

Developing Shear Resistant Asphalt Mixes for Roundabout Pavements

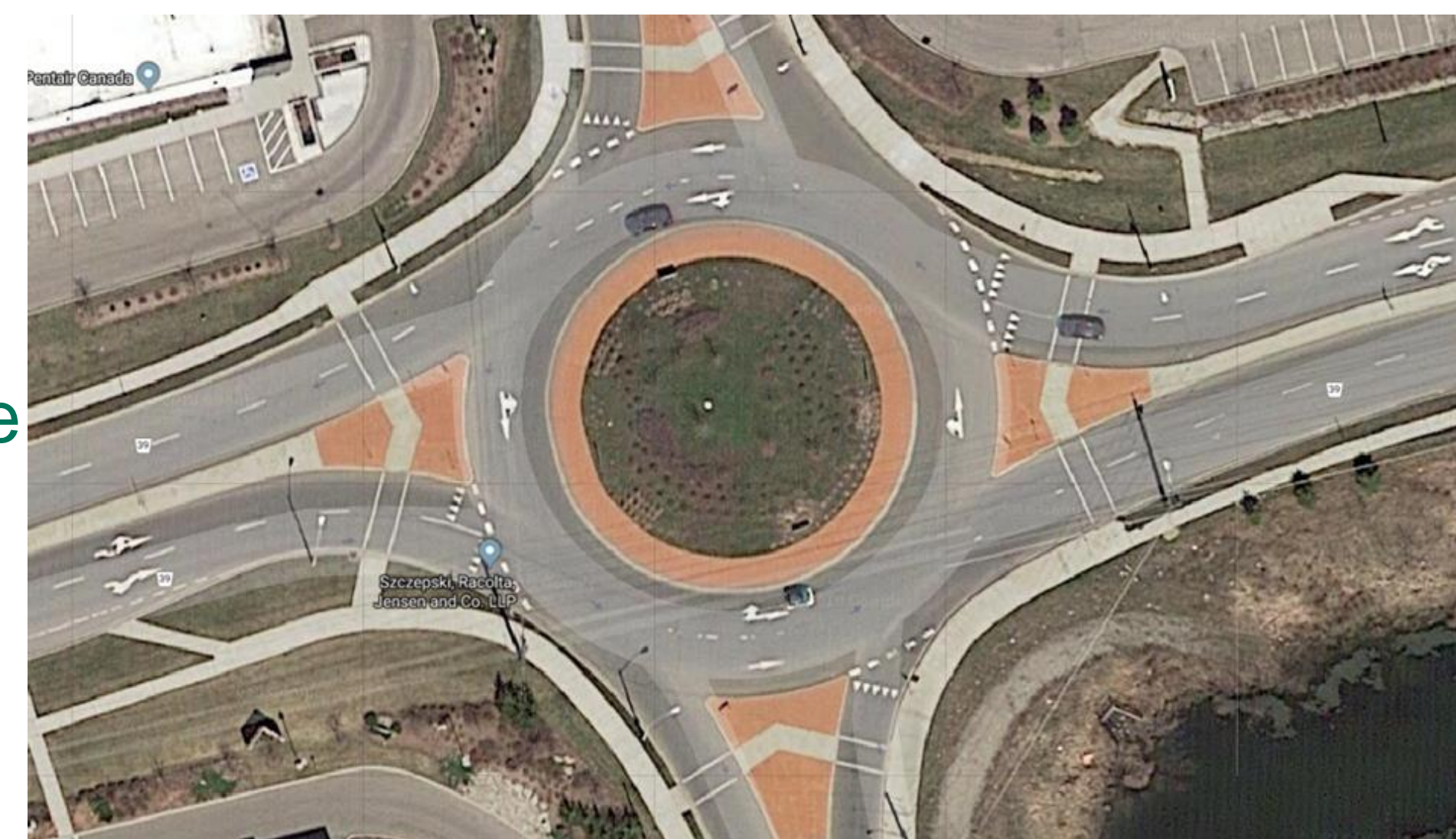
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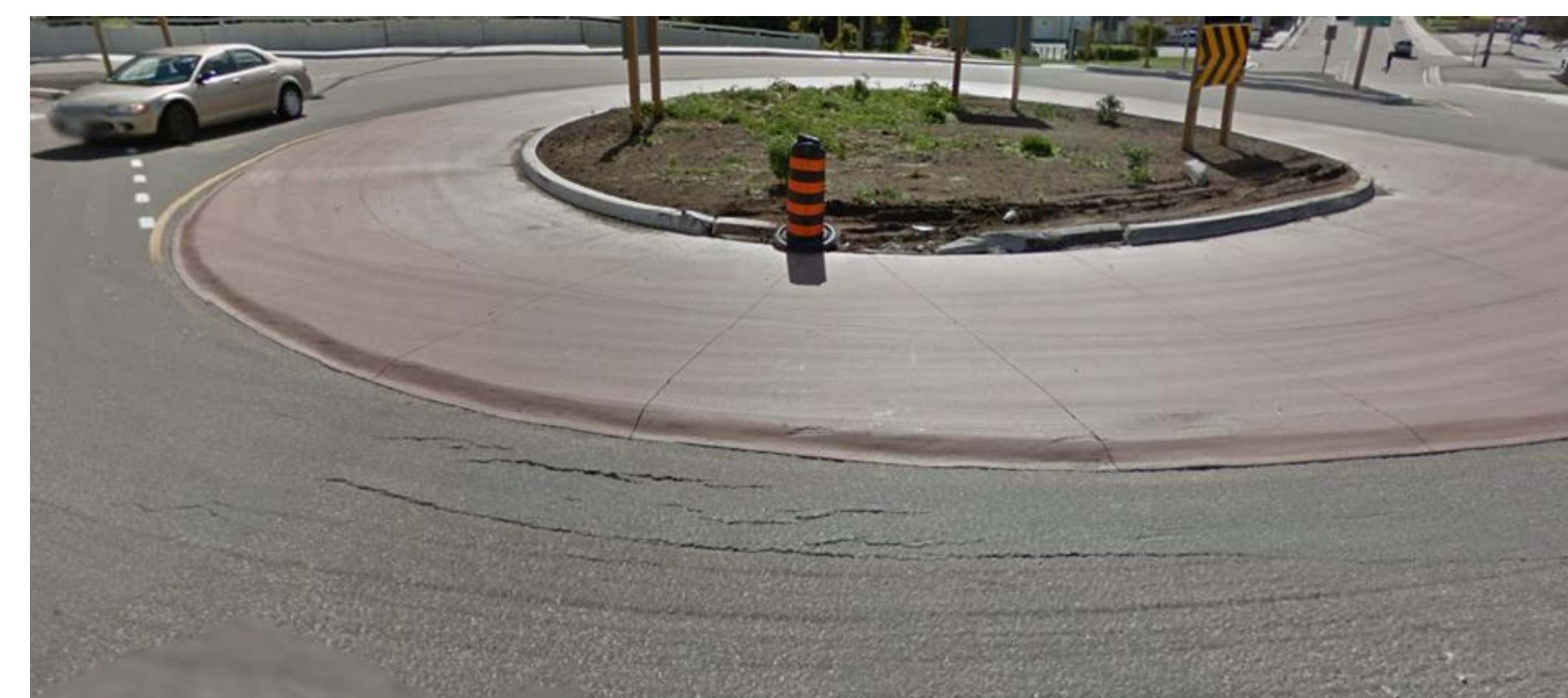
Introduction

- Use of roundabouts becomes more common in many municipalities and larger cities in Canada
- Typically, conventional asphalt mixes are used on roundabout pavements
- Typical pavements structural design is for vertical loading
- Pavement distresses are often observed on roundabouts; mainly in approach zone due to braking and turning circle due to high centrifugal forces.

Pavements at Roundabouts



- Small radius – high horizontal forces and shear stress
- Stop bars in the approach zone - high shear stress
- Distresses – shoving, cracking and slipping



Asphalt Mix for Race Tracks

Conventional asphalt mixes life is very short on race tracks, a few weeks at critical locations

Requirements:

- Good shear resistance to cope with the extensively high vertical forces at very sharp turns to prevent shoving, cracking, slippage and raveling
- Good frictional characteristics
- Good durability

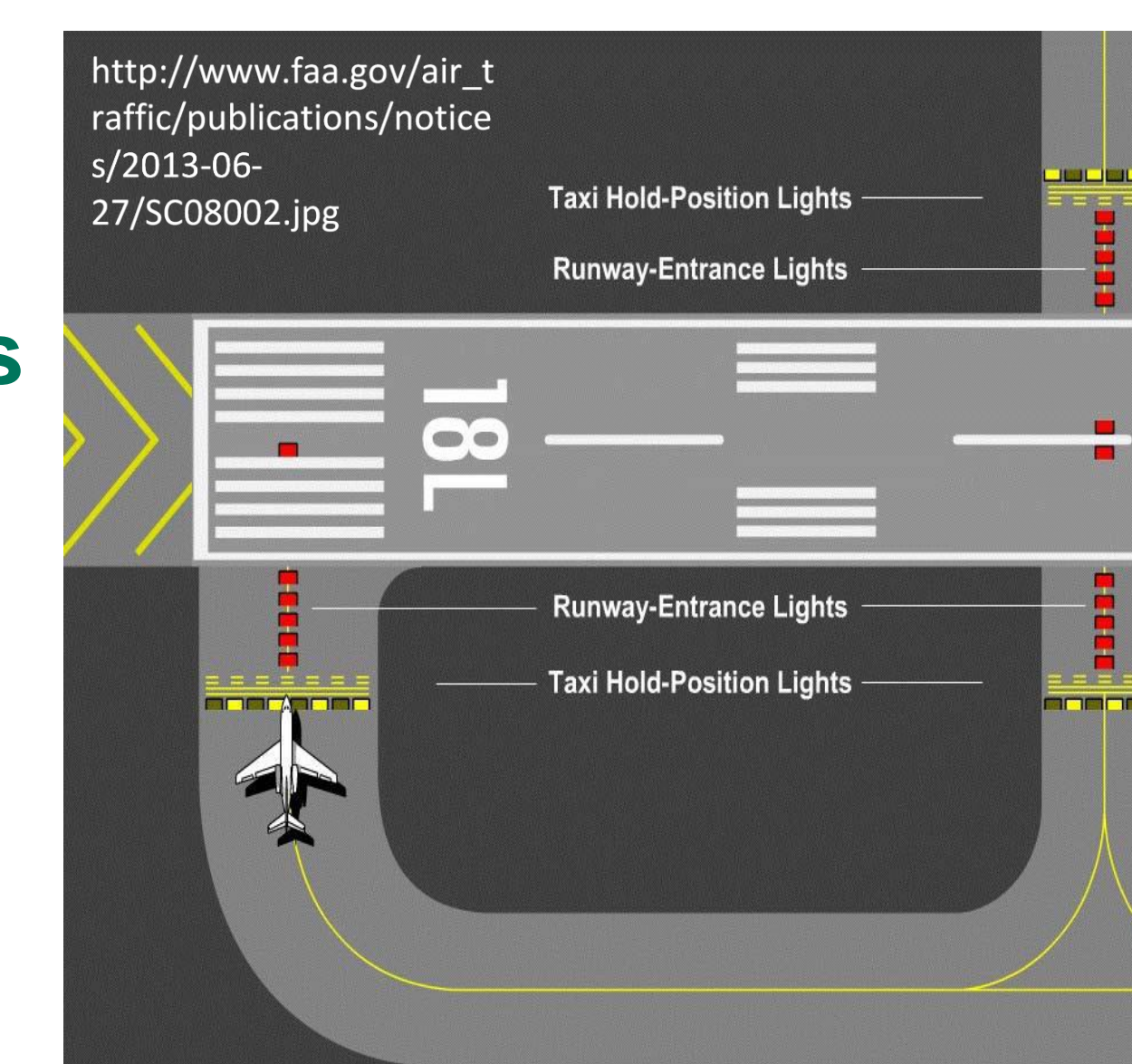
Mix design - focus on three main components:

- Characteristics of asphalt cement
- Gradation of aggregates – strong skeleton and texture
- Aggregate angularity – aggregate interlock and good friction
- Mix design procedure – modified Superpave
- Durability – the Cantabro Loss Test
- Performance testing – the developed mix exhibited excellent resistance to rutting and cracking



Potential for application on airport pavements

- Very high vertical loads and horizontal forces
- Very high shear forces at stop bars, sharp turns and take off areas
- Typical distresses – shoving, cracking and slippage



Other Applications of Race Track Mixes

Research by University of Waterloo, Greater Toronto Airport Authority (GTAA) and Golder Associates

- Developing asphalt mixes that offer superior shear resistance
- To be durable
- Meet other HMA requirements
- To be cost effective

Shear testing issue

- Superpave Shear Test (SST)
- Few available and very high cost
- Repeated shear at Constant Height Test (RSCH)
- Simple shear at constant height test (SSCH)

New recently developed equipment

Uniaxial Shear Tester

- Recently purchased by U of W
- Good correlation with SST



Potential use of racetrack mixes for roundabout pavements and at intersections

- Excellent resistance to shear and vertical load, resistance to rutting, and fatigue endurance
- Excellent durability
- Be aware of potential construction challenges
- Heavily polymerized asphalt cement
- Placement and compaction require increased care

References

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