UDOT Median Barrier Selection Process
March 6, 2012

Notes:

- This process is not intended to define the need for barrier, rather to standardize the type of barrier selected when barrier is required.

- Use of glare screen is by site specific study only and is not covered by this process. Contact the Traffic and Safety Operations Engineer.

- All current UDOT Standards are NCHRP 350 compliant. Test Level as per NCHRP 350.

- Test Level 5 cast-in-place constant slope barriers are acceptable per February 14, 2000 FHWA “Report 350 Nonproprietary Guardrails and Median Barriers” memo from Dwight Horne, Director of Office of Highway Safety Infrastructure.

- Test Level (TL) defined: A set of conditions, defined in terms of vehicle mass, vehicle impact speed, and vehicle impact angle, that quantifies the impact severity of a matrix of tests.
  
  - Test Level 3: Tests up to a 4,400 lb vehicle impacting at speeds up to 62 mph and at approach angles up to 25 degrees.
  
  - Test Level 5: Tests up to a 79,400 lb vehicle impacting at speeds up to 50 mph and at approach angles up to 15 degrees.

Barrier Selection Process:

1. UDOT median barrier reference information:

   a. Roadside Design Guide:
      
      i. Accepted as UDOT’s resource per the Roadway Design Manual of Instruction
      
      ii. Chapters 6 and 10 (barrier warrants sections)
b. Use UDOT Standard Drawings (BA series) for location and installation requirements

c. Overview of median barrier:
   i. On freeways and other roadways with medians:
      1. Median width is less than 50 feet
      2. Posted speed is 45 mph or more
   ii. Crossover crash rate exceeds the expected value for the facility. See the operational safety report
   iii. Recommended by UDOT Traffic and Safety

2. Review options for barrier type selection:
   a. Test Level 3 barriers:
      i. Median cable barrier
      ii. 30” median barrier W-beam guardrail
      iii. 32” precast concrete full barrier standard shape (New Jersey shape)
      iv. 42” precast concrete constant slope barrier
      v. 42” cast-in-place constant slope barrier
      vi. 54” cast-in-place constant slope barrier
   b. Test Level 4 barriers: Parapets for use on bridges only, as per UDOT Structures Division guidance
   c. Test Level 5 barriers:
      i. 42” cast-in-place constant slope barrier
      ii. 54” cast-in-place constant slope barrier
3. **Determine Test Level required:**
   a. Test Level 3, or higher, is required for all medians with barrier
   b. Test Level 5 is required for:
      i. Site specific locations when needs justify Test Level 5. Use items one through four of the “UDOT Test Level 5 Barrier Warrants/Approval Request Form” to determine if Test Level 5 barrier should be considered. Examples of site specific needs may include:
         1. Crash history
         2. Roadway geometrics (e.g., long downgrade with horizontal curves)
         3. High AADT and truck volumes
      ii. Column protection:
         1. Use when required by AASHTO Load and Resistance Factor Design (LRFD) in median and/or shoulder applications to protect bridge columns
         2. See UDOT Standard Drawing BA 1E for more information
         3. Consult with the bridge engineer assigned to the project

4. **Determine barrier type:**
   a. Test Level 3:
      i. Use cable barrier unless another type is justified due to:
         1. Compatibility with existing site (drainage, median width constraints, existing site grading, etc.)
         2. Roadway geometric considerations or crash history
         3. Deflection and redirection capabilities
ii. When higher performance barrier is justified, determine barrier type based on:

1. Life cycle cost considerations (see appendix):
   a. Expected service life
   b. Initial construction costs
   c. Expected repair rates based on hit rates and severity
   d. Anticipated salvage and removal costs

2. Corridor consistency

3. Need for an integrated gawk screen on urbanized freeways. Use 54” cast-in-place constant slope barrier

b. Determine height of Test Level 5 barrier:

   i. Use 42” unless 54” cast-in-place constant slope barrier is justified due to:

      1. Matching adjacent barrier height
      2. Concerns of trucks affecting opposing traffic
      3. Need for an integrated gawk screen on urbanized freeways
      4. Column protection:

         a. Use 54” cast-in-place constant slope barrier when required by AASHTO Load and Resistance Factor Design (LRFD) in median and/or shoulder applications to protect bridge columns

         b. See UDOT Standard Drawing BA 1E for more information

         c. Consult with the bridge engineer assigned to the project
Appendix: Reference Information to Assist in Barrier Selection

Costs updated February 2012
See UDOT average bid costs in PDBS for current information

Expected Service Life

*Cast-in-place or precast barrier* ....................................... 40 years

*Cable barrier* ............................................................... 30 years

*W-beam guardrail* .......................................................... 30 years

**Hit Repair Costs** (use actual historical costs where possible)

*Cast-in-place*

- Large vehicle (truck) ..................................................... $15,000 per hit
  *(30 feet total replacement – loose steel cut free and tied into both ends)*
- Small vehicle (car/SUV) .................................................. $0 per hit

*Precast*

- Large vehicle (truck) ..................................................... $3,900 per hit
  *(3 barrier segments replaced and 8 segments reset)*
- Small vehicle (car/SUV) .................................................. $1,900 per hit
  *(1 barrier segments replaced, 4 segments reset)*

*Cable*

- Large vehicle (truck) ..................................................... $750 per hit
  *(6-20 posts replaced – requiring 2 man hours)*
- Small vehicle (car/SUV) .................................................. $250 per hit
  *(3-6 posts replaced – requiring 1 man hour)*

**Construction Costs**

*Cast-in-place* ............................................................... $65 to 135 per ft

*Precast* ................................................................. $45 to 55 per ft

*Cable* ............................................................... $13 to 17 per ft
Hit Rate Ranges (use actual historical and anticipated hit rates where possible)

Urban

Large vehicle (truck) ..............................................0.4 to 0.8 hits/mile/year
Small vehicle (car/SUV) ......................................5.0 to 7.0 hits/mile/year

Rural

Large vehicle (truck) ..............................................0.1 to 0.3 hits/mile/year
Small vehicle (car/SUV) ......................................1.0 to 3.0 hits/mile/year