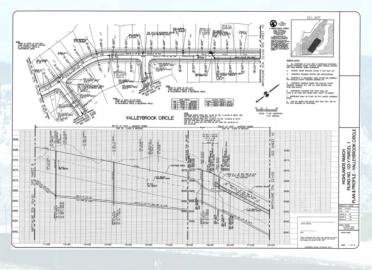


## ROADWAY DESIGN AND CONSTRUCTION STANDARDS







Adopted: 1990

Amended: 1994

2003

2011 2013

# ROADWAY DESIGN AND CONSTRUCTION STANDARDS

## ORIGINALLY ADOPTED IN 1990 Resolution No. R-990-046

#### **OFFICIALLY AMENDED IN 1994**

#### OFFICIALLY AMENDED IN 2003 Resolution No. R-003-092

(Minor Changes concern Traffic Signal Specifications and Signage and Striping Supplement)

#### OFFICIALLY AMENDED IN 2011 Resolution No. R-011-073

(Adoption of new Rural Local Roadway Design and Technical Criteria)

## OFFICIALLY AMENDED IN 2013 Motion No. M-013-047

(Major revisions to Chapters 1, 2, 3, 4, 7, 11, 13, 14, 15, 16 and Appendix A)

## DOUGLAS COUNTY, COLORADO ACKNOWLEDGEMENTS

### THE BOARD OF COUNTY COMMISSIONERS OF THE COUNTY OF DOUGLAS, COLORADO

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#### **REFERENCES**

- 1. <u>Douglas County Subdivision Resolution</u>, 2010, Douglas County Planning Division
- 2. <u>A Policy on Geometric Design of Highway and Streets, 6<sup>th</sup> Revision,</u> 2011, American Association of State Highway and Transportation Officials
- 3. <u>Douglas County Storm Drainage Design and Technical Criteria</u>, 2008, Douglas County Engineering Division
- 4. <u>Standard Specifications for Road and Bridge Construction</u>, 2011, Colorado Department of Transportation
- Transportation Standards and Details for the Engineering Division, 2010 City and County of Denver Public Works
- 6. <u>Infrastructure Design and Construction Standards</u>, 2007, Arapahoe County Department of Public Works and Development
- 7. <u>Urban Storm Drainage Criteria Manual, Vol. 1, 2 & 3,</u> July 2001, Urban Drainage and Flood Control District
- 8. <u>Manual on Uniform Traffic Control Devices for Streets and Highways</u>, 2009 Edition, U.S Department of Transportation, Federal Highway Administration
- 9. <u>Standard Specifications for Highway Bridges, 17<sup>th</sup> Edition</u>, American Association of State Highway and Transportation Officials
- 10. <u>State of Colorado State Highway Access Code, Volume 2, Code of Colorado Regulations, 601-</u> <u>1, 2002 Colorado Department of Transportation</u>
- 11. Highway Capacity Manual, 2000, Transportation Research Board National Research Council
- 12. Trip Generation, 8<sup>th</sup> Edition, Institute of Transportation Engineers
- 13. <u>American Society for Testing and Material</u>
- 14. National Fire Protection Association NFPA -13D, 2010
- 15. <u>Douglas County Grading, Erosion and Sediment Control (GESC) Manual</u>, 2004, Douglas County Engineering Division
- 16. <u>CDOT Roadway Design Guide</u>, 2005, Colorado Department of Transportation
- 17. <u>CDOT M-Standards</u>, 2006, Colorado Department of Transportation
- 18. <u>CDOT Traffic S-Standard Plans</u>, 2006, Colorado Department of Transportation
- 19. <u>Roadside Design Guide, 4<sup>th</sup> Edition</u>, 2011, American Association of State Highway and Transportation Officials
- 20. Douglas County Zoning Resolution, 2010, Douglas County Planning Division

#### **REFERENCES**

<u>Guidelines for Geometric Design of Very Low-Volume Local Roads (ADT&lt;400)</u> , 2001, American Association of State Highway and Transportation Officials				