INTRODUCTION

In recent years, the Ministry of Transportation of Ontario (MTO) has identified a need for a rehabilitation method that:
- has a long service life,
- can be installed in 8-hour construction windows, and
- can be installed reliably

Because of good success in past, PRECAST CONCRETE PANELS were identified as a promising option.

Support conditions beneath panels are typically considered to be one of the primary considerations for a well-performing precast slab.

During detailed design, three different designs differentiated by their support conditions were produced:

- A test section was constructed in September 2016 which incorporated each of the three designs.

This study considers and evaluates the support conditions based on their construction, including input from the MTO and Dufferin Construction, who conducted the test section.

TEST SECTION CONSTRUCTION

The test section was constructed during September 2016.

- Consisted of three sections, each defined by a different support condition.
- Each section was placed during consecutive over-night construction periods and subjected to traffic loading between construction closures.
- Lane #2 and Lane #3 were both closed for construction operation.

RESEARCH METHODOLOGY

The average responses from both MTO and Dufferin personnel are shown below.

<table>
<thead>
<tr>
<th>Support Condition</th>
<th>Cost ($)</th>
<th>Installation Rate (est. panels/night)</th>
<th>Repeatability (1/10)</th>
<th>Resiliency (1/10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asphalt Supported</td>
<td>10855</td>
<td>40</td>
<td>5.4</td>
<td>6.4</td>
</tr>
<tr>
<td>Grade Supported</td>
<td>10813</td>
<td>30</td>
<td>8</td>
<td>5.8</td>
</tr>
<tr>
<td>Grout Supported</td>
<td>10707</td>
<td>4.5</td>
<td>8</td>
<td>6.2</td>
</tr>
</tbody>
</table>

VALUES

The values for each criterion were subjected to an AHP to determine relative values (shown below).

- Values were then considered based on the weightings obtained from MTO.
- Based on the construction-related criteria, the Grout-Supported slabs were found to be the best method to address the MTO's general criteria.

The average responses from both MTO and Dufferin personnel are shown below.

SUPPORT CONDITIONS

- Support conditions identified as main factor in slab performance.
- Support beneath slab must be uniform (+13mm) and strong to provide full and lasting support to slabs.
- The conditions affect all of the main evaluation criteria of this project; namely durability, cost, and constructability.
- Three different support conditions will be evaluated:
  1. Asphalt Supported: finely-milled asphalt supports slabs directly
  2. Grade Supported: cement-treated bedding material screeded and compacted after milling to support slabs
  3. Grout Supported: slabs are leveled using cast-in-lifts and voids are filled using high early strength grout

Design costs/benefits for support conditions

<table>
<thead>
<tr>
<th>No extra support material required (CTBM, rapid setting grout)</th>
<th>Unknown time requirement for precision milling (grout)</th>
<th>Pavement can open as soon as slab is placed</th>
<th>Slabs are leveled using cast-in-lifts and voids are filled using high early strength grout</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contractor familiarity with method</td>
<td>Time/effort required to place CTBM</td>
<td>Pavement opened immediately</td>
<td>High smoothness of asphalt surface not a requirement</td>
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CONCLUSIONS/FUTURE

- Based on the criteria and comments from contractors, the grout-supported design was found to be the ideal solution, though all options scored similarly in the AHP.
- Grout-supported slabs require curing time and potentially a second grouting crew due to the large amount of grout required in relation to other designs.
- Final selection of support condition could be largely dependent on the performance characteristics of the test section.
- This performance will be measured using:
  - FWD testing for load transfer efficiency
  - Noise/friction measurements
  - Sub-surface instrumentation monitoring
  - Detailed condition surveys

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Determine the ideal strategy for PCIP from construction perspective.

Goal:

Criteria: Relative Cost, Installation Rate, Repeatability, Resiliency

Alternatives: Asphalt-Supported, Grade-Supported, Grout-Supported