

December 8, 2005

**PROCESS TO DEVELOP DESIGN STANDARDS
Using AASHTO Manual**

Reference Documents:

"A POLICY on GEOMETRIC DESIGN of HIGHWAYS and STREETS - 2001" by American Association of State Highway and Transportation Officials (AASHTO Manual). As the AASHTO Manual is updated the most current edition applies as appropriate.

"TILLAMOOK FIRE DISTRICT UNIFORM FIRE CODE", Appendix III-E (Fire Department Access). **This document was updated by the Fire Defense Board on 4/21/05. Some section numbering and standards were updated accordingly.**

This handout is meant to provide clarification of procedures used to determine road standards when applying the AASHTO Manual (see below). This handout is not designed to replace actual use and reference of the AASHTO Manual. Note that if other County Ordinances or the local fire departments have higher standards than AASHTO, those other standards apply.

The purpose of this analysis is to develop the design features for a "Local" rural road functional classification. This type of road is consistent with "Major Local" and "Minor Local" roads. For design features for "Minimum Local" roads (i.e. a street accessing 4 or less residences), see Page 3 of this handout.

DEFINITIONS FOR TERRAIN (Page 235 of AASHTO Manual)

"Level" terrain is where highway sight distances, as governed by both horizontal and vertical restrictions, are generally long or could be made to be so without construction difficulty or major expense.

"Rolling" terrain is where the natural slopes consistently rise above and fall below the road grade and where occasional steep slopes offer some restriction to normal horizontal and vertical roadway alignment.

"Mountainous" terrain is where longitudinal and transverse changes in the elevation of the ground with respect to the road are abrupt and where benching and side hill excavations are frequently required to obtain acceptable horizontal and vertical alignment.

**DEVELOPMENT OF DESIGN STANDARDS for
"MAJOR LOCAL" AND "MINOR LOCAL" ROADS**

1. Determine the design Average Daily Traffic (ADT).
 - a. For most developments this will be the existing ADT plus additional ADT for the developments being considered which are causing the needed improvements.
 - b. When considering land development as a cause of increased ADT, the increased ADT should assume the maximum density allowed by the zoning.
 - c. For residential developments the ADT is assumed to be 10 vehicles per day per residence.
2. Determine the Design Speed.
 - a. Use Table 5-1 (Page 385).
 - b. Use Terrain definitions listed above.
3. Determine Stopping Sight Distance and "K" Values for Vertical Curves: Use Table 5-2 (Page 385).
4. No sections with passing sight distances are required with typical subdivision or major partition roads.
5. Determine Maximum Grade: Use Table 5-4 (Page 386).
6. Roadway Cross Slope. (Use 2% crown unless otherwise needed for curve superelevation or alternate engineered design)
7. Determine Superelevation and Maximum Degree of Curve.
 - a. Maximum superelevation is 12% (Page 387).
 - b. Use Tables 3-21 through 3-25 (Pages 157-165) horizontal curvature design. If an applicant proposes a curve radius inconsistent with these tables, they need to provide engineered design details subject to approval by the Director of Public Works.
8. Determine Minimum Width of Traveled Way (paved road): Use Table 5-5 (Page 388).
9. Determine Width of Graded Shoulder (each side).
 - a. Use Table 5-5 (Page 388).
 - b. In Mountainous Terrain shoulder in roadway cuts may be decreased by 2 feet, but only if:
 - (1) the total roadway width is not less than 18 feet, and
 - (2) the cut is not on the inside of a minimum radius curve, and
 - (3) stopping sight distance is not impaired by the roadway cut.

**DEVELOPMENT OF DESIGN STANDARDS for MINIMUM LOCAL ROADS
(i.e. streets accessing a potential of 4 or less residences)**

The first two pages of this handout deal with design standards for Local Roads ("Major" and "Minor"). These standards are driven by potential traffic volume on the road and topography.

A "Minimum Local" Road is defined as a street designed primarily for access to abutting properties and accessing 4 or less residences. In AASHTO this type of road is also known as a "Local Service" Road. When one deals with road standards for a Local Service Road, traffic volume is not the primary factor in design.

Pages 408-420 apply to the design of a Local Service Road. **Read the last two paragraphs on Pages 420 regarding specific application of Local Service Road standards.** In Tillamook County, applicable Local Service Roads standards are applied with the following minimum standards overriding the language of AASHTO:

- Consistent with the County Land Division Ordinance, where ever local fire department road design guidelines are more restrictive than AASHTO, the fire department standards are applied. **To reference further fire department minimum standards, the Tillamook Fire District Uniform Fire Code (UFC) [Appendix III-E] is the acknowledged Access Guidelines source for all fire departments in the County.** The most often applied fire department standards are noted below. A respective fire department reserves the right to conduct case by case reviews of design proposals and may apply a standard greater than the UFC if needed.
- The AASHTO Design Vehicle Type that all local service roads shall be designed to is the Motor Home and Boat Trailer (MH/B, MH-B or MHB).
- Though speed of traffic on Local Service Roads is not a major design factor, speed shall be considered in vertical curve alignment.

DEVELOPMENT OF DESIGN STANDARDS for MINIMUM LOCAL ROADS
(continued)

SUMMARY PROCESS

The below steps outline the summary process for determining design of Minimum Local (Local Service) Roads. Outlined below are highlights only of AASHTO Manual (i.e. not all sub-sections are discussed). They are not intended to replace full utilization of the Special Purpose Roads section as appropriate.

1. Determine the Design Speed: Page 409. This section describes criteria for determining design speeds of proposed roads. Most Minimum Local (Local Service) Roads are considered "Area Roads". These roads are not through roads, but will generally dead end at the service to the last parcel on the road. The minimum acceptable design speed without a Variance is 20 mph.
2. Design Vehicle: MH/B (see above discussion).
3. Determine Stopping Sight Distance and "K" Values for Vertical Curves: Pages 411-412 and Table 5-13.
4. Passing Sight Distance: Pages 410-411.
5. Determine Maximum Grade: Page 413. **On 4/21/05 the Tillamook Fire Defense Board updated their Uniform Fire Code. Section 3.11 provides for a maximum 10% road grade. The fire chief may allow for up to a 15% exception with justification and mitigation. This Section outlines criteria for fire department consideration of grades steeper than 10%.**
6. Determine Horizontal Alignment (Maximum Curvature and Superelevation): Use of the following Exhibits (16 & 17) from the AASHTO Guidelines for Very Low-Volume Local Roads is authorized if the road is gravel. If a paved road, standards for Minor Local Roads applies or an engineered design subject to approval by the Director of Public Works. **Section 3.9 of the UFC outlines minimum turning radii [outside radius not less than 50 feet, inside radius not less than 30 feet].**

Metric						
NOT SHOWN FOR CLARITY						
US Customary						
Design speed (mph)	Minimum radius (ft) for specified traction coefficient					
	0.7	0.6	0.5	0.4	0.3	
15	50	50	50	75	150	
20	55	70	90	135	270	
25	85	105	140	210	420	
30	120	150	200	300	600	
35	165	205	275	410	820	
40	215	270	360	535	1070	
45	270	340	450	675	1350	

Exhibit 16. Guidelines for Minimum Radius of Curvature for New Construction of Unpaved Surfaces with No Superelevation (11)

Material	Surface Condition		
	Dry	Wet	Other
Gravel, packed, oiled	0.50 - 0.85	0.40 - 0.80	-
Gravel, loose	0.40 - 0.70	0.36 - 0.75	-
Rock, crushed	0.55 - 0.75	0.55 - 0.75	-
Earth ^a	0.55 - 0.65	0.40 - 0.50	-
Dry, packed snow	-	-	0.20 - 0.55
Loose snow	-	-	0.10 - 0.60
Snow, lightly salted	-	-	0.29 - 0.31
Snow, lightly salted with chains	-	-	0.34
Ice, without chains	-	-	0.07 - 0.12

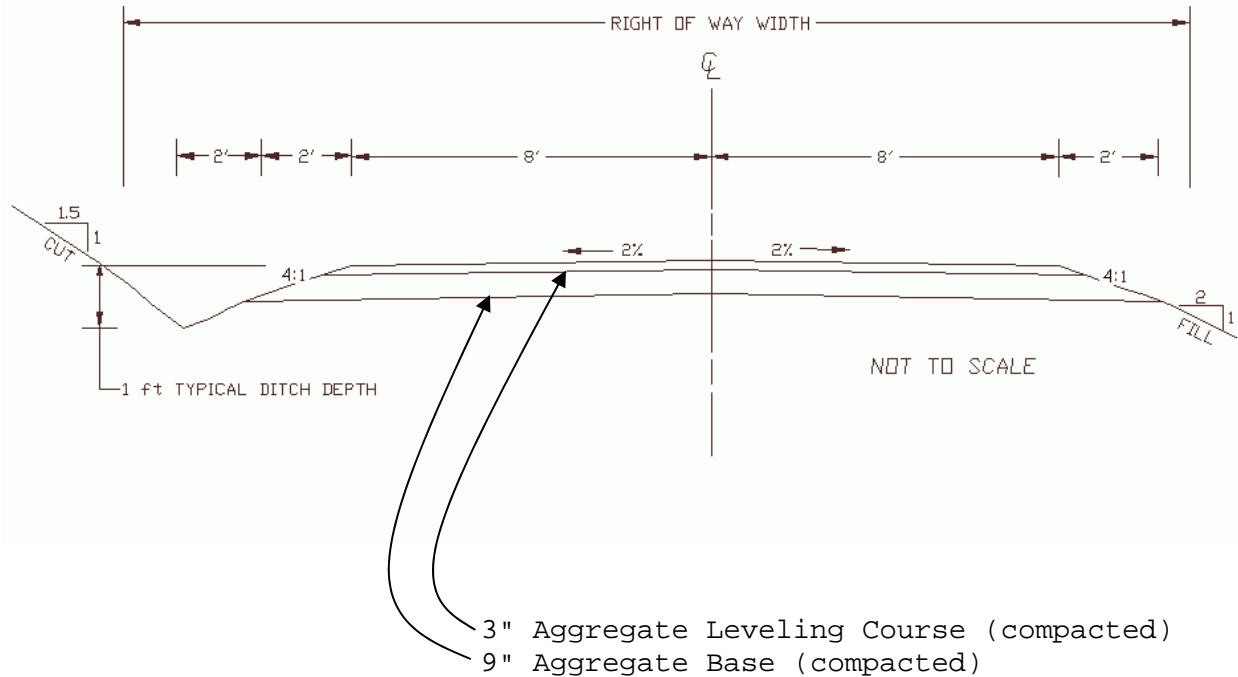
^a reduce earth values by 50 percent for wet clays

Exhibit 17. Traction Coefficients Used in Design of Horizontal Alignment on Unpaved Roads (11)

- Determine Widths of Traveled Way and Shoulders: Sum of the traveled way and shoulder widths constitute the roadway width. **Section 3.5 of the UFC outlines minimum roadway width for minimum local roads. The attached minimum road cross section is consistent with the fire department minimum.** When required, paving applies to the Traveled Way width.

If potential Average Daily Traffic is greater than 40 ADT, roadway widths described for "Major Local" and "Minor Local" Roads applies.

TILLAMOOK COUNTY
MINIMUM ROADWAY SECTION



Notes:

- A. This minimum roadway section is consistent with local fire department minimum roadway width for emergency services vehicles.
- B. Width of traveled way centered in the right of way.
- C. Aggregate and asphalt specifications in accordance with Materials Specifications as outlined by Tillamook County Public Works.
- D. If certain condition(s) are met, paving of the traveled way may be required (not shown in the above section).

ATTACHMENTS:

- Copy of AASHTO Manual Pages 384-388
- Copy of AASHTO Manual Pages 408-420
- Copy of AASHTO Manual Pages 157-163 (metric charts excluded)
- (select portions of above documents not included for clarity)
- Tillamook Fire Defense Board Fire Department Access Guidelines (includes Supplement #1 regarding turnarounds)