Aalto University

Rural Roads Design meeting nr 5., April 3rd to 4th 2014

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Finnish Geometric Guidelines & Capacity Review Guidelines - status and research

31.3.2014

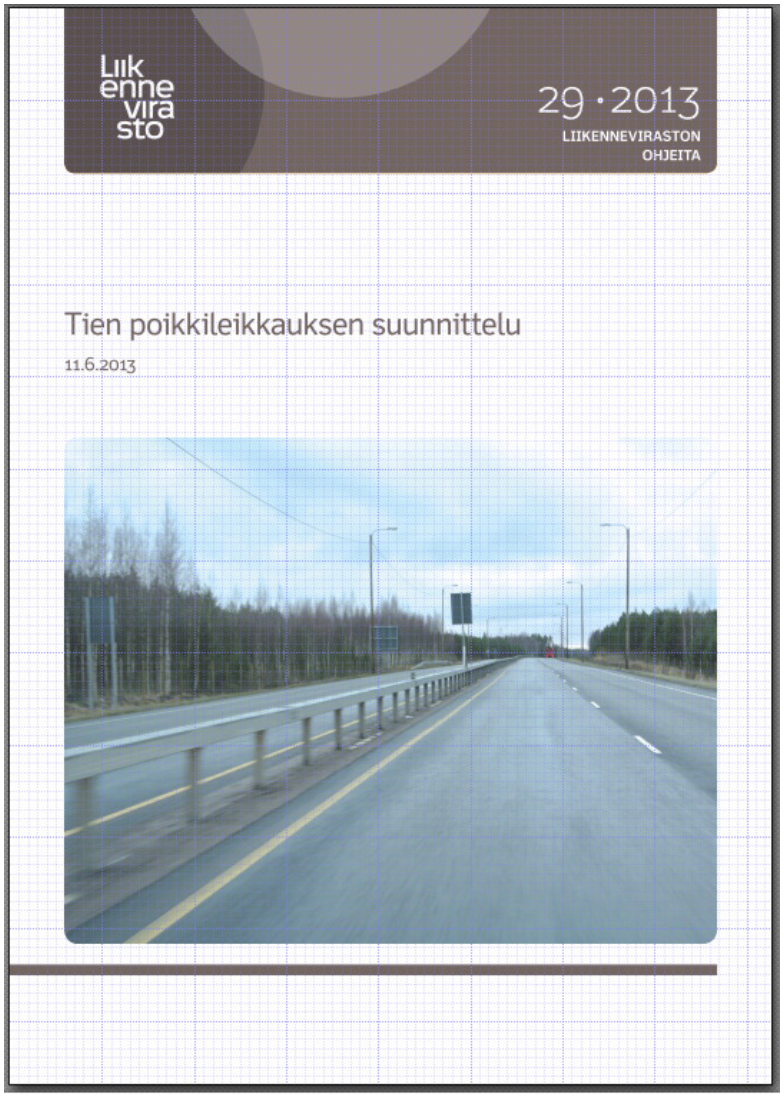
Main existing older Geometric Guidelines

- **Intersections**
  - Published in 2001
  - Dimensioning of intersections for heavy traffic e.g. for 25,25 m trucks with trailer
- **Freeway interchanges**
  - Part A, published in 1994
    - General operational and technical guidelines of motorways as a part of planned traffic network
  - Part B, published in 1993
    - Detailed geometric planning of interchanges
- **Design of overtaking lanes**
  - Published in 2003
  - Design and dimensioning of passing lanes (2+1, 2+2) with and without guardrail in the middle of the road
    - Cross-section 2+1 with guardrail 15,75 m (gravel shoulders are included)
    - Cross-section 2+2 with guardrail 19,00 m (gravel shoulders are included)

Recently renewed Geometric Guidelines

Design of cross-section of roads

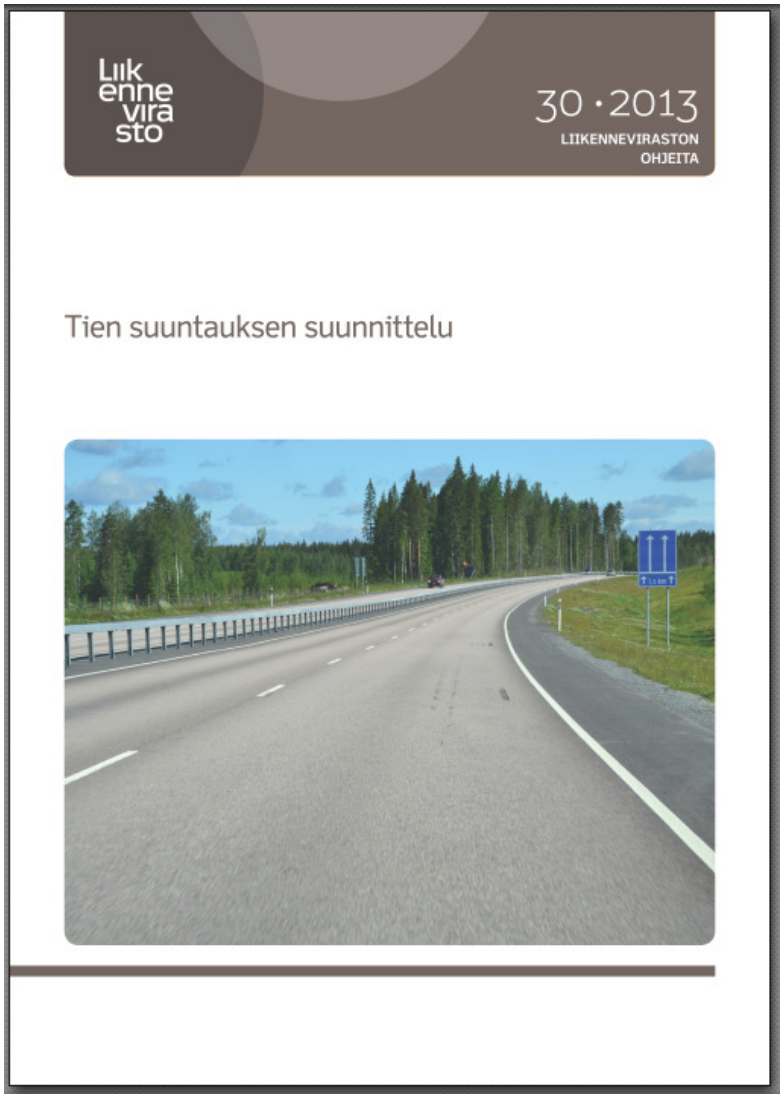
- Published in 2013 and gathers together previous fragmented guidelines
- Differs from previous guidelines among others the following way
  - dimensioning criteria have been revised
  - narrow 1+1 (10/10,5 m) and 2+1 (13,5 m) cross-sections with median barrier have been introduced (use is allowed only with permission of Transport Agency, still not used)
  - design of roadside area and guardrail requirement assessment have been incorporated into guideline



Recently renewed Geometric Guidelines

Alignment design of roads

- Published in 2013 and replaces a group of former guidelines
- Relates dimensioning of roads both in rural and densely populated areas
- Takes into account among others
  - the changed road classification
  - needs of readjustment consequent upon the existing dimensioning of vehicles (e.g. 25,25 m trucks with trailer)
  - new road types e.g. roads with median barrier and their demands for alignment



Geometric Guidelines being updated or starting up

Design of pedestrian and bicycle roads

- puts out spring 2014
- former guidelines published in 1998

Intersections

- updating of intersection sight distances
- addition of design principles of separate right turn lanes (separate guidelines since 2007)
- addition of design principles of turbo roundabouts (separate guidelines since 2009)
- updating of free right turn arrangement design principles at signalized intersections (additions now in separate guidelines since 2004)

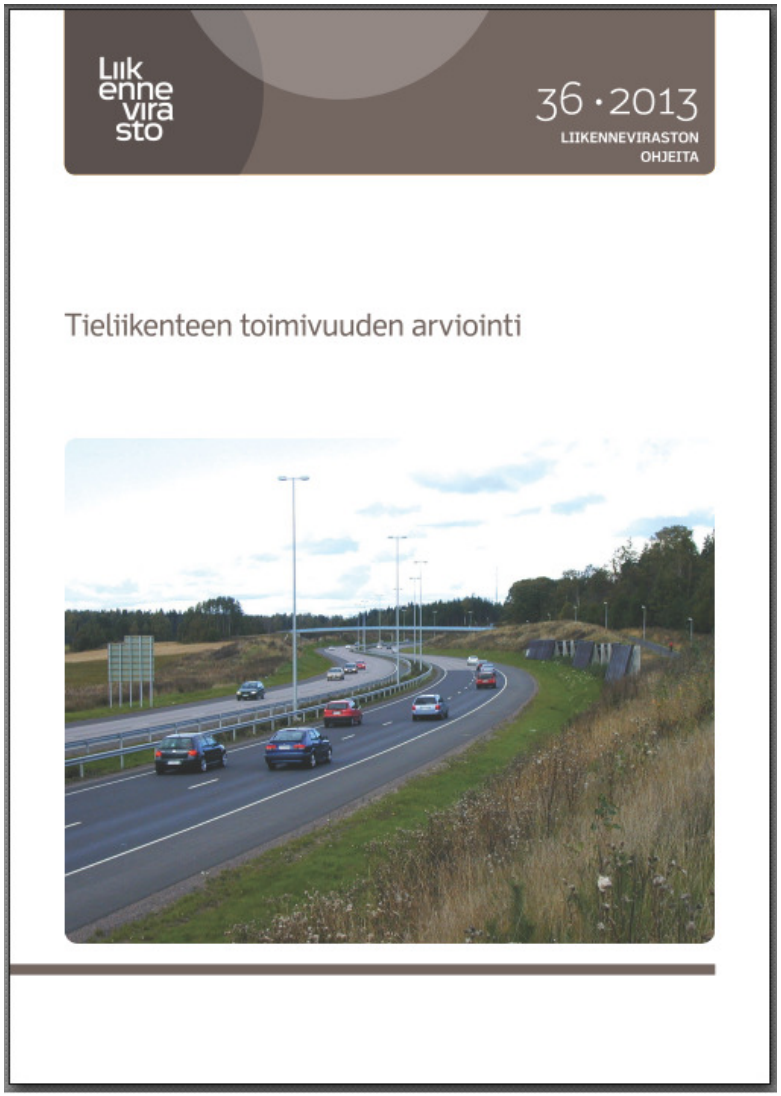
Design of interchanges on main roads

- does not cover design of freeway interchanges
- new guidelines

New Guidelines

Evaluation of functioning/fluency of road traffic

- Express guide published in 2013
- Standardizes road capacity reviews at intersections and between intersections
- Relates
  - acquiring of source information
  - definition of the considered area
  - selecting of calculation program or method
  - carrying out a survey and reporting of findings
  - standard ordering practices of commissions
  - data filing



Quick guide for capacity analysis & simulation

- Quick guide for consultants and road authorities to carry out capacity analysis in various traffic environments
  - Analytic methods (HCM 2010, CapCal, DanCap, LIVASU (trafiksignaler))
  - Simulation software (VISSIM, Paramics och Synchro/SimTraffic)
- Motivation: Diffrent analysis/simulation tools can give diffrent results from the same case ?!
  - The available methods must be evaluated
- The suitability of different tools for various cases
  - Signalized/non-signalized junctions, motorways, other road types
  - Are they suitable ? What are the problems or advantages of each tool ?
  - Are they calibrated properly ?
  - Is there data for calibtation or new field measurements needed
- Basic steps and requirements on how to carry out properly a capacity study
  - What are the basic questions of the study ?
  - Input data, site model, output data, reporting
  - Uncertainties, parameters, calibration
  - Requirement of the tender, archiving etc.

Evaluation of analysis & simulation tools

Study area		Paramics	Synchro	VISSIM	HCM/HCS	Capcal	DanKap	LIVASU	Ksuhde
Junctions	Signalized junctions	1	1	1	1	1	1	1	1
	Nonsignalized junctions	1	1	1	1	1	1	-1	-1
	Roundabouts (1 lane)	1	-1	1	0	-1	0	-1	-1
	Roundabout (many lanes)	1	-1	1	0	-1	0	-1	-1
Grade Separated junctions	Weaving sections	1	0	1	1	-1	-1	-1	-1
	Off ramps	1	0	1	1	-1	-1	-1	-1
	On ramps	1	0	1	1	-1	-1	-1	-1
Motorways		1	0	1	1	-1	-1	-1	-1
Roads 1+1, 2+1		1	-1	1	-1	-1	-1	-1	-1
Other road types		1	0	1	0	-1	-1	-1	-1
Work zones	Detour	1	1	1	-1	-1	-1	-1	-1
	Lane closed	1	1	1	0	0	0	0	0
	One lane per time closed	1	1	1	0	0	0	0	0
	Temporary junctions	1	1	1	0	0	0	0	0
Public transport		1	-1	1	-1	-1	-1	-1	-1
Pedestrians		0	0	1	-1	-1	-1	-1	-1
Cycling		0	-1	1	-1	-1	0	-1	-1

1	Suitable (commonly used)
0	Limited usability
-1	Not usable

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Research and field measurement plan for calibration of simulation models for Finnish environment

Plan for field studies:

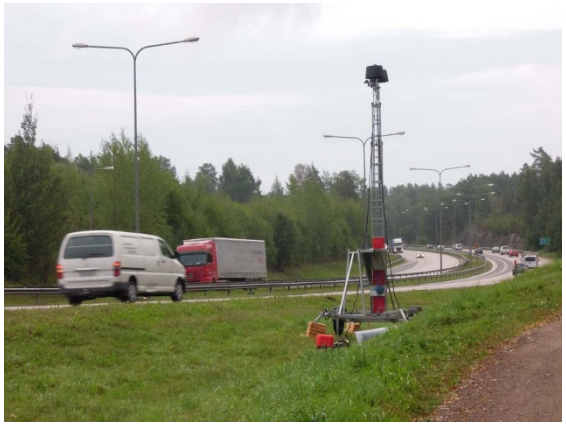
- *Motorvays and major arterials*:
- ramps and weaving sections
- 2013-2014
- measurements in 6-10 places

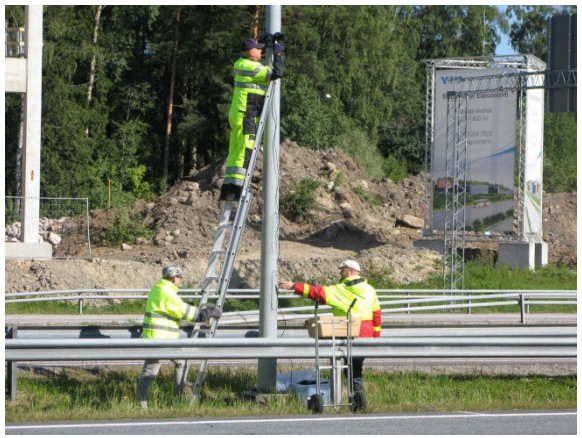
- *Roundabouts*
- 6 intersections
- Previous study (http://alk.tiehallinto.fi/julkaisut/pdf2/3201131-v_kiertoliittymien_valityskyky.pdf)
- Measurements 2014

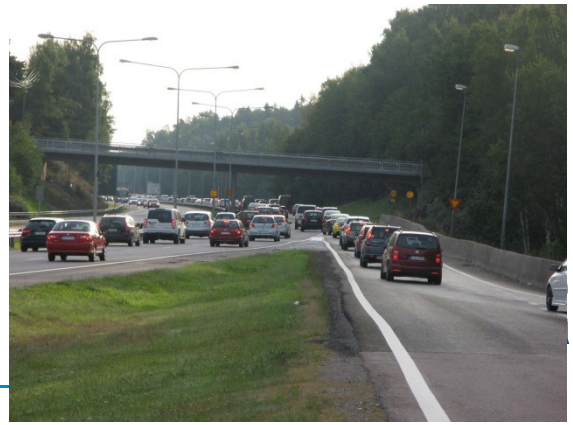
- Two-lane rural roads with low speeds (40-60 km/h)
- Junctions with/without traffic signals

Measurements at on-ramps on motorways, major arterials and weaving sections

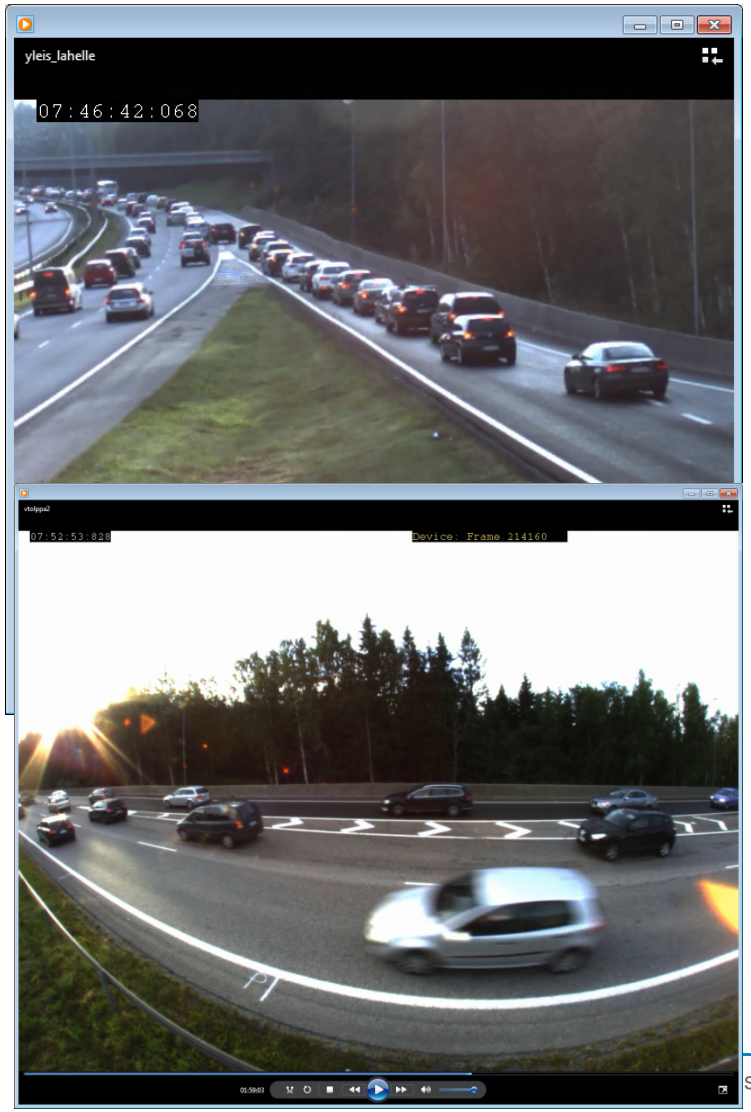
- Video recording during rush hours
- 3-4 cameras in light poles between the roadways (hight about 4 m), 2 cameras in a mast (hight 12 m), 1-2 cameras for overview of the ramp area performance

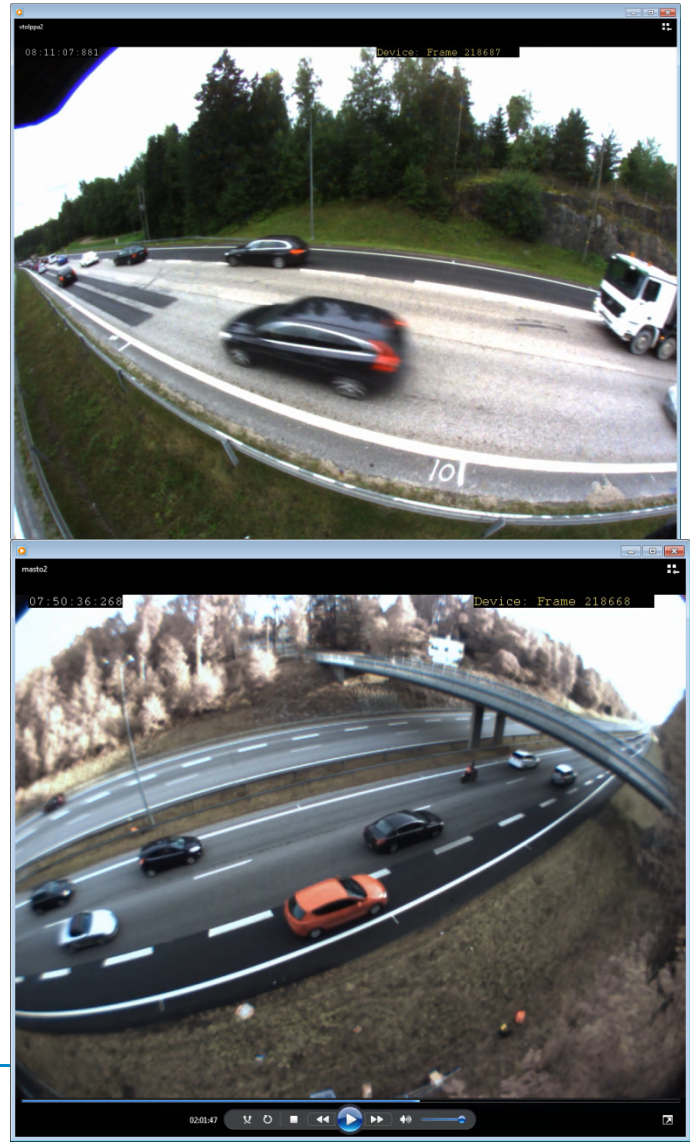






The data processing and evalutation is going on using Labview software





The field data give information about

- Traffic volumes, lane distribution, lane changing
- Speeds at different locations on the ramp and the motorway lanes
- Lane changing position of the entering vehicles
- Gaps and distances on the main road and the ramp

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- Where *Science* and
Art meet **Technology**
and *Business*

Thank You

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Publications

- **Traffic studies and traffic solutions at sites that generate large traffic flows**
- http://www2.liikennevirasto.fi/julkaisut/pdf3/lts_2012-03_suuria_liikennevirtoja_web.pdf

- **Effects during construction activities in project evaluation**
- http://www2.liikennevirasto.fi/julkaisut/pdf3/lts_2012-12_rakentamisen_aikaiset_web.pdf

- **Roads with a wide center marking in winter conditions**
- http://www2.liikennevirasto.fi/julkaisut/pdf3/lts_2012-29_levean_keskimerkinnan_web.pdf

- **Tecnical dimensioning criteria in road design**
- **http://www2.liikennevirasto.fi/julkaisut/pdf3/lts_2012-50_tiensuunnittelun_liikennetekniset_web.pdf**

- **Development Needs of Traffic Signals on Public Roads**
- http://www2.liikennevirasto.fi/julkaisut/pdf3/lts_2013-01_maanteiden_liikennevalojen_web.pdf

- **Current State of Traffic Capacity Analysis in Finland**
- http://www2.liikennevirasto.fi/julkaisut/pdf3/lts_2012-37_liikenteen_valityskyky_web.pdf

- **Evaluation of the road traffic performance**
- http://www2.liikennevirasto.fi/julkaisut/pdf3/lo_2013-36_tieliikenteen_toimivuuden_web.pdf