WET SURFACE CRASH REDUCTION PROGRAM

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Introduction

- Frictional Demand
- Federal Mandate
  - “every State shall have a program of design, construction and maintenance to improve highway safety.”
- Department Responsibility
  - Wet Surface Crash Reduction Program
TxDOT Responsibility

- Skid Testing
- Aggregate Selection
- Wet Surface Crash Analysis
Skid Testing (macro-texture)

- Locked wheel Skid Truck ASTM E-274
Skid Testing

- Smooth Tire (ASTM E-528)

- Speed 50 mph (SN50)

- Sample Size
  - 50 percent of the interstate
  - 25 percent of all other systems
<table>
<thead>
<tr>
<th>Category</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue</td>
<td>Mean and Above</td>
</tr>
<tr>
<td>Green</td>
<td>-0.5 - 0.0 Std. Dev.</td>
</tr>
<tr>
<td>Yellow</td>
<td>-1.0 - -0.5 Std. Dev.</td>
</tr>
<tr>
<td>Orange</td>
<td>-1.5 - -1.0 Std. Dev.</td>
</tr>
<tr>
<td>Red</td>
<td>Less Than -1.5 Std. Dev.</td>
</tr>
</tbody>
</table>
Aggregate Selection (Micro-texture)

- Rainfall (inches per year)
- Traffic volume (ADT, vehicles per lane, etc.)
- Posted speed
- Geometrics (both number and severity of horizontal and vertical curves, super elevation, etc.)
- Frequency of vehicle stops (driveways, crossroads, etc.)
Aggregate Selection

- Amount of cross traffic
- Amount of truck traffic (percent, number ESALs)
- Surface texture (rough, smooth, etc.)
- Drainage characteristics (cross slope, ponding, rutting, etc.)
- Visibility restrictions (sight distance)
<table>
<thead>
<tr>
<th>Demand for Friction</th>
<th>Low (1)</th>
<th>Moderate (2)</th>
<th>High (3)</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rain Fall (inches/year)</td>
<td>&lt;20</td>
<td>&gt;20 &lt;40</td>
<td>&gt;40</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traffic (ADT)</td>
<td>&lt;5000</td>
<td>&gt;5000 &lt;15,000</td>
<td>&gt;15,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speed (mph)</td>
<td>&lt;35</td>
<td>&gt;35 &lt;60</td>
<td>&gt;60</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trucks (%)</td>
<td>&lt;8</td>
<td>&gt;8 &lt;15</td>
<td>&gt;15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vertical Grade (%)</td>
<td>&lt;2</td>
<td>&gt;2 &lt;5</td>
<td>&gt;5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Horizontal Curve (°)</td>
<td>&lt;3</td>
<td>&gt;3 &lt;7</td>
<td>&gt;7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Driveways (per mile)</td>
<td>&lt;5</td>
<td>&gt;5 &lt;10</td>
<td>&gt;10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intersecting Roadways (ADT)</td>
<td>≤500</td>
<td>&gt;500 &lt;750</td>
<td>&gt;750</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wet Surface Crashes (%)</td>
<td>≤5</td>
<td>&gt;5 &lt;15</td>
<td>&gt;15</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Summary of Total Frictional Demand**

0
<table>
<thead>
<tr>
<th><strong>Available Friction</strong></th>
<th>Low (2)</th>
<th>Moderate (5)</th>
<th>High (8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cross Slope (%)</td>
<td>&lt;2</td>
<td>2 - 3</td>
<td>3 - 4</td>
</tr>
<tr>
<td>Surface Design Life (years)</td>
<td>&gt;10</td>
<td>&gt;5 ≤10</td>
<td>&lt;5</td>
</tr>
<tr>
<td>Macro Texture of proposed surface</td>
<td>Fine (Such as: HMAC Type 'D' and 'F')</td>
<td>Medium (Such as: HMAC Type 'C', CMHB, SuperPave, Microsurface)</td>
<td>Coarse (Such as: PFC, SMA, Seal Coat, NovaChip)</td>
</tr>
<tr>
<td>Aggregate MicroTexture</td>
<td>SAC C</td>
<td>SAC B</td>
<td>SAC A</td>
</tr>
</tbody>
</table>

**Summary of Total Friction Available**

Does total available friction equal or exceed total frictional demand? [Yes] [No]
Wet Surface Crash Analysis

- Identification of Wet Surface Crash Sites
  - Rural Roadway Section - Three (3)
  - Urban Roadway Section - Six (6)

- Wet Surface Crash Site Review
Wet Surface Crash Analysis
Intent of District Review

- Perform a detailed review of the crashes that include field investigations and ultimately develop a plan to mitigate/eliminate the wet surface hazard.

The District Review Consists of a 3 stages:

1. District Operations Review
2. Site Visits and Field Review
3. Final Review and Recommendations
District Operations Review Process

- In late summer/early fall TxDOT’s Traffic Safety Division sends a list to the District of crashes that could potentially be caused by wet weather.
- This data specifies the District/County/Roadway/Texas Reference Markers (TRM) and number of crashes in these locations.
- Using this information, District Operations accesses the Crash Records Inventory System (CRIS) and pulls the crash reports within the limits of each roadway listed.
- In CRIS the crash reports are the reports filled out by the emergency responder who worked the scene of the crash. These reports contain full details of the crash but the following information is used to review a wet surface crash:
  - Description of the crash
  - Causative factors
  - Lighting conditions
  - Weather conditions

- At that time the District is using that information to determine if the wet surface on the roadway contributed to the crash or were the other causative factors the route cause of the crash.

- If it is determined by the District that the wet surface was a contributing factor, we begin field investigations to assess the condition of our roadway.
Field Review Process

- Upon identifying the locations where a wet surface could have contributed to a crash, the District Staff sends the list to the Area Engineer and Maintenance Supervisor to physically look at the roadway.
- Documentation request is a list of potential deficiencies and photographs of the roadway itself.
- Pavement deficiencies considered:
  - Flushed pavement
  - Polished surfaces
  - Rutting in the wheel paths
  - Low spots that create potential for ponding
  - Deficient cross slope
  - Less than desirable super-elevation in curves
  - High edges built up
- Once the information from the Area Office and Maintenance Sections is received District Operations schedules a meeting to review
Final Review and Recommendations

- Participants
  - DE
  - Directors
  - Traffic Engineer
  - Area Engineers

- Review the crash reports together and evaluate the findings in the field.
- Make a determination whether or not the wet surface was the ultimate reason for the crash.
- If it is concluded that the wet pavement was the contributing factor, we check our 4 yr pavement plan to see if we have a preventative maintenance or rehab project planned.
- If there is a project planned for that section, we ask the following question
  - What is the letting date?
  - Does the planned work address the wet weather crash concern?
Final Review and Recommendations Cont.

- If it does not address the issue, we make sure to re-scope the project to address the concern.
- If a location has wet weather crashes but the project is several years out, we look at interim fixes to mitigate the issue. If none exist, we consider moving the project up to address the issue sooner.
- If there are not any projects planned, we look at maintenance opportunities to fix the issue or consider this in our 4 yr plan review and add the location.
Wet Surface Crash Analysis: District Review

- Goals of the District Review
  - Get into the details of each crash and find a route cause.
  - Formulate a plan using sound engineering judgement.
  - Eliminate or minimize the potential causes from the roadway system.
  - Ultimately to make the Department’s Highway System as safe as possible for the travelling public.