INTERSTATE 405 Corridor Program
Congestion Relief & Bus Rapid Transit Projects

APPENDIX O4

Design Parameter Forms

I-405, SR520 to SR522 Stage 1 (Kirkland Stage 1)

Request For Proposal
July 15, 2005

Washington State Department of Transportation

Mainline Design: Northbound I-405

Nickel Project

Description: Northbound I-405 for the entire Kirkland Corridor

This checklist is to confirm interpretation of standards. Your project may require that additional/different/or fewer Design Elements be addressed.

Design Data					
Design Class	I-1 (Interstate)				
Design Year	2030				
Design Speed (Posted Speed)	65 (60) mph				
Number of Lanes	General Purpose: 4		HOV: 1	Auxiliary:	
2030 ADT	xxxxx (2-way)				
2030 Truck Percentage	x.x%				
Design Element	**DM Reference**	**Fig Ref**	**Design Standard**	**Existing**	**Determination**
Access Control	1420.02[12/03]	440-4 [5/01] 1420-1 [12/03]	Full	60-65	Existing to remain.
Vertical Clearance (Bridges not a part of the project)	1120.04(5)[9/02]	1120.01[9/02]	16.0 ft (Under/Over Existing Bridge) 16.5 ft (New Construction)		Existing to remain.
Right of Way Width		440-4[5/01]	Min. required to fit all design elements		Existing to remain.
Interchange Spacing	940.04 (3) [9/02]	940-5 [9/02]			
Median					
Median Width	440.10[5/01]	440-4[5/01] 640-15a[2/02] 640-15b[2/02] 640-15c[2/02]	22 ft., min.	Varies.	Shoulders to be restriped. Minimum median width 10'
Median Width Transitions	620.07(2)[11/99]		65:1 Desirable		
Median Accident/Barrier Warrant					
Median Width/Barrier Placement					

Design Element	DM Reference	Fig Ref	Design Standard	Existing	Determination
Roadway					
Lane Width	440.08[5/01]	440-4[5/01]	12 ft.	stet	Lanes restriped. Standard met for 84% of project
Turning Roadway Width	640.04(2)(d)[2/02]	640-7a,b [2/02]	Varies with radius and lane configuration		
Lane Transition	620.07(1)[11/99]		1:4 to 1:15 to widen, 1:65 to reduce		
Max. Superelevation	640.05(1)[2/02]	640.11a [2/02]	10%		
Superelevation Transition	640.05(4)[2/02]	640-13a-e[2/02]	Varies with super rate and roadway width		
Lane Cross Slope	640.04(1)[2/02]	640-3[2/02]	2.00%		
Shoulders					
Shoulder Width - Inside	440.09[5/01]	440-4[5/01]	10 ft	Standard met for 31% of project.	Standard met for 56% of project.
Shoulder Width - Outside	440.09[5/01]	440-4[5/01]	10 ft	Standard met for 69% of project.	Standard met for 71% of project.
Shoulder Cross Slope	640.04(3)[2/02]	640-3[2/02]	Same as traveled way		
Grade					
Maximum Grade	440.15[5/01]	440-4[5/01]	4 % Rolling terrrain		Existing to remain.
Minimum Grade	630.03(4)[5/01]		As Needed for Drainage		Existing to remain.
Length of Grade	630.03(5)[5/01]	630-2[4/98]	Varies with grade		Existing to remain.
Horizontal Alignment					
Stopping Sight Distance	650.05[4/98, 6/99]	650-2[6/99] 650-4[6/99] 650-9[5/01]	Varies with design speed and grades		SEE SPREADSHEET
Horizontal Curve Radii	640[2/02]	640-11a[2/02]	1370' minimum		

Design Element	DM Reference	Fig Ref	Design Standard	Existing	Determination
Vertical Alignment					
Stopping Sight Distance	650.05[4/98, 6/99]	650-7[4/98] 650-8[5/00]	Varies with design speed and grades		SEE SPREADSHEET
Minimum Length of Vertical Curves	650.05[4/98,6/99]	650-2[6/99]	195'		
Decision Sight Distance	650.06[11/99]	650-5[4/98]	Urban speed/path/direction change 1370 ft		
Roadside					
Fill Slope	640.07(1)[2/02]	640-3[2/02]	Varies between 2:1 and 6:1, depending on height of fill		
Ditch Slope	640.07(1)[2/02] 640.07(4)[2/02]	640-3[2/02]	Varies between 2:1 and 6:1, depending on height of ditch		
Back Slope & Cut Slope	640.07(1)[2/02]	640-3[2/02]	Varies between 2:1 and 6:1, depending on height of cut		
Clear Zone	700.04[5/03]	700-1[5/03]	Varies depending on side slope		

I-405 Congestion Relief and Bus Rapid Transit Project	*Job Number* Kirkland Nickel	*Sheet*	1 of 1
	Made by C. Barnett	*Date*	7/20/04
I-405 Project - NB Kirkland Proposed Stage 1 Alignment	*Checked by* G. Niemasz	*Date*	7/21/04

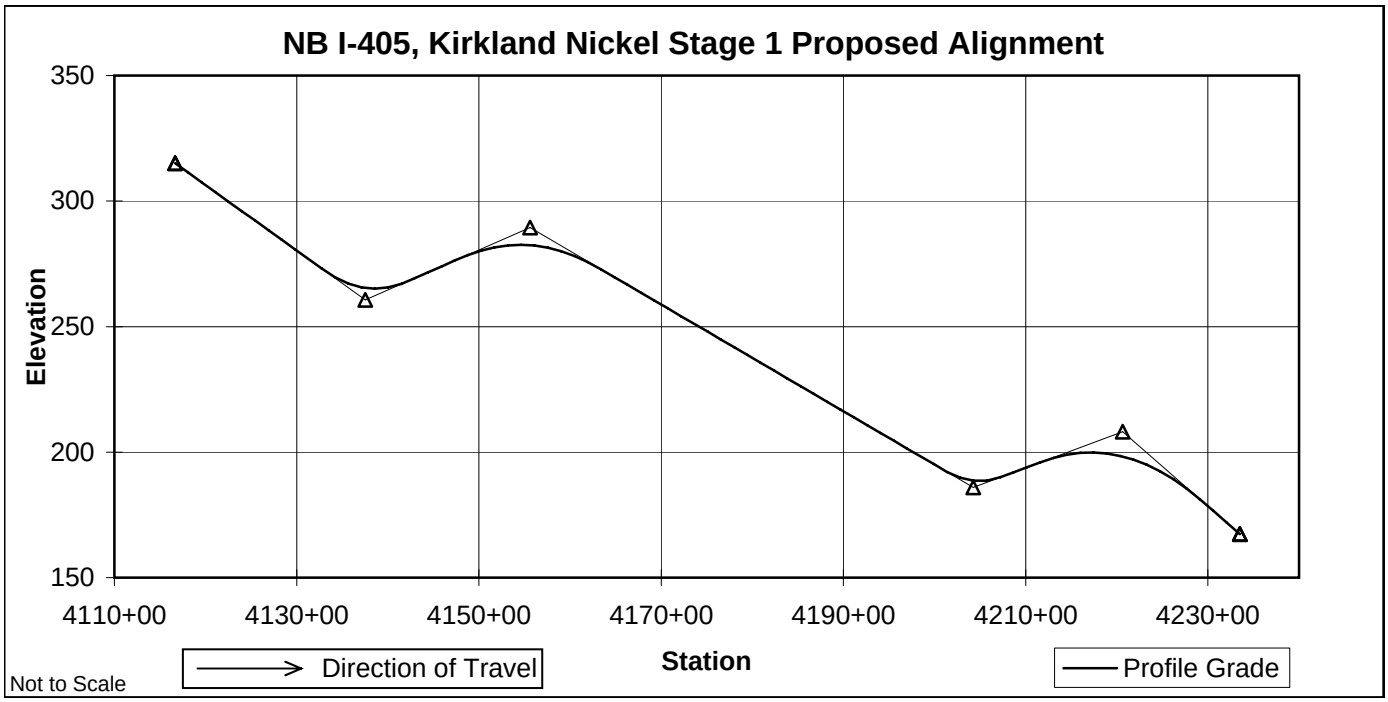
HORIZONTAL STOPPING SIGHT DISTANCES

Description			Inside Lane Width	Shldr Width Inside of Curve	Grade	Radius at Center Inside Lane	Offset to Obstruction (M)	Stopping Sight Distance	Design Speed (Design[2])
PC	PT	Direction							
4123+91	4137+72	Right	12.00'	10.00'	-2.61%	5661'	16.00'	851.4'	76.7 mph
4155+11	4181+86	Left	12.00'	10.00'	-2.13%	22901'	16.00'	>1130'	>80 mph
4198+78	4204+86	Right	12.00'	10.00'	-2.13%	14670'	16.00'	>1130'	>80 mph
4204+86	4218+93	Left	12.00'	10.00'	-2.13%	4571'	16.00'	765.1'	72.0 mph
4218+93	4227+28	Left	12.00'	10.00'	-3.18%	3628'	16.00'	681.7'	64.8 mph

Notes:

1) The Stopping Sight Distance calculations are based on WSDOT Figure 650-9, May 2001.
   Formulas from this figure are: m = R*[1-cos(28.65*S/R)] and S = (R/28.65)*cos-1[(R-m)/R]
   Where R = Radius of centerline of inside lane,
   m = Middle ordinate, centerline of inside lane to sight obstruction, and
   S = Stopping sight distance along the centerline of inside lane
2) The Stopping Sight Distance and Design Speed calculations are based on WSDOT Figures 650-2, 650-3, and 650-4, as amended by Design Manual Supplement, October 9, 2002.

I-405 Congestion Relief and Bus Rapid Transit Project	*Job Number*	*Sheet* 1 of 1
	Made by C. Barnett	*Date* 9/3/04
NB I-405 Kirkland Nickel Stage 1 Proposed Conditions	*Checked by* G. Niemasz	*Date* 9/3/04



PVI Station	PVI Elev.	Vertical Curve Length	Forward Grade	K	Stopping Sight Distance	Design Speed Calculated (Design)	Design Speed Calculated (Existing)	Design Speed Req'd	Ahead Tangent Length
			-2.61%						
4116+67.44	315.08		-2.61%	N/A	N/A	N/A	N/A	65 mph	1634 ft
4137+51.51	260.66	900 ft	1.59%	214	851 ft	76.7 mph	>80 mph	65 mph	609 ft
4155+60.53	289.39	1500 ft	-2.13%	-404	733 ft	70.1 mph	78.3 mph	65 mph	3815 ft
4204+25.36	185.98	600 ft	1.35%	173	720 ft	69.4 mph	77.3 mph	65 mph	466 ft
4220+66.58	208.14	1750 ft	-3.18%	-386	717 ft	66.8 mph	77.1 mph	65 mph	409 ft
4233+50.82	167.33		-3.18%	N/A	N/A	N/A	N/A	65 mph	0 ft

Notes

1) The Stopping Sight Distance and Design Speed calculations are based on WSDOT Figures 650-2, 650-3, and 650-4, as amended by Design Manual Supplement, October 9, 2002.

Mainline Design: Southbound I-405

Nickel Project

Description: Southbound I-405 for the entire Kirkland Corridor

This checklist is to confirm interpretation of standards. Your project may require that additional/different/or fewer Design Elements be addressed.

Design Data					
Design Class	I-1 (Interstate)				
Design Year	2030				
Design Speed (Posted Speed)	65 (60) mph				
Number of Lanes	General Purpose: 4		HOV: 1	Auxiliary:	
2030 ADT	xxxxx (2-way)				
2030 Truck Percentage	x.x%				
Design Element	**DM Reference**	**Fig Ref**	**Design Standard**	**Existing**	**Determination**
Access Control	1420.02[12/03]	440-4 [5/01] 1420-1 [12/03]	Full	Standard met.	Existing to remain.
Vertical Clearance (Bridges not a part of the project)	1120.04(5)[9/02]	1120.01[9/02]	16.5 ft (New Construction) 16.0 ft (Under/over Existing Bridge)		Existing to remain.
Right of Way Width		440-4[5/01]	Min. required to fit all design elements		Existing to remain.
Interchange Spacing	940.04(3)[9/02]	940-5[9/02]			
Median					
Median Width	440.10[5/01]	440-4[5/01] 640-15a[2/02] 640-15b[2/02] 640-15c[2/02]	22 ft., min.	Varies.	Shoulders to be restriped. Minimum median width 10'
Median Width Transitions	620.07(2)[11/99]		65:1 Desirable	Varies.	
Median Accident/Barrier Warrant					
Median Width/Barrier Placement					

Design Element	DM Reference	Fig Ref	Design Standard	Existing	Determination
Roadway					
Lane Width	440.08[5/01]	440-4[5/01]	12 ft.	Standard met	Standard met for 72% of project.
Turning Roadway Width	640.04(2)(d)[2/02]	640-7a,b[2/02] 640-8a[2/02]	Varies with radius and lane configuration		
Lane Transition	620.07(1)[11/99]		1:4 to 1:15 to widen, 1:65 to reduce		
Max. Superelevation	640.05(1)[2/02]	640-11a[2/02]	10%		
Superelevation Transition	640.05(4)[2/02]	640-13a-e[2/02]	Varies with super rate and roadway width		
Lane Cross Slope	640.04(1)[2/02]	640-3[2/02]	2.00%		
Shoulders					
Shoulder Width - Inside	440.09[5/01]	440-4[5/01]	10 ft	Standard met for 24% of project.	Standard met for 61% of project.
Shoulder Width - Outside	440.09[5/01]	440-4[5/01]	10 ft	Standard met for 88% of project.	Standard met for 72% of project.
Shoulder Cross Slope	640.04(3)[2/02]	640-3[2/02]	Same as traveled way		
Grade					
Maximum Grade	440.15[5/01]	440-4[5/01]	4 % Rolling terrrain		Existing to remain.
Minimum Grade	630.03(4)[5/01]		As Needed for Drainage		Existing to remain.
Length of Grade	630.03(5)[5/01]	630-2[4/98]	Varies with grade		Existing to remain.
Horizontal Alignment					
Stopping Sight Distance	650.05[4/98, 6/99]	650-2[6/99] 650-4[6/99] 650-9[5/01]	Varies with design speed and grades		SEE SPREADSHEET
Horizontal Curve Radii		640-11a[2/02]	1370' minimum		
Vertical Alignment					

Design Element	DM Reference	Fig Ref	Design Standard	Existing	Determination
Stopping Sight Distance	650.05[4/98, 6/99]	650-7[4/98] 650-8[5/00]	Varies with design speed and grades		SEE SPREADSHEET
Minimum Length of Vertical Curves	650.05[4/98,6/99]	650-2[6/99]	195'		
Decision Sight Distance	650.06[11/99]	650-5[4/98]	Urban speed/path/direction change 1370 ft		
Roadside					
Fill Slope	640.07(1)[2/02]	640-3[2/02]	Varies between 2:1 and 6:1, depending on height of fill		
Ditch Slope	640.07(1)[2/02]	640-3[2/02]	Varies between 2:1 and 6:1, depending on height of ditch		
Back Slope & Cut Slope	640.07(1)[2/02]	640-3[2/02]	Varies between 2:1 and 6:1, depending on height of cut		
Clear Zone	700.04[5/03]	700-1[5/03]	Varies depending on side slope		

I-405 Congestion Relief and Bus Rapid Transit Project	*Job Number* Kirkland Nickel	*Sheet* 1 of 1
	Made by C. Barnett	*Date* 11/09/04
I-405 Project - SB Kirkland Proposed Stage 1 Alignment	*Checked by* G. Niemasz	*Date* 11/22/2004

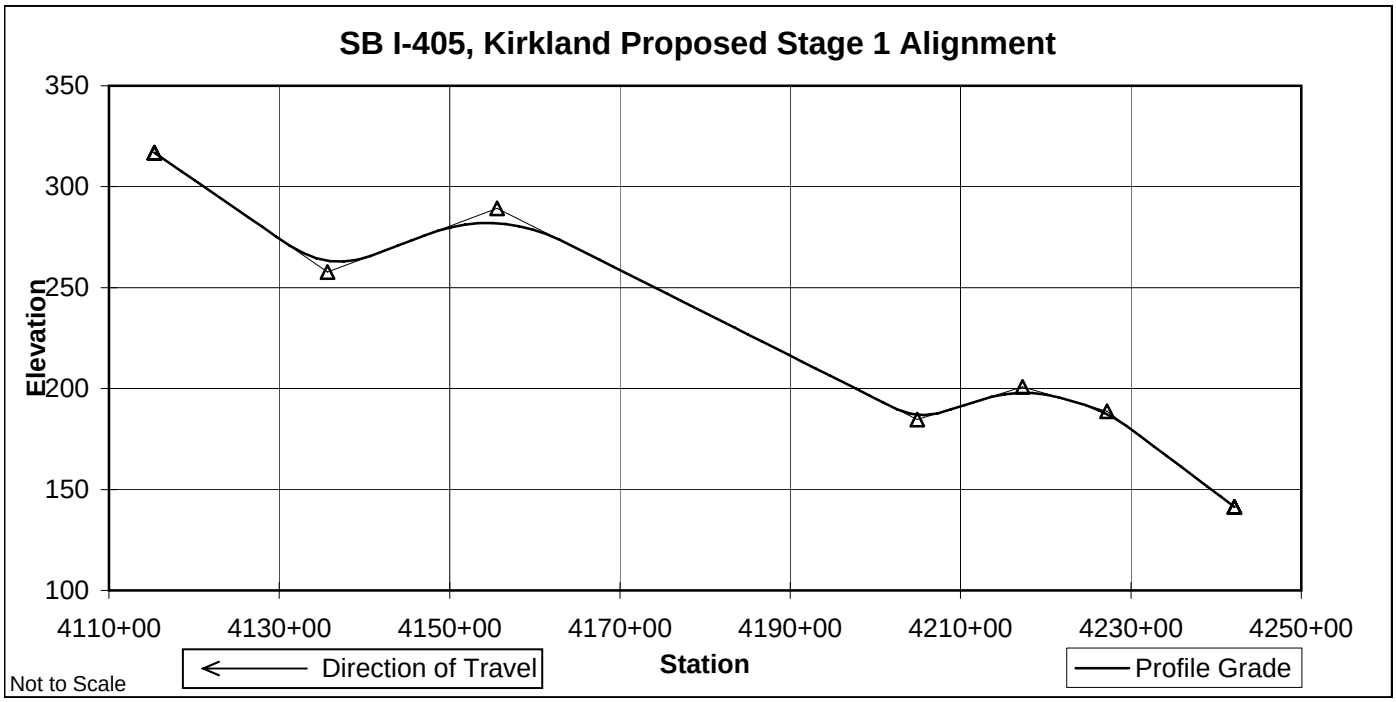
HORIZONTAL STOPPING SIGHT DISTANCES

Description			Inside Lane Width	Shldr Width Inside of Curve	Grade	Radius at Center Inside Lane	Offset to Obstruction (M)	Stopping Sight Distance	Design Speed (Design[2])
PC	PT	Direction							
4123+92	4137+88	Right	12.00'	10.00'	-2.89%	5654'	16.00'	850.9'	76.7 mph
4155+33	4181+99	Left	12.00'	10.00'	-2.15%	22817'	16.00'	>1130'	>80 mph
4199+71	4205+83	Right	12.00'	10.00'	-2.59%	14768'	16.00'	>1130'	>80 mph
4205+83	4223+79	Left	12.00'	10.00'	1.31%	4420'	16.00'	752.4'	71.2 mph
4223+79	4228+12	Left	12.00'	10.00'	1.31%	3870'	16.00'	704.1'	68.5 mph

Notes:

1) The Stopping Sight Distance calculations are based on WSDOT Figure 650-9, May 2001.
   Formulas from this figure are: m = R*[1-cos(28.65*S/R)] and S = (R/28.65)*cos-1[(R-m)/R]
   Where R = Radius of centerline of inside lane,
   m = Middle ordinate, centerline of inside lane to sight obstruction, and
   S = Stopping sight distance along the centerline of inside lane
2) The Stopping Sight Distance and Design Speed calculations are based on WSDOT Figures 650-2, 650-3, and 650-4, as amended by Design Manual Supplement, October 9, 2002.

I-405 Congestion Relief and Bus Rapid Transit Project	*Job Number*	*Sheet* 1 of 1
	Made by C. Barnett	*Date* 11/22/2004
SB I-405 Kirkland Nickel Stage 1 Proposed Conditions	*Checked by* G. Niemasz	*Date* 11/22/2004



PVI Station	PVI Elev.	Vertical Curve Length	Forward Grade	K	Stopping Sight Distance	Design Speed Calculated (Design)	Design Speed Calculated (Existing)	Design Speed Req'd	Ahead Tangent Length
			-2.91%						
4115+33.65	316.89		-2.91%	N/A	N/A	N/A	N/A	65 mph	1534 ft
4135+67.86	257.75	1000 ft	1.59%	223	880 ft	78.3 mph	>80 mph	65 mph	691 ft
4155+58.79	289.31	1600 ft	-2.12%	-432	757 ft	71.5 mph	>80 mph	65 mph	3865 ft
4204+92.93	184.62	538 ft	1.31%	157	669 ft	66.4 mph	73.3 mph	65 mph	517 ft
4217+28.52	200.77	900 ft	-1.20%	-359	690 ft	67.7 mph	75.0 mph	65 mph	233 ft
4227+20.87	188.84	618 ft	-3.18%	-313	646 ft	65.0 mph	71.6 mph	65 mph	1186 ft
4242+16.27	141.36		-3.18%	N/A	N/A	N/A	N/A	65 mph	0 ft

Notes

1) The Stopping Sight Distance and Design Speed calculations are based on WSDOT Figures 650-2, 650-3, and 650-4, as amended by Design Manual Supplement, October 9, 2002.

Ramp Design: NB I-405 Off-Ramp to NE 116th St

Nickel Project

Description: Off-Ramp from NB I-405 to NE 116th St

This checklist is to confirm interpretation of standards. Your project may require that additional/different/or fewer Design Elements be addressed.

Design Data					
Design Class	Interstate Off Ramp				
Design Year	2030				
Ramp	Type: Taper	Off			
Number of Lanes	General Purpose 1	HOV 0			
2030 ADT	xxxxx				
2030 Truck Percentage	x.x %				
Design Element	**DM Reference**	**Fig Ref**	**Design Standard**	**Existing**	**Determination**
Access Control	1420.02[12/03] 1430.03[12/03]	440-4[5/01] 1420-1[12/03] 1430-1a-c[12/03] 1430-2[12/03] 1430-3[12/03]	Full - No driveways within 300' of ramp CL at intersection with I/C crossroad. No driveways within 130' of center of intersection at intersections within 350' of ramp CL.	Standard met.	Possible LA issue east of ramp gore.
Interchange Pattern	940.04(2)[9/02]	940-4[9/02]		Half Diamond	Replace with Half-SPUI
Design Speed, at gore	940.05(1)[9/02]	940-1[9/02]	55 mph		Standard met.
Design Speed, Minimum	940.05(1)[9/02]	940-1[9/02]	25 mph		Standard met.
Design Speed, Terminal at intersection	940.05(1)[9/02]		15 mph for turning traffic 0 mph for stop condition		
Grade					
Maximum Grade	940.05(3)[9/02]	940-2[9/02]	7% 25-30 mph; 6% 35-40 mph; 5% 45+ mph. 2% additional grade allowed for one-way down grades		3%
Lane Width	940.05(4)[9/02]	940-3[9/02]	1-Lane, 15 ft; 2-Lane, 25 ft; 3 or more lanes, 25 ft plus 12' for each lane over 2 lanes		15'
Turning Roadway Width	640.04(2)[2/02]	640-9a[9/02] 640-9b[9/02] 640-9c[9/02] 640-8a,b[2/02]	1-Lane, 15 ft for radii > 300 ft, else see figure		Standard met.

Design Element	DM Reference	Fig Ref	Design Standard	Existing	Determination
Deceleration Length	940.06(5)[9/02]	940-10[9/02]	Apply Fig 940-10, with grade adjustment factor. For ramp design speed, use design speed for 1st curve from the gore.	1050'	1300' - Standard met.
Lane Transition	620.07(1)[11/99]		To reduce: L (ft) = V (mph) x T (ft), or 1:25 for speeds < 45 mph. To widen, 1:4 to 1:15		Standard met.
Max. Superelevation	640.05(1)[2/02]		10%		
Superelevation Transition	640.05(5)[2/02]	640-14b[2/02]	Varies with super rate and roadway width		
Lane Cross Slope	640.04(1)[2/02] 940.05(4)[9/02]	640-6a[2/02] 640-6b[2/02]	2%		
Ramp Shoulders					
Shoulder Width - Inside	940-05(4)[9/02] 710.05(1)[12/03]	940-3[9/02]	1-Lane, 2 ft + 2 ft shy 2 or more Lane, 4 ft + 2 ft shy	4'	4' - Standard met.
Shoulder Width - Outside	940-05(4)[9/02]	940-3[9/02]	8 ft	10'	8' - Standard met.
Shoulder Cross Slope	640.04(3)[2/02]	640-10a[2/02] 640-10b[2/02]	Match ramp lane cross slope		Standard met.

Ramp Terminal Design					
Design Vehicle	910.05[5/01]		WB-50		Standard met.
Intersection Turning Radii – Right	910.06[5/01] 910.07(2)[2/02]	910-8[5/01] 910-12[2/02,05/01] 910-13[2/02,05/01] 910-16a-c[2/02,5/01]	50-85 ft min, depending on intersection angle		85' - Standard met.
Intersection Turning Radii – Left	910.07(1)[5/01]	910-19[5/01]	50 ft min, verify using auto-turn for design vehicle		138' - Standard met.
Intersection Angle	910.04(2)a[2/02]	910-19[5/01]	75° to 105° (new construction) 60° to 120° (existing to remain)	90	90 - Standard met.
Intersection Sight Distance	910.10[5/01] 940.05(2)[9/02]	910-6[5/01] 910-18a[5/01] 910-18b[5/01]	Provide sight distance for right turning P vehicle. Sight triangle varies with grade and speed of cross street. If Truck volumes are high, adjust to WB-67		
Horizontal Alignment					

Design Element	DM Reference	Fig Ref	Design Standard	Existing	Determination
Stopping Sight Distance	650.05[4/98,6/99,11/99,5/00,5/01] 940.05(2)[9/02]	650-2[6/99] 650-4[6/99] 650-9[5/00]	Varies with design speed and grades		SEE SPREADSHEET
Vertical Alignment					
Stopping Sight Distance	650.05[4/98,6/99,11/99,5/00,5/01] 940.05(2)[9/02]	650-2[6/99] 650-4[6/99] 650-7[4/98] 650-8[5/00]	Varies with design speed and grades		SEE SPREADSHEET
Decision Sight Distance	650.06[11/99]	650-5[4/98]	Varies with design speed.		
Roadside					
Fill Slope	640.07(1)[2/02]	640-6a[2/02] 640-6b[2/02]	Varies between 2:1 & 6:1, depending on depth of fill		
Ditch Slope	640.07(1)[2/02] 640.07(4)[2/02]	640-6a[2/02] 640-6b[2/02]	Varies between 2:1 & 6:1, depending on depth of ditch		
Back Slope & Cut Slope	640.07(1)[2/02]	640-6a[2/02] 640-6b[2/02]	Varies between 2:1 & 6:1, depending on depth of cut		
Clear Zone	700.04[5/03]	700-1[5/03]	Varies with design speed, ADT, cut and fill slope		
Gore Nose	940.06(5b)[9/02]	940-11a[9/02]			Standard met.
Reserve Area Length	940.06(5b)[9/02]	940-11a[9/02]	Varies with mainline design speed		
Reserve Area Taper	940.06(5b)[9/02]	940-11a[9/02]	Varies with mainline design speed		
Ramp/Mainline Taper	940.06(5)[9/02]	940-12a[9/02]	20 to 1		15:1

Ramp Design: SB I-405 On-Ramp from NE 116th St

Nickel Project

Description: On-Ramp to SB I-405 from NE 116th St

This checklist is to confirm interpretation of standards. Your project may require that additional/different/or fewer Design Elements be addressed.

Design Data	
Design Class	Interstate On Ramp
Design Year	2030
Ramp	Type: Two Lane Ramp with HOV Bypass (Taper On)
Number of Lanes	General Purpose 2 HOV 1
2030 ADT	xxxxx
2030 Truck Percentage	x.x %

Design Element	DM Reference	Fig Ref	Design Standard	Existing	Determination
Access Control	1420.02[12/03] 1430.03[12/03]	440-4[5/01] 1420-1[12/03] 1430-1a-c[12/03] 1430-2[12/03] 1430-3[12/03]	Full - No driveways within 300' of ramp CL at intersection with I/C crossroad. No driveways within 130' of center of intersection at intersections within 350' of ramp CL.	Standard met.	Standard met.
Interchange Pattern	940.04(2)[9/02]	940-4[9/02]		Half Diamond	Replace with Half-SPUI
Design Speed, at gore	940.05(1)[9/02]	940-1[9/02]	55 mph (min.)		60
Design Speed, Minimum	940.05(1)[9/02]	940-1[9/02]	25 mph		
Design Speed, Terminal at intersection	940.05(1)[9/02]		15 mph for turning traffic 0 mph for stop condition		
Grade					
Maximum Grade	940.05(3)[9/02]	940-2[9/02]	7% 25-30 mph; 6% 35-40 mph; 5% 45+ mph. 2% additional grade allowed for one-way down grades		4%
Roadway					
Lane Width	940.05(4)[9/02] 1050.06(4)[5/03]	940-3[9/02] 1050-1[5/03] 1050 3[5/03]	1-Lane, 15 ft; 2-Lane, 25 ft; 3 or more lanes, 25 ft plus 12' for each lane over 2 lanes	37'	37' - Standard met.

Design Element	DM Reference	Fig Ref	Design Standard	Existing	Determination
Turning Roadway Width	640.04(2)[2/02] 1050.06(4)[5/03]	640-8a,b[2/02] 640-9a[9/02] 640-9b[9/02] 640-9c[9/02] 1050-3[5/03]	1-Lane, 15 ft for radii > 300 ft, else see figure		Standard met.
Acceleration Length	940.06(4)[9/02]	940-8[9/02] 1050-4b[5/03]	Varies based on ramp design speed and grade per figure.	630'	2050' - Standard met.
Lane Transition	620.07(1)[11/99]		To reduce: L (ft) = V (mph) x T (ft), or 1:25 for speeds < 45 mph. To widen, 1:4 to 1:15.		
Max. Superelevation	640.05(1)[2/02]		10%		
Superelevation Transition	640.05(5)[2/02]	640-14b[2/02] 640 13d[2/02]	Varies with super rate and roadway width		
Lane Cross Slope	640.04(1)[2/02] 940.05(4)[9/02]	640-6a[2/02] 640-6b[2/02]	2%		
Ramp Shoulders					
Shoulder Width - Inside	940-05(4)[9/02] 710.05(1)[12/03] 1050.06(4)[5/03]	940-3[9/02]	1-Lane, 2 ft + 2 ft shy 2 or more Lane, 4 ft + 2 ft shy	4'	4' - Standard met.
Shoulder Width - Outside	940-05(4)[9/02] 1050.06(4)[5/03]	940-3[9/02]	8 ft	8'	8' - Standard met.
Shoulder Cross Slope	640.04(3)[2/02]	640-10a[2/02] 640-10b[2/02]	Match ramp lane cross slope		

Ramp Terminal Design					
Design Vehicle	910.05[5/01]		WB-50		Standard met.
Intersection Turning Radii – Right	910.06[5/01] 910.07[2/02]	910-8[5/01] 910-12[2/02,5/01] 910-13[2/02,5/01] 910-16a-c[2/02,5/01]	50-85 ft min, depending on intersection angle		75' - Standard met.

Design Element	DM Reference	Fig Ref	Design Standard	Existing	Determination
Intersection Turning Radii – Left	910.07(1)[5/01]	910-19[5/01]	50 ft min, verify using auto-turn for design vehicle		185' - Standard met.
Intersection Angle	910.04(2)a[2/02]	910-19[5/01]	75° to 105° (new construction) 60° to 120° (existing to remain)		90 - Standard met.
Intersection Sight Distance	910.10[5/01] 940.05(2)[9/02]	910-6[5/01] 910-18a[5/01] 910-18b[5/01]	Provide sight distance for right turning P vehicle. Sight triangle varies with grade and speed of cross street. If Truck volumes are high, adjust to WB-67		
Horizontal Alignment					
Stopping Sight Distance	650.05[4/98,6/99,11/99,5/00,5/01] 940.05(2)[9/02]	650-2[6/99] 650-4[6/99] 650-9[5/01]	Varies with design speed and grades		SEE SPREADSHEET
Vertical Alignment					
Stopping Sight Distance	650.05[4/98,6/99,11/99,5/00,5/01] 940.05(2)[9/02]	650-2[6/99] 650-4[6/99] 650-7[4/98] 650-8[5/00]	Varies with design speed and grades		SEE SPREADSHEET
Decision Sight Distance	650.06[11/99]	650-5[4/98]	Varies with design speed.		
Roadside					
Fill Slope	640.07(1)[2/02]	640-6a[2/02] 640-6b[2/02]	Varies between 2:1 & 6:1, depending on depth of fill		
Ditch Slope	640.07(1)[2/02] 640.07(4)[2/02]	640-6a[2/02] 640-6b[2/02]	Varies between 2:1 & 6:1, depending on depth of ditch		
Back Slope & Cut Slope	640.07(1)[2/02]	640-6a,b[2/02]	Varies between 2:1 & 6:1, depending on depth of cut		
Clear Zone	700.04[5/03]	700-1[5/03]	Varies with design speed, ADT, cut and fill slope		
Gore Nose	940.06(4)[9/02]	940-9[9/02]			

Design Element	DM Reference	Fig Ref	Design Standard	Existing	Determination
Ramp/Mainline Taper	940.06(4)[9/02]	940-9a[9/02] 1050 4b[5/03]	50 to 1		60:1 - Standard met.
Enforcement Area	1050.06(7)[5/03]	1050-4b[5/03]			Standard met.
Ramp Meter Storage	860.04[11/99]		1000' rule of thumb--traffic analysis required for final design		2000'

Cross Street Design: NE 116th St

Nickel Project

Description: Cross Street that runs east-west under I-405
This checklist is to confirm interpretation of standards. Your project may require that additional/different/or fewer Design Elements be addressed.

Design Data	
Design Class	Urban Minor Arterial (P-6)
Design Year	2030
Design Speed (Posted Speed)	45(35) mph
Number of Lanes	General Purpose 4 Auxiliary 1
2030 ADT	xxxxx ADT
2030 Truck Percentage	xxx% Trucks

Design Element	DM Reference	Fig Ref	Design Standard	Existing	Determination
Access Control	1420.02 [12/03] 1430.03[12/03]	1420-1[12/03] 1430-1a-c[12/03] 1430-2[12/03] 1430-3[12/03]	Full - No driveways within 300' of ramp CL at intersection with I/C crossroad. No driveways within 130' of center of intersection at intersections within 350' of ramp CL.	Standard met.	Standard met.
Bicycle/Pedestrian	1025.07(2e)[5/01]	1025-2a,b[5/01] 1025-3[5/01]	6 ft min sidewalk, 8 ft desirable	Both sides 5' bike lane, 18" c&g, 6' sidewalk	Remove and replace in kind
Right of Way Width	LAG42.31-pg9[3/03]	42.31-pg9[3/03]	Min to fit all design elements		
Roadway					
Lane Width	LAG42.31-pg9[3/03]	42.31-pg9[3/03]	12 ft outside, 11 ft inside (see LAG table)	11'	12' East of 120th; 11' West of 120th
Shoulder Width	LAG42.31-pg9[3/03]	42.31-pg9[3/03]	8 ft (where no curb installed)	Urban C&G	Remove and replace in kind
Intersection Angle	910.04(2)a[2/02]	910-19[5/01]	75-105 Degrees	90 all intersections	Standard met
Intersection Turning Radii – Right	910.06[5/01]	910-8[5/01]	55-75 ft depending on Intersection angle	varies	55' all turns
Intersection Turning Radii – Left	910.07(1)[5/01]	910-11a-e[5/01]	50 ft min - verify using WB-67 turn template	varies	75' all turns
Design Vehicle	910.05[5/01]	910-3[5/01]	WB-50		Standard met.
Vertical Clearance					

Design Element	DM Reference	Fig Ref	Design Standard	Existing	Determination
Min vertical clearance	1120.04(5)[9/02] LAG42.31pg7[3/03]	1120-1[9/02] 42.31pg7[3/03]	16.5' (new construction) 16.0' (over/under existing bridge)		Standard met.
Sight Distance					
Intersection Sight Distance	910.10[5/01]	910-6[5/01]	730 ft		SEE SPREADSHEET
Horizontal Stopping Sight Distance	650.05[6/99]	650-2[6/99] 650-4[6/99]	310 - 450 ft, depending on profile grade		SEE SPREADSHEET
Vertical Stopping Sight Distance	650.05[6/99]	650-2[6/99] 650-4[6/99]	310 - 450 ft, depending on profile grade		SEE SPREADSHEET
Maximum Grade	440.15[5/01] AASHTO[2001]pg475	440-6a,b[5/01] AASHTO(2001)ex7-10	7%		
Maximum Superelevation	AASHTO[2001]pg475		Varies		
Lane Cross Slope	AASHTO[2001]pg476		1.5% to 3.0%, Depends on Drainage		
Roadside					
Fill Slope	640.07(1)[2/02]	640-4[2/02]	Varies between 2:1 & 6:1, depending on depth of fill		
Ditch Slope	640.07(1)[2/02]	640-4[2/02]	Varies between 2:1 & 6:1, depending on depth of fill		
Back Slope & Cut Slope	640.07(1)[2/02]	640-4[2/02]	Varies between 2:1 & 4:1, depending on depth of fill		
Clear Zone	700.04[5/03] AASHTO [2001] pg. 403	700-1[5/03]	1.5 ft min between curb face and obstruction		

Ramp Design: SB CD Road to NE 85th St WB

Nickel Project

Description: Off-Ramp from SB CD Road to NE 85th St WB

This checklist is to confirm interpretation of standards. Your project may require that additional/different/or fewer Design Elements be addressed.

Design Data	
Design Class	Interstate Off Ramp
Design Year	2030
Ramp	Type: Taper Off
Number of Lanes	General Purpose 1 HOV 0
2030 ADT	xxxxx
2030 Truck Percentage	x.x %

Design Element	DM Reference	Fig Ref	Design Standard	Existing	Determination
Access Control	1420.02[12/03] 1430.03[12/03]	440-4[5/01] 1420-1[12/03] 1430-1a-c[12/03] 1430-2[12/03] 1430-3[12/03]	Full - No driveways within 300' of ramp CL at intersection with I/C crossroad. No driveways within 130' of center of intersection at intersections within 350' of ramp CL.	Standard met.	
Interchange Pattern	940.04(2)[9/02]	940-4[9/02]		Cloverleaf	Cloverleaf
Design Speed, at gore	940.05(1)[9/02]	940-1[9/02]	55 mph		
Design Speed, Minimum	940.05(1)[9/02]	940-1[9/02]	25 mph		
Design Speed, Terminal at intersection	940.05(1)[9/02]		15 mph for turning traffic 0 mph for stop condition		
Grade					
Maximum Grade	940.05(3)[9/02]	940-2[9/02]	7% 25-30 mph; 6% 35-40 mph; 5% 45+ mph. 2% additional grade allowed for one-way down grades		
Lane Width	940.05(4)[9/02]	940-3[9/02]	1-Lane, 15 ft; 2-Lane, 25 ft; 3 or more lanes, 25 ft plus 12' for each lane over 2 lanes	15'	15'
Turning Roadway Width	640.04(2)[2/02]	640-9a[9/02] 640-9b[9/02] 640-9c[9/02] 640-8a,b[2/02]	1-Lane, 15 ft for radii > 300 ft, else see figure	16.5'	15'

Design Element	DM Reference	Fig Ref	Design Standard	Existing	Determination
Deceleration Length	940.06(5)[9/02]	940-10[9/02]	Apply Fig 940-10, with grade adjustment factor. For ramp design speed, use design speed for 1st curve from the gore.		
Lane Transition	620.07(1)[11/99]		To reduce: L (ft) = V (mph) x T (ft), or 1:25 for speeds < 45 mph. To widen, 1:4 to 1:15		
Max. Superelevation	640.05(1)[2/02]		10%		
Superelevation Transition	640.05(5)[2/02]	640-14b[2/02]	Varies with super rate and roadway width		
Lane Cross Slope	640.04(1)[2/02] 940.05(4)[9/02]	640-6a[2/02] 640-6b[2/02]	2%		
Ramp Shoulders					
Shoulder Width - Inside	940-05(4)[9/02] 710.05(1)[12/03]	940-3[9/02]	1-Lane, 2 ft + 2 ft shy 2 or more Lane, 4 ft + 2 ft shy	1'	1'
Shoulder Width - Outside	940-05(4)[9/02]	940-3[9/02]	8 ft	8'	8'
Shoulder Cross Slope	640.04(3)[2/02]	640-10a[2/02] 640-10b[2/02]	Match ramp lane cross slope		

Ramp Terminal Design					
Design Vehicle	910.05[5/01]		WB-50		
Intersection Turning Radii – Right	910.06[5/01] 910.07(2)[2/02]	910-8[5/01] 910-12[2/02,05/01] 910-13[2/02,05/01] 910-16a-c[2/02,5/01]	50-85 ft min, depending on intersection angle	75'	70'
Intersection Turning Radii – Left	910.07(1)[5/01]	910-19[5/01]	50 ft min, verify using auto-turn for design vehicle	N/A	
Intersection Angle	910.04(2)a[2/02]	910-19[5/01]	75° to 105° (new construction) 60° to 120° (existing to remain)	80°	75°
Intersection Sight Distance	910.10[5/01] 940.05(2)[9/02]	910-6[5/01] 910-18a[5/01] 910-18b[5/01]	Provide sight distance for right turning P vehicle. Sight triangle varies with grade and speed of cross street. If Truck volumes are high, adjust to WB-67		
Horizontal Alignment					

Design Element	DM Reference	Fig Ref	Design Standard	Existing	Determination
Stopping Sight Distance	650.05[4/98,6/99,11/99,5/00,5/01] 940.05(2)[9/02]	650-2[6/99] 650-4[6/99] 650-9[5/00]	Varies with design speed and grades		SEE ATTACHED SPREADSHEET
Vertical Alignment					
Stopping Sight Distance	650.05[4/98,6/99,11/99,5/00,5/01] 940.05(2)[9/02]	650-2[6/99] 650-4[6/99] 650-7[4/98] 650-8[5/00]	Varies with design speed and grades		SEE ATTACHED SPREADSHEET
Decision Sight Distance	650.06[11/99]	650-5[4/98]	Varies with design speed.		
Roadside					
Fill Slope	640.07(1)[2/02]	640-6a[2/02] 640-6b[2/02]	Varies between 2:1 & 6:1, depending on depth of fill		
Ditch Slope	640.07(1)[2/02] 640.07(4)[2/02]	640-6a[2/02] 640-6b[2/02]	Varies between 2:1 & 6:1, depending on depth of ditch		
Back Slope & Cut Slope	640.07(1)[2/02]	640-6a[2/02] 640-6b[2/02]	Varies between 2:1 & 6:1, depending on depth of cut		
Clear Zone	700.04[5/03]	700-1[5/03]	Varies with design speed, ADT, cut and fill slope		
Gore Nose	940.06(5b)[9/02]	940-11a[9/02]			
Reserve Area Length	940.06(5b)[9/02]	940-11a[9/02]	Varies with mainline design speed		
Reserve Area Taper	940.06(5b)[9/02]	940-11a[9/02]	Varies with mainline design speed		
Ramp/Mainline Taper	940.06(5)[9/02]	940-12a[9/02]	20 to 1		

Cross Street Design: NE 85th St

Description: Cross Street that runs east-west over I-405
This checklist is to confirm interpretation of standards. Your project may require that additional/different/or fewer Design Elements be addressed.

Design Data		
Design Class	Urban Principal Arterial (P-6)	
Design Year	2030	
Design Speed (Posted Speed)	45(XX) mph	
Number of Lanes	General Purpose	Auxiliary
ADT	2030 ADT	
Truck Percentage	2030 % Trucks	

Design Element	DM Reference	Fig Ref	Design Standard	Existing	Determination
Access Control	1420.02 (3c)[6/89]	1420-1b[3/94]	No access points within 300ft of ramp CL. If within 350 ft, allow additional 130 ft beyond 2ndry access point		
Bicycle/Pedestrian	1025.07(2e)[5/01]		6 ft min sidewalk, 8 ft desirable		
Right of Way Width	LAG42.31-9[3/03]	42.31-9[3/03]	Min to fit all design elements		
Roadway					
Lane Width	LAG42.31-9[3/03]	42.31-9[3/03]	12 ft		
Shoulder Width	LAG42.31-9[3/03]	42.31-9[3/03]	8 ft		
Intersection Angle	910.04(2)a[2/02]	910-19[5/01]	75-105 Degrees		
Intersection Turning Radii – Right	910.06[5/01]	910-8[5/01]	55-85 ft depending on Intersection angle		
Intersection Turning Radii – Left	910.07[5/01]	910-11a-e[5/01]	50 ft min - run WB-67 turn temp		
Design Vehicle	910.05[5/01]	910-3[5/01]	WB-50		
Vertical Clearance					
Min vertical clearance	1120.04(5)[9/02]	1120-1[\9/02]	16.5'		
Sight Distance					
Intersection Sight Distance	910.10[5/01]	910-6[5/01]	730 ft		SEE SPREADSHEET

Design Element	DM Reference	Fig Ref	Design Standard	Existing	Determination
Horizontal Stopping Sight Distance	650.05[10/02]	650-2[10/02] 650-4[10/02]	320 - 428 ft, depending on profile grade		SEE SPREADSHEET
Vertical Stopping Sight Distance	650.05[10/02]	650-4[10/02]	320 - 428 ft, depending on profile grade		SEE SPREADSHEET
Roadside					
Fill Slope	640.07(1)[2/02]	640-4[2/02]	Varies between 2:1 & 6:1, depending on depth of fill		
Ditch Slope	640.07(1)[2/02]	640-4[2/02]	Varies between 2:1 & 6:1, depending on depth of fill		
Back Slope & Cut Slope	640.07(1)[2/02]	640-4[2/02]	Varies between 2:1 & 4:1, depending on depth of fill		
Clear Zone	700.04[5/03] AASHTO [2001] pg. 403	700-1[5/03]	1.5 ft min between curb face and obstruction		