RILEM & ISAP **Activities on Recycling**

- RILEM TC 206 ATB Advanced Testing and Charact. of Bit. Materials:
  TG05 Recycling of Bituminous Materials
- ISAP TC on Constitutive Modeling of Asphaltic Materials:
  WG05 Re-Use of Construction Materials for Asphalt Pav.

International Union of Laboratories and Experts in Construction Materials, Systems and Structures
www.rilem.org

by

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Vairirei ISAP-SIIV, L'Aquila, 28 June 2007

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TC 206-ATB

Advanced Testing and Characterization of Bit. Materials

Task Groups:

- **TG 1 Binders** *(Dariusz Sybilski)*
- **TG 2 Compaction** *(Hussain Bahia)*
- **TG 3 Mechanical testing of mixtures** *(Herve Di Benedetto)*
- **TG 4 Pavement perf. prediction eval.** *(Herald Piber)*
- **TG 5 Recycling** *(Chantal De La Roche)*

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RILEM TC 206-ATB: Advanced Testing and Characterization of Bit. Materials

TG5 Recycling of Bituminous Materials

(Chantal De La Roche)

Members: De La Roche, Planche, Khalid, Hugener, Koenders-Porot, Ishai, Luminari, Paez, Buttlar.
Correspond.: Bankowski, Bernaldo, Airey, Chaidron, Di Benedetto, Isacsson, Partl, Soenen, Svechinsky, Sybilski, Vanelstraete, Van de Ven, Mouillet, Loizos, Freire, Jenkins, Van den Bergh, Gaudefroy, Farcas

Task: Evaluate tests & mix design for use of RAP for hot mix recycling; Propose Recommendation

Working Plan:

Aim:

- Evaluate **test and mix design methods** for the use of materials with bituminous materials from the road (RAP), cold & hot in view of sustainable development
- Propose a **recommendation** on this subject
- But **not duplicate** the existing work (PIARC, European projects as SAMARIS, SCORE, NR2C, PARAMIX, ALTMAT (ended in 2002), NCHRP D9-12 use of RAP, NCHRP - detection of RAP in asphalt mixtures)
  - Recommendation on Aging Methodology
- **Mix Design Methodology from Mixes Containing RAP**
  - Search for old sites to be recycled or for RAP stockpile
    - Proposal for RAP Site: LCPC

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TG5 European Survey on Recycling

(J.-P. Planche)

Countries: BE (Flanders and Wallonia), CZ, FR, DE, IT, NL, Nordic Countries, ES, CH, UK

Findings:

- **Growing use** of RAP to overcome **bitumen** cost increase & **aggregate** shortage
  - Use differs in each country, but **similar** usages and trends
- **Regulations:**
  - Use of RAP generally **not mandatory** but pressure from highway agencies
  - Not always **nat. specs** (Recom, Guidelines, Local Specs, Requir. in UK, BE, CZ,...)
- **Techniques / usages:**
  - Main techniques use **hot recycling** (see EAPA for available processes)
  - RAP content limits
    - Hot recycling, always below **50%,** usually below **30%** (depends on layer)
    - For cold recycling, up to 100% RAP
  - Main use in **base** and **binder** course
  - New usages in **wearing courses** for SMA (DE,CZ) and dense mixes (BE)
  - Use of **PmB**: not common but does not seem to be a problem

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TG5 Overview on Aging Protocols

(L.Porot)

Protocol	Sample type	Short-term ag.	Long-term ageing	Characterization	Correlation
AASHTO R30-02	Compacted samples	Loose state 4h @ 135°C	5d @ 85°C	For further mix testing	With LTPP field sections
Liverpool University	Marshall comp. of Porous Asphalt	None	Air flow @ 60°C up to 21d	Binder recovered & rheol. eval.	With exposed sample (18 mths)
Nottingham University SATS	Compacted samples	None	Saturated @ 85°C, 2.1MPa for 65h	ITSM on mix samples	
TRL	Cores from pav.	None	48h @ 60°C	ITSM	With field (397d)
EMPA	Compacted sample	3h @ 135°C	16h @ 120°C or 110°C		Correlate w. 20 y field aging
VTI	Gyratory comp. samples	4.5 wks @ ambient temp.	7d @ 60°C with oxygen flow	Mech. properties of asphalt mix	Ranking test
BRRC	Loose material of Porous Asphalt	none	1y @60°C no air flow or w. oxygen flow	R&B, pen, rheol. eval. asphaltene,	
LCPC (4 methods)	Loose mix	4h @ 135°C	24h @ 100°C (then compaction)		
Shell	Loose material	2h @ mix temp	7d @ 80°C	Pen and R&B	With PAV
Shell Qualagon	*Loose material*	*16h @ 160°C*		*R&B and Pen*	*Long-term storage @ mix plant*

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TG5 Comparison Aging Protocols

- **Objectives of mix aging protocol**
  - Mostly to simulate **long term aging** of asphalt mix
  - **Field correlation** still subject of discussion
- **Type of specimen**
  - Mostly **compacted** samples (6 protocols)
  - Only few on **loose** materials (3 protocols)
- **Short-term aging (curing)**
  - Not systematic, if so mostly at **135°C** between **2…4 h**
- **Long-term aging**
  - Mostly in **oven** some times with air or oxygen flow
  - 5…7 **days** @ temperature in range of 60…85°C
  - 16…24 **hours** @ high temperature (100°C to 120°C)
- **Additional conditions**
  - Pressure, flow of air or oxygen, no UV
- **Characterization**
  - For **samples**: mechanical properties
  - On recovered **binders** rheol. charact. & convent. prop. (pen, R&B)

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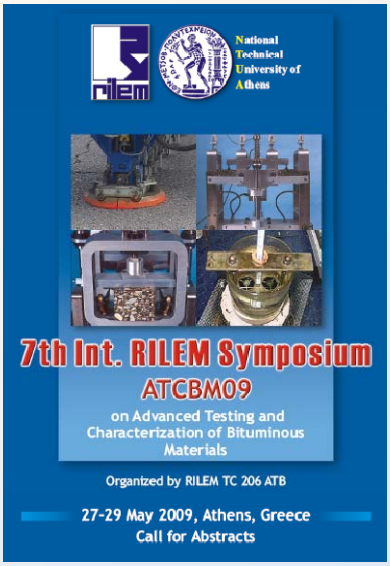
RILEM TC 206-ATB: Advanced Testing and Characterization of Bit. Materials

7th In RILEM Symposium ATCBM09, Athens



Deadline Abstract Submission: 30Sep 07

WEB:

http://www.centra.ntua.gr/-pavnet/ATB2009
(under preparation)

or
http://www.rilem.net

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ISAP TC WG5 „Re-Use of Construction Materials for Asphalt Pavements“

- **Task: Explore different aspects** of the re-use of construction materials for asphalt pavements, such as:
  - Environmentally **sustainable** material (when, where does re-used material make sense?)
  - **Repeated recycling** and material **resources**
  - **Durability and aging** of pavements with re-used pavement material
  - **Compaction** and **quality** issues (life cycle analysis)
  - **Pavement design** aspects for re-used materials
  - **Mix design** link with **RILEM**: RAP content, binder, additives, moisture, mixing process
  - **Low energy asphalt** mix production and placing/compaction
  - **Emissions** and **working safety**
  - In situ **performance**

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General Recycling Research Topics

- **Temperature:** hot, warm, cold (emulsions, foam bitumen, etc)
- **Mix design:** mix components, mix properties, combination w. concrete
- **Placing:** Installation: compaction, homogeneity, mixing techniques, energy reduction, health aspects, noise
- **Layers:** wearing, binder, base coarse, overlays
- **Sustainability:** repeated recycling, material components (stones additives, stimulation to use RAP
- **Durability:** moisture/water, mechanical resistance, aging, performance under combined effects
- **Test and assessment methods:** binder, mix , aggregates, environment

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ISAP TC WG5 „Re-Use of Constr. Materials for Asphalt Pav."

- **Topics for WG work**
  - **1) RAP recycling, in particular the repeated recycling.**
    - Traditional mix design test methods applicable?
    - Specific tests or methodology necessary? (e.g. artificial aging)
    - Mix performance (fatigue, creep,...) and characteristics of single components vs performance (emulsions, old bitumen, ...)
  - **2) byproducts suitable for asphalt mixes:** mech. charact., performance and mix design (test methods & charact. protocols)
  - **3) environmental aspects of recycling:** leaching and other type of air and water pollution
- **Proposal Workshop/Session**
  - During Varirei Conference 27..29 June 2007 in L'Aquila (Italy)

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ISAP2008 Symposium

Topics

- Emissions and working **safety**
- **Noise** reducing pavements
- Drainage and **water** susceptibility
- **Low energy** asphalt mix production & placing
- Environmentally sustainable **new materials**
- **Repeated** recycling and material resources
- **Durability** and aging
- Innovative **design**
- Roads for **energy production**
- Roads for envir. friendly **winter maintenance**

Aug. 18th…20th, 2008

www.empa.ch/ISAP2008

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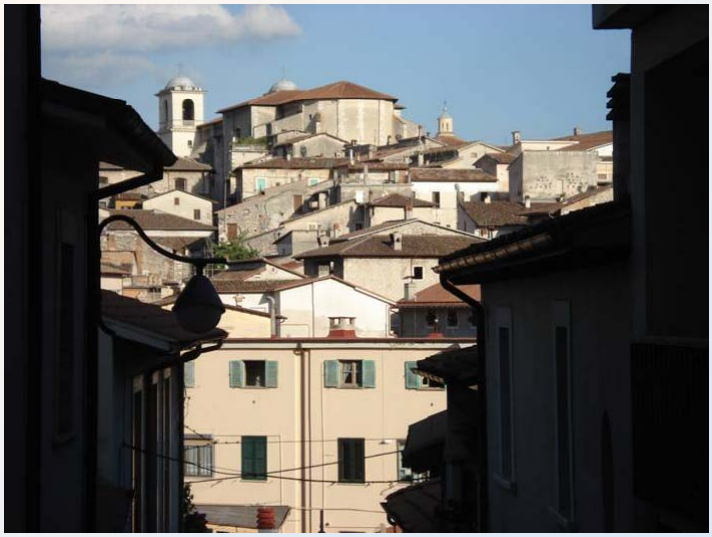
Thank You



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