



Design Problem No. 4

Dean L. Sicking, Ph.D., P.E.

2004 Roadside Safety Workshop

June 23-24, 2004



Design Problem No. 4

- TH 4 criteria
 - Rural 2-lane undivided highway
 - 12' lanes
 - 10' shoulders (2' bit., 8' aggr.)
 - ADT = 2,100
 - Design speed = 60 mph
 - Posted speed = 55 mph

Design Problem No. 4 (Continued)

- Resurfacing scheduled for 2005
 - 3" mill & 3" overlay
- Guardrail upgrades
 - West of bridge 46003 are straightforward
 - Between bridges 46003 and 932 are less clear



Distance: 4186.7 ft
Latitude: +43.6483803
Heading: 79.3°
District: 7
Name: M4
FDiPost: 10.111

Mile Point: 10.940 RP
Longitude: -94.7584686
Grade-CS:
Co: 0
DD: I
TDiPost: 10.990

SurveyDateTime: 05/27/2003 14:58

Bridge 46003



Distance: 4237.5 ft
Latitude: +43.6484070
Heading: 79.6°
District: 7
Name: M4
FDiPost: 10.111

Mile Point: 10.950 RP
Longitude: -94.7582779
Grade-CS:
Co: 0
DD: I
TDiPost: 10.990

SurveyDateTime: 05/27/2003 14:58



Distance: 4485.8 ft
Latitude: +43.6485252
Heading: 79.7°
District: 7
Name: M4
FDiPost: 10.111

Mile Point: 10.997 RP
Longitude: -94.7573471
Grade-CS:
Co: 0
DD: I
TDiPost: 10.990

SurveyDateTime: 05/27/2003 14:58

test



Distance: 4584.6 ft
Latitude: +43.6485748
Heading: 80.0°
District: 7
Name: M4
FDiPost: 10.111

Mile Point: 11.015 RP
Longitude: -94.7569885
Grade-CS:
Co: 0
DD: I
TDiPost: 10.990

SurveyDateTime: 05/27/2003 14:58



Distance: 298.4 ft
Latitude: +43.6487160
Heading: 80.1°
District: 7

Mile Point: 11.056 RP
Longitude: -94.7558746
Grade-CS:
Co: 0
DD: I
TDiPost: 11.979

Name: M4
FDiPost: 10.990
SurveyDateTime: 05/27/2003 14:59

Bridge 932



Distance: 541.7 ft
Latitude: +43.6488342
Heading: 79.5°
District: 7
Name: M4
FDiPost: 10.990

Mile Point: 11.103 RP
Longitude: -94.7549515
Grade-CS:
Co: 0
DD: I
TDiPost: 11.979

SurveyDateTime: 05/27/2003 14:59



Distance: 688.3 ft
Latitude: +43.6488991
Heading: 81.1°
District: 7
Name: M4
FDiPost: 10.990

Mile Point: 11.130 RP
Longitude: -94.7544098
Grade-CS:
Co: 0
DD: I
TDiPost: 11.979

SurveyDateTime: 05/27/2003 14:59

Design Problem No. 4 (Continued)

- Existing guardrail
 - 3-cable guardrail
 - Protects deep ditch adjacent to highway
 - 2:1 slope

- What type of guardrail would work best between bridges 46003 and 932?

3-Cable Guardrail on 1.5:1 Slope







Computer Simulation Results

- Reduced post spacing to 4'
 - Increased lateral stiffness
 - Reduced lateral barrier deflections
- Increased barrier offset to 4' from breakpoint
 - Limited vehicle penetration on slope
 - Reduced vehicle c.g. drop

Design Problem No. 4 Conclusions

- Cable guardrail not acceptable within 1' of 1.5:1 slope
- For steep slopes use 4' post spacing and install barrier at least 3' from slope breakpoint
- Rounding slope breakpoint will improve barrier performance