

**APPENDIX R**

**Design Exceptions**



To	Richard Kelley
From	Kevin Morrison
Date	July 6, 2010
RE	AASHTO Design Exceptions for Partial Cloverleaf Option

The following is a list containing all of the design exceptions that will be required to implement the proposed partial cloverleaf option for the Route 9 Interchange in Wellesley. The list is organized by roadway designation and the specific section of the AASHTO Geometric Design of Highways and Streets Guide that requires the design exception.

#### I-95/Route 128 Mainline

- Minimum Radius (Pg. 147)
  - According to Exhibit 3-15, the minimum radius for a 65-mph design speed with  $e=6\%$  is 1,660 feet, while the current design calls for a minimum 1,600 ft radius curve on the I-95/Route 128 mainline (this curve meets the existing 1,600 ft radius curve at the northern limit of work). The current design, however, is satisfactory for a design speed of 60 mph.
- Tangent Runout Location with Respect to End of Curve (Pg. 183)
  - Exhibit 3-33 recommends that 80% of the tangent runout be placed prior to the curve with two lanes rotated; the current design calls for 85% of the runout before the curve.
- Design Controls for Crest Vertical Curves (Pg. 272)
  - The current design meets AASHTO requirements for a design speed of 60 mph for the I-95/Route 128 mainline, but not for a 65 mph design speed.
- Design Controls for Sag Vertical Curves (Pg. 277)
  - The current design meets AASHTO requirements for a design speed of 60 mph for the I-95/Route 128 mainline, but not for a 65 mph design speed.
- Pavement and Shoulders (Pg. 505, 814)
  - “The usable paved width of the right shoulder should be at least 10 ft; where the DDHV for truck traffic exceeds 250 veh/h, the right shoulder width should be at least 12 ft”. The current design calls for 10-ft paved right shoulders with a narrower 6-ft paved right shoulder in the rock cut area. However, for an auxiliary lane, AASHTO states that “the adjacent shoulder should desirably be 8 to 12 ft in width, with a minimum 6 ft wide shoulder considered.

### Route 9 Mainline

- Vertical Clearance (Pg. 472)
  - AASHTO states that “new or reconstructed structures should provide 16-ft vertical clearance over the entire roadway width. Existing structures that provide clearance of 14-ft, if allowed by local statute, may be retained. In highly urbanized areas, a minimum clearance of 14-ft may be provided if there is an alternate route with 16-ft clearance. Structures should provide additional clearance for future resurfacing of the underpassing road”, while the design calls for a clearance of 15 feet over Route 9.

### Ramp W-1

- Tangent Runout Location with Respect to End of Curve (Pg. 183)
  - Exhibit 3-33 recommends that either 70% or 80% of the tangent runout located before the curve, for single and dual-lane ramps, respectively. The current design calls for 67% of the runout to be located before the curve on all ramps.
- Design Controls for Crest Vertical Curves (Pg. 272)
  - The current design meets AASHTO requirements for a design speed of 40 mph.
- Design Controls for Sag Vertical Curves (Pg. 277)
  - The current design meets AASHTO requirements for a design speed of 30 mph.

### Ramp W-2

- Use of Compound Curves (Pg. 164)
  - AASHTO states that “for compound curves, it is preferable that the ratio of the flatter radius to the sharper radius not exceed 2:1”. The current design for Ramp W-2 has a 2,000 ft radius transitioning to a 500 ft radius, a 4:1 ratio.
- Tangent Runout Location with Respect to End of Curve (Pg. 183)
  - Exhibit 3-33 recommends that either 70% or 80% of the tangent runout located before the curve, for single and dual-lane ramps, respectively. The current design calls for 67% of the runout to be located before the curve on all ramps.
- Design Controls for Crest Vertical Curves (Pg. 272)
  - The current design meets AASHTO requirements for a design speed of 40 mph.
- Design Controls for Sag Vertical Curves (Pg. 277)
  - The current design meets AASHTO requirements for a design speed of 35 mph.

### Ramp W-3

- Tangent Runout Location with Respect to End of Curve (Pg. 183)

- Exhibit 3-33 recommends that either 70% or 80% of the tangent runout located before the curve, for single and dual-lane ramps, respectively. The current design calls for 67% of the runout to be located before the curve on all ramps.
- Design Controls for Sag Vertical Curves (Pg. 277)
  - The current design meets AASHTO requirements for a design speed of 45 mph.

#### Ramp W-5

- Tangent Runout Location with Respect to End of Curve (Pg. 183)
  - Exhibit 3-33 recommends that either 70% or 80% of the tangent runout located before the curve, for single and dual-lane ramps, respectively. The current design calls for 67% of the runout to be located before the curve on all ramps.
- Design Controls for Crest Vertical Curves (Pg. 272)
  - The current design meets AASHTO requirements for a design speed of 40 mph.
- Design Controls for Sag Vertical Curves (Pg. 277)
  - The current design meets AASHTO requirements for a design speed of 30 mph.

#### Ramp W-6

- Tangent Runout Location with Respect to End of Curve (Pg. 183)
  - Exhibit 3-33 recommends that either 70% or 80% of the tangent runout located before the curve, for single and dual-lane ramps, respectively. The current design calls for 67% of the runout to be located before the curve on all ramps.

#### Ramp W-7

- Tangent Runout Location with Respect to End of Curve (Pg. 183)
  - Exhibit 3-33 recommends that either 70% or 80% of the tangent runout located before the curve, for single and dual-lane ramps, respectively. The current design calls for 67% of the runout to be located before the curve on all ramps.
- Design Controls for Crest Vertical Curves (Pg. 272)
  - The current design meets AASHTO requirements for a design speed of 40 mph.
- Design Controls for Sag Vertical Curves (Pg. 277)
  - The current design meets AASHTO requirements for a design speed of 35 mph.