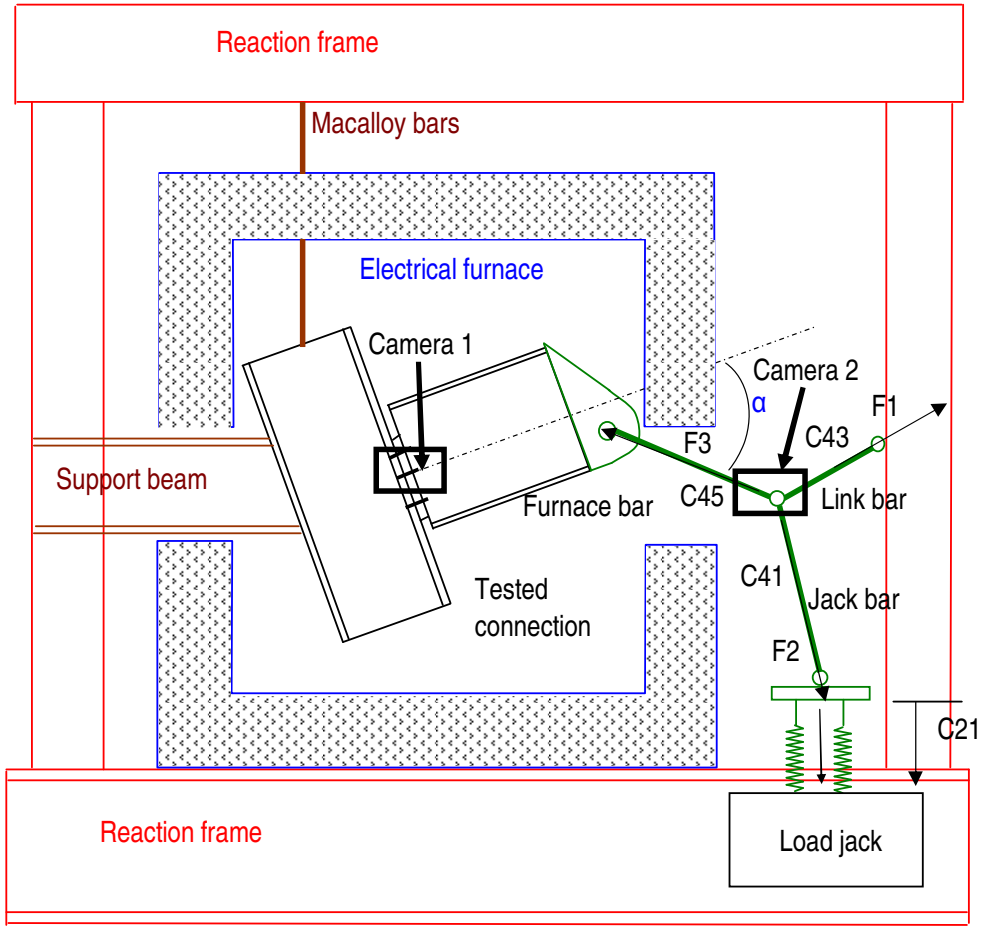
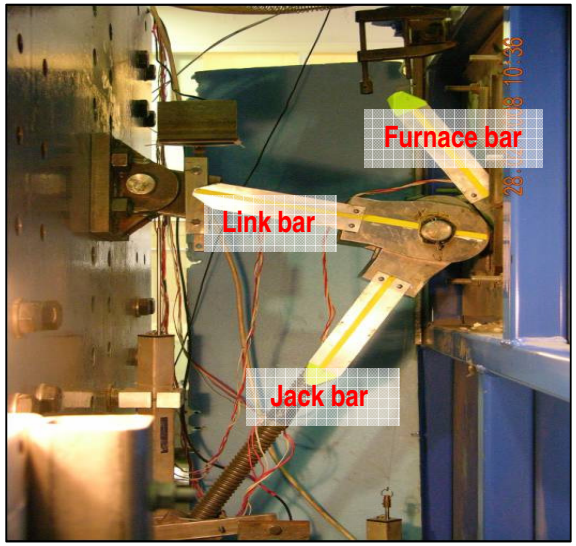
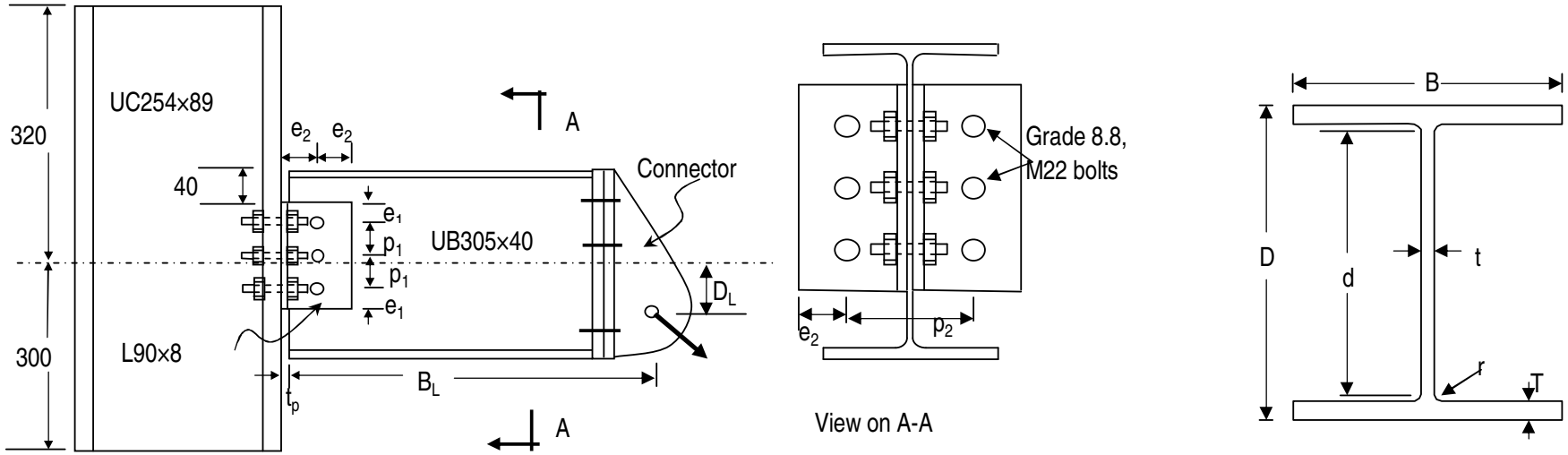

Reaction frame
Macalloy bars
Electrical furnace
Camera 1
Camera 2
α
F1
F3
C43
Support beam
Furnace bar
C45
Link bar
C41
Jack bar
Tested
connection
F2
C21
Reaction frame
Load jack


Camera 1


Furnace bar
Link bar
Jack bar



The specimen details

Diameter of bolt	d (mm)	20
Diameter of bolt hole	d_0 (mm)	22
End distance	e_1 (mm)	60
Edge distance	e_2 (mm)	50
Spacing between centres of bolts in the direction of load transfer	p_1 (mm)	60
Spacing between rows of bolts	p_2 (mm)	103
Thickness of end plate	t_p (mm)	10
Horizontal distance of lever arm	B_L (mm)	490
Vertical distance of lever arm	D_L (mm)	51.7

Steel Grade		S275	S355
Dimension of Members		UB305×165×40	UC254×254×89
Depth of Section	D (mm)	303.4	260.3
Width of Section	B (mm)	165	256.3
Thickness of Web	t (mm)	6	10.3
Thickness of Flange	T (mm)	10.2	17.3
Root Radius	r (mm)	8.9	12.7
Depth between Fillets	d (mm)	265.2	200.3

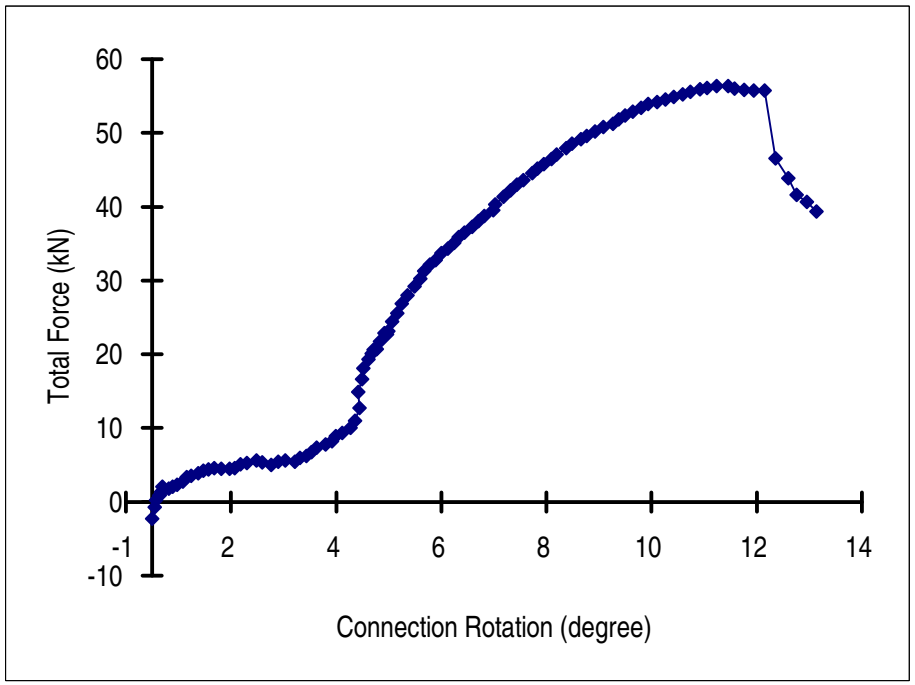
Nominal Temperature **550°C**

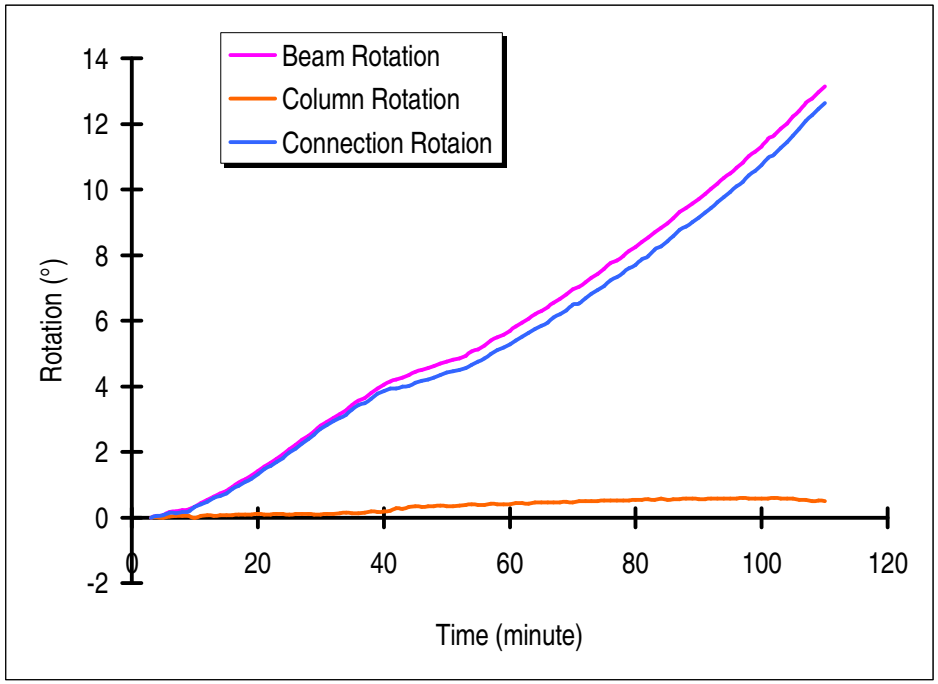
Time	Thermocouple	Jack Displacement	Load Angle	Beam Rotation	Column Rotation	Connection Rotation	Force Rotation	F3 from F1	F3 from F2	F3 Average	Tension	Shear	Moment
(minute)	Average(°C)	(mm)	α(°)	(°)	(°)	(°)	(°)	(kN)	(kN)	(kN)	(kN)	(kN)	(kN*m)
0	546.144	2.465											
1	546.287	2.464											
2	546.570	2.465											
3	546.663	2.464	46.96	0.000	0.000	0.000	67.335	-5.41	0.89	-2.26	-1.54	-1.65	-925.60
4	546.835	3.778	46.96	0.051	0.008	0.043	67.279	-3.64	2.23	-0.70	-0.48	-0.52	-288.93
5	546.981	5.305	47.01	0.075	-0.001	0.076	67.206	-2.70	3.25	0.27	0.19	0.20	111.94
6	547.056	6.902	46.90	0.170	0.030	0.140	67.226	-2.51	4.37	0.93	0.64	0.68	380.94
7	547.321	8.683	47.07	0.176	0.043	0.133	67.050	-2.37	4.07	0.85	0.58	0.62	349.96
8	547.351	10.417	47.28	0.215	0.042	0.173	66.794	-1.85	4.64	1.40	0.95	1.03	575.39
9	547.507	11.898	47.38	0.239	0.045	0.194	66.675	-1.39	5.47	2.04	1.38	1.50	840.48
10	547.582	13.296	47.39	0.316	0.000	0.316	66.586	-1.20	4.72	1.76	1.19	1.30	725.70
11	547.652	14.896	47.30	0.445	0.051	0.394	66.547	-1.28	5.48	2.10	1.42	1.54	863.39
12	547.900	16.448	47.35	0.534	0.059	0.475	66.406	-0.86	5.57	2.36	1.60	1.73	971.92
13	547.957	17.974	47.32	0.643	0.054	0.589	66.334	-0.23	5.69	2.73	1.85	2.00	1123.37
14	548.043	19.431	47.35	0.726	0.070	0.656	66.220	0.24	6.55	3.39	2.30	2.50	1398.45
15	548.102	20.969	47.26	0.815	0.077	0.738	66.215	0.39	6.66	3.53	2.39	2.59	1452.23
16	548.152	22.567	47.13	0.934	0.059	0.875	66.227	0.75	7.05	3.90	2.65	2.86	1602.24
17	548.342	24.112	47.11	1.056	0.086	0.970	66.127	1.27	7.24	4.26	2.90	3.12	1748.01
18	548.439	25.621	47.13	1.160	0.084	1.076	66.004	1.24	7.48	4.36	2.97	3.19	1790.44
19	548.595	27.056	46.97	1.277	0.093	1.184	66.041	1.79	7.44	4.62	3.15	3.37	1892.01
20	548.671	28.537	46.91	1.415	0.102	1.313	65.968	1.68	7.26	4.47	3.05	3.26	1830.72
21	548.646	30.049	46.92	1.557	0.081	1.476	65.817	1.81	7.12	4.47	3.05	3.26	1829.47
22	548.804	31.499	46.79	1.665	0.091	1.573	65.837	2.05	7.13	4.59	3.14	3.35	1876.93

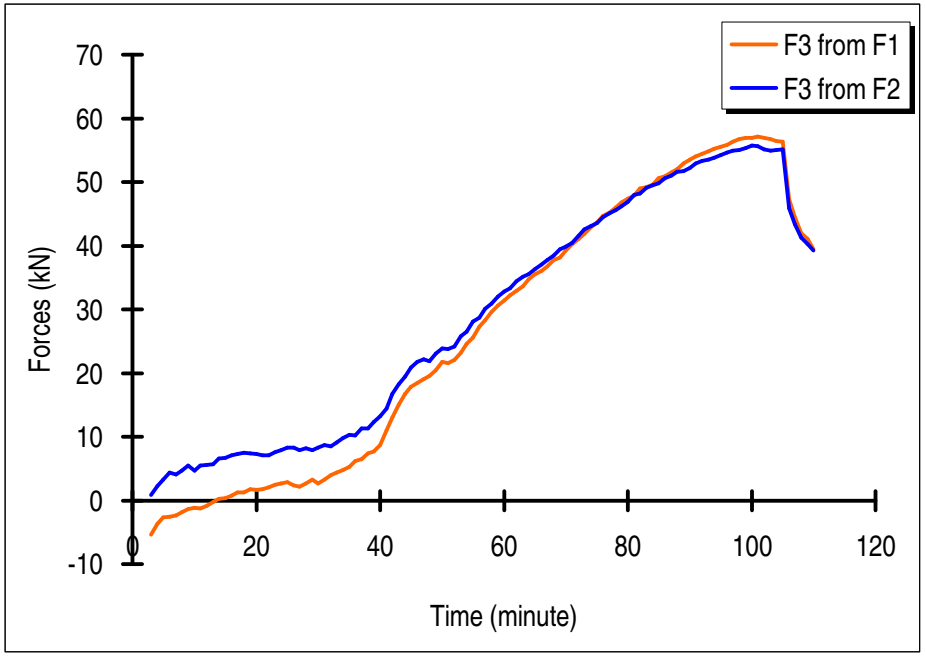
23	548.852	33.012	46.77	1.792	0.108	1.684	65.731	2.50	7.62	5.06	3.47	3.69	2068.18
24	548.897	34.558	46.66	1.917	0.117	1.800	65.720	2.67	7.87	5.27	3.62	3.83	2150.01
25	549.073	36.106	46.50	2.079	0.092	1.987	65.717	2.83	8.31	5.57	3.84	4.04	2268.78
26	549.101	37.715	46.43	2.207	0.114	2.093	65.658	2.39	8.25	5.32	3.67	3.86	2164.35
27	549.275	39.325	46.38	2.367	0.108	2.259	65.548	2.16	7.93	5.04	3.48	3.65	2049.07
28	549.402	40.911	46.22	2.495	0.100	2.395	65.575	2.69	8.22	5.45	3.77	3.94	2211.22
29	549.423	42.544	46.12	2.632	0.096	2.536	65.544	3.22	7.92	5.57	3.86	4.02	2255.35
30	549.515	44.154	46.05	2.805	0.094	2.711	65.440	2.62	8.28	5.45	3.78	3.92	2203.95
31	549.581	45.804	45.96	2.925	0.110	2.815	65.406	3.24	8.70	5.97	4.15	4.29	2410.88
32	549.672	47.453	45.97	3.043	0.113	2.930	65.278	3.95	8.52	6.24	4.33	4.48	2519.19
33	549.749	49.039	45.92	3.159	0.134	3.025	65.214	4.37	9.07	6.72	4.67	4.83	2712.35
34	549.745	50.648	45.80	3.275	0.146	3.129	65.217	4.82	9.81	7.32	5.10	5.25	2948.80
35	549.861	52.266	45.70	3.421	0.126	3.295	65.173	5.25	10.25	7.75	5.41	5.55	3118.22
36	549.869	53.845	45.59	3.558	0.135	3.423	65.143	6.20	10.23	8.22	5.75	5.87	3301.71
37	549.983	55.398	45.48	3.644	0.152	3.492	65.169	6.53	11.33	8.93	6.26	6.37	3582.15
38	550.077	56.984	45.30	3.799	0.180	3.618	65.193	7.36	11.27	9.32	6.55	6.62	3726.62
39	550.113	58.512	45.15	3.927	0.158	3.769	65.212	7.65	12.35	10.00	7.05	7.09	3991.58
40	550.276	60.122	45.05	4.041	0.181	3.860	65.199	8.69	13.22	10.96	7.74	7.75	4365.80
41	550.267	61.676	44.95	4.145	0.207	3.938	65.197	10.96	14.45	12.71	8.99	8.98	5056.03
42	550.364	63.182	44.85	4.202	0.279	3.922	65.243	13.02	16.76	14.89	10.56	10.50	5914.84
43	550.456	64.759	44.86	4.261	0.272	3.988	65.168	15.07	18.24	16.66	11.80	11.75	6618.12
44	550.426	66.337	44.77	4.347	0.328	4.019	65.172	16.72	19.47	18.10	12.85	12.75	7181.80
45	550.601	67.843	44.66	4.448	0.338	4.109	65.190	17.87	20.84	19.35	13.77	13.60	7666.08
46	550.643	69.227	44.55	4.503	0.330	4.173	65.235	18.41	21.79	20.10	14.33	14.10	7950.77
47	550.729	70.477	44.63	4.551	0.337	4.214	65.111	19.05	22.11	20.58	14.65	14.46	8149.26
48	550.884	71.614	44.57	4.613	0.346	4.267	65.111	19.52	21.90	20.71	14.75	14.53	8191.12
49	550.843	72.856	44.61	4.688	0.353	4.335	64.995	20.41	23.07	21.74	15.48	15.27	8604.07
50	551.007	74.249	44.68	4.757	0.336	4.421	64.853	21.78	23.89	22.83	16.23	16.06	9047.79
51	551.020	75.394	44.61	4.802	0.335	4.466	64.883	21.57	23.81	22.69	16.15	15.93	8979.56
52	551.157	76.563	44.61	4.848	0.353	4.494	64.840	22.05	24.16	23.10	16.45	16.22	9144.10

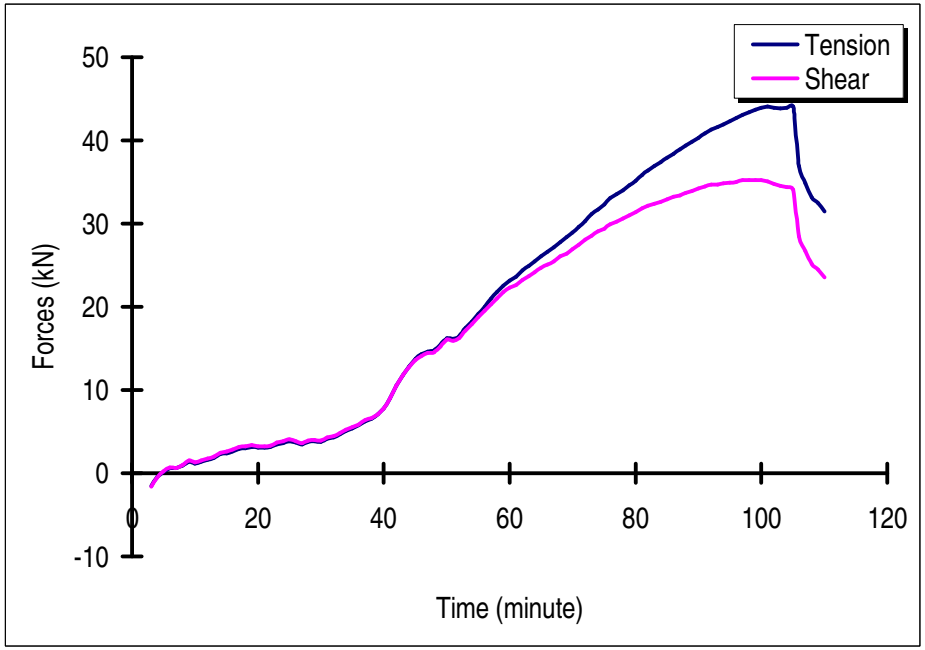
53	551.281	77.964	44.53	4.930	0.371	4.559	64.830	23.19	25.76	24.47	17.45	17.16	9675.36
54	551.306	79.495	44.43	5.059	0.396	4.663	64.805	24.60	26.51	25.55	18.25	17.89	10086.07
55	551.382	81.038	44.36	5.130	0.388	4.742	64.807	25.58	28.07	26.82	19.18	18.75	10575.70
56	551.406	82.616	44.32	5.234	0.383	4.850	64.743	27.25	28.73	27.99	20.03	19.56	11029.60
57	551.455	84.130	44.09	5.401	0.413	4.988	64.804	28.33	30.09	29.21	20.98	20.32	11467.99
58	551.600	85.635	44.05	5.495	0.391	5.104	64.749	29.58	30.91	30.25	21.74	21.03	11867.53
59	551.569	87.221	43.98	5.580	0.407	5.172	64.734	30.62	31.98	31.30	22.52	21.74	12268.80
60	551.738	88.823	43.90	5.692	0.407	5.285	64.704	31.46	32.79	32.12	23.15	22.27	12574.84
61	551.806	90.401	43.77	5.827	0.440	5.387	64.701	32.19	33.29	32.74	23.64	22.65	12789.07
62	551.770	91.971	43.70	5.941	0.434	5.507	64.656	32.92	34.43	33.68	24.35	23.26	13140.12
63	551.804	93.539	43.55	6.049	0.421	5.628	64.692	33.63	35.09	34.36	24.90	23.67	13376.38
64	551.838	95.094	43.44	6.195	0.454	5.741	64.654	34.68	35.49	35.09	25.47	24.13	13635.51
65	551.935	96.664	43.44	6.298	0.461	5.837	64.560	35.52	36.29	35.90	26.07	24.69	13952.00
66	551.996	98.216	43.32	6.405	0.464	5.941	64.569	36.08	36.99	36.54	26.58	25.07	14171.15
67	551.973	99.729	43.18	6.554	0.462	6.092	64.563	36.72	37.76	37.24	27.16	25.48	14411.50
68	552.035	101.283	43.14	6.662	0.458	6.204	64.486	37.75	38.43	38.09	27.79	26.05	14732.16
69	552.064	102.813	42.93	6.802	0.487	6.314	64.559	38.09	39.40	38.74	28.37	26.39	14934.10
70	552.094	104.383	42.96	6.952	0.465	6.487	64.386	39.23	39.83	39.53	28.93	26.94	15242.28
71	552.059	105.856	42.84	7.029	0.501	6.528	64.422	40.29	40.40	40.35	29.58	27.44	15529.69
72	552.053	107.409	42.77	7.180	0.497	6.683	64.347	41.08	41.58	41.33	30.34	28.06	15885.88
73	552.178	109.019	42.53	7.317	0.497	6.820	64.450	41.87	42.61	42.24	31.13	28.55	16172.87
74	552.153	110.507	42.50	7.429	0.494	6.935	64.363	42.90	43.10	43.00	31.70	29.05	16458.79
75	552.227	112.126	42.30	7.580	0.522	7.057	64.417	43.69	43.59	43.64	32.28	29.37	16646.18
76	552.226	113.768	42.14	7.748	0.513	7.234	64.406	44.65	44.47	44.56	33.04	29.90	16952.66
77	552.271	115.385	42.01	7.842	0.518	7.324	64.443	45.20	45.08	45.14	33.54	30.21	17136.21
78	552.339	116.962	41.95	7.969	0.514	7.454	64.377	45.95	45.56	45.76	34.03	30.59	17352.60
79	552.372	118.516	41.87	8.122	0.524	7.598	64.303	46.76	46.23	46.49	34.62	31.03	17608.01
80	552.378	119.981	41.74	8.240	0.543	7.697	64.310	47.35	46.88	47.11	35.15	31.37	17805.79
81	552.449	121.542	41.59	8.405	0.528	7.876	64.303	47.87	47.98	47.93	35.85	31.81	18064.70
82	552.393	123.113	41.51	8.532	0.552	7.980	64.254	48.97	48.16	48.57	36.37	32.19	18281.46

83	552.528	124.683	41.27	8.696	0.536	8.160	64.329	49.21	49.08	49.15	36.94	32.42	18425.20
84	552.541	126.187	41.09	8.833	0.570	8.262	64.367	49.60	49.54	49.57	37.36	32.58	18528.42
85	552.567	127.766	41.01	8.965	0.541	8.424	64.319	50.60	49.82	50.21	37.89	32.95	18739.11
86	552.567	129.262	40.88	9.128	0.549	8.579	64.285	50.94	50.59	50.77	38.38	33.22	18904.74
87	552.512	130.815	40.64	9.325	0.558	8.766	64.330	51.48	51.04	51.26	38.90	33.38	19007.42
88	552.642	132.304	40.55	9.443	0.570	8.873	64.301	51.99	51.63	51.81	39.37	33.68	19183.14
89	552.656	133.858	40.44	9.573	0.576	8.997	64.278	52.95	51.74	52.35	39.84	33.95	19343.90
90	552.712	135.500	40.33	9.709	0.561	9.147	64.251	53.47	52.22	52.85	40.28	34.20	19491.64
91	552.715	137.102	40.16	9.858	0.555	9.302	64.274	54.00	52.87	53.44	40.84	34.46	19649.67
92	552.703	138.680	40.03	10.017	0.580	9.437	64.246	54.47	53.34	53.91	41.28	34.67	19775.42
93	552.852	140.256	39.85	10.181	0.576	9.604	64.258	54.78	53.56	54.17	41.59	34.71	19810.53
94	552.878	141.850	39.71	10.347	0.579	9.767	64.239	55.19	53.82	54.50	41.93	34.82	19879.75
95	552.921	143.452	39.55	10.485	0.568	9.917	64.257	55.48	54.21	54.85	42.29	34.92	19948.19
96	552.949	145.029	39.36	10.671	0.577	10.094	64.267	55.83	54.58	55.20	42.68	35.01	20006.57
97	552.872	146.601	39.26	10.826	0.589	10.237	64.211	56.34	54.89	55.62	43.07	35.19	20120.23
98	552.925	148.155	39.05	11.009	0.584	10.425	64.230	56.74	55.07	55.90	43.41	35.22	20148.53
99	552.961	149.762	38.91	11.144	0.585	10.559	64.235	56.96	55.30	56.13	43.67	35.26	20176.65
100	552.971	151.364	38.76	11.311	0.572	10.739	64.220	56.90	55.73	56.32	43.91	35.26	20188.01
101	553.013	152.965	38.48	11.533	0.579	10.954	64.279	57.11	55.59	56.35	44.11	35.06	20092.98
102	553.146	154.581	38.36	11.662	0.590	11.072	64.267	56.93	55.09	56.01	43.92	34.76	19929.68
103	553.280	156.169	38.19	11.845	0.582	11.263	64.254	56.78	54.90	55.84	43.88	34.53	19804.51
104	553.212	157.753	38.09	12.008	0.569	11.439	64.199	56.44	55.07	55.76	43.89	34.39	19735.57
105	553.231	159.411	37.75	12.229	0.581	11.648	64.310	56.33	55.09	55.71	44.05	34.11	19594.11
106	553.236	161.085	37.63	12.393	0.534	11.859	64.268	47.30	45.86	46.58	36.89	28.44	16344.83
107	553.225	162.711	37.41	12.627	0.531	12.096	64.256	44.42	43.35	43.89	34.86	26.66	15333.82
108	553.309	164.337	37.24	12.766	0.507	12.259	64.291	41.98	41.28	41.63	33.14	25.19	14494.79
109	553.290	165.930	36.96	12.965	0.515	12.450	64.365	41.05	40.22	40.63	32.47	24.43	14072.77
110	553.361	167.483	36.80	13.137	0.498	12.639	64.357	39.43	39.21	39.32	31.48	23.55	13572.67


Total Force (kN)
60
50
40
30
20
10
0
-1
-10
2
4
6
8
10
12
14
Connection Rotation (degree)


Beam Rotation
Column Rotation
Connection Rotaion
Rotation (°)
14
12
10
8
6
4
2
0
-2
0
20
40
60
80
100
120
Time (minute)


F3 from F1
F3 from F2
Forces (kN)
70
60
50
40
30
20
10
0
-10
0
20
40
60
80
100
120
Time (minute)


Tension
Shear
Forces (kN)
50
40
30
20
10
0
-10
0
20
40
60
80
100
120
Time (minute)

Photographs after Test