Presentations

1. Bridge description and collapse
2. Construction activities on bridge at time of collapse
3. Gusset plate inadequacy
4. Finite Element Analysis
5. Design and review process
6. Bridge load rating and bridge load analysis
7. Bridge inspections
8. Gusset plate inspections
2007 Construction Project

- Maintenance repair and renovation
- Conducted by Progressive Contractors, Inc. (PCI)
- June – October 2007
- Project included
  - Removal of concrete deck surface and replacement with new concrete overlay
  - Other repairs: curbing, expansion joints, and deicing system
Roadway Construction Work

2 closed outside northbound traffic lanes

2 closed inside southbound traffic lanes
Lane Designations

Northbound Completed - CLOSED
Northbound - OPEN
Northbound - OPEN
Southbound Milled - CLOSED
Southbound Completed - OPEN
Southbound Completed - OPEN
Staging of Construction Materials

• Mn/Dot project requirements
  – Low slump concrete: dense concrete mix, low water/cement ratio, sets up quickly, higher strength
  – Mix concrete close to pour site
  – Lane closure restrictions
  – Materials mixed near worksite (sand, gravel, cement, and water)

• Materials and machinery staged on two inside southbound lanes
Staging of Construction Material

07/06/07
07/23/07
08/01/07

Spans 12-14
Spans 9-11
Span 8
Span 7
Span 6
Spans 1-5

U10 Node
North
South
Material Staging – Previous Overlay Pour

• PCI foreman discussed staging of materials with Mn/DOT construction inspector

• Mn/DOT
  – Written request should have been made to Mn/DOT project engineer
  – No specific policy or guidance on material staging
  – Analysis of loads should have been completed before approving request
Total Live Loads – I-35W Bridge

Total live loads
1,259,900 lbs

Construction documents
Wreckage locations
Witness statements
Pre & post collapse photographs
Weights of wreckage
Replicated stockpiles of aggregate
Traffic Live Loads – Center Span

Northbound
57,100 lbs

Southbound
64,600 lbs

Total live loads from traffic
121,700 lbs
Construction Live Loads – Center Span

Construction live loads
578,700 lbs
Construction Work – Day of Accident

- Piles of aggregate
- Construction equipment and vehicles
- U10 west node
Construction Materials & Vehicles

Construction materials: 383,000 lbs
Construction equipment: 195,500 lbs
Center span combined: 578,500 lbs

Overhead view:
- U10
- Closed lanes

Elevation view:
- South
Post Collapse Load Evaluation

• Mn/DOT
  – No policy or guidance to contractor for written requests regarding stockpiling materials
  – Response to request could have been based on load rating analysis

• Post-collapse Mn/DOT load rating analysis indicated bridge would have supported additional load
Construction Loading Guidance

• AASHTO: guidance was generalized
• FHWA technical advisory issued after the accident was also generalized
• Safety Board Survey
  – 10 State Departments of Transportation
  – Rely on contactor for placement of construction loads
  – Primarily concerned with oversized vehicles
  – Rather than the loading from stockpiling of raw materials
Construction Loading Survey

- AASHTO Survey
  - 39 States responded
  - 22 States had procedures
  - Followed State truck size and weight statutes
Summary

• No formal and specific guidance in place
• Treated as overweight vehicle
• No provision for conducting load-rating analysis that includes gusset plates
• Bridge owners may allow stockpiling before analysis