

Vehicle Transfer Span Gradients as described in [Section 610.05](#) and summarized in [Exhibit 610-7](#) are calculated from Design Vessel Freeboards, Minimum and Maximum Water Levels, Span and Apron Lengths and other adjustments as tabulated on the following tables.



TRANSFER SPAN GEOMETRY

TRANSFER SPAN AND APRON GRADIENTS

DESIGN CONDITIONS (MAX AND MIN WATER LEVELS AND CAT 1 DESIGN VESSELS)

Made by T Bertucci  
Checked by J Bernstein

Terminal	Slip	Bridge Seat Elev (A)	Span Type	Apron Type	Span Length	Apron Length	Total Length	Apron Near End Height	Apron Far End Height	Vessel Class (Cat I only)	Lay-up (Max) Freeboard	Max Water Level (Excl SLR)	Max Deck	Max Apron Near End (B)	Max Apron Far End (C)	Max Span Vertical (B) - (A)	Max Apron Vertical (B) - (C)	Max Span Gradient	Max Apron Gradient	Max Gradient Change	Vessel Class (Cat I only)	Operational (Min) Freeboard	Min Water Level	Min Deck	Min Apron Far End (D)	Min Span Vertical (A) - (D)	Min Span/Apron Gradient
		Feet MLLW			Feet	Feet	Feet	Feet	Feet		Feet	Feet MLLW	Feet MLLW	Feet MLLW	Feet MLLW	Feet	Feet	%	%	%		Feet	Feet MLLW	Feet MLLW	Feet MLLW	Feet	%
Anacortes	1	16.88	Girder	Diagonal	90.64	15.25	105.89	1.54	0.50	Olympic	9.03	10.90	19.93	21.47	20.43	4.59	1.04	5	-7	12	Super (SOLAS)	6.25	-4.36	1.89	2.39	14.49	-14
Anacortes	2	16.52	Girder	Diagonal	90.64	15.25	105.89	1.54	0.50	Olympic	9.03	10.90	19.93	21.47	20.43	4.95	1.04	5	-7	12	Super (SOLAS)	6.25	-4.36	1.89	2.39	14.13	-13
Bainbridge Island	1	18.36	Girder	3/8" Pan	90.64	14.92	105.56	1.54	0.35	Jumbo Mark II	8.79	14.60	23.39	24.93	23.74	6.57	1.19	7	-8	15	Jumbo Mark II	8.25	-4.98	3.27	3.62	14.74	-14
Bainbridge Island	2	18.37	Box	Diagonal	90.69	15.75	106.44	1.42	0.50	Jumbo Mark II	8.79	14.60	23.39	24.81	23.89	6.44	0.92	7	-6	13	Jumbo Mark II	8.25	-4.98	3.27	3.77	14.60	-14
Bremerton	1	17.39	Girder	Diagonal	90.64	15.25	105.89	1.54	0.50	Olympic	9.03	15.18	24.21	25.75	24.71	8.36	1.04	9	-7	16	Super	7.25	-4.88	2.37	2.87	14.52	-14
Bremerton	2	16.73	Truss	1/2" Pan	90.83	15.25	106.08	1.54	0.50	Olympic	9.03	15.18	24.21	25.75	24.71	9.02	1.04	10	-7	17	Super	7.25	-4.88	2.37	2.87	13.86	-13
Clinton	1	17.55	Girder	1/2" Pan	90.64	14.50	105.14	1.42	0.58	Olympic	9.03	14.16	23.19	24.61	23.77	7.06	0.84	8	-6	14	Issaquah (SOLAS)	7.25	-4.83	2.42	3.00	14.55	-14
Clinton	2	17.62	Girder	Diagonal	90.64	15.25	105.89	1.54	0.50	Olympic	9.03	14.16	23.19	24.73	23.69	7.11	1.04	8	-7	15	Issaquah (SOLAS)	7.25	-4.83	2.42	2.92	14.70	-14
Coupeville	1	14.19	Girder	1/2" Pan	90.64	15.25	105.89	1.54	0.58	Kwa-di Tabil	8.15	11.60	19.75	21.29	20.33	7.1	0.96	8	-6	14	Kwa-di Tabil	6.58	-4.46	2.12	2.70	11.49	-11
Edmonds	1	16.76	Girder	Diagonal	90.64	15.25	105.89	1.54	0.50	Jumbo Mark II	8.79	14.02	22.81	24.35	23.31	7.59	1.04	8	-7	15	Jumbo	7.75	-4.83	2.92	3.42	13.34	-13
Fauntleroy	1	15.65	Girder	Diagonal	90.64	15.25	105.89	1.54	0.50	Evergreen St	8.61	14.89	23.50	25.04	24.00	9.39	1.04	10	-7	17	Issaquah (SOLAS)	7.25	-4.93	2.32	2.82	12.83	-12
Friday Harbor	1	16.93	Girder	Diagonal	90.64	15.25	105.89	1.54	0.50	Olympic	9.03	10.90	19.93	21.47	20.43	4.54	1.04	5	-7	12	Super (SOLAS)	6.25	-4.09	2.16	2.66	14.27	-14
Kingston	1	18.05	Girder	1/2" Pan	90.64	14.96	105.60	1.54	0.35	Jumbo Mark II	8.79	14.16	22.95	24.49	23.30	6.44	1.19	7	-8	15	Jumbo	7.75	-4.88	2.87	3.22	14.83	-14
Kingston	2	17.43	Girder	Diagonal	90.64	15.25	105.89	1.54	0.50	Jumbo Mark II	8.79	14.16	22.95	24.49	23.45	7.06	1.04	8	-7	15	Jumbo	7.75	-4.88	2.87	3.37	14.06	-13
Lopez	1	18.67	Girder	1/2" Pan	90.64	15.25	105.89	1.54	0.50	Olympic	9.03	10.79	19.82	21.36	20.32	2.69	1.04	3	-7	10	Super (SOLAS)	6.25	-4.05	2.20	2.70	15.97	-15
Mukilteo	1	17.39	Truss	Channel	96.58	14.50	111.08	1.42	0.58	Olympic	9.03	14.16	23.19	24.61	23.77	7.22	0.84	7	-6	13	Issaquah (SOLAS)	7.25	-4.83	2.42	3.00	14.39	-13
Orcas	1	18.94	Girder	1/2" Pan	90.64	14.92	105.56	1.54	0.58	Olympic	9.03	10.44	19.47	21.01	20.05	2.07	0.96	2	-6	9	Super (SOLAS)	6.25	-3.92	2.33	2.91	16.03	-15
Point Defiance	1	18.67	Girder	Diagonal	90.64	15.25	105.89	1.54	0.50	Kwa-di Tabil	8.15	15.33	23.48	25.02	23.98	6.35	1.04	7	-7	14	Kwa-di Tabil	6.58	-4.93	1.65	2.15	16.52	-16
Port Townsend	1	16.56	Box	Diagonal	90.69	15.75	106.44	1.54	0.50	Kwa-di Tabil	8.15	11.60	19.75	21.29	20.25	4.73	1.04	5	-7	12	Kwa-di Tabil	6.58	-4.36	2.22	2.72	13.84	-13
Port Townsend	2	16.58	Truss	3/8" Pan	75.00	14.73	89.73	1.42	0.35	Kwa-di Tabil	8.15	11.60	19.75	21.17	20.10	4.59	1.07	6	-7	13	Kwa-di Tabil	6.58	-4.36	2.22	2.57	14.01	-16
Seattle	1	18.65	Girder	3/8" Pan	90.64	14.92	105.56	1.54	0.35	Olympic	9.03	14.60	23.63	25.17	23.98	6.52	1.19	7	-8	15	Super	7.25	-4.88	2.37	2.72	15.93	-15
Seattle	2	18.53	Girder	Channel	90.64	15.25	105.89	1.54	0.50	Olympic	9.03	14.60	23.63	25.17	24.13	6.64	1.04	7	-7	14	Super	7.25	-4.88	2.37	2.87	15.66	-15
Seattle	3	18.61	Girder	Channel	90.64	15.25	105.89	1.54	0.50	Olympic	9.03	14.60	23.63	25.17	24.13	6.56	1.04	7	-7	14	Super	7.25	-4.88	2.37	2.87	15.74	-15
Shaw	1	12.86	Short Girder	Diagonal	80.64	15.25	95.89	1.54	0.50	Olympic	9.03	10.44	19.47	21.01	19.97	8.15	1.04	10	-7	17	Super (SOLAS)	6.25	-4.32	1.93	2.43	10.43	-11
Southworth	1	18.65	Girder	Diagonal	90.64	15.25	105.89	1.54	0.50	Issaquah 100	8.24	14.89	23.13	24.67	23.63	6.02	1.04	7	-7	13	Issaquah (SOLAS)	7.25	-4.83	2.42	2.92	15.73	-15
Tahlequah	1	17.73	Girder	Diagonal	90.64	15.25	105.89	1.54	0.50	Kwa-di Tabil	8.15	15.33	23.48	25.02	23.98	7.29	1.04	8	-7	15	Kwa-di Tabil	6.58	-4.93	1.65	2.15	15.58	-15
Vashon	1	19.11	Girder	Diagonal	90.64	15.25	105.89	1.54	0.50	Evergreen St	8.61	14.89	23.50	25.04	24.00	5.93	1.04	7	-7	13	Issaquah (SOLAS)	7.25	-4.93	2.32	2.82	16.29	-16
Vashon	2	18.91	Girder	Diagonal	90.64	15.25	105.89	1.54	0.50	Evergreen St	8.61	14.89	23.50	25.04	24.00	6.13	1.04	7	-7	14	Issaquah (SOLAS)	7.25	-4.93	2.32	2.82	16.09	-15

This table provides the extreme slopes based on the following:  
 Design Vessel Classes include only Category I vessels per TDM Exhibit 330-4  
 Min Tide is Minimum Water Level and Max Tide is Maximum Water (Excluding Sea Level Rise) per TDM Exhibit 330-11  
 Span Length is defined as the distance between Transfer Span Hinge and Apron Hinge centerlines  
 Apron Length is defined as the distance between Apron Hinge and Apron Lip Hinge centerlines  
 Standard Apron Near End Height is 1.04 feet plus following adjustment value:  
 Apron Near End Height adjustment 0.5 foot  
 H-Span Apron Near End Height is actual height of 1.42 feet with no adjustment since span can be adjusted

TRANSFER SPAN GEOMETRY

TRANSFER SPAN AND APRON GRADIENTS

NORMAL CONDITIONS (MHHW AND MLLW WATER LEVELS AND CAT I AND CAT 2 DESIGN VESSELS)

Made by T Bertucci  
Checked by J Bernstein

Terminal	Slip	Bridge Seat	Span Type	Apron Type	Span Length	Apron Length	Total Length	Apron Near End	Apron Far End	Vessel Class (Cat I and II)	Lay-up (Max)	Max Water Level	Max Deck	Max Apron Near End	Max Apron Far End	Max Span Vertical	Max Apron Vertical	Max Span Gradient	Max Apron Gradient	Max Gradient Change	Vessel Class (Cat I and II)	Operational	Min Water Level	Min Deck	Min Apron Far End	Min Span Vertical	Min Span/Apron
		Elev (A)						Height	Height		Freeboard	(MHHW)	Feet MLLW	Feet MLLW	Feet MLLW	Feet MLLW	Feet MLLW	Feet	Feet	Feet		Feet	Feet	Feet	Feet	Feet	Feet
Anacortes	1	16.88	Girder	Diagonal	90.64	15.25	105.89	1.54	0.50	Olympic	9.03	8.05	17.08	18.62	17.58	1.74	1.04	2	-7	9	Super (SOLAS)	6.25	0.00	6.25	6.75	10.13	-10
Anacortes	2	16.52	Girder	Diagonal	90.64	15.25	105.89	1.54	0.50	Olympic	9.03	8.05	17.08	18.62	17.58	2.10	1.04	2	-7	9	Super (SOLAS)	6.25	0.00	6.25	6.75	9.77	-9
Bainbridge Island	1	18.36	Girder	3/8" Pan	90.64	14.92	105.56	1.54	0.35	Jumbo Mark II	8.79	11.31	20.10	21.64	20.45	3.28	1.19	4	-8	12	Super	7.25	0.00	7.25	7.60	10.76	-10
Bainbridge Island	2	18.37	Box	Diagonal	90.69	15.75	106.44	1.42	0.50	Jumbo Mark II	8.79	11.31	20.10	21.52	20.60	3.15	0.92	3	-6	9	Super	7.25	0.00	7.25	7.75	10.62	-10
Bremerton	1	17.39	Girder	Diagonal	90.64	15.25	105.89	1.54	0.50	Olympic	9.03	11.74	20.77	22.31	21.27	4.92	1.04	5	-7	12	Super	7.25	0.00	7.25	7.75	9.64	-9
Bremerton	2	16.73	Girder	1/2" Pan	90.83	15.25	106.08	1.54	0.50	Olympic	9.03	11.74	20.77	22.31	21.27	5.58	1.04	6	-7	13	Super	7.25	0.00	7.25	7.75	8.98	-8
Clinton	1	17.55	Girder	1/2" Pan	90.64	14.50	105.14	1.42	0.58	Olympic	9.03	11.10	20.13	21.55	20.71	4.00	0.84	4	-6	10	Kwa-di Tabil	6.58	0.00	6.58	7.16	10.39	-10
Clinton	2	17.62	Girder	Diagonal	90.64	15.25	105.89	1.54	0.50	Olympic	9.03	11.10	20.13	21.67	20.63	4.05	1.04	4	-7	11	Kwa-di Tabil	6.58	0.00	6.58	7.08	10.54	-10
Coupeville	1	14.19	Girder	1/2" Pan	90.64	15.25	105.89	1.54	0.58	Kwa-di Tabil	8.15	8.59	16.74	18.28	17.32	4.09	0.96	5	-6	11	Kwa-di Tabil	6.58	0.00	6.58	7.16	7.03	-7
Edmonds	1	16.76	Girder	Diagonal	90.64	15.25	105.89	1.54	0.50	Olympic	9.03	10.93	19.96	21.50	20.46	4.74	1.04	5	-7	12	Super	7.25	0.00	7.25	7.75	9.01	-9
Fauntleroy	1	15.65	Girder	Diagonal	90.64	15.25	105.89	1.54	0.50	Evergreen St	8.61	11.55	20.16	21.70	20.66	6.05	1.04	7	-7	14	Kwa-di Tabil	6.58	0.00	6.58	7.08	8.57	-8
Friday Harbor	1	16.93	Girder	Diagonal	90.64	15.25	105.89	1.54	0.50	Olympic	9.03	7.72	16.75	18.29	17.25	1.36	1.04	1	-7	8	Super (SOLAS)	6.25	0.00	6.25	6.75	10.18	-10
Kingston	1	18.05	Girder	1/2" Pan	90.64	14.96	105.60	1.54	0.35	Olympic	9.03	10.99	20.02	21.56	20.37	3.51	1.19	4	-8	12	Super	7.25	0.00	7.25	7.60	10.45	-10
Kingston	2	17.43	Girder	Diagonal	90.64	15.25	105.89	1.54	0.50	Olympic	9.03	10.99	20.02	21.56	20.52	4.13	1.04	5	-7	11	Super	7.25	0.00	7.25	7.75	9.68	-9
Lopez	1	18.67	Girder	1/2" Pan	90.64	15.25	105.89	1.54	0.50	Olympic	9.03	7.82	16.85	18.39	17.35	-0.28	1.04	0	-7	7	Super (SOLAS)	6.25	0.00	6.25	6.75	11.92	-11
Mukilteo	1	17.39	Truss	Channel	96.58	14.50	111.08	1.42	0.58	Olympic	9.03	11.05	20.08	21.50	20.66	4.11	0.84	4	-6	10	Kwa-di Tabil	6.58	0.00	6.58	7.16	10.23	-9
Orcas	1	18.94	Girder	1/2" Pan	90.64	14.92	105.56	1.54	0.58	Olympic	9.03	7.88	16.91	18.45	17.49	-0.49	0.96	-1	-6	6	Super (SOLAS)	6.25	0.00	6.25	6.83	12.11	-12
Point Defiance	1	18.67	Girder	Diagonal	90.64	15.25	105.89	1.54	0.50	Evergreen St	8.61	11.94	20.55	22.09	21.05	3.42	1.04	4	-7	11	Hiyu	6.50	0.00	6.50	7.00	11.67	-11
Port Townsend	1	16.56	Box	Diagonal	90.69	15.75	106.44	1.54	0.50	Kwa-di Tabil	8.15	8.55	16.70	18.24	17.20	1.68	1.04	2	-7	8	Kwa-di Tabil	6.58	0.00	6.58	7.08	9.48	-9
Port Townsend	2	16.58	Truss	3/8" Pan	75.00	14.73	89.73	1.42	0.35	Kwa-di Tabil	8.15	8.55	16.70	18.12	17.05	1.54	1.07	2	-7	9	Kwa-di Tabil	6.58	0.00	6.58	6.93	9.65	-11
Seattle	1	18.65	Girder	3/8" Pan	90.64	14.92	105.56	1.54	0.35	Olympic	9.03	11.36	20.39	21.93	20.74	3.28	1.19	4	-8	12	Super	7.25	0.00	7.25	7.60	11.05	-11
Seattle	2	18.53	Girder	Channel	90.64	15.25	105.89	1.54	0.50	Olympic	9.03	11.36	20.39	21.93	20.89	3.40	1.04	4	-7	11	Super	7.25	0.00	7.25	7.75	10.78	-10
Seattle	3	18.61	Girder	Channel	90.64	15.25	105.89	1.54	0.50	Olympic	9.03	11.36	20.39	21.93	20.89	3.32	1.04	4	-7	10	Super	7.25	0.00	7.25	7.75	10.86	-10
Shaw	1	12.86	Short Girder	Diagonal	80.64	15.25	95.89	1.54	0.50	Olympic	9.03	7.84	16.87	18.41	17.37	5.55	1.04	7	-7	14	Super (SOLAS)	6.25	0.00	6.25	6.75	6.11	-6
Southworth	1	18.65	Girder	Diagonal	90.64	15.25	105.89	1.54	0.50	Issaquah 100	8.24	11.58	19.82	21.36	20.32	2.71	1.04	3	-7	10	Kwa-di Tabil	6.58	0.00	6.58	7.08	11.57	-11
Tahlequah	1	17.73	Girder	Diagonal	90.64	15.25	105.89	1.54	0.50	Evergreen St	8.61	11.89	20.50	22.04	21.00	4.31	1.04	5	-7	12	Hiyu	6.50	0.00	6.50	7.00	10.73	-10
Vashon	1	19.11	Girder	Diagonal	90.64	15.25	105.89	1.54	0.50	Evergreen St	8.61	11.53	20.14	21.68	20.64	2.57	1.04	3	-7	10	Kwa-di Tabil	6.58	0.00	6.58	7.08	12.03	-11
Vashon	2	18.91	Girder	Diagonal	90.64	15.25	105.89	1.54	0.50	Evergreen St	8.61	11.53	20.14	21.68	20.64	2.77	1.04	3	-7	10	Kwa-di Tabil	6.58	0.00	6.58	7.08	11.83	-11

This table provides the normal slopes based on the following:  
 Design Vessel Classes include both Category I and II vessels per TDM Exhibit 330-4  
 Min Tide is MLLW and Max Tide is MHHW per TDM Exhibit 330-11  
 Span Length is defined as the distance between Transfer Span Hinge and Apron Hinge centerlines  
 Apron Length is defined as the distance between Apron Hinge and Apron Lip Hinge centerlines  
 Standard Apron Near End Height is 1.04 feet plus following adjustment value:  
 Apron Near End Height adjustment 0.5 foot  
 H-Span Apron Near End Height is actual height of 1.42 feet with no adjustment since span can be adjusted