



## 172nd / 190th Corridor Plan

# TECHNICAL MEMORANDUM #6.1

## Design Criteria

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This technical memorandum outlines the design criteria and parameters that will guide the development of design concepts for the 172<sup>nd</sup>-190<sup>th</sup> Corridor Plan.

Because there are a number of government agencies that own and maintain the different roadways within the project study area (PSA), the project design criteria considers applicable standards from each of the following jurisdictions:

- Clackamas County
- City of Happy Valley
- City of Gresham

The City of Damascus does not currently maintain any roadways within the PSA, and therefore County standards are used for those streets within the City limits.

The remainder of this technical memorandum outlines the key design criteria for the 172<sup>nd</sup>-190<sup>th</sup> Corridor as well as the other roadways that may be affected by improvement concepts.

### ***172<sup>nd</sup> – 190<sup>th</sup> Corridor***

Design criteria for the 172<sup>nd</sup>-190<sup>th</sup> Corridor were established using Clackamas County's Roadway Standards as the primary basis. The Project Management Team, which consists of staff from Clackamas County, City of Happy Valley, City of Damascus, City of Gresham, Metro, and the consultant team, provided further input and specific direction for the corridor design parameters.

Table 1 summarizes the design criteria for the 172<sup>nd</sup>-190<sup>th</sup> Corridor.

**Table 1 Design Criteria for 172nd-190th Corridor**

Design Element	Design Criteria	Source, Reference**										
Roadway Classification	Minor Arterial	CCCP, Map v-2a, v-2b										
Design Speed		CCRS, Section 250.1.2c; County Staff and PMT direction										
Main Travel Corridor	35 to 40 mph											
Village Centers/Commercial Cores	25 to 35 mph											
Posted Speed (anticipated)		CCRS, Section 250.1.2c; County Staff and PMT direction										
Main Travel Corridor	35 to 40 mph											
Village Centers/Commercial Cores	25 to 35 mph											
Design Vehicle	SU (4 tire)	CCRS, Section 250.1.3										
Control Vehicle	WB-67	CCRS, Section 250.1.3										
Intersection Sight Distance	240 ft – 445 ft	CCRS, Tables 2-6 thru 2-9										
Stopping Sight Distance	155 - 305 ft	CCRS, Table 2-10										
Clear Zone	10 ft	CCRS, Table 2-11										
Horizontal Curve	40 mph: 765 ft 35 mph: 510 ft 30 mph: 335 ft 25 mph: 200 ft	CCRS, Table 2-13 (See Section 250.6); AASHTO										
Tapers	$L=S \times W$ (> 45 mph) $L= WS^2/60$ (< 45 mph) 10:1 (min.) for right-turns & bike	CCRS, Section 250.6.4										
Vertical Curve	<table border="0"> <tr> <td>K (crest)</td> <td>K (sag)</td> </tr> <tr> <td>40 mph: 44</td> <td>40 mph: 64</td> </tr> <tr> <td>35 mph: 29</td> <td>35 mph: 49</td> </tr> <tr> <td>30 mph: 19</td> <td>30 mph: 37</td> </tr> <tr> <td>25 mph: 12</td> <td>25 mph: 26</td> </tr> </table>	K (crest)	K (sag)	40 mph: 44	40 mph: 64	35 mph: 29	35 mph: 49	30 mph: 19	30 mph: 37	25 mph: 12	25 mph: 26	CCRS, Table 2-14 (See Section 250.7)
K (crest)	K (sag)											
40 mph: 44	40 mph: 64											
35 mph: 29	35 mph: 49											
30 mph: 19	30 mph: 37											
25 mph: 12	25 mph: 26											
Roadway Grade	1% - 8%, 10% in residential	CCRS, Section 250.7.2 Dwgs C100-C140										
Maximum Cross Slope	2% - 4%	CCRS, Dwgs C100-C140										
Maximum Superelevation	4% (max.)	CCRS, Section 250.7.6 and AASHTO										
Side Slopes	2:1 (max.) cut/fill slopes outside PUE/clear zone	CCRS, Section 250.9										
Curb Radius*	25 ft – 35 ft	CCRS, Table 2-15 (See Section 250.8.1)										
Minimum Intersection Spacing												
Intersection with Arterials	1,000 ft											
Intersection with Collectors	500 ft											
Intersection with Connectors	250 ft											
Intersection with Local Roads	250 ft											
Signalized Intersections	600 ft											
		CCRS, Table 2-2, Section 220.3-220.10										

Design Element	Design Criteria	Source, Reference**
Sidewalk Width	6 ft (min.), 8 ft (min.) at transit stops	ZDO Section 1007.05, Table 1
Lane Widths		
Travel Lane	11 ft	CCRS, Dwgs C100-C140
Turn Lane	11 ft	
Bike Lane	6 ft	
Shy Distance (where app)	2 ft	
Median Width	14 ft	
Landscape Strip Width	6 ft (min.) with trees, 4 ft (min) with no trees	
Driveway Widths	12 ft (min.) – 35 ft (max.)	CCRS, Section 230.4a
ADA Ramps	2 per intersection corner	CCRS, Section 250.3.8
Street Lights	Required on all improvements	CCRS, Chapter 6
Design Storm	25-year storm event 100-year for bridge design	CCRS, Section 430.2.5
Drainage Slopes	Clear zone: 4:1 (max.) foreslope Swales, ditches: 3:1 (max.) Rock-lined ditch: 2:1 (max.)	CCRS, Section 440.4.3
Intersection Operating Standard	LOS "D" or better	CCCP, page V-9

Notes: \* Curb radii can be reduced 5' if bike lane is present

\*\* CCCP: *Clackamas County Comprehensive Plan*

CCRS: *Clackamas County Roadway Standards*, adopted 1/1/2010

ZDO: *Clackamas County Zoning and Development Ordinance*

AASHTO: *Association of State Highway and Transportation Officials, A Policy on Geometric Design of Highways and Streets*, 2004

### **Other PSA Roadways**

In addition to the 172<sup>nd</sup>-190<sup>th</sup> Corridor, several other existing roadways may be modified or extended within the PSA. The design of these potential roadway improvements will be guided by the relevant plans and design standards of the applicable jurisdictions. Tables 2 through 4 outline the design criteria applicable to each of the various roads within the PSA.

**Table 2 Design Criteria for Other Clackamas County Roads**

Design Element	Design Criteria	Source, Reference**
Roadway Classification	Major Arterial: Sunnyside Rd. Minor Arterial: 172 <sup>nd</sup> , Foster, Tillstrom Collector: 190th, Borges Local: Vogel, Troge, Hemrick, Sager, Cheldelin	CCCP, Map v-2a, v-2b
Design Speed Major Arterial Minor Arterial Collector Local	25-50 mph: 45 mph 30 mph, 35 mph, 40 mph 25-40 mph 25-30 mph	CCRS, Dwgs C100-C140
Posted Speed	5 mph less than design speed	CCRS, Section 250.1.2c
Design Vehicle	SU (4 tire)	CCRS, Section 250.1.3
Control Vehicle	WB-67	CCRS, Section 250.1.3
Intersection Sight Distance	205 ft – 445 ft	CCRS, Tables 2-6 thru 2-9
Stopping Sight Distance	40 mph: 305 ft 35 mph: 250 ft 30 mph: 200 ft 25 mph: 155 ft	CCRS, Table 2-10
Clear Zone	10 ft (minor arterial) 7 ft (collector, local < 30 mph)	CCRS, Table 2-11 (See Section 245)
Horizontal Curve	40 mph: 762 ft 35 mph: 510 ft 30 mph: 333 ft	CCRS, Table 2-13 (See Section 250.6)
Tapers	$L=S \times W$ (> 45 mph) $L= WS^2/60$ (< 45 mph) 10:1 (min.) for right-turns & bike	CCRS, Section 250.6.4
Vertical Curve	K (crest) 40 mph: 44 35 mph: 29 30 mph: 19 K (sag) 40 mph: 64 35 mph: 49 30 mph: 37	CCRS, Table 2-14 (See Section 250.7)
Roadway Grade Major Arterial Minor Arterial Collector Local	1% - 8% 1% - 8%, 10% in residential 1% - 10%, 12% in residential 1% - 10%, 15% in residential	CCRS, Section 250.7.2 Dwgs C100-C140
Maximum Cross Slope	2% - 4%	CCRS, Dwgs C100-C140
Maximum Superelevation	4% (max.)	CCRS, Section 250.7.6 and AASHTO
Side Slopes	2:1 (max.) cut/fill slopes outside PUE/clear zone	CCRS, Section 250.9

Design Element	Design Criteria	Source, Reference**
Curb Radius*		
Major Arterial	25 ft – 35 ft	CCRS, Table 2-15 (See Section 250.8.1)
Minor Arterial	25 ft – 35 ft	
Collector	20 ft – 25 ft	
Local	20 ft	
Minimum Intersection Spacing	250 ft – 500 ft	CCRS, Table 2-2, Section 220.3-220.10
Driveways	12 ft (min.) – 35 ft (max.)	CCRS, Section 230.4a
Sidewalk Width		ZDO Section 1007.05, Table 1
Major Arterial	8 ft	
Minor Arterial	6 ft – 8 ft	
Collector	5 ft – 8 ft	
Local	5 ft	
At Transit Stops	8 ft (min.)	
ADA Ramps	2 per intersection corner	CCRS, Section 250.3.8
Street Lights	Required on all improvements	CCRS, Chapter 6
Lane Widths		CCRS, Dwg's C100-C140
Travel Lane	10 ft – 14 ft	
Turn Lane	11 ft – 14 ft	
Shoulder	6 ft (min.)	
Bike Lane	6 ft	
Median Width	4 ft – 16 ft	
Shy Distance (where app)	2 ft	
Design Storm	25-year storm event 100-year for bridge design	CCRS, Section 430.2.5
Drainage Slopes	Clear zone: 4:1 (max.) foreslope Swales, ditches: 3:1 (max.) Rock-lined ditch: 2:1 (max.)	CCRS, Section 440.4.3

Notes: \* can be reduced 5' if bike lane is present

\*\* CCCP: Clackamas County Comprehensive Plan

CCRS: Clackamas County Roadway Standards, adopted 1/1/2010

ZDO: Clackamas County Zoning and Development Ordinance

**Table 3 Design Criteria for City of Happy Valley Roadways**

Design Element	Design Criteria		Source, Reference**
Roadway Classification	<i>Neighborhood:</i> Hagen <i>Residential:</i> Vogel, Tristane, Troge, Hemrick		HV TSP, Figure 3-5
Design Speed <i>Neighborhood</i> <i>Residential</i>	25 mph 25 mph		HVEDM, Section 120.5
Design Vehicle	WB-50		HVEDM, Section 210.6
Minimum Intersection Spacing	240 ft (25 mph)		HVEDM, Table IIc, Section 210.5
Horizontal Curve	25 mph: 185 ft		HVEDM, Table IIa, Section 210.3
Tapers	L=SxW (> 45 mph) L= WS <sup>2</sup> /60 (< 45 mph) 3:1 for narrow to wide		HVEDM, Section 210.14
Vertical Curve	K (crest) 25 mph: 12	K (sag) 25 mph: 26	HVEDM, Table IIb, Section 210.4
Roadway Grade	0.5% (min.) 10% - 15% (max.)		HVEDM, Section 210.4
Maximum Cross Slope	2.5% - 5%		HVEDM, Section 210.9
Maximum Superelevation	Per design		AASHTO
Side Slopes	2:1 (typ.) to ROW 5:1 within PUE 1.5: (up), 2:1 (down) out of PUE		HVEDM, Section 210.9
Curb Radius <i>Neighborhood, Local</i>	25 ft		HVEDM, Table II d, Section 210.6
Intersection Spacing <i>Neighborhood, Local</i> <i>Driveways</i>	530 ft 25 ft – 50 ft		HVEDM, Sections 210.6 and 210.8
Driveways	35 ft width incl. wings (max.)		HVEDM, Section 210.8
Sidewalks	5 ft separated sidewalks (typ.)		HVEDM, section 210.10; Dwg. 100
ADA Ramps	1-2 per intersection corner, Crosswalks marked only at signals		HVEDM, Section 210.10
Street Lights	As required by City		HVEDM, Section 340
Lane Widths Travel Lane Shoulder Bike Lane	14 ft – 17 ft 6 ft (min.) 6 ft		HVSD, Dwgs 100, 105
Design Storm	25-year storm event		HVEDM, Section 210.4
Drainage Slopes			

Notes: \*\* HV TSP: Happy Valley Transportation System Plan, adopted 02/21/2006  
HVEDM: Happy Valley Engineering Design Manual  
HVSD: Happy Valley Standard Details

**Table 4 Design Criteria for City of Gresham Roadways**

Design Element	Design Criteria		Source, Reference**
Roadway Classification	Major Arterial: SE 190th Ave (with median, green street stds)		PVP, Figure 6 & 17 (2005)
Design Speed	35 -45 mph		GPWS, Section 6.02.05
Posted Speed	35 -45 mph		GPWS, Section 6.02.05
Design Vehicle	Per Engineer		GPWS, Section 6.02.11
Stopping Sight Distance	Per AASHTO, posted speed		GPWS, Section 6.01.01
Horizontal Curve	35 mph: 450 ft 40 mph: 670 ft 45 mph: 900 ft		GPWS, Section 6.02.06
Vertical Curve	K (crest) 35 mph: 29 40 mph: 44 45 mph: 61	K (sag) 35 mph: 49 40 mph: 64 45 mph: 79	AASHTO, p. 272 & p. 277
Roadway Grade	0.5% (min.) 6% (max.)		GPWS, Section 6.02.08
Maximum Cross Slope	2%		GPWS, Section 6.02.13
Maximum Superelevation	2%		GPWS, Section 6.02.13
Side Slopes	2:1 (typ.)		GPWS, Section 6.06.02
Curb Radius	20 ft - 30 ft		GPWS, Section 6.02.11
Minimum Intersection Spacing	Arterials 300 ft - 500 ft Driveways 100 ft		GPWS, Section 6.02.10, 6.04
Driveways	12 ft – 36 ft width		GPWS, Section 6.04
Sidewalks	6 ft – 12.5 ft (4 ft - 6 ft planter strip)		PVP, Table 15 GPWS, Section 6.05.01
ADA Ramps	2 per intersection corner		GPWS, Section 6.05.02
Street Lights	As required by City		GPWS, Section 6.02.14
Lane Widths	Travel Lane 11 ft Swale/median 16 ft Bike Lane 6 ft Parking Lane 7 ft		PVP, Table 15
Design Storm	100-year storm event		PVP, Ch. 8
Drainage Slopes	2:1		GPWS, Std. Detail 615

Notes: \*\* PVP: Pleasant Valley Plan, District Plan, adopted 01/06/2005  
GPWS: Gresham Public Works Standards, adopted 01/01/2006