



Design Problem No. 5

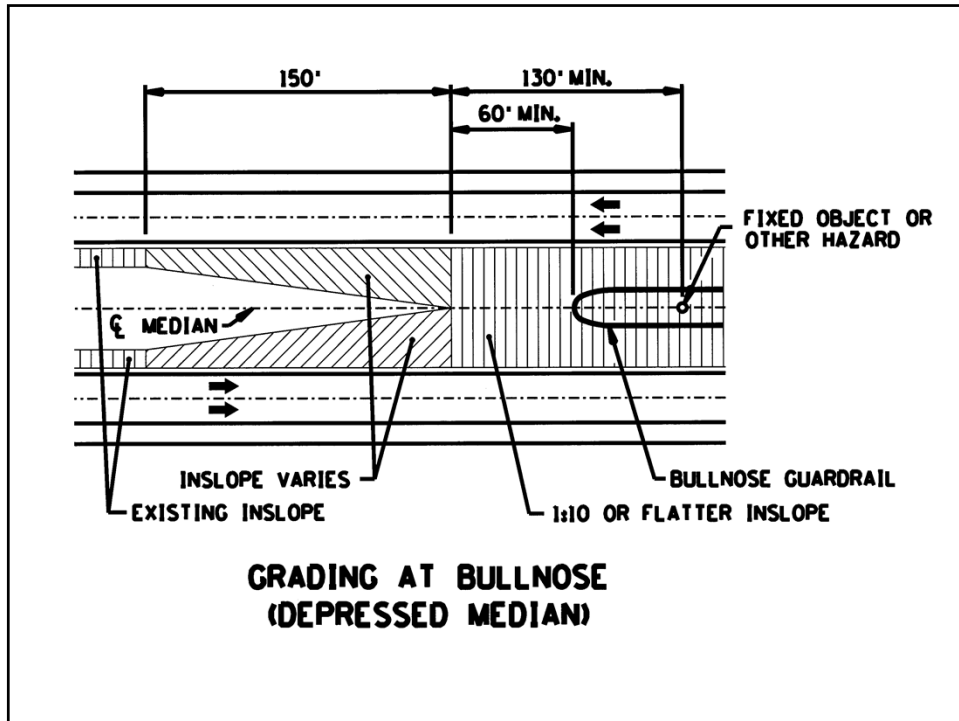
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Design Problem No. 5

■ Facts

- 5-ft radius W-beam bullnose systems upgraded when significantly damaged
- use MwRSF thrie beam bullnose (350 approved)
- thrie beam bullnose requires 10:1 front slope upstream of nose
- significant costs to upgrade system, including materials, installation, grading, and drainage
- What alternatives exist?
- How are they different from the thrie beam bullnose option? (cost, grading, maintenance, etc.)



Thrie Beam Bullnose



Cedar Avenue



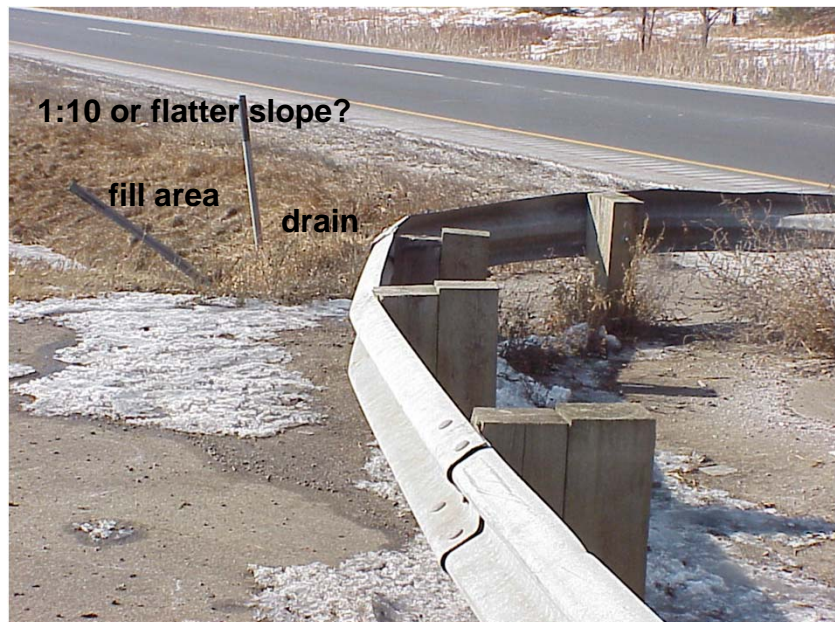
Cedar Avenue



5-Ft W-Beam Radius



5-Ft W-Beam Radius



Alternatives

- CAT System (cost/grading?)
- Guardrail End Terminals (cost/grading?)
 - Kansas Example
 - Missouri Example
- BEAT – BP (cost/grading?)
- MwRSF Bullnose (cost/grading?)
- Inertial Barrels (cost/grading?)
- Other Crash Cushions (cost/grading?)

CAT System



ET-2000 System



ET-2000 System



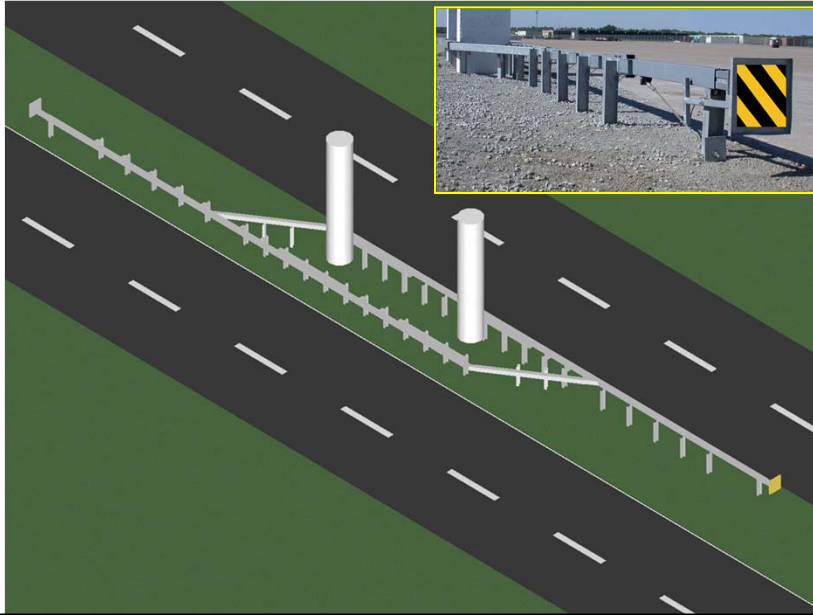
Kansas Example



Missouri Example

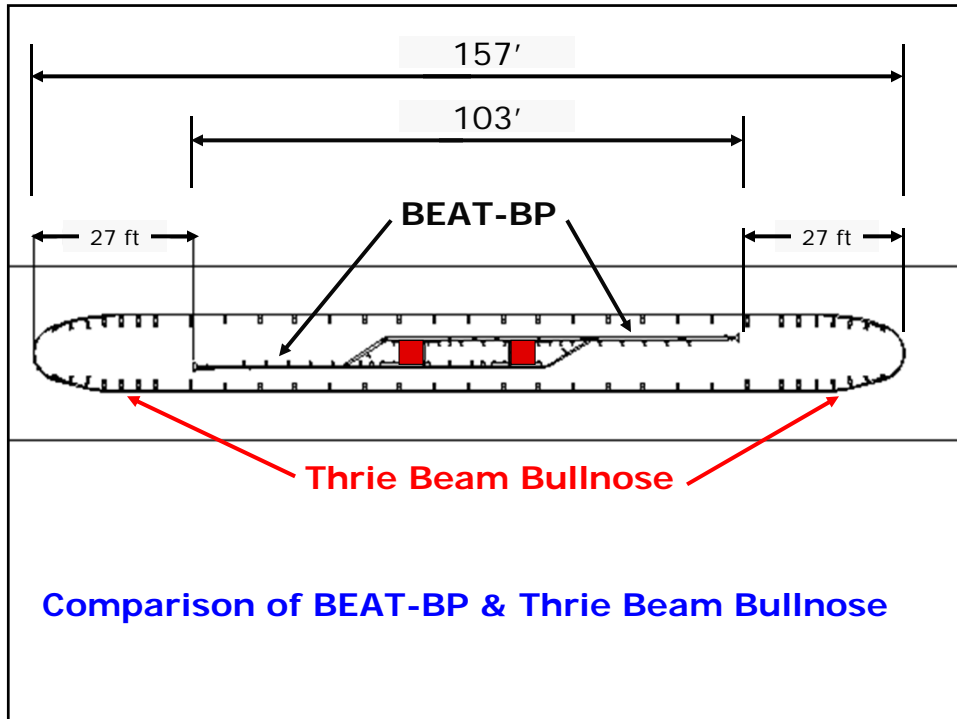


BEAT-BP



BEAT-BP





Comments

- All treatments require grading
- Cost analysis must include hardware, grading, drainage, and maintenance
- Actual cost data difficult for MwRSF to obtain
- Maintenance costs must be considered when determining best solution
- Length of system and distance from travel way is best surrogate for maintenance cost

Estimated Costs

- All treatments require grading
- Cost analysis must include hardware, grading, drainage, and maintenance
- Actual cost data difficult for MwRSF to obtain
- Maintenance costs must be considered when determining best solution
- Length of system and distance from travel way is best surrogate for maintenance cost

Recommendations

- Conduct a benefit-cost analysis to determine preferred alternatives and develop generic guidelines
- Research study can be funded to develop these guidelines