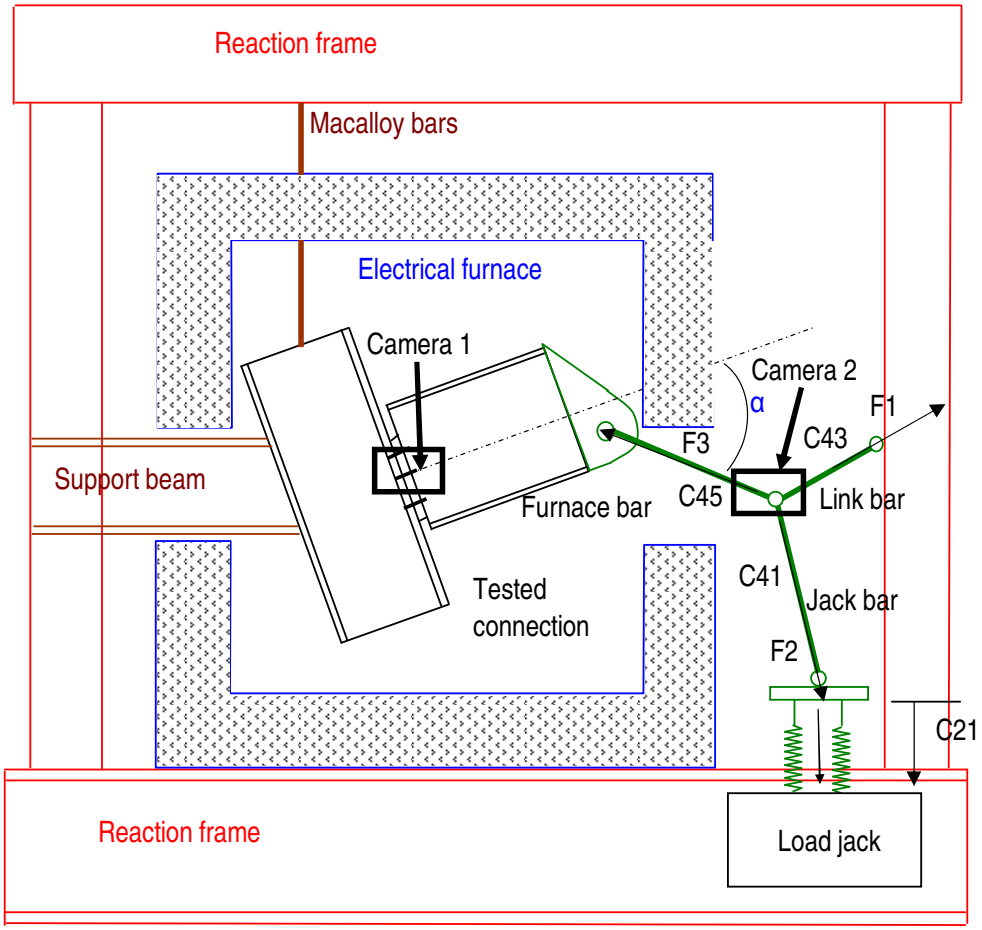
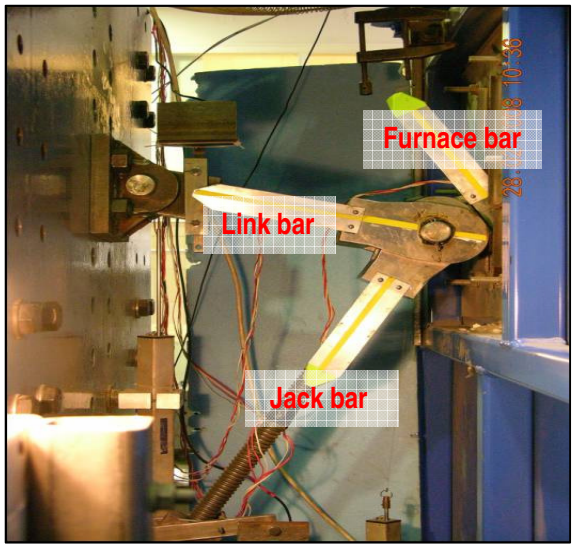
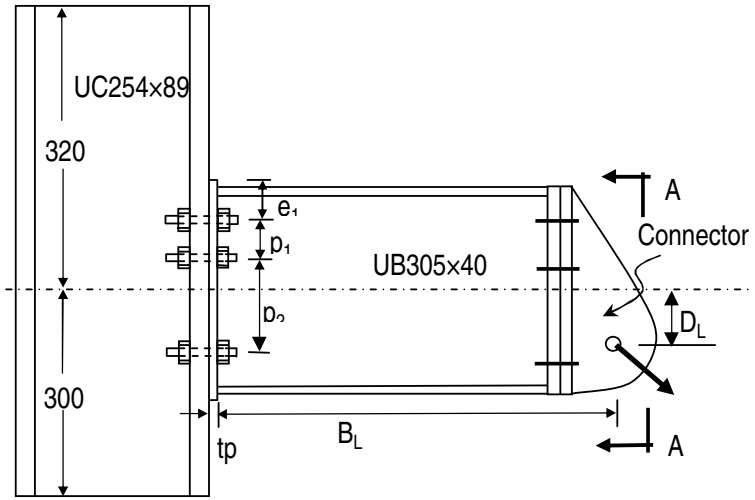
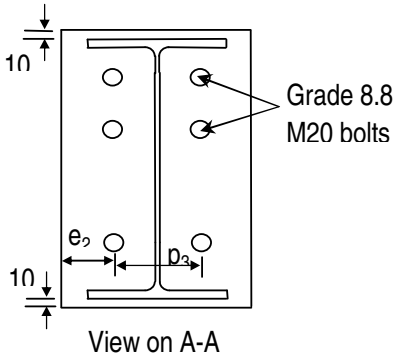
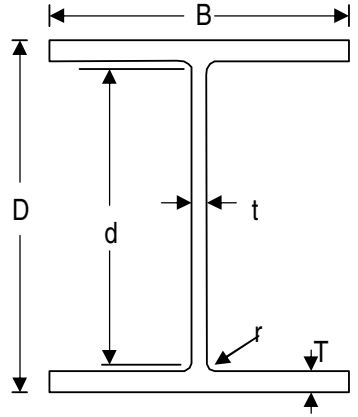

Reaction frame
Macalloy bars
Electrical furnace
Camera 1
Camera 2
α
F1
F3
C43
Support beam
Furnace bar
C45
Link bar
C41
Jack bar
Tested
connection
F2
C21
Reaction frame
Load jack


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)	55
Spacing between centres of bolts in the direction of load transfer	p_1 (mm)	70
	p_2 (mm)	133.4
Spacing between rows of bolts	p_3 (mm)	90
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

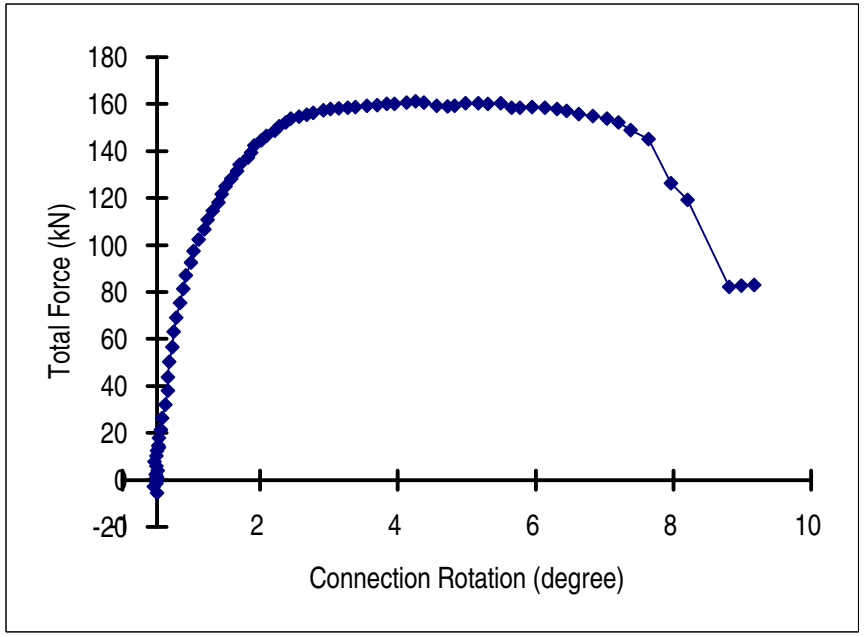
Nominal Temperature **450°C**

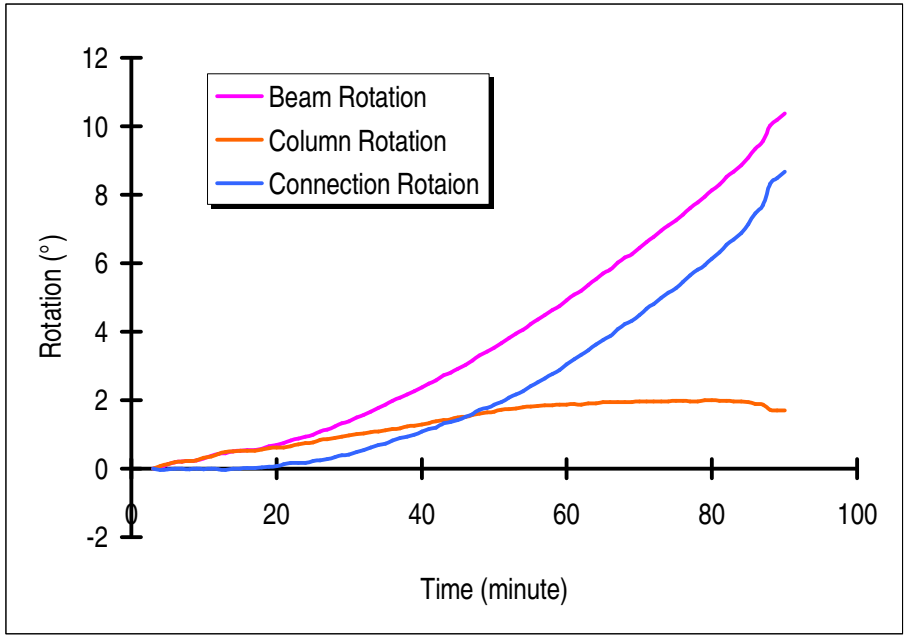
Time	Thermocouple	Jack Displacement	Load Angle	Beam Rotation	Column Rotation	Connection Rotation	Force Rotation	F3 from F1	F3 from F2	F3 Average	Tension	Shear	Moment
(minute)	Average(°C)	(mm)	α(°)	(°)	(°)	(°)	(°)	(kN)	(kN)	(kN)	(kN)	(kN)	(kN*m)
0		1.029											
1		1.031											
2		1.032											
3	24.557	1.062	55.16	0.000	0.000	0.000	58.836	-7.31	-3.80	-5.55	-3.17	-4.56	-2520.18
4	24.526	2.367	55.31	0.032	0.078	-0.047	58.687	-4.86	-1.06	-2.96	-1.68	-2.43	-1345.24
5	24.430	3.951	55.34	0.128	0.139	-0.011	58.660	-2.54	-0.45	-1.50	-0.85	-1.23	-680.58
6	24.373	5.454	55.45	0.185	0.191	-0.006	58.553	-0.85	1.05	0.10	0.06	0.08	45.04
7	24.351	7.056	55.52	0.206	0.202	0.004	58.476	0.00	1.01	0.50	0.29	0.42	229.84
8	24.337	8.408	55.70	0.221	0.230	-0.010	58.304	0.00	1.91	0.95	0.54	0.79	434.18
9	24.307	9.425	55.76	0.250	0.251	-0.001	58.241	0.23	2.20	1.21	0.68	1.00	553.53
10	24.253	10.874	55.77	0.304	0.318	-0.014	58.227	1.13	3.67	2.40	1.35	1.99	1097.26
11	24.190	12.317	55.76	0.368	0.359	0.008	58.244	3.18	4.70	3.94	2.22	3.26	1799.19
12	24.132	13.702	55.72	0.425	0.437	-0.012	58.280	4.81	7.02	5.91	3.33	4.89	2700.63
13	24.111	15.216	55.66	0.446	0.480	-0.034	58.337	6.78	8.92	7.85	4.43	6.48	3581.63
14	24.057	16.569	55.64	0.500	0.506	-0.006	58.361	8.67	11.67	10.17	5.74	8.40	4640.50
15	24.033	17.954	55.67	0.524	0.521	0.003	58.329	11.35	13.48	12.42	7.00	10.25	5666.80
16	24.012	19.188	55.67	0.546	0.520	0.026	58.332	12.30	15.36	13.83	7.80	11.42	6311.92
17	24.008	20.412	55.67	0.550	0.530	0.020	58.326	13.60	15.83	14.71	8.30	12.15	6714.71
18	23.970	21.749	55.61	0.587	0.554	0.033	58.390	16.14	19.74	17.94	10.13	14.81	8183.05
19	23.903	23.224	55.58	0.654	0.596	0.058	58.420	20.06	22.98	21.52	12.16	17.75	9810.11
20	23.862	24.609	55.59	0.695	0.615	0.080	58.414	24.48	28.15	26.31	14.87	21.71	11996.98
21	23.812	26.186	55.62	0.746	0.624	0.122	58.379	30.67	33.27	31.97	18.05	26.38	14580.99
22	23.742	27.685	55.64	0.815	0.654	0.161	58.361	36.54	39.53	38.03	21.47	31.40	17351.15

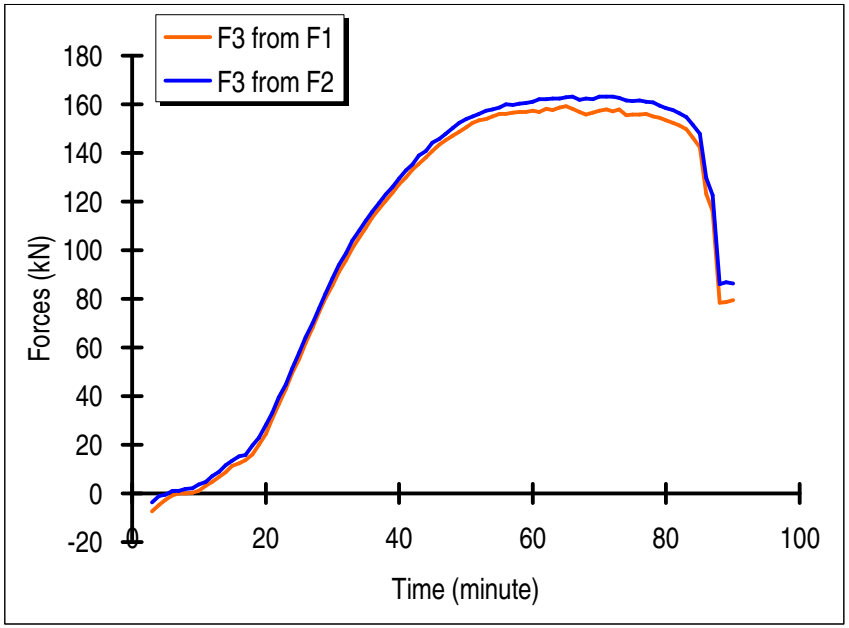
23	23.680	29.221	55.66	0.877	0.717	0.160	58.338	42.96	44.77	43.86	24.74	36.22	20014.97
24	23.626	30.790	55.62	0.932	0.756	0.176	58.380	49.43	51.24	50.33	28.42	41.54	22957.41
25	23.559	32.297	55.69	0.999	0.774	0.224	58.314	55.27	57.87	56.57	31.89	46.72	25818.69
26	23.473	33.922	55.73	1.085	0.837	0.247	58.272	61.89	64.29	63.09	35.53	52.13	28807.43
27	23.411	35.445	55.74	1.146	0.865	0.281	58.263	68.15	70.05	69.10	38.90	57.11	31556.04
28	23.317	37.055	55.74	1.240	0.901	0.339	58.263	74.40	76.06	75.23	42.36	62.18	34355.87
29	23.235	38.616	55.72	1.323	0.939	0.383	58.278	80.36	82.13	81.24	45.76	67.13	37095.42
30	23.165	40.120	55.71	1.392	0.972	0.420	58.289	85.60	88.30	86.95	48.98	71.84	39695.25
31	23.059	41.787	55.71	1.499	1.006	0.493	58.288	90.96	93.95	92.45	52.08	76.39	42208.64
32	22.988	43.301	55.70	1.569	1.035	0.534	58.304	95.83	98.78	97.31	54.84	80.38	44417.03
33	22.887	44.958	55.72	1.671	1.061	0.609	58.285	100.86	103.85	102.35	57.66	84.57	46729.42
34	22.781	46.567	55.72	1.777	1.088	0.688	58.278	105.20	108.14	106.67	60.08	88.14	48703.44
35	22.693	48.122	55.71	1.865	1.129	0.735	58.293	109.33	112.02	110.68	62.36	91.44	50526.04
36	22.578	73.779	55.73	1.979	1.164	0.815	58.271	113.47	115.83	114.65	64.56	94.74	52350.78
37	22.479	75.284	55.72	2.079	1.185	0.894	58.282	116.99	119.44	118.22	66.59	97.68	53973.85
38	22.387	76.742	55.73	2.170	1.230	0.940	58.272	120.20	123.00	121.60	68.48	100.49	55524.65
39	22.304	78.239	55.74	2.253	1.254	0.999	58.264	123.64	126.09	124.87	70.30	103.20	57019.65
40	22.187	79.745	55.74	2.370	1.292	1.078	58.263	127.11	129.38	128.25	72.20	105.99	58564.30
41	22.072	81.283	55.73	2.486	1.326	1.159	58.267	129.90	132.90	131.40	73.98	108.59	60001.09
42	21.977	82.836	55.75	2.580	1.375	1.205	58.247	133.19	135.32	134.26	75.56	110.98	61319.86
43	21.822	84.381	55.76	2.735	1.413	1.322	58.236	135.66	138.87	137.26	77.22	113.48	62698.05
44	21.758	85.888	55.79	2.799	1.430	1.369	58.206	138.19	140.78	139.49	78.41	115.36	63734.34
45	21.650	87.409	55.81	2.907	1.491	1.416	58.192	140.84	144.21	142.52	80.09	117.89	65132.53
46	21.521	89.043	55.84	3.037	1.521	1.516	58.161	143.44	145.70	144.57	81.18	119.63	66089.39
47	21.396	90.515	55.84	3.161	1.574	1.587	58.161	145.19	147.96	146.57	82.30	121.29	67004.90
48	21.242	92.060	55.88	3.315	1.603	1.712	58.124	147.11	150.31	148.71	83.42	123.11	68007.05
49	21.135	93.648	55.91	3.422	1.643	1.779	58.086	148.78	152.39	150.58	84.39	124.71	68891.33
50	21.022	95.290	55.93	3.536	1.667	1.869	58.072	150.61	153.82	152.22	85.28	126.09	69648.18
51	20.896	96.802	55.95	3.661	1.715	1.946	58.049	152.40	155.13	153.77	86.09	127.40	70374.13
52	20.753	98.396	56.00	3.804	1.735	2.069	58.002	153.53	155.98	154.76	86.54	128.30	70863.06

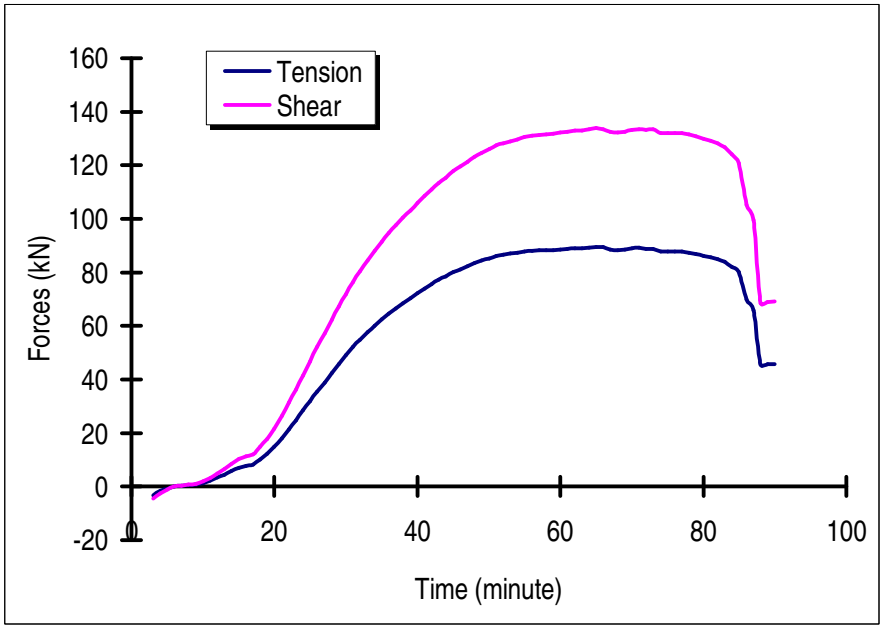
53	20.620	99.821	56.01	3.937	1.760	2.177	57.990	153.83	157.36	155.60	86.99	129.01	71255.38
54	20.495	101.590	56.04	4.063	1.792	2.271	57.965	154.95	157.79	156.37	87.36	129.69	71627.25
55	20.324	103.177	56.07	4.234	1.817	2.417	57.934	156.02	158.59	157.31	87.81	130.51	72080.66
56	20.200	104.683	56.09	4.358	1.837	2.521	57.907	156.10	159.91	158.00	88.14	131.13	72420.50
57	20.069	106.219	56.10	4.488	1.849	2.639	57.905	156.69	159.84	158.27	88.28	131.35	72541.97
58	19.929	107.717	56.11	4.628	1.854	2.774	57.886	156.81	160.28	158.54	88.39	131.61	72682.83
59	19.805	109.248	56.15	4.752	1.868	2.884	57.851	156.89	160.52	158.71	88.40	131.80	72784.37
60	19.633	110.641	56.17	4.925	1.870	3.055	57.835	157.30	161.02	159.16	88.62	132.21	73005.69
61	19.471	112.234	56.17	5.086	1.883	3.203	57.831	156.92	162.07	159.50	88.80	132.49	73162.32
62	19.359	113.690	56.21	5.199	1.864	3.335	57.794	158.05	162.04	160.05	89.02	133.00	73442.33
63	19.198	115.261	56.23	5.360	1.910	3.450	57.773	157.75	162.49	160.12	89.01	133.10	73491.59
64	19.023	116.823	56.24	5.534	1.907	3.627	57.762	158.61	162.43	160.52	89.21	133.45	73683.35
65	18.862	118.289	56.24	5.695	1.941	3.754	57.761	159.24	163.01	161.13	89.54	133.96	73963.55
66	18.736	119.755	56.20	5.822	1.946	3.876	57.799	158.15	163.19	160.67	89.38	133.52	73724.67
67	18.548	121.477	56.23	6.010	1.942	4.068	57.769	156.77	161.81	159.29	88.54	132.41	73113.41
68	18.389	122.780	56.26	6.168	1.944	4.224	57.744	155.70	162.38	159.04	88.34	132.24	73017.58
69	18.290	124.166	56.27	6.267	1.943	4.324	57.733	156.58	162.07	159.33	88.48	132.50	73158.52
70	18.101	125.761	56.28	6.456	1.970	4.486	57.719	157.31	163.19	160.25	88.96	133.29	73593.08
71	17.936	127.193	56.25	6.621	1.956	4.665	57.748	157.78	163.23	160.51	89.17	133.46	73688.04
72	17.782	128.794	56.31	6.776	1.971	4.805	57.690	157.07	163.10	160.09	88.80	133.20	73539.74
73	17.602	130.379	56.33	6.955	1.966	4.989	57.670	157.90	162.68	160.29	88.87	133.40	73649.09
74	17.446	131.942	56.35	7.112	1.964	5.148	57.652	155.60	161.56	158.58	87.88	132.00	72875.95
75	17.312	133.519	56.38	7.245	1.975	5.270	57.617	155.71	161.38	158.55	87.78	132.03	72887.45
76	17.132	135.104	56.37	7.426	1.974	5.452	57.634	155.72	161.58	158.65	87.87	132.09	72921.34
77	16.950	136.675	56.36	7.607	1.970	5.637	57.638	155.93	161.09	158.51	87.81	131.97	72854.47
78	16.782	138.286	56.40	7.775	1.968	5.807	57.601	155.13	160.70	157.91	87.39	131.53	72607.95
79	16.609	139.774	56.41	7.948	1.996	5.952	57.589	154.50	159.58	157.04	86.88	130.82	72215.70
80	16.435	141.385	56.44	8.122	1.993	6.129	57.557	153.37	158.33	155.85	86.15	129.88	71692.61
81	16.258	142.881	56.45	8.299	1.972	6.327	57.546	152.32	157.56	154.94	85.62	129.13	71281.59
82	16.039	144.514	56.48	8.518	1.982	6.536	57.520	151.37	156.24	153.80	84.94	128.23	70777.62

83	15.892	146.060	56.46	8.666	1.965	6.701	57.541	149.72	154.64	152.18	84.08	126.84	70013.75
84	15.705	147.695	56.50	8.852	1.969	6.883	57.500	146.30	151.50	148.90	82.18	124.17	68535.77
85	15.467	149.401	56.46	9.090	1.950	7.140	57.541	142.32	147.76	145.04	80.14	120.89	66731.33
86	15.215	151.242	56.48	9.343	1.881	7.462	57.516	123.07	129.70	126.38	69.78	105.37	58161.12
87	14.991	153.036	56.48	9.566	1.860	7.706	57.517	116.02	122.69	119.36	65.91	99.51	54927.06
88	14.534	155.325	56.48	10.023	1.711	8.312	57.524	78.38	85.95	82.17	45.38	68.50	37810.29
89	14.369	156.888	56.52	10.188	1.701	8.487	57.483	78.74	86.75	82.74	45.65	69.01	38091.60
90	14.175	158.585	56.53	10.383	1.707	8.676	57.470	79.57	86.25	82.91	45.73	69.16	38174.74






F3 from F1
F3 from F2
180
160
140
120
100
80
60
40
20
0
-20
Forces (kN)
0
20
40
60
80
100
Time (minute)


Tension
Shear
160
140
120
100
80
60
40
20
0
-20
Forces (kN)
0
20
40
60
80
100
Time (minute)

Photographs after Test