Getting Paving Right in Ontario –
A Menu of Ideas to Improve the Process

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The Public Road Paving Conundrum

• The Engineering side of the conundrum:
  • The heavier the pavement structure – the longer it lasts and the more it costs.
  • Reducing pavement structure allows the agency to pave more lane-kilometers of road each year.
The Public Road Paving Conundrum

• The Financial side of the conundrum:
  • Public agencies must split their resources between construction, rehabilitation, repair, and maintenance.
  • Traditionally paving contracts are awarded to the lowest qualified bidder.

• Bottom-line – The agency is driven toward low-cost pavement designs to maximize the lane-kilometers it can build, repair, and maintain with its annual budget.
The Pavement Quality Paradigm:

The engineer articulates the **MINIMUM** acceptable level of quality when it produces the paving project’s plans and specifications.
The Pavement Quality Paradigm:

The paving contractor bids to provide the **MINIMUM** acceptable level of quality shown the paving project’s plans and specifications its tender offer.
The Pavement Quality Paradigm:
The agency inspects the constructed product to ensure that it got the **MINIMUM** acceptable level of quality shown the paving project’s plans and specifications to pay the contractor.
Bottom-line – The current pavement project delivery system MINIMIZES pavement quality by definition.
The Theme of This Presentation

• Based on the previous information, I conclude:
  
  If you want it cheap, you will get what you pay for!

• So how do we break the “cheaper is better mentality?”
Ideas to Improve the Paving Process

• **ORBA** White Paper

  A. Communication and Engagement
  B. Desired Outcomes (specifications)
  C. Procurement
  D. Testing and Monitoring
  E. Contracting
  F. Skills, Education and Research

• I’d like to offer some ideas in several of these categories that have been used successfully elsewhere to modify the paradigm.
Early Contractor Design Involvement (ECDI)

- Agency engineers and consultants know how to design pavements.
- But the contractors have:
  - The best estimators in the industry.
  - The most experience with means and methods.
  - The deepest knowledge of the local market.
  - The most experience with paving in the local environment, both climatological and with the local public road user.
- It makes sense to bring that rich constructability experience into the pavement design process in a manner that allows the agency to optimize its budget while NOT minimizing quality.

I am NOT talking about design-build here.... though it does fill the bill!
Early Contractor Design Involvement (ECDI)

• Current examples of contractor design involvement
  • Microsurfacing: Contractor furnishes the job mix formula as submittal
  • Chip seals: Agency provides average bitumen and aggregate rates in contract to calculate material quantities but expects contractor to adjust actual rates in the field.
  • Shop drawings: Required to be sealed by a professional engineer
  • Temporary structures: Formwork, falsework, shoring, coffer dams, etc.

• It already exists. So let’s exploit the opportunity
A. Communications & Engagement

- Alternative Technical Concepts used on Design-Bid-Build (DBB) projects.
- In use by Alabama, Michigan, and Missouri DOTs
- Different processes for obtaining ECDI
  - Joint agency/industry committee identify potential ATC projects.
  - Early industry outreach meetings to explain the ATC process and gauge interest.
  - Publishing agency goals for specific projects.
DBB with ATCs Process

• Agency puts ~60% plans in the public plans room 12 months before letting.

• 120-180 days before letting, an ATC outreach meeting to explain the process to interested contractors.

• 60 to 120 days before letting, confidential, one-on-one meetings held with interested contractors.

• Quick evaluation of conceptual ATC potential

• Final ATCs submitted and approved, conditionally approved or disapproved

• Contractor can choose to bid the approved ATC or bid the baseline design.
DBB with ATCs

• Michigan DOT uses a limited scope DBB ATCs.
  • Only allows bidding contractors to submit ATCs on the maintenance of traffic plan for the project.
  • US 10 Bridge Replacement Project outcomes
    • 5 contractors submitted 6 ATCs
    • Spread between the low and 2nd low was 1.3%
    • Winner’s MOT plan allowed all work on the traveled way that would restrict or disrupt traffic to be completed in one season instead of the baseline plan for two seasons of traffic control.
DBB with ATCs

- Missouri DOT has used both limited and unlimited scope DBB ATCs.
  - Alternate Paving since 2003 - 25% increase in bidders; Bid savings of 9% to 10%.
  - Alternate Pipes/Culverts since 2006 - 10% to 15% bid savings vs. historical RCP cost.
  - Optional Grading/Staging ATCs since 2007 - 9% to 15% below program budget.
  - Unlimited scope ATCs - ~10 projects
    - New Mississippi Bridge ATC – redesigned foundation $7.5 million saved.
MoDOT Advantages

• “Integrates contractor experience and innovation is an opportunity for MoDOT and allows industry to participate in a cooperative effort to find a best value solution to our projects.

• Allows contractor to mold project to their specialties and methods allow each interested contractor to propose alternatives that best fit their operations which allows them to be in their ideal competitive position for the project.

• Contractors become more familiar with a project’s technical challenges earlier and can use the ATC process to mitigate or eliminate potentially costly risks.

• We not only provide the ability to reduce a specific project's costs or completion time, but we also have the ability to implement any developed alternative system-wide for other applicable projects.”
B. Desired Outcomes

- While this category is aimed at material specifications, there are a couple of opportunities to use a performance-base approach to achieve a better longer-lived solution.
- **Life cycle bidding** – used on Germany and New Zealand
  - Agency develops a set of increasingly robust pavement structures.
  - Contractors bid on each alternative
  - Agency awards to the one that most closely matches the available funding.

“closest to the pin” award
Optimize Warranties

Competitively-bid, graduated pavement warranties

• Agency produces a set of pavement cross-sections
• A warranty is associated with each. The deeper the section – the longer the warranty
• A separate pay item is allocated to each warranty
• Contractors bid each section and the cost of the warranty
• Award is made on a best value basis using a weighted formula
Optimize Warranties

Graduated warranty example formula

\[
BV_{\text{wrt}y} \text{ Factor} = \left( \frac{\text{warranty cost}_x - \text{lowest warranty cost}_x}{\text{lowest warranty cost}_x} \right) \times (wt_{\text{wrt}y})
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\[
BV_{\text{price}} \text{ Factor} = \left( \frac{\text{bid price}_x - \text{lowest bid price}}{\text{lowest bid price}} \right) \times (wt_{\text{price}})
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EDCI to Enhance Sustainability

• Green pavement projects – usually DB or CMGC
  • Performance requirements
    • Maximize recycled materials
    • Minimize carbon footprint
    • Etc.
  • Usually includes an incentive disincentive scheme.
Reward contractor with the most fuel-efficient equipment and the most efficient means and methods. Example uses gallons of diesel fuel as the metric of sustainability.

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C. Procurement

- **Regional Major Task Order Contracts (MATOC)**
  - Indefinite delivery/indefinite quantity (IDIQ) model
  - Competitively bid task orders for multiple similar type projects: overlays; small bridge replacements; signal projects, etc.
- **In use by Florida and New York DOTs and US Federal agencies.**
- **ECDI achieved by progressive improvements on successive task orders.**
  - Tweaks to design criteria
  - Adjustments for local climate and traffic
  - Optimize construction phasing and work zone configuration
MATOC Process

• Agency selects 3 to 5 contractors on a basis of qualifications, past performance, availability of equipment, and proposed mark-up on direct costs.

• Base contract is usually 2-3 years with 3+ 1-year options to extend.

• Each task order is treated like a separate project.
  • MATOC contractors competitively bid direct unit costs
  • Each contractor’s approved mark-up is applied
  • Award to low bidder

• Agency monitors performance of both the constructed product and the contractor

• Improvements to baseline design made as appropriate based on field experience.

• Contractors can be disqualified from bidding for poor performance.
E. Contracting

• Gainshare/Painshare payment provisions in pavement warranty contracts.
• Used in Australia, New Zealand and the UK in various forms.
• Comes from Alliance contracting procurement field.
  • “We all win or we all lose.”
  • Limb 1: Contractor’s direct costs are guaranteed.
  • Limb 2: Painshare = Profit and corporate overhead are at risk.
  • Limb 3: Gainshare = Performance-based incentive
• Involves a robust set of key performance measures (KPI)
Painshare/Gainshare Provisions
F. Skills, Education and Research

• Training is the key to changing longstanding business practices.

• Training must include:
  • The business case for change
  • Limitations on the scope of changes
  • Legal implications of changes
  • A pragmatic approach to implementing the change
EDCI Training Content

• **ECDI training: Agency personnel and their consultants**
  - Methods for leveraging contractor experience.
  - Identifying features of design work whose quality is heavily dependent on construction means and methods.
  - Approach to reviewing and approving contractor early design input.
  - Key performance metrics for acceptance and payment

• **ECDI training: Construction contractors**
  - ATC development
  - New procurement and contracting model issues, benefits, and limitations
  - Legal limitations on design liability
Existing data is available in all phases of project development:

So EXPLOIT it!
Summary

• University of Calgary study of Canadian industry use of constructability (Jergeas and Van der Put, 2001) found the potential to yield the greatest benefits are the following:
  • Up-front involvement of construction personnel
  • Use of construction-sensitive schedules
  • Use of designs that facilitate construction efficiency

• Public road projects should be developed in a method that is “construction-centric” rather than the current “design-centric” mode.

• Leveraging the experience of the construction industry to contribute to the road design process through ECDI will yield benefits in long-term life cycle performance.
Questions ???

Feel free to catch me during the conference or give me a call at 405-503-3393; dgransberg@gransberg.com