ADVANCED TIRE DESIGN

NTSB Tire Safety Symposium
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Michelin North America
“I am unsure about how fast and at what point tires begin to lose grip and I begin to sacrifice my family’s safety.”

“I get more nervous driving in bad weather. That’s when I’m glad for all those safety options. You know, just in case.”
FACT: REAR-END COLLISIONS LEAD ALL ACCIDENT CATEGORIES

FACT: WET ROADS ARE A LEADING FACTOR IN REAR-END ACCIDENTS

Rear-end Accident Conditions

• 20% OCCUR ON WET ROADS
• 87% OCCUR WHEN THE POSTED SPEED LIMIT BELOW 55 MPH
  • On average approximately 40 MPH
• 13-30% INCLUDE NO CORRECTIVE ACTION
• AVERAGE TIME SPENT BRAKING PRIOR TO IMPACT: 1.1 SECONDS
For the same distance covered, on wet roads, you are more than twice as likely to have an accident as on a dry road.

FACT: WET ROADS INCREASE ACCIDENTS

U.S. DOT NHTSA: Tire-Related Factors in the Pre-Crash Phase (2012)
SO LITTLE KEEPS YOU IN CONTROL

30 sq. inches
Amount of rubber that touches the ground at any given time

BRAKES STOP YOUR WHEELS

TIRES STOP YOUR CAR
WITH EACH MILE AND STOP, WET TRACTION DETORIORATES

19,850 miles/year
× 2.08 stops/mile

41,288 STOPS/yr

Estimate based on National Household Travel Survey (2009) and EPA test procedures for average stopping
WATER: ITS IMPACT ON GRIP

Max Grip (\(\mu_{\text{max}}\)) : Depending on Depth of Water and Speed

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<thead>
<tr>
<th>Depth of Water</th>
<th>Speed</th>
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<tbody>
<tr>
<td></td>
<td>60 km/h</td>
</tr>
<tr>
<td>0 (dry surface)</td>
<td>1</td>
</tr>
<tr>
<td>&lt; 10 (\mu\text{m}) (damp surface)</td>
<td>0.8</td>
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<tr>
<td>1.5 mm</td>
<td>0.6</td>
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<tr>
<td>5 mm</td>
<td>0.5</td>
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Depth of water: a few \(\mu\text{m}\) 0.5 mm
UNDERSTANDING AND IMPROVING WET TRACTION IS A PRIMORDIAL TO TIRE DESIGN AT MICHELIN BECAUSE WE CARE ABOUT SAFETY
ANOTHER GAME-CHANGING ADVANCE

1946 Radial

1992 Silica

2014 MICHELIN® Premier® A/S Tire
Traditionally, compounds required a trade-off between rolling resistance and grip, but silica delivers both.
SAFE WHEN NEW
EXCEPTIONAL TRACTION

EXTREME SILICA is key for wet weather performance. The MICHELIN® Premier® A/S tire has the maximum amount of silica, distributed finely and evenly throughout the tread for incredible wet road grip.

SUNFLOWER OIL gives the tire greater flexibility at low temperatures, improving cold-weather grip.
The tire’s tread grooves and sipe system help evacuate water and improve grip on wet surfaces.

WET TRACTION
TREAD DESIGN

Siped tread block:
- greater water channeling capacity
- shorter distance to tread grooves
- pressure surges along edges

Water trapped in the sipes is driven into tread grooves
SAFE WHEN WORN
IMPROVES WET GRIP
REDUCES HYDROPLANING

EXPANDING RAIN GROOVES
As the tire wears, rain grooves widen, maintaining their ability to remove water and deliver wet traction.
SAFE WHEN WORN IMPROVES WET GRIP REDUCES HYDROPLANING

EMERGING GROOVES

New grooves – hidden in the rubber – emerge, adding to the ability to grip the road.
SAFE WHEN NEW.  SAFE WHEN WORN.

Evolving tread design permits the tire to maintain the ability to evacuate water.
SAFE WHEN NEW. SAFE WHEN WORN.

WET BRAKING TEST RESULTS USING TIRE SIZE 235/55R17(H) (2012 Cadillac CTS)

NEW MICHELIN® Premier® A/S 106 ft

NEW Leading Competitor 133 ft*

WORN MICHELIN® Premier® A/S 119 ft

Based on internal wet braking tests from 40 and 50 MPH conducted in September & October 2013; all stopping results are averaged from multiple test runs on specific days; the worn MICHELIN® Premier® A/S tire was buffed to 5/32" of tread. Actual on-road results may vary based upon vehicle type. * Actual competitor stopping distances recorded were 139 ft. and 127 ft. respectively.
ADVANCED TIRE DESIGN
COMBINING RESEARCH IN MATERIALS
WITH ADVANCES IN TREAD DESIGN

SAFE WHEN NEW
SAFE WHEN WORN
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