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FEEDBACK ON THE INAUGURAL MEETING OF THE COST 347 ACCELERATED LOADING TEST (ALT) ACTION IN EUROPE: JUNE 27TH TO 29TH 2001

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Abstract:

This report describes in summary the attendance of the author to an invited meeting of the COST 347 ALT (Accelerated Loading Testing) Committee in Cologne, Germany, Europe. The meeting was held at BASt, near Cologne, from 27th June 2001 to 29th June 2001. The 27th started with a seminar on ALT topics, and several presentations were made. The second and third day involved committee and working group meetings. The author presented two topics, i.e. Accelerated Pavement Testing (APT) in South Africa, and Stress-In-Motion (SIM).

This COST 347 action started in October 2001, and need to deliver recommendations on ALT April 2004. There are 6 Working Groups, chaired by several country members, working on the project.

South Africa was invited to officially joint the COST 347 action, and Management of Transportek need to take a decision on this issue.

Keywords: COST 347, ALT, Accelerated Pavement Testing, Europe

Proposals for implementation: Management to consider proposals

Related documents: None, but see website: http://www.test-pave.org

Signatures:			
McCarran **Language Editor**	**B Verhaeghe Technical Reviewer**	B Verhaeghe **Programme Manager**	**Stefni Roets Info Centre**

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EXECUTIVE SUMMARY

During the week 25th June to 29th June 2001, the author attended the inaugural meeting of the COST 347 action o n Accelerated Loading Testing (ALT), at the Bundesanstalt fur Stassenwesen (BASt) in Bergisch Gladbach, an Eastern suburb of Koln (Cologne). **BASt** is the **Federal Highway Research Institute** of Germany). Dr Mike Nunn of TRL, who serves on the COST 347 Management Committee and is also the Editor for the ALT newsletter, invited the author to present the South African perspective and experiences with ALT. Note that in South Africa and the USA we refer to this technology as APT (Accelerated Pavement Testing). In addition to the ALT perspective, the author was also asked to give a presentation on Stress-In-Motion (SIM) technology in South Africa.

Mr Magnus Carle of COST Management stated that they invite CSIR Transportek to consider official membership of the COST 347 Committee – may be through a MoU. It is therefore suggested that <u>Mr Hendricks and Verhaeghe to comment and suggest how to join.</u>

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1. INTRODUCTION

During the week 25th June to 29th June 2001, the author attended the inaugural meeting of the COST 347 action o n Accelerated Loading Testing (ALT), at the Bundesanstalt fur Stassenwesen (BASt) in Bergisch Gladbach, an Eastern suburb of Koln (Cologne). **BASt** is the **Federal Highway Research Institute** of Germany). Dr Mike Nunn of TRL, who serves on the COST 347 Management Committee and is also the Editor for the ALT newsletter, invited the author to present the South African perspective and experiences with ALT. Note that in South Africa and the USA we refer to this technology as APT (Accelerated Pavement Testing). In addition to the ALT perspective, the author was also asked to give a presentation on Stress-In-Motion (SIM) technology in South Africa.

Photo 1: Picture of Dome Cathedral in Cologne, Germany

2. BACKGROUND ON EUROPEAN COST ACTIONS

Founded in 1971, COST is an intergovernmental framework for European Co-operation in the field of Scientific and Technical Research, allowing the co-ordination of nationally funded research on a European level. COST Actions cover basic and pre-competitive research as well as activities of public utility.

The goal of COST is to ensure that Europe holds a strong position in the field of scientific and technical research for peaceful purposes, by increasing European co-operation and interaction in this field.

COST has clearly shown its strength in non-competitive research, in pre-normative co-operation and in solving environmental and cross-border problems and problems of public utility. It has been successfully used to maximise European synergy and added value in research co-operation and it is a useful tool to further European integration, in particular concerning Central and Eastern European countries.

Ease of access for institutions from non-member countries also makes COST a very interesting and successful tool for tackling topics of a truly global nature.

To emphasise that the initiative came from the scientists and technical experts themselves and from those with a direct interest in furthering international collaboration, the founding fathers of COST opted for a flexible and pragmatic approach. COST activities have in the past paved the way for Community activities and its flexibility allows COST Actions to be used as a testing and exploratory field for emerging topics.

The member countries participate on an "à la carte" principle and activities are launched on a "bottom-up" approach. One of its main features is its built-in flexibility. This concept clearly meets a growing demand and in addition, it complements the Community programmes.

COST has a geographical scope beyond the EU and most of the Central and Eastern European countries are members. COST also welcomes the participation of interested institutions from non-COST member states without any geographical restriction.

COST has developed into one of the largest frameworks for research co-operation in Europe and is a valuable mechanism co-ordinating national research activities in Europe. Today it has almost 200 Actions and involves nearly 30,000 scientists from 32 European member countries and more than 46 participating institutions from 11 non-member countries and Non Governmental Organisations.

2.1 COST Status 2001

2.1.1. COST Countries

In total, institutions from 43 countries participate in COST under different forms:

33 member states:

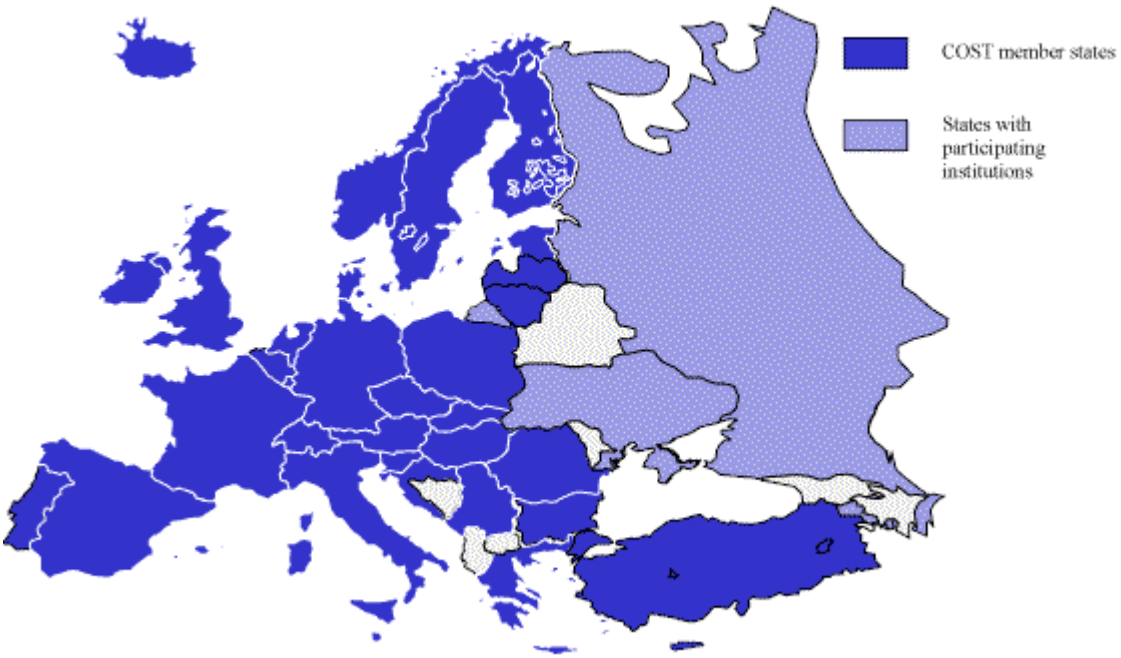
Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, The Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom, Federal Republic of Yugoslavia.

1 Co-operating State*: Israel

9 States with participating Institutions:

COST has a geographical scope beyond the EU. Institutions from non-COST countries may join COST Actions and at present, there are institutions from the following states: Armenia (2), Australia (2), Canada (4), India (1), Japan (3), China (Macao) (1), Russia (11), Ukraine (3), USA (6). There are also 3 participating Non Governmental Organisations (NGO).

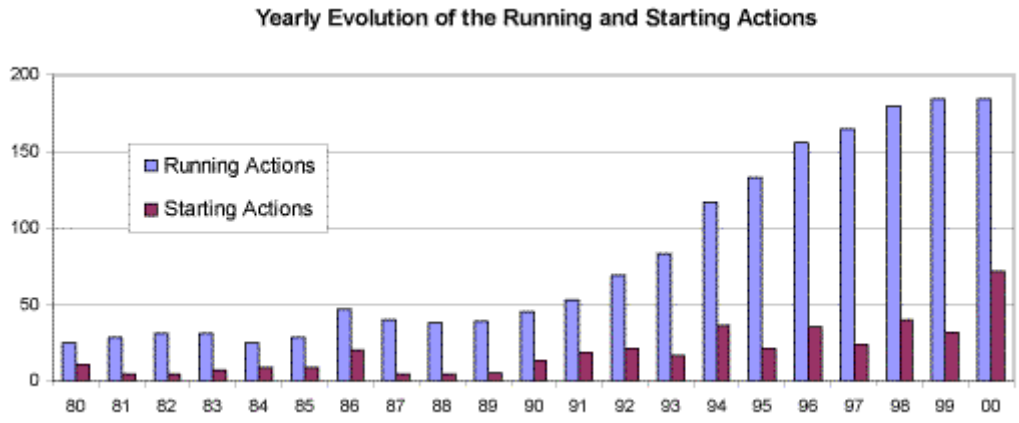
* The status of Co-operation State implies non-voting membership in horizontal Committees (CSO and Technical Committees) and full member rights on Action level.



2.1.2. Actions

COST is based on Actions. These are networks of co-ordinated national research projects in fields, which are of interest to a minimum number of participants (at least 5) from different member states. The Actions are defined by a Memorandum of Understanding (MoU) signed by the Governments of the COST states wishing to participate in the Action. **The duration of a COST Action is generally 4 years.**

The increasing number of COST Actions (see below) proves the success of COST within the European Scientific Community.



2.1.3. Level of country participation:

The participation of the various countries in COST actions is shown below. In general the participation over the member countries appears to be evenly distributed. No significant change in this distribution has taken place over the last 5 years.

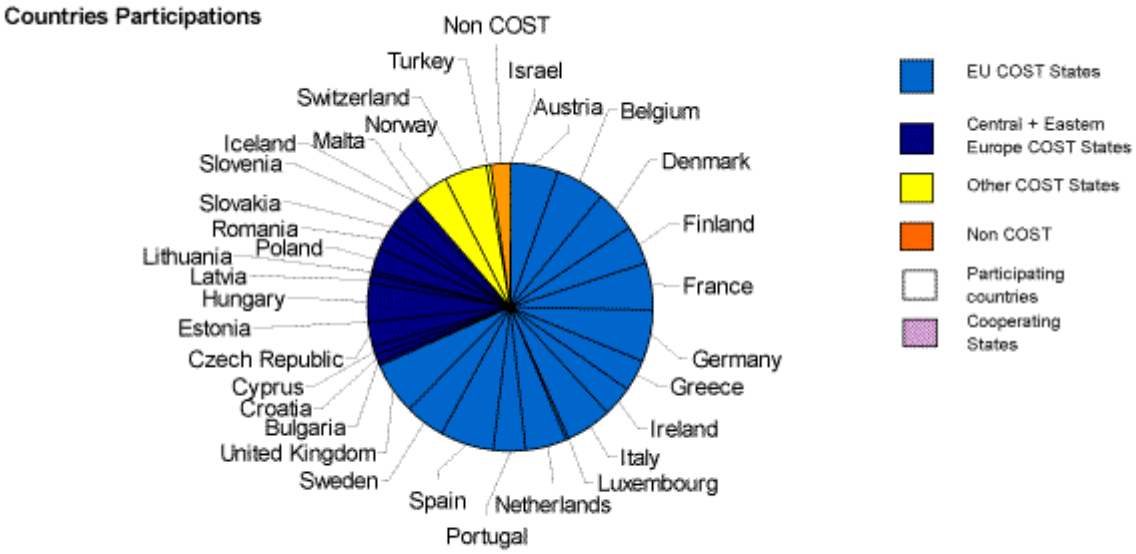


Figure 1: Current COST Participation Countries

2.1.4. Scientific domains

COST covers a wide range of scientific and technological domains. The present 17 domains and their share of running actions in 2001 are shown below.

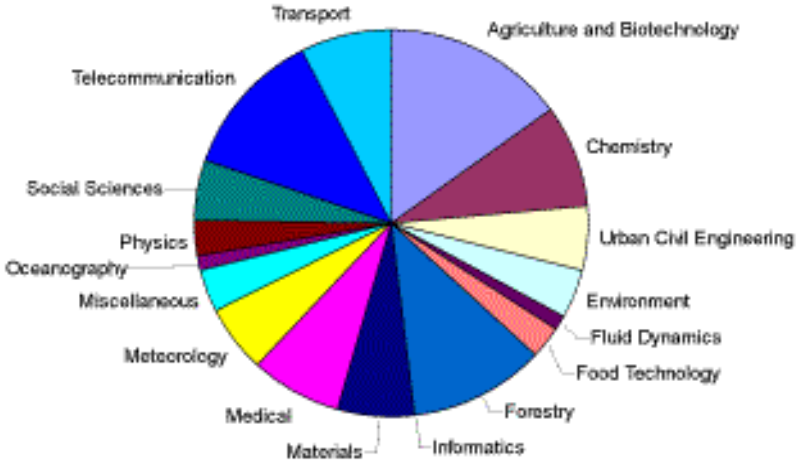


Figure 2: Active Scientific domains

2.1.5. Funding

COST represents an estimated volume of national funding of more than € 1.5 billion per year.

An average of € 60 000 per Action is available for co-ordination depending on size and activity of the Action. This expenditure represents on average 0.5% of the overall national funding, which shows that COST gives excellent value for money.

This funding is basically used to cover co-ordination costs such as contributions to workshops/conferences, travel costs for meetings, contributions to publications and short term scientific missions of researchers to visit other laboratories.

How to create or join an Action:
In order to create or join an Action, just contact the relevant national COST Co-ordinator for details or study the relevant documents on the COST web-page (see below).

2.1.6. COST Organisation Structure

The main bodies of COST are:
Committee of Senior Officials (CSO)
The CSO is the decision making and highest body in COST. It is composed of COST member states representatives, one of whom in each case acts as COST National Co-ordinator (see below).

Technical Committees (TC) are responsible for a particular sector under the authority of the CSO. Responsible for technical preparation work, they also oversee the implementation of the Actions and aid in the co-ordination, evaluation in an advisory capacity.

Management Committees (MC) are in charge of implementation, supervising and co-ordinating the COST Actions. An MC is formed by not more than two representatives of each Signatory Country.

2.1.7. COST National Coordinator (CNC)

One member of the CSO from each member state acts as national coordinator (CNC) for COST Actions. The CNC provides the liaison between the scientists and institutions in his country and the Council COST secretariat. The CNC has specifically to:

- ensure that the national funding is available
- appoint and officially forward the names of the national delegates to the technical committees (TC) and management committees (MC);
- forward proposals from other countries to experts in his own country; and
- assess at national level all projects undertaken within the COST framework.

2.1.8. Secretariat

The secretariat is provided by the European Commission (scientific and administrative matters) and the Secretariat General to the Council of the European Union (secretariat of the CSO).

2.1.9. COST on the Internet

Internet: Further information may be obtained directly from the EU COST secretariat (for details see back of front page) The URL of the official COST website is: http://www.belspo.be/cost/

2.1.10. Links:

Most domains and actions as well as the Council secretariat and various national co-ordinators have their own WEB page, most of them linked with the COST home page.

2.1.11. Forum:

A forum is included in the COST website where different groups can discuss and interchange opinions about themes related to COST.

2.1.12. COST Participating Country abbreviations :

The following abbreviations are used in the directory and based on the postal codes.

1. Austria A Latvia LV
2. Belgium B Lithuania LT
3. Bulgaria A Luxembourg L
4. Croatia HR Malta MT
5. Cyprus CY Netherlands NL
6. Czech Republic CZ Norway N
7. Denmark DK Poland PL
8. Estonia EE Portugal P
9. Finland FIN Romania RO
10. France F Slovakia SK
11. Germany D Slovenia SI
12. Greece GR Spain E
13. Hungary H Sweden S
14. Iceland IS Switzerland CH
15. Ireland IRL Turkey TR
16. Italy I United Kingdom GB
17. Israel IL Federal Republic of Yugoslavia YU

3. BACKGROUND ON COST 347

During May 2001, Dr Mike Nunn wrote the following background re: the European COST 347 action. "The European COST Action 347 was recently started with the participation of approximately 20 European countries. The main objective of this action is to develop a European code of practice to optimise the use of **accelerated load facilities** and to improve the application of results from these facilities. It is also expected that the action will provide a background of co-operation with pavement other international research groups.

It has been agreed by the COST 347 management committee that an initial seminar would get the action of to a good start, help establish contacts and it would help to publicise and raise the profile of the action. This initiative has also been accepted by the European Commission who will refund travel expenses to invited international speakers on the same basis as for European members of the Action. I believe that this covers economy airfare and possibly a daily allowance (we will find out the precise details). These expenses may not amount to a full reimbursement.

Against this background, we would like you to consider speaking at this seminar. I am sure this and future co-operation with the COST 347 group will be of benefit to you and CSIR.

The workshop will take place on 27th June at the offices of the Bundesanstalt fur Stassenwesen (BASt) in Bergisch Gladbach, an Eastern suburb of Koln (Cologne). The nearest long haul international airport is Frankfurt from where you can catch a train to Koln very easily".

An overview and work packages of COST 347 is given in Appendix A.

4. COST 347 INAUGURAL MEETING: AGENDA

The inaugural meeting of the COST 347 program included a one-day seminar on Accelerated Loading Testing of Pavements, on 27th June 2001. the 28th and 29th were planned for site visit to BASt, and committee meetings. Some photos of BASt facilities are given in Appendix C.

The agenda (as it appear on the internet) for the seminar is given below:

AGENDA FOR COST 347 INAUGURAL SEMINAR- MEETING:

27th June 2001

Bundesanstalt für Straßenwesen (BASt), Bergisch Gladbach, Köln, Germany

PROGRAMME

8:30	Reception	
8:45	Welcome from BASt	
9:00	Multi-Media-Show of BASt	
9:30		Introduction to the Seminar
Session 1:	**Accelerated Loading Testing of Pavements**	
		Chairman: Mike Nunn
10:00	Gregers Hildebrand	COST 347 Overview [0.3MB]
10:15	John Metcalf	ALT: The Global Perspective [27.3MB]
10:45	Nick Coetzee	ALT: Current Focus in the US [18.9MB]
11:15		Coffee Break
11:30	Morris de Beer	ALT in South Africa .[59.1MB]
12:00	Brian Pidwerbesky	CAPTIF: New Zealand's Experiences [15.7MB]
12:30	Discussion	

13:00	Lunch	
Session 2:	**ALT Experiments and selected topics**	
		Chairman: Jacques Perret
14:00	Per Ullidtz	Theoretical Considerations [7.5MB]
14:25	Jari Pihlajamaki	HVS in Finland and Sweden [20.5MB]
14:45		Coffee Break
15:00	Morris de Beer	Stress-In-Motion (SIM) Technology [70.3MB]
15:30	Open discussion	
		Discussion leader: Andrew Dawson
16:30	Closing remarks	

There are also copies of the following documents which may be browsed on- line:

- Bryan Pidwerbesky's Summary of recent CAPTIF projects
- John Metcalf's Summary of ALT around the World
- Morris de Beer's ALT Axioms

4.1 Summary of seminar presentations (abstract from ALT newsletter)

Inaugural Seminar for COST 347

"On June 27 this year BASt hosted an inaugural seminar for COST 347 members and invited guests in

Cologne. The seminar was truely international with contributors from the USA, New Zealand, South Africa, Finland, Denmark, Switzerland and the UK. Gregers Hildebrand Chairman of COST 347 gave an overview of the Action that covered the objectives, organisation and deliverables (see separate article). He said that the Action would lead to a co-ordinated European approach and improved international co-operation and transfer of knowledge. This would result in a better understanding of pavement behaviour and improved methods of pavement design and maintenance.

The global perspective was provided by John Metcalf from the University of Louisiana. John Metcalf described the development of ALT facilities starting from the early 1900s. He covered the background, the range and types of facilities, their application to research and future directions research may take. The correlation of ALT data with LTPP data is of particular importance. He finished by pointing out that the ALT programs have shown the benefits to be real and sub-stantial, and that the magnitude of the effort involved in an ALT project is such that a partnership approach is the best and, probably, the only way to proceed.

Nick Coetzee of Dynatest Consulting Inc. and Chairman of TRB Committee A2B09 described the ALT ctivity taking place in the USA including the work of the TRB APT Forum under Task Force A2B52 and Committee A2B209. This was concerned with linking APT with pavement performance. Nick Coetzee briefly described the various ALT facilities in the States and summarised the important features of the test programmes being carried out.

Morris de Beer of CSIR gave two presentations describing ALT activities in South Africa. He first described the development of the Heavy Vehicle Simulator (HVS), its instrumentation and the subsequent work that has been carried out. He said the HVS had been the dominant force in South African pavement engineering for the last 25 years and it had led to many significant advances. Amongst these are the design of balanced pavements, upside down pavements, improved material and pavement design and design transfer functions.

Morris de Beer, in his second presentation, gave an interesting account of the innovative development of stress in motion technology at CSIR Transpotek. This technology seeks to understand the complex 3-D nature of tyre stress interaction and its effect on pavement performance. In pavement design the tyre/pavement interaction has been over-simplified. More rational methods of modelling pavement deterioration close to the tyre are possible using F-E techniques that incorporate 3-D tyre stresses.

Bryan Pidwerbesky of Fulton Hogan, described the New Zealand, Nation Road Authority's CAPTIF accelerated load facility. Since the facility was constructed in 1984, 14 major projects have been completed. Bryan Pidwerbesky pointed out that CAPTIF benefits by having to seek external research funds. This means that all projects are well focused and generally have a wide client base. This leads to a speedy translation of results into practice. The work is very cost effective and the estimated benefits outweigh the costs by at least 10 to1.

Per Ullidtz of the Technical University of Denmark dealt with theoretical aspects of ALT. The two main objectives were to verify response models and to develop performance models. The accuracy of instrumentation was a crucial issue. He said that non-linear models generally predicted pavement response better than linear elastic theory. He also described his work to relate deformation prediction and the measured performance in an ALT facility.

Jari Pilhajamaki of VTT described the joint research being carried out by Finland and Sweden using the HVS-NORDIC (see separte article).

To round off, Andrew Dawson from Nottingham University led a focused discussion on key issues raised during the day. It was felt that the Seminar was a extremely efficient way of giving the COST Members and their guests a good overview of ALT activities throughout the world. The COST Management Committee would like to thank the presenters for for their excellent contributions and BASt for providing the facilities and organisation. The Seminar presentations are available on CD which can be obtained from Gregers Hildebrand via the www.pave-test.org portal".

5. NOTES TAKEN DURING MEETINGS

The author took the following notes during the meetings:

- For road authorities in Europe the real life tests (RLT) vs ALT (or APT) is a very important issue;
- COST 347 started in October 2000, and will terminate in April 2004;
- Currently, 16 member countries part of COST 347 action;
- Any country in Europe can sign- up to participate in the COST actions;
- Messages from France indicate the following:
    - ALT too expensive;
    - Need for smaller ALT systems?;
    - Obliged to validate new materials;
    - View is to do laboratory first and then ALT.
    - Material validations:
    - Construction companies are urged to show performance;
- Prof. Metcalf noted that USA is moving towards thin surfacings;
- In the UK there is the so-called Highway approval schemes that need to be adhered to by companies and contractors;
- In USA private companies want to convince Caltrans to try out their new products – currently 87 requests;
- France is using reference materials in the laboratory;
- Problems exist when there is a product failure- there is a moratorium of 2 years on results.
- In Romania the view is that technology needs to be proven in ALT;
- Problems are in the hands of the Road Administration;
- Mr Andrew Dawson of Nottingham University mentioned that there a laboratory demonstration project is needed firstly, before EU funding may be obtained;
- In Denmark the view is that RLT (Real Load Testing) and ALT are considered ***public assets***;
- The calculation of Benefit/Cost Ratios (B/C) compulsory in New Zealand – and guidelines for calculation is available – Benefits to be quantify- still a problem area;
- Influences of “boxed-in” ALT test configurations – not sure if a 5 m wide test pit could influence ALT results;
- USACE ERDC (WES) constructed own test sections for ALT device (HVS Mk V, Airport tyres);
- In Sweden, good control over construction of ALT test sections;;
- Spain at CEDEX, contractor required to construct ALT test section as would normally be done on a real site;
- In France: Standard private contractors, but special conditions in contract. LCPC do own quality control on construction – mainly density and layer thickness control;
- On reduced scaled ALT devices:
    - Better quality construction and quality control?;
    - Availability of Machine data?;
    - Interpretation of pavement response data?;
    - Automatic metrological information from Internet – NB;

- Format of data important for purposes of comparison;
- Pavement measurements – difficult – It was stated that the person using the ALT data should also drive the capturing of the data;

6. SIX WORKING GROUPS AND CHAIR PERSONS

1. Working Group 1: Inventory: Angle Mateos;
2. Working Group 2: Research: Jean Louis Gordon (LCPC, France);
3. Working Group 3: ALT vs RLT : Me Gudrun Golkowski (BASt, Germany);
4. Working Group 4: Common code of good practice: Gregers Hildebrand (Denmark);
5. Working Group 5: Future use of ALT: Nicolas Odermatt (Sweden);
6. Working Group 6: Dissemination: Dr Mike Nunn (TRL, UK);

7. COMMENTS ON MEETING DURING WORK PACKAGE 2 (WP - 2) : - ALT RESEARCH

This committee chaired by Jean Louis Gordon (France) raised the following issues:

- ALT Data summary forums to be held;
- References needed on B/C ratios and socio-economic impact from client bodies (not researchers) – use New Zealand example – Dr Bryan Pidwerbesky;
- RLT vs ALT – info needed (ratios ?);
- ALT costs to be expressed as percentage of annual maintenance cost of road networks;
- ALT users to be aware of conferences, symposia, etc;
- ALT to be used to improve recycling technologies on existing or waste materials, including old tyres and bitumen binders;
- Socio-economic benefits to be highlighted – score “ECO-POINTS”;
- Questionnaire to be send out from COST 347 be aware and assist;

8. COMMENTS ON MEETING DURING WORK PACKAGE 4 (WP - 4) : - COMMON CODE OF GOOD PRACTICE

The chairman Gregers Hildebrand noted the following:

- Need for a common code of good practice for the application of ALT;
- Road markings *and* pavement response to be evaluated;
- Questionnaire and synthesis to be done;
    - ALT Facilities;
    - Pavement Conditions;
    - Pavement Instrumentation;

- COST 347 and TRB A2B09 APT Committee to work together;
- COST 347 timetable to be updated;
- B/C analysis;
- Next meeting: Brussels: 8/9 November 2001
- Following-up meeting: March 2002 –Athens

9. FINAL MANAGEMENT MEETING

Mr Magnus Carle of COST Management stated that they invite CSIR Transportek to consider official membership of the COST 347 Committee – may be through a MoU. Mr Hendricks and Verhaeghe to comment and suggest how to join.

The COST LOGO was accepted, as given below:

Figure 3 COST 347 LOGO

- Mr Carle also ask the Working Groups to suggest scientific proposals;
- He further stated that the seminar during the inaugural meeting was a good example of outreach, and sharing of new ideas;
- All website info to be forwarded to Mr Andrew Dawson (Nottingham University);
- Official Website of COST 347: http://www.pave-test.org;
- ALT/APT discussion groups to be generated on the web site;
- Site should include frequently ask questions and answers;

10. SUMMARY AND CONCLUSIONS

In summary Mr Gregers Hildebrand of the Road Directorate, Danish Road Institute concluded that the seminar was very informative. It seems that researchers in ALT technology talk more and more the

same language. There are similarities in strategies, etc. However, there is a need for more *harmonisation* in pavement performance and response measuring methods. The socio-economic aspects of ALT should also be highlighted.

Mr Magnus Carle of COST Management stated that they invite CSIR Transportek to consider official membership of the COST 347 Committee – may be through a MoU. Mr Hendricks and Verhaeghe to comment and suggest how to join.

If CSIR Transportek want to co-operate with Europe on COST 347- ALT/APT, then it is suggested that Management to consider the invitation positively, with the implications of associated HR and running expenses for this action.

APPENDIX A: COST 347 OVERVIEW AND WORK PAKAGES (WP)

Table A1: COST OVERVIEW: BY GREGERS HILDEBRAND: CHAIRMAN OPF COST 347

COST 347
Improvements in Pavement Research with Accelerated Load Testing

COST 347 OVERVIEW

GREGERS HILDEBRAND

ROAD DIRECTORATE, DANISH ROAD INSTITUTE

COST 347
Improvements in Pavement Research with Accelerated Load Testing

Background

- Analytical pavement analysis and design
- Pavement tests
- European activities in ALT
- COST Actions
- International activities in ALT

COST 347
Improvements in Pavement Research with Accelerated Load Testing

Main objective

To develop a European code of good practice to optimise the use of Accelerated Load Testing facilities and improve the application of results from these facilities

COST 347
Improvements in Pavement Research with Accelerated Load Testing

Secondary objectives

- Enable future cost-sharing co-operative research ventures between public and private sector research institutions and companies
- Improve the possibilities for non-owner institutions to make use of existing ALT facilities
- Provide the background for beneficial co-operation with related research activities outside Europe in the future

COST 347
Improvements in Pavement Research with Accelerated Load Testing

Organisation

- ALT inventory
- Previous and current research
- ALT versus RLT
- Common code of good practice
- Future use of ALT
- Dissemination

COST 347
Improvements in Pavement Research with Accelerated Load Testing

Deliverables

- WP 1 Inventory
  - Facilities
  - Instrumentation
  - Condition evaluation
- WP 2 Research
  - Past European tests
  - Literature review
  - Socio-economic considerations
  - Test-facility matrix

Table A1 Cont.

COST 347
Improvements in Pavement Research with Accelerated Load Testing

Deliverables

- WP 3
  ALT vs. RLT
  - European RLT sections
  - ALT
  - RLT
  - ALT vs. RLT
- WP 4
  Common code of good practice
  - Research topics in ALT -> facility requirements
  - Research topics not in ALT
  - Design of new or improved facilities

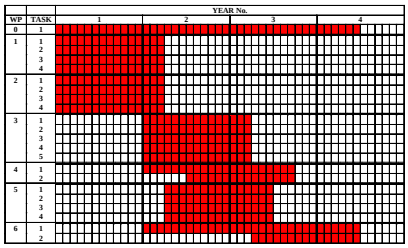
COST 347
Improvements in Pavement Research with Accelerated Load Testing

Deliverables

- WP 5
  Future use of ALT
  - Materials
  - External influence factors
  - Mechanical properties vs. condition
  - Lab. vs. ALT vs. field
- WP 6
  Dissemination
  - Conferences
  - Articles
  - Web sites
  - News letters
  - Personal communication

COST 347
Improvements in Pavement Research with Accelerated Load Testing

Time Schedule



COST 347
Improvements in Pavement Research with Accelerated Load Testing

Participants

Austria	France	Netherlands	Switzerland
Belgium	Germany	Romania	United Kingdom
Czech Republic	Greece	Slovenia	
Denmark	Hungary	Spain	
Finland	Iceland	Sweden	

COST 347
Improvements in Pavement Research with Accelerated Load Testing

Benefits of COST 347

- Harmonisation of European efforts within the field
- Improved methods for pavement design
- Transfer of knowledge within Europe
- Improved co-operation with parallel international activities

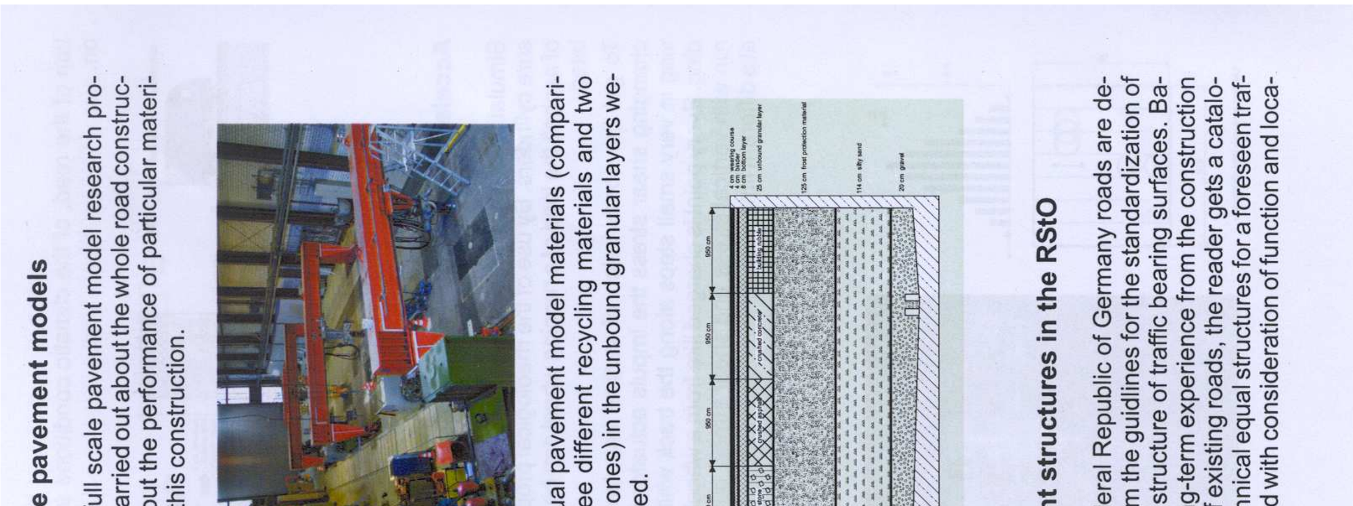
COST 347
Improvements in Pavement Research with Accelerated Load Testing

Co-operative efforts

- Among current and future European ALT owners
- Among pavement researchers in Europe and internationally
- Among ALT owners and potential (private) customers
- Among ALT owners world-wide

APPENDIX B: ALT NEWS LETTER (4-PAGES)

APPENDIX C: SOME INFORMATION AND FACILITIES AT BASt, Germany



e pavement models

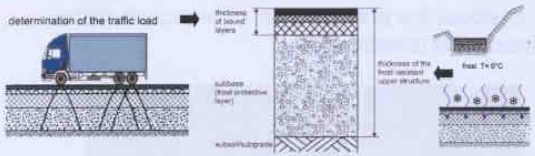
ull scale pavement model research pro-
arried out about the whole road construc-
out the performance of particular materi-
this construction.

ual pavement model materials (compari-
ee different recycling materials and two
ones) in the unbound granular layers we-
ed.

nt structures in the RStO

eral Republic of Germany roads are de-
m the guidlines for the standardization of
structure of traffic bearing surfaces. Ba-
g-term experience from the construction
f existing roads, the reader gets a catalo-
nical equal structures for a foreseen traf-
d with consideration of function and loca-

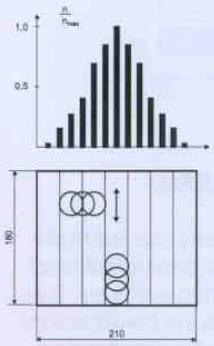
tion of the road, of the climatic conditions and so on.



Accelerated loading

Simulation of traffic load is done by hydraulic pressure cylinders. By use of the rheological properties of asphalt the load of a running wheel can be simulated.

To get the combination of vertical impulses and changing shear stress the impuls actuator is moving in very small steps along the track while loading. Every point is charged like from a wheel overrun with vertical stress and shear stress, but each at a different time.



Loading area with load distribution

Tasks:

- Basic problems concerning the different stress and strain situations of pavement constructions
- Design of pavement constructions
- Testing about the different stress and strain situations of roads and pavement surfaces
- Measurement and assessment of the mechanical properties of road constructions (bearing capacity, layer properties)
- Dynamic material testing
- Nuclear test methods
- Measurement and rating of the functionality of construction machinery

Current research projects:

Axle load and stress distribution on federal highways

Investigation of seasonal effects on measurement and assessment of the bearing capacity

Measurement of real loading in a full scale pavement model

Accelerated load testing on concrete pavements in a full scale pavement model

Assessment of structural condition of bound layers (fatigue of asphalt)

Comparison of deformation performance of F1-subsoils and frost protection layers

Automatic compaction control

Comparison of the lifecycle costs of different pavement structures

Thickness measurement with ground penetration radar

additional there is activity in national and international research commitees.

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full scale pavement model
accelerated load testing
pavement structures
laboratory testing

bast section S4
pavement testing and design

PHOTOT2: APT DEVICE AT BASt

PHOTO 3: Electromagnetic Propulsion tyre test (road noise, etc) device

PHOTO 4: Circular Pavement markings test facility