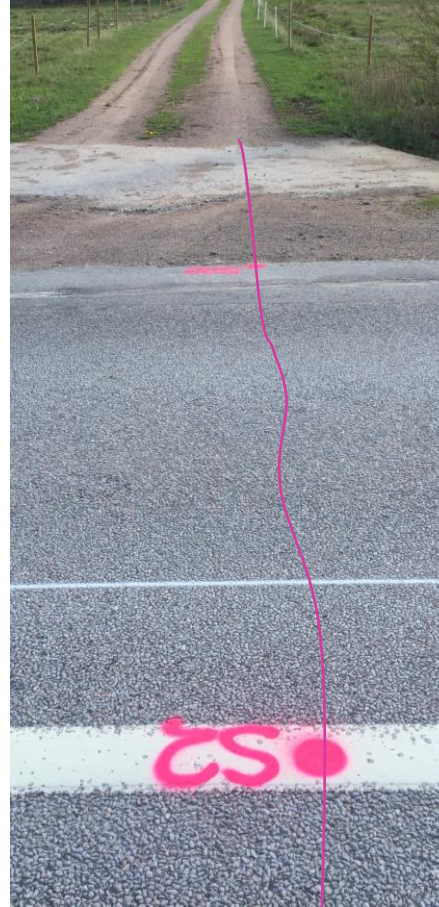




# Position/Coordinates

The following cases can be tested

- Absolute height of the longitudinal profile on the road (dx 10 m)
- Wide transverse profile accuracy, Profile width  $\pm 3$  m (6 m), suggested dx 0.1 m
- Positioning of objects, position and height (coordinate system will be decided later)



## Reference, cracks

*(To be decided)*

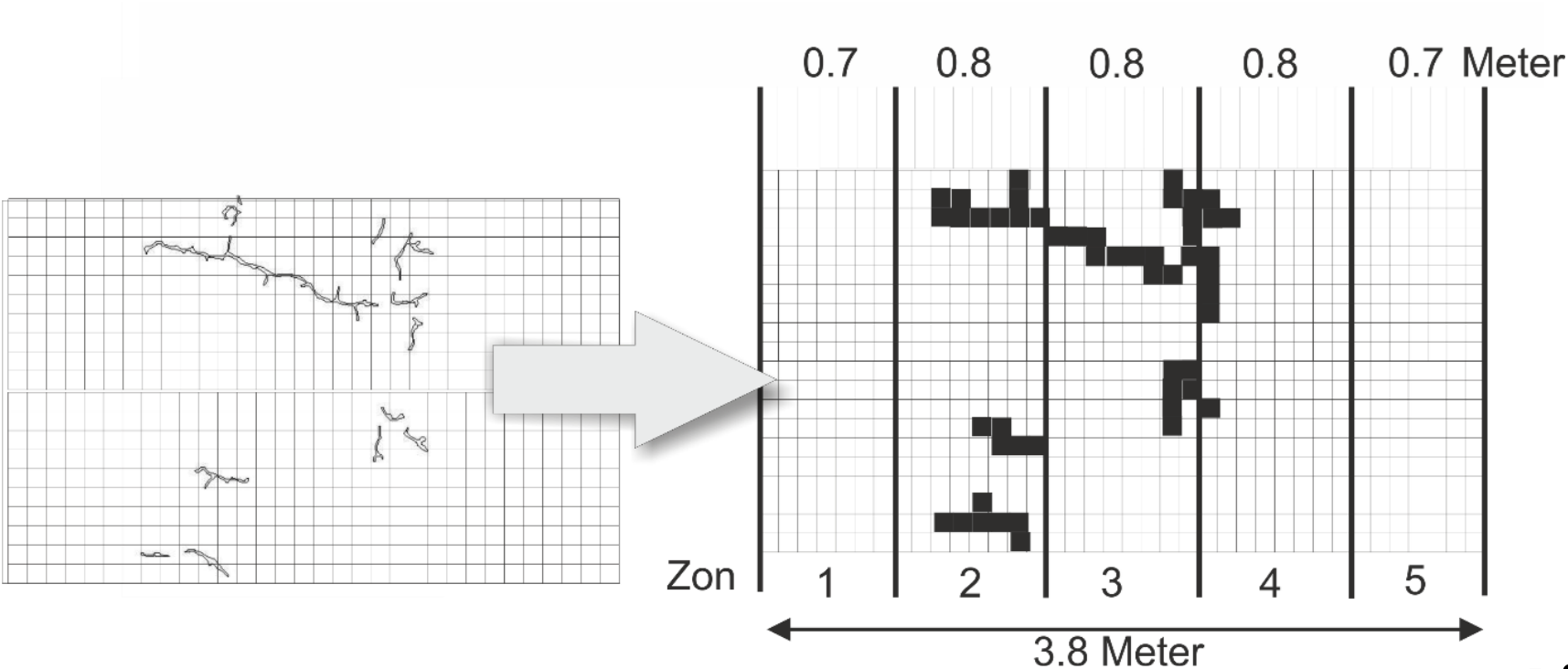
The reference for cracks will be a subjective mapping of cracks.

Reference could be percent of the area with cracks.

The surface is divided into squares  $0.1 \times 0.1$  m. If a square has a crack, it contributes to the percent cracked area.



# Cracks



Picture: Swedish Transport Administration

# Output from the study

- During next years ERPUG we will present a preliminary result at the end of the conference, for some of the variables.
- After the conference we will make a public report with the results.
- We will divide the participating systems in the following groups,
  1. Ordinary measurement vehicles, point laser
  2. Ordinary measurement vehicles, line laser
  3. Lidar based (only) measurement systems
  4. Connected vehicles and smartphone systems
- The suppliers will be coded when the results is presented.
- Each supplier will have a key to their own system(s).

# Sign up as a participant

- Registration – no later than 30 April 2024
- We need at least 10 to 15 participants to go through with the test.

If you want to sign up, please contact

[thomas.lundberg@vti.se](mailto:thomas.lundberg@vti.se), [leif.sjogren@vti.se](mailto:leif.sjogren@vti.se) or [roger.moller@erpug.org](mailto:roger.moller@erpug.org)

# Financing of the study

To be able to go through with the test, we need financiers.

**ERPUGs** will contribute from own fundings.

**BASt** will grant access to duraBASt for free, for two days.

**The Swedish Transport Administration** has responded positive to finance the test, a definite answer will come.

*“It would be very valuable to us (directly and indirectly) to get results from such a test.”*

If you are willing to contribute to this study, please contact

[thomas.lundberg@vti.se](mailto:thomas.lundberg@vti.se), [leif.sjogren@vti.se](mailto:leif.sjogren@vti.se) or [roger.moller@erpug.org](mailto:roger.moller@erpug.org)

# Thanks for the attention

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