Collapse of the Interstate 5 Skagit River Bridge Following a Strike by an Oversize Vehicle Mount Vernon, Washington May 23, 2013
Bridge Collapse
Mount Vernon, Washington
HWY13MH012

Robert Accetta
Investigator-in-Charge
Accident Information

• Oversize load
  • 2010 Kenworth truck-tractor
  • 1997 Aspen semitrailer
  • Steel casing shed

• Mullen Trucking LP
  • 41-year-old truck driver
Accident Information continued

• 1997 Dodge Ram pickup truck (pilot/escort vehicle)
  • 55-year-old driver
Accident Information continued

• Combination unit
  • 2000 Kenworth truck-tractor
  • 1996 Utility semitrailer

• Motorways Transport
  • 35-year-old truck driver
Accident Information continued

2010 Dodge Ram

1997 Jayco camper

2013 Subaru

1995 BMW
Lower Vertical Clearances

Maximum Vertical Clearances

Lower Vertical Clearances
I-5 Bridge Deck

Thru Truss Structure

Span 5  Span 6  Span 7  Span 8  Span 9

Pier 5  Pier 6  Pier 7  Pier 8  Pier 9

Spans 1 - 4  Spans 9 - 12

Southbound
Injury Information

- Accident truck driver – not injured
- Other truck driver – not injured
- Pilot car driver – not injured
- Passenger vehicles
  - 3 minor injuries
  - 1 uninjured
On-Scene Personnel

- Deborah Hersman  Former Chairman
- Cresence Stafford  Special Assistant
- Gary Van Etten (ret.)  Motor Carrier
- Jennifer Morrison  Vehicle
- Tom Barth, PhD  Survival
- Dennis Collins  Human Performance
- Dan Walsh  Highway
- Robert Squire  Reconstruction
- Joe Epperson  Materials Laboratory
<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
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<tbody>
<tr>
<td>Donald Kramer, PhD</td>
<td>Materials Laboratory</td>
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<td>Kelly Nantel</td>
<td>Public Affairs</td>
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<td>Peter Knudson</td>
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<td>Jane Terry</td>
<td>Government Affairs</td>
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<td>John Whitener</td>
<td>Computer Specialist</td>
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<td>Cassandra Johnson</td>
<td>Event Recorders</td>
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<td>Robert Accetta</td>
<td>Investigator in Charge</td>
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Report Development Personnel

- Deborah Bruce, PhD  Project Manager
- Gwynne O'Reagan  Editor
- Carl Schultheisz, PhD  Vehicle Performance
- Dan Horak, PhD  Vehicle Performance
- Sean Payne  Vehicle Recorders
- Ivan Cheung, PhD  Graphics
- James Rodriguez  General Counsel
- Julie Perrot  Recommendations
- Mark Bagnard  Audio/Visual
Parties to the Investigation

- Federal Highway Administration
- Federal Motor Carrier Safety Administration
- Washington State Department of Transportation
- Washington State Patrol
- Mullen Trucking LP
Safety Issues

- Permitting & route surveys
- Pilot/escort vehicle operations
- Commercial driver operations
- State practices
- Low-clearance signage
Permitting and Route Surveys for Oversize Loads

Jennifer Morrison
Oversize Load Permits

- Size and weight limits
  - Set by states, provinces
  - Vary among states, provinces
  - Can vary within states, provinces
- Permits granted for oversize loads
- Federal regulations for size and weight
- No federal regulations for permitting
In Washington State permits are required for vehicles:

<table>
<thead>
<tr>
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<th>Permitted size of oversize combination vehicle:</th>
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<tr>
<td>Trailer Length</td>
<td>&gt; 53’</td>
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<tr>
<td>Overall Height</td>
<td>&gt; 14’</td>
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<tr>
<td>Overall Width</td>
<td>&gt; 8’ 6”</td>
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<tr>
<td></td>
<td>70’ 11”</td>
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<tr>
<td></td>
<td>15’ 9” (postcrash at 15’11”)</td>
</tr>
<tr>
<td></td>
<td>11’ 6”</td>
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Oversize Load Permits

• Mullen Trucking
  • Specialized in oversize loads
  • Employed a dedicated permit coordinator
  • Permit coordinator applied for the permit online

• WSDOT automatically granted the permit
  • Without personnel review
  • Without comparison of given dimensions to the proposed route
Oversize Load Permits

“Route OK – WSDOT Does Not Guarantee Height Clearances”

Bridge List:
Min Vertical Clearance 14’ 5”
Permitted height 15’ 9”
Permitted width 11’ 6”

Sway Brace

WSDOT Does Not Guarantee Height Clearances

11’
Route Surveys

• WSDOT website states that it’s the carrier’s responsibility to identify hazards

• Carrier *should* conduct a route survey

• Route surveys are not required

• Mullen Trucking was familiar with the I-5 route and did not conduct a route survey

• Automatic permit process does not motivate carriers to conduct route surveys
Route Surveys

- Even if a route survey had been conducted, it may not have identified the low clearance
Navigation Systems

- Bridge clearance data available to commercial vehicle navigation systems
  - Nokia HERE
  - Google, Inc
  - Rand McNally
- Incentives through state permitting
Summary

- WSDOT permit was inadequate
- Permitting does not ensure route surveys
- Effective route surveys need more accurate representation of structures and loads
- Adding clearance data to commercial vehicle navigation systems could improve safe routing of oversize loads
Overview

- Pilot/Escort driver requirements
- Guidelines/best practices/training
- Identified issues
  - Placement of height pole
  - Low clearance data
  - Cell phone use
Pilot/Escort Driver Requirements

- Pilot/Escort drivers overseen at the state level
- No universal training/certification requirement
- Board addressed in 2001; some progress made
Pilot/Escort Driver Requirements

- Lack of standardized training leaves some drivers poorly prepared, means less safety
- Facilitate reciprocity
- Model training/certification process needed
Identified Issues

• Height pole placement
• Low-clearance data
• Cell phone use
Height Pole Placement

- Shows pole to left
- Text reads lowest point in travel lane
- Nothing in WAC, training materials on $H \times L \times W$
- New method needed
Low-Clearance Data

- Guidelines state some states’ data available
- Clear direction / training to check needed
Cell Phone Use

• Hands-free during approach
• On phone 15 of 30 minutes prior
• Best practices developed before cell phone use restricted
• Use of any portable electronic device can be distracting
Cell Phone Use (continued)

- Diminished ability to identify narrow lanes, overhead clearances, and pole strikes
- Pilot/escort drivers have significant safety responsibilities
- Recognized – restrictions and certifications
Summary

• Driver requirements vary; standardization needed
• Need better method than single pole
• Need revised guidelines for state data use
• Cell phone use not consistent with responsibilities
Motor Carrier Factors

Mike Fox
Presentation Overview

- Mullen Trucking and oversight
- CDL requirements for oversize loads
- Endorsements for CDL holders
- Knowledge and skill requirements for oversize loads
Mullen Trucking LP

- Specialized in oversize loads
- Adequate oversight from Alberta and FMCSA
- Last rating “Satisfactory”
- Employed a full-time permit coordinator
Route and Permit Process

• Driver measures load; permit coordinator gets permits

• The carrier and or the driver scheduled the Pilot/escort vehicles

• On portions of the route a second, trailing escort was required
Accident Driver Credentials

- Held a valid CDL and permits
- The driver did not require any license endorsement
- Oversize loads do not require any endorsement or special credentials
Driver Performance

- Unaware of bridge clearance
- Unaware of lane width
- Following distance was too short
  - Actual (~400 feet) or 5 seconds
  - Desired (865 feet) or 10 seconds
Limited Rear Field of View

Area of mirror blind spot

200'

23' 3"
Specialized Credentials

P - Passenger

S - School Bus

T - Doubles and Triples

N - Tank

H - Hazardous Materials
New York State Endorsements

- F - Farm Class A vehicles
- G - Farm Class B vehicles
- M - Metal coils
- R - Recreational vehicles > 26,000 lbs.
- W - Tow truck
- Z - Farm / Hazmat
Why are Endorsements Required?

- Potential danger of the cargo
- Additional weight and vehicle characteristics
- Unique driving dynamics
- Additional safety procedures required
- Additional training required
Oversize Load Knowledge and Skills

- Permit procedures
- Route clearance
- Police escort
- Pilot vehicle escort
- Advanced driving skills
- Special securement
Summary

• Specialized knowledge and skills are required for the safe movement of oversize loads

• Training and testing materials for CDL endorsement for oversized loads
High Load Bridge Strikes and Low-Clearance Signage

Dan Walsh
Overview

- Vertical clearances and history of high load hits
  - I-5 Skagit River Bridge
  - Other bridges in Washington State
- State practices for high load bridge hits and requirements for low-clearance signs in the Manual on Uniform Traffic Control Devices (MUTCD)
High Load Hits to I-5 Skagit Bridge

- Received numerous high load hits dating back to 2003
- High load hit on 11/29/2012
  - Portal brace, Span 5
  - Northbound direction
  - 16-inch section
  - 3-inch tear in steel
High Load Hits on All Bridges

- Through-truss bridge strikes (2008 – 2013)
  - 1 bridge hit 4 times
  - 2 bridges hit twice
  - 7 bridges hit once

- All bridge types
  - Hit frequently and repeatedly

I-82 Naches River through-truss bridge

Olympic Drive concrete beam bridge
Low-Clearance Sign Requirements

- MUTCD requirement for posting of low-clearance signs
  - Statutory maximum vehicle height
  - Within 12 inches of legal max. height
- Statutory maximum vehicle height has increased over the years
- Prior to the 1960s, bridges designed to different standard
MUTCD and AASHTO Policy

• MUTCD requirement has not changed since 1961

• 1984 AASHTO policy
  • Placed special emphasis on design of new through-truss structures
  • Minimum vertical clearance of 17 feet

• Review found inconsistency of low-clearance signage requirements
Uniform Minimum Clearance Height

- Washington State has 22 through-truss bridges on Interstate system
  - None are posted with low-clearance signs
- Will help states raise their low-clearance signage requirement
- Last direct opportunity to warn the driver of an oversize load
Signage for Arched Structures

• Alexandria, VA – 2004
  • National Park Service developed new low-clearance sign
  • All buses stay in left lane

• United Kingdom
  • Arched structures

• New warning sign
  • Proper lane of travel
Summary

• Action needed at national level
  • Risks of high load hits / countermeasures
• Uniform minimum clearance height
  • Bring MUTCD into conformance with current AASHTO policy
  • Remove disparity of low-clearance signage requirements among states
• New warning sign in the MUTCD
  • Proper lane of travel under arched structure
Improvements to the I-5 Bridge

I-5 Bridge – Before Accident

I-5 Bridge – After Accident