City of Colorado Springs Bridge Design Criteria and Guidelines - City Addendums

The City of Colorado Springs has developed the following standards and guideline addendums for use on all bridges to be designed and constructed within the city limits. These are addendums to the CDOT Bridge Design Manual. The current version of any manual reference shall govern.

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ADDENDUM 1: BRIDGE APPROACH RAIL GUIDELINES

The following guidelines exist for the low-speed urban roadways in the city. This addendum outlines the recommended and expected design approach for City guardrail barriers at bridges and provides table providing guidance on approach rail lengths based on the Federal Highway Administration Low Speed Road Design Guidelines.

There are several documents that provide information and guidance concerning approach rail length. These include the AASHTO Policy on Geometric Design of Highways, AASHTO Roadside Design Guide, Manual on Uniform Traffic Control Devices, and CDOT M & S Standards. This addendum is intended supplement these documents and clarify the expectations for bridge approach rails in the city.

The bridge approach rail guidelines are as follows:

- CDOT Bridge Design Manual for bridge design overview and guardrail intent. The manual provides an outline of the state's guardrail intent and design guidance. (https://www.codot.gov/programs/bridge/bridge-manuals/design_manual/cdot_bridge_design_manual_2022_02.pdf).

- The Federal Highway Administration has the November 2005 FLH Barrier Guide for Low Volume and Low Speed Roads which should also be referenced for the Cities barrier designs. (https://highways.dot.gov/sites/fhwa.dot.gov/files/docs/federal-lands/resources/highway-safety/12791/flh-barrier-guide.pdf).

- Based on the Federal Highway Administration FLH Barrier Guide for Low Volume and Low Speed Roads (https://highways.dot.gov/federal-lands/safety/barrier-length-need). The suggested approach guardrail runout lengths area in the table below. Note that there is also an Excel Document (accessible through the aforementioned link) available which provides a tool for developing these suggested runout distances. The current version shall govern.

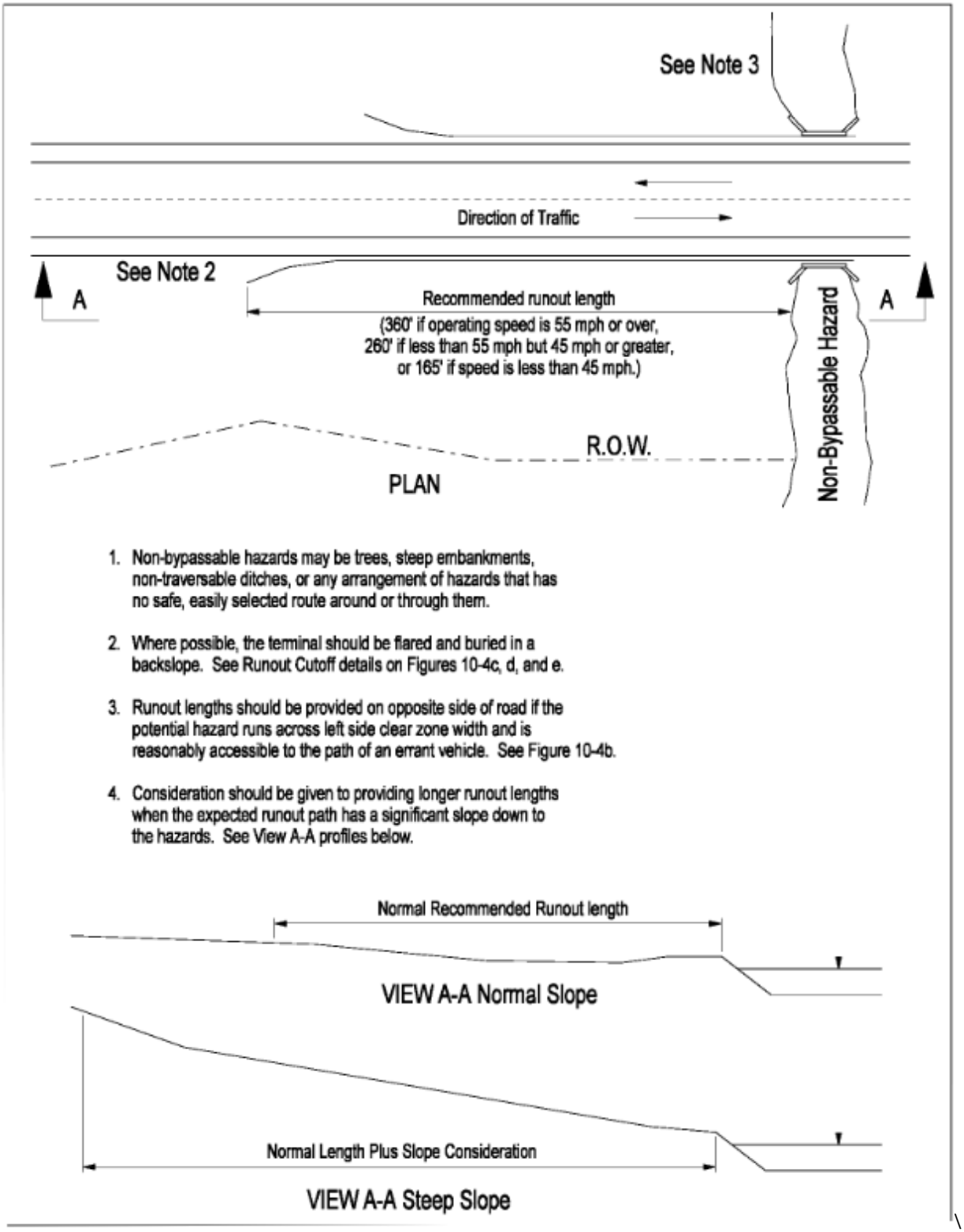
Suggested Runout Lengths				
RDG T5-10 & FLHBG T4.1				
Design Speed (mph)	Traffic Volume (ADT)			
	Over 10000	5000-10000	1000-5000	under 1000
	Runout Length, Lr (ft)			
20	***60***	***50***	***35***	***25***
25	***85***	***70***	***60***	***50***
30	110	90	80	70
35	**135**	**110**	**95**	**85**
40	160	130	110	100
45	***195***	***160***	***135***	***125***
50	230	190	160	150
55	***265***	***220***	***185***	***175***
60	300	250	210	200
70	360	330	290	250

FHWA FLH Barrier Guide for Low Volume and Low Speed Roads, Rev June 2018

- "Runout length" is the length of clear area available parallel to and behind a barrier. For the City design process, the runout length is measured from the start of a barrier to a “non-bypassable hazard”. A “non-bypassable hazard” is any hazard or arrangement of hazards such that a driver running in the clear area parallel to the highway will be unlikely to find a safe route around or through them. Non-bypassable hazards may include bodies of water, non-traversable streams, creeks, and ditches, steep transverse embankments or hillsides (those with contours running perpendicular to the roadway), stands of trees, or hazards in a swale or in the clear runout width at the bottom of a slope. The abutment and embankment for a bridge passing over the highway will usually constitute a non-bypassable hazard, as well. The toes of such embankments should be well rounded on the side facing approaching traffic to give an errant vehicle an opportunity to run up the embankment, rather than impacting into it. See the Exhibit on the following page for additional information.

The City recognizes that exceptions to these guidelines will be required due to issues that are commonly encountered in urban areas. These exceptions will be considered, and decisions made concerning their approval through the City of Colorado Springs Design Variance process.

Exhibit 10-7 Runout Lengths



ADDENDUM 2: BRIDGE RAIL REQUIREMENTS

This addendum outlines the typical Bridge Rail design types which can be used on City of Colorado Springs Bridges. Any variance from these typical design types would require specific approval via the City Design Variance Process.

1) Acceptable bridge rails within the city include CDOT Type 7, Type 8R MASH, and Type 10 MASH. Please refer to the attached link for details(https://www.codot.gov/programs/bridge/bridge-manuals/design_manual/bdm_section_13_2022.pdf).

2) "Dog House" Rail may be approved for specific locations. Please see the attached drawings which are available at the attached link (https://coloradosprings.gov/public-works/page/standard-details).

3) Approval can be granted by City Engineering for other rail designs based on crash tested design speed. The designer must provide information that verifies the crash testing.

ADDENDUM 3: BRIDGE WATERPROOFING SYSTEMS

This addendum requires waterproofing systems be installed during construction of a new bridge or during bridge rehabilitation efforts.

Waterproofing System

Addition of a waterproofing system is required when bridges have concrete decks and for concrete box culverts.

Currently accepted waterproofing systems:

- Membrane application prior to HMA overlay CDOT Section 515.
    - Membrane application shall extend a minimum of 18” down the sides of a box culvert and extend dampproofing down the entirety of the sides whenever feasible.
- Thin Bonded Overlay (Polyester Concrete) CDOT Section 519.
- Other waterproofing systems will be considered, subject to approval from the Bridge Asset Manager.

ADDENDUM 4: BRIDGE DESIGN AND CONSTRUCTION GUIDELINES

For new bridges and bridges being rehabilitated, the City requires the following or requires the following to be considered during the design process:

1) Culvert Length and Bridge Rail - The City recommends that the configuration of a culvert extend the ends of the culvert beyond the roadway clear zone instead of providing bridge and bridge approach rails.
2) Ice Buildup on Roadway and Sidewalks – Use of solid bridge rail is discouraged on bridges with and East-West orientation due to the potential for ice buildup on the road and sidewalk. Rail segments that have a shaded area behind the rail, and are not exposed to the sun, have a history of potentially creating ice buildup. Bridge rail that is not solid and provides opportunity for the sunlight to pass through the rail to melt the snow and ice is encouraged at these locations.
3) Pedestrian and Bicycle Shared Use - When pedestrians and bicycles share a sidewalk over a bridge, use of a wider sidewalk on the bridge is recommended.
4) Pedestrian Area Lighting - Lighting of sidewalks on bridges should be considered and provided where it is appropriate.
5) Fences on Bridges – Use of chain link fence on bridges shall be used only when specifically approved by the City. When chain link fence is included within a project the chain link should be a colored vinyl covered 2”x2” pattern.
6) Year Built Placard - Each new bridge completed, or bridge replacement shall include a placard which provides the year of completion of the structure. The preferred method is a numbering inset into a concrete surface such as the bridge rail or abutment.
7) Bridge Deck and Roadway Drainage – The City requires roadway drainage water catchment be designed and installed prior to the water running onto a bridge. Drainage features, such as inlets, should be outside of approach slab whenever possible. The CDOT Bridge Design Manual provides additional information concerning bridge deck drainage.
8) Expansion Joint Configuration and Location – Bridge expansion joints should be designed for locations that minimize the potential for water exposure to the abutments, bearings, and other bridge features. Expansion joints, when required, should consider drainage paths in the bridge design and minimization of long-term maintenance.