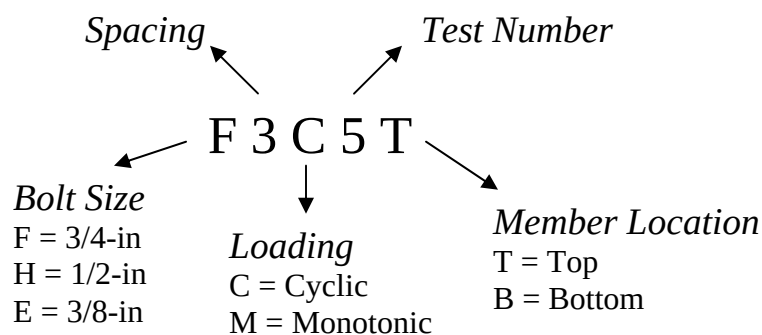


Appendix A – Monotonic Connection Test Data

Data presented here is for all the monotonic tests performed for this study. Results for all parameters are tabulated and included as well as generated charts and calculated material properties.

Naming of each specimen consists of five digits. The first digit refers to the bolt size used in the test and is either a “F”, “H”, or “E”. A “F” refers to three-Fourths inch bolts. A “H” refers to one-Half inch bolts and an “E” refers to three-Eighths inch bolts. The next digit refers to the spacing between the bolts. Therefore, a 3 would refer to the 3D spacing, a 5 refers to the 5D spacing and so forth. The third digit refers to the type of loading. A “M” is used for monotonic loading tests and a “C” for cyclic loading tests. The fourth digit is the number of the test. Ten cyclic tests were performed so the fourth number ranges from 1 to 10 for cyclic tests. Three monotonic tests were performed so the fourth number ranges from 1 to 3 for monotonic tests. The final digit is either a “T” or a “B” and refers to whether the specimen is the member affixed to the top or bottom fixture respectively. For example, a top member in the fifth cyclic test performed using the 3D spacing between the bolts and 3/4 inch bolts has the designation of “F3C5T”. When reporting the results, the last digit is missing since the data is for the combination of the top and bottom members working together.



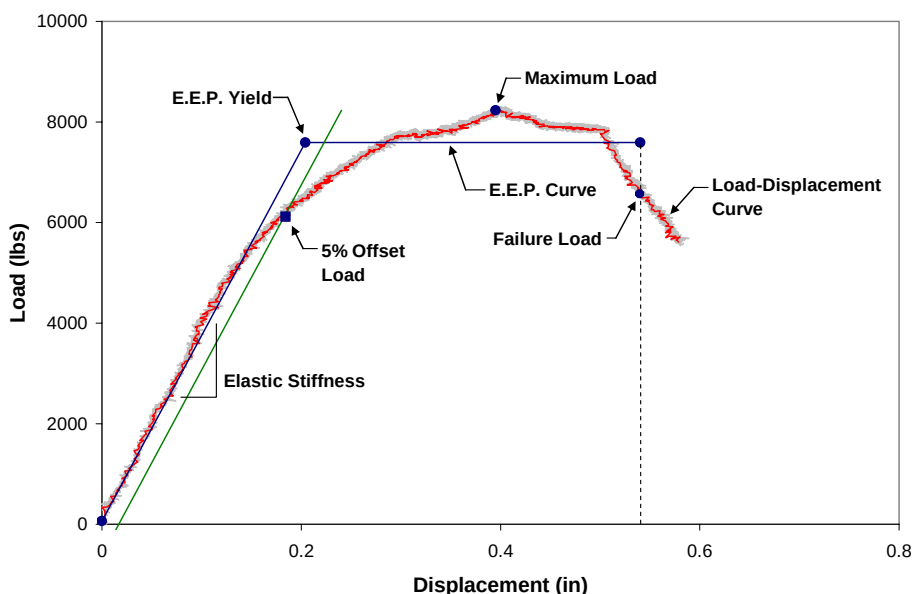


Figure A.1: Typical Test Identification and Definition of Monotonic Test Parameters.

A.1 Expected Yield Mode II

Table A.1: F8 Connection and Member Properties

	F8 Series*				
	F8M2	F8M3	Mean	St. Dev.	COV(%)
Max Load (lbs)	25409	17971	21690.1	5260.0	24.3
@ Displacement (in)	0.99	0.43	0.709	0.399	56.2
Failure Load (lbs)	20212	14338	17275.1	4153.9	24.0
@ Displacement (in)	0.98	0.53	0.753	0.315	41.8
40% Max (lbs)	10070	7157	8613.5	2059.3	23.9
@ Displacement (in)	0.12	0.11	0.117	0.008	7.16
E.E.P. Yield (lbs)	20328	15506	17916.7	3409.5	19.0
@ Displacement (in)	0.27	0.24	0.252	0.021	8.46
5% Offset (lbs)	13241	12479	12859.8	539.0	4.19
@ Displacement (in)	0.21	0.23	0.217	0.016	7.54
Elastic Stiff. (lb/in)	71486	66646	69066.2	3422.2	4.95
Slack (in)	-0.02	0.00	-0.007	0.015	-227
E.E.P. Energy (lb*in)	17005	6383	11694.2	7510.6	64.2
Ductility Ratio	3.65	2.24	2.947	1.001	34.0
Yield Mode	II	II			
Failure Mode	splitting	splitting			
Governing Member	B	B			

F8 Series*					
Member Top	F8M2T	F8M3T	Mean	St. Dev.	COV(%)
M.C. (%)	15	10	12.8	3.3	25.7
S.G.	0.42	0.31	0.4	0.1	21.6
D.E. 5% Yield (psi)	5055	4700	4877.6	251.2	5.2
D.E. Capacity (psi)	4999	5785	5392.0	555.9	10.3

Member Bottom	F8M2B	F8M3B	Mean	St. Dev.	COV(%)
M.C. (%)	15	14	14.5	1.1	7.4
S.G.	0.39	0.42	0.4	0.0	6.2
D.E. 5% Yield (psi)	4447	4027	4236.8	296.7	7.0
D.E. Capacity (psi)	4173	3940	4056.3	165.1	4.1

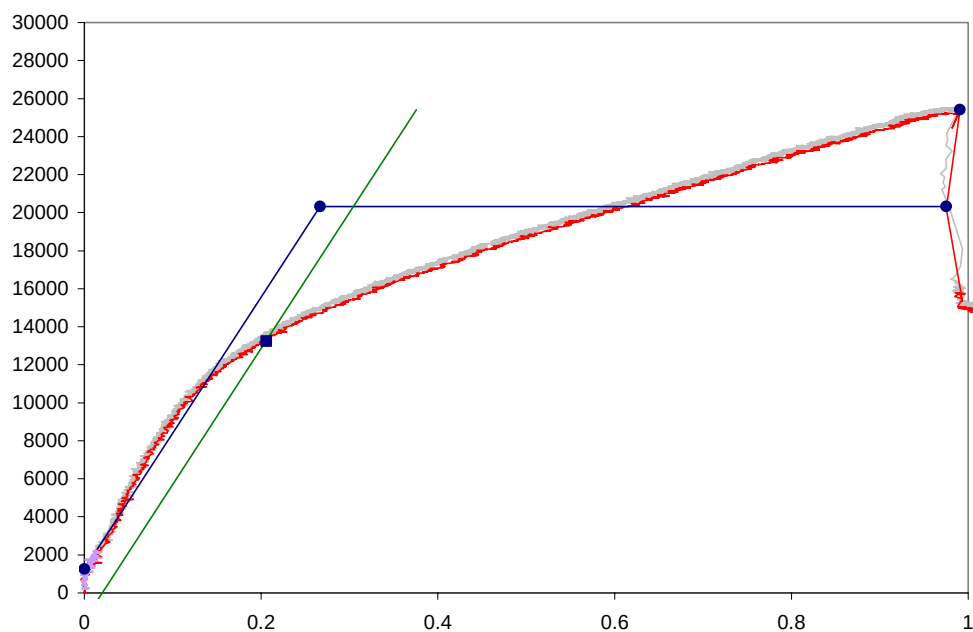


Figure A.2: F8M2 Load (lbs) – Deflection (in) Plot

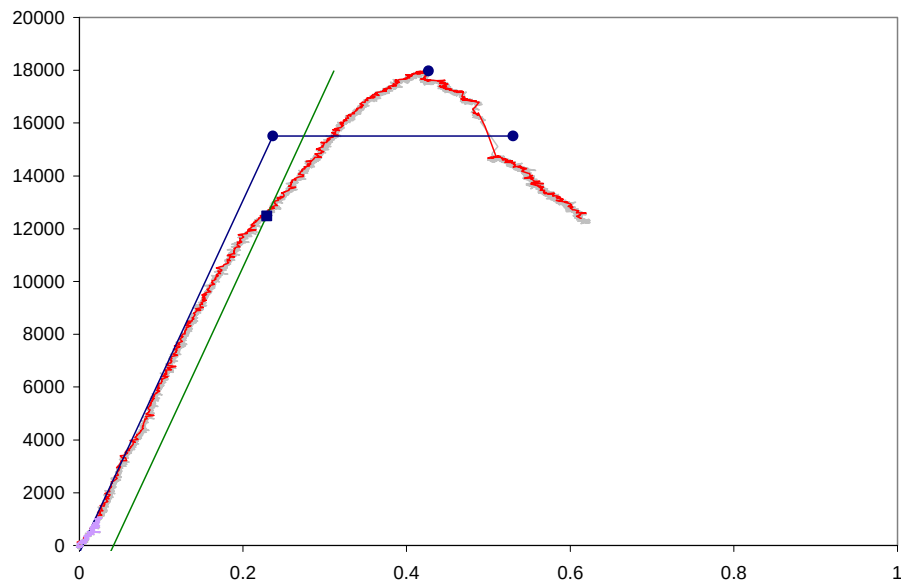


Figure A.3 F8M3 Load (lbs) – Deflection (in) Plot

Table A.2: F7 Connection and Member Properties

	F7 Series					
	F7M1	F7M2	F7M3	Mean	St. Dev.	COV(%)
Max Load (lbs)	24595	19664	21283	21847.3	2513.8	11.5
@ Displacement (in)	0.90	0.48	0.61	0.665	0.216	32.5
Failure Load (lbs)	19522	15655	16889	17355.2	1975.2	11.4
@ Displacement (in)	0.99	0.65	0.73	0.791	0.178	22.6
40% Max (lbs)	9769	7861	8513	8714.1	969.8	11.1
@ Displacement (in)	0.25	0.11	0.09	0.148	0.086	58.0
E.E.P. Yield (lbs)	19676	17545	17829	18349.8	1157.5	6.31
@ Displacement (in)	0.41	0.26	0.19	0.285	0.112	39.2
5% Offset (lbs)	13499	12570	11651	12573.6	923.9	7.35
@ Displacement (in)	0.35	0.22	0.16	0.243	0.094	38.6
Elastic Stiff. (lb/in)	61417	65306	92036	72919.8	16668.7	22.9
Slack (in)	0.09	-0.01	0.00	0.024	0.055	228
E.E.P. Energy (lb*in)	15465	9180	11297	11981.0	3197.7	26.7
Ductility Ratio	2.43	2.54	3.83	2.932	0.780	26.6
Yield Mode	II	II	II			
Failure Mode	splitting	splitting	splitting			
Governing Member	B	B	T			

F7 Series						
Member Top	F7M1T	F7M2T	F7M3T	Mean	St. Dev.	COV(%)
M.C. (%)	15	13	12	13.3	1.4	10.4
S.G.	0.53	0.52	0.50	0.5	0.0	3.8
D.E. 5% Yield (psi)	6011	4861	6424	5765.3	810.3	14.1
D.E. Capacity (psi)	5849	4854	5981	5561.2	615.9	11.1

Member Bottom	F7M1B	F7M2B	F7M3B	Mean	St. Dev.	COV(%)
M.C. (%)	13	12	16	13.5	2.1	15.5
S.G.	0.54	0.51	0.60	0.6	0.0	7.5
D.E. 5% Yield (psi)	4372	6106	5848	5442.2	935.4	17.2
D.E. Capacity (psi)	4196	4502	5438	4712.1	647.2	13.7

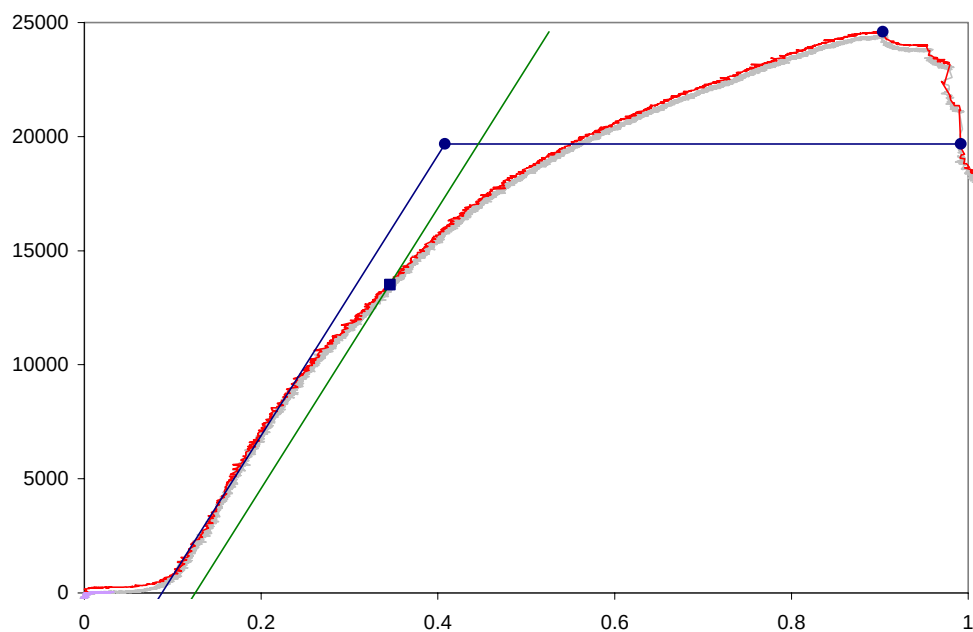


Figure A.4: F7M1 Load (lbs) – Deflection (in) Plot

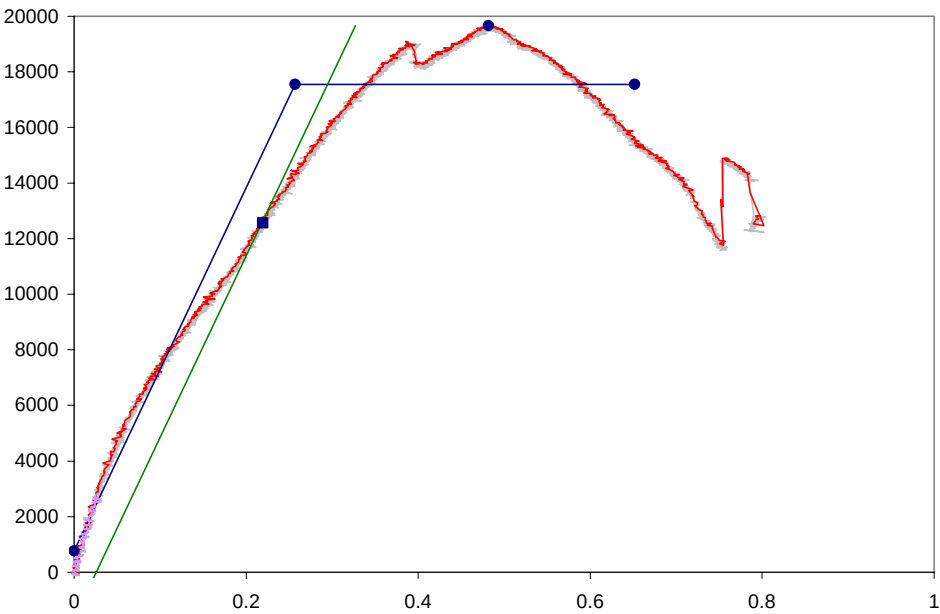


Figure A.5: F7M2 Load (lbs) – Deflection (in) Plot

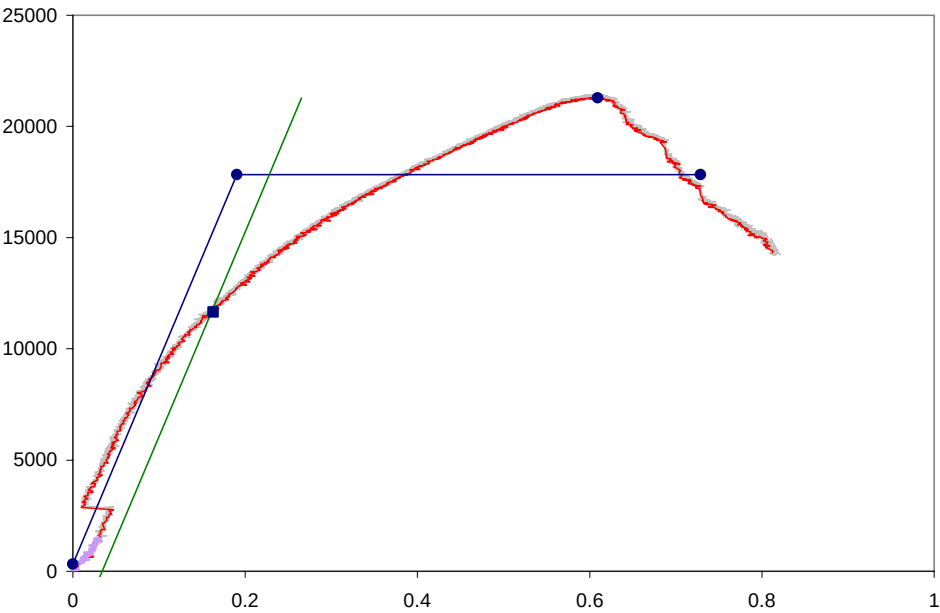


Figure A.6: F7M3 Load (lbs) – Deflection (in) Plot

Table A.3: F6 Connection and Member Properties

	F6 Series					
	F6M1	F6M2	F6M3	Mean	St. Dev.	COV(%)
Max Load (lbs)	18025	17045	19969	18346.2	1488.4	8.11
@ Displacement (in)	0.29	0.53	0.54	0.455	0.142	31.2
Failure Load (lbs)	14392	13539	14084	14004.9	431.9	3.08
@ Displacement (in)	0.41	0.79	0.74	0.646	0.203	31.3
40% Max (lbs)	7048	6748	7955	7250.2	628.7	8.67
@ Displacement (in)	0.11	0.07	0.12	0.100	0.024	24.1
E.E.P. Yield (lbs)	14617	15106	17411	15711.4	1492.0	9.50
@ Displacement (in)	0.18	0.17	0.24	0.193	0.037	19.1
5% Offset (lbs)	16314	11415	13392	13707.1	2464.8	18.0
@ Displacement (in)	0.23	0.17	0.22	0.205	0.035	16.9
Elastic Stiff. (lb/in)	117715	86703	79218	94545.6	20411.7	21.6
Slack (in)	0.05	-0.01	0.02	0.020	0.029	141
E.E.P. Energy (lb*in)	4773	10602	10817	8730.8	3429.4	39.3
Ductility Ratio	2.36	4.66	3.14	3.389	1.171	34.6
Yield Mode	II	II	II			
Failure Mode	splitting	splitting	splitting			
Governing Member	T	B	T			

F6 Series						
Member Top	F6M1T	F6M2T	F6M3T	Mean	St. Dev.	COV(%)
M.C. (%)	14	15	14	14.4	0.4	2.5
S.G.	0.50	0.56	0.62	0.6	0.1	9.9
D.E. 5% Yield (psi)	4758	4570	4752	4693.4	106.6	2.3
D.E. Capacity (psi)	4602	3922	4752	4425.4	442.1	10.0

Member Bottom	F6M1B	F6M2B	F6M3B	Mean	St. Dev.	COV(%)
M.C. (%)	12	16	15	14.3	2.3	15.9
S.G.	0.49	0.70	0.57	0.6	0.1	18.0
D.E. 5% Yield (psi)	5565	4547	4628	4913.2	565.8	11.5
D.E. Capacity (psi)	5323	2845	2665	3611.2	1485.4	41.1

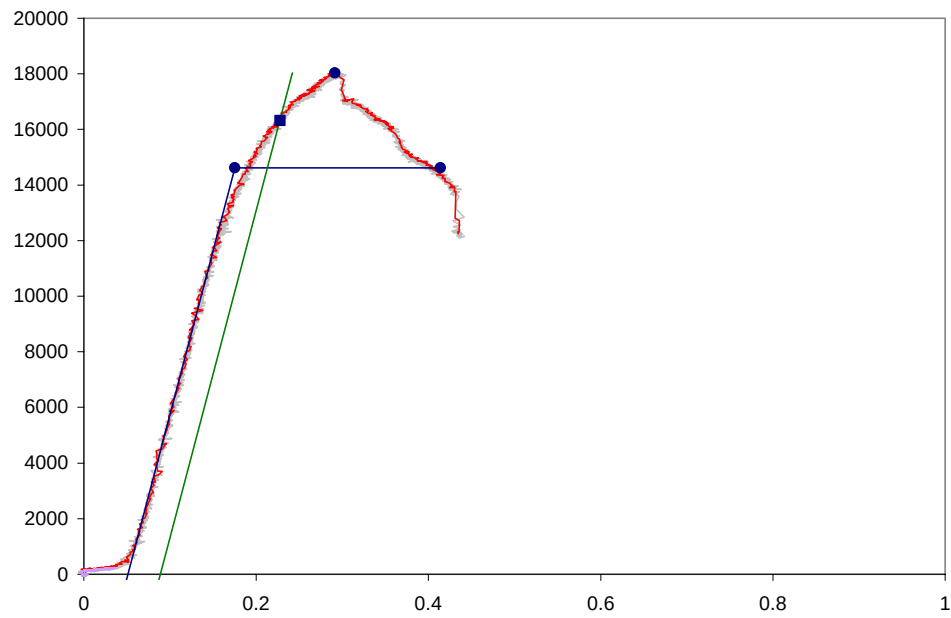


Figure A.7: F6M1 Load (lbs) – Deflection (in) Plot

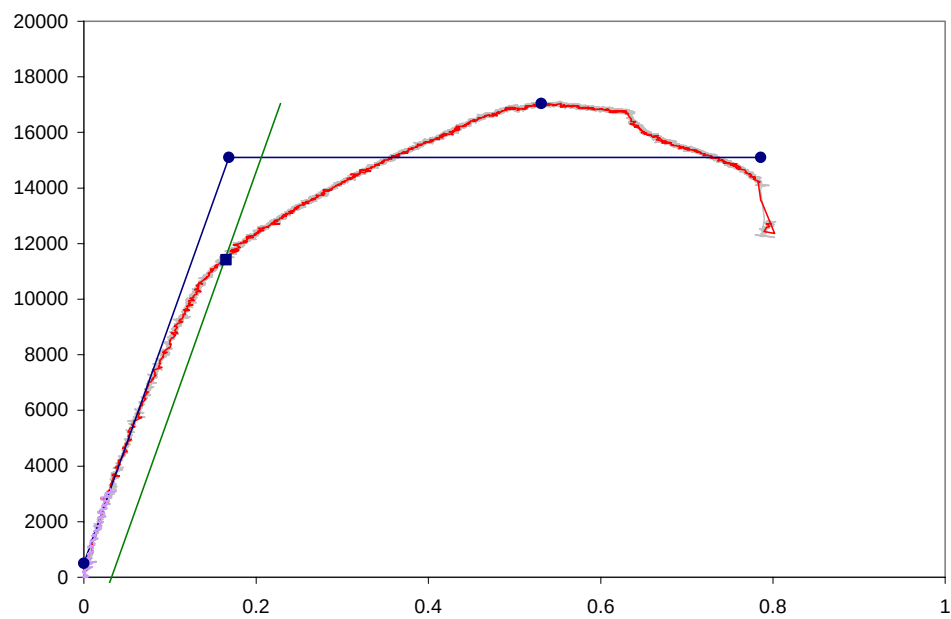


Figure A.8: F6M2 Load (lbs) – Deflection (in) Plot

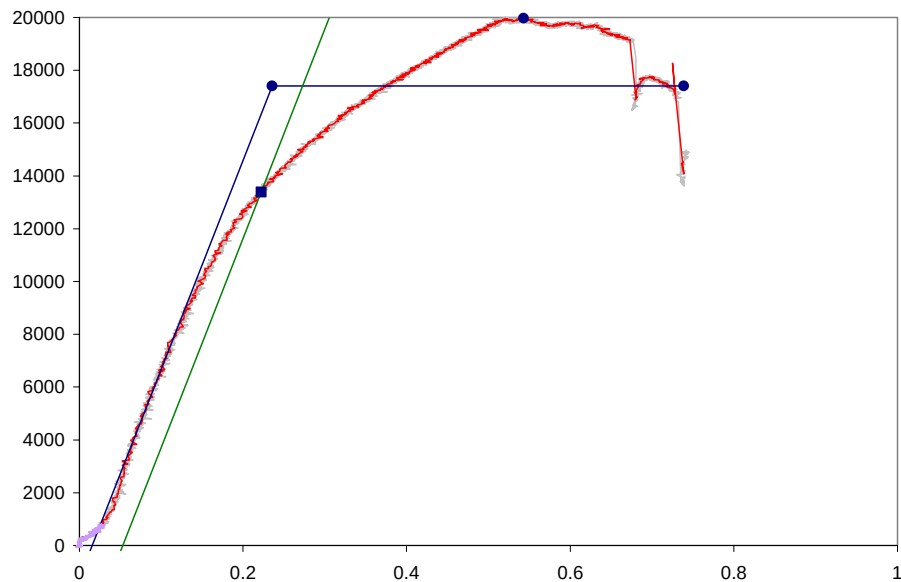


Figure A.9: F6M3 Load (lbs) – Deflection (in) Plot

Table A.4: F5 Connection and Member Properties

	F5 Series			Mean	St. Dev.	COV(%)
	F5M1	F5M2	F5M3			
Max Load (lbs)	14771	19203	14837	16270.4	2540.0	15.6
@ Displacement (in)	0.38	0.47	0.44	0.428	0.046	10.7
Failure Load (lbs)	11906	13638	12824	12789.5	866.5	6.8
@ Displacement (in)	0.61	0.74	0.60	0.652	0.076	11.6
40% Max (lbs)	5887	7589	5842	6439.0	995.8	15.5
@ Displacement (in)	0.07	0.12	0.13	0.107	0.030	28.1
E.E.P. Yield (lbs)	12904	16521	12551	13992.0	2196.9	15.7
@ Displacement (in)	0.15	0.21	0.23	0.197	0.039	19.6
5% Offset (lbs)	11198	14830	12755	12927.8	1822.1	14.1
@ Displacement (in)	0.17	0.23	0.28	0.226	0.051	22.6
Elastic Stiff. (lb/in)	86523	98124	68022	84222.7	15182.2	18.0
Slack (in)	0.01	0.04	0.05	0.030	0.021	71.8
E.E.P. Energy (lb*in)	6925	10492	6114	7843.5	2329.2	29.7
Ductility Ratio	3.97	3.57	2.62	3.385	0.696	20.6
Yield Mode	II	II	II			
Failure Mode	splitting	splitting	splitting			
Governing Member	B	B	T			

Member Top	F5 Series			Mean	St. Dev.	COV(%)
	F5M1T	F5M2T	F5M3T			
M.C. (%)	15	14	14	14.6	0.6	3.9
S.G.	0.64	0.61	0.52	0.6	0.1	10.0
D.E. 5% Yield (psi)	2900	3812	4208	3640.2	670.6	18.4
D.E. Capacity (psi)	3324	3743	2361	3142.6	709.0	22.6

Member Bottom	F5M1B	F5M2B	F5M3B	Mean	St. Dev.	COV(%)
M.C. (%)	15	14	12	13.9	1.2	8.9
S.G.	0.59	0.62	0.48	0.6	0.1	13.5
D.E. 5% Yield (psi)	4924	4512	4018	4484.8	454.0	10.1
D.E. Capacity (psi)	4756	4512	3736	4334.8	532.3	12.3

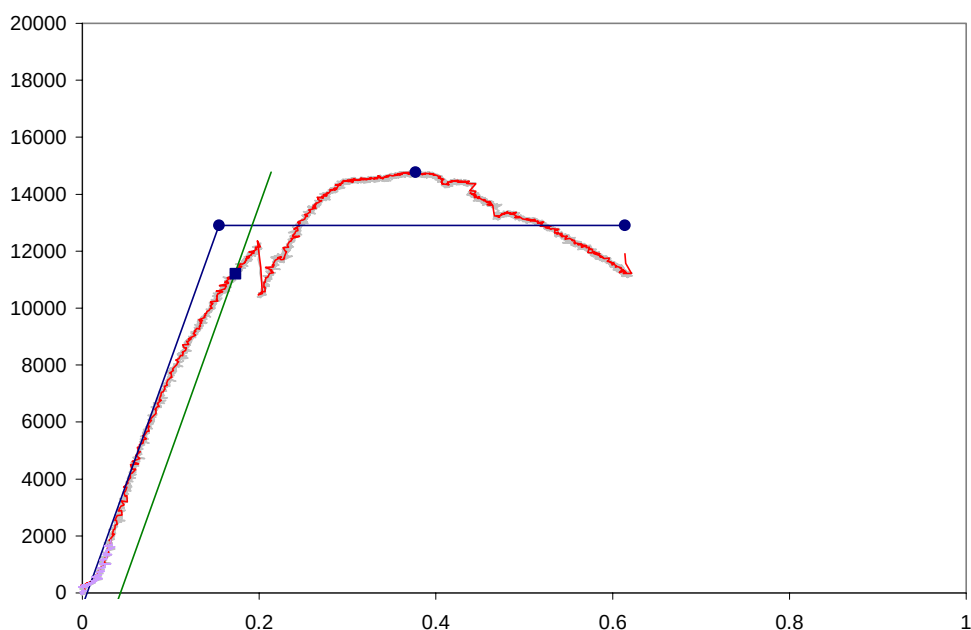


Figure A.10: F5M1 Load (lbs) – Deflection (in) Plot

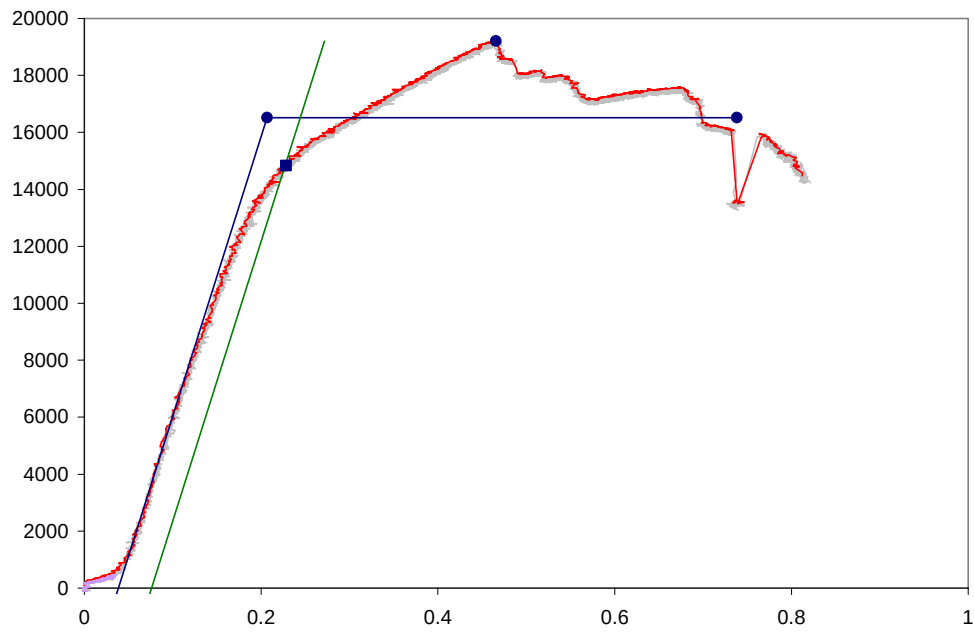


Figure A.11: F5M2 Load (lbs) – Deflection (in) Plot

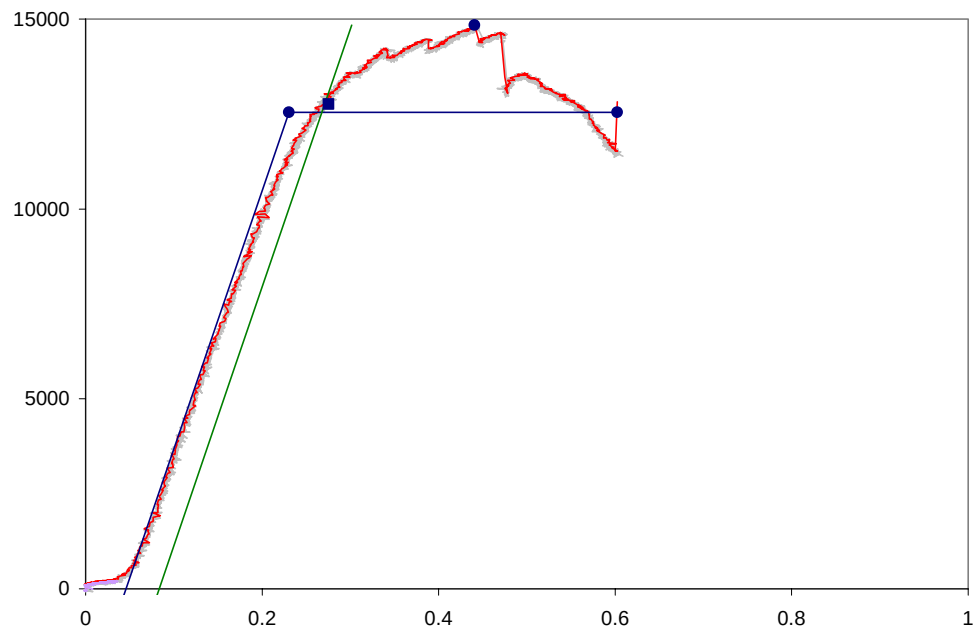


Figure A.12: F5M3 Load (lbs) – Deflection (in) Plot

Table A.5: F3 Connection and Member Properties

	F3 Series					
	F3M1	F3M2	F3M3	Mean	St. Dev.	COV(%)
Max Load (lbs)	11847	10531	12283	11553.5	912.2	7.90
@ Displacement (in)	0.40	0.35	0.37	0.375	0.023	6.11
Failure Load (lbs)	9458	8302	9785	9181.5	779.2	8.49
@ Displacement (in)	0.67	0.44	0.84	0.650	0.200	30.7
40% Max (lbs)	4709	4173	4873	4584.9	366.3	7.99
@ Displacement (in)	0.12	0.12	0.18	0.143	0.035	24.7
E.E.P. Yield (lbs)	10324	8425	10494	9747.4	1148.8	11.8
@ Displacement (in)	0.19	0.17	0.27	0.207	0.054	26.0
5% Offset (lbs)	11049	8488	11011	10182.7	1467.8	14.4
@ Displacement (in)	0.23	0.21	0.32	0.252	0.058	23.1
Elastic Stiff. (lb/in)	84922	101133	66467	84173.9	17344.9	20.6
Slack (in)	0.07	0.08	0.11	0.086	0.022	26.0
E.E.P. Energy (lb*in)	5976	2897	7382	5418.3	2293.7	42.3
Ductility Ratio	3.59	2.65	3.12	3.121	0.469	15.0
Yield Mode	II	II	II			
Failure Mode	splitting	splitting	splitting			
Governing Member	T/B	T	T			

Member Top	F3 Series					
	F3M1T	F3M2T	F3M3T	Mean	St. Dev.	COV(%)
M.C. (%)	12	11	13	12.0	0.8	6.4
S.G.	0.47	0.42	0.50	0.5	0.0	9.2
D.E. 5% Yield (psi)	5412	5256	4788	5151.9	324.7	6.3
D.E. Capacity (psi)	4589	5172	5152	4971.0	330.6	6.7

Member Bottom	F3M1B	F3M2B	F3M3B	Mean	St. Dev.	COV(%)
M.C. (%)	13	10	14	12.5	2.0	15.8
S.G.	0.47	0.38	0.53	0.5	0.1	17.0
D.E. 5% Yield (psi)	4466	5739	4349	4851.1	770.8	15.9
D.E. Capacity (psi)	3518	5102	1760	3459.9	1671.9	48.3

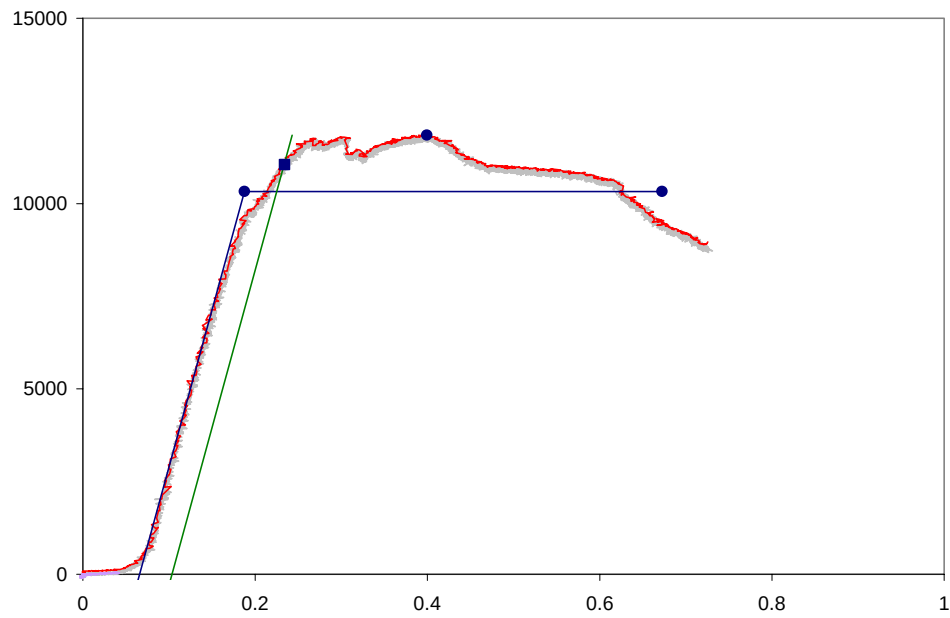


Figure A.13: F3M1 Load (lbs) – Deflection (in) Plot

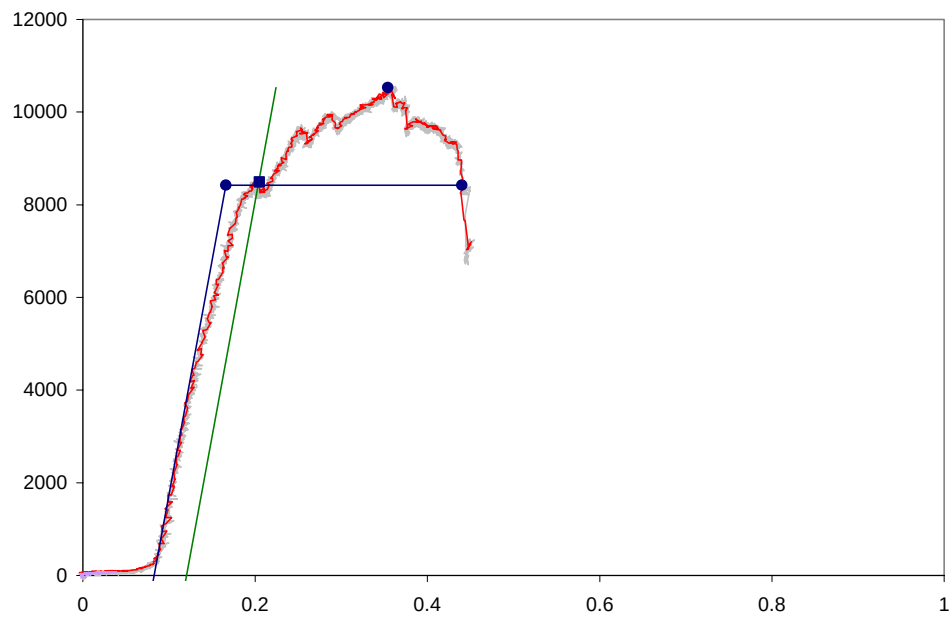


Figure A.14: F3M2 Load (lbs) – Deflection (in) Plot

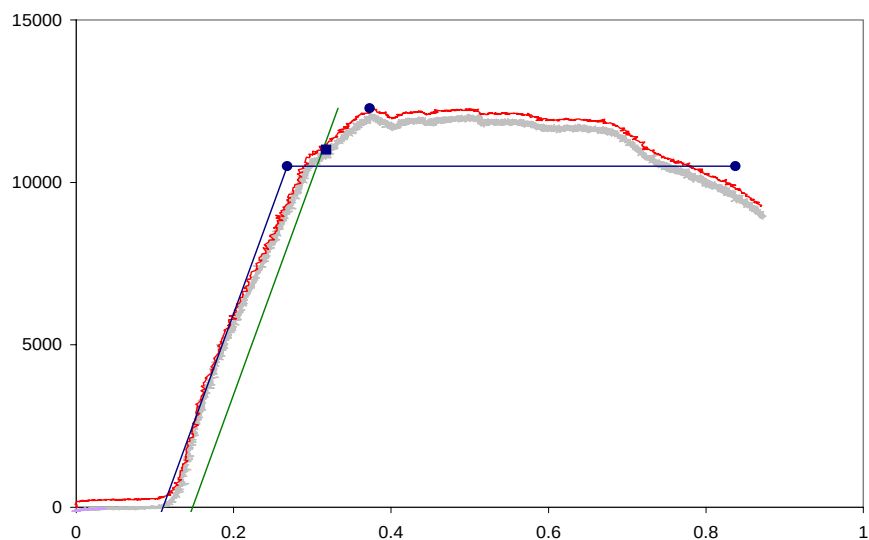


Figure A.15: F3M3 Load (lbs) – Deflection (in) Plot

A.2 Expected Yield Mode III

Table A.6: H8 Connection and Member Properties

	H8 Series					
	H8M1	H8M2	H8M3	Mean	St. Dev.	COV(%)
Max Load (lbs)	24097	21331	22401	22609.9	1394.6	6.17
@ Displacement (in)	0.49	0.40	0.46	0.450	0.041	9.16
Failure Load (lbs)	19219	17020	17875	18038.1	1108.9	6.15
@ Displacement (in)	0.56	0.53	1.40	0.832	0.491	59.0
40% Max (lbs)	9471	8418	8905	8931.2	526.9	5.90
@ Displacement (in)	0.14	0.19	0.15	0.161	0.028	17.6
E.E.P. Yield (lbs)	19798	17065	19212	18691.7	1438.9	7.70
@ Displacement (in)	0.23	0.28	0.27	0.260	0.025	9.78
5% Offset (lbs)	17089	18250	16762	17367.0	781.8	4.50
@ Displacement (in)	0.23	0.32	0.27	0.273	0.045	16.4
Elastic Stiff. (lb/in)	109170	97977	91728	99625.0	8836.8	8.87
Slack (in)	0.05	0.11	0.06	0.071	0.031	42.8
E.E.P. Energy (lb*in)	8888	6426	24323	13212.2	9700.4	73.4
Ductility Ratio	2.44	1.90	5.24	3.192	1.793	56.2

Appendix A – Monotonic Connection Test Data

Yield Mode	IV	II,IV	IV
Failure Mode	splitting	splitting	splitting
Governing Member	B	B	B

	H8 Series					
	H8M1B	H8M2B	H8M3B	Mean	St. Dev.	COV(%)
M.C. (%)	13	14	14	13.8	0.3	1.9
S.G.	0.19	0.19	0.16	0.2	0.0	10.2
D.E. 5% Yield (psi)	7343	7421	8058	7607.3	392.6	5.2
D.E. Capacity (psi)	7580	7167	7588	7445.1	240.8	3.2

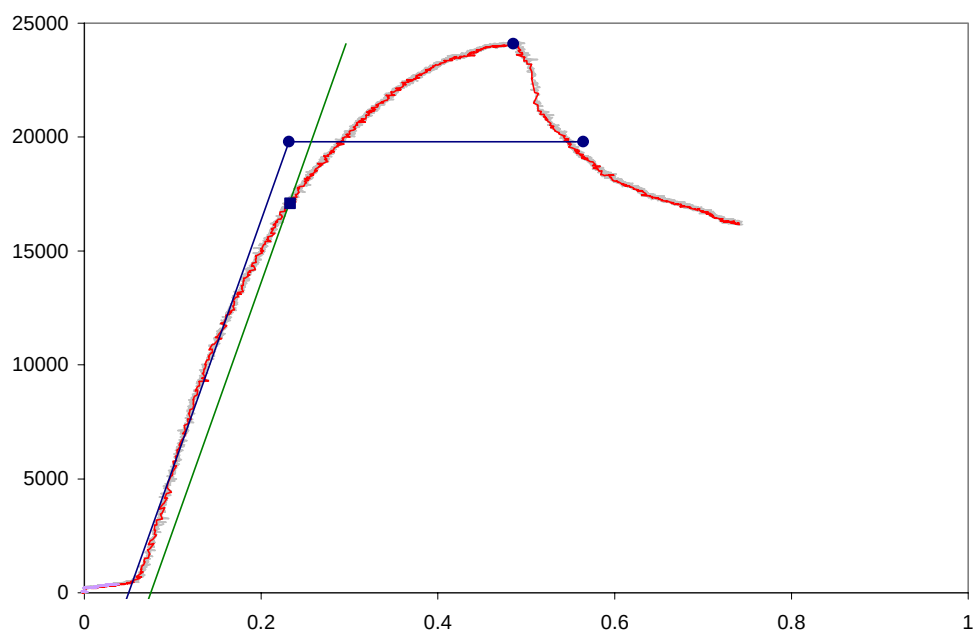


Figure A.16: H8M1 Load (lbs) – Deflection (in) Plot

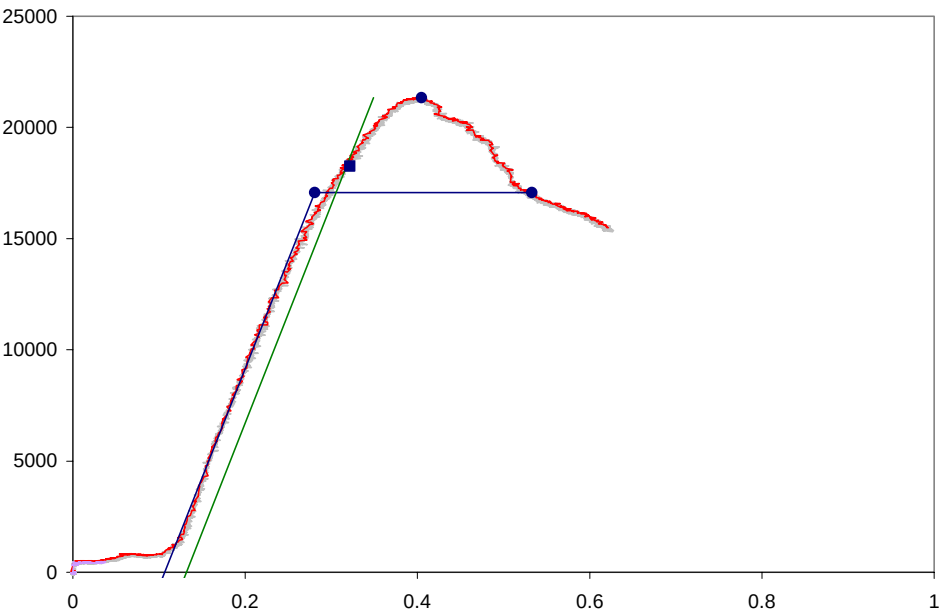


Figure A.17 H8M2 Load (lbs) – Deflection (in) Plot

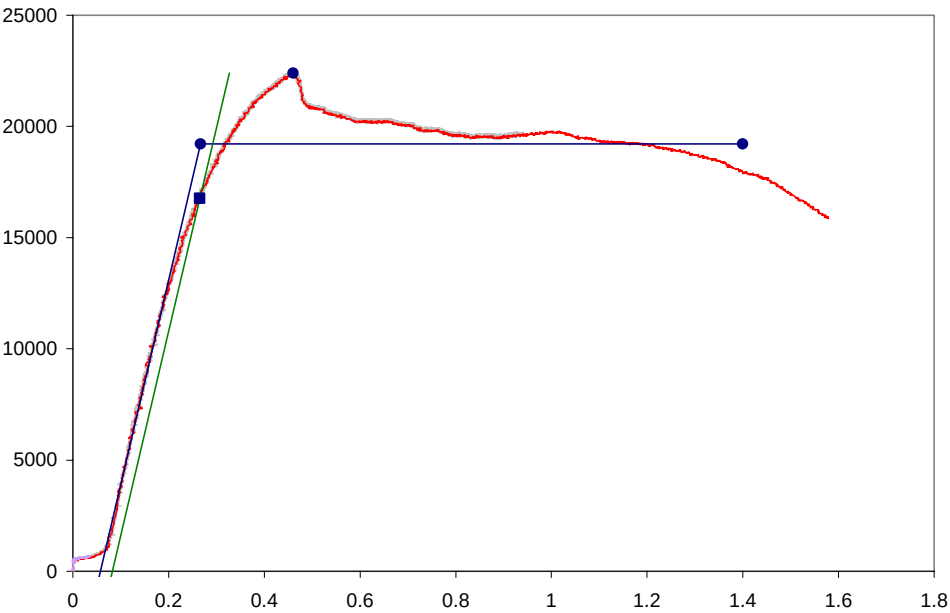


Figure A.18 H8M3 Load (lbs) – Deflection (in) Plot

Table A.7: H7 Connection and Member Properties

	H7 Series			Mean	St. Dev.	COV(%)
	H7M1	H7M2	H7M3			
Max Load (lbs)	20267	22078	25758	22701.2	2798.1	12.3
@ Displacement (in)	0.79	0.61	0.67	0.690	0.092	13.4
Failure Load (lbs)	16200	17472	20585	18085.8	2256.2	12.5
@ Displacement (in)	0.85	0.61	0.72	0.726	0.122	16.8
40% Max (lbs)	8047	8804	10285	9045.6	1138.5	12.6
@ Displacement (in)	0.20	0.19	0.18	0.190	0.012	6.26
E.E.P. Yield (lbs)	16542	17663	21066	18423.6	2356.1	12.8
@ Displacement (in)	0.31	0.29	0.29	0.296	0.013	4.45
5% Offset (lbs)	13617	15764	16240	15206.7	1397.1	9.19
@ Displacement (in)	0.30	0.30	0.26	0.286	0.020	6.91
Elastic Stiff. (lb/in)	78194	86403	100789	88462.2	11437.5	12.9
Slack (in)	0.10	0.09	0.08	0.088	0.011	13.1
E.E.P. Energy (lb*in)	11515	8047	12106	10556.0	2193.0	20.8
Ductility Ratio	2.74	2.08	2.51	2.445	0.334	13.6
Yield Mode	II,IV	II,IV	II,IV			
Failure Mode	splitting	splitting	splitting			
Governing Member	B	B	B			

	H7 Series			Mean	St. Dev.	COV(%)
	H7M1B	H7M2B	H7M3B			
M.C. (%)	15	12	15	14.2	1.9	13.7
S.G.	0.25	0.18	0.24	0.2	0.0	17.1
D.E. 5% Yield (psi)	2549	2816	3814	3059.7	666.9	21.8
D.E. Capacity (psi)	2424	2789	3562	2925.0	580.9	19.9

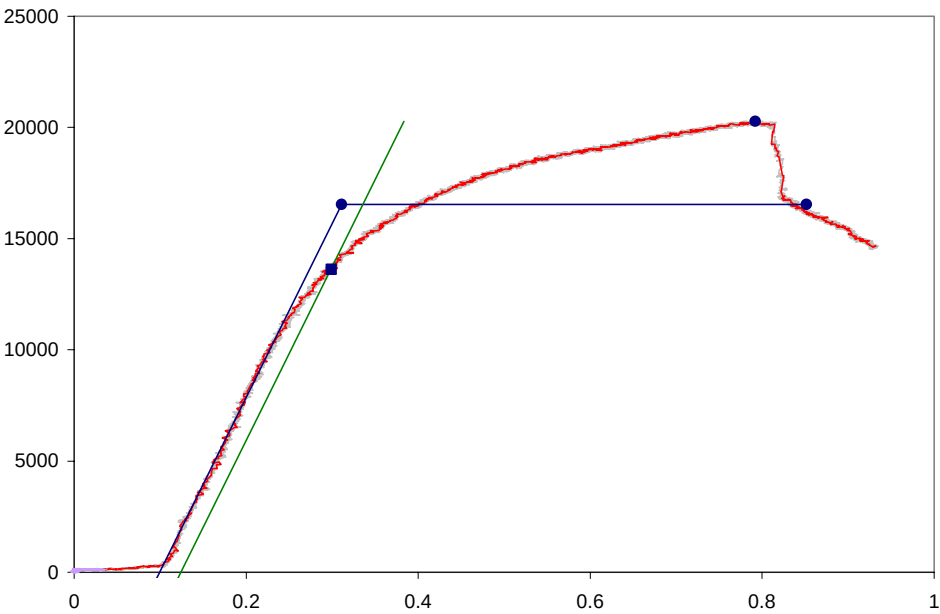


Figure A.19: H7M1 Load (lbs) – Deflection (in) Plot

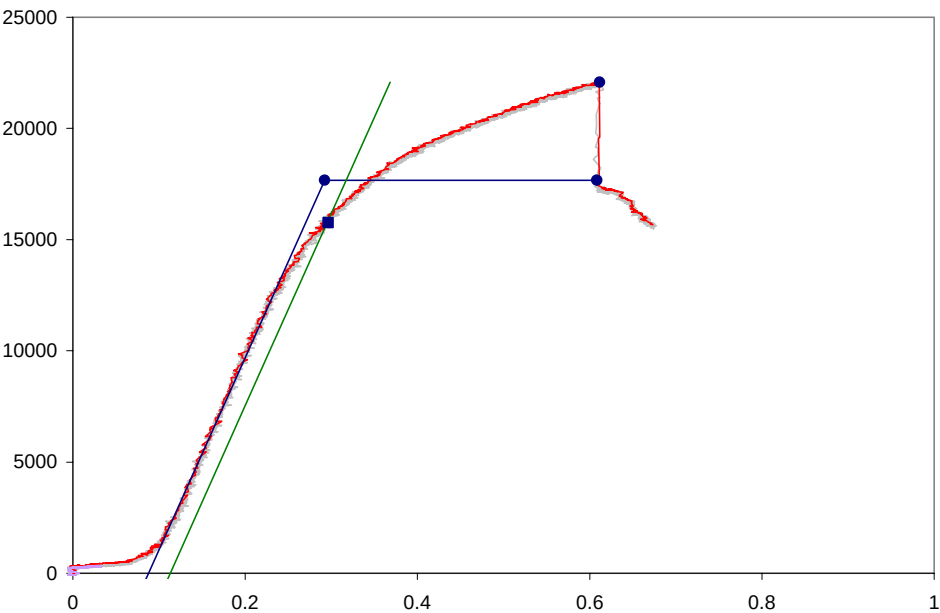


Figure A.20: H7M2 Load (lbs) – Deflection (in) Plot

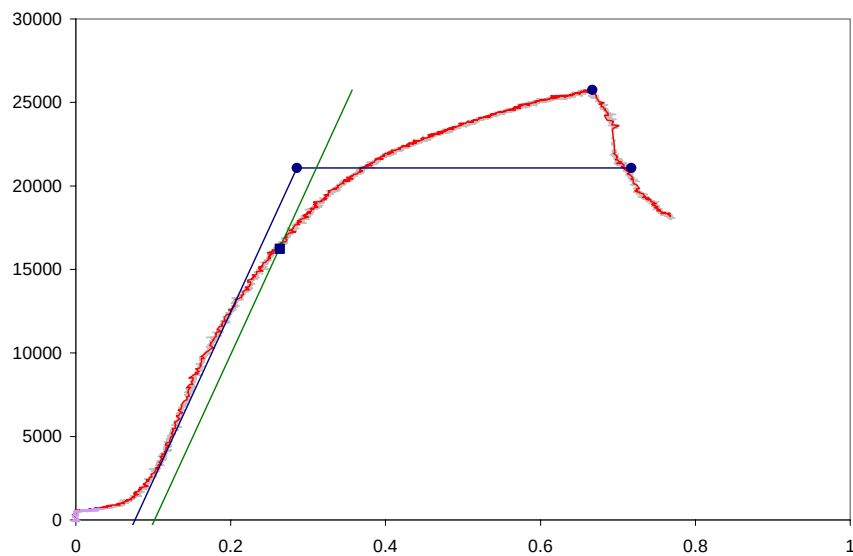


Figure A.21: H7M3 Load (lbs) – Deflection (in) Plot

Table A.8: H6 Connection and Member Properties

	H6 Series					
	H6M1	H6M2	H6M3	Mean	St. Dev.	COV(%)
Max Load (lbs)	15746	12146	17967	15286.1	2937.9	19.2
@ Displacement (in)	0.27	0.29	0.23	0.263	0.027	10.3
Failure Load (lbs)	11845	9709	14165	11906.2	2228.5	18.7
@ Displacement (in)	0.27	0.48	0.25	0.332	0.131	39.5
40% Max (lbs)	6217	4793	7109	6039.6	1168.3	19.3
@ Displacement (in)	0.18	0.17	0.12	0.155	0.031	20.0
E.E.P. Yield (lbs)	12596	9716	14374	12228.9	2350.3	19.2
@ Displacement (in)	0.23	0.23	0.18	0.216	0.029	13.6
5% Offset (lbs)	14000	12067	17700	14588.9	2862.4	19.6
@ Displacement (in)	0.27	0.29	0.24	0.265	0.026	9.88
Elastic Stiff. (lb/in)	122869	73740	117212	104606.9	26880.5	25.7
Slack (in)	0.13	0.10	0.06	0.097	0.035	35.8
E.E.P. Energy (lb*in)	1162	3445	2005	2204.0	1154.4	52.4
Ductility Ratio	1.15	2.06	1.36	1.524	0.473	31.1
Yield Mode	II	II	II			
Failure Mode	splitting	splitting	splitting			
Governing Member	B	B	B			

	H6 Series			Mean	St. Dev.	COV(%)
	H6M1B	H6M2B	H6M3B			
M.C. (%)	14	15	15	14.7	0.6	4.2
S.G.	0.27	0.26	0.25	0.3	0.0	3.7
D.E. 5% Yield (psi)	2974	2538	3384	2965.5	422.6	14.3
D.E. Capacity (psi)	2827	2377	2731	2644.9	237.0	9.0

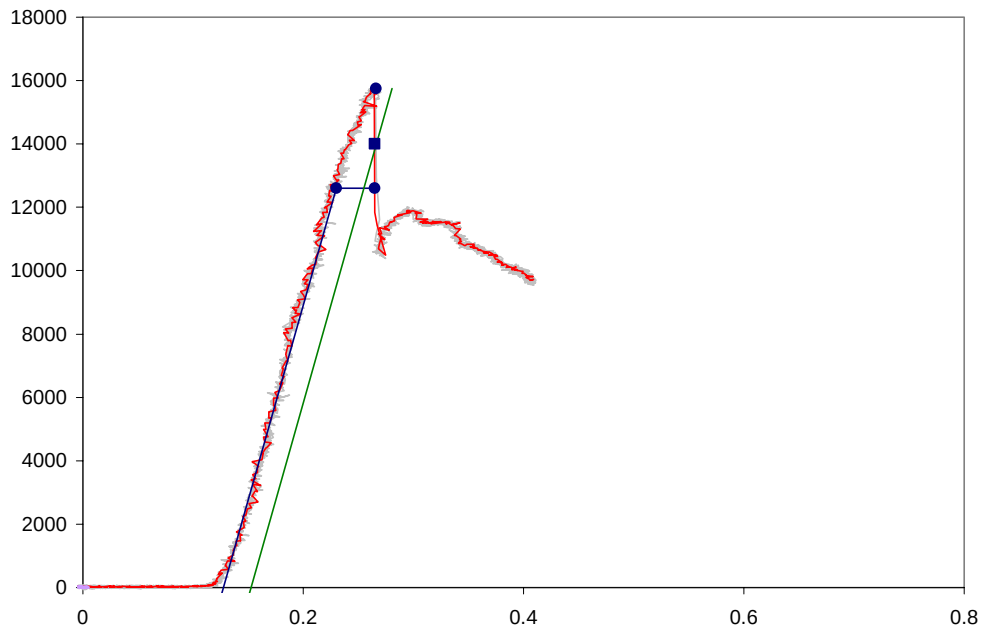


Figure A.22: H6M1 Load (lbs) – Deflection (in) Plot

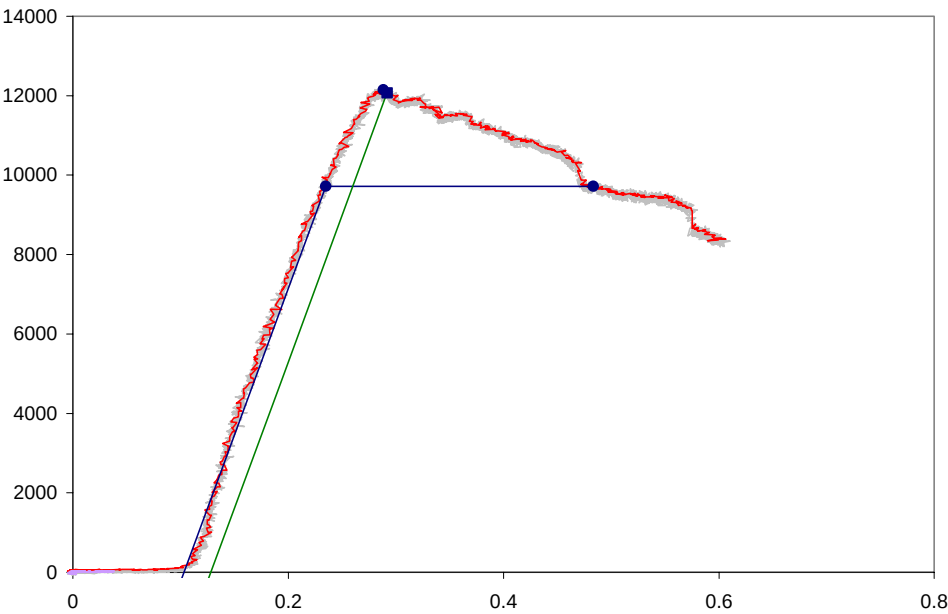


Figure A.23: H6M2 Load (lbs) – Deflection (in) Plot

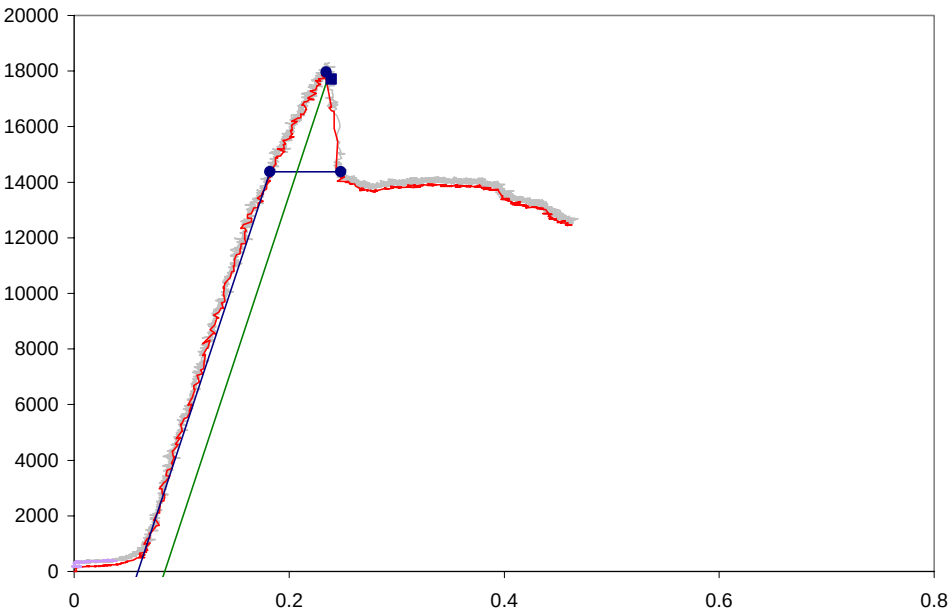


Figure A.24: H6M3 Load (lbs) – Deflection (in) Plot

Table A.9: H5 Connection and Member Properties

	H5 Series					
	H5M1	H5M2	H5M3	Mean	St. Dev.	COV(%)
Max Load (lbs)	21684	16619	16982	18428.1	2825.3	15.3
@ Displacement (in)	0.24	0.53	0.23	0.335	0.166	49.5
Failure Load (lbs)	17314	13281	13556	14717.1	2253.2	15.3
@ Displacement (in)	0.40	0.55	0.38	0.444	0.095	21.4
40% Max (lbs)	8567	6634	6776	7325.7	1077.1	14.7
@ Displacement (in)	0.057	0.164	0.061	0.094	0.061	64.7
E.E.P. Yield (lbs)	19989	13445	15439	16291.1	3354.4	20.6
@ Displacement (in)	0.15	0.29	0.16	0.198	0.078	39.3
5% Offset (lbs)	18832	12023	15562	15472.2	3405.3	22.0
@ Displacement (in)	0.16	0.29	0.19	0.214	0.066	30.8
Elastic Stiff. (lb/in)	125585	54905	88315	89601.5	35357.7	39.5
Slack (in)	-0.01	0.04	-0.02	0.005	0.033	631
E.E.P. Energy (lb*in)	6463	5500	4658	5540.3	903.5	16.3
Ductility Ratio	2.69	1.92	2.40	2.336	0.387	16.6
Yield Mode	II,III,IV	II	II			
Failure Mode	splitting	splitting	splitting			
Governing Member	B	B	B			

	H5 Series					
	H5M1B	H5M2B	H5M3B	Mean	St. Dev.	COV(%)
M.C. (%)	14	14	14	14.0	0.3	2.4
S.G.	0.31	0.28	0.29	0.3	0.0	5.6
D.E. 5% Yield (psi)	3115	2557	4671	3447.5	1095.3	31.8
D.E. Capacity (psi)	2477	2248	3690	2804.8	775.1	27.6

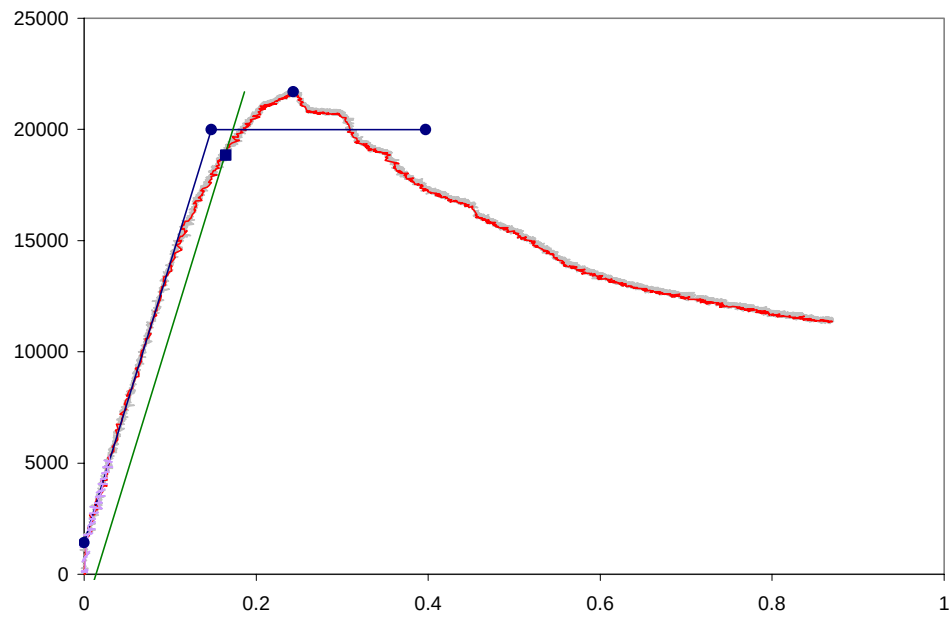


Figure A.25: H5M1 Load (lbs) – Deflection (in) Plot

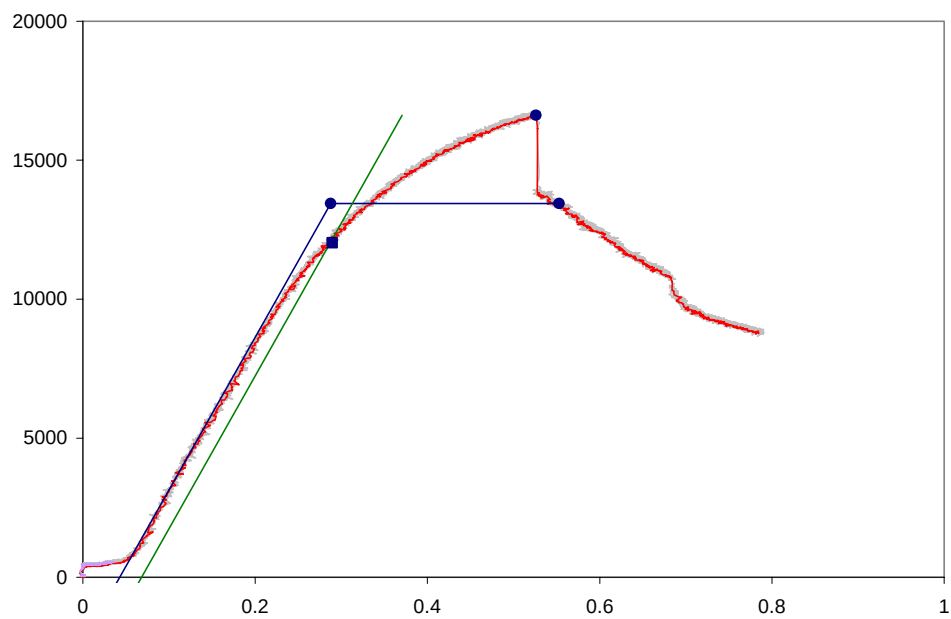


Figure A.26: H5M2 Load (lbs) – Deflection (in) Plot

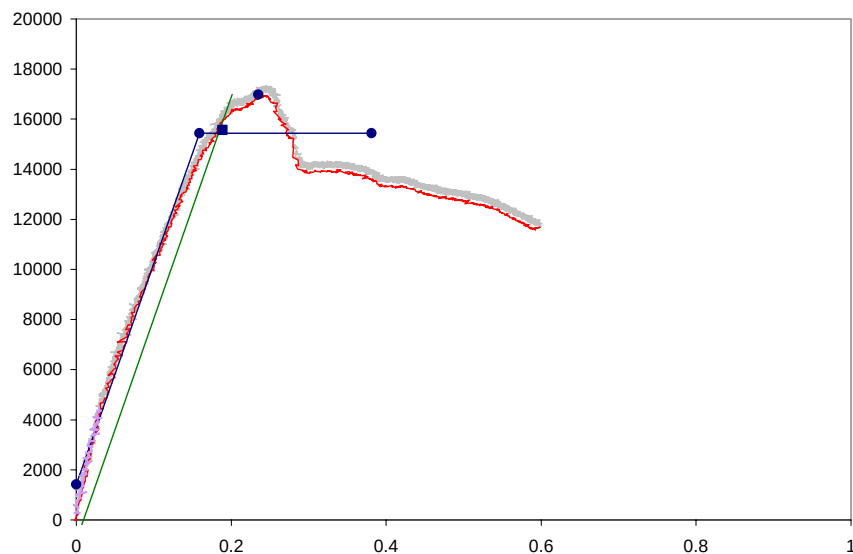


Figure A.27: H5M3 Load (lbs) – Deflection (in) Plot

Table A.10: H3 Connection and Member Properties

	H3 Series			Mean	St. Dev.	COV(%)
	H3M1	H3M2	H3M3			
Max Load (lbs)	12512	8906	11148	10855.4	1820.8	16.8
@ Displacement (in)	0.22	0.28	0.39	0.297	0.083	28.1
Failure Load (lbs)	9982	7080	8897	8652.8	1466.5	16.9
@ Displacement (in)	0.31	0.32	0.78	0.471	0.271	57.5
40% Max (lbs)	4972	3533	4341	4282.2	721.2	16.8
@ Displacement (in)	0.12	0.17	0.05	0.117	0.060	51.1
E.E.P. Yield (lbs)	10010	7125	10271	9135.4	1746.0	19.1
@ Displacement (in)	0.19	0.23	0.14	0.185	0.046	25.1
5% Offset (lbs)	11692	8540	9646	9959.3	1599.3	16.1
@ Displacement (in)	0.24	0.27	0.15	0.222	0.063	28.3
Elastic Stiff. (lb/in)	71892	67755	73785	71143.6	3083.8	4.33
Slack (in)	0.05	0.12	0.00	0.057	0.063	111
E.E.P. Energy (lb*in)	2127	1172	7359	3552.8	3331.1	93.8
Ductility Ratio	1.62	1.40	5.80	2.939	2.477	84.3
Yield Mode	II	II	II,III,IV			
Failure Mode	splitting	splitting	splitting			
Governing Member	B	B	B			

	H3 Series			Mean	St. Dev.	COV(%)
	H3M1B	H3M2B	H3M3B			
M.C. (%)	13	16	13	13.8	1.5	10.5
S.G.	0.33	0.29	0.24	0.3	0.0	15.7
D.E. 5% Yield (psi)	3503	2742	4393	3546.0	826.1	23.3
D.E. Capacity (psi)	3447	2571	3763	3260.5	617.4	18.9

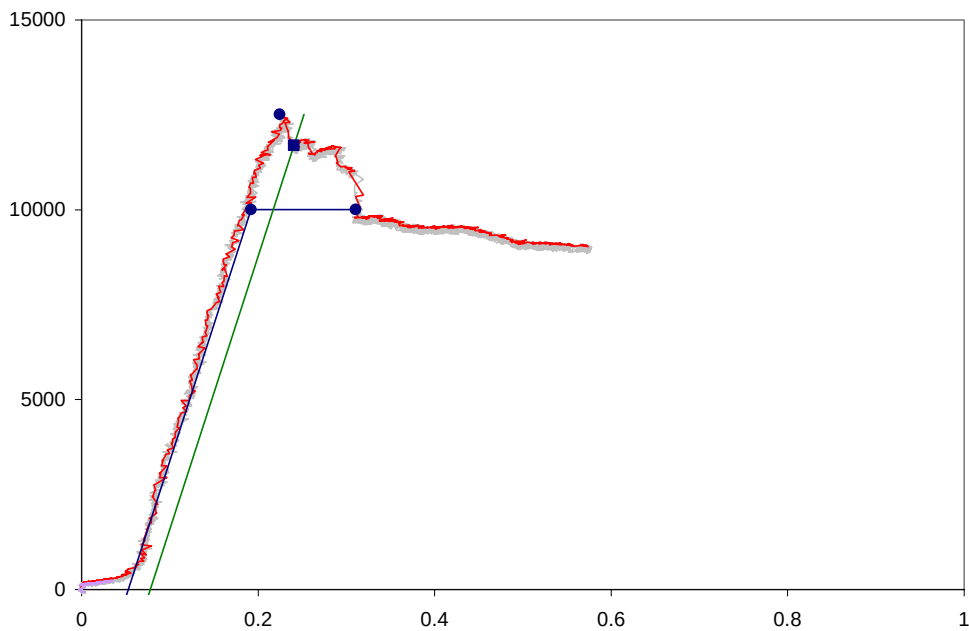


Figure A.28: H3M1 Load (lbs) – Deflection (in) Plot

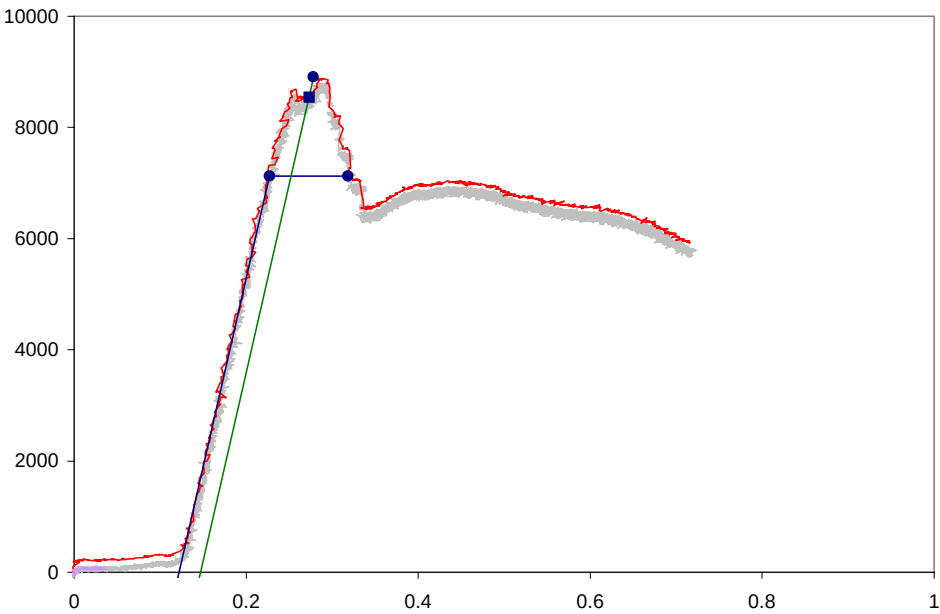


Figure A.29: H3M2 Load (lbs) – Deflection (in) Plot

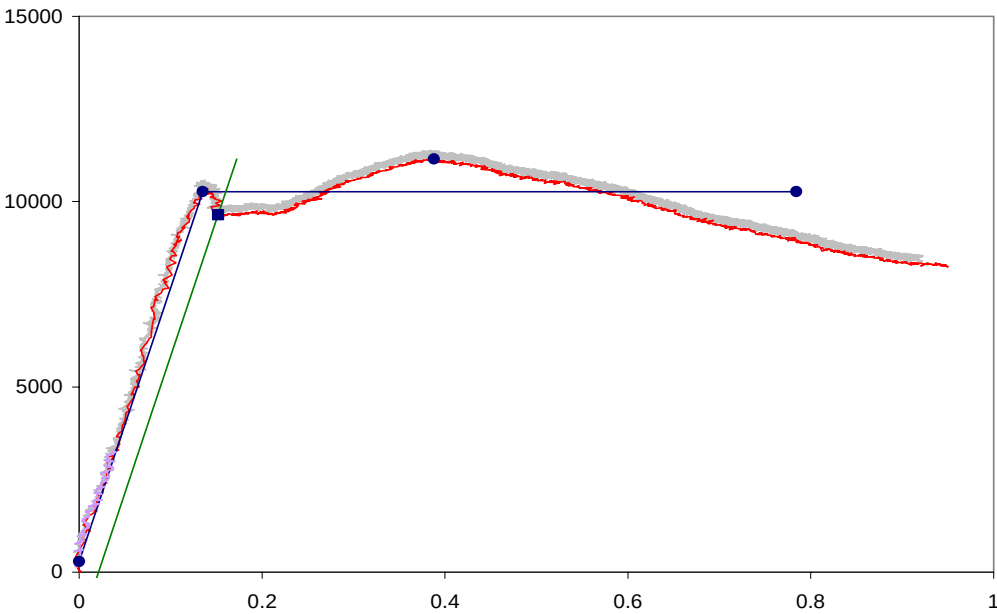


Figure A.30: H3M3 Load (lbs) – Deflection (in) Plot

A.3 Expected Yield Mode IV

Table A.11: E8 Connection and Member Properties

	E8 Series				St. Dev.	COV(%)
	E8M2	E8M3	E8M4	Mean		
Max Load (lbs)	10692	8298	7280	8756.8	1751.8	20.0
@ Displacement (in)	0.84	0.45	0.38	0.556	0.248	44.6
Failure Load (lbs)	8508	6598	5417	6840.7	1559.9	22.8
@ Displacement (in)	0.92	0.82	0.51	0.751	0.214	28.4
40% Max (lbs)	4233	3289	2878	3466.4	694.6	20.0
@ Displacement (in)	0.18	0.10	0.10	0.129	0.048	36.9
E.E.P. Yield (lbs)	8811	7307	6303	7473.6	1262.3	16.9
@ Displacement (in)	0.32	0.21	0.20	0.246	0.067	27.4
5% Offset (lbs)	5848	5143	4413	5134.9	717.6	14.0
@ Displacement (in)	0.25	0.17	0.17	0.198	0.049	24.6
Elastic Stiff. (lb/in)	32756	37188	33078	34340.8	2471.0	7.2
Slack (in)	0.06	0.02	0.01	0.028	0.024	86.0
E.E.P. Energy (lb*in)	6676	5237	2581	4831.4	2077.6	43.0
Ductility Ratio	2.84	3.88	2.52	3.080	0.716	23.2
Yield Mode	III,IV	II,III	II			
Failure Mode	splitting	splitting	splitting			
Governing Member	B	T	T			

Member Top	E8 Series			Mean	St. Dev.	COV(%)
	E8M2T	E8M3T	E8M4T			
M.C. (%)	15	11	15	13.9	2.2	15.9
S.G.	0.60	0.44	0.56	0.5	0.1	15.4
D.E. 5% Yield (psi)	3658	3085	3061	3268.0	337.6	10.3
D.E. Capacity (psi)	3896	3116	3234	3415.4	420.5	12.3

Member Bottom	E8M2B	E8M3B	E8M4B	Mean	St. Dev.	COV(%)
M.C. (%)	15	15	15	15.1	0.4	2.7
S.G.	0.57	0.68	0.57	0.6	0.1	10.7
D.E. 5% Yield (psi)	2981	2475	3015	2823.7	302.6	10.7
D.E. Capacity (psi)	2880	2395	3306	2860.2	455.8	15.9

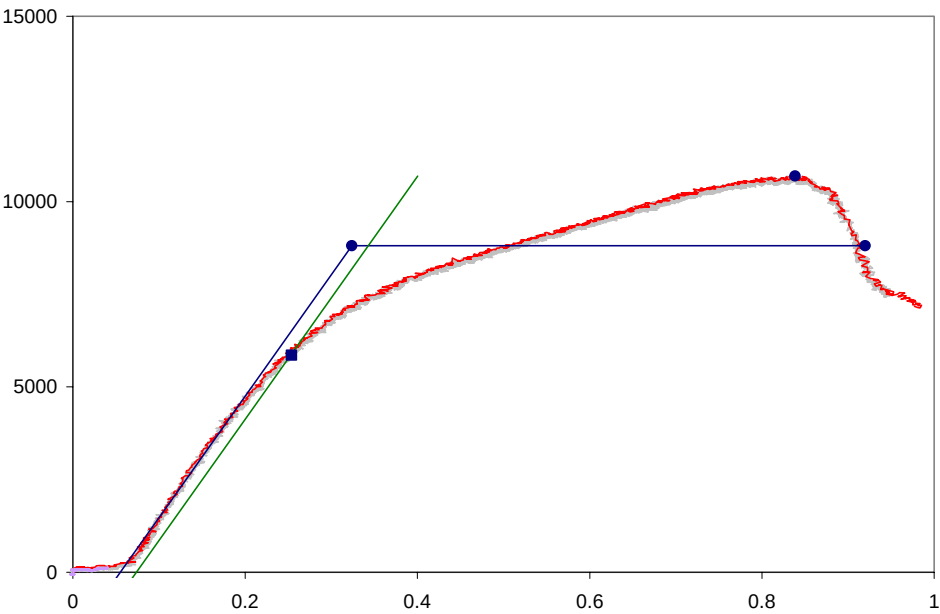


Figure A.31: E8M2 Load (lbs) – Deflection (in) Plot

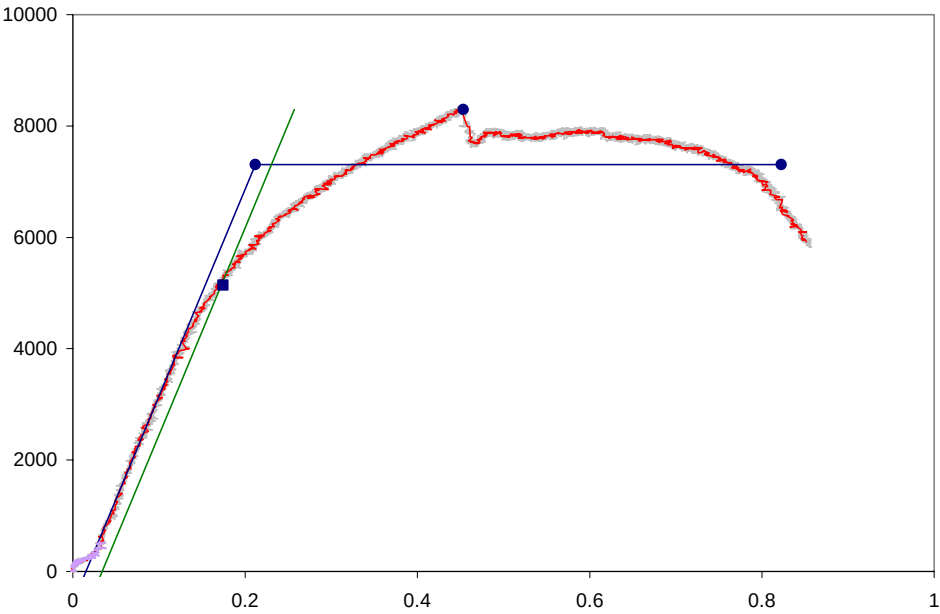


Figure A.32 E8M3 Load (lbs) – Deflection (in) Plot

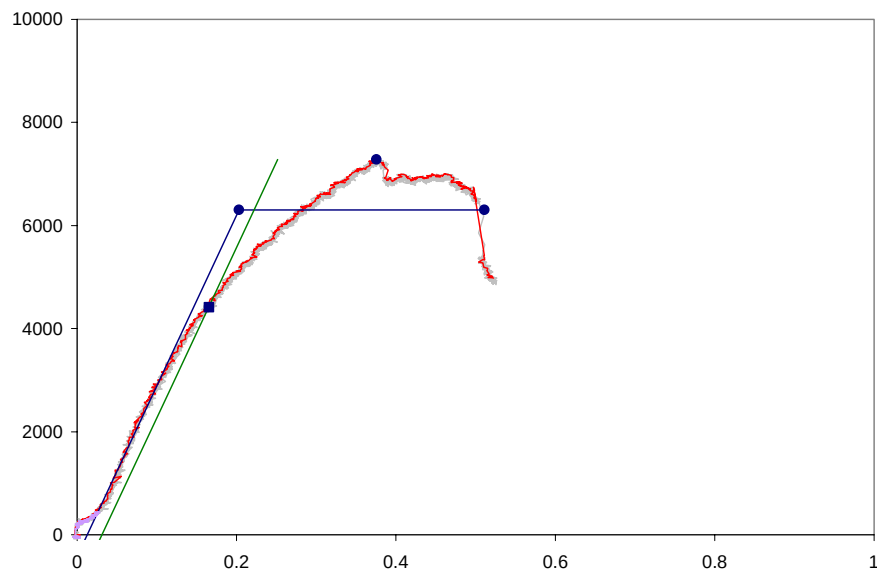


Figure A.33 E8M4 Load (lbs) – Deflection (in) Plot

Table A.12: E7 Connection and Member Properties

	E7 Series					
	E7M1	E7M2	E7M3	Mean	St. Dev.	COV(%)
Max Load (lbs)	8160	10434	8229	8941.0	1293.3	14.5
@ Displacement (in)	0.46	0.81	0.39	0.558	0.225	40.3
Failure Load (lbs)	6522	8314	6578	7137.8	1018.8	14.3
@ Displacement (in)	0.62	0.96	0.54	0.706	0.224	31.7
40% Max (lbs)	3229	4118	3263	3536.5	503.8	14.2
@ Displacement (in)	0.12	0.12	0.09	0.110	0.020	18.2
E.E.P. Yield (lbs)	7238	8743	7587	7856.2	787.5	10.0
@ Displacement (in)	0.24	0.25	0.20	0.230	0.023	9.78
5% Offset (lbs)	5507	5528	6113	5716.3	343.9	6.02
@ Displacement (in)	0.21	0.18	0.18	0.190	0.016	8.49
Elastic Stiff. (lb/in)	33912	37007	36823	35914.3	1736.1	4.83
Slack (in)	0.03	0.01	0.00	0.011	0.015	128
E.E.P. Energy (lb*in)	3595	7333	3326	4751.2	2239.7	47.1
Ductility Ratio	2.56	3.92	2.65	3.043	0.760	25.0
Yield Mode	II,III,IV	II,III	II			
Failure Mode	splitting	splitting	splitting			
Governing Member	T	T	T			

Member Top	E7 Series			Mean	St. Dev.	COV(%)
	E7M1T	E7M2T	E7M3T			
M.C. (%)	14	13	14	13.5	0.5	3.7
S.G.	0.57	0.52	0.55	0.5	0.0	4.3
D.E. 5% Yield (psi)	2604	2680	3125	2803.1	281.5	10.0
D.E. Capacity (psi)	2468	2798	3105	2790.3	318.6	11.4

Member Bottom	E7M1B	E7M2B	E7M3B	Mean	St. Dev.	COV(%)
M.C. (%)	14	13	15	13.9	1.0	7.2
S.G.	0.56	0.54	0.62	0.6	0.0	7.5
D.E. 5% Yield (psi)	3920	2763	2717	3133.5	682.0	21.8
D.E. Capacity (psi)	4455	2566	2846	3289.2	1019.5	31.0

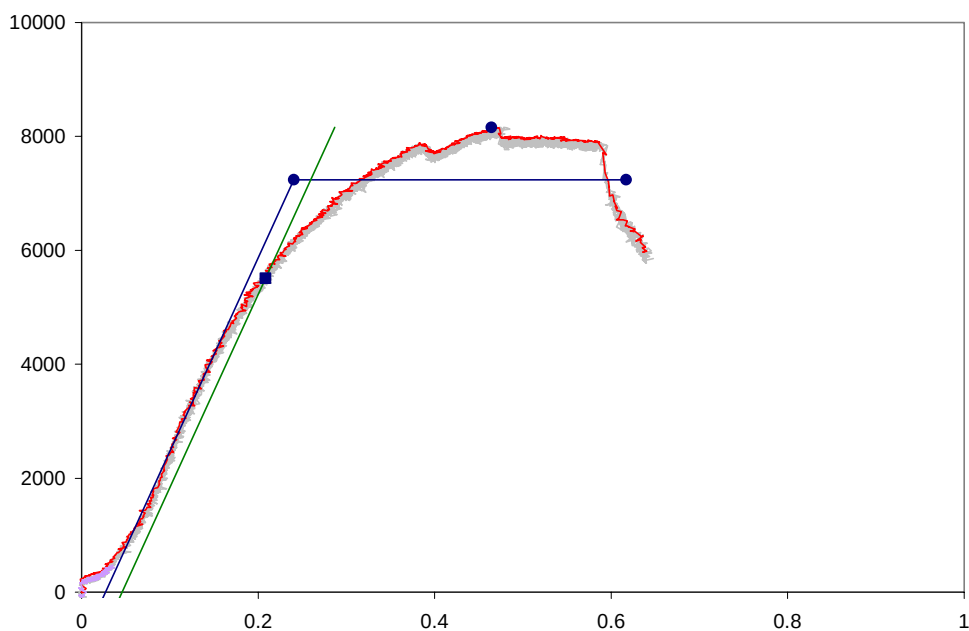


Figure A.34: E7M1 Load (lbs) – Deflection (in) Plot

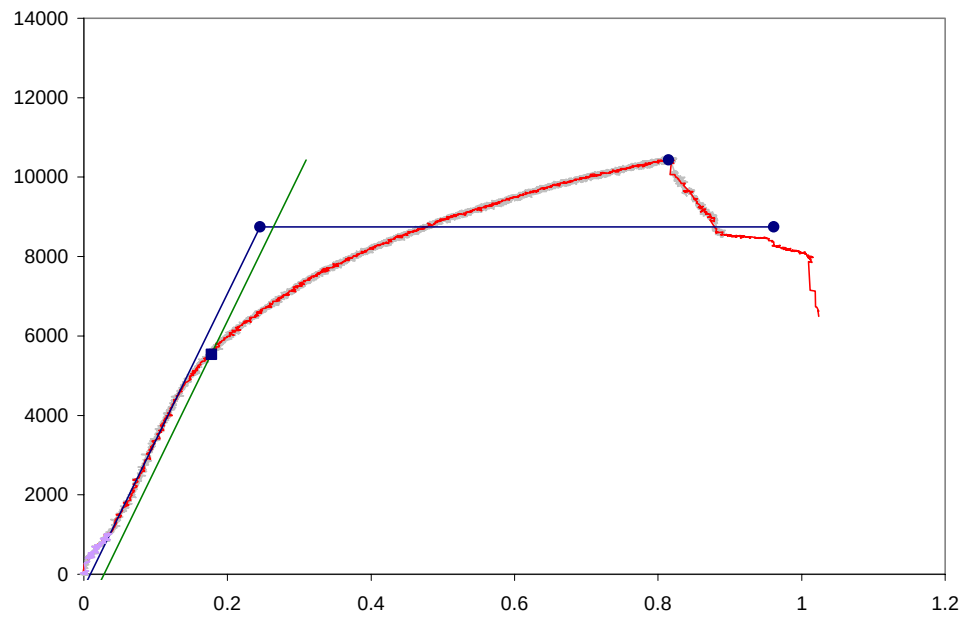


Figure A.35: E7M2 Load (lbs) – Deflection (in) Plot

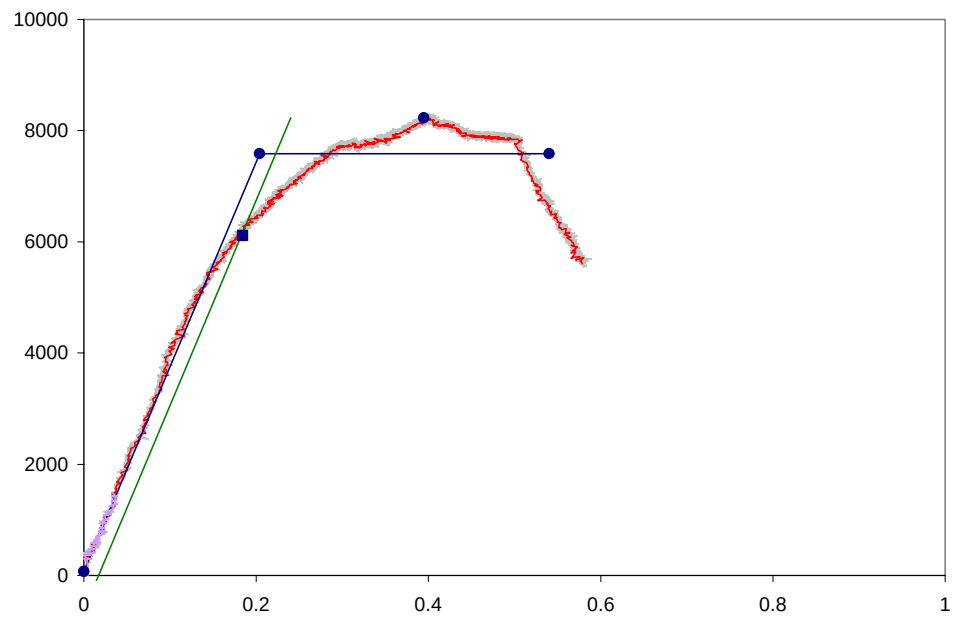


Figure A.36: E7M3 Load (lbs) – Deflection (in) Plot

Table A.13: E6 Connection and Member Properties

	E6 Series			Mean	St. Dev.	COV(%)
	E6M1	E6M2	E6M3			
Max Load (lbs)	6777	8240	8272	7762.8	854.3	11.0
@ Displacement (in)	0.38	0.56	0.50	0.479	0.089	18.7
Failure Load (lbs)	5406	6572	6616	6198.0	686.6	11.1
@ Displacement (in)	0.55	0.76	0.66	0.658	0.104	15.8
40% Max (lbs)	2684	3277	3294	3085.2	347.2	11.3
@ Displacement (in)	0.15	0.09	0.11	0.113	0.030	27.0
E.E.P. Yield (lbs)	5651	7211	7137	6666.7	880.1	13.2
@ Displacement (in)	0.24	0.18	0.21	0.210	0.030	14.3
5% Offset (lbs)	4783	4637	4772	4730.8	81.0	1.71
@ Displacement (in)	0.23	0.14	0.16	0.179	0.047	26.4
Elastic Stiff. (lb/in)	31648	42042	37577	37089.2	5214.3	14.1
Slack (in)	0.06	0.01	0.02	0.030	0.028	95.4
E.E.P. Energy (lb*in)	2438	4825	3989	3750.8	1211.0	32.3
Ductility Ratio	2.30	4.21	3.19	3.230	0.956	29.6
Yield Mode	II	II,III	II			
Failure Mode	splitting	splitting	splitting			
Governing Member	B	B	B			

Member Top	E6 Series			Mean	St. Dev.	COV(%)
	E6M1T	E6M2T	E6M3T			
M.C. (%)	15	15	15	15.4	0.1	0.8
S.G.	0.67	0.79	0.51	0.7	0.1	21.3
D.E. 5% Yield (psi)	2662	2926	2636	2741.2	160.7	5.9
D.E. Capacity (psi)	2735	2960	2686	2793.6	146.0	5.2

Member Bottom	E6M1B	E6M2B	E6M3B	Mean	St. Dev.	COV(%)
M.C. (%)	15	15	15	14.9	0.0	0.2
S.G.	0.65	0.66	0.62	0.6	0.0	3.8
D.E. 5% Yield (psi)	2620	3213	3431	3088.1	419.6	13.6
D.E. Capacity (psi)	2654	3374	3314	3114.2	399.2	12.8

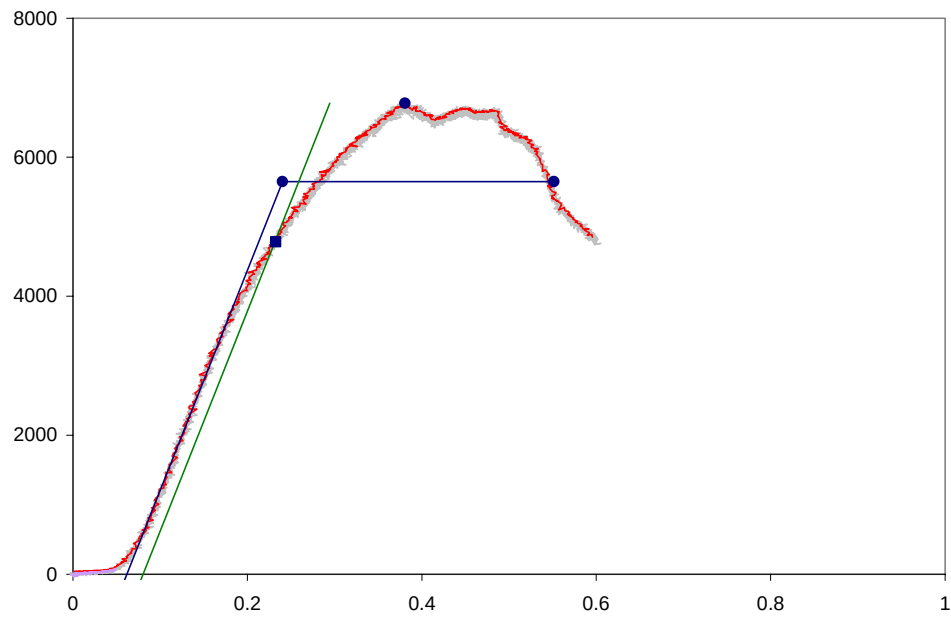


Figure A.37: E6M1 Load (lbs) – Deflection (in) Plot

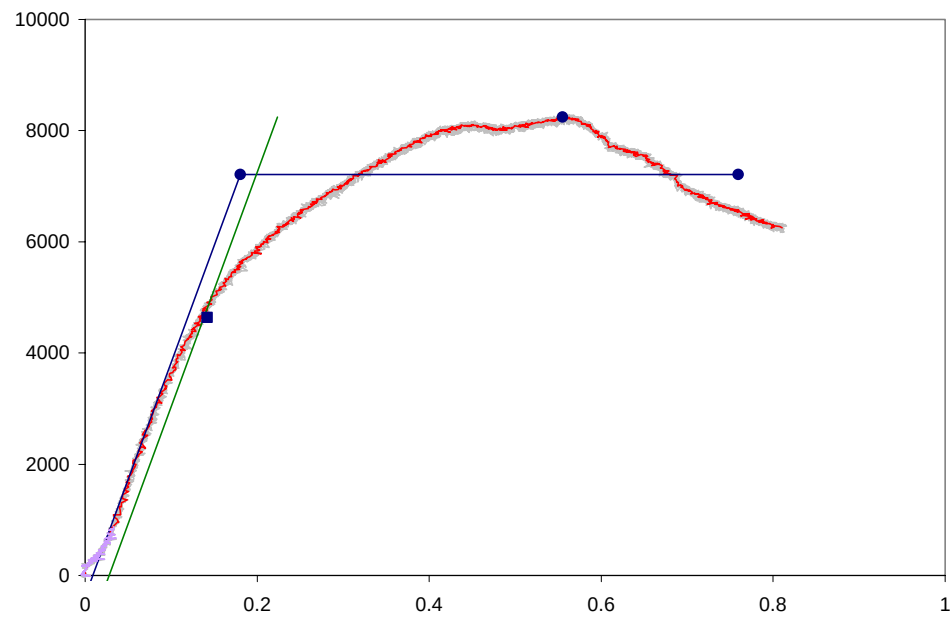


Figure A.38: E6M2 Load (lbs) – Deflection (in) Plot

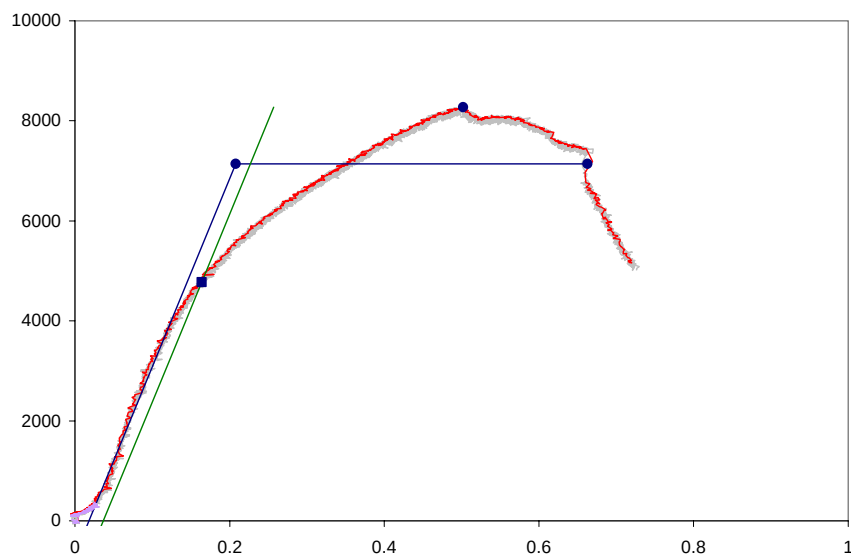


Figure A.39: E6M3 Load (lbs) – Deflection (in) Plot

Table A.14: E5 Connection and Member Properties

	E5 Series			Mean	St. Dev.	COV(%)
	E5M1	E5M2	E5M3			
Max Load (lbs)	6945	7368	6899	7070.5	258.4	3.65
@ Displacement (in)	0.40	0.46	0.47	0.445	0.039	8.77
Failure Load (lbs)	5527	5863	5506	5632.0	200.5	3.56
@ Displacement (in)	0.575228	0.66	0.59	0.608	0.045	7.46
40% Max (lbs)	2755	2932	2711	2799.4	116.9	4.18
@ Displacement (in)	0.17	0.12	0.15	0.148	0.022	15.1
E.E.P. Yield (lbs)	5556	6188	5825	5856.4	317.2	5.42
@ Displacement (in)	0.25	0.20	0.26	0.234	0.033	13.9
5% Offset (lbs)	4919	4716	5190	4941.7	238.0	4.82
@ Displacement (in)	0.25	0.19	0.25	0.230	0.038	16.7
Elastic Stiff. (lb/in)	34795	44419	29609	36274.3	7514.8	20.7
Slack (in)	0.09	0.06	0.06	0.069	0.017	24.8
E.E.P. Energy (lb*in)	2483	3473	2683	2879.4	523.6	18.2
Ductility Ratio	2.31	3.34	2.29	2.649	0.603	22.8
Yield Mode	II	II,III	II			
Failure Mode	splitting	splitting	splitting			
Governing Member	T	B	B			

Member Top	E5 Series			Mean	St. Dev.	COV(%)
	E5M1T	E5M2T	E5M3T			
M.C. (%)	13	11	13	12.3	1.1	8.6
S.G.	0.53	0.48	0.63	0.6	0.1	13.7
D.E. 5% Yield (psi)	2709	3464	2911	3027.7	390.7	12.9
D.E. Capacity (psi)	2771	3465	2778	3004.4	399.0	13.3

Member Bottom	E5M1B	E5M2B	E5M3B	Mean	St. Dev.	COV(%)
M.C. (%)	12	14	14	13.7	1.1	7.8
S.G.	0.58	0.65	0.78	0.7	0.1	15.6
D.E. 5% Yield (psi)	3371	2959	3190	3173.6	206.6	6.5
D.E. Capacity (psi)	3306	2964	3285	3184.9	191.9	6.0

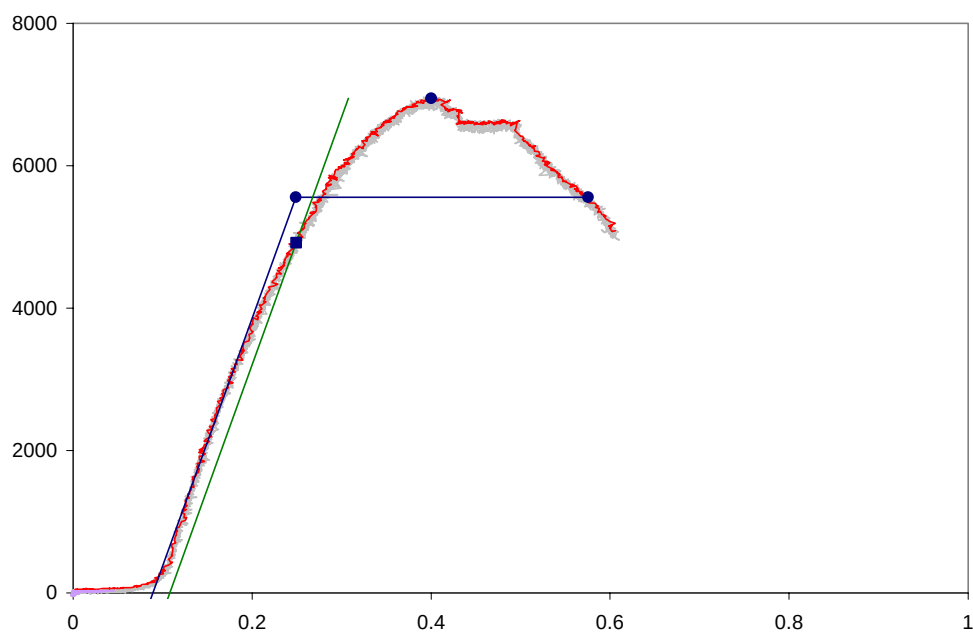


Figure A.40: E5M1 Load (lbs) – Deflection (in) Plot

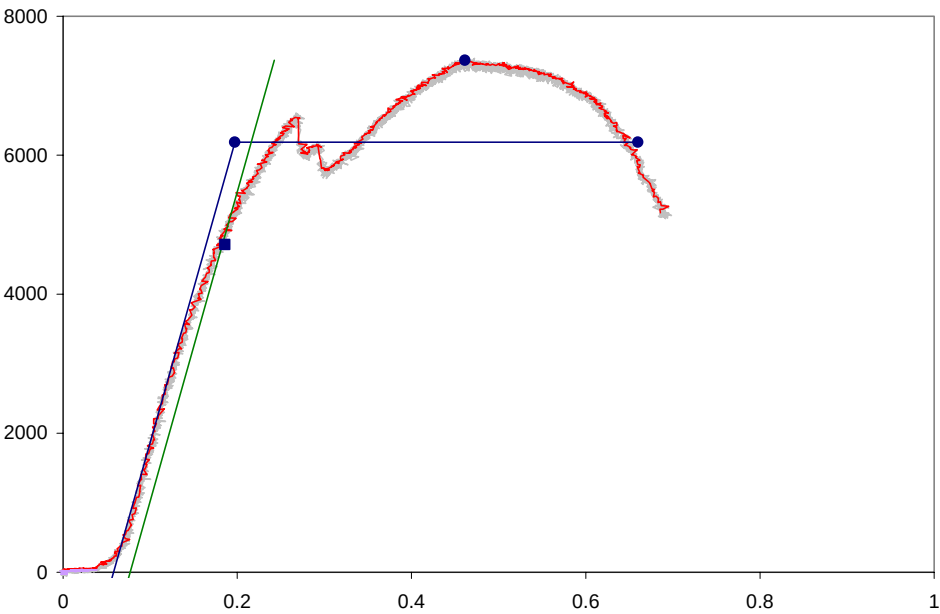


Figure A.41: E5M2 Load (lbs) – Deflection (in) Plot

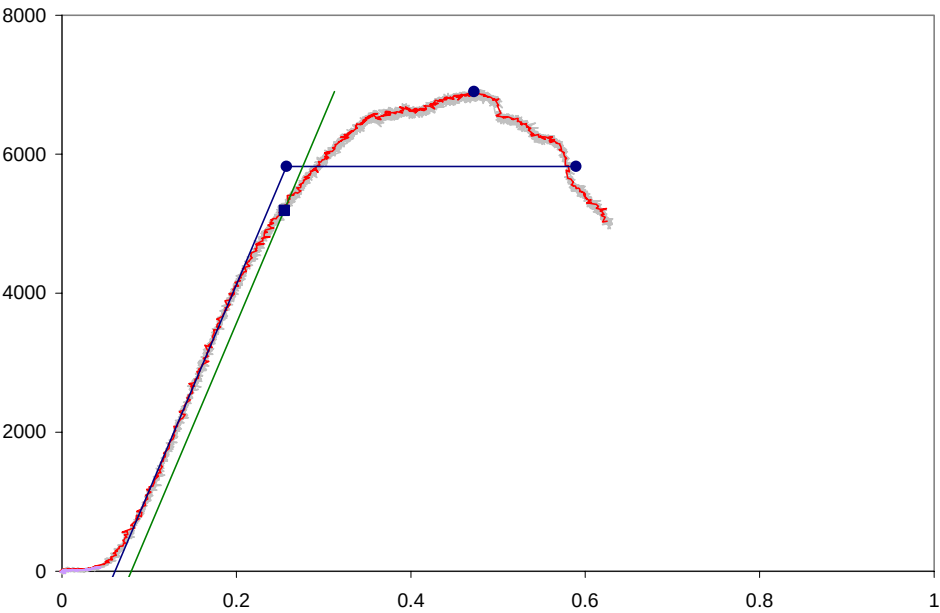


Figure A.42: E5M3 Load (lbs) – Deflection (in) Plot

Table A.15: E3 Connection and Member Properties

	E3 Series					
	E3M1	E3M3	E3M4	Mean	St. Dev.	COV(%)
Max Load (lbs)	6492	6447	5430	6122.9	600.9	9.81
@ Displacement (in)	0.30	0.22	0.35	0.291	0.065	22.3
Failure Load (lbs)	4926	5064	4334	4774.3	387.9	8.12
@ Displacement (in)	0.38	0.31	0.48	0.390	0.087	22.2
40% Max (lbs)	2575	2505	2130	2403.2	239.4	10.0
@ Displacement (in)	0.06	0.08	0.12	0.085	0.028	33.0
E.E.P. Yield (lbs)	6242	5421	4758	5473.5	743.3	13.6
@ Displacement (in)	0.164	0.147	0.206	0.172	0.031	17.7
5% Offset (lbs)	5024	5293	4537	4951.4	383.4	7.74
@ Displacement (in)	0.15	0.16	0.22	0.177	0.036	20.4
Elastic Stiff. (lb/in)	35167	44007	28850	36008.2	7613.6	21.1
Slack (in)	-0.01	0.02	0.04	0.017	0.028	163
E.E.P. Energy (lb*in)	1856	1275	1797	1642.6	320.1	19.5
Ductility Ratio	2.31	2.10	2.33	2.248	0.129	5.75
Yield Mode	II	II	II			
Failure Mode	splitting	splitting	splitting			
Governing Member	T	T	T			

Member Top	E3 Series					
	E3M1T	E3M2T	E3M3T	Mean	St. Dev.	COV(%)
M.C. (%)	16	15	13	14.6	1.1	7.3
S.G.	0.72	0.59	0.59	0.6	0.1	11.5
D.E. 5% Yield (psi)	3503	2370	2605	2826.3	597.9	21.2
D.E. Capacity (psi)	3334	2400	2600	2777.9	492.0	17.7

Member Bottom	E3M1B	E3M2B	E3M3B	Mean	St. Dev.	COV(%)
M.C. (%)	13	13	15	13.8	0.9	6.5
S.G.	0.57	0.61	0.55	0.6	0.0	5.6
D.E. 5% Yield (psi)	2588	4175	2727	3163.5	878.6	27.8
D.E. Capacity (psi)	2647	4401	2820	3289.2	966.5	29.4

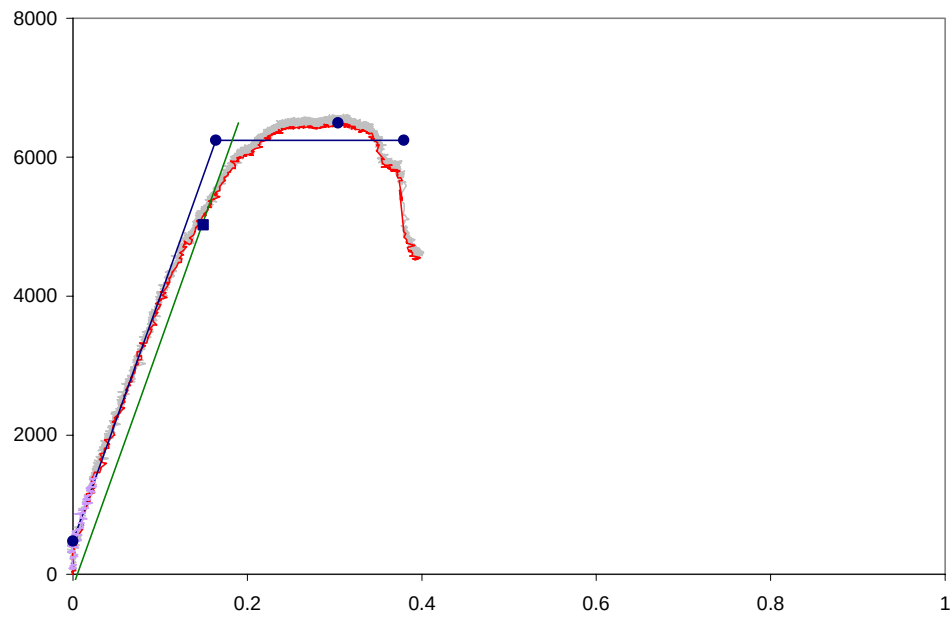


Figure A.43: E3M1 Load (lbs) – Deflection (in) Plot

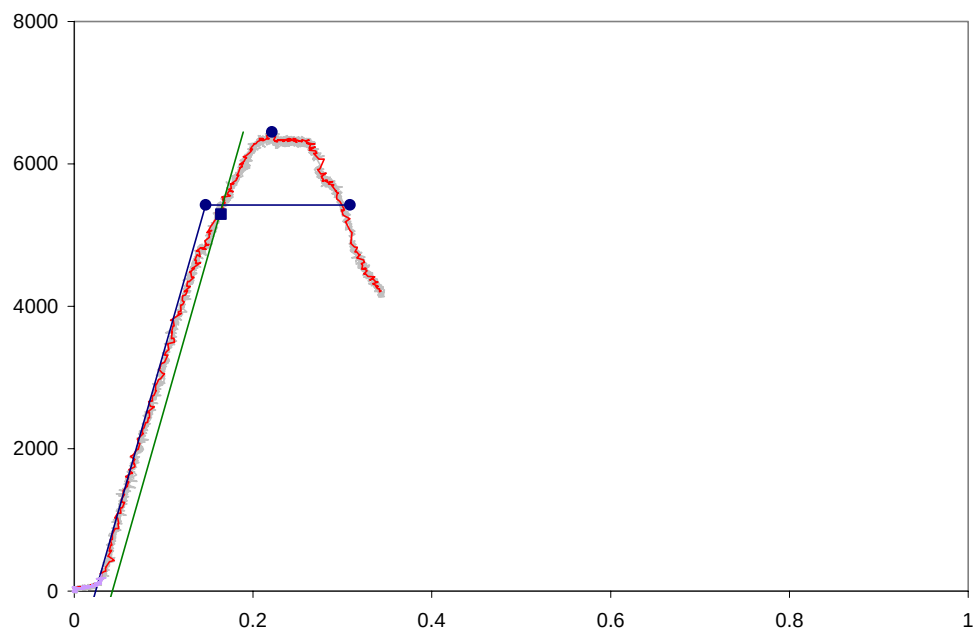


Figure A.44: E3M3 Load (lbs) – Deflection (in) Plot

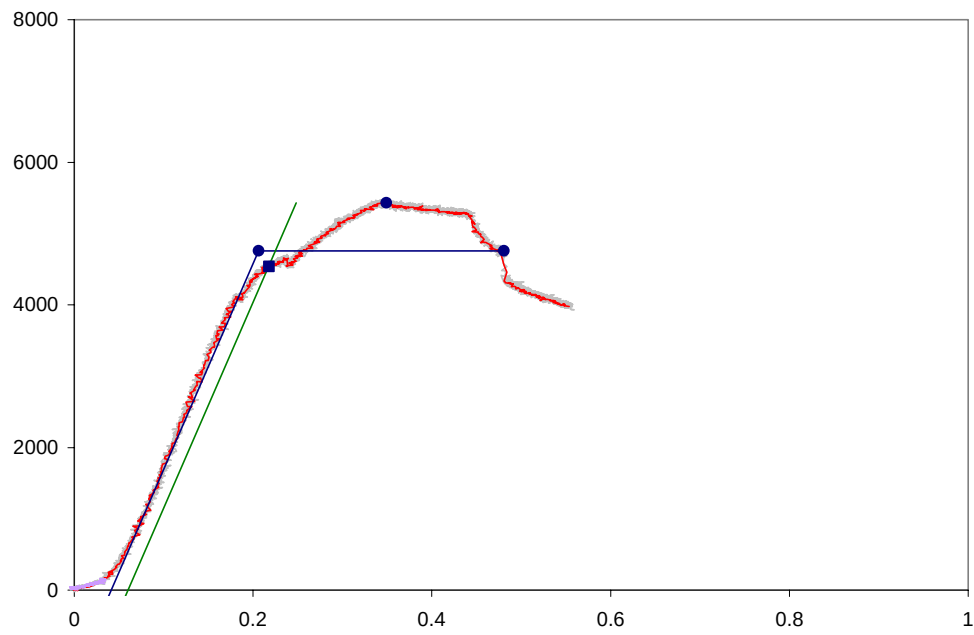


Figure A.45: E3M4 Load (lbs) – Deflection (in) Plot