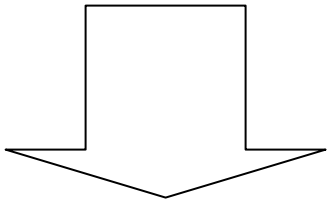
TRA Transport Research Arena Europe 2008
Ljubljana, Slovenia
21 - 24 April 2008

ARCHES

a gaze on Central European highway structures

Tomasz Wierzbicki
IBDiM

The main goal of NMS's administration is constructing a new roads - mainly motorways



Insufficient resources for the conservation of existing infrastructure

Pan-European corridors

May 1st 2004

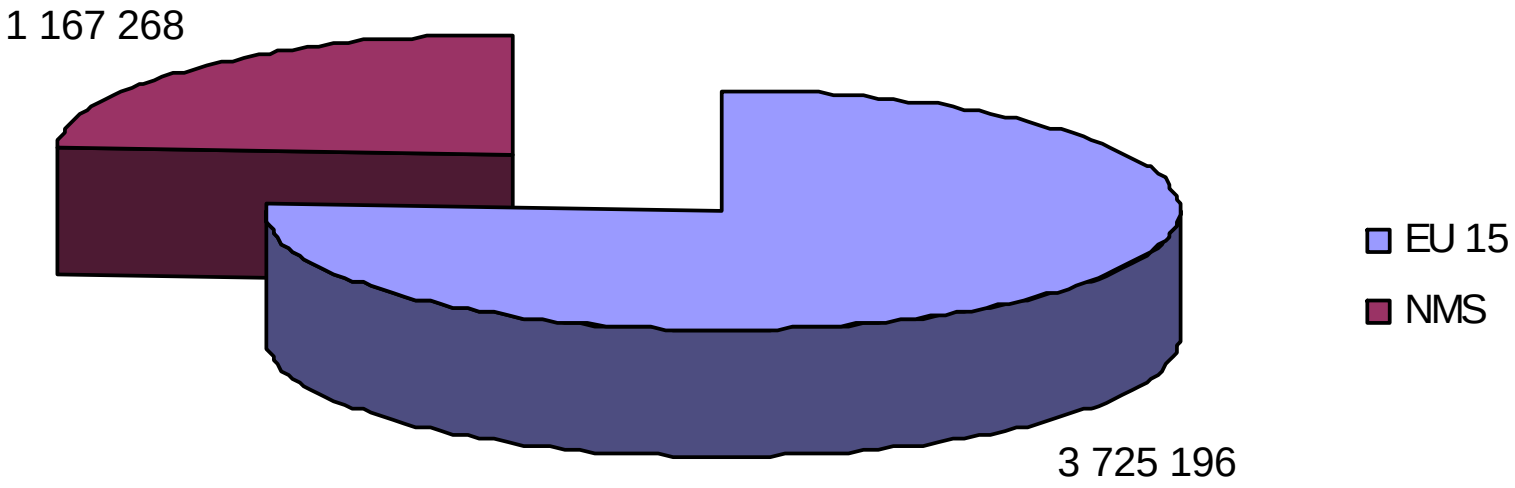
1st European Union Enlargement

10 new road networks in system

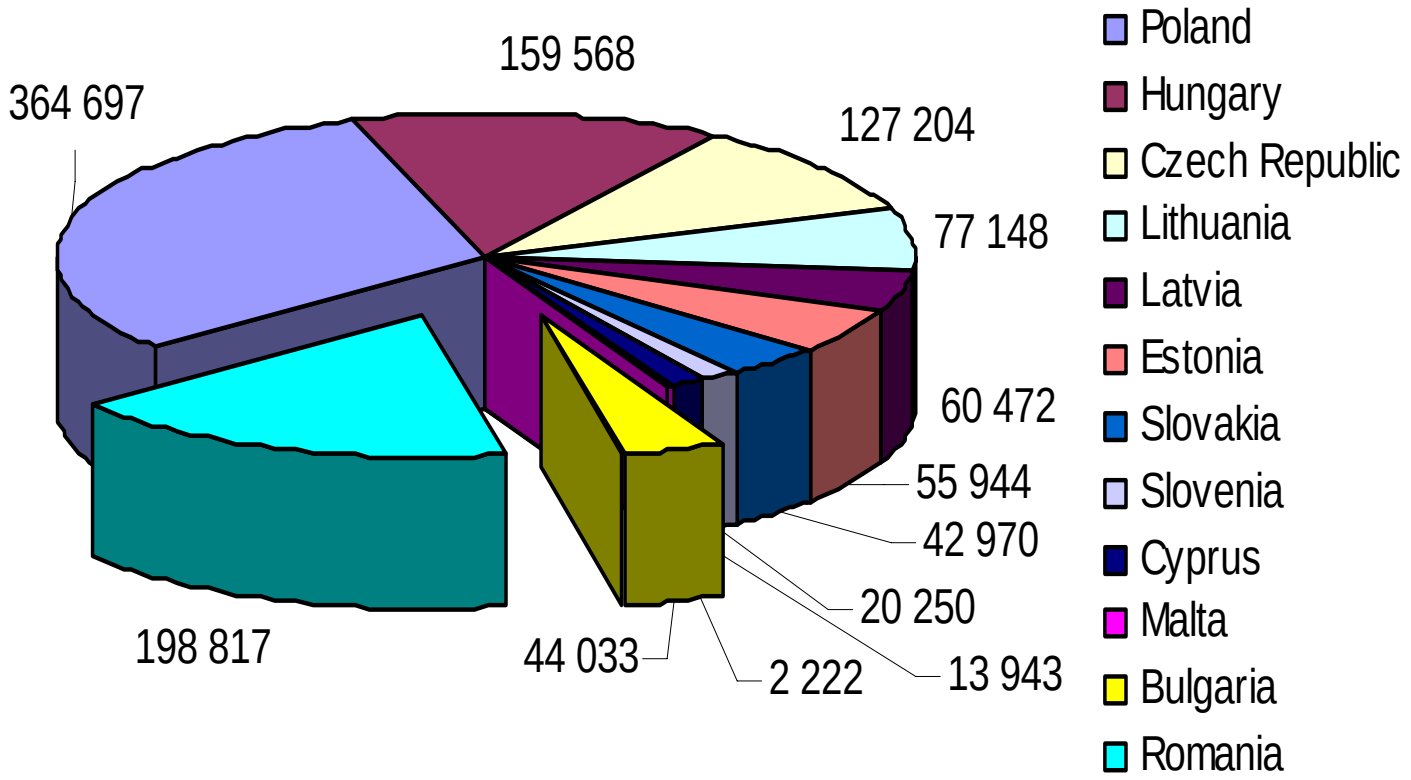
December 31st 2007

2nd European Union Enlargement
2 new road networks in system

Road system distribution between EU15 and NMS [km]



Road network in new Members States [km]



SIXTH FRAMEWORK PROGRAMME

PRIORITY 1.6.2

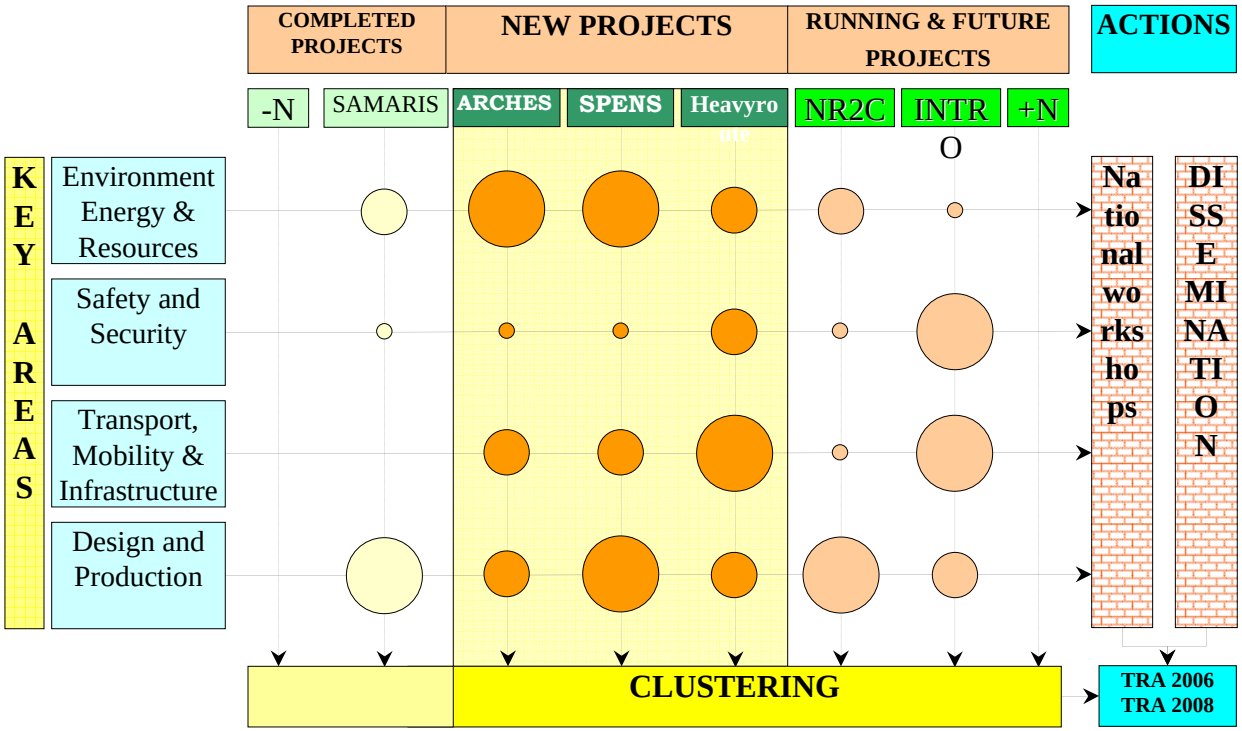
Sustainable Surface Transport

Call 3B

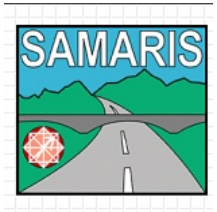
FEHRL
Forum of European National Highway Research Laboratories

the initiative body of the proposal

FEHRL project clustering



The Arches Genesis

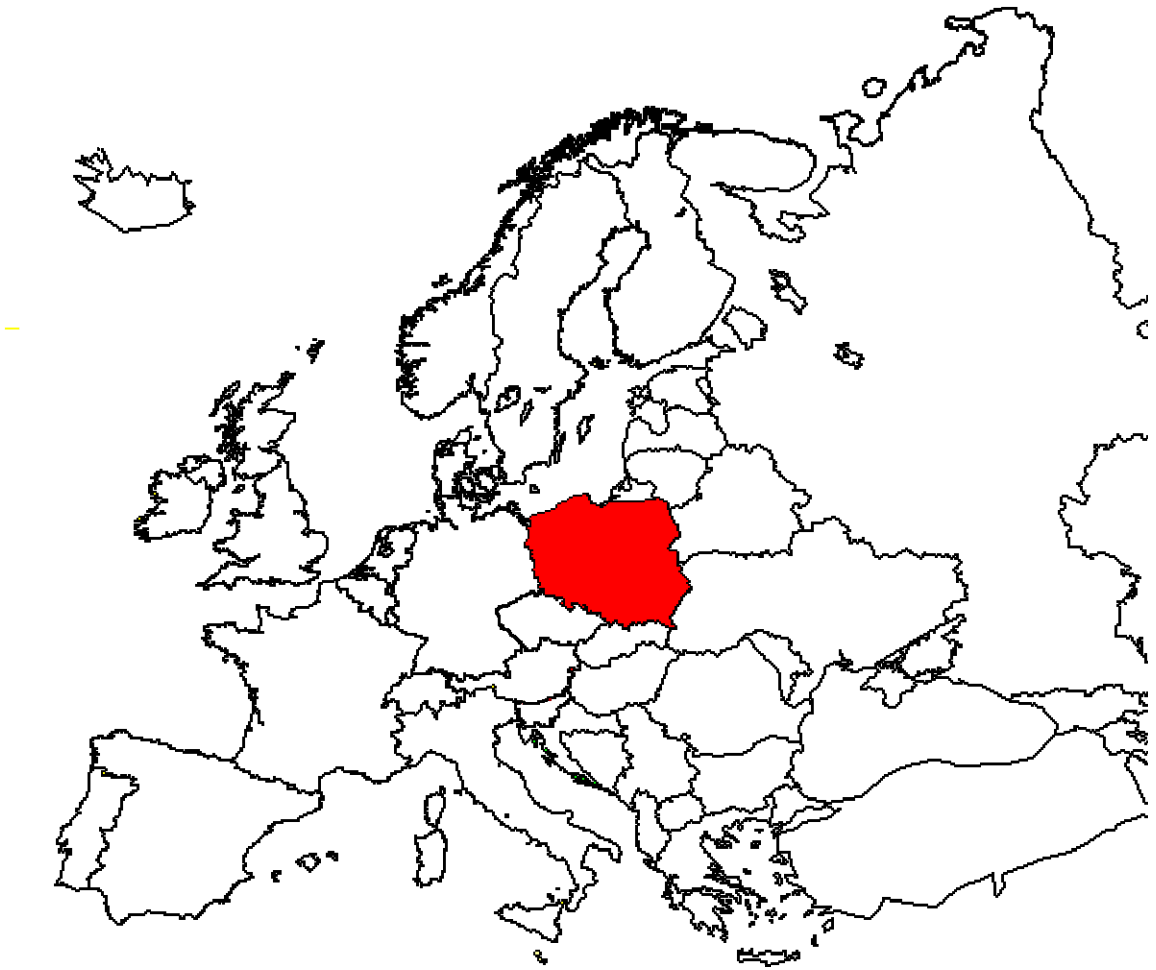


1 st of September 2006

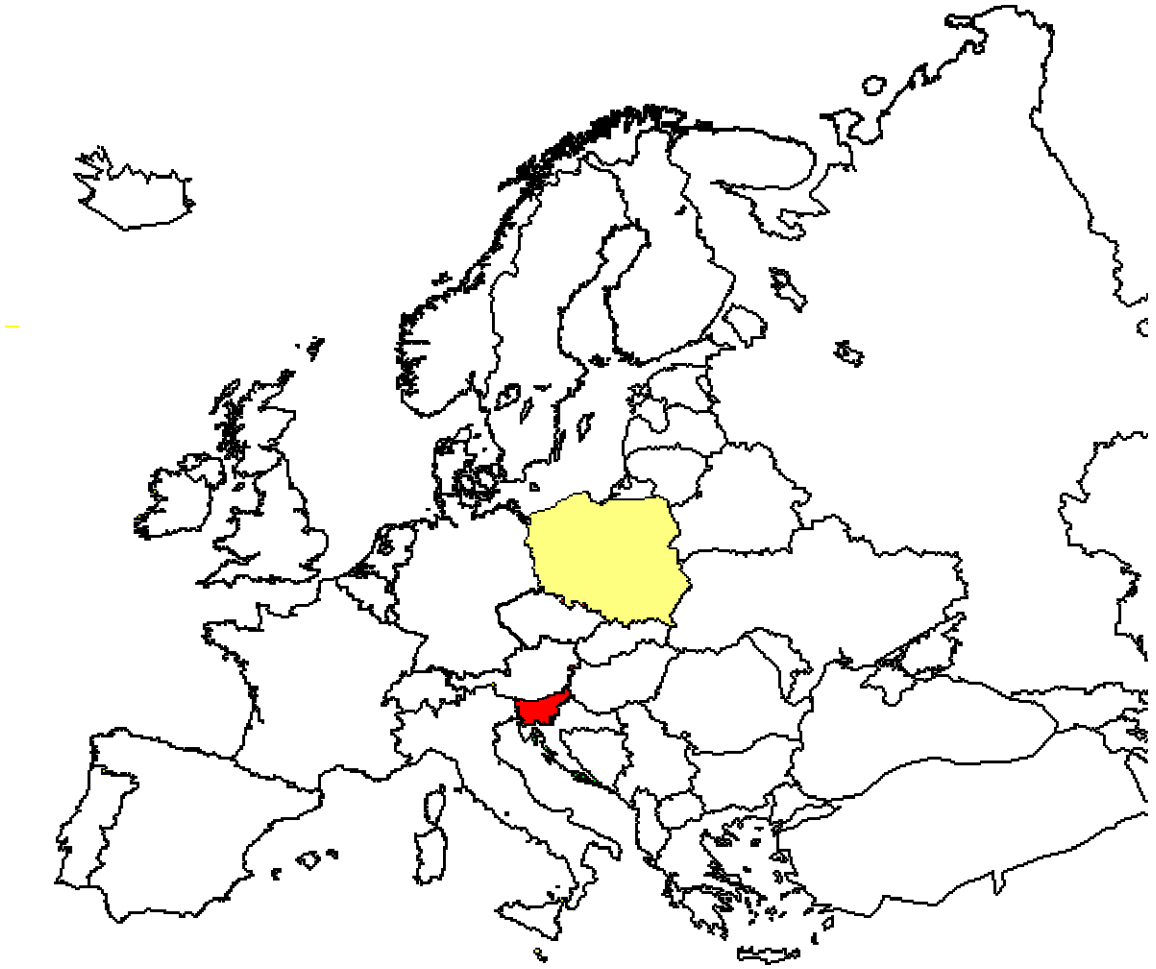
Official start of the ARCHES Project

The ARCHES partners

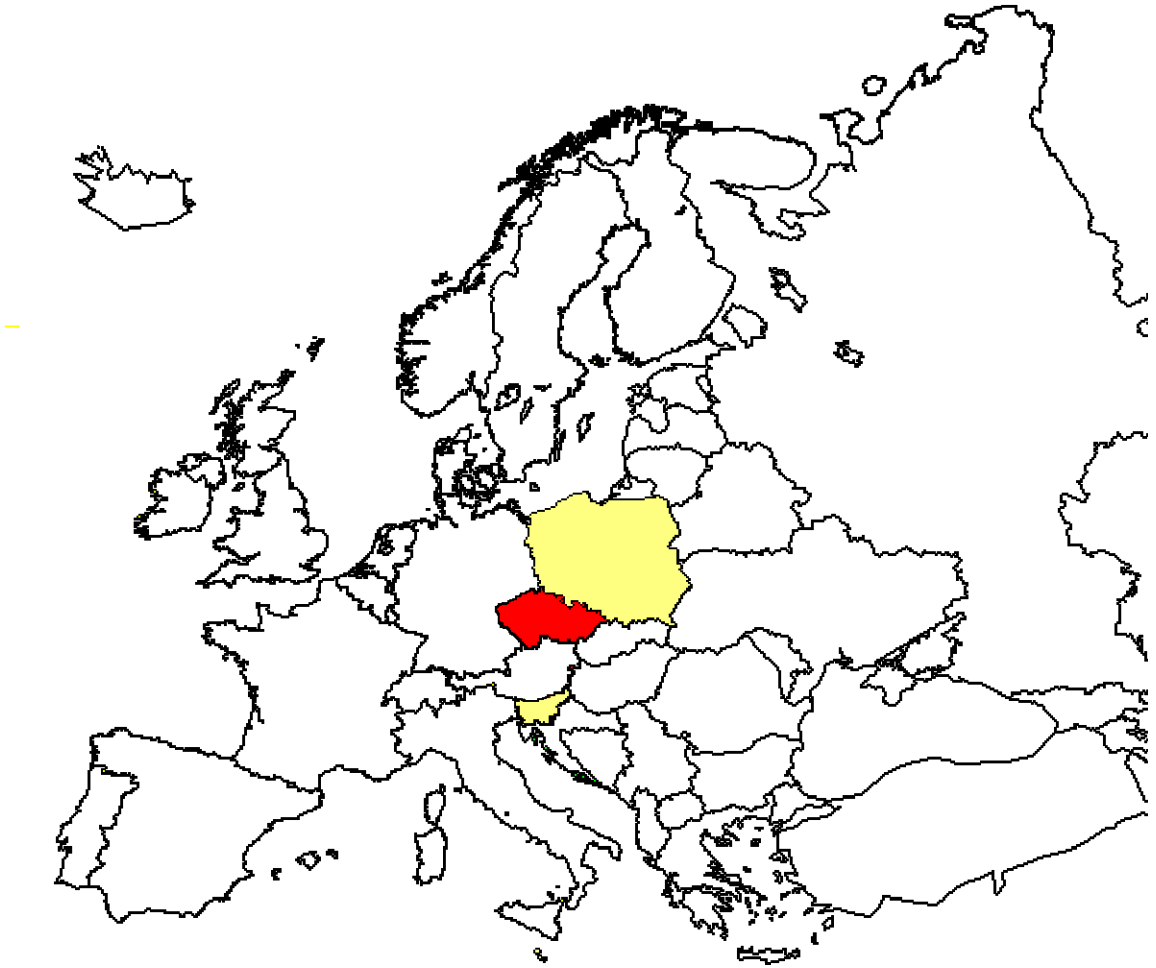
Road and Bridge Research Institute



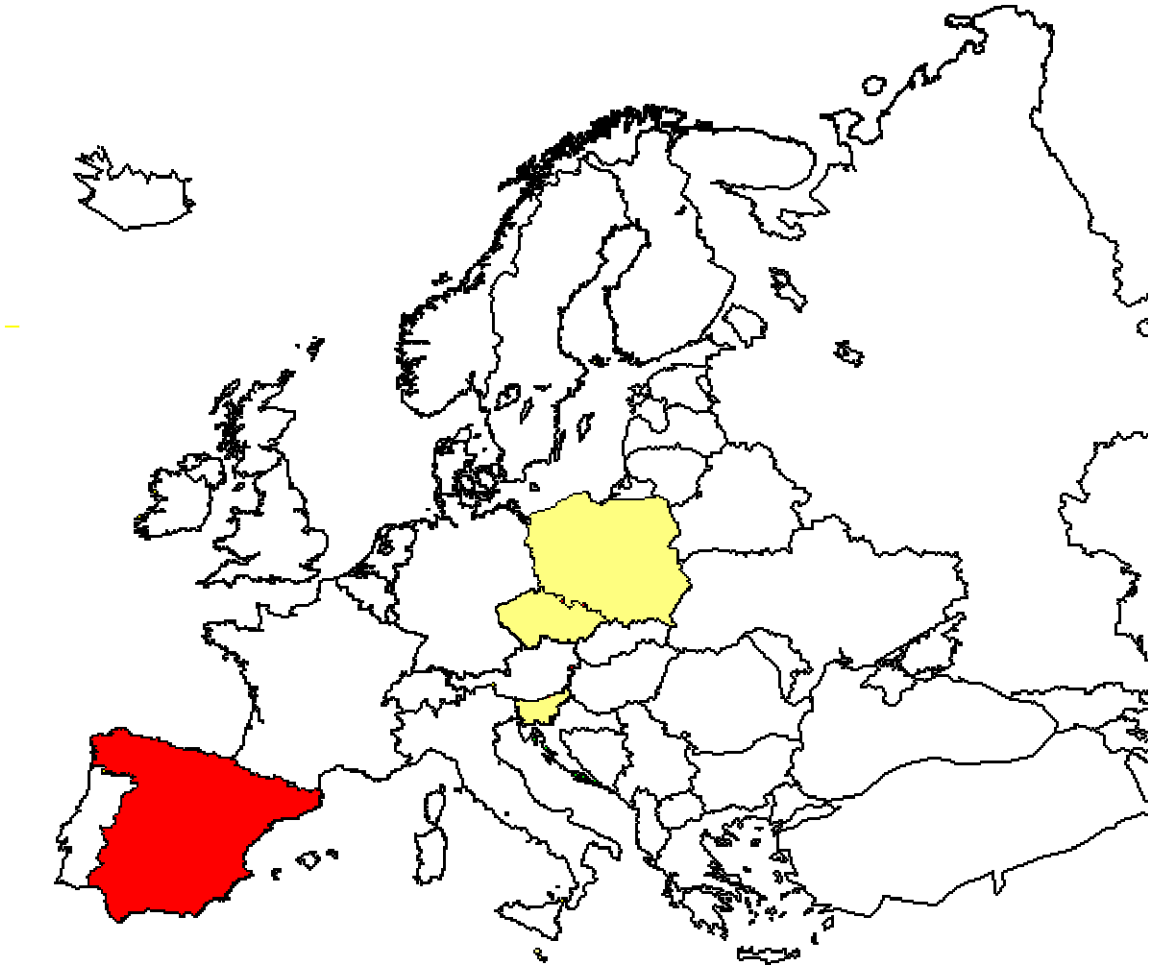
Slovenian National Building and Civil Engineering Institute



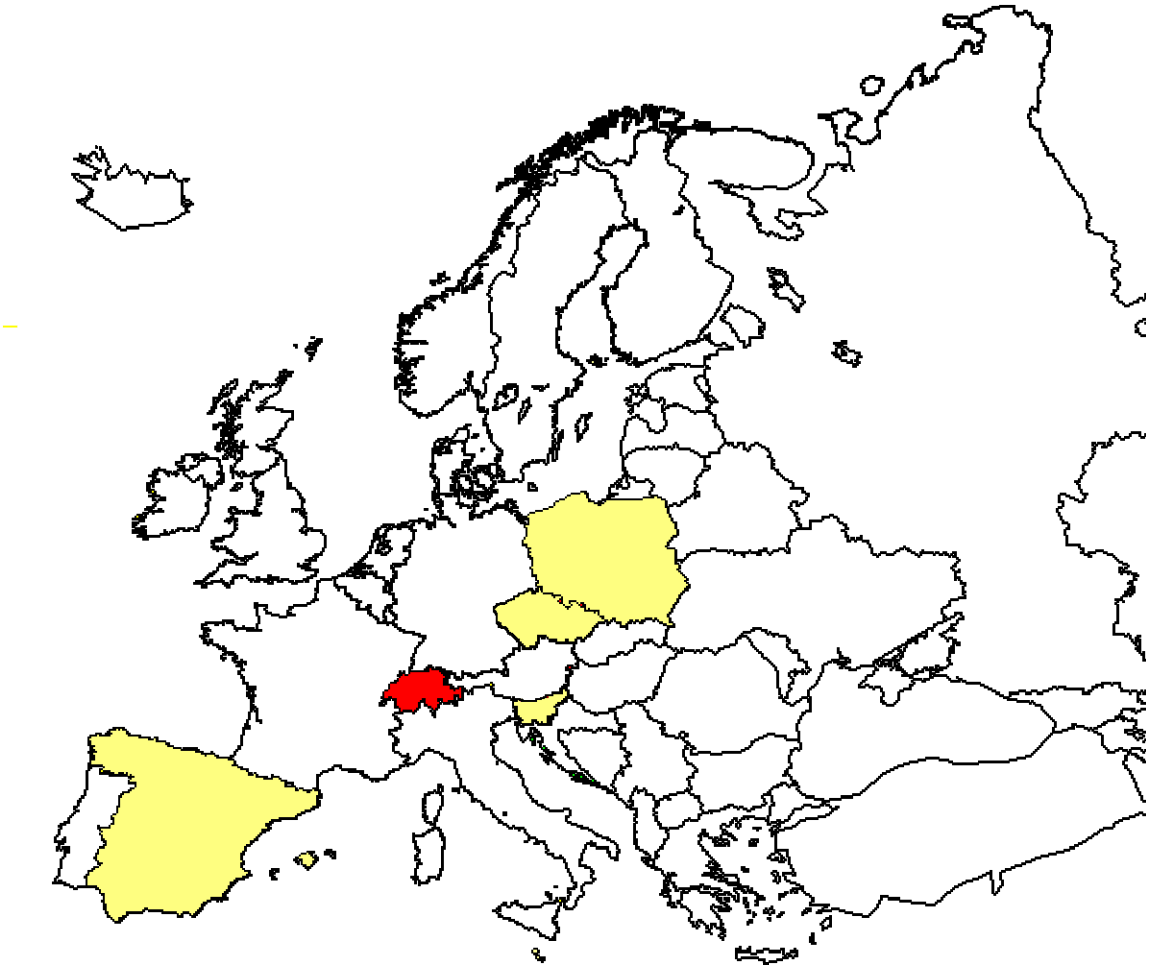
Transport Research Centre



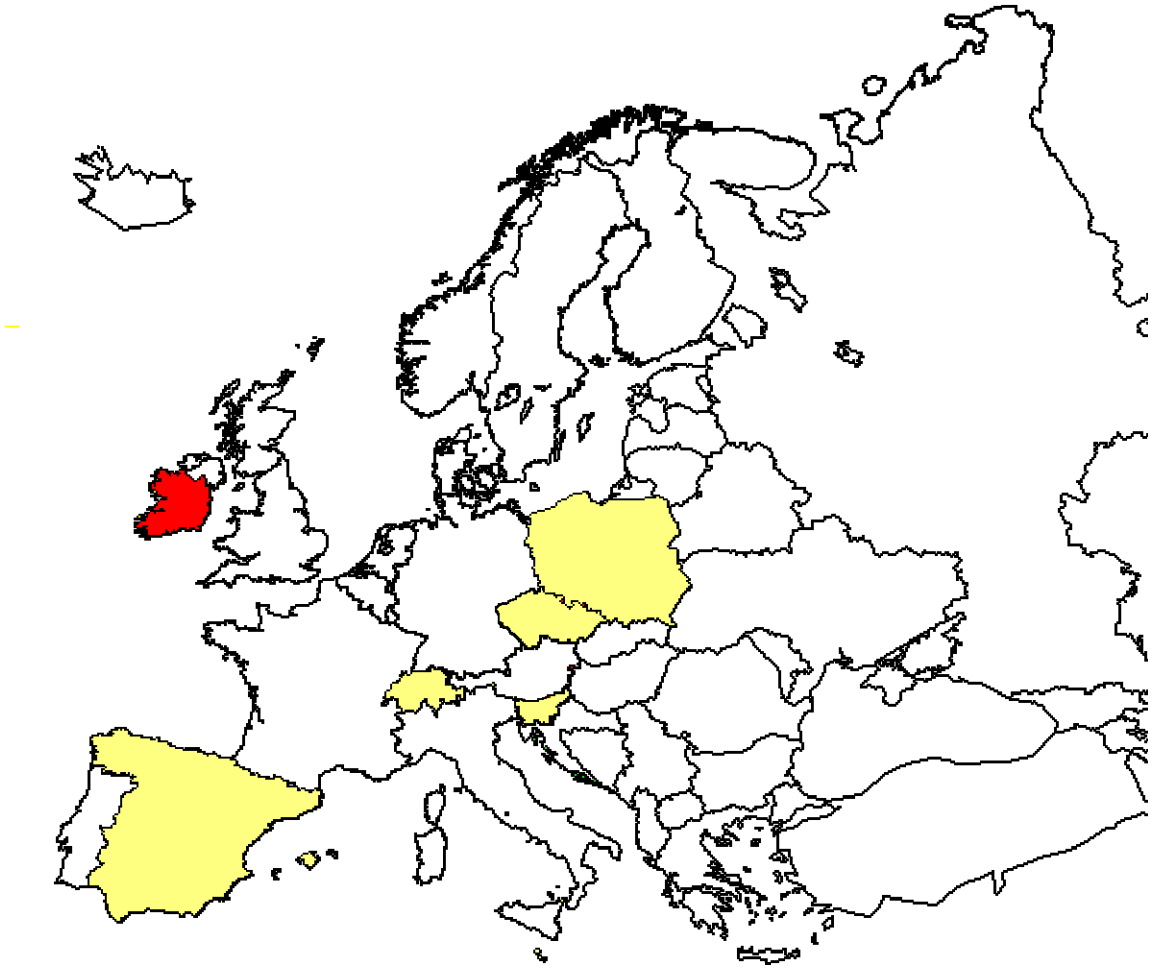
Technical University of Catalonia



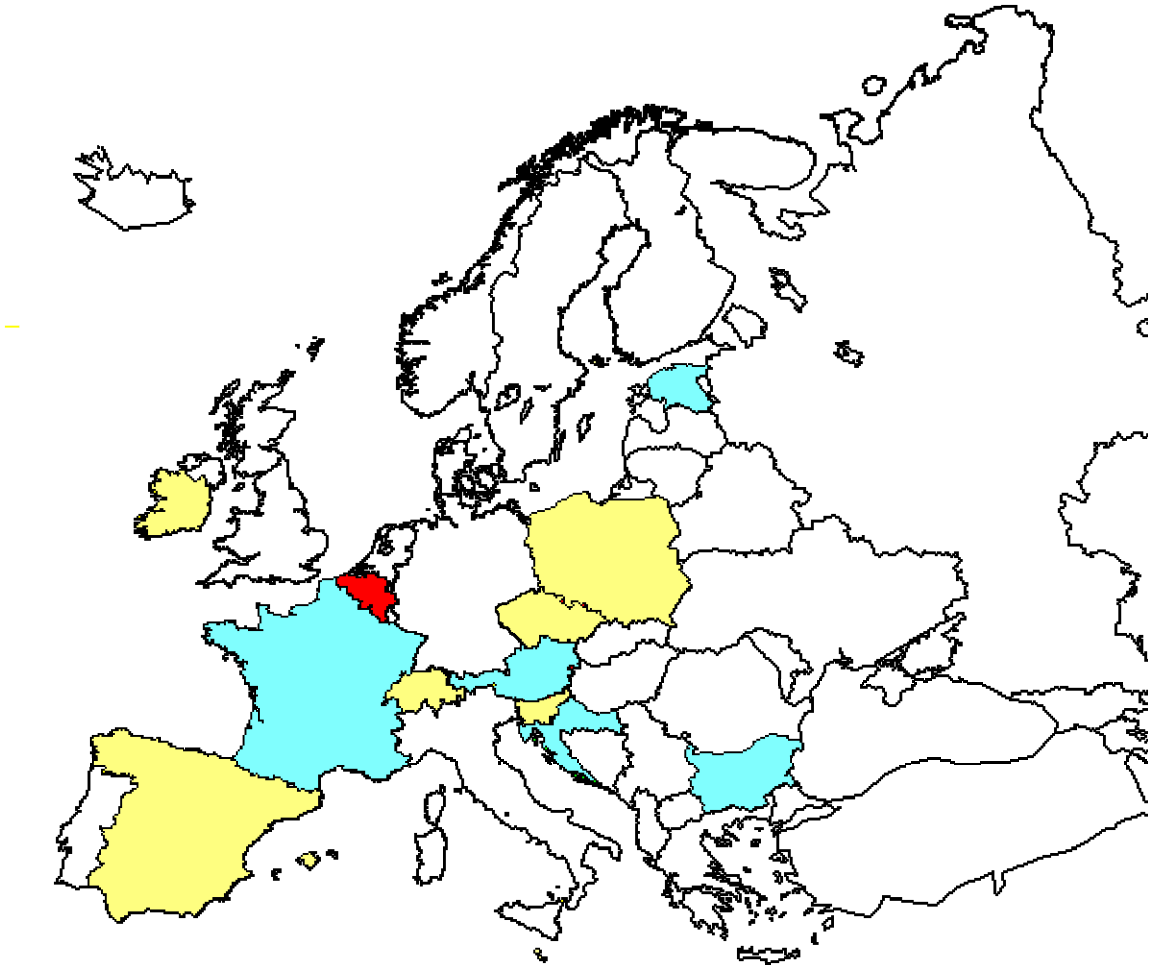
Ecole Polytechnique Fédérale de Lausanne



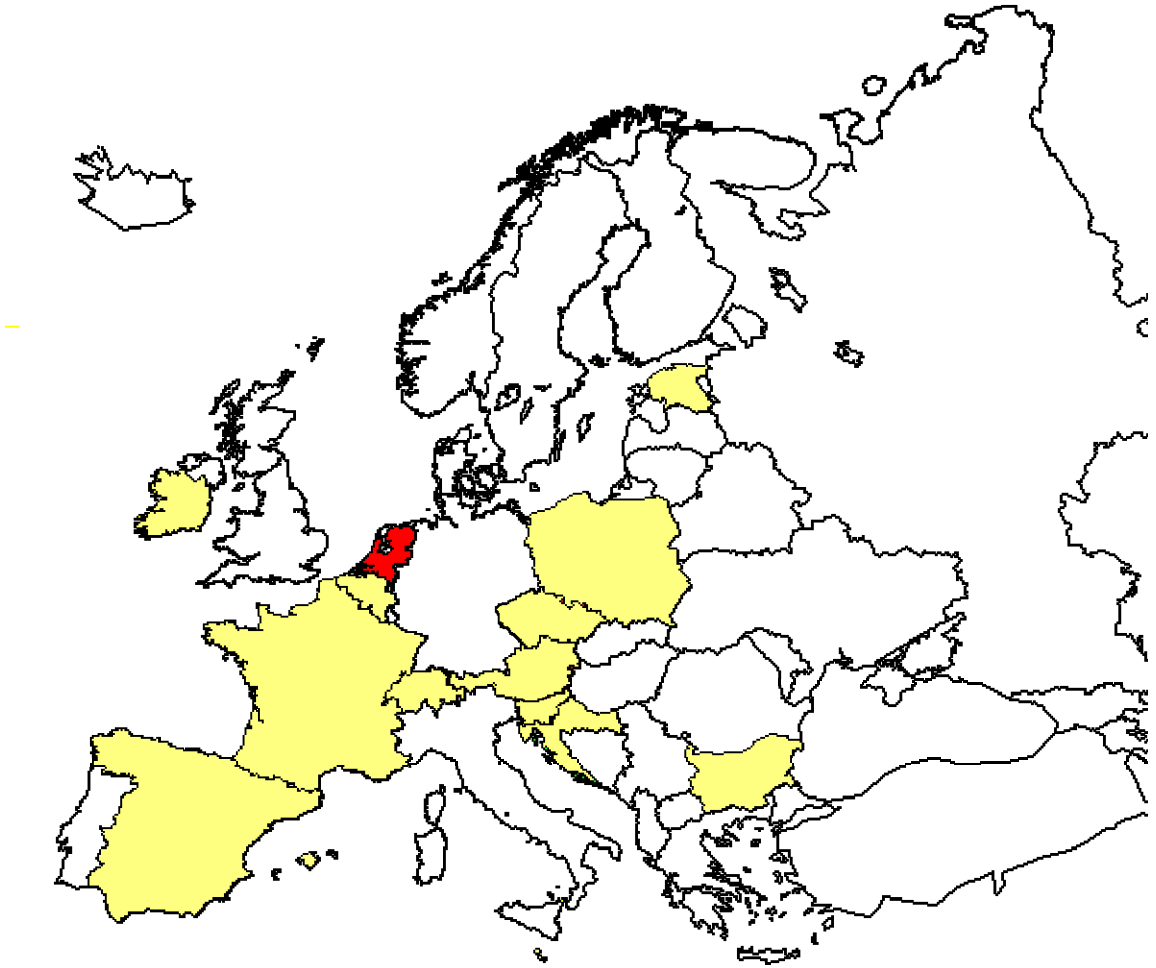
University College Dublin



Forum of European National Highway Research Laboratories (and its allies)



Leggedoor Concrete Repair



Autostrade per l'Italia

University of Zagreb

Salonit Anhovo

Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek
TNO

The ARCHES partners

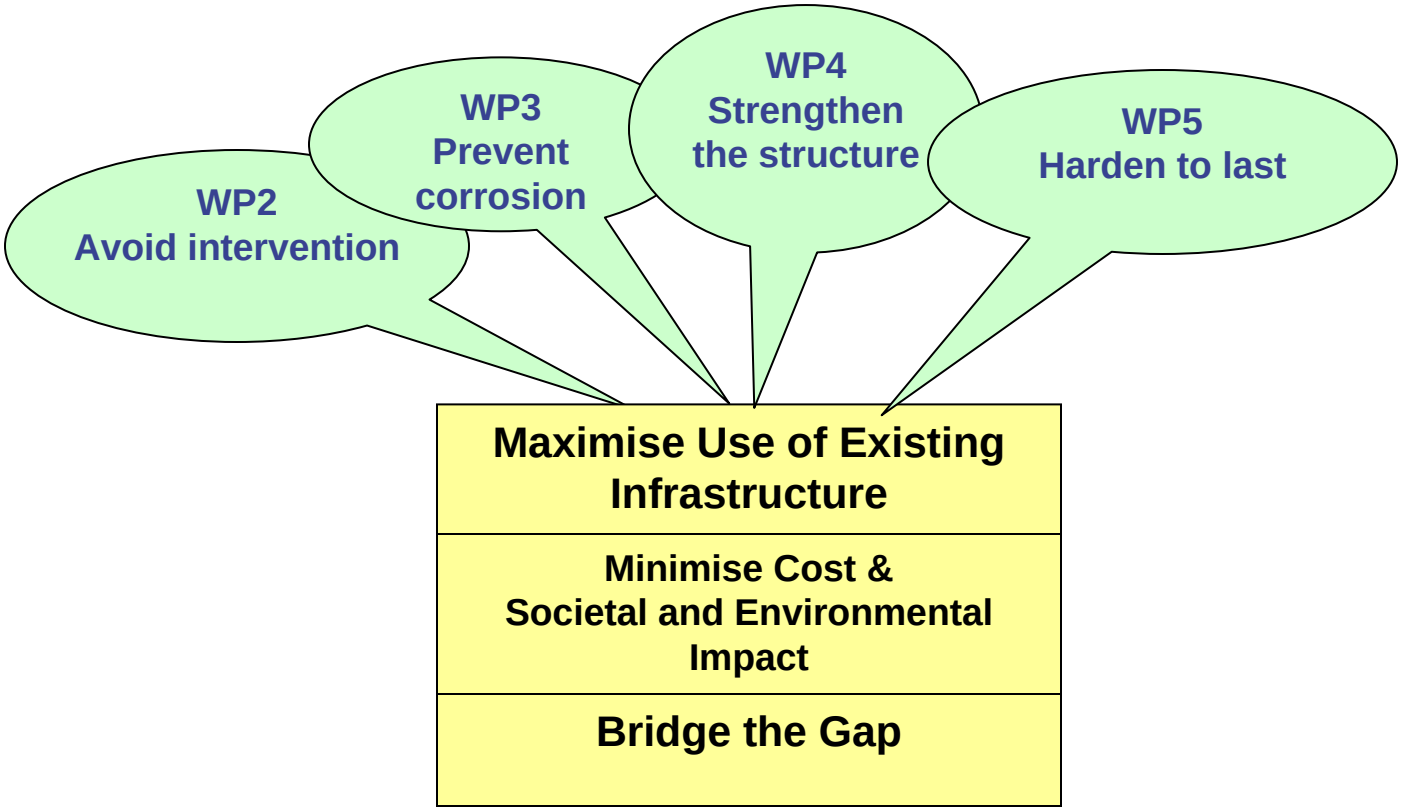
Road and Bridge Research Institute	Poland
Slovenian National Building and Civil Engineering Institute	Slovenia
Transport Research Centre	Czech Republic
Technical University of Catalonia	Spain
Ecole Polytechnique Fédérale de Lausanne	Switzerland
University College Dublin	Ireland
Europe's National Road Research Centers	Belgium
Leggedoor Concrete Repair	Holland
Autostrade per l'Italia	Italy
University of Zagreb	Croatia
Salonit Anhovo	Slovenia
Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek	Holland

The Project main goal

to reduce the gap
in the standard of highway infrastructure between
Central and Eastern European Countries (CEEC)

and the rest of the EU

The project structure and its main aims



Workpackage 2

Structural Assessment

The main objective is to develop CEEC-appropriate techniques for optimal bridge assessment

Bridge structures load testing

Photo T. Wierzbicki

Bridge structures monitoring

Workpackage 3

Prevention of Corrosion

The objective - to provide techniques that will arrest corrosion in existing concrete structures and to develop new cheap reinforcing materials that are highly resistant to corrosion


Prevent corrosion !!!
Photo T. Wierzbicki

Workpackage 4

Strengthening of Highway Structures

The objective – to develop techniques for bridge strengthening with *Fibre Reinforced Polymer*

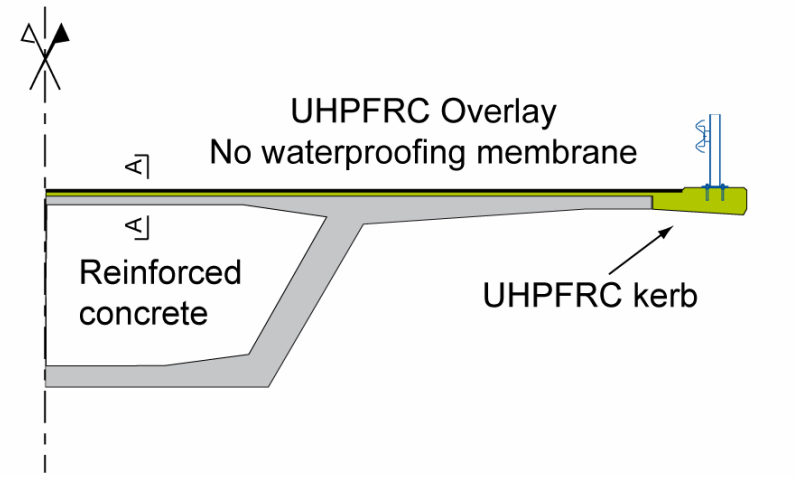
Photo M. Lagoda

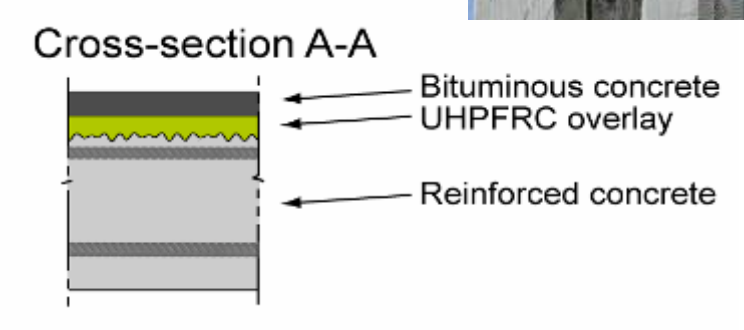
Workpackage 5

Hardening of Highway Structures

The objective – to develop techniques for hardening structures in zones of severe environmental and mechanical loading with the use of *Ultra High Performance Fibre Reinforced Concretes*

➔ Goal 1: Development of UHPFRC recipes from local materials in Slovenia and Poland.

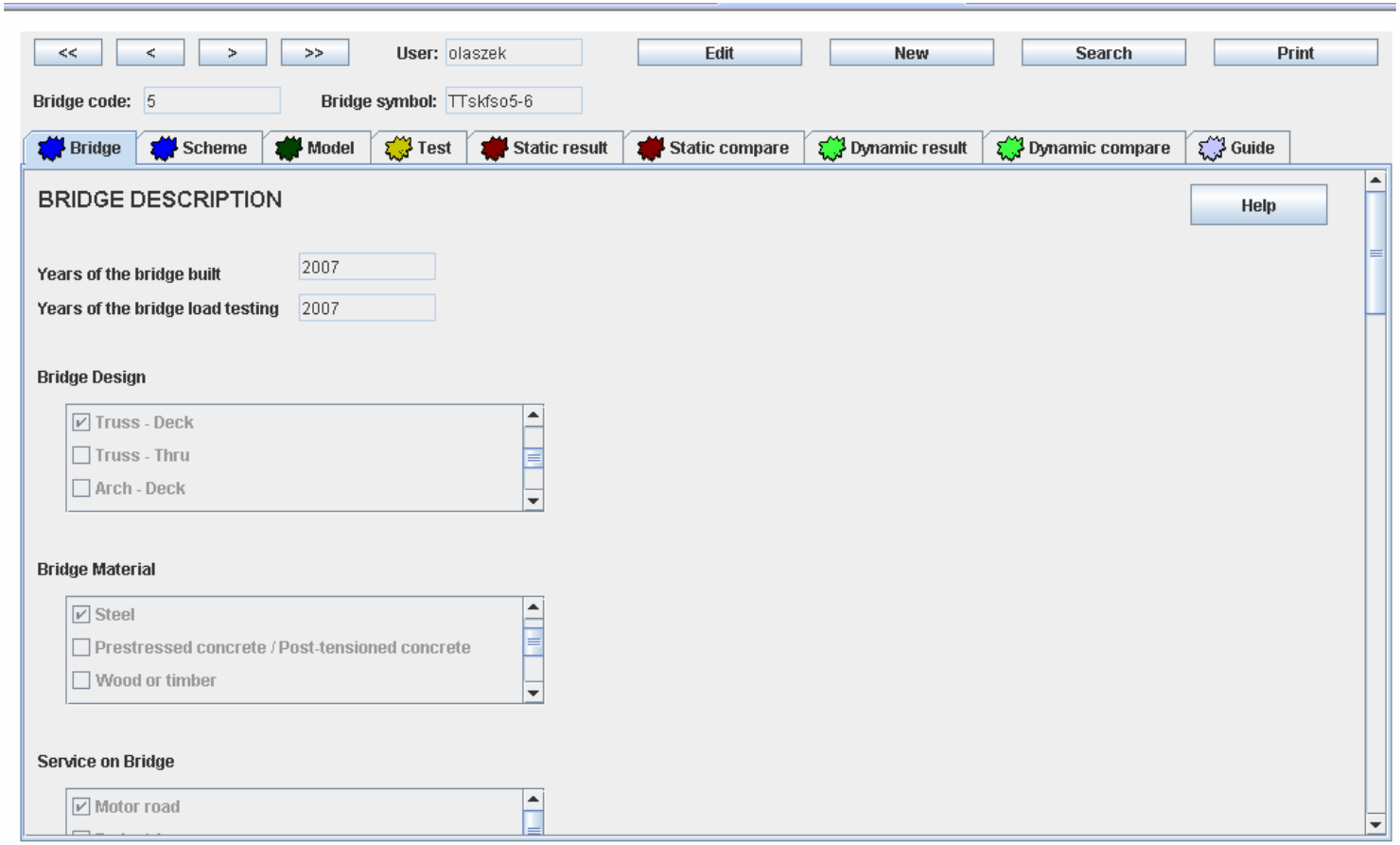




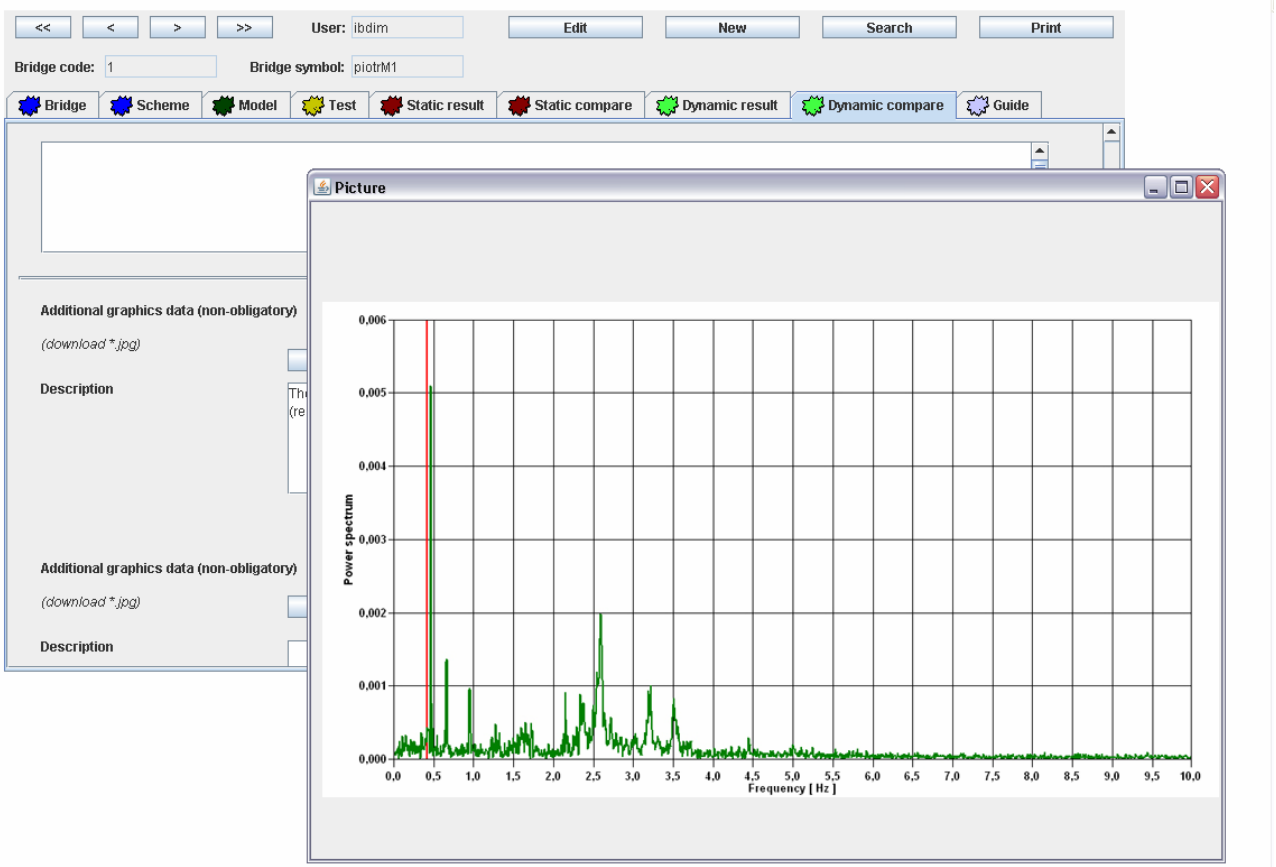
➔ Goal 2:Full scale applications of UHPFRC for rehabilitation in Slovenia and Poland

The ARCHES news

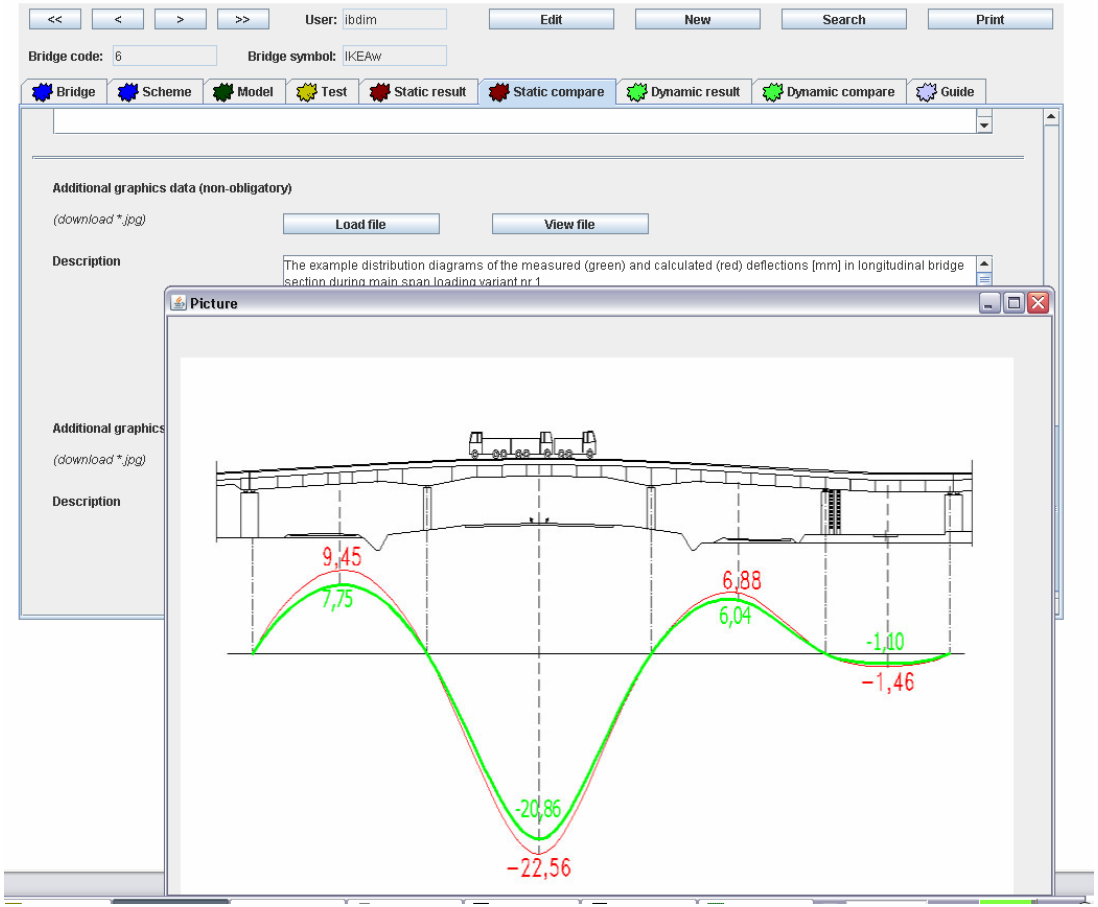
Load test Internet data base



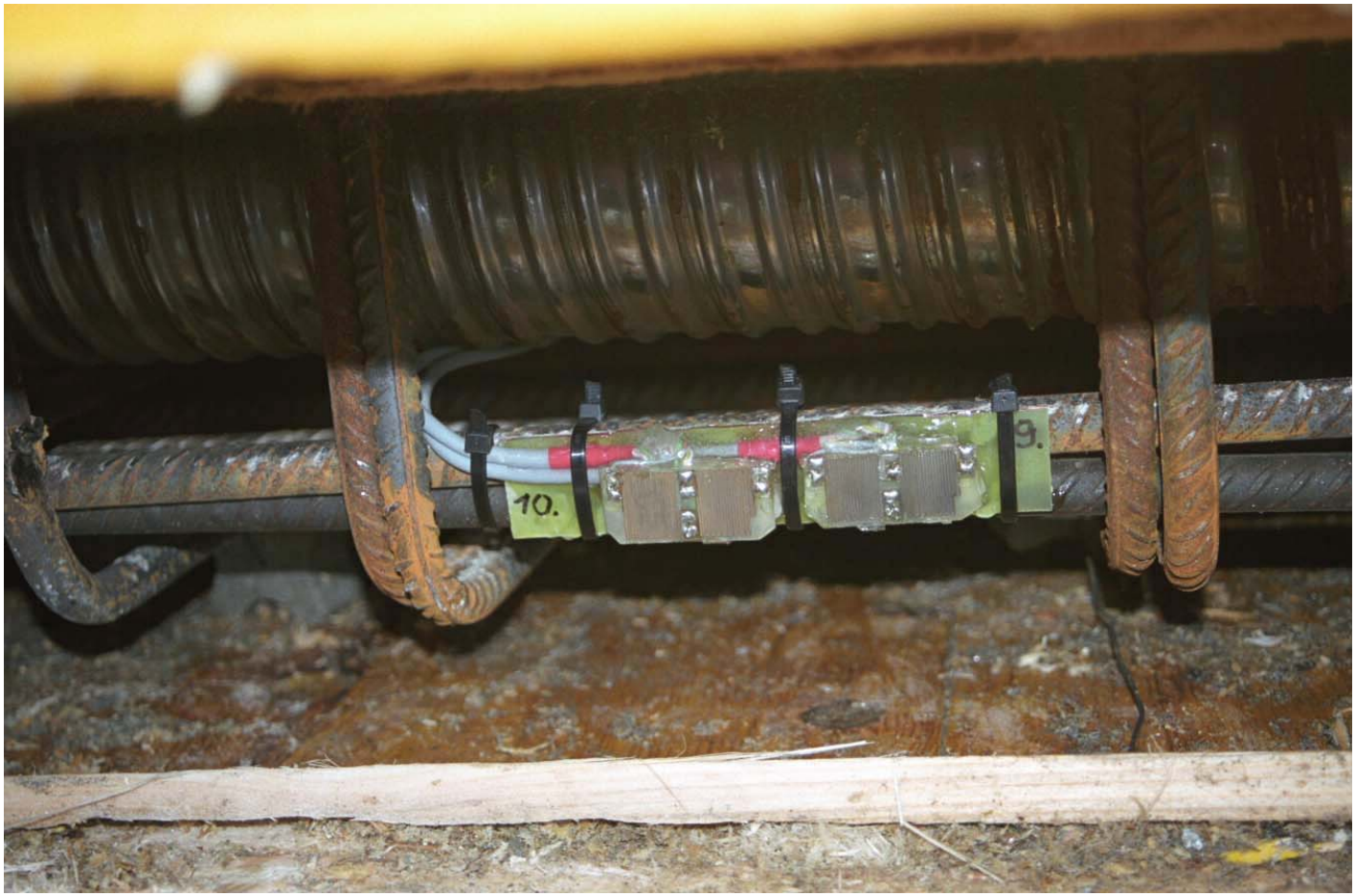
Load test Internet data base



Load test Internet data base



Steel bar corrosion investigation



Cathodic Protection pilot test - Slovenia

UHPFRC Achievements of first 18 months

➔ Technology transfer for processing of UHPFRC and test methods – Slovenia - Poland

➔ *Determination of a general methodology for the tailoring of UHPFRC matrix components to locally available products*

➔ Dissemination of conceptual approach and contacts with local road authorities in Slovenia and Poland

➔ *Design of a first full scale application in Poland – Krolowy Most bridge + on site works ongoing*

➔ *Full scale applications foreseen in Slovenia for 2008*

Protective functions

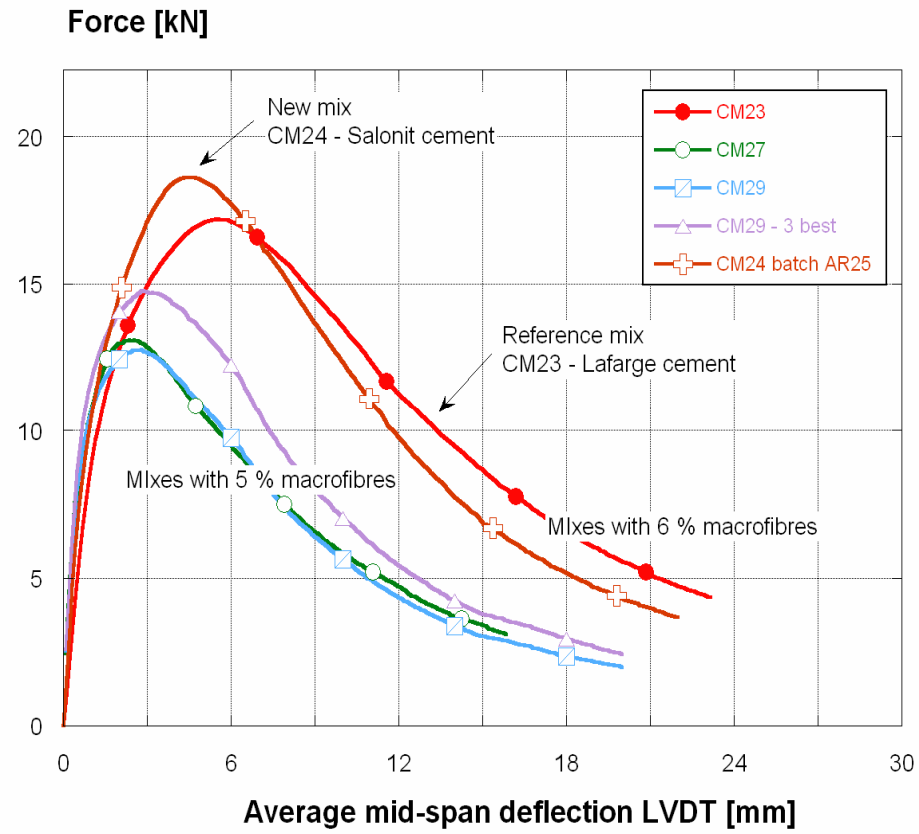
UHPFRC

Reference	Air permeability [10^{-16} m^2]	Capillary water absorption coefficient [$g/m^2.h^{0.5}$]
Bad concrete	2	1200
Good concrete	0.03	400
CM23 (ref.)	0.003	45 (EPFL meas.)
CM24	0.008	53 (EPFL meas.)
CM27	n.a	23 (ZAG meas.)
CM29	n.a	23 (ZAG meas.)

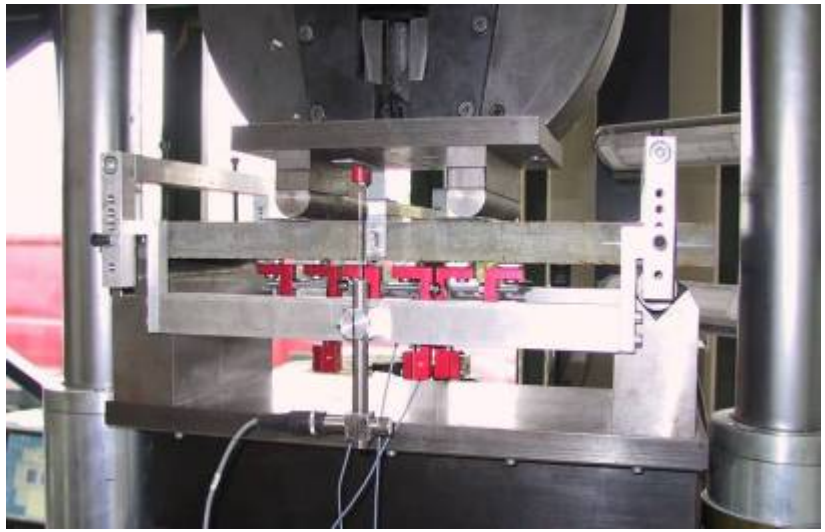
Air permeability testing

➔ Recipes CM24, CM27 and CM29 with Slovenian components exhibit excellent protective properties comparable to reference mix CM23 (project SAMARIS).

Mechanical performance



- Flexural response under 4 PT bending
- Plates 50 x 20 x 3 cm
- Span 42 cm
- Average curves on 5 to 10 specimens



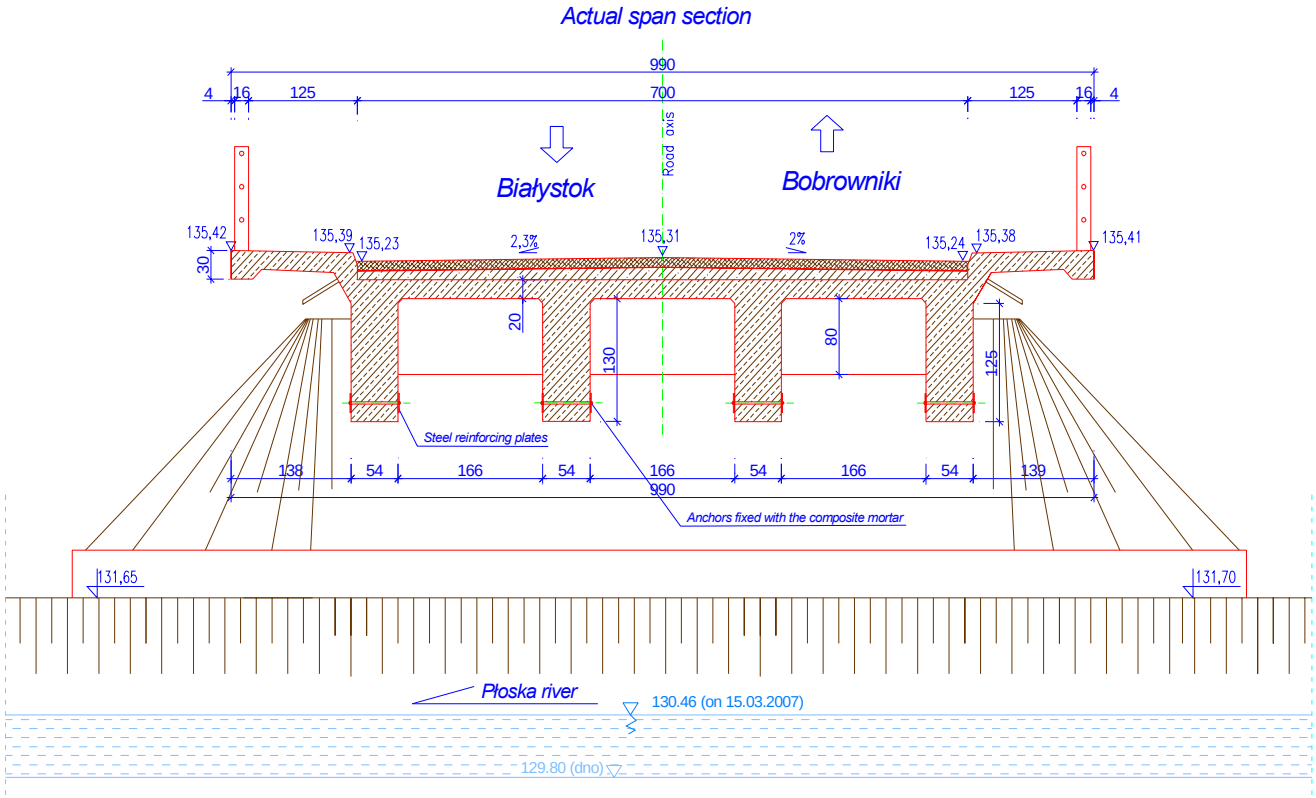
➔ Recipe CM24 with Slovenian components exhibits excellent mechanical performance comparable to the reference mix CM23.

Full scale applications

Krolowy Most bridge – Poland – spring 2008

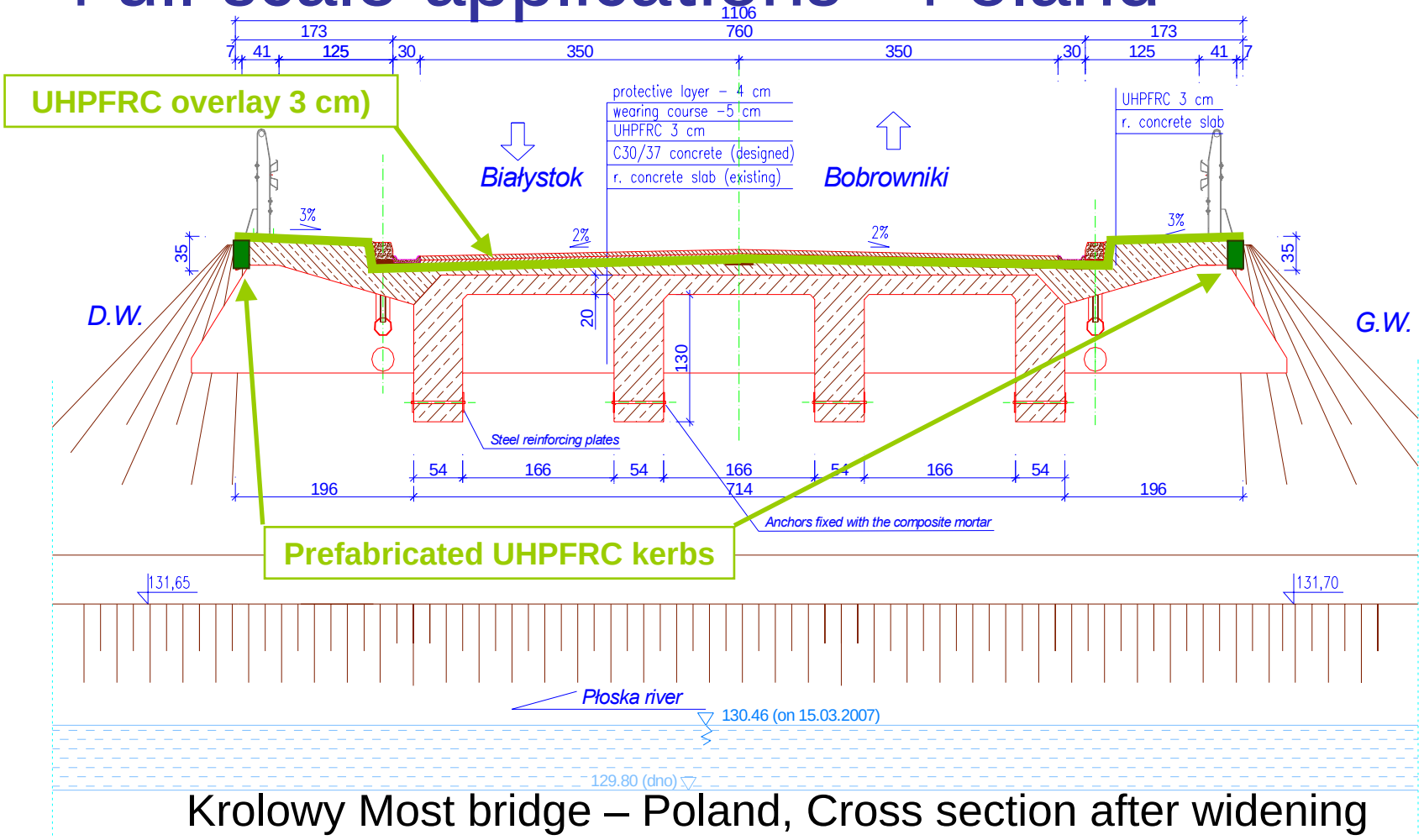
Widening + application of UHPFRC with polish components

Full scale applications - Poland



Krolowy Most bridge – Poland, Cross section before rehabilitation

Full scale applications - Poland



Krolowy Most bridge – Poland, Cross section after widening

Full scale applications - SLOVENIA

Log Cezsoski bridge – Soca river, application foreseen for 2008

- rehabilitation of the sidewalk,
- rehabilitation of the deck – if needed,
- replacement of the dilation,
- repair of concrete cover of the pillar
- widening of the bridge at the left bank.

31st August 2009

The end of ARCHES Project

The ARCHES website

http://arches.fehrl.org/