

Original data of Figure 10a: Influence line of K_I of the crack at the welding toe of top deck

Cases	SIF/ Pa·√m	SIF/ MPa·√mm	Cases	SIF/ Pa·√m	SIF/ MPa·√mm	Cases	SIF/ Pa·√m	SIF/ MPa·√mm
Z1-H1	4.58×10 ⁵	14.48544528	Z2-H1	-1.65×10 ⁶	-52.28193656	Z3-H1	-5.45×10 ⁶	-172.3757553
Z1-H2	-1.71×10 ⁵	-5.402435155	Z2-H2	-2.17×10 ⁶	-68.66885939	Z3-H2	-5.81×10 ⁶	-183.6176523
Z1-H3	-8.88×10 ⁵	-28.06553046	Z2-H3	-2.40×10 ⁶	-75.89782612	Z3-H3	-5.33×10 ⁶	-168.6664036
Z1-H4	-1.94×10 ⁶	-61.307077	Z2-H4	-3.22×10 ⁶	-101.8032047	Z3-H4	-5.39×10 ⁶	-170.5258228
Z1-H5	-2.55×10 ⁶	-80.7424355	Z2-H5	-3.59×10 ⁶	-113.4308997	Z3-H5	-4.91×10 ⁶	-155.4132979
Z1-H6	-1.94×10 ⁶	-61.40826988	Z2-H6	-2.10×10 ⁶	-66.29082659	Z3-H6	-2.25×10 ⁶	-71.03424308
Z1-H7	-9.02×10 ⁵	-28.51046293	Z2-H7	-1.03×10 ⁶	-32.56197307	Z3-H7	-1.14×10 ⁶	-35.90450055
Z1-H8	3.96×10 ⁴	1.252293576	Z2-H8	1.06×10 ⁵	3.351381864	Z3-H8	1.57×10 ⁵	4.97141671
Z1-H9	2.51×10 ⁵	7.94680376	Z2-H9	1.40×10 ⁵	4.412642247	Z3-H9	-1.82×10 ⁴	-0.574269623
Z1-H10	5.88×10 ⁵	18.60146588	Z2-H10	-3148	-0.099548501	Z3-H10	-8.61×10 ⁵	-27.22278347
Z1-H11	1.27×10 ⁶	40.01862379	Z2-H11	4.43×10 ⁵	14.00035188	Z3-H11	-1.18×10 ⁶	-37.37179739
Z1-H12	1.51×10 ⁶	47.70612078	Z2-H12	2.47×10 ⁵	7.800074077	Z3-H12	-2.50×10 ⁶	-79.12334934
Z1-H13	2.28×10 ⁵	7.218214987	Z2-H13	-1.90×10 ⁶	-60.0326791	Z3-H13	-5.71×10 ⁶	-180.5597298

Cases	SIF/ Pa·√m	SIF/ MPa·√mm	Cases	SIF/ Pa·√m	SIF/ MPa·√mm	Cases	SIF/ Pa·√m	SIF/ MPa·√mm
Z4-H1	-5.24×10 ⁶	-165.5547223	Z5-H1	-1.27×10 ⁶	-40.0881939	Z6-H1	8.68×10 ⁵	27.44667272
Z4-H2	-5.65×10 ⁶	-178.5358721	Z5-H2	-1.95×10 ⁶	-61.67706348	Z6-H2	-6.38×10 ⁴	-2.016173368
Z4-H3	-5.23×10 ⁶	-165.4472049	Z5-H3	-1.86×10 ⁶	-58.67289971	Z6-H3	-1.05×10 ⁶	-33.14066988
Z4-H4	-5.33×10 ⁶	-168.4766669	Z5-H4	-2.84×10 ⁶	-89.82765921	Z6-H4	-2.34×10 ⁶	-73.97199903
Z4-H5	-4.95×10 ⁶	-156.5453933	Z5-H5	-3.39×10 ⁶	-107.1885636	Z6-H5	-3.15×10 ⁶	-99.6528559
Z4-H6	-2.38×10 ⁶	-75.11990582	Z5-H6	-2.48×10 ⁶	-78.55730163	Z6-H6	-2.58×10 ⁶	-81.64368463
Z4-H7	-1.18×10 ⁶	-37.45085433	Z5-H7	-1.18×10 ⁶	-37.2706045	Z6-H7	-1.15×10 ⁶	-36.51798242
Z4-H8	1.59×10 ⁵	5.039405679	Z5-H8	1.11×10 ⁵	3.515187847	Z6-H8	4.29×10 ⁴	1.356111152
Z4-H9	7617	0.240870689	Z5-H9	2.13×10 ⁵	6.721104939	Z6-H9	3.65×10 ⁵	11.54231346
Z4-H10	-8.08×10 ⁵	-25.54993858	Z5-H10	1.42×10 ⁵	4.505929438	Z6-H10	8.22×10 ⁵	25.98728158
Z4-H11	-1.12×10 ⁶	-35.3605888	Z5-H11	6.38×10 ⁵	20.17975866	Z6-H11	1.62×10 ⁶	51.34590237
Z4-H12	-2.34×10 ⁶	-73.96251219	Z5-H12	5.92×10 ⁵	18.7121456	Z6-H12	1.93×10 ⁶	60.95606418
Z4-H13	-5.51×10 ⁶	-174.1181702	Z5-H13	-1.55×10 ⁶	-48.98051868	Z6-H13	5.78×10 ⁵	18.28587057

工况	SIF/ Pa·√m	SIF/ MPa·√mm
Z7-H1	1.56×10 ⁶	49.37264111
Z7-H2	5.01×10 ⁵	15.84427599
Z7-H3	-7.04×10 ⁵	-22.26401587
Z7-H4	-2.07×10 ⁶	-65.31052052
Z7-H5	-2.94×10 ⁶	-92.99309915
Z7-H6	-2.66×10 ⁶	-84.05650248
Z7-H7	-1.14×10 ⁶	-36.09423721
Z7-H8	-1.30×10 ⁴	-0.410179035
Z7-H9	4.10×10 ⁵	12.95205684
Z7-H10	1.04×10 ⁶	32.97939372
Z7-H11	1.89×10 ⁶	59.80183283
Z7-H12	2.33×10 ⁶	73.68106948
Z7-H13	1.26×10 ⁶	39.99965012

SIF- Stress intensity factor

Original data of Figure 10b: Influence line of K_I of the crack at the welding toe of U-rib web

Cases	SIF/ Pa·√m	SIF/ MPa·√mm	Cases	SIF/ Pa·√m	SIF/ MPa·√mm	Cases	SIF/ Pa·√m	SIF/ MPa·√mm
Z1-H1	-2.91×10 ⁵	-9.21297973	Z2-H1	-6.37×10 ⁵	-20.1364355	Z3-H1	-2.49×10 ⁶	-78.6395209
Z1-H2	-8.39×10 ⁵	-26.5343556	Z2-H2	-1.36×10 ⁶	-43.0797086	Z3-H2	-3.30×10 ⁶	-104.440544
Z1-H3	-8.09×10 ⁵	-25.5679636	Z2-H3	-1.32×10 ⁶	-41.8306089	Z3-H3	-3.35×10 ⁶	-105.816135
Z1-H4	-3.94×10 ⁵	-12.4479898	Z2-H4	-7.78×10 ⁵	-24.6031527	Z3-H4	-2.50×10 ⁶	-78.993696
Z1-H5	-1.25×10 ⁵	-3.96612864	Z2-H5	-4.86×10 ⁵	-15.3582339	Z3-H5	-1.20×10 ⁶	-37.9030600
Z1-H6	4.21×10 ⁵	13.31129158	Z2-H6	3.46×10 ⁵	10.94274562	Z3-H6	2.61×10 ⁵	8.253860921
Z1-H7	1.06×10 ⁶	33.58655103	Z2-H7	1.03×10 ⁶	32.49240296	Z3-H7	9.88×10 ⁵	31.24172214
Z1-H8	2.45×10 ⁶	77.35563612	Z2-H8	2.58×10 ⁶	81.61206185	Z3-H8	2.69×10 ⁶	84.91664201
Z1-H9	2.75×10 ⁶	86.80452177	Z2-H9	2.91×10 ⁶	92.17723152	Z3-H9	3.07×10 ⁶	97.19260389
Z1-H10	2.47×10 ⁶	78.22842476	Z2-H10	2.63×10 ⁶	83.04141136	Z3-H10	2.86×10 ⁶	90.43165425
Z1-H11	1.78×10 ⁶	56.30119146	Z2-H11	1.80×10 ⁶	56.77869539	Z3-H11	1.71×10 ⁶	54.12554443
Z1-H12	1.18×10 ⁶	37.17889845	Z2-H12	1.06×10 ⁶	33.47587131	Z3-H12	-2.05×10 ⁵	-6.4905749
Z1-H13	-5.58×10 ⁵	-17.6549962	Z2-H13	-9.17×10 ⁵	-29.0059918	Z3-H13	-2.78×10 ⁶	-87.8860207

Cases	SIF/ Pa·√m	SIF/ MPa·√mm	Cases	SIF/ Pa·√m	SIF/ MPa·√mm
Z4-H1	-2.72×10 ⁶	-86.1372812	Z5-H1	-1.23×10 ⁶	-38.813796
Z4-H2	-3.59×10 ⁶	-113.576364	Z5-H2	-2.09×10 ⁶	-65.99357249
Z4-H3	-3.68×10 ⁶	-116.390792	Z5-H3	-2.00×10 ⁶	-63.16649626
Z4-H4	-2.83×10 ⁶	-89.5841638	Z5-H4	-1.40×10 ⁶	-44.25923813
Z4-H5	-1.42×10 ⁶	-44.8094744	Z5-H5	-9.11×10 ⁵	-28.80360607
Z4-H6	1.74×10 ⁵	5.487500424	Z5-H6	8.64×10 ⁴	2.732903599
Z4-H7	9.57×10 ⁵	30.26109984	Z5-H7	9.36×10 ⁵	29.60967064
Z4-H8	2.73×10 ⁶	86.24163635	Z5-H8	2.70×10 ⁶	85.53644843
Z4-H9	3.40×10 ⁶	107.5300896	Z5-H9	3.10×10 ⁶	97.88198042
Z4-H10	2.95×10 ⁶	93.39154614	Z5-H10	2.82×10 ⁶	89.17306774
Z4-H11	1.79×10 ⁶	56.49092812	Z5-H11	1.88×10 ⁶	59.40338585
Z4-H12	-2.91×10 ⁵	-9.21171482	Z5-H12	8.34×10 ⁵	26.37023341
Z4-H13	-3.03×10 ⁶	-95.7063334	Z5-H13	-1.54×10 ⁶	-48.64847952

Cases	SIF/ Pa·√m	SIF/ MPa·√mm	Cases	SIF/ Pa·√m	SIF/ MPa·√mm
Z6-H1	-1.01×10 ⁶	-32.03071042	Z7-H1	-1.08×10 ⁶	-34.06089268
Z6-H2	-1.86×10 ⁶	-58.96066697	Z7-H2	-1.93×10 ⁶	-61.17742361
Z6-H3	-1.87×10 ⁶	-59.1409168	Z7-H3	-1.97×10 ⁶	-62.16721652
Z6-H4	-1.32×10 ⁶	-41.85274483	Z7-H4	-1.46×10 ⁶	-46.20403889
Z6-H5	-8.60×10 ⁵	-27.19210937	Z7-H5	-9.15×10 ⁵	-28.93167831
Z6-H6	-4168	-0.131803733	Z7-H6	-8.97×10 ⁴	-2.83665793
Z6-H7	9.12×10 ⁵	28.83554507	Z7-H7	8.73×10 ⁵	27.61743572
Z6-H8	2.65×10 ⁶	83.68335372	Z7-H8	2.58×10 ⁶	81.47608391
Z6-H9	3.01×10 ⁶	95.25728996	Z7-H9	2.93×10 ⁶	92.79387566
Z6-H10	2.68×10 ⁶	84.84074734	Z7-H10	2.61×10 ⁶	82.58604337
Z6-H11	1.77×10 ⁶	55.97863914	Z7-H11	1.73×10 ⁶	54.62202202
Z6-H12	8.55×10 ⁵	27.0466446	Z7-H12	7.52×10 ⁵	23.78064423
Z6-H13	-1.33×10 ⁶	-42.06461744	Z7-H13	-1.40×10 ⁶	-44.23393991

SIF- Stress intensity factor

Original data of Figure 12: Thermal and mechanical parameters of Q345 steel in welding process analysis

Temperature /°C	Density/	Specific heat	Heat transfer	Poisson's ratio	Elastic	Yield strength
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	kg/m ³	capacity /(J/(kg·°C))	coefficient /(W/(m·°C))		modulus /GPa	/MPa
0	7880	425	50.7	0.28	211	345
200	7800	510	46.5	0.29	202	330
400	7720	590	43.1	0.31	175	275
600	7695	835	36.2	0.35	142	132
800	7627	1060	26.1	0.4	83.5	10
1000	7585	810	26.8	0.41	30	7.525
1200	7517	790	26.8	0.45	6	5.05
1600	7490	1000	100	0.48	0.8	2.575
2000	7490	980	100	0.45	0.6	0.1

Original data of Figure 16: The cumulative strain energy release rate at the welding toe of U-rib

Cycle Numbers	G _I /(N/m)	G _{II} /(N/m)	G _{III} /(N/m)
1	590.1	12.328	28.277
3	821.3	31.828	46.567
4	973.2	129.338	121.067
5	1111.4	187.448	146.697
6	1187.29	190.592	222.417
7	1383.49	194.939	252.047
8	1555.29	200.944	284.717
10	1654.06	211.234	290.874
12	1770.46	221.644	294.136
13	1908.56	239.534	300.697
14	1989.32	267.374	307.497
16	2062.18	293.694	314.297
17	2135.05	319.984	321.063
18	2156.84	346.454	328.002
26	2176.57	354.218	343.372
33	2296.37	398.548	361.542
34	2419.87	442.958	382.102
35	2544.47	489.418	419.552
36	2668.47	509.838	431.982
37	2720.32	512.851	466.052
43	2777.96	587.601	553.262
44	2855.38	593.872	555.575
46	2888.62	600.764	557.878
60	2921.99	603.886	560.181
62	2938.29	607.005	562.484
63	2949.15	609.839	564.766
179	2975.97	613.35	567.181
196	3018.98	616.731	569.621
200	3046.14	635.091	578.078

Original data of Figure 18: The cumulative strain energy release rate at the welding toe of top deck

Cycle numbers	G _I /(N/m)	G _{II} /(N/m)	G _{III} /(N/m)
1	891.5	4.6461	9.484

3	1281.8	5.7741	10.741
4	1569.7	6.7417	31.491
5	1847.6	17.0017	47.611
6	2127.3	18.7017	78.841
7	2241.2	20.7927	80.622
8	2259.6	21.5259	81.0874
29	2270.05	22.2809	81.5482
42	2277.725	22.7958	82.1646
84	2285.399	23.3105	82.4246
156	2328.049	28.1585	82.7168
157	2351.019	29.3205	83.0134
181	2366.299	29.5531	83.2043
190	2381.929	38.1431	84.4073
200	2397.329	41.4941	85.6493

Original data of Figure 20: Numbers of cracking elements under the different cycle numbers

Crack length – 2.5mm/10mm		Crack length – 4mm/10mm		Crack length – 2.5mm/15mm	
Cycle Numbers	Number of cracking elements	Cycle Numbers	Number of cracking elements	Cycle Numbers	Number of cracking elements
1	2	1	2	1	1
3	4	3	4	4	3
4	6	4	5	7	5
5	8	5	8	28	6
6	9	6	9	39	7
7	12	7	12	56	8
8	14	8	13	95	11
29	15	28	14	96	12
42	16	29	15	103	13
84	17	33	16	200	15
156	18	47	18		
181	20	96	19		
190	21	98	20		
200	22	102	21		
		106	22		
		128	23		
		129	25		
		151	27		
		160	29		
		188	31		
		200	32		