



Finnish Transport Agency

ROUNDABOUTS IN FINLAND
Stockholm 1st July 2011

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Roundabouts in Finland

↑ **Design guidelines**

↑ **Safety, accident study in 2008**

↑ **Capacity, field measurements 2009**

↑ **Experiences**

Number of roundabouts in Finland

↑ The first roundabouts were built in the 1950s

- Low capacity and safety level

↑ The first modern roundabout was built in 1990

↑ over 600 roundabout in operation in 2010

↑ 50 2-lane roundabout

↑ 3 turbo-roundabout (the first one 2007)

↑ 95% in built-up area

Roundabouts _ design principles 1

↑ Design guidelines for

- **1- and 2 –lane roundabouts in 2000**
- **Turbo- roundabouts in 2009**
- **3-4 lane roundabouts with very high traffic volumes :**
 - **no guidelines, some roundabouts in design stage**

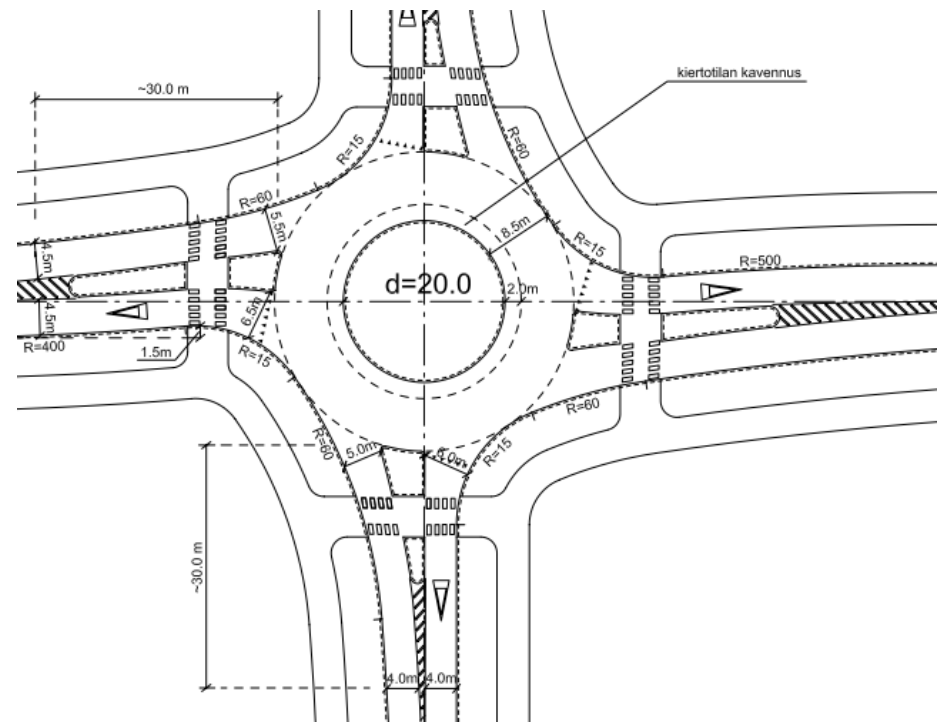
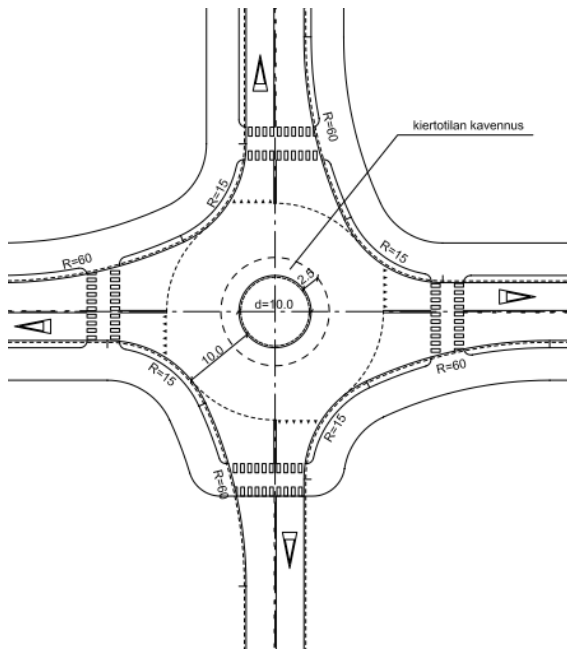
Roundabouts _ design principles 2

Roundabout size

Type	Diameter of central island d (m)	
mini	-4	
small	4 - 12	
normal	12 - 40	
large	40 -	
2-lane roundabout	d min	16 m
	dmax	60 m

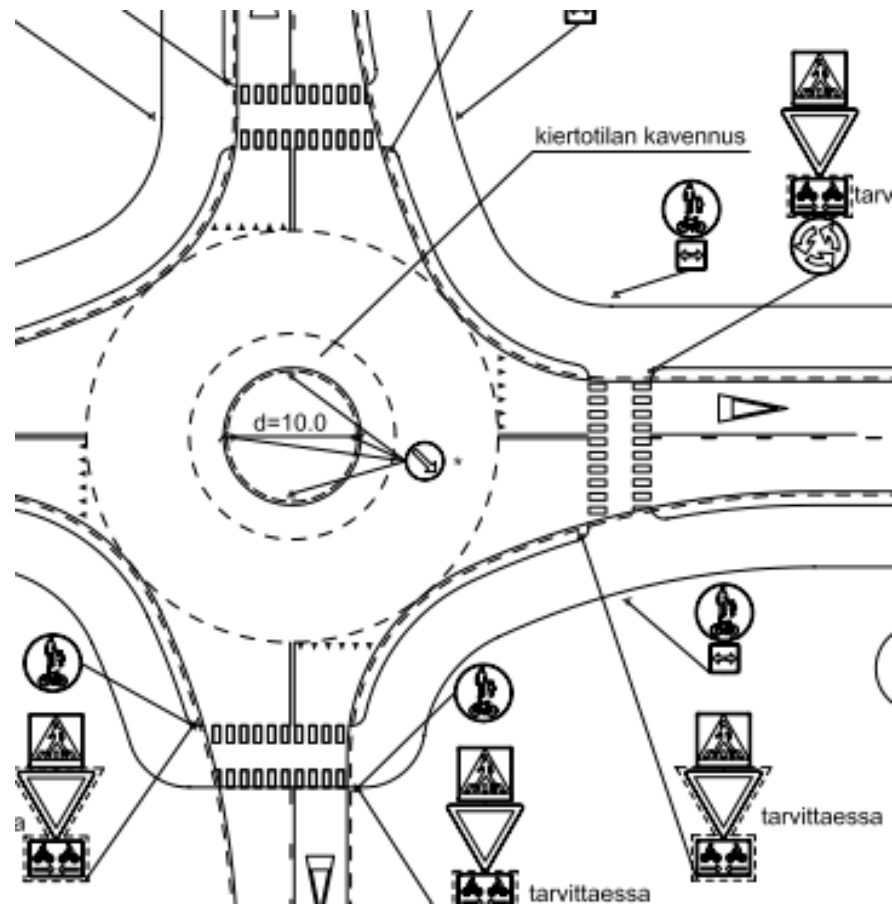
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One-lane roundabout, typical designs



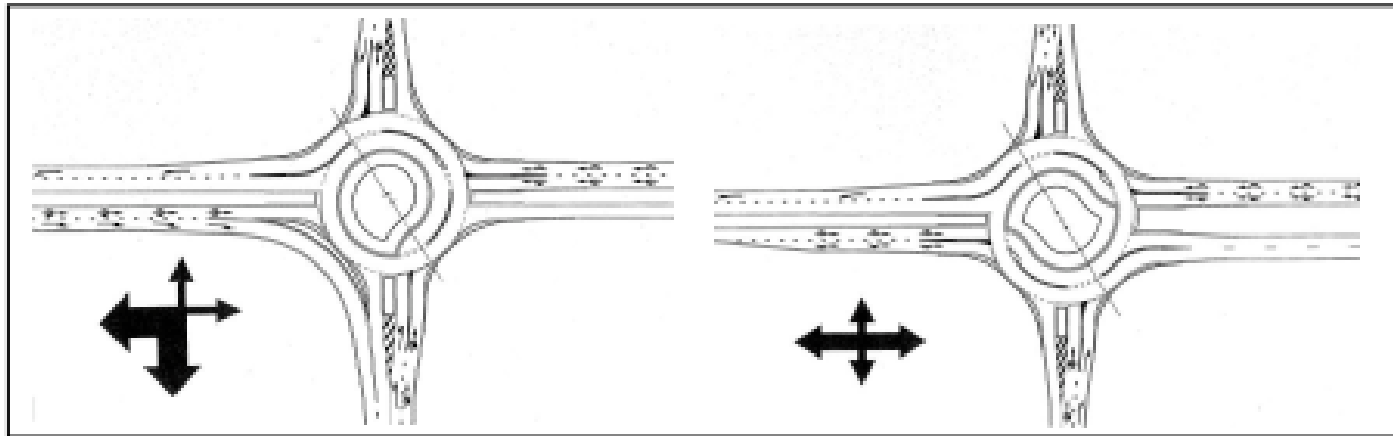
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Pedestrian /bicycle crossing



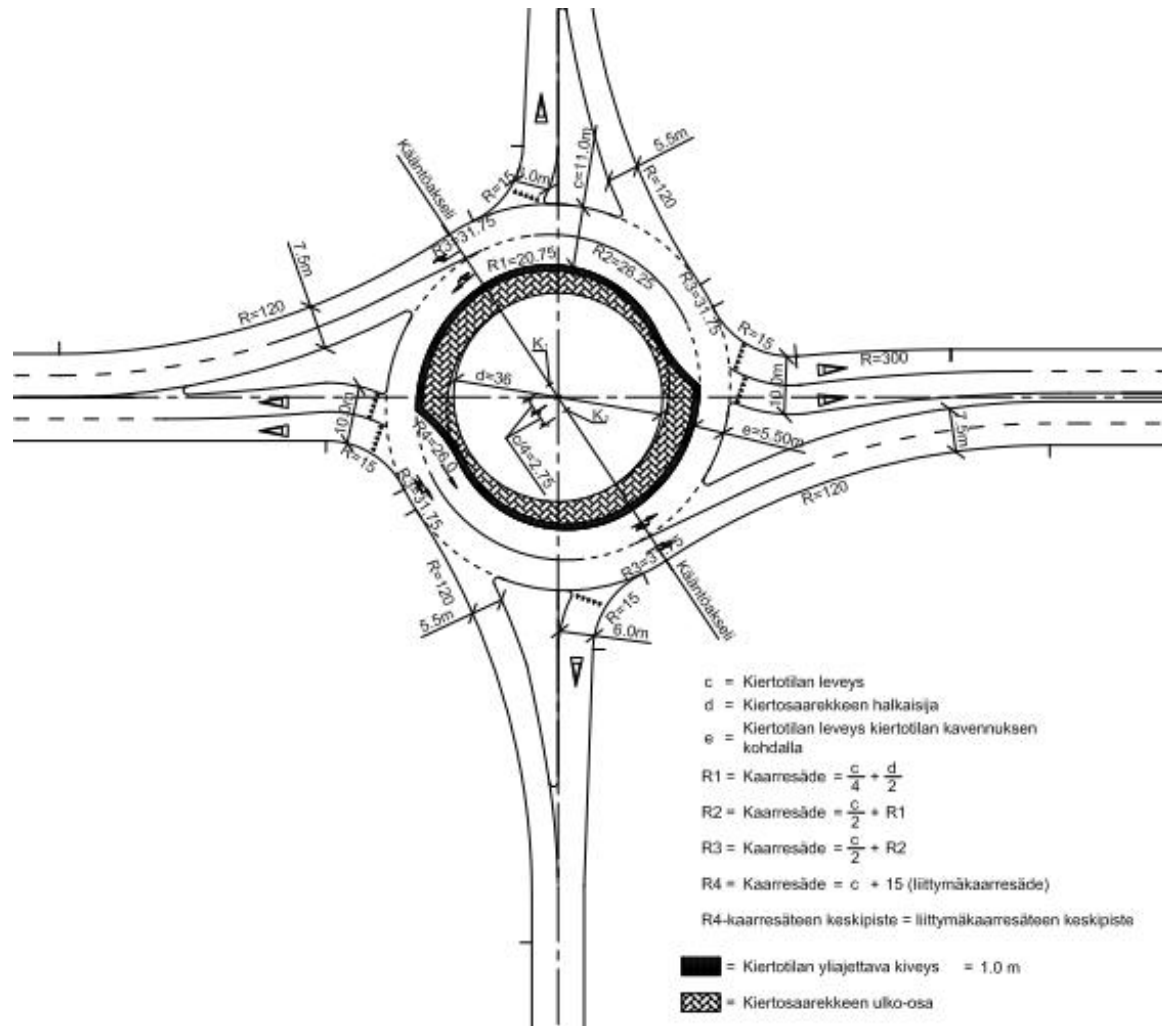
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Turbo-roundabouts, basic design types



Roundabouts _ design principles 7

Turbo - roundabout



Roundabouts _ examples



Roundabouts _ examples



Roundabouts _ examples



Roundabouts _ examples



Roundabouts _ examples



Roundabouts _ safety

Accident study 2009 (300 roundabouts)

Type of roundabout	Accident rate	
	All accidents	Injury accidents
1-lane roundabouts	0.23	0.04
2-lane roundabouts	0.52	0.05
All	0.26	0.04

Accident rate = number of accidents per million incoming vehicles

Roundabouts _ safety

Accident study 2009

Type of roundabout	Accident rate	
	All accidents	Injury accidents
3 –leg, 1-lane	0.15	0.03
4 –leg, 1 -lane	0.24	0.04
4 – leg , 2-lane	0.59	0.05

Accident rate = number of accidents per million incoming vehicles

Roundabouts _ safety

Accident study 2009

Diameter of central island (m)	Accident rate	
	All accidents	Injury accidents
-13	0.25	0.03
13 - 20	0.22	0.05
21 - 25	0.25	0.03
26 - 30	0.27	0.03
30 -	0.32	0.04

Roundabouts _ safety

Traffic volume (veh /d)	Accident rate	
	All accident	Injury accidents
- 3000	0.26	0.04
3000 - 6000	0.26	0.03
6000 - 9000	0.25	0.04
9000 – 12 000	0.23	0.04
12 000 -	0.25	0.04

Roundabouts _ safety

Accident type	Percentage of injury accident (%)
Bicycle , moped	47
Crash against central island	12
Pedestrian	9
Rolling over	9
Other types	23
	100

Roundabouts_ accident study

The drivers do not yield bicycles!



Roundabouts _ safety

Percentage of alcohol accidents in roundabouts (%)		
Drunken driver	All accidents	Injury accidents
Yes	15.4	14.3
No	84.6	85.7
	100	100
Percentage of alcohol accident in ordinary intersections	8.5	6.0

Roundabouts _ safety

↑ **Changing ordinary intersection into roundabouts**

↑ **Safety effect**

↑ **Number of all accidents - 50 % decrease**

↑ **Number of injury accidents - 60% decrease**

↑ **(serious accidents -70%)**

↑ **Bicycle accidents!**

↑ **Drunken driver accidents!**

Roundabouts _ capacity

↑ Capacity calculations

↑ Capacity guidelines in the 1980s, based on HCM (not updated)

- **Analytical methods /capacity diagrams**
- **Capcal**
- **Dankap**
- **HCM**
- **Micro simulation methods**

Roundabouts _ capacity

↑ Capacity study 2009

↑ 5 roundabouts (3 one lane roundabouts)

↑ Field measurements, video recording

↑ Capacity was exceeded in all one lane roundabouts

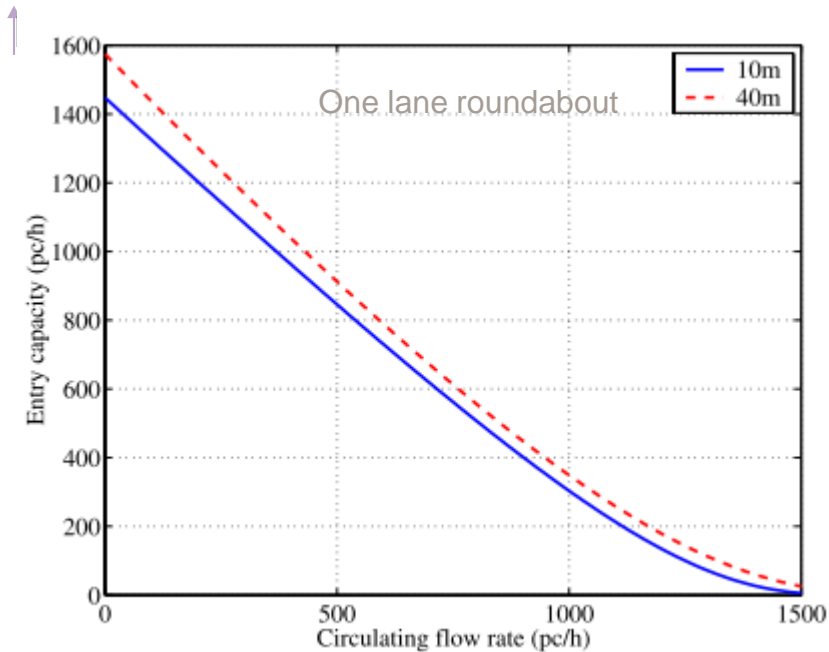
↑ Comparison between measured and calculated capacity

- Finnish method
- German method (HBS 2005)

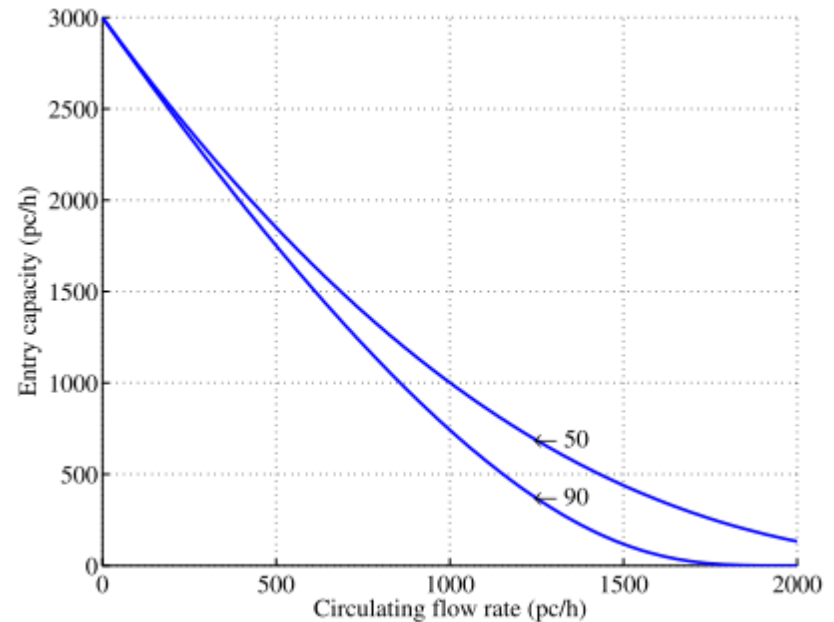
Roundabouts _ capacity

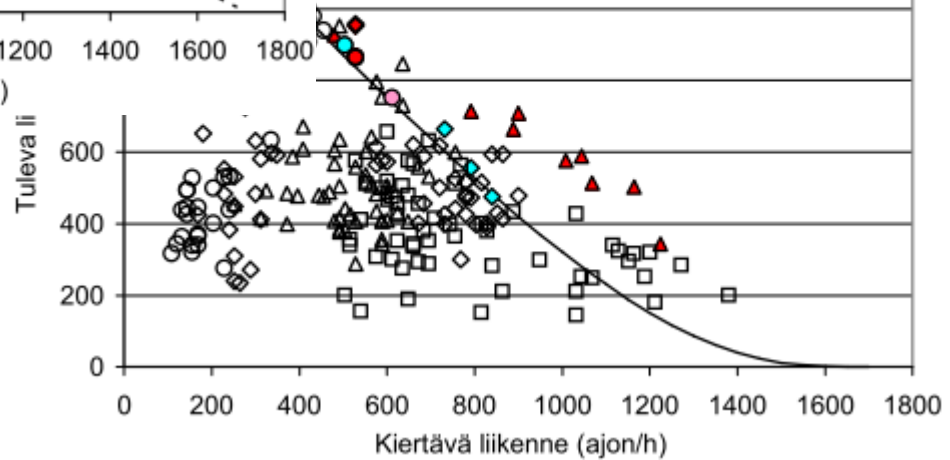
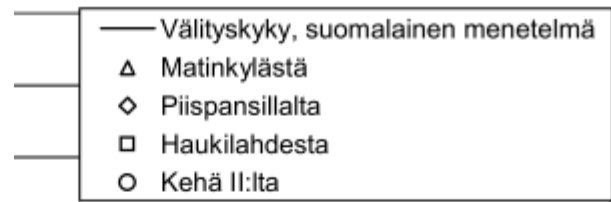
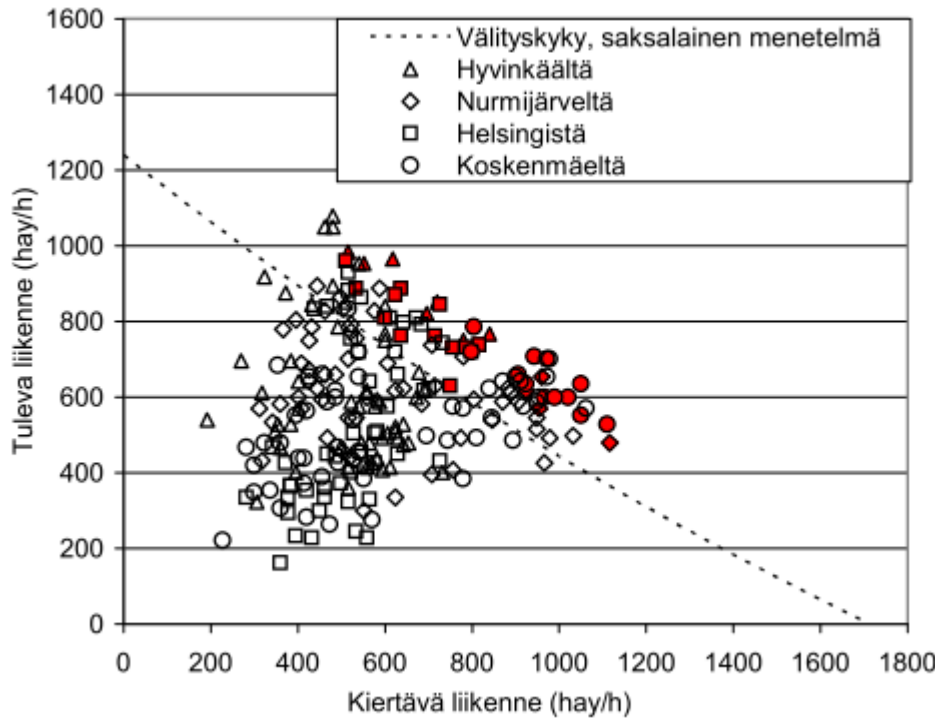
Capacity study 2009

One-lane roundabout



Two lane roundabouts Two lane entry





Roundabouts _ capacity

Capacity study 2009

Results

- **Measured entry capacity was always higher than calculated**
- **Differences 0...320 pcu /h Finnish method**
10...250 pch/h German method

Differences was biggest at high circulating volumes

1-lane roundabout, 1-lane entry : capacity at least 1500 veh/h

1-lane roundabout, 2 –lane entry : capacity 1750 ... 2000 veh/d

Roundabouts _ capacity

↑ **Signalized intersections near roundabout lower capacity (long queues)**



Roundabouts in Finland

Thank you!