Brake Performance Study
Alteration’s Effect on As-Designed, Maintained Brake System
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Accident Vehicle

- 2001 Ford Excursion altered into a limousine
- Accident weight of limousine exceeded original GVWR of Excursion by about 5,000 lbs.
- Brake design did not appear to be upgraded
- No evidence of testing to verify that brakes had been certified to FMVSS 105 at accident weight
Accident Vehicle

• Question: Did the accident weight of the limousine exceed the design capacity of the brake system?
Brake Study Objective

• To estimate whether limousine, with properly functioning brakes, would have had sufficient braking capacity to have safely negotiated accident route

• NOT intended to re-create the braking of the accident vehicle
Brake Components Used in Study

• Used Original Equipment (OE) brake components specified for the unaltered Excursion

• OE components best represent level of performance Ford intended for unaltered Excursion
Inspection of Accident Brakes

• Contained non-OE replacement brake components

• Non-OE replacement brake parts may fail at lower temperatures than OE parts

• Until accident brakes are tested, correlation between accident brakes and those used in testing is unknown
Overview of Braking Testing

• **Part 1** – Full-Scale Vehicle Testing
  • Test vehicle - exemplar Excursion at accident weight
  • FMVSS 105 Fade and Recovery requirements
  • FMVSS 105 Stopping Distance requirements
  • Baseline for performance

• **Part 2** – Dual-End Inertia Brake Dynamometer Testing
  • Simulate vehicle braking over accident route
Dynamometer Testing - Simulations

Figure 1 - Dual-end Inertia Brake Dynamometer
Limousine Enters I-90

Crash Site
Accident Route Profile

Final Two Long Descents Prior to Crash
Summary/Findings

With properly functioning and well-maintained brakes, limousine would have been capable of:

- Stopping safely at bottom of downgrade
- Meeting FMVSS 105 fade and recovery and stopping distance requirements (with one minor exception)