Review of Performance Based Contracting in the Road Sector

Phase 2: Review of Training Materials and Resources

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REVIEW OF PERFORMANCE BASED CONTRACTING IN THE ROAD SECTOR
PHASE 2: REVIEW OF TRAINING MATERIALS AND RESOURCES
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The support of Performance Based Contracts (PBCs), from initial concept to final delivery, is essential if the best outcomes are to be achieved for the road users. This report, completed as part of the Opus International Consultants overall review of PBCs for the World Bank under contract 7158253, focuses on the existing training materials and resources available and provides recommendations on the updating, expansion or creation of materials to increase the chances of overall success.

The report recommends a more structured approach to the materials available, with a clearer intent on the audience and the topics addressed. Although some material would be duplicated between the audiences, it is recommended that materials be developed that focus specifically on:

- The Executive Level
  - World Bank Staff
  - Government/Road Agency Exec Management
- The Management Level
  - Road Agency “Owner” of the PBC
  - Agency Procurement Team
- The Delivery Teams
  - Road Agency contract management team
  - Consultants and
  - Contractors.

Based on the review, a modular “topics of focus” approach to the training and resource materials is recommended, with the following modules included to address the primary issues that have been observed to be hampering success:

- Introduction/Objectives of Asset Management and how PBC facilitates the paradigm shift;
- PBC Types and Case Studies;
- Structuring the PBC according to AM Strategy;
- Governance Structures (and the impact of outsourcing on the Road Agency);
- Contract Development;
- Tender Process;
- Risk Management; and
- PBC Delivery.

The review has also considered the means of delivery of the training, with a mix of face-to-face and remote training considered appropriate for various levels of training.
2.1. BACKGROUND TO ASSIGNMENT

Performance Based Contracts (PBC's) are not new to the transport sector, with many variants in use in different countries for close to two decades. International lending institutions – such as the World Bank – have played a significant role in pushing PBCs into developing nations as part of loan assistance packages.

However, there has been a tendency for a “one-size-fits-all” approach to the implementation, with the result being a variation in the success of any implemented PBCs, as well as a significant proportion of the proposed PBCs not making it to the contract award stage. To address these issues, the World Bank has commissioned a Review of Performance Based Contracting in the Road Sector (contract number 7158253) led by Opus International Consultants Limited.

Outputs from the project to date include:

- Phase 1 report covering the review of previous PBCs (Opus 2011)
- A guide for the application of PBCs (Opus, 2012a)
- Points to guide Bank implementation of PBCs (Opus, 2012b)
- This review of existing training materials and resources.

2.2. PURPOSE OF THIS TASK

The purpose of this task is to review the existing training materials and resources available within the Bank for PBCs in light of the recommendations from Opus (2011, 2012a and 2012b) and provide a summary in terms of:

- What is fine to continue using
- What is no longer relevant and should be discontinued and
- What gaps exist that need new material developed.

The task incorporated feedback received from PBC implementers on the existing materials, including responses to the questionnaire (Opus, 2011) on which materials were used (and how useful were they) by the various PBC team leaders.
3 A REVIEW OF AVAILABLE TRAINING MATERIAL AND RESOURCES

3.1. PURPOSE OF THIS TASK

Feedback received from the case studies (Opus, 2011) suggested that parties involved found the resources such as the sample bidding documents useful but still felt that there were a number of areas where more assistance was needed. Often the implementations were undertaken by Bank staff, consultants and contractors, none of whom had prior experience with PBC contracts. In addition to that, many of the “failed” projects, in particular the one’s that never got off the ground, failed because there were some misunderstandings from government officials regarding the PBC process or the aims it is trying to address.

Opus (2011) highlighted that PBCs can only be successful if it is adopted within the appropriate institutional context and readiness. From the Bank resource guide (and other readily available material) there are a significant number of presentations and reports that describe the intent of a PBC, or which present case studies of specific implementations. There is very little material though, which provides guidance on how to progress a PBC from initial concept through to having a successful contract in place.

Once the decision to adopt a PBC is made (i.e. the “why” question has been answered to the satisfaction of the executive level and they have brought into the concept), the guidance on the “how to” aspects of the implementation needs to be enhanced. For example, the risk sharing principle is explained in some presentations, yet the practical implication and guidance of how to develop a risk sharing framework for a particular contract is limited. The same applies to the development of the tender document and contracts. There are certain fundamentals that are essential to procurement options and if not well understood, some impractical changes or omissions may cause downstream difficulties with the projects.

3.2. RECOMMENDED CHANGES TO CURRENT FRAMEWORK

Based on the review and the feedback from the case studies (Opus 2011), the following recommendations are made in order to increase the value form both the training presentations and resources:

- **Target Audience/Focus and Training Levels** – The training resources on PBC are extensive, yet most of it is of a general nature and does not target a specific audience. This has resulted in most of the presentations being very long.
Additionally, most of the presentations lack a clear topic of focus (e.g. risk management). It is recommended to adopt a modular training material framework that collates material for specific parties within the PBC environment, and for specific topics. This will not only allow for specific issues to be covered by the respective modules, but it will result in material to be more relevant to the target audience. Although some material would be duplicated between the audiences, it is recommended that materials be developed that focus on:

- **The Executive Level.** At this level the aim is to raise awareness of the benefits and issues of PBC implementation, the need for good AM practice and related prerequisites. The focus is to answer the question of “why should I consider PBC for my network” with the target audience being:
  - World Bank Staff
  - Government/Road Agency Exec Management

- **The Management Level.** At this level the focus moves on to the fundamental principle levels and addresses the question of “how to procure a PBC”. The audience for this level would consist of:
  - Road Agency “Owner” of the PBC
  - Agency Procurement Team

- **The Delivery Teams.** At this level there would be specific details on the issues that need to be understood from those directly involved in the PBC to enhance the chances of success. The question is “how to make it work on the ground” would be answered with a target of:
  - Road Agency contract management team
  - Consultants and
  - Contractors.

- **Modular Framework** – The existing Bank training material are split into the following categories:
  - General PBC
  - Procurement
  - Road Maintenance
  - Country/Region Specific

It is recommended to structure the material into more specific topic areas/modules. It is noted that the modules identified below would need to be aligned to each of the three levels of audience noted above. The following modules should be included to the current structure:

- Introduction/Objectives of Asset Management and how PBC facilitates the paradigm shift;
- PBC Types and Case Studies;
- Structuring the PBC according to AM Strategy;
- Governance Structures (and the impact of outsourcing on the Road Agency);
- Contract Development;
- Tender Process;
- Risk Management; and
- PBC Delivery.

Subsequent sections contain more detail discussions of these modules.
4 ASSESSING THE STATUS OF CURRENT RESOURCES

4.1 TRAINING MATERIAL

Appendix 1 contains a listing of the materials reviewed as part of this review. The assessment of the existing training material is summarized in Table 1. The table categorized the current material availability into the following categories:

- Existing material is adequate;
- Repackage existing material – this imply that the material has to be split up into the suggested sector groups and module levels. The intent is to focus presentations for a very specific topic area;
- Enhance existing material, suggesting that there are some current material could be combined with new development in order to complete the respective modules; and
- New development will largely involve full development of the modules indicated.

As can be observed from the table, there is significant material available, especially in the introduction of PBC concepts. Furthermore, there has been excellent work completed in the case study area and the wider benefits and lessons learned from PBCs. The primary areas where more and/or new development is required include:

- Introduction/Objectives of Asset Management and how PBC facilitates the paradigm shift;
- Structuring PBCs according to wider asset management objectives; and,
- Most of the implementation stages of PBC including governance, contract development, tendering and risk sharing.
# Table 1: Assessment of the Status for Existing PBC Training Material

<table>
<thead>
<tr>
<th>Level</th>
<th>Audience</th>
<th>Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Introduction / Objectives for PBC</td>
</tr>
<tr>
<td>Executive Level</td>
<td>World Bank</td>
<td>R</td>
</tr>
<tr>
<td></td>
<td>Government/Road Agency Exec</td>
<td>R</td>
</tr>
<tr>
<td></td>
<td>Management</td>
<td>R</td>
</tr>
<tr>
<td>Management Level</td>
<td>Road Agency &quot;Owner&quot; of the PBC</td>
<td>R</td>
</tr>
<tr>
<td></td>
<td>Agency Procurement Team</td>
<td>R</td>
</tr>
<tr>
<td>Delivery Team</td>
<td>Road Agency contract management team</td>
<td>R</td>
</tr>
<tr>
<td></td>
<td>Consultants</td>
<td>R</td>
</tr>
<tr>
<td></td>
<td>Contractors</td>
<td>R</td>
</tr>
</tbody>
</table>

**Legend:**

- **Existing material is adequate** (A)
- **Repackage** (R)
- **Enhance existing** (E)
- **New development** (N)
- **No material needed** (-)
4.2. DOCUMENTS AND OTHER RESOURCES

A similar review has also been completed on the supporting documentation and other resources available to support PBC implementation. The summary of this review is presented in Table 2.

It is noted that the completeness of coverage of the contents documented on PBCs significantly exceeds that of the training material (as summarized in Table 1), with most of the areas within the delivery spectrum of PBC having been documented in one form or another. It is noted that some of the materials are partly documented across a number of publications and may appear fragmented to the reader.

The vast range of publications in this area results in the reader having to undertake an intensive literature review in order to get a complete picture of specific topics, and/or to determine what is "best practice" rather than “best to avoid practice”. For this reason there are three main recommendation regarding the documentation and resources on PBCs:

- Developing a **compendium/library** for the documentation. In essence this library already exists on the Banks PBC resource website – the recommendations is to expand the headings in the modular structure that covers the full range of PBC delivery and clearly index all materials to the relevant headings;

- Some of the topic areas are adequately covered in various publications but in a fragmented manner. It is recommended to **summarize/consolidate** some of these documents into a single Road Note or guideline. An excellent example of such publications is the guideline note titled: “Structuring Output-based Aid Approaches in World Bank Group Operations” This document is focused in a very specific area that summarized the main considerations for the topic thus increasing its value to the reader;

- **Specific resources** such as contract type templates are increasing consistency and efficiency for the implementations across many countries and this approach would be promoted for all commonly needed areas. Examples of needed resources include:

  - Contract templates (sample bidding documents) for most commonly used PBC contract variations (refer to Opus 2011 and 2012a);

  - Summarizing the value of PBC for senior government officials in a road note. The first question many senior government officials will ask when considering PBC is “Give me some examples of how much money can be saved when using PBCs?” Any implementer knows the complexity of this question as PBC offers many other benefits that do not necessary include cost savings (especially short term cost savings that may be in conflict with the whole-of-life costing principles of asset management). There needs to be single document explaining the benefits with evidence/data from existing case studies that demonstrate how some of these benefits
were achieved. The Guide (Opus 2012a) covers a significant component of this, but is potentially too long to create/stimulate the initial interest;

- Standardized risk register that can be used to decide/define risk sharing concepts in tender documents and more importantly communicating the issues faced in a region.
### TABLE 2: ASSESSMENT OF THE STATUS FOR EXISTING PBC DOCUMENTS AND RESOURCES

<table>
<thead>
<tr>
<th>Modules</th>
<th>Introduction /Objectives for PBC</th>
<th>PBC Types and Case Studies</th>
<th>Structuring according to AM Strategy</th>
<th>Governance Structures</th>
<th>Contract Development</th>
<th>Tender Process</th>
<th>Risk Management</th>
<th>PBC Delivery</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Executive Level</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>World Bank</td>
<td>A</td>
<td>A</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>R</td>
<td>R</td>
<td>R</td>
</tr>
<tr>
<td>Government/Road Agency Exec Management</td>
<td>A</td>
<td>A</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<td>-</td>
</tr>
<tr>
<td><strong>Management Level</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Road Agency “Owner” of the PBC</td>
<td>A</td>
<td>A</td>
<td>E</td>
<td>-</td>
<td>-</td>
<td>R</td>
<td>R</td>
<td>R</td>
</tr>
<tr>
<td>Agency Procurement Team</td>
<td>A</td>
<td>A</td>
<td>E</td>
<td>R</td>
<td>E</td>
<td>R</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Delivery Team</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Road Agency contract management team</td>
<td>A</td>
<td>A</td>
<td>E</td>
<td>R</td>
<td>E</td>
<td>R</td>
<td>N</td>
<td>R</td>
</tr>
<tr>
<td>Consultants</td>
<td>A</td>
<td>A</td>
<td>E</td>
<td>R</td>
<td>E</td>
<td>R</td>
<td>N</td>
<td>R</td>
</tr>
<tr>
<td>Contractors</td>
<td>A</td>
<td>A</td>
<td>E</td>
<td>R</td>
<td>-</td>
<td>R</td>
<td>N</td>
<td>R</td>
</tr>
</tbody>
</table>

**Legend:**

- Existing material is adequate: A
- Repackage: R
- Enhance existing: E
- New development: N
- No material needed: -
5 DELIVERY OPTIONS

5.1 REVIEW OF DELIVERY OPTIONS

A key aspect of training is the means by which it is delivered. While there is little doubt that face-to-face training delivers the best outcome, there are other well established means of providing training that greatly reduces the costs associated with delivering and receiving training. On the basis of the three different levels of training required (Executive, Management and Delivery Teams), the suitability of training delivery options has been assessed.

The options under consideration are:

- **Workshops and seminars**: These are the traditional means of delivering training, and involve the trainer using prepared materials and travelling to the location of the clients’ project team. Results are best when a high level of interaction occurs, which can be difficult in large groups.

- **Web-Based Training**: Various technical solutions exist ranging from largely one-way (passive audience) to two-way (active audience) solutions. While suitable to some situations, the lack of interaction could pose significant challenges when training is delivered across cultural boundaries (as is typical for PBCs).

- **Pre-Recorded Videos**: While watching videos of training sessions delivered elsewhere can in its own right be a training means, it is considered that this approach is most successful when used as a basis for guiding discussions, wherein the video is stopped regularly and a trainer in the room with the trainees then leads discussion on the topic just viewed.

- **Self-Study**: This is generally considered a good means once the fundamentals of the subject matter have been understood. It is therefore considered more as a supporting means of delivering the training, rather than a replacement for either of the above methods.

To support increasing demand for PBC’s, there is likely a need to increase the number of competent trainers on PBCs. Consideration of a “train-the-trainers” course may well be a suitable means of both ensuring the quality of training delivered, as well as ensuring the quantity of trainers is available.
### 5.2 RECOMMENDED DELIVERY OPTIONS

Based on the training delivery options above, and the courses to be delivered, Table 3 presents the recommended delivery options.

<table>
<thead>
<tr>
<th>Audience</th>
<th>Workshops / Seminars</th>
<th>Web-Based Training</th>
<th>Pre-Recorded Videos</th>
<th>Self-Training</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Executive</strong></td>
<td>Ideal, especially as target audience is small in numbers and it is essential that full buy-in to the PBC concepts is understood to provide leadership to the initiative.</td>
<td>Potentially ok if venue and IT is suitable. Executive level is likely to be more open to asking questions across a web-based delivery means.</td>
<td>Suitable as a refresher to enable clients to study specific topics as/when required, or to support other training. Not considered suitable as a primary means of training.</td>
<td></td>
</tr>
<tr>
<td>Teams</td>
<td>either small training groups, or that a larger group is regularly split into small discussions to ensure attendees feel comfortable asking questions. This is especially so in some cultures where there is a general reluctance to ask questions in large groups or in front of one’s manager.</td>
<td>training on technically challenging material across a web-based training means, especially when the cultural challenges are added.</td>
<td>enable clients to study specific topics as/when required, or to support other training. Not considered suitable as a primary means of training.</td>
<td>topics to cover, self training is likely to be suitable only as an extension of subjects taught, and not as a primary means of training.</td>
</tr>
</tbody>
</table>
6 RECOMMENDED DEVELOPMENTS

6.1 TRAINING MATERIAL

The training material development needs are summarized in Table 4. Note that “repackaging” of material pertains to the task of taking existing materials and compiling a new presentation focused on a very specific topic area within the PBC delivery range.

<table>
<thead>
<tr>
<th>Module</th>
<th>Development Need</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction/Objectives for PBC</td>
<td>Repackage existing material in order to give relevant focus to different sector groups. For example introduction presentations with a focus such as “What PBC means to the contractor?”</td>
</tr>
<tr>
<td>PBC Types and Case Studies</td>
<td>Adequate presentations exist within this area. They just require clear referencing to the relevant PBC model type (DBMOT, Network Management etc., as per Opus (2012a))</td>
</tr>
<tr>
<td>Structuring according to AM Strategy</td>
<td>New presentation materials is required that explains linking asset management objectives to both management and project owner level. For example this topic area should include aspects such as:</td>
</tr>
<tr>
<td></td>
<td>Understanding your current network performance - performance monitoring principles and/or benchmarking;</td>
</tr>
<tr>
<td></td>
<td>Understanding life-cycle cost aspects on the network;</td>
</tr>
<tr>
<td></td>
<td>Identifying inefficiencies of a network and the way it is managed;</td>
</tr>
<tr>
<td></td>
<td>Understanding network traffic capacity and impacts of improved road conditions; and</td>
</tr>
<tr>
<td></td>
<td>Understanding pavement loading capacity on network level and associated strategies to manage this in the contract.</td>
</tr>
<tr>
<td>Governance Structures</td>
<td>Material discussing appropriate contract governance structures for different contract types.</td>
</tr>
<tr>
<td>Module</td>
<td>Development Need</td>
</tr>
<tr>
<td>---------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Contract Development| Current training material covers this topic fairly well. Most of this is focused around fundamental PBC specific contractual aspects. The areas that needs expansion via tailored training include:  
  Specific training material that explains the difference between PBC and traditional contracts. Some road agencies feel reluctant to move away from traditional contract clauses and often slow down the implementation process as a result of extensive rewriting (and subsequent approval process of changes);  
  Specific training is also required in the process of developing specifications for network performance. Few network managers understand how to develop outcome based specifications that will drive the right outcomes yet provide “space” for the contractor to be efficient and effective in their work practices. |
| Tender Process      | Few resources exist on the actual tendering process. In contrast to traditional contracts there are some aspects that need to be explained to implementers including:  
  Methods and value of information sharing;  
  Different techniques used in tender assessment;  
  Utilising an interactive tendering process.                                                                                              |
| Risk Management     | Fundamental risk sharing principles are well covered; more material must be developed to cover the practicalities and identification of specific risks for the intended contract area. This includes the use of standard definitions of risks, and risk boundaries.                                                                                      |
| PBC Delivery        | New material has to be developed to give implementers an idea of the “how-to” aspects in running a PBC. Apart from covering the day-to day activities related to the management of a contract by outcomes (as opposed to directing via inputs or outputs), training is also required to include scenarios of the contract not going the way it is intended to. |


APPENDICES

LIST OF RESOURCES REVIEWED

Presentations/Training Resources
From World Bank Website

   Regional Seminar on Performance-Based Management and Maintenance Contracts,
   Arusha, Tanzania
   February 2008
   Also available as PDF file.

   Regional Seminar on Performance-Based Management and Maintenance Contracts,
   Arusha, Tanzania
   February 2008
   Also available as PDF file.

   Regional Seminar on Performance-Based Management and Maintenance Contracts,
   Arusha, Tanzania
   February 2008
   Also available as PDF file.

   VicRoads International from Australia
   Workshop organized with the Egypt Road Authority (GARBLT)
   February 2008
   Also available as PDF file.

5. "Public Private Partnerships as an Option to Speed Up Investments in Intermodal Infrastructure and Services," César Queiroz, Transport Infrastructure Consultant, World Bank
   InterBaltic Final Conference: “A Future Transport Policy for the Baltic Sea Region,”
   Klaipeda, Lithuania,
   19-21 November 2007
   Also available as PDF file.
## Various Presentations

<table>
<thead>
<tr>
<th>TITLE</th>
<th>AUTHOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance-based Contracts in the Road Sector under World Bank funded projects</td>
<td>Andreas Schliessler</td>
</tr>
<tr>
<td>Performance Based Contracts in The Road Sector</td>
<td>unknown</td>
</tr>
<tr>
<td>The Development of WB Sample Bidding Documents for Performance-based Road Contracts</td>
<td>Andreas Schliessler</td>
</tr>
<tr>
<td>Performance Based Contracting in Eastern Europe. Word Bank PBC Resource Guide</td>
<td>César Queiroz</td>
</tr>
<tr>
<td>Output and Performance Based Road Contracts (OPRC) in Roads Asset Management</td>
<td>Yitzhak Kamhi</td>
</tr>
<tr>
<td>Framework for Introducing OPRC</td>
<td>Christopher R. Bennett</td>
</tr>
<tr>
<td>The Review of Performance-based Contracting in the road sector and the guideline for implementation</td>
<td>Katsuya ABE</td>
</tr>
<tr>
<td>Road Maintenance and Performance-Based Contracting</td>
<td>Asif Faiz</td>
</tr>
<tr>
<td>Performance Based Contracting in Estonia. Word Bank PBC Resource Guide</td>
<td>César Queiroz</td>
</tr>
<tr>
<td>Performance Based Contracts in the Road Sector</td>
<td>Eric Lancelot</td>
</tr>
<tr>
<td>Output- and Performance-based Road Contracts (OPRC)</td>
<td>Unknown</td>
</tr>
<tr>
<td>Implementing Output and Performance-Based Contracting</td>
<td>Ben Gericke</td>
</tr>
<tr>
<td>Practical Guidance to Procure Output- and Performance-Based Road Contracts (OPRC) under Bank-Financed Projects</td>
<td>Patricia Baquero</td>
</tr>
<tr>
<td>Use of OPRC contracts through small local enterprises using labor-based methods</td>
<td>Gerardo W. Flintsch</td>
</tr>
<tr>
<td>Argentina Performance-Based Road Rehabilitation And Maintenance Contracts (CREMA)</td>
<td>Marcela Silva</td>
</tr>
</tbody>
</table>
From World Bank Website (http://www.esd.worldbank.org/pbc_resource_guide/resources-publications.htm#general)


Procurement


Road Maintenance


Country/Region Specific


From project Literature Search

<table>
<thead>
<tr>
<th>Reference</th>
</tr>
</thead>
</table>
| Title: Transacting under a performance-based contract: the role of negotiation and competitive tendering  
Personal Author: Hensher, DA (University of Sydney Institute of Transport and Logistics Studies)  
Name of Conference: International Conference on Competition and Ownership in Land Passenger Transport, 10th, 2007, Hamilton Island, Queensland, Australia  
Source: DATE: 2007-08, PAGES: 17p [performance based contracts], PUBLISHER: University of Sydney. Institute of Transport and Logistics Studies, T: Sydney, S: New South Wales, C: Australia |
| Title: Sample bidding document: procurement of performance-based management and maintenance of roads (output-based service contract)  
Corporate Author: World Bank  
| Highway management, the highway highlanders way  
Issue Title: Proceedings - 21st ARRB and 11th REAAA Conference, Transport Our Highway to a Sustainable Future  
Publication Date: 20031201 |
| Title: Transacting under a performance-based contract: the role of negotiation and competitive tendering  
Personal Author: Hensher, DA (University of Sydney Institute of Transport and Logistics Studies); Stanley, J (Bus Association Victoria)  
Name of Conference: ARRB Transport Research Ltd Conference, 19th, 1998, Sydney, New South Wales, Australia  
| Title: Risk management in new performance-based contracts  
Personal Author: van der Zwan, J; van Dommelen, A; Schut, E  
Name of Conference: Transport Research Arena Europe, 2008, Ljubljana, Slovenia  
Source: DATE: 2008-04, PAGES: 8p, PUBLISHER: Road and Transportation Research Association of Slovenia, T: Ljubljana, C: Slovenia |
| Modelling R&M in performance based contracts - When does risk equal reward? Jacobino, Andrew  
Proceedings - Annual Reliability and Maintainability Symposium VOL ISSU PAGE 142-146 DATE 2007 |
| Title: Risk issues in performance-specified flexible paving contracts  
Personal Author: Gallagher, PJ (Australian Asphalt Pavement Association); Mangan, DA (Australian Asphalt Pavement Association)  
Name of Conference: ARRB Transport Research Ltd Conference, 19th, 1998, Sydney, New South Wales, Australia  
| Risk-Based Model for Valuation of Performance-Specified Pavement Maintenance Contracts  
by Ivan Damnjanovic, (Asst. Prof., Zachry Dept. of Civ. Engrg., Constr. Engrg. and Mgmt. Group, Texas A&M Univ., College Station, TX 77843 (corresponding author). E-mail: idamnjanovic@civil.tamu.edu) and Zhanmin Zhang, (Assoc Prof., Dept. of Civ. Engrg., Transp. Engrg. Group, The Univ. of Texas at Austin, 1 University Station C1761, Austin, TX 78712. E-mail: z.zhangx+mail.utexas.edu)  
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<td>Title: Transacting under a <strong>performance-based</strong> contract: the role of negotiation and competitive tendering&lt;br&gt;Personal Author: Hensher, DA (University of Sydney Institute of Transport and Logistics Studies); Stanley, J (Bus Association Victoria)&lt;br&gt;Source: PN: Transportation Research, Part A-Policy and Practice, VOL: 42A, NO: 9, DATE: 2008-11, PAGES: 1143-51</td>
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<td>Title: Pavement and surfacing condition in Western Australia with ten-year maintenance contracts&lt;br&gt;Personal Author: Kennedy, D (Main Roads Western Australia); Peters, B (Main Roads Western Australia)&lt;br&gt;Name of Conference: ARRB Conference, 23rd, 2008, Adelaide, South Australia, Australia&lt;br&gt;Source: DATE: 2008-07, PAGES: 16p, PUBLISHER: ARRB Group Ltd, T: Vermont South, S: Victoria, C: Australia, ISSN: 0572-1431, ISBN: 1876592540 Pagination: 16</td>
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<td>Title: Effectiveness of <strong>performance</strong> indicators in managing road networks&lt;br&gt;Personal Author: Kadar, P (MWH Australia); Henning, T (MWH New Zealand); Parkman, C (Transit New Zealand)&lt;br&gt;Name of Conference: ARRB Conference, 22nd, 2006, Canberra, ACT, Australia&lt;br&gt;Source: DATE: 2006-11, PAGES: 15p, PUBLISHER: ARRB Group Ltd, T: Vermont South, S: Victoria, C: Australia, ISSN: 0572-1431, ISBN: 1876592494</td>
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