

CZECH REPUBLIC



**ROADWAY
MAINTENANCE AND
REPAIR TECHNOLOGIES**

Czech Republic in Europe



Motorway and expressway network - 1989

-  Dálnice a rychlostní silnice v provozu
-  Silnice I. třídy




Dálniční síť

stav k 31.12.1989



Motorway and expressway network - 2010

-  Dálnice a rychlostní silnice v provozu
-  Dálnice a rychlostní silnice - výtled
-  Silnice I. třídy



Dálniční síť

Stav k 31.12.2009



Motorway and expressway network -

2014



Dálniční síť

stav k 1. 1. 2014



Current situation of the motorways and expressways in Czech Rep.

◎ period 1990 – 2010:

- ❖ Funding of the new the motorway and expressway network sections – new constructions

◎ period 2010 - 2014:

- ❖ New constructions stopped
- ❖ Almost all funding goes to maintenance and repairs of the existing motorways
- ❖ Main topic: I) REPAIRS
II) MAINTENANCE

ISPROFOND – RECONSTRUCTION OF MOTORWAY (LONGER THHAN 2 KM)

2009		14,6 km
D1 Rekonstrukce CB vozovky km 134,29 - 136,8 L	2,5	
D1 Oprava AB voz. km 61,951 - 59,038 L	2,9	
D1 Oprava AB voz. km 59,105 - 62,043 P	2,9	
D1 Oprava AB voz. km 89,806 - 91,044 L	1,2	
D5 Oprava AB voz. km 57,5 - 60,5 L	3,0	
D2 Oprava AB vozovky km 48,25 - 50,25 L	2,0	
2010		4,3 km
D8-806 rekonstrukce	4,3	
2011		9,0 km
D5 Oprava AB vozovky v km 22,42 - 18,00 L	4,4	
D5 Oprava AB vozovky km 31,630 - 34,055 P	2,4	
D11 Přetah CB vozovky v km 19,811 - 22,004 P	2,2	
2012		20,2 km
D11 Přetah CB voz. km 18,0 - 13,7 L	4,3	
D1 Rekonstrukce CB vozovky D1 km 211,0-214,6 P	3,6	
D5 Oprava AB voz. D5 km 34,000 - 31,300 L	2,7	
D5 Oprava AB vozovky v km 14,5 - 11,0 L	3,5	
D2 Oprava AB vozovky D2 km 53,3-56,2 P	2,9	
D1 Oprava AB vozovky km 87,1 - 90,3 P	3,2	
2013		54,7 km
D5 Oprava AB vozovky km 40,7 - 34,0 L	6,7	
D5 Oprava AB vozovky km 61,15 - 66,6 P	5,5	
D8 Oprava AB vozovky km 17,7 - 11,2 L	6,5	
D11 Přetah CB vozovky km 13,7 - 7,8 L	5,9	
D11 Přetah CB vozovky km 23,250 - 25,550 P	2,3	
D1 Oprava AB vozovky km 193,8 - 199,3 L	5,5	
D1 Rekonstrukce CB vozovky km 214,6 - 220,2 P	5,6	
D1 Rekonstrukce CB vozovky km 220,2 - 225,85 L	5,7	
D2 Přetah CB vozovky km 48,7 - 42,6 L	6,1	
D2 Oprava AB vozovky km 55,3 - 50,3 L	5,0	



D1 Oprava AB vozovky km 193,8 - 199,3 L

I) Roadway repair technologies

- ◎ A) Road surface - Asphalt roadways – asphalt layers
 - 1) - Emulsion microcarpet
 - 2) - Surface layers recycling - remix plus
 - 3) - Asphalt layers replacement (surface, intermediate, base)
 - 4) - Aggregate base layer recycling (cold way) – cement, asphalt emulsion, or both (+ upper layers replacement)



I-A-1) ASPHALT ROADWAY– EMULSION MICROCARPET

- ◎ VARIATIONS:

- two microlayers 16 mm (mixture 0/8 – 0/8)
- one layer 8 mm (mixture 0/8)

- ◎ REQUIREMENTS:

- focus on implementing the technology during the right weather conditions (essential for durability)
- before laying of the microcarpet must all the ruptures and local damages be fixed (using modified asphalt filler)

LIFE SPAN OF THE TECHNOLOGY:

- approx. 3-5 years

- ◎ COST OF THE TECHNOLOGY (Kč/m²):

- approx. 150 - 250 (6-9 EUR/m²)

I-A-2) ASPHALT ROADWAY– SURFACE LAYERS RECYCLING

- ◎ VARIATIONS:

- REMIX (surface layer recycling + binding material + gravel aggregate) – thickness 35-50 mm

- REMIX PLUS (surface layer removal, intermediate layer recycling and immediately afterwards is the new surface layer added) thickness 55 mm intermediate + 35 mm new surface layer)

- ◎ REQUIREMENTS:

- surface layer must be cleared of other materials (from previous local repairs, etc.

- ◎ LIFE SPAN:

- approx. 4-7 years

- ◎ COST (Kč/m²):

- approx. 1500 (50 EUR/m²)

I-A-3) ASPHALT ROADWAY– ASPHALT LAYERS REPLACEMENT

- VARIATIONS:
 - surface layer replacement
 - cover layers replacement – surface+intermediate
 - all layers replacement surface+intermediate+base
- REQUIREMENTS:
 - thorough diagnostics to decide necessary depth of the repairs
- LIFE SPAN:
 - approx. 10-18 years
- COST (Kč/m²):
 - surface = 310 - 400 (12-15 EUR/m²)
 - cover = 750 - 1000 (25-35 EUR/m²)
 - all = 1400 - 1800 (50-65 EUR/m²)

I-A-4) ASPHALT ROADWAY– AGGREGATE BASE RECYCLING (cold way)

- VARIATIONS:
 - cement (+ asphalt layers replacement)
 - asphalt emulsion (+ asphalt layers replacement)
 - cement and asphalt emulsion (+ asphalt layers replacement)
- REQUIREMENTS:
 - thorough diagnostics to decide necessary depth of the repairs
- LIFE SPAN:
 - approx. 15-20 years
- COST:
 - depends on the diagnostics

I) Roadway repair technologies

◎ B) Road surface - Concrete roadways

- 1) - two layer emulsion microcarpet (with gaps)
- 2) - asphalt covering (strengthening the roadway with asphalt layers)
- 3) - replacement of the unanchored concrete roadway for the new concrete roadway
- 4) - replacement of the unanchored concrete roadway with the asphalt layers
- 5) - replacement of the unanchored concrete roadway and aggregate layers (partially recycled) for the new concrete roadway – modernization of the D1 motorway



I-B-1) CONCRETE ROADWAY – TWO LAYER EMULSION MICROCARPET

- ◎ TECHNOLOGY:
 - two microlayers 16 mm (mixture 0/8 – 0/8)
- ◎ REQUIREMENTS:
 - focus on implementing the technology during the right weather conditions (essential for durability)
 - before laying of the microcarpet must all the ruptures and local damages be fixed (using modified asphalt filler)

LIFE SPAN OF THE TECHNOLOGY:

- approx. 4-7 years
- ◎ COST OF THE TECHNOLOGY (Kč/m²):
 - approx. 150 - 250 (6-9 EUR/m²)



I-B-2) CONCTRETE ROADWAY – asphalt covering (strengthening the roadway with asphalt layers)

- ◎ TECHNOLOGY:
 - segmentation of the existing concrete roadway
 - laying the asphalt layer SAL (stess absorbin layer) 30 mm
 - laying the intermediate asphalt layer 60-100 mm
 - laying the surface asphalt layer 40 mm
- ◎ REQUIREMENTS:
 - right weather conditions are essential, especially for the SAL asphalt layer
- ◎ LIFE SPAN:
 - approx. 12 years
- ◎ COST (Kč/m²)
 - approx. 2000 (75 EUR/m²)

I-B-3) CONCRETE ROADWAY – replacement of the unanchored concrete roadway for the new concrete roadway

◎ TECHNOLOGY:

- after old concrete pavement is removed, base layer is reprofiled (shaped)

- laying the new concrete roadway 270mm (two layers 220+50mm), with pikes and clamps on longitudinal gaps

- upper cement surface is brushed to get the rough structure

REQUIREMENTS:

- quality requirements for following the proper procedure and proper brushing the surface of the concrete pavement

◎ LIFE SPAN:

- cca 25 - 30 years

◎ COST (Kč/m²):

- cca 2500,- Kč/m² (90 EUR/m²)

I-B-4) CONCRETE ROADWAY – replacement of the unanchored concrete roadway with the asphalt layers

○ TECHNOLOGY:

- after old concrete pavement is removed, base layer is reprofiled (shaped)
 - laying the base asphalt layer 120-140 mm
 - laying the intermediate modified asphalt layer 80 mm
 - laying the surface asphalt layer 40 mm
 - layers are connected with mastic spray

○ REQUIREMENTS:

- carrying capacity check for the base layers and shaping
- right weather conditions during the asphalt layers laying
- suitable for the inter city sections and heavy traffic parts of the network (over 80000/24h) traffic is present at the site – only the half of the roadway is replaced, with longitudinal joint)

○ LIFE SPAN:

- cca 20 – 25 years

○ COST (Kč/m²):

- cca 2000 – 2500 (80-90 EUR/m²)

I-B-5) CONCRETE ROADWAY – replacement of the unanchored concrete roadway and aggregate layers (partially recycled) for the new concrete roadway – modernization of the D1 motorway

◎ TECHNOLOGY:

- after old concrete pavement is removed, base layer is reprofiled (shaped)
- laying the new concrete roadway 270mm (two layers 220+50mm), with pikes and clamps on longitudinal gaps
- upper cement surface is brushed to get the rough structure

◎ REQUIREMENTS:

- carrying capacity check for the base layers and shaping (recycled lower part and also new 120 mm upper part of the base layer)
- quality requirements for following the proper procedure and proper brushing the surface of the concrete pavement

◎ LIFE SPAN:

- cca 25 - 30 years

◎ COST (Kč/m²):

- 7000 (250 EUR)

- D1 motorway modernization consists the widening of the roadside, the complete draining renewal, safety fences, optic and metallic cable lines, etc

MODERNIZATION D1



II) MAINTENANCE TECHNOLOGIES

○ A) RIGID PAVEMENT - CONTINUOUS MAINTENANCE

- RENEWAL OF THE SKID RESISTANCE – unsuitable friction characteristics:
 - PEEL JET (using high pressure water beam up to 2500 bar)
 - PELLET JET (using pellets)

- CONCRETE PANEL DEPRESSION (STAIRS ON GAPS):
 - TSM (TECHNOLOGY OF SHEER MILLING)
 - MILLING USING DIAMOND DISC

- SURFACE GROOVING (for the parts with unsuitable drainage – to prevent the aquaplaning)

- SEALING THE LONGITUDINAL AND LATERAL GAPS, RENEWAL OF THE ASPHALT JOINTS OF THE CONCRETE PANELS ON THE ROADWAY

- APPEARANCE ASR (alkaline-silicious reaction): TECHNOLOGY FOR DRAWING OUT THE CONCRETE PAVEMENT DECAY
 - laying the emulsion microcarpet
 - local repairs on the edges of concrete panels (on the lateral gaps)
 - separate concrete panel replacement

PEEL-JET, MILLING TECHNOLOGY AND TSM



Thank you for your attention

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