Delivering Good Asset Management in the Road Sector Through Performance Based Contracting

Tony Porter, Ian Greenwood, Theuns Henning, and Katsuya Abe

The authors acknowledge the contributions of Graeme Dunnet, Gerardo Flintsch, Peter O’Neil, Kulwinder Rao, Asif Faiz, and Ben Gericke in preparing this Transport Note.

The road sector represents a significant asset to any country – both in terms of the physical cost to build it, and the social and economic benefits that it facilitates. Good asset management in the road sector is about obtaining the desired benefits at the least whole-of-life cost, and it is therefore natural to seek to implement a robust asset management approach on what is typically a nation’s largest asset.

Performance based contracting (PBC) necessitates the identification of many of the cornerstones to asset management, such as knowing your asset, managing risks and determining the sustainable level of service for the funds available. Performance based contracting is therefore a proven method to deliver a paradigm shift in all parties responsible for the management and preservation of the road infrastructure, including addressing construction quality issues, delivering consistent levels of service and reducing the opportunities for corruption.

The document is intended to provide World Bank transport sector staff, Ministries of Transport and road agencies of developing and transition countries with a summary understanding of the benefits, and risks, of applying the PBC approach. The aim of this note is to help the reader understand:

- What asset management is and why it is important;
- How performance based contracting delivers good asset management; and
- What the issues and challenges are to successfully implementing a performance based contract.

This note is supported by the Review of Experience (Opus 2012a) and a Technical Guide (Opus 2012b) documents. The focus of the work is on PBCs with a significant contract term and not performance based Design-Build contracts. It is not intended to cover performance based design-build only contracts. Similarly the work does not seek to address in any detail the funding options (road taxes, general taxes, external borrowing, tolls etc.) that may be used to fund the works and for this reason it does not address public-private-partnerships specifically, noting however, that a robust PBC underpins all successful PPP projects.
1 INTRODUCTION

1.1 WHAT IS ASSET MANAGEMENT

Good infrastructure asset management (AM) is defined in numerous guidelines and standards, with the common themes being that of providing the desired level of service in the most cost effective manner. The following definition is from AASHTO:\footnote{America Association of State Highway and Transport Officials, Subcommittee on Asset Management, Strategic Plan 2011–2015}:

“Transportation Asset Management is a strategic and systematic process of operating, maintaining, upgrading and expanding physical assets effectively throughout their lifecycle. It focuses on business and engineering practices for resource allocation and utilization, with the objective of better decision making based upon quality information and well defined objectives.”

For many infrastructure asset owning agencies, their traditional means of managing the assets better resembles a Facility Management approach, wherein the approach is to “find and fix as many faults as possible within the budget available”, with the level of service provided being an outcome of the works completed and little thought about minimizing whole of life costs.

1.2 Why is Asset Management Important

AM is important because infrastructure (and in particular road infrastructure) is so critical to the functioning of modern societies, and will typically constitute the largest asset of any country. Furthermore, every dollar spent on the physical infrastructure in excess of that necessary is one less dollar available to be spent on the social services of a country. With good AM come benefits such as:

- Reduced Life-cycle Costs;
- Consistent Levels of Service;
- Ability to Monitor and Track Performance;
- Improved Transparency in Decision Making;
- Ability to Predict Consequences of Funding Decisions and future funding needs;
- Demonstrable asset custodianship; and
- Decreased Financial, Operational and Legal Risk.

Which all add up to provide:

- Better Financial Management;
- Better Communication; and
- Fewer surprises going forward.

2 HOW PERFORMANCE BASED CONTRACTING FACILITATES ASSET MANAGEMENT

2.1 What is Performance Based Contracting

Performance-based contracting (PBC) is defined as “a type of contract in which payment for the deliverable is explicitly linked to the contractor's successfully meeting or exceeding certain clearly defined performance indicators”. PBC involves a significant shift away from more traditional approaches to the delivery and maintenance of road infrastructure and associated services by departing from the client having responsibility for the design and supervision of construction and maintenance activities, to focus upon the key outcomes that the client wishes to achieve and incentivizing the achievement of those outcomes. Most PBC’s consist of a subset of the following six components: design, build, finance, operate, maintain, and transfer.

The World Bank (Bank) has supported different types of PBCs in the road sector over the last 15 years. The Bank developed sample bidding documents for PBC in 2002 (Performance-based management and maintenance of roads – PMMR (World Bank (2002))), and again in 2006 (Output- and Performance- based Road Contracts – OPRC (World Bank 2006)) to secure minimum standards of quality for PBC implementation. Also, the Bank published Transport Note No.27 (World Bank 2005) and a supporting web based Resource Guide (World Bank 2006) in 2006, to assist national and sub-national road agencies launching or enhancing PBC projects for constructing, operating and maintaining their road networks.

2.2 Why PBC Facilitates Good AM

The process of implementing a PBC forces those responsible for the funding, governance and management (at all levels) of the asset to
answer the questions that have the potential to drift on, lacking answers, without the contractual pressure of the PBC timeframe. Specifically, to successfully implement a PBC, answers are needed to questions such as:

- What assets do I own and which of these do I wish to be managed under this contract?
- What is the level of service that we want to provide to the road user?
- What condition are my assets in?
- What is the forward works program required to deliver the least whole-of-life-cost solution?
- What risks exist in the delivery of the levels of service, and how are those risks best managed?

PBCs also tend to:

- Provide a better focus by the road agency on governance as a result of the separation from the day-to-day operational activities;
- Deliver a more consistent (and/or better) service level across the network;
- Reduce costs and/or set costs at a fixed level to enable for long term fiscal planning by the road agency;
- Better allocate risk;
- Improve workmanship; and
- Address internal labor shortages wherein the authority may not have the internal resources/capacity to manage a network according to the traditional model.

While many of these desired outcomes might be achieved via alternative contracting means, it is the PBCs requirement to address all of these at once that is often perceived as the key benefit to the contract model as they force a paradigm shift and consideration of all the principles of good asset management.

### 2.3 PBC Model Types

PBC is but one of a continuum of contract methodologies that are in use to maintain road networks around the world. As indicated within Table 1 the key changes in progressing from an Input contract through to a PBC (or Outcome) contract is the change in responsibility for efficiency and effectiveness of works, and what the financial motivation of the contractor is.

The term PBC itself represents a spectrum of contract models, with variations resulting from the scope of assets included, the nature/condition of the existing road network, and the payment mechanism to name but a few. The key situations and intents of the resultant PBC are:

- **Unpaved Roads PBC**: Owing to their relatively fast deterioration the outcomes are generally easy to specify and are focused on the road user comfort measures. While there is an issue around the specification of appropriate durability measures to account for gravel loss, they have been successfully implemented in a number of countries.

- **Paved roads in a generally poor-fair condition (DBMOT PBC)**: With these roads the focus within the PBC needs to move from the initial upgrading of the network, through to the maintenance of the network. The form of the payment mechanism needs careful examination to ensure that the contractor is suitably incentivized to deliver on the maintenance portion of the contract. These contracts are often referred to as Design-Build-Maintain-Operate-Transfer (DBMOT) contracts.

- **Paved roads in a generally good-excellent condition (Network Management PBC)**: These roads require a relatively small (if any) initial investment to bring the network into full compliance with the required service levels. The focus is to obtain the least whole of life costs from the assets under management whilst also ensuring an appropriate condition at the end of the contract term. With these networks the payment is typically a uniform amount per month, and the focus is on a long term sustainable service levels. These contracts require a sound understanding of asset management by the contractor if he is to deliver the timely interventions and good workmanship needed to deliver the specified service level for the least cost.
The primary difference between the DBMOT and Network Management contract formats is the spread of the works over the term of the contract, with the DBMOT contract typically forcing significantly higher costs during the first few years of the contract period. Careful consideration is required to ensure an appropriate balance is achieved between minimizing the contractors borrowing costs (if this is desired by the road agency) and ensuring the contractor retains a financial interest in delivering the maintenance outcomes over the longer term. For the Network Management contract form, any debt is typically “within year” with no substantial carry over from one year to the next as a result of a notionally uniform quantum of work to be completed each year.

<table>
<thead>
<tr>
<th>Table 1: Spectrum of Contract Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Common Name</strong></td>
</tr>
<tr>
<td><strong>Payment</strong></td>
</tr>
<tr>
<td><strong>Sophistication Required from Contractor</strong></td>
</tr>
<tr>
<td><strong>Contractors’ Motivation</strong></td>
</tr>
<tr>
<td><strong>Who carries efficiency risks</strong></td>
</tr>
<tr>
<td><strong>Who carries effectiveness risks</strong></td>
</tr>
</tbody>
</table>

3 ADVENTAGES & DISADVANTAGES OF A PBC

To have an informed discussion about the merits (or otherwise) of a PBC, those involved need to understand what the reported advantages and disadvantages of PBCs are. It may be that for certain locales that the choice of a PBC is not the correct one as the identified advantages may already have been obtained by another means, resulting in only the potential downside of a PBC implementation remaining.

Potential Advantages:

- Potential reduction in costs. This is typically difficult to quantify as there is seldom retention of the same service levels before/after a PBC is implemented. The initial investment necessary to get a network up to standard is often significant and improvements to road safety and road carrying [width and strength] capacity are often included in the contract. Unless the costs and benefits of each element are clearly identified there is a danger the benefits of a PBC will not be understood because of the long term nature of the benefits being delivered by the investment. However savings of at least 25% can be expected due to the move to a PBC if other factors are held constant.
  - Improved level of service (could cost more). DBMOT style contracts are typically implemented for the requirement to raise the standard and consistency of service above that currently in existence.
  - An ability to improve the safety outcomes of the network through a combination of an improvement to the standard and consistency of routine maintenance activities (e.g. pothole repairs, line marking, vegetation control), and through the enhancements that can be delivered at marginal cost in conjunction with road reconstruction/rehabilitation projects.
  - The transfer of risk to the contractor thereby providing surety of costs to the agency (albeit at a potentially higher contract price).
• Securing of an appropriate level of multi-year financing. While an advantage for the road network within the PBC area, the contractual allocation of sufficient multi-year funds to one part of the network may result in a reduction (of typically already scarce) funding for the remainder of the network.

• More innovation as a result of the PBC contractor having a financial incentive to apply new tools and techniques to the management of the road network.

• More integrated services (dependent upon the scope of the services within the PBC).

• Enhanced asset management on the part of both the PBC contractor (who benefits from understanding whole-of-contract costs and levels of service) and for the road agency (the preparation of a PBC requires the development of an asset management plan and fundamental AM skills to be applied).

• Ability to reap the benefits of partnering, with the skill set of the road agency supplemented by those of the contractor.

• Building a new industry and/or adding new skills to the existing contracting industry with regard to understanding AM and maintenance practices.

• Achieving economies of scale, thereby enabling the use of more efficient and effective means of delivering the required contractual outcomes.

• Consciously focusing resource (through contractual means with stated objectives) on the long term needs of the asset.

• Quicker to get works implemented, as only the conceptual design needs to be completed, not the full design with all the associated approvals required for a traditional contract model.

• A reduction (or elimination) in the level of corruption as a result of there being far fewer financial transactions (easier to audit) and with the focus on delivering transparent level of service outcomes rather than specific projects, political intervention is also greatly reduced.

Potential Disadvantages:

• A more costly procurement process for the bidders. The costs to industry are much higher than standard procurement as a result of the need to better understand the behavior of the asset and associated risks. Typically there is also a requirement to have a higher skilled contracting industry to undertake PBCs. Also, as the PBC implementation is often a new concept, it is necessary to incorporate a significant quality aspect to the selection of the contractor – via either a price-quality trade-off, or via a short listing of contractors before receiving full tender submissions.

• The complexity of the bids also increases the evaluation time required by the road agency, which to ensure a focus on the quality (non-price attributes) should include for the use of a two-envelope assessment method, or short-listing. As opposed to a "lowest price conforming" method of evaluation, where potentially only a single tender needs to be evaluated, under the two-envelope system all tenders need to be evaluated.

• Potentially a longer procurement process. This may extend to needing to convince the client that PBC is a good idea, to convincing the Bank procurement process and engineers that the modifications to the OPRC sample bidding documents are appropriate. There is also the risk that the process may be curtailed owing to institutional or industry resistance to change. This must be weighed against the time to complete detailed design and gain all necessary approvals before tenders can be called under a conventional model. Once the PBC process is established the time from concept to implementation is typically significantly less than conventional measure and value contracts.

• The increased cost of having good data (including accurate inventory and historical
condition and achievement data) on the asset to be able to tender accurately and be aware of the risks. While this should happen with/without the PBC (i.e. this is really a cost of establishing and maintaining good asset management and should occur irrespective of the drive for PBC), the PBC often forces a higher level of investment in the data sets.

- A reduction in competition. Where there is insufficient non-PBC work for a competitor to remain in the marketplace this can be an issue.
- Uncertainty associated with long-term contracting relationships, especially where the term of the contract exceeds the term of any loan or external funding arrangements.
- A potential loss of agency control and flexibility; for example, to reallocate funds during times of fiscal constraint when the bulk of the expenditure is under fixed long-term contractual commitments. In both the developing and the developed world, the road sector is often seen as having a greater level of flexibility with budgets to both reduce expenditure without the immediate impact that a similar cut in health or education may have, and similarly to provide a stimulus via employment when additional funds can be leveraged. This reiterates the need for the Ministry of Finance to be committed to the PBC initiative, as well as the road agency.
- Where the risks associated with the development of the works program has been transferred to the contractor, the agency may lose control of asset management decisions and be less able to respond to political requests for works to be completed in certain areas.

### 3.1 PBC Implementing Strategy

Historically, not all PBC initiatives have ended in the successful implementation of a contract. In many cases the timeline was too great for the momentum to be maintained, while in others the sole focus of implementing a PBC, at the expense of recognizing the benefits of implementing asset management, put the project team at odds with the road agency involved.

For an organization that has not adopted asset management as a way of working, to focus on PBC in its self as the way of managing their network increases the risk that the organization involved will not support the initiative. It is essential that the organization firstly grasps the need and benefit of asset management, before endeavoring to explain the benefits of PBC in delivering the asset management outcomes.

Although it is difficult to prioritize the importance of success factors for PBCs, it is well accepted that institutional issues are the foundation of any successful PBC process. This statement can even be taken as far as saying that PBC can only be successful if it is "driven from the top". Furthermore, the organizations ‘culture” must be aligned with the desired outcomes e.g. preservation of the asset's value, consistent levels of service for road users, collaborative long-term relationships etc.

However, failing to implement the PBC should not be considered a failure if there has been a substantial shift in the practice of AM within the road agency. As indicated in

Figure 2 there are substantial AM benefits to be gained prior to the tendering process (Step E over).
To assist in a greater number of projects making it to the delivery phase, it is concluded that the focus of the consultant support role should be:

1. Making the client aware of the value of the assets they are the custodians of and their duty to future generations
2. Assist in building an understanding of asset management within the client;
3. Development of an asset management plan, to identify risks, levels of service, long term demands, etc. This should ideally be for the whole network, but can equally be just for the sub-network under examination for the PBC project;
4. Prepare a procurement plan (including OPRC and non-OPRC options) for the physical delivery of the works necessary to meet the requirements outlined in the AMP;
5. And only then, should the focus move on to facilitating the implementation of an OPRC.
Such a model is illustrated within the figure below. The middle “after Phase 1 of PBC Initiative” reflects the timing within the PBC implementation process where the generic asset management activities are recommended for completion, and the decision on how to deliver the physical works is to be made.

**Figure 3: Separating Delivery Model from Asset Management (Opus, 2012a)**

By not pre-ordaining the outcome of the entire process of being one of “PBC must occur” to instead being one of “asset management must occur, PBC may be a good support tool that will be examined at some stage” it is anticipated that the level of apathy towards PBC could be greatly reduced, as asset management does not in its own right require that PBC is the outcome.

The following are identified as critical success factors for PBC (further explanation of each is found within Opus (2012b)), without which the chances of their being a successful outcome are significantly reduced.

1. **Road Agency Institutional Buy-in**: There has to be a genuine institutional desire within the road agency and belief that PBC procurement options will offer significant achievements of given objectives for an agency. This buy-in should also be linked to specific individuals in an organization who will be prepared to champion the PBC process.

2. **Financial**: Two aspects were identified with these being:

   a. **Assurance (Guarantee) of Funding**: Where there is not clarity on the long-term availability of funding to support the contract (e.g., if World Bank loans don’t cover the entire PBC contract period), then the contracting industry will be concerned as to the risk of not being paid (or the contract being cancelled owing to lack of client finance).

   b. **Financing Costs**: There is a need to fully understand the payment model and both how this potentially imparts significant financing costs on the contractor and the tools [such as advance payments and output based payments] to potentially mitigate this impact. While asking the contractor to carry financing costs may be entirely appropriate (and necessary) to meet agency financing constraints, it is essential that the impact is understood.

3. **Legal**: The legal issues tend to be more of an enabler than an identifier of likely PBC success or failure. If the jurisdictions legal framework is not conducive to a PBC then either it will not be possible to implement at
all, or the risk pricing will potentially be very high (making the PBC financially unattractive).

4. Institutional Knowledge in both the Transport Agencies and the Lending Institutions: While some shortcomings in institutional knowledge can be addressed via the use of consulting advisors, it is essential that the basics of asset management are soundly understood.

5. Tendering Process: Successful implementation of PBC (especially in the early years of implementation of PBC into a country/organization) requires for selection of a contractor with the right skill mix to deliver the project. If selected on a lowest price basis, there is a reduced chance of selecting a competent contractor who fully understands the principles and risks of a PBC. To mitigate this, one of two approaches are recommended:
   a. Include a significant non-price weighting into the contractor selection process, or
   b. Implement a two-stage tendering process, where stage one short-lists only those contractors that have a clearly demonstrated competency to do the work.

   Either of these approaches should be considered alongside industry engagement to both gain knowledge on the perceptions of risk within industry, and also to ensure a correct understanding of expectations is in place.

6. Performance Measurement: Both the ability to measure performance and clear consequence of non-conformance are essential to PBC success. Management regimes that use a predominance of response time measures tend to be more cumbersome to enforce when compared to the “density of defect” type measures and this latter (density) approach should be encouraged.

7. Performance Payment: The consequence of non-conformance needs to be graduated and equitable with the level of non-conformance.

   The traditional approach of “three strikes and you are out” has not worked to drive performance and should be discouraged from use. Approaches such as the “bucket of defects” (refer to Opus (2012)) have been found to be simple to implement and provide the contractor with an incentive to perform over the duration of the contract. Measures need to focus on the short, medium and long term needs of the asset to ensure a balance of focus is maintained. Additionally there is the need for clear business improvement measures to encourage innovation and optimize the chance of progressing asset management practice through the course of the contract.

8. Risk Sharing: The allocation of risk (except at the extremes such as force majeure) was not observed to be a major identifier of success or failure of a PBC. However there is clear financial benefit from the equitable allocation of risk and the clear definition of risk boundaries. So long as risk was clearly apportioned and the contracting party was sufficiently experienced to manage (and price) the risk, then “inappropriate” risk allocation tended to result in higher tender prices rather than a “failure” per se. That being said, if the occurrence of a risk would render the contract financially unviable (i.e. the risk would remove all profit from the contract), then there is an increased chance of default on the part of the contractor – a scenario under which neither party wins.

9. Timing: The process to implement a PBC in an agency which does not have experience is typically 3-5 years at present. This is a relatively long time to maintain momentum for an initiative, especially if considered against the duration of many international funding loans. There would appear to be some anecdotal evidence that compressing the timeframe would help build enthusiasm and enable a greater portion of PBCs to make it to the Delivery phase. The development of a full suite of sample Bank bidding
documents, better support material and approval processes could significantly reduce the time to get from conception to implementation.

10. Sufficient technical support during implementations of PBCs. For example there are examples of PBC implementations where neither the client, nor the contractors had prior experience of PBCs. In such cases including an experienced 3rd party consultant for assistance during the tendering and initial stage of the contract is essential.

11. ‘Control’ under-pricing of tenders through a mechanism to disqualify unsustainable low tender prices. No contractor can be successful on a contract without receiving sufficient compensation for work being undertaken. While the direct control of under-pricing is difficult, a significant amount of risk can be mitigated by applying a conformance hurdle that requires demonstrable skills and capability in asset management.

12. Ensuring the appropriate investment in pavement reconstruction is undertaken during the contract to enable Levels of Service can be maintained cost effectively over the long-term. Underpinned quantities, with an associated robust quality control program, can be used to help ensure the desired residual life is delivered at the end of the contract term. Technical measures relating to residual life, such as FDW data, can have a high degree of variability with certain pavement, geology, or weather combinations and need to be supported by other methods.

4 OTHER ISSUES

The Guide (Opus 2012) also addresses other specific issues necessary to understand before a PBC can be successfully implemented. These issues include: Performance indicators and baseline surveys; Payment models; Contract documents, bidding and negotiations; Monitoring and evaluation of performance; Local industry capacity and competency; Legal and financing framework; Risk management and allocation; Management of asset consumption; and Prevention of under-pricing through contract format.

5 REFERENCES


6 FOR FURTHER INFORMATION

Ben Gericke, Lead Transport Specialist (bgericke@worldbank.org)
Andreas Schliessler, Transport Specialist (Aschliessler@worldbank.org)
Kulwinder Rao (KulwinderSRao@worldbank.org)
Tony Porter, AM/PBC Specialist (tony.porter@opus.co.nz)
Ian Greenwood, AM/PBC Specialist (Ian.greenwood@opus.co.nz)