Performance Related Specifications for Concrete Pavement

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Performance Related Specifications for Concrete Pavement

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PRS Background
- Commitment of highway community to the public:
  - Providing roadways of the highest possible quality
- A cooperative effort to improve quality:
  - Inclusion of statistical quality assurance elements to the specifications
  - Sometimes includes price adjustment based on test results

Definition of PRS
- Specifications that describe the desired levels of key materials and construction quality characteristics that have been found to correlate with fundamental engineering properties that predict performance
PRC Concept

QC/QA Specifications vs PRS

- QC/QA Specifications
  - Minimum Portland Cement Content
  - Maximum Water-Cement Ratio
  - Unit Weight
  - Air Content (disincentive pay factor)
  - Flexural Strength (disincentive pay factor)
  - Thickness (disincentive pay factor)
  - Smoothness (incentive pay factor)

- PRS Concept

PRC Concept

QC/QA Specifications vs PRS

- QC/QA require engineering intuition to establish price adjustments for each quality characteristic
- PRS uses mathematical models taking all quality characteristics into account to determine price adjustments.
QC/QA Specifications vs PRS

- PRS Level 1
  - Identical to QC/QA
  - Flexural Strength (price adjustment)
  - Thickness (price adjustment)
  - Smoothness (price adjustment)

- PRS Level 2
  - Performance quality characteristics (one overall price adjustment) for current + any other PRS quality characteristics

PRS Models for LCC

Basis for Price Adjustment

- Inputs
  - Design variables such as: traffic loading, climatic factors, etc
  - Materials and construction quality characteristic such as: concrete strength, pavement smoothness, thickness, etc.
Basis for Price Adjustment...
- Target values as inputs will give as-designed LCC
- Actual measured values as inputs will give as constructed LCC
- The difference between the as-designed LCC and the as constructed LCC is the basis for any price adjustment

Criteria for PRS Elements
- Distress types to be controlled through PRS
  - It is under contractor’s control
  - It can be predicted through an engineering-based model
  - It impacts pavement life and required maintenance and rehabilitation

Criteria for PRS Elements...
- Materials and Construction Quality
  Characteristics that influence each controllable distress type
  - It is under contractor’s control
  - It is measurable
  - It correlates strongly with the distress
### Differences between PRS Level 1 and Level 2...

<table>
<thead>
<tr>
<th>Level 1</th>
<th>Level 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary method of Acceptance Testing</td>
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</tr>
<tr>
<td>Current acceptance testing (QC/QA)</td>
<td>In situ acceptance testing</td>
</tr>
<tr>
<td>Acceptance Quality Characteristics</td>
<td>Acceptance Quality Characteristics</td>
</tr>
<tr>
<td>Current acceptance characteristics</td>
<td>Current acceptance characteristics + any other desired PRS quality characteristics</td>
</tr>
</tbody>
</table>

### Differences between PRS Level 1 and Level 2...

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<tr>
<td>Price Adjustment</td>
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<tr>
<td>Price adjustment for each quality characteristic</td>
<td>One overall price adjustment which reflects interactions among quality characteristics</td>
</tr>
<tr>
<td>Individual price adjustment for each quality characteristic based on an as-constructed LCC estimate (assuming other characteristics are held constant at their target value)</td>
<td>Overall price adjustment based on as-constructed LCC estimate calculated from all quality characteristics</td>
</tr>
</tbody>
</table>

### Quality Characteristics

| On target but inconsistent | Consistent but out of target |