Project Estimating Breakout Session

2017 ACEC/WisDOT Transportation Improvement Conference
February 2017
Presenters

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Outline

- Implications of estimate accuracy
- Performance measures
- Market trends
- Bidder analysis
- Managing risk
- Tools and resources
- Estimate development, documentation and review
Implications of Estimate Inaccuracy

Why estimate accuracy is important:
- Program and budget stability
- Fewer projects rejected
- Department & local municipalities have a stable program
- Letting the right projects at the right time
Engineering Estimate Accuracy (EEA) Performance Measure

- FHWA/WisDOT Stewardship Agreement (Sept 2010) goal
  - 50% of estimates within 10% of low bid

- WisDOT goal
  - 60% of estimates within 10% of low bid
  - 75% of estimates within 15% of low bid
  - Goals tracked in Estimate accuracy report

- WisDOT external MAPPS measurement - [http://wisconsindot.gov/Pages/about-wisdot/performance/mapss/measures/accountability/on-budget.aspx](http://wisconsindot.gov/Pages/about-wisdot/performance/mapss/measures/accountability/on-budget.aspx)
Estimate Accuracy: All Projects

Percent of Proposals Within 10% of the Low Bid

<table>
<thead>
<tr>
<th>Year</th>
<th>Actual</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY12</td>
<td>47%</td>
<td></td>
</tr>
<tr>
<td>FY13</td>
<td>45%</td>
<td></td>
</tr>
<tr>
<td>FY14</td>
<td>48%</td>
<td></td>
</tr>
<tr>
<td>FY15</td>
<td>44%</td>
<td></td>
</tr>
<tr>
<td>FY16</td>
<td>42%</td>
<td></td>
</tr>
<tr>
<td>FY17</td>
<td>40%</td>
<td></td>
</tr>
</tbody>
</table>
Estimate Accuracy: Project Size

Percent of Proposals within 10% of the Low Bid

$0-$0.5M: FY12-FY16 - 29%, FY17 - 39%
$0.5M-$1.0M: FY12-FY16 - 42%, FY17 - 57%
$1.0M-$2.0M: FY12-FY16 - 42%, FY17 - 34%
$2.0M-$10.0M: FY12-FY16 - 52%, FY17 - 37%
$10.0M-$20.0M: FY12-FY16 - 57%, FY17 - 50%
$20.0M+: FY12-FY16 - 47%, FY17 - 33%
Letting Implementation Plan: Goals

(millions)

Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun

Goal

8
Letting Implementation Plan

(millions)

<table>
<thead>
<tr>
<th>Month</th>
<th>Goal</th>
<th>2017</th>
<th>2014-2016 Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jul</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aug</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Sep</td>
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<td>Oct</td>
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<tr>
<td>Nov</td>
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<tr>
<td>Dec</td>
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<td></td>
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<tr>
<td>Jan</td>
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<tr>
<td>Feb</td>
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<td></td>
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<tr>
<td>Mar</td>
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<td></td>
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<tr>
<td>Apr</td>
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<td></td>
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<tr>
<td>May</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jun</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Estimate Accuracy: By Let Month

FY12-FY16
Proposals within 10% of the Low Bid

<table>
<thead>
<tr>
<th>Month</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jul</td>
<td>30%</td>
</tr>
<tr>
<td>Aug</td>
<td>17%</td>
</tr>
<tr>
<td>Sep</td>
<td>20%</td>
</tr>
<tr>
<td>Oct</td>
<td></td>
</tr>
<tr>
<td>Nov</td>
<td>53%</td>
</tr>
<tr>
<td>Dec</td>
<td>39%</td>
</tr>
<tr>
<td>Jan</td>
<td>50%</td>
</tr>
<tr>
<td>Feb</td>
<td>62%</td>
</tr>
<tr>
<td>Mar</td>
<td>38%</td>
</tr>
<tr>
<td>Apr</td>
<td>42%</td>
</tr>
<tr>
<td>May</td>
<td>37%</td>
</tr>
<tr>
<td>Jun</td>
<td>45%</td>
</tr>
</tbody>
</table>
Market Trends

- Cement shortages
  - Concrete masonry prices have returned to normal.
    - Prices were averaging $675/CY during the highest quarter with the cement shortages.
    - Prices have generally decreased each quarter since then.
    - Prices were averaging $517/CY the last quarter of 2016.

- Increased competition
Market Trends

- Low fuels prices
  - Low asphalt prices and lower costs for all items

![Fuel and Asphalt Prices Graph](image-url)
Market Trends: Construction Cost Index

- A cost index is an indicator of the average cost of representative items over time.
  - It measures average inflation or deflation of costs over time.
- A cost index can be used to track construction costs.
- The Department previously had used the Quarterly Price Index (QPI).
  - QPI was based upon 7 bid items.
  - Quantities for these items were based upon the base year and did not fluctuate based upon their use.
  - QPI became less relevant as it became older. The base year needed to be regularly updated.
Market Trends: Construction Cost Index

Average Annual Inflation

- WisDOT CCI: 4.33%
- Asphalt CCI: 3.28%
- Concrete CCI: 5.88%
- Earthwork CCI: 6.57%
- Structure CCI: 4.37%
Market Trends: Construction Cost Index

- The Chained Fisher Construction Cost Index (CCI)
  - The CCI is typically made up of 90 to 100 items.
  - Accounts for changes in type and usage of items.
  - Eliminates issue of updating the base period.
    - Able to accommodate usage for the current year and base year.
  - Performs better than fixed-weight indices when prices and quantities are volatile.

Market Trends: Construction Cost Index

- Includes standard bid items with measurable units.
- Does not include lump sum items such as Mobilization, Traffic Control Projects, and Removing Old Structure bid items.
- Does not include SPVs.
Bidder Analysis

- Accuracy of losing bids compared to low bid
- Average number of bidders per proposal
- Correlation by number of bidders and estimate accuracy
Bidder Analysis: Competition Accuracy

By Low Bid - 2014 to 2016

2nd Bidders  3rd Bidders  All Losing Bids  Estimates with 2+ Bids

- All Projects
- General Structure
- Asphalt Paving
- Concrete Paving
- Grading
- Incidental
Bidder Analysis: Number of Bidders

Average Number of Bidders per Proposal by Fiscal Year

- **Annual Average Bidders**
- **Quarterly Average Bidders**
Bidder Analysis: Estimate Accuracy and Number of Bids (FY12-FY17)
Bidder Analysis: Number of Bidders

- More desirable projects will have more bidders.
  - Medium and large projects
  - Mainline closure or off alignment work

- Some areas across the state predominantly have a single bid. There may be a single asphalt paving, structure, or other prime contractor in the area.
Managing Risk

- The more uncertainty or risk in a proposal, the greater chance the contractor will increase the bid cost to protect against financial loss.
  - Risk = Cost
- Clear special provisions
- Clear intent of the project for how it’s going to be built
- Accurate quantities
- Limit the number of undistributed quantities
- Estimate according to the amount of known risks
Managing Risk: SPV Reduction

- Make up 25% of awarded bids.
- May not have been vetted by statewide technical committees.
- May not reflect changes to General Requirements in the Standard Specifications.
- Contractors have to interpret the SPVs, increasing risk and cost.
- Has little or no bid history.
- Non-standard items may be in short supply and are more expensive.
Managing Risk: SPV Reduction

- If the result for a task is the same for an SPV and a standard bid item, then use the standard bid item.
- If you must use an SPV, use SPV libraries maintained by the region first.
- If create your own SPV item, avoid using lump sum unit measures.
Managing Risk: Lump-Sum SPVs

- Transfers risk to a contractor.
- Difficult to manage in the field if multiple sub-contractors complete the item.
- Try not to be prescriptive for the means of construction and materials. Specify the requirements for the final item.
- Most lump-sum items are very different from one project to another.
Tools and Resources: Overview

- Estimator
- Bid Express
- Cost-based Estimating
- Average Unit Prices
- Production Rate Tool
Tools and Resources: FDM 19-5

- Bid item usage
- Estimating tools
- Estimate development
- Estimate documentation
- Estimate reviews
Tools and Resources: Estimator and Bid Express

- **Estimator**
  - AASHTOware software
  - Last three years of bid results
  - Calculated cost based on location, work type and quantity

- **Bid Express (BidX)**
  - Info Tech Inc web-based product
  - Historical bid tab data
  - Review awarded contracts
  - Searchable - bid items, item descriptions, data ranges for quantity, dates, prices
Tools and Resources: Estimating Website

- Quantities 2 Plan (Q2P)
- Asphalt
- Mobilization
- Pit Location Tool
- Majors and Backbone
- Construction Cost Index (dotnet)
Tools and Resources: Production Rate Tool

- WisDOT Construction Productivity Rates
- Maintaining current production rates of bid items vital to the construction schedule.
- The tool can be found at the following location:
  https://sites.google.com/a/wisc.edu/wisdot-productivity/
Tools and Resources: Production Rate Tool

- Data is entered by construction staff.
- Designers obtains information from the Productivity Estimation Tool.
Step 1: Thinking of the project for which you want to estimate productivity rates, determine for each of these project factors whether 1, 2 or 3 would best describe your project.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Description</th>
<th>Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of work</td>
<td>1 = New construction project</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 = Reconstruction, resurfacing or maintenance project</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 = Rehabilitation project (structure currently used for transportation)</td>
<td></td>
</tr>
<tr>
<td>Project Size</td>
<td>1 = Small (≤ 10,000 total tons)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 = Medium (10,000 - 50,000 total tons)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 = Large (≥ 50,000 total cubic tons)</td>
<td></td>
</tr>
<tr>
<td>Expedited Project Schedule</td>
<td>1 = 40 hours week, 8 hours per day, normal (optimum) crew size, no work on holidays.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 = 50 hours per week, larger than normal or constantly changing crew sizes, work on some holidays.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 = Working beyond 50 weekly hours (overtime), much larger than normal crew sizes (overmanning), working on all holidays, no excuse completion dates.</td>
<td></td>
</tr>
<tr>
<td>Night Time Paving</td>
<td>1 = Daytime paving</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 = Nighttime paving</td>
<td></td>
</tr>
</tbody>
</table>
Please find in the table below the estimated productivity rates for your project based on an 8 hour working day.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Min</th>
<th>Predicted Value</th>
<th>Max</th>
<th>Unit/Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMA Placement Lower Layer</td>
<td>20</td>
<td>200</td>
<td>350</td>
<td>Tons/Hour</td>
</tr>
<tr>
<td>HMA Placement Surface Layer</td>
<td>25</td>
<td>197</td>
<td>350</td>
<td>Tons/Hour</td>
</tr>
<tr>
<td>Hand Placement of Asphalt Pavement</td>
<td>4</td>
<td>95.7</td>
<td>150</td>
<td>Tons/Hour</td>
</tr>
<tr>
<td>Thick Milling (&gt;2&quot;)</td>
<td>1467</td>
<td>11,226</td>
<td>20500</td>
<td>S.Y./Day</td>
</tr>
<tr>
<td>Base Course Placement</td>
<td>60</td>
<td>1,199</td>
<td>3400</td>
<td>Tons/Day</td>
</tr>
</tbody>
</table>
Tools and Resources: Production Rate Tool

- Advantages of this tool
  - Production rates can be updated regularly.
  - More accurate contract time schedules in the design phase.
  - Identification of need for extraordinary.
  - Bid item prices increased or decreased.
Estimate Development

- Competition
- Unit Price Considerations
  - Multiple projects in a proposal
  - Estimator regression curves
  - Past project comparison similarities
  - Mobilization needs
  - Combined asphalt pricing
  - Project characteristics
Estimate Development: Project Characteristics

- Haul distances
- Rural/Urban
- Location
  - Suppliers
  - Competition
- Time constraints
- Traffic
  - Staging
  - Night work
- Other conflicts
Estimate Documentation Report

- Consists of executive summary, project characteristics, item level documentation, review summary
- Updated guidance with an upcoming FDM transmittal
- Standard template
Estimate Documentation and Review

- Independent review
- Region Program Controls review
- Central Office reviews
  - Pre-letting
  - Post letting
    - Estimate Justification
    - Checking quantities for penny bids
    - Unbalanced Bid Analysis for changes in quantities
Additional Efforts

- Estimate review summaries is shared with QA Engineers
- Preliminary Plans
- Pre-bid Questions and Answers
Preliminary Plans

- Preliminary Plan Availability
  - Provide industry information early for large/complex projects.
  - Located on HCCI site: http://wisconsindot.gov/Pages/doing-bus/contractors/hcci/prelim-plans.aspx
  - One week prior to the advertisement, the plans and provisions will be removed from the website.
Preliminary Plans

- Preliminary Plans Process
  - Information will stamped PRELIMINARY AND NOT FOR BIDDING PURPOSES.
  - Information could include:
    - Plans/Special Provisions
    - Soils Reports
    - Digital Models
  - Construction Staging or Overview roll plots
Pre-Bid Question and Answers

- Questions and Answers have been available since June 2016.
- Questions submitted through Bid Express.
- Ability to view and search questions and answers through Bid Express or on the HCCI website.
- The questions and answers will be posted on Fridays after advertisement, as well as the Monday, Wednesday, Friday, and Monday before the letting.
- The postings will be available on Bid Express and the Bid Letting web pages.
- Documentation on the policy and how to use the feature will be posted on the HCCI site and in the FDM.
Upcoming

- FDM 19-5 Estimates section updates
- Estimate Documentation updates
- SPV Item Classification
- Estimate Training
- Cost Based Estimates
- FHWA Cost Review Report
Contact Information

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