Welcome in Germany

PIARC TC 2.4
2.-4.10.2013
Garmisch-Partenkirchen
356.700 km² base area
82 Mio. Inhabitants

12.800 km Motorways („Autobahn“)

218.700 km Rural Roads

413.000 km Urban Roads

High traffic density
Much transit traffic

Garmisch-Partenkirchen
ca. 800 m above sea
Winter Maintenance Standards

- **Level of Service**
  - Motorways: 24 hours daily
    - Spreading Service time: 2 hours
    - Snow Removal: 3 hours
  - Rural Roads: 6 – 22 h
    - Service time: 3 hours
  - Urban Roads: 6 – 22 h

- **Spreading Agents**
  - Motorways and Rural Roads: generally Salt (Pre-Wetted Salt)
  - Urban Road: „Differentiated Winter Maintenance“
    - Main Roads and dangerous Points: Salt Spreading
    - other Roads: no spreading, only removal
    - pedestrian paths: abrasive matters

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Climate (30 year medium)
December 2010

Average 1961-1990 deviation from these average in 2010

Normalwerte (Zeitraum 1961 - 1990)

Abweichung zum Normalwert 1961 - 1990

°C

> 2,0
0,1 - 2,0
-1,9 - 0,0
-3,9 - -2,0
<= -4,0

K

> -2,0
-2,9 - -2,0
-3,9 - -3,0
-4,9 - -4,0
-6,9 - -5,0
<= -6,0
Snow drifts on German Motorway 2010
City in Northern Germany December 2010
Total Salt Consumption

Salzverbrauch in der Bundesrepublik Deutschland

Winterperiode

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Medium snow height per day
Forecast for the next ten years,
Compared to actual situation
White = +1 cm
Grey = +3 cm
Black = +5 cm or more
Monitoring of salt storage filling amounts per webcam and automatic picture calculation
Salt filling amount monitoring for a whole region
Closing of one lane in cases of strong snow fall and salt shortness
Preventive Spreading
Comparison 10 g/m² Pre-Wetted Salt / 15 ml/m² Brine

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Combi-spreader
Pre-wetted salt with spinner disc and liquid spreading with pipes
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Additional liquid storage capacity
With a bag inside of the salt hopper
Liquid spreading on bicycle paths
<table>
<thead>
<tr>
<th>Expected Surface Condition</th>
<th>Recommended Winter Maintenance Action</th>
<th>Recommended Spreading Density ***</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hoarfrost</td>
<td>Preventive Spreading**</td>
<td>10 – 15 ml/m² 5 – 15 g/m²</td>
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<td></td>
<td>- preferential Liquid Spreading*</td>
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<tr>
<td></td>
<td>- otherwise Pre-Wetted Salt</td>
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</tr>
<tr>
<td>Light Black Ice (freezing moisture)</td>
<td>Preventive Spreading**</td>
<td>10 – 25 ml/m² 5 – 30 g/m²</td>
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<td></td>
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<tr>
<td>Black Ice (freezing wetness)</td>
<td>Preventive Spreading**</td>
<td>15 – 40 g/m² (20 – 50 ml/m²)</td>
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<td></td>
<td>- Pre-Wetted Salt or Liquid Spreading*</td>
<td></td>
</tr>
<tr>
<td>Freezing Rain (black ice)</td>
<td>If possible Preventive Spreading**</td>
<td>40 – 60 ml/m² 30 – 40 g/m²</td>
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<td></td>
<td>- preferential Liquid Spreading*</td>
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<td>- otherwise Pre-Wetted Salt</td>
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<tr>
<td>Snow Fall (packed snow)</td>
<td>1. Where possible Preventive Spreading with Liquid Spreading* or Pre-Wetted Salt</td>
<td>15 – 30 ml/m² (10 – 20 g/m²)</td>
</tr>
<tr>
<td></td>
<td>2. During Snow Fall Snow Removal and Spreading of Pre-Wetted Salt with low spreading density</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. After Snow Fall aggressive Removal of Snow and Spreading with Pre-Wetted Salt</td>
<td>10 – 15 g/m²</td>
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<td></td>
<td>* Liquid Spreading only at temperatures above -6°C, at lower temperatures only Pre-Wetted Salt</td>
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</tr>
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<td></td>
<td>** if preventive salting was not possible, existing slipperiness must be eliminated with Pre-Wetted Salt</td>
<td>20 – 40 g/m²</td>
</tr>
<tr>
<td></td>
<td>*** low values for temperatures tight below 0°C, higher values for lower temperatures</td>
<td></td>
</tr>
</tbody>
</table>
Detailled Weather Forecasts for each road section

- From 3.5 °C to 15 °C
- From 1.5 °C to 3.5 °C
- From 0.5 °C to 1.5 °C
- From -0.5 °C to 0.5 °C
- From -1.0 °C to -0.5 °C
- From -1.5 °C to -1.0 °C
- From -2.0 °C to -1.5 °C
- From -10 °C to -2.0 °C

Temperaturunterschiede
von +3.5°C bis -10°C

Dr.-Ing. Hanke - Winterdienst in Deutschland
Pictures one week after meeting:
Garmisch-Partenkirchen 11.10.2013
Heavy snow falls
Traffic and energy problems
Strong winter maintenance

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