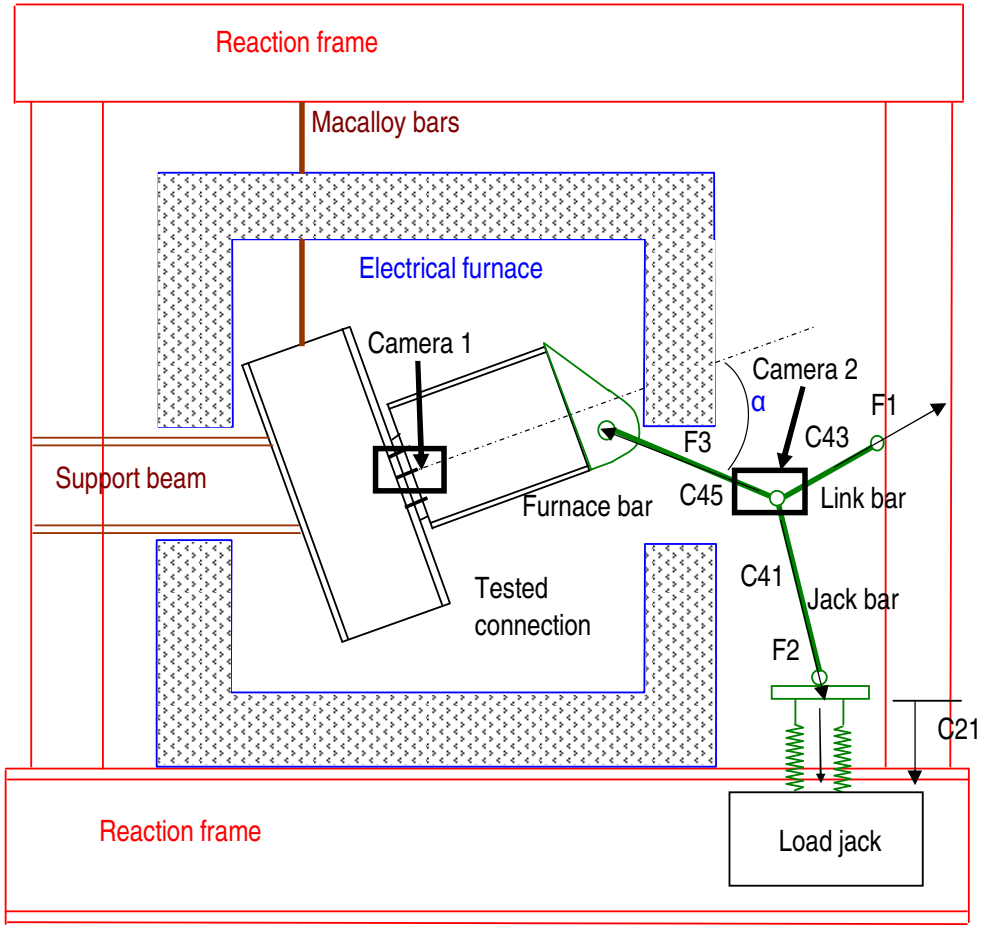
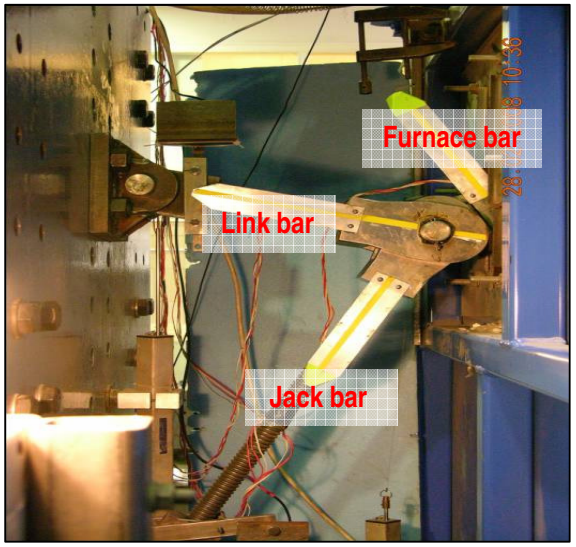
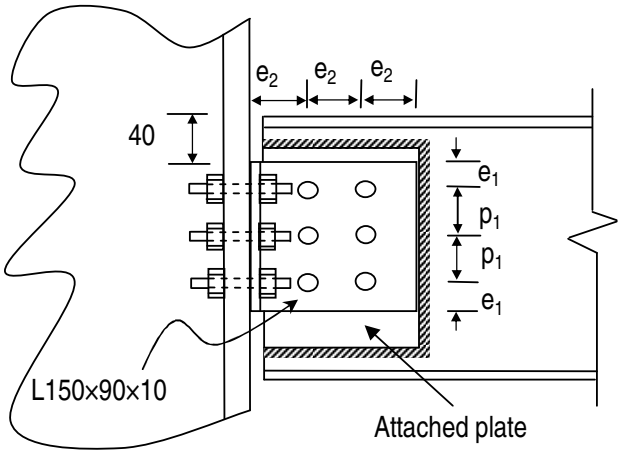
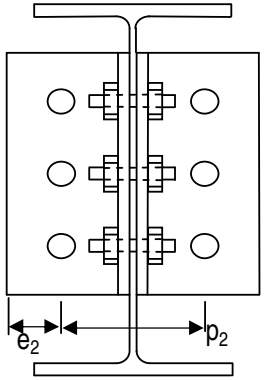

Reaction frame
Macalloy bars
Electrical furnace
Camera 1
Camera 2
α
F1
F3
C43
Support beam
Furnace bar
C45
Link bar
C41
Jack bar
Tested
connection
F2
C21
Reaction frame
Load jack

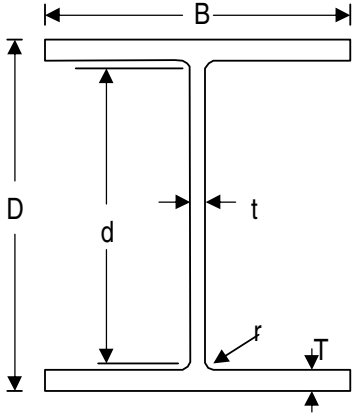

Camera 1


Furnace bar
Link bar
Jack bar





View on A-A



The specimen details

Diameter of bolt	d (mm)	20
Diameter of bolt hole	d_0 (mm)	22
End distance	e_1 (mm)	40
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)	123
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

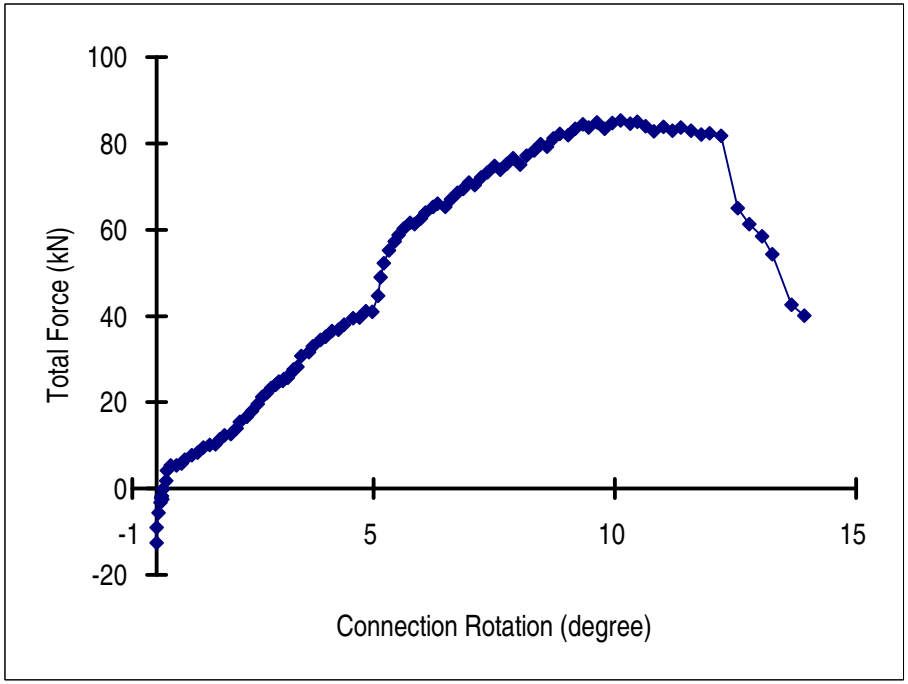
Nominal Temperature **550°C**

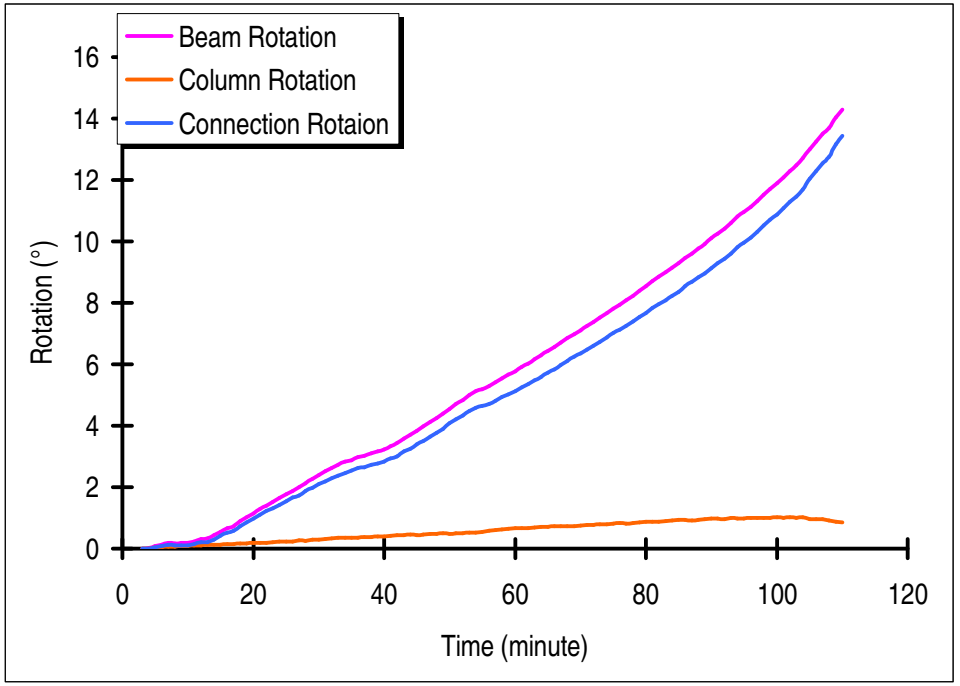
Time	Thermocouple	Jack Displacement	Load Angle	Beam Rotation	Column Rotation	Connection Rotation	Force Rotation	F3 from F1	F3 from F2	F3 Average	Tension	Shear	Moment
(minute)	Average(°C)	(mm)	α(°)	(°)	(°)	(°)	(°)	(kN)	(kN)	(kN)	(kN)	(kN)	(kN*m)
0	547.792	2.173											
1	547.885	2.174											
2	547.962	2.179											
3	548.056	2.184	40.22	0.000	0.000	0.000	73.563	-13.99	-11.33	-12.66	-9.66	-8.17	-4658.92
4	548.064	3.485	40.24	0.018	0.008	0.010	73.528	-9.97	-8.04	-9.00	-6.87	-5.81	-3314.67
5	548.174	5.020	40.23	0.079	0.037	0.043	73.469	-6.41	-4.82	-5.61	-4.28	-3.62	-2066.28
6	548.241	6.518	40.21	0.128	0.045	0.082	73.440	-3.77	-2.70	-3.23	-2.47	-2.09	-1190.32
7	548.288	8.081	40.17	0.188	0.064	0.124	73.429	-2.66	-2.27	-2.47	-1.89	-1.59	-907.42
8	548.377	9.991	40.12	0.171	0.063	0.108	73.492	-2.19	-1.37	-1.78	-1.36	-1.15	-655.49
9	548.427	11.502	40.68	0.178	0.083	0.095	72.923	-2.43	-2.05	-2.24	-1.70	-1.46	-831.92
10	548.508	12.911	40.80	0.196	0.091	0.105	72.785	-2.00	-1.39	-1.69	-1.28	-1.11	-630.01
11	548.514	14.472	40.84	0.232	0.094	0.138	72.708	-0.33	0.10	-0.12	-0.09	-0.08	-43.58
12	548.558	15.837	40.83	0.302	0.102	0.200	72.654	1.27	2.25	1.76	1.33	1.15	654.58
13	548.636	17.371	40.82	0.340	0.127	0.213	72.618	3.79	4.55	4.17	3.16	2.73	1551.42
14	548.752	18.959	40.77	0.431	0.132	0.299	72.581	4.71	5.92	5.32	4.03	3.47	1976.45
15	548.836	20.539	40.69	0.542	0.131	0.411	72.554	4.83	5.93	5.38	4.08	3.51	1996.08
16	548.899	22.032	40.61	0.672	0.150	0.522	72.502	4.95	6.53	5.74	4.36	3.74	2127.70
17	548.951	23.574	40.57	0.740	0.150	0.589	72.474	6.09	7.44	6.76	5.14	4.40	2505.16
18	548.998	25.168	40.45	0.895	0.162	0.733	72.434	7.16	8.37	7.77	5.91	5.04	2871.01
19	549.084	26.763	40.37	1.015	0.166	0.849	72.399	7.91	8.70	8.31	6.33	5.38	3066.29
20	549.162	28.254	40.24	1.149	0.179	0.970	72.394	8.88	10.21	9.54	7.28	6.16	3513.24
21	549.236	29.865	40.12	1.286	0.184	1.102	72.375	9.70	10.52	10.11	7.73	6.52	3715.21
22	549.292	31.412	40.00	1.406	0.179	1.227	72.376	9.96	10.51	10.23	7.84	6.58	3752.43

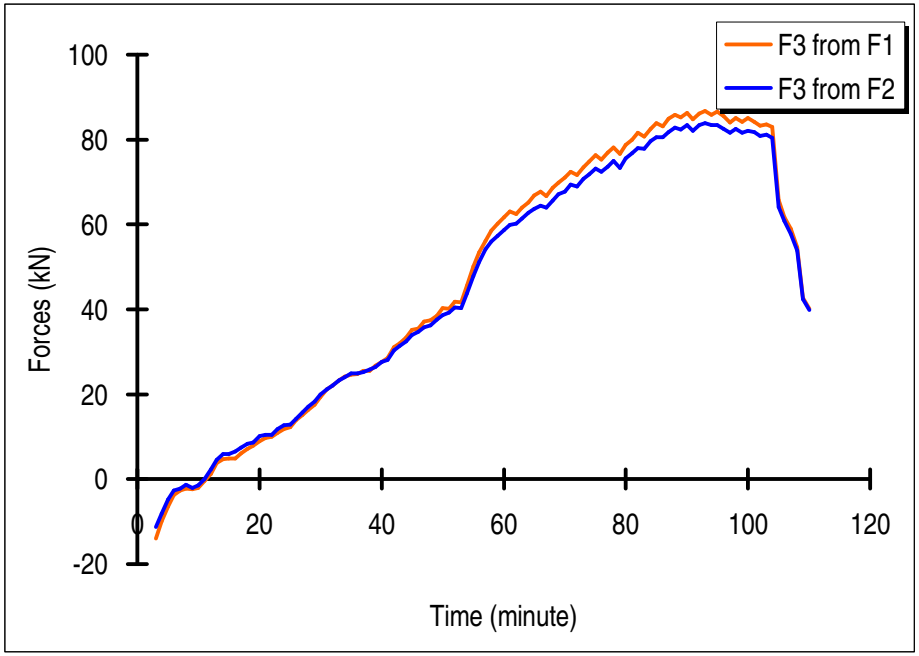
23	549.341	32.983	39.90	1.520	0.201	1.319	72.361	10.96	11.85	11.41	8.75	7.32	4175.50
24	549.353	34.458	39.80	1.636	0.227	1.409	72.343	11.83	12.76	12.30	9.45	7.87	4492.48
25	549.426	36.069	39.70	1.773	0.226	1.547	72.310	12.28	12.88	12.58	9.68	8.04	4588.55
26	549.518	37.529	39.59	1.883	0.226	1.657	72.309	13.84	14.18	14.01	10.80	8.93	5099.78
27	549.555	39.188	39.51	1.994	0.267	1.727	72.279	15.15	15.77	15.46	11.93	9.84	5618.53
28	549.623	40.725	39.41	2.128	0.249	1.879	72.248	16.32	17.06	16.69	12.90	10.60	6054.53
29	549.698	42.297	39.33	2.262	0.288	1.974	72.187	17.60	18.26	17.93	13.87	11.37	6496.10
30	549.760	43.828	39.24	2.388	0.291	2.097	72.154	19.28	19.94	19.61	15.19	12.41	7093.59
31	549.814	45.374	39.13	2.516	0.321	2.195	72.139	21.22	21.19	21.21	16.45	13.38	7654.10
32	549.865	46.793	39.09	2.616	0.330	2.286	72.081	22.05	22.13	22.09	17.15	13.93	7968.08
33	549.933	48.340	38.97	2.728	0.352	2.376	72.086	23.27	23.27	23.27	18.09	14.64	8374.59
34	549.999	49.767	38.90	2.824	0.357	2.467	72.057	24.20	24.03	24.11	18.77	15.14	8667.08
35	550.027	51.074	38.87	2.885	0.352	2.533	72.024	24.68	24.98	24.83	19.33	15.58	8918.78
36	550.079	52.268	38.77	2.980	0.362	2.618	72.034	24.81	24.99	24.90	19.41	15.59	8926.51
37	550.145	53.533	38.72	3.013	0.371	2.642	72.054	25.48	25.21	25.35	19.78	15.85	9079.07
38	550.230	54.913	38.65	3.109	0.382	2.727	72.020	25.59	25.88	25.73	20.10	16.07	9206.27
39	550.284	56.169	38.57	3.167	0.388	2.779	72.047	26.66	26.37	26.52	20.73	16.53	9471.47
40	550.335	57.467	38.47	3.236	0.396	2.840	72.075	27.66	27.59	27.62	21.62	17.18	9847.84
41	550.367	58.806	38.37	3.337	0.409	2.928	72.078	28.48	28.04	28.26	22.15	17.54	10054.95
42	550.401	60.314	38.26	3.442	0.436	3.006	72.078	31.10	30.38	30.74	24.14	19.04	10916.44
43	550.458	61.884	38.20	3.591	0.428	3.163	71.994	31.98	31.37	31.67	24.89	19.59	11234.98
44	550.513	63.406	38.08	3.699	0.453	3.246	72.005	33.38	32.48	32.93	25.92	20.31	11653.28
45	550.555	64.977	37.93	3.841	0.447	3.394	72.015	35.10	33.91	34.51	27.22	21.21	12176.14
46	550.639	66.646	37.87	3.971	0.462	3.508	71.944	35.51	34.71	35.11	27.72	21.55	12375.77
47	550.658	68.160	37.71	4.122	0.478	3.644	71.947	37.20	35.81	36.51	28.88	22.33	12830.59
48	550.692	69.626	37.64	4.260	0.486	3.774	71.881	37.37	36.25	36.81	29.15	22.48	12918.65
49	550.750	71.254	37.47	4.398	0.506	3.892	71.918	38.54	37.54	38.04	30.19	23.14	13304.04
50	550.763	72.761	37.30	4.549	0.471	4.078	71.935	40.26	38.64	39.45	31.38	23.91	13753.54
51	550.814	74.187	37.19	4.716	0.505	4.211	71.878	40.09	39.29	39.69	31.62	23.99	13806.63
52	550.880	75.758	37.02	4.839	0.501	4.338	71.926	41.84	40.40	41.12	32.83	24.75	14255.32

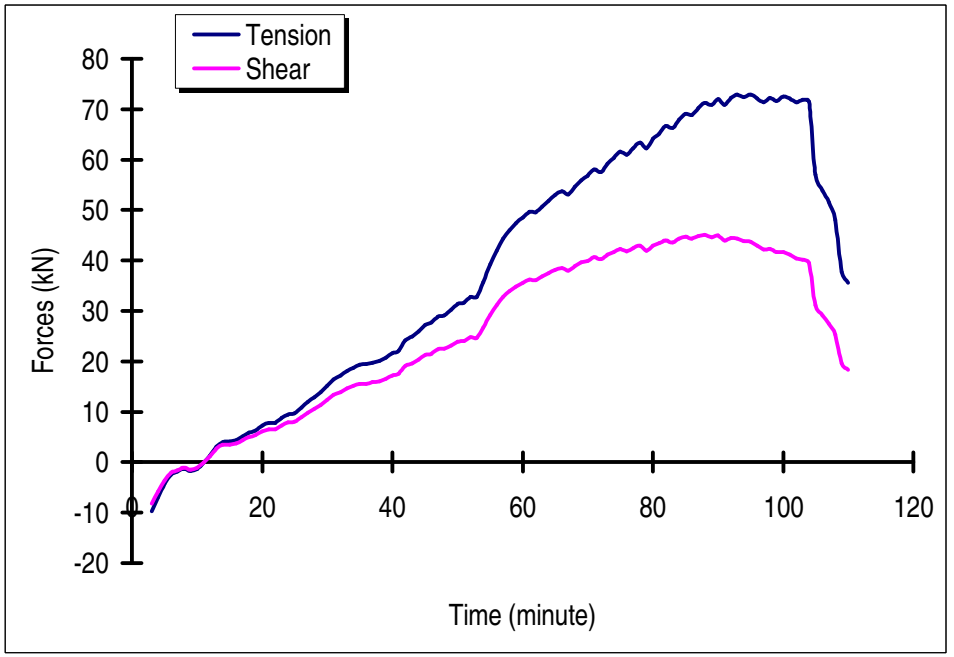
53	550.952	77.360	36.92	4.990	0.520	4.470	71.868	41.61	40.32	40.97	32.75	24.61	14177.38
54	550.991	78.931	36.78	5.116	0.528	4.588	71.889	45.53	43.78	44.66	35.77	26.74	15409.63
55	551.025	80.519	36.72	5.196	0.551	4.645	71.864	50.05	47.79	48.92	39.21	29.25	16861.96
56	551.061	82.074	36.63	5.289	0.577	4.712	71.868	53.43	51.09	52.26	41.94	31.18	17978.82
57	551.094	83.644	36.51	5.425	0.606	4.819	71.852	56.18	54.23	55.20	44.37	32.84	18945.56
58	551.134	85.215	36.40	5.551	0.617	4.934	71.835	58.51	55.91	57.21	46.05	33.95	19592.07
59	551.174	86.827	36.30	5.659	0.644	5.014	71.827	60.18	57.40	58.79	47.38	34.80	20090.57
60	551.246	88.397	36.19	5.777	0.659	5.118	71.815	61.65	58.73	60.19	48.58	35.54	20527.43
61	551.302	89.944	36.07	5.915	0.657	5.258	71.793	63.12	59.94	61.53	49.73	36.23	20933.51
62	551.306	91.483	36.08	6.029	0.677	5.352	71.670	62.42	60.20	61.31	49.55	36.11	20863.49
63	551.324	93.029	35.98	6.163	0.679	5.484	71.639	63.99	61.36	62.68	50.72	36.82	21283.90
64	551.380	94.625	35.86	6.287	0.708	5.579	71.635	65.25	62.73	63.99	51.86	37.48	21675.29
65	551.411	96.204	35.72	6.433	0.699	5.734	71.632	66.84	63.68	65.26	52.98	38.10	22040.40
66	551.482	97.686	35.60	6.558	0.729	5.829	71.625	67.69	64.44	66.07	53.72	38.46	22259.83
67	551.473	99.305	35.57	6.705	0.723	5.982	71.505	66.61	64.01	65.31	53.12	37.99	21992.40
68	551.517	100.956	35.42	6.847	0.736	6.111	71.518	68.57	65.59	67.08	54.67	38.87	22515.97
69	551.551	102.415	35.29	6.977	0.733	6.244	71.516	69.86	67.21	68.53	55.94	39.59	22942.45
70	551.639	103.977	35.13	7.114	0.756	6.358	71.534	71.05	67.75	69.40	56.75	39.94	23157.30
71	551.682	105.444	34.98	7.245	0.765	6.480	71.555	72.37	69.44	70.91	58.10	40.65	23585.25
72	551.705	106.951	34.96	7.375	0.780	6.595	71.451	71.59	68.93	70.26	57.59	40.26	23358.35
73	551.734	108.537	34.81	7.517	0.791	6.726	71.456	73.52	70.79	72.15	59.24	41.19	23911.65
74	551.746	109.996	34.65	7.663	0.797	6.866	71.474	74.85	71.83	73.34	60.33	41.69	24219.64
75	551.805	111.503	34.46	7.822	0.809	7.013	71.505	76.31	73.15	74.73	61.62	42.28	24579.93
76	551.840	112.937	34.43	7.947	0.825	7.122	71.409	75.33	72.35	73.84	60.91	41.75	24273.28
77	551.834	114.517	34.28	8.077	0.822	7.255	71.429	76.96	73.61	75.29	62.21	42.40	24668.61
78	551.887	116.135	34.09	8.232	0.843	7.389	71.462	78.09	74.93	76.51	63.37	42.88	24968.00
79	551.934	117.627	34.01	8.399	0.863	7.536	71.371	76.64	73.39	75.01	62.18	41.96	24438.42
80	551.911	119.100	33.84	8.549	0.875	7.674	71.390	78.68	75.62	77.15	64.08	42.97	25041.88
81	551.961	120.752	33.66	8.702	0.879	7.823	71.425	79.94	76.75	78.35	65.21	43.42	25324.96
82	551.978	122.427	33.45	8.846	0.881	7.965	71.489	81.65	78.02	79.83	66.61	44.00	25687.38

83	552.021	123.878	33.36	8.995	0.901	8.094	71.427	80.75	77.86	79.30	66.24	43.61	25468.26
84	552.078	125.464	33.14	9.147	0.916	8.231	71.499	82.56	79.70	81.13	67.94	44.35	25924.93
85	552.123	127.035	32.90	9.285	0.930	8.355	71.600	83.91	80.56	82.24	69.05	44.67	26137.47
86	552.170	128.726	32.79	9.461	0.928	8.533	71.531	83.14	80.54	81.84	68.80	44.32	25948.10
87	552.198	130.305	32.58	9.602	0.924	8.678	71.604	84.88	81.76	83.32	70.21	44.86	26289.18
88	552.199	131.923	32.32	9.765	0.931	8.834	71.697	85.85	82.88	84.37	71.30	45.11	26463.33
89	552.224	133.527	32.21	9.916	0.961	8.955	71.652	85.17	82.30	83.74	70.85	44.64	26201.73
90	552.232	134.986	31.95	10.095	0.971	9.124	71.741	86.31	83.47	84.89	72.03	44.92	26397.26
91	552.286	136.813	31.81	10.252	0.969	9.283	71.720	84.80	82.13	83.46	70.92	43.99	25871.01
92	552.328	138.295	31.60	10.413	0.966	9.447	71.773	86.13	83.45	84.79	72.22	44.43	26151.98
93	552.353	139.889	31.30	10.606	0.991	9.615	71.873	86.69	83.90	85.29	72.88	44.32	26124.09
94	552.368	141.420	31.15	10.808	0.988	9.820	71.820	85.81	83.40	84.61	72.40	43.77	25821.46
95	552.409	143.000	30.92	10.951	0.985	9.966	71.916	86.56	83.46	85.01	72.94	43.68	25796.17
96	552.428	144.617	30.79	11.123	0.991	10.132	71.866	85.48	82.49	83.98	72.14	42.99	25408.12
97	552.459	146.229	30.62	11.314	1.001	10.313	71.853	84.07	81.65	82.86	71.31	42.20	24959.69
98	552.476	147.863	30.34	11.523	1.010	10.513	71.924	85.09	82.44	83.77	72.30	42.31	25060.90
99	552.500	149.346	30.19	11.699	1.001	10.698	71.896	84.13	81.66	82.89	71.65	41.68	24708.86
100	552.527	150.909	29.88	11.890	1.021	10.869	72.008	85.14	82.13	83.64	72.52	41.67	24742.56
101	552.550	152.672	29.71	12.077	0.997	11.080	71.999	84.21	81.80	83.00	72.09	41.13	24445.36
102	552.522	154.299	29.46	12.301	1.017	11.284	72.017	83.25	80.81	82.03	71.42	40.35	24011.30
103	552.588	155.759	29.15	12.479	1.010	11.469	72.150	83.60	81.08	82.34	71.91	40.11	23911.64
104	552.624	157.417	28.91	12.715	1.019	11.696	72.154	82.97	80.42	81.70	71.51	39.50	23577.58
105	552.664	159.235	28.62	13.008	0.958	12.050	72.155	65.75	64.20	64.97	57.03	31.12	18607.07
106	552.673	160.816	28.38	13.241	0.950	12.291	72.162	61.69	60.76	61.23	53.87	29.10	17424.40
107	552.679	162.362	28.05	13.494	0.949	12.545	72.241	58.95	57.83	58.39	51.54	27.46	16472.27
108	552.720	164.038	27.85	13.686	0.926	12.760	72.243	54.62	53.87	54.24	47.96	25.34	15222.19
109	552.728	165.686	27.49	14.043	0.885	13.158	72.245	42.72	42.35	42.54	37.73	19.64	11820.71
110	552.738	167.347	27.18	14.291	0.862	13.429	72.307	40.18	39.88	40.03	35.61	18.29	11030.84


100
80
60
40
20
0
-1
-20
5
10
15
Total Force (kN)
Connection Rotation (degree)


Beam Rotation
Column Rotation
Connection Rotaion
16
14
12
10
8
6
4
2
0
0
20
40
60
80
100
120
Rotation (°)
Time (minute)


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


Tension
Shear
Forces (kN)
Time (minute)
80
70
60
50
40
30
20
10
0
-10
-20
0
20
40
60
80
100
120

Photographs after Test