

***Traffic Incident detection***  
—  
***Workshop***

*Tunnels and ITS*

*Bergen, 18.9.2013*

*Håkon Wold, ViaNova Plan og Trafikk*

# Background

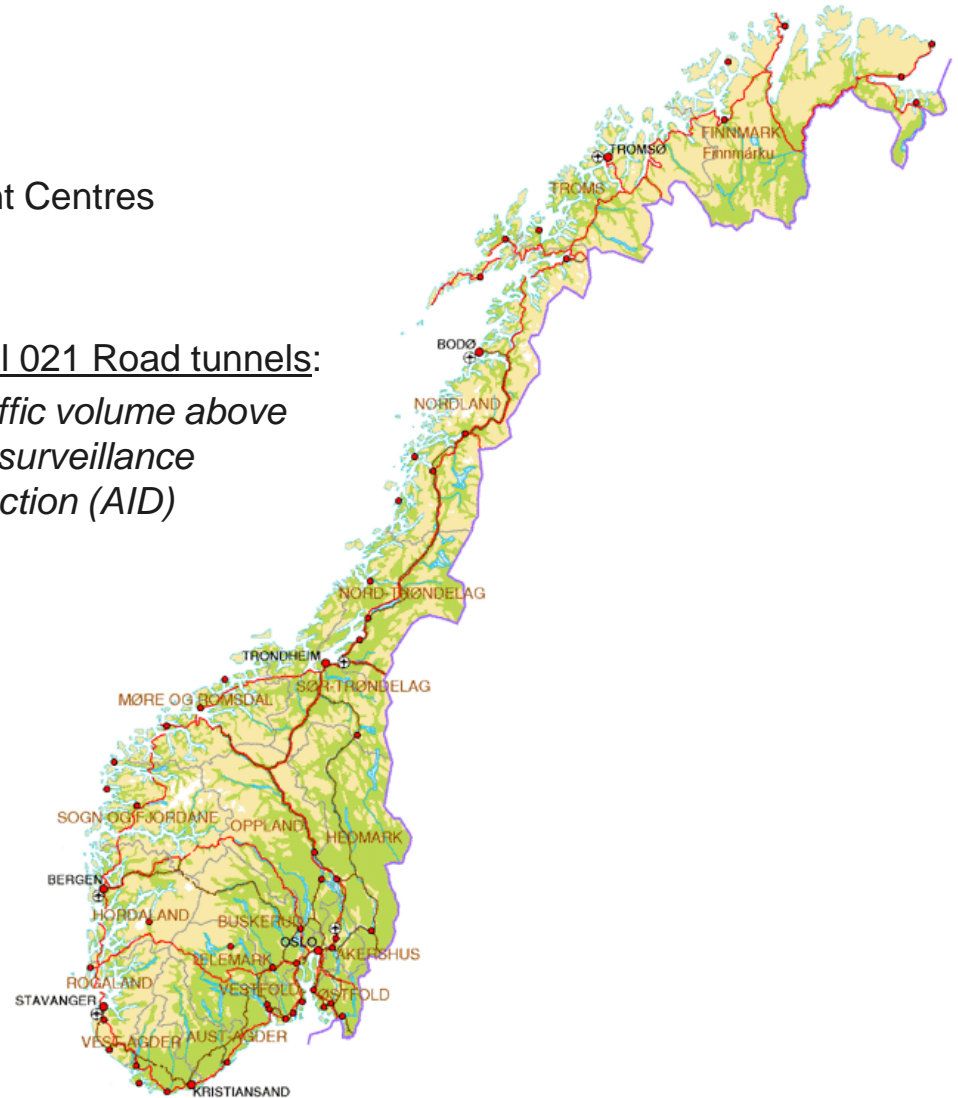
Approx 1000 road tunnels in Norway

40-50 (?) tunnels equipped with ITV and AID

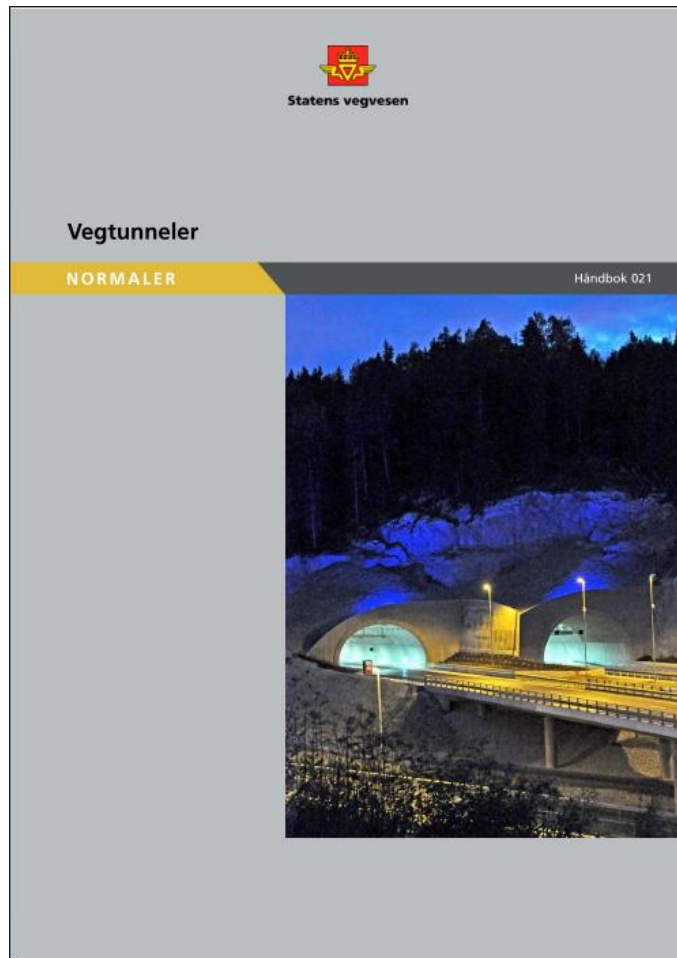
Monitored from five regional Traffic Management Centres

Norwegian Public Roads Administration, Manual 021 Road tunnels:

- *Tunnels exceeding 3 km in length and a traffic volume above 8000 veh/day shall be equipped with video surveillance cameras (ITV) and Automatic Incident Detection (AID)*



# Manual 021 Road tunnels



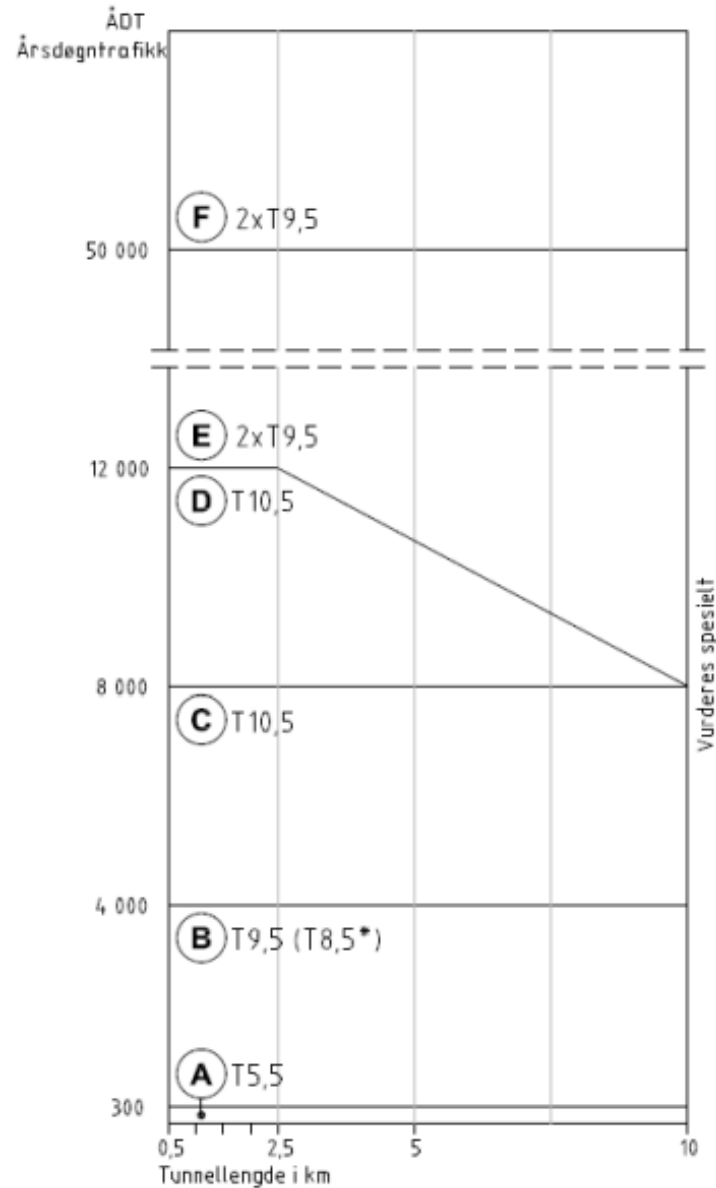
NO (2010)

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ENG (2004)

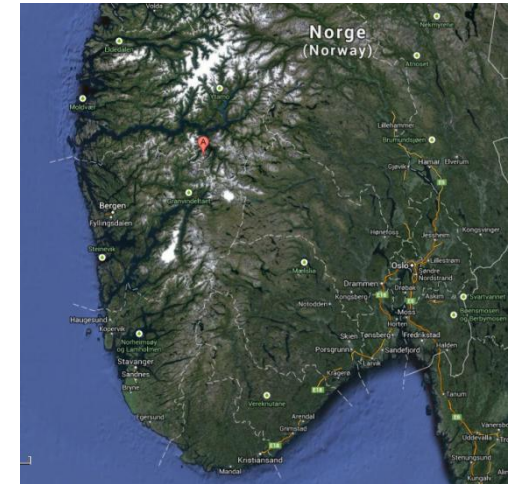
# Tunnel category

- $f$  (AADT+tunnel length)
- Geometric design
- Safety equipment



# Case: The Gudvangen tunnel

- E16 Gudvangatunnelen, Sogn og Fjordane county, western Norway
- Opened 1991
- 11,4 km – Norway's second longest road tunnel
- One tube, two way traffic
- Challenging topography (curves and size of gradient)
- Narrow lanes (3,0 m + 3.0 m), no hard shoulder
- 2000 veh/day, 25 % HGV's
- No emergency exits
- Relatively poor light conditions in the tunnel
- Emergency telephones, fire extinguishers
- Ventilation fans
- Measurement of gas levels
- Activation of barriers and signs to close the tunnel



# The Gudvanga tunnel

- Swiss company HOJ Consulting GmbH/Matrisk GmbH concluded in a report from April 2013:
  - «*Without upgrading there will be an unacceptably high risk [of incidents/accidents] in the Gudvanga tunnel. This conclusion is valid for today's traffic volumes. With the expected annual traffic growth the risk will be even higher during the next 20 years*»
- Aim of the report: *review what measures to be taken to comply with EU directives from 2019*
- Recommended immediate measures to be taken: 60 km/h speed limit
- Recommended in a longer perspective: construct a new tunnel
- There is a need for regular (monthly) upgrades to reach an acceptable safety level
- Recommended upgrade of:
  - **Communication infrastructure**
  - **Ventilation**
  - **Light**
  - **Signs/traffic management**
- And:
  - **Implement video monitoring**
  - **Upgrade of the power supply**
  - **New technical rooms**
- INOK 300-500 mill (€ 40-60 mill) to get an acceptable safety standard

# *The Gudvangen tunnel fire*

## Situation:

- On August 5th 2013 at 12:10 a fire started in a truck 2-3 km into the tunnel
- A large rescue operation started, involving several organisations
- 70 people sent to hospital, incl 24 chinese in a tourist bus
- Short circuit due to an earth fault causing 3 km of tunnel without lighting
- Reduced ventilation due to opening of emergency phone cabinets
- Open for regular traffic from September 5th 2013
- Cost: NOK 40-50 mill (€ 5-6,5 mill)



# *The Gudvanga tunnel fire*

Experience:

- The safety systems worked as intended during the fire
- Incl.:
  - **Emergency telephones**
  - **Ventilation system and operation of ventilation fans**
  - **The GSM system**
  - **Fire extinguishers**
- The fire damaged the power supply cable in the roof of the tunnel
- The lights went out on one side of the accident site (3 km to the tunnel portal)
- There were still lights in the tunnel on the opposite side of the accident

# *The Gudvanga tunnel*

## Short term measures

- What is done:
  - **Recovering existing technical systems**
  - **Reduced speed 70 km/h**
  - **Tunnel wall and roof painted white**
- Other possible short term measures:
  - **No overtaking for heavy vehicles**
  - **Distance based automatic speed control**
  - **Improved lighting in portal zones**



# *The Gudvanga tunnel*

## Long term measures:

- Water mist or sprinkler
- Detectors / sensors (fire etc)
- Video monitoring
- Automatic incident detection
- Other ITS measures
  
- New tunnel

