Guardrail Calculator

Description
For years designers and technicians have used MoDOT’s Guardrail Length Need Program to help assess and design guardrail needs on projects. In recent years, the program has become outdated and no longer automatically calculates the correct length of need for guardrail components. This is mostly in part because AASHTO tables have been modified for run-out lengths for the various design criteria that MoDOT encounters. The Guardrail Calculator is a quick and easy Guardrail Length of Need spreadsheet calculator. This innovation is a simple spreadsheet to aid a designer that by entering and selecting a few design variables have instantaneous and correct guardrail data.

Benefit
The calculator spreadsheet saves MoDOT money by correctly evaluating guardrail length of need based on updated AASHTO tables since the new run-out lengths dictate shorter runs of guardrail than the old tables. It simplifies work by the ease of use for the designer. While the spreadsheet contains some complicated formulas, the user will not have to use them. The user simply opens the file, saves it as their own document then adds a few project details and variables. The results are automatic. Also, since it is an Excel spreadsheet, it is easily modified without programming experience. The spreadsheet saves the user time by eliminating the need to look up correct AASHTO tables for calculating. By using the spreadsheet in the design process, safety is improved since the most accurate guardrail analysis for the various hazards that require the safety and protection that guardrail offers.

Materials and Labor
5 hours of staff time with no material costs. Spreadsheet shown on back page.

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Additional photos or videos can be seen by accessing the Innovations Challenge SharePoint page at: http://sharepoint/systemdelivery/TP/Documents/InnovationsChallenge.aspx.
Length of Need Spreadsheet

<table>
<thead>
<tr>
<th>Date:</th>
<th>Current Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>County:</td>
<td>Any County</td>
</tr>
<tr>
<td>Route:</td>
<td>Any Route</td>
</tr>
<tr>
<td>Job Number:</td>
<td>Any Job Number</td>
</tr>
<tr>
<td><strong>Comments:</strong></td>
<td>describe the location</td>
</tr>
</tbody>
</table>

**INPUT DATA:**
- **TRAFFIC SPEED (MPH):** 60
- **DESIGN ADT:** 2250
- **SLOPE TYPE:** Fill 4:1 - 5:1
- **DIRECTION:** Adjacent
- **BRIDGE:** YES
- **BARRIER TYPE:** Safety Barrier
- **HORIZONTAL CURVE RADIUS (ft):** NONE
- **(L1) Lateral Extent (ft):** 40
- **(L2) Lateral Distance (ft):** 10

**BEGIN STATION:** +00.00  
**END STATION:** +00.00  
**BEGIN LOG MILE:** 0.000  
**END LOG MILE:** 0.000

**OUTPUT DATA:**
- **(Lc) Clear Zone (ft):** 32-40 (a)  
- **(Lt) Runout Length (ft):** 210  
- **(I) ft:** 157,500  
- **SEG Bridge Appr. Trans. Section (ft):** 37.5  
- **SEG End Anchor (ft):** 0.00  
- **MASH CW End Terminal (ft):** 31.25  
- **MASH Guardrail Length (ft):** 100.0  
- **Approximate Total Guardrail length (ft):** 181.25

**STATION RANGE**

<table>
<thead>
<tr>
<th>N/A</th>
<th>N/A</th>
<th>N/A</th>
<th>N/A</th>
</tr>
</thead>
</table>

**DIAGRAM:**
- **L1 (ft):** 40  
- **L2 (ft):** 10  
- **Lr (ft):** 210  
- **X (ft):** 157,500  
- **Lc (ft):** 32-40 (a)  

**Horizontal Curve Radius (ft):** NONE

**Notes:**
- **(a)** - Where a sight specific investigation indicates a high probability of continuing crashes, or such occurrences are indicated by crash history, the designer may provide clear zone distances greater than the distance shown. Clear zones may be limited to 30 ft for practicality and to provide consistent roadway layout. If previous experience with similar projects or designs, indicates satisfactory performance.
- **(b)** - Survey recovery is less likely on the unhindered, traversable 3:1 slopes, fixed objects should not be present in the vicinity of the toe of these slopes. Recovery of high speed vehicles that impact beyond the edge of the shoulder may be expected to occur beyond the toe of the slope. Determination of the distance of the recovery area at the toe of the slope should take into consideration right-of-way availability, environmental concerns, economic factors, safety needs, and accident histories. Also, the distance between the edge of the travel lane and the beginning of the 3:1 slope should influence the recovery area provided at the toe of slope.
- **(c)** - For roadways with low volume it may not be practical to apply even the minimum values found in AASHTO Table 3.1. Refer to the AASHTO Roadside Design Guide Chapter 10 for additional guidance for urban applications and Chapter 11 for additional considerations for low-volume roadways.
- **(d)** - When design speeds are greater than the values provided, the designer may need to provide greater clear-zone distances. Select desired Lateral Extent of Hazardous Area (L1).
- **(e)** - If a Horizontal Curve value between 330 and 2950 is selected, a Curve Correction Factor will be applied to the Clear Zone distance. Select radius closest to your curve. Select the larger radius if both lie between this corrected Clear Zone distance may affect the distance the designer will use. Select radius closest to your curve. The larger radius effect of the hazardous area will greatly affect the Length of Need. The clear-zone correction factor is applied to the outside of curves only. Select None for straight roadways and horizontal curves with a radius that is 2950 ft. (AASHTO Table 3.2)