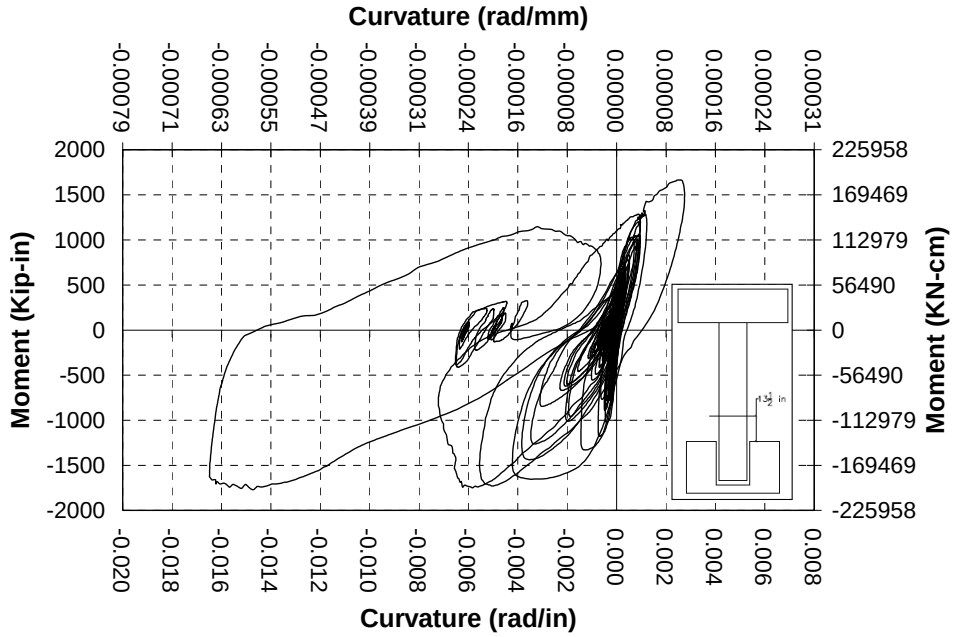


Fig. 3-232. Accumulated Moment Curvature at the Second Level in FRP Column

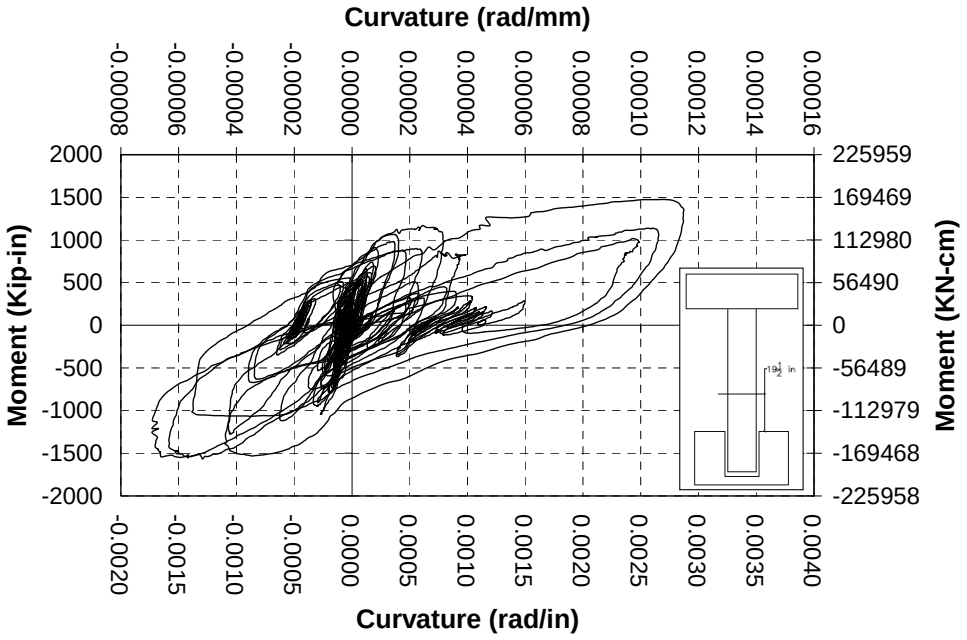


Fig. 3-233. Accumulated Moment Curvature at the Third Level in FRP Column

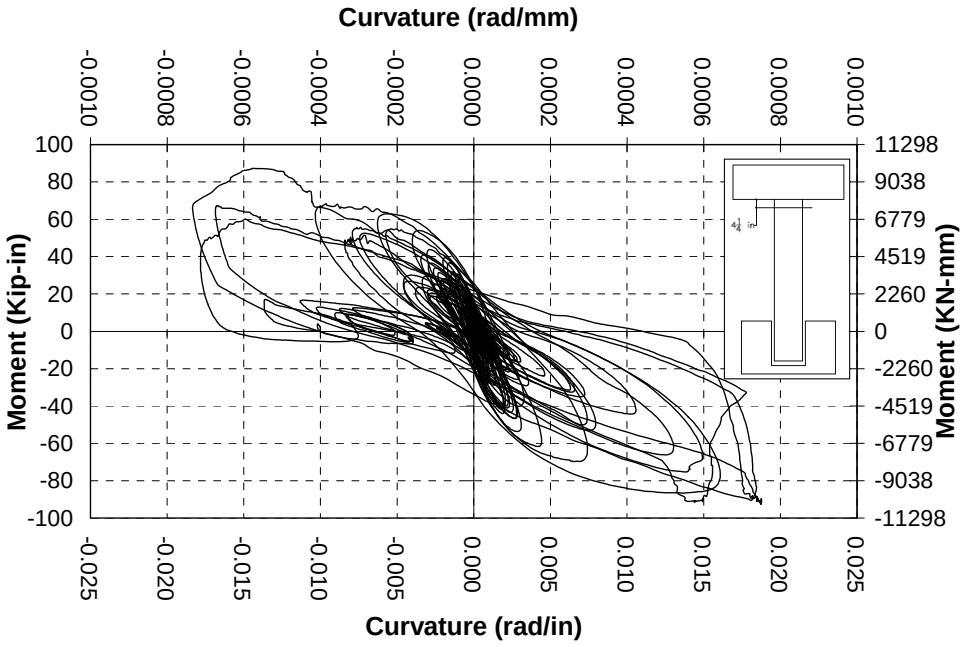


Fig. 3-234. Accumulated Moment Curvature at the Fourth Level in FRP Column

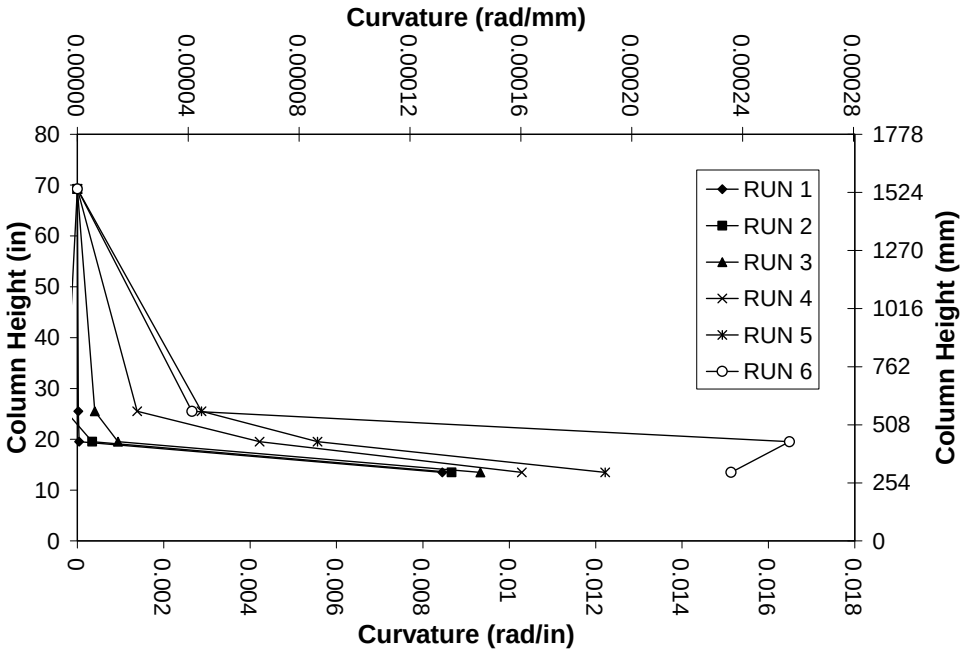


Fig. 3-235. Curvature Profile for FRP Column

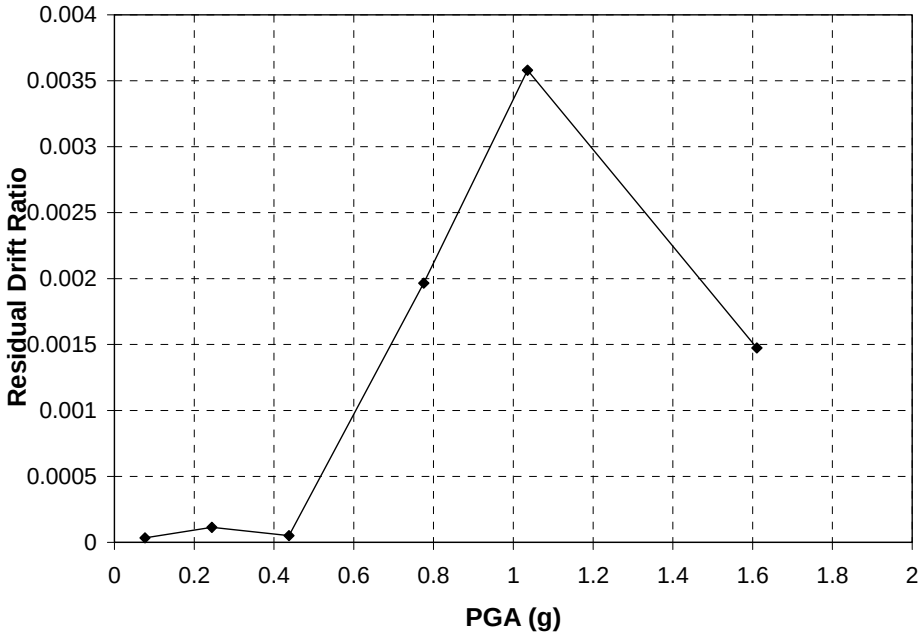


Fig. 3-236. Residual Drift Ratio vs. PGA in FRP Column

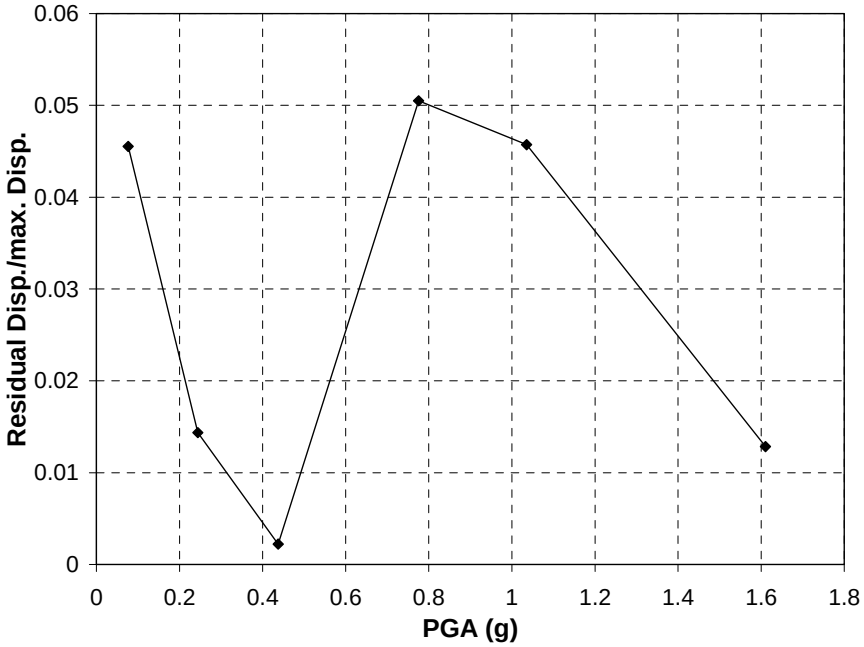


Fig. 3-237. Residual Disp. / Max. Disp. vs. PGA in FRP Column

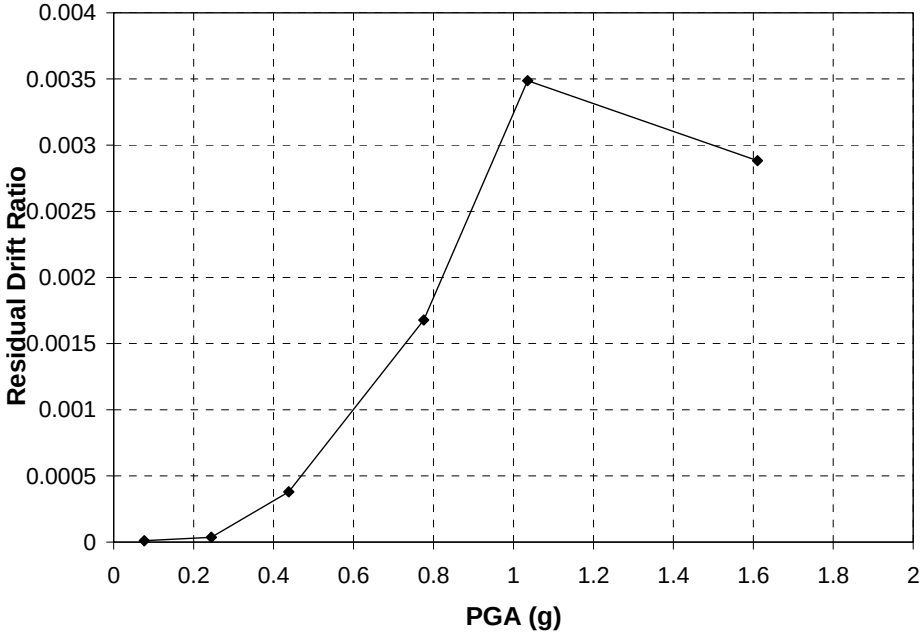


Fig. 3-238. Residual Drift Ratio vs. PGA in RC-ECC Column

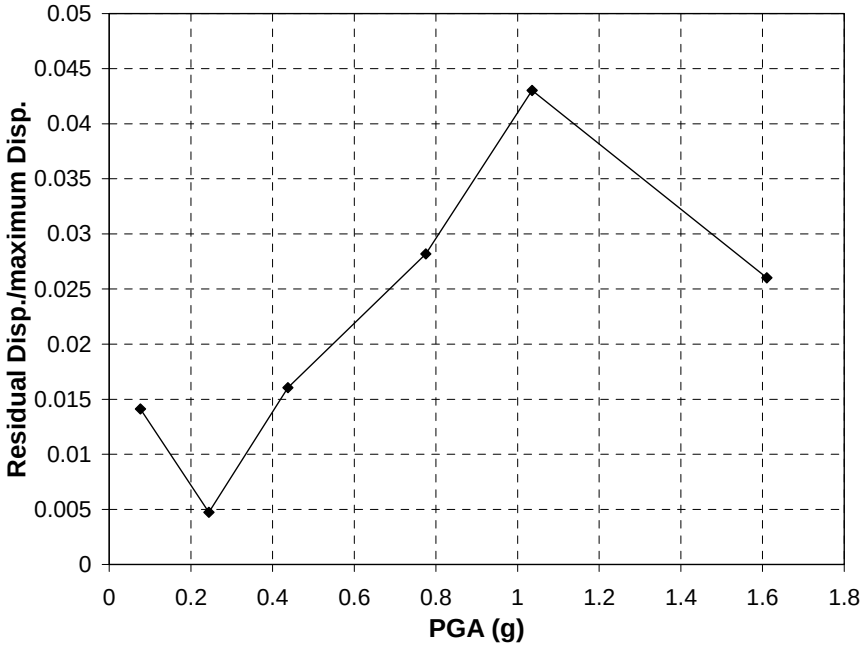


Fig. 3-239. Residual Disp. / Max. Disp. vs. PGA in RC-ECC Column

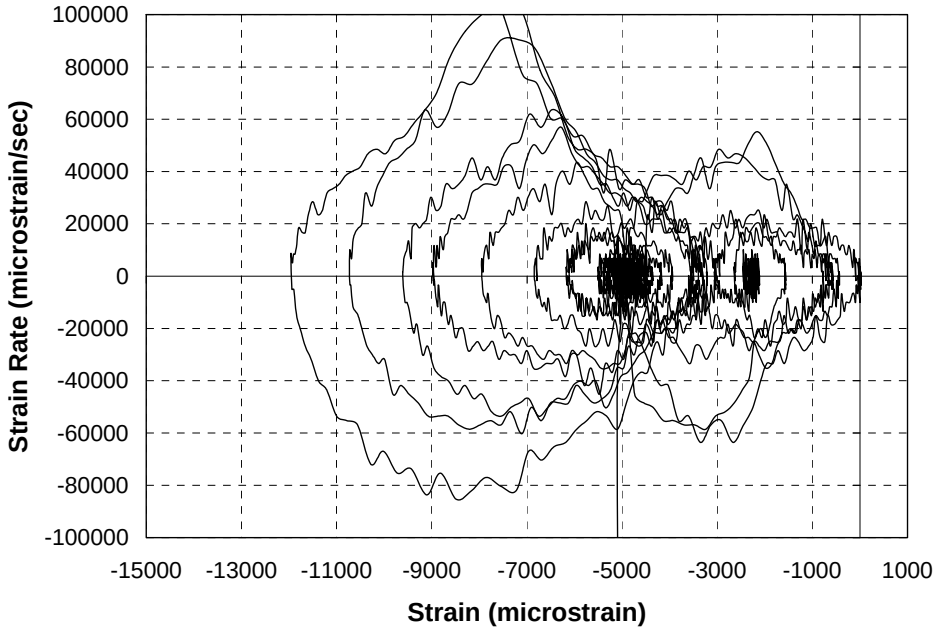


Fig. 3-240. Strain Rate vs. Strain in FRP column, Gauge 45, Run 3

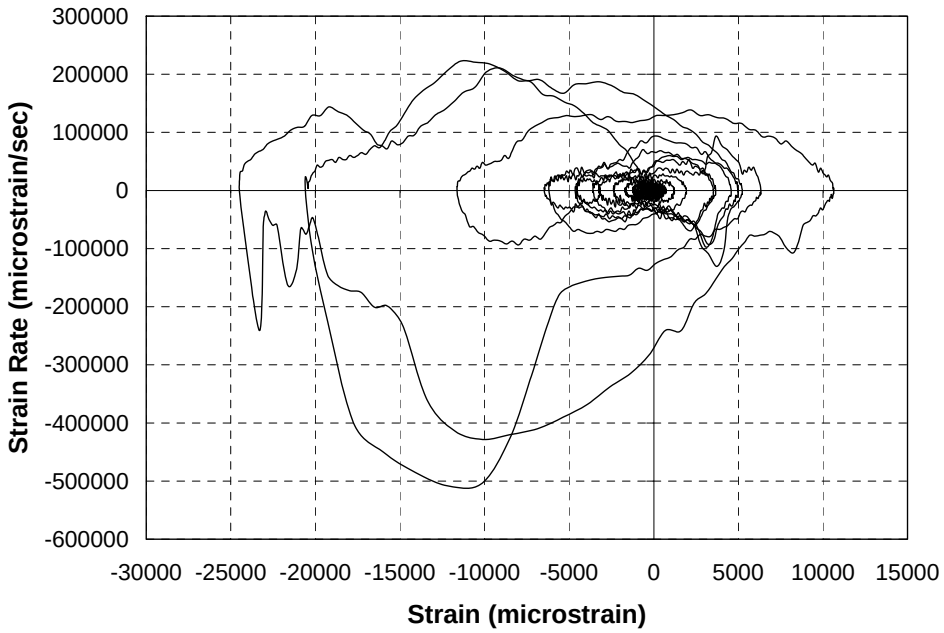


Fig. 3-241. Strain Rate vs. Strain in RC-ECC Column, Gauge 6, Run 3

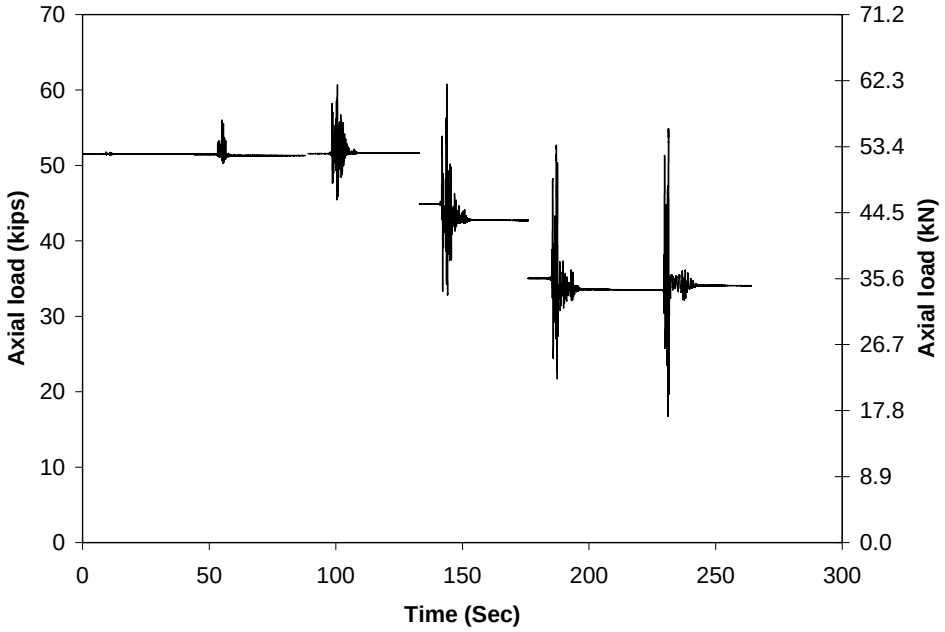


Fig. 3-242. Axial Load History on FRP Column

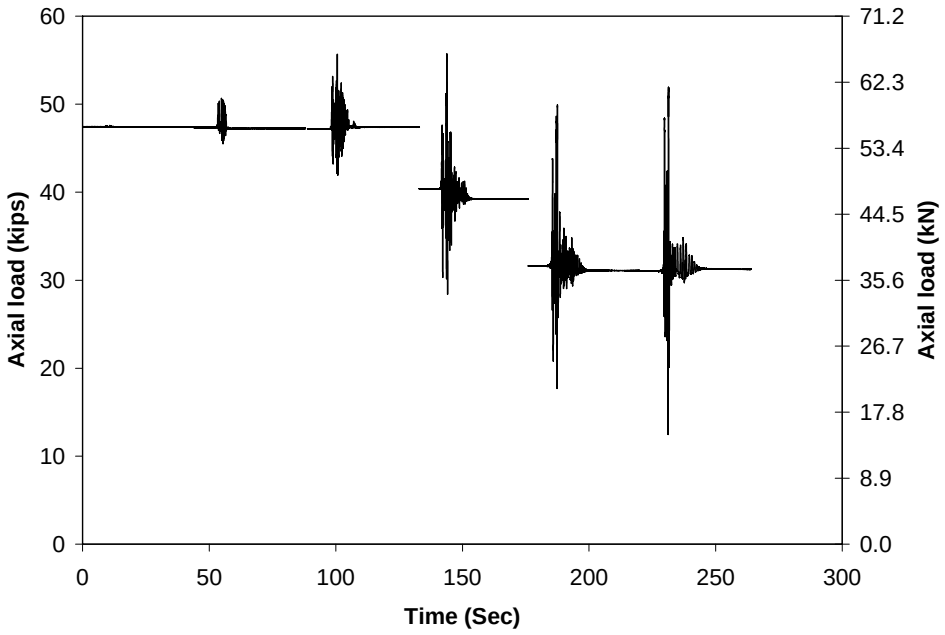


Fig. 3-243. Axial Load History on RC-ECC Column

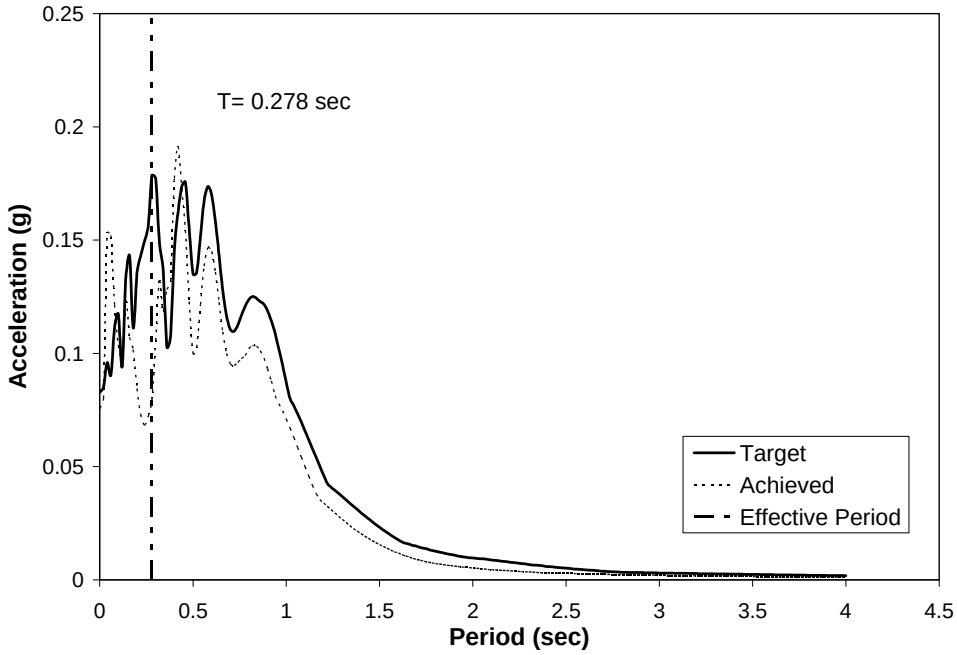


Fig. 3-244. Target vs. Achieved Ground Motion Spectra, Run-1 in PEFB

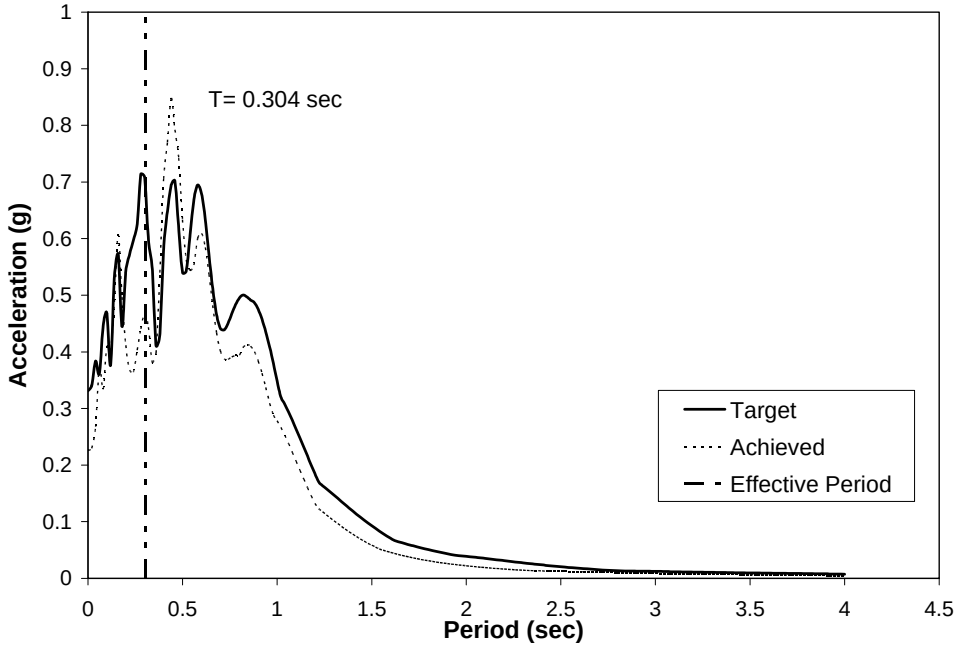


Fig. 3-245. Target vs. Achieved Ground Motion Spectra, Run-2 in PEFB

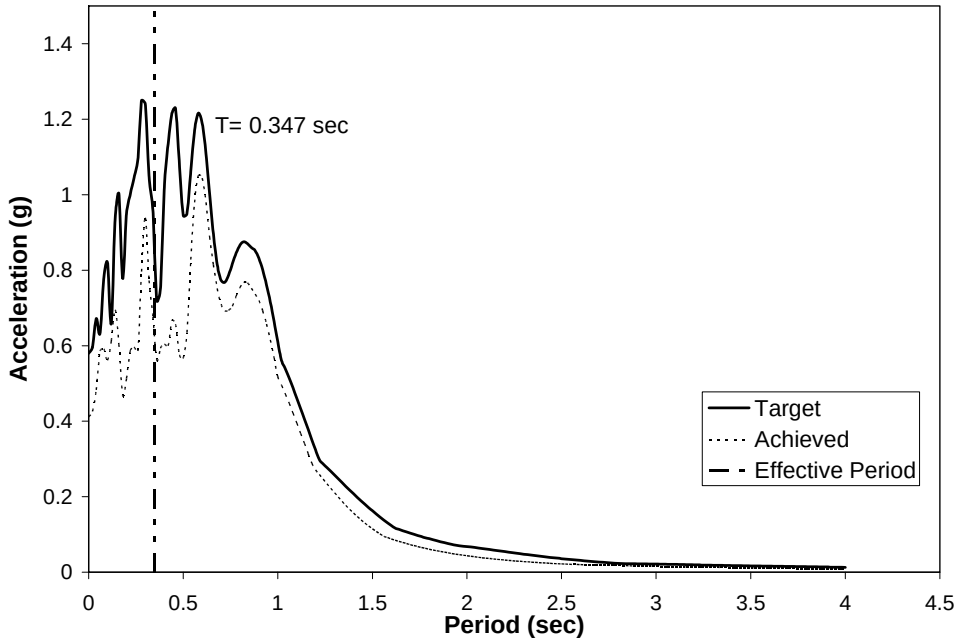


Fig. 3-246. Target vs. Achieved Ground Motion Spectra, Run-3 in PEFB

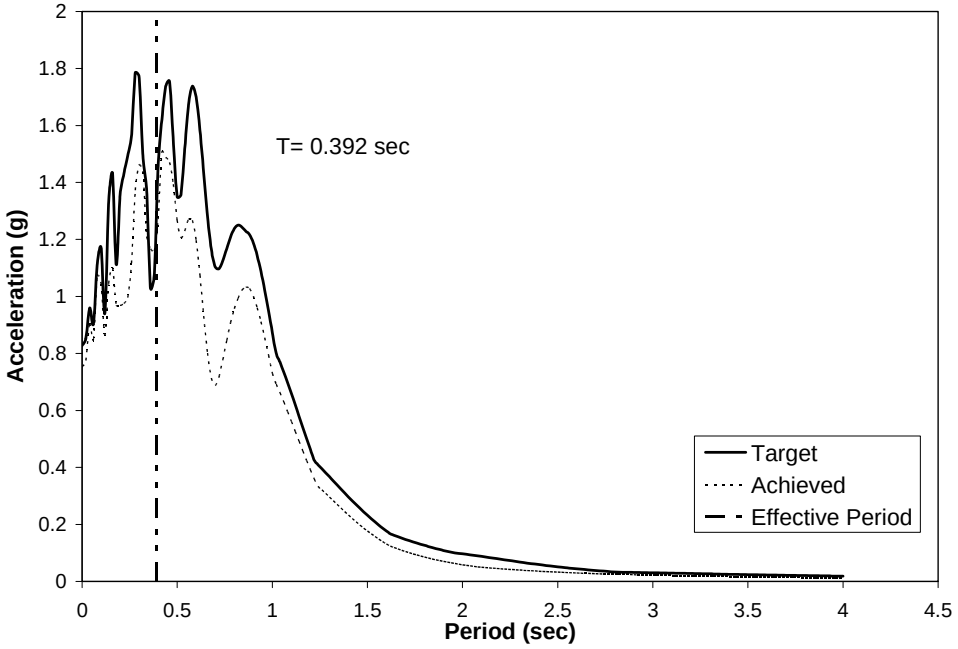


Fig. 3-247. Target vs. Achieved Ground Motion Spectra, Run-4 in PEFB

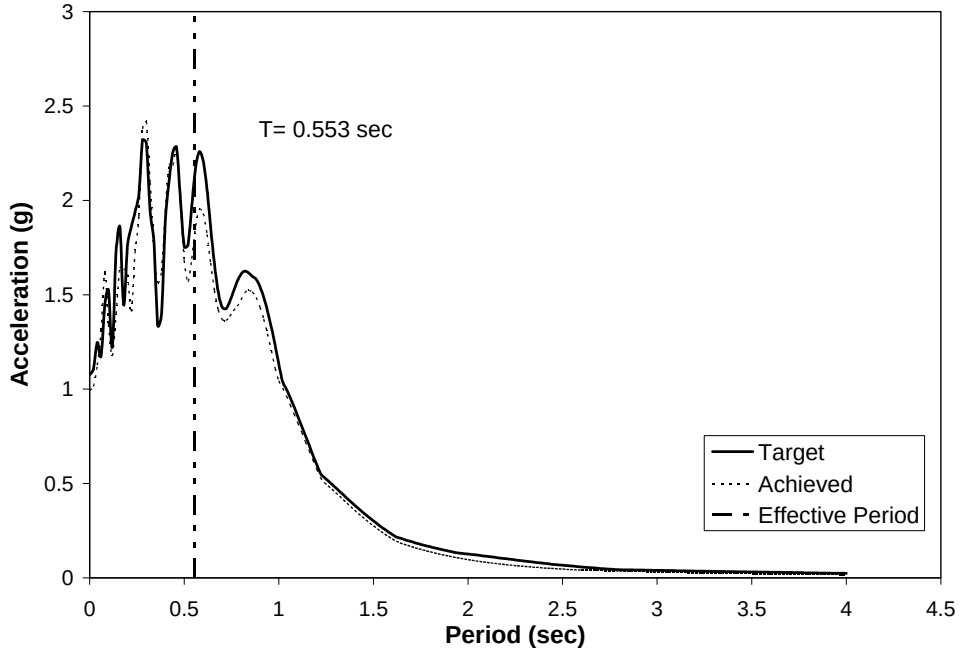


Fig. 3-248. Target vs. Achieved Ground Motion Spectra, Run-5 in PEFB

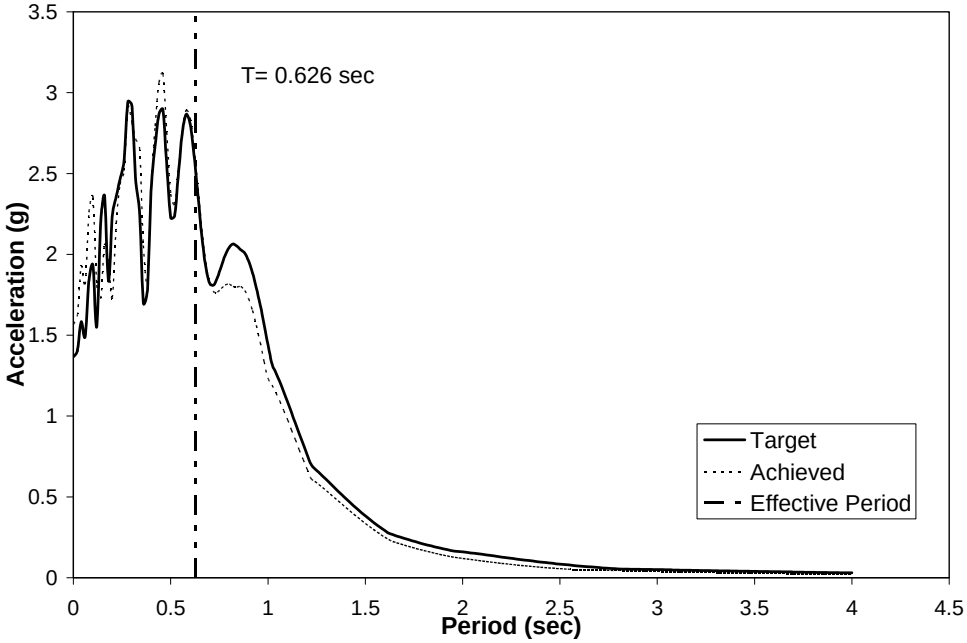
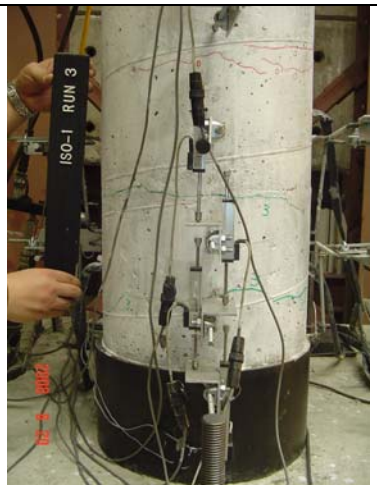
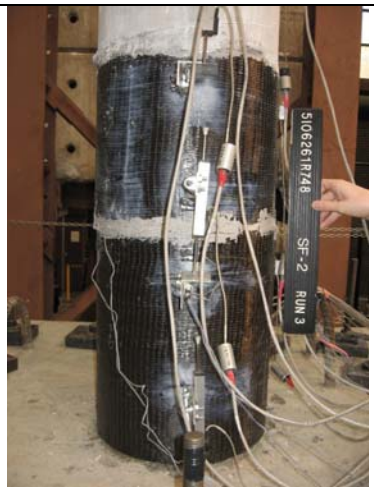


Fig. 3-249. Target vs. Achieved Ground Motion Spectra, Run-6 in PEFB

a)

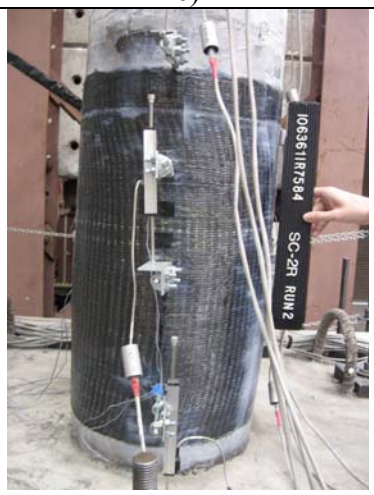


b)



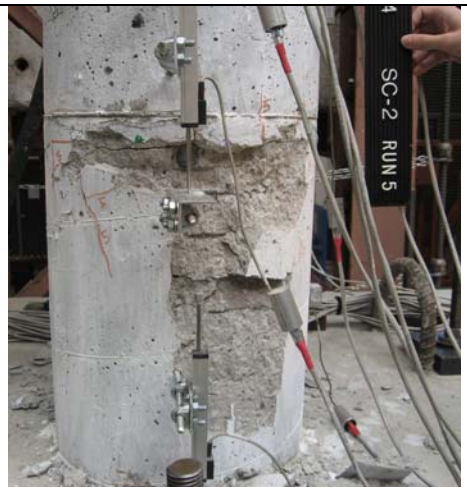
c)

d)

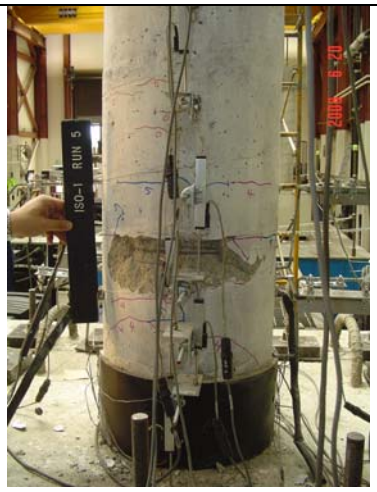


e)

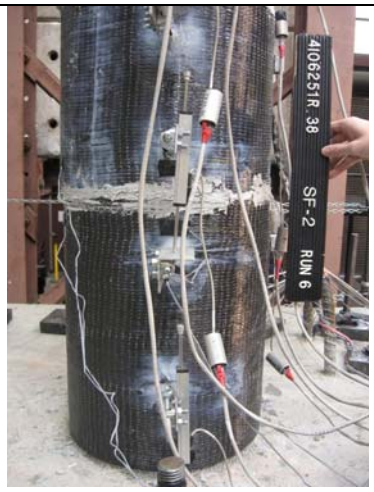
Fig. 4-1. Apparent Damage at 2% Drift for a) SC-2, b) SBR-1, c) SF-2, d) SE-2, e) SC-2R



a)

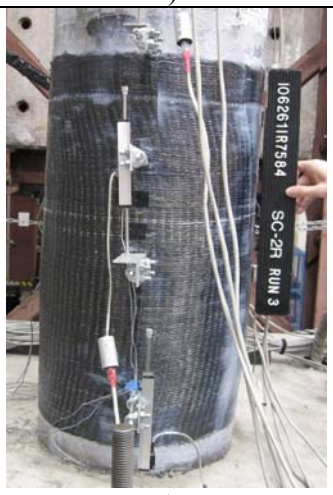


b)



c)

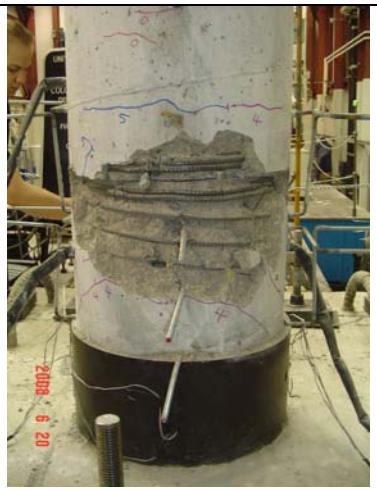
d)



e)

Fig. 4-2. Apparent Damage at 5% Drift for a) SC-2, b) SBR-1, c) SF-2, d) SE-2, e) SC-2R

a)



b)

c)

d)

e)

Fig. 4-3. Apparent Damage at 10% Drift for a) SC-2, b) SBR-1, c) SF-2, d) SE-2, e) SC-2R

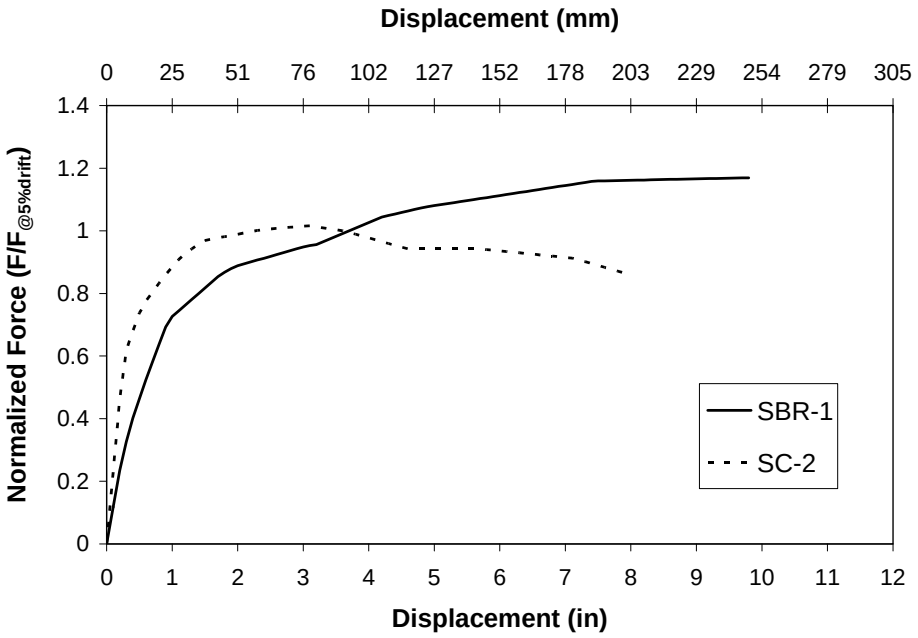


Fig. 4-4. Comparison of Normalized Backbone Curves in SBR-1 and SC-2

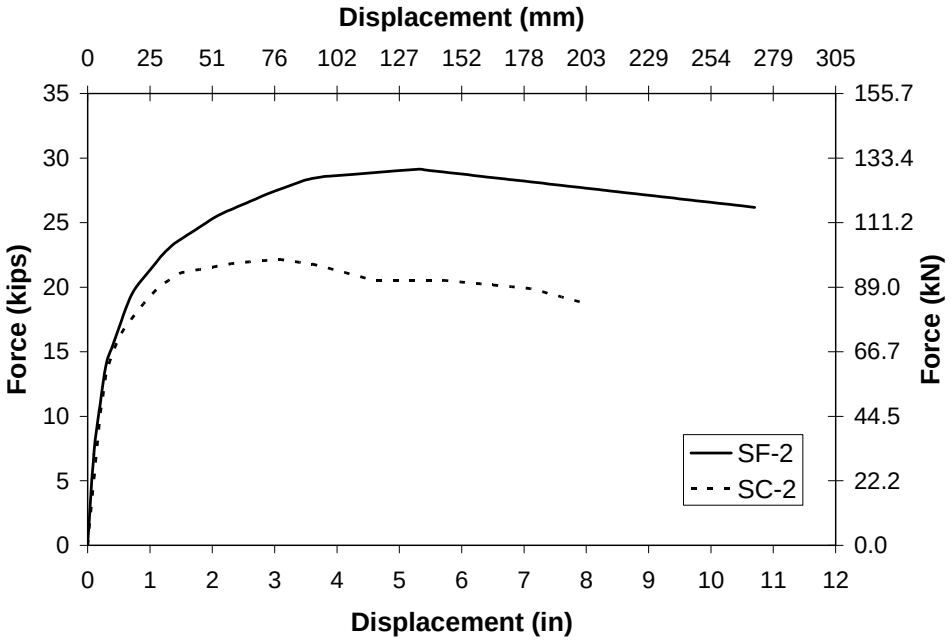


Fig. 4-5. Comparison of Backbone Curves in SF-2 and SC-2

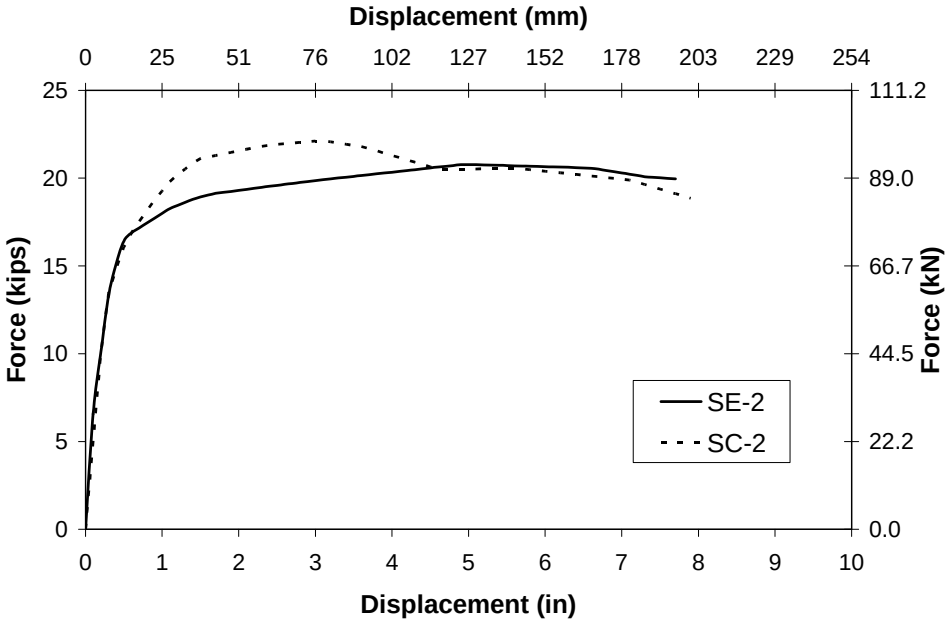


Fig. 4-6. Comparison of Backbone Curves in SE-2 and SC-2

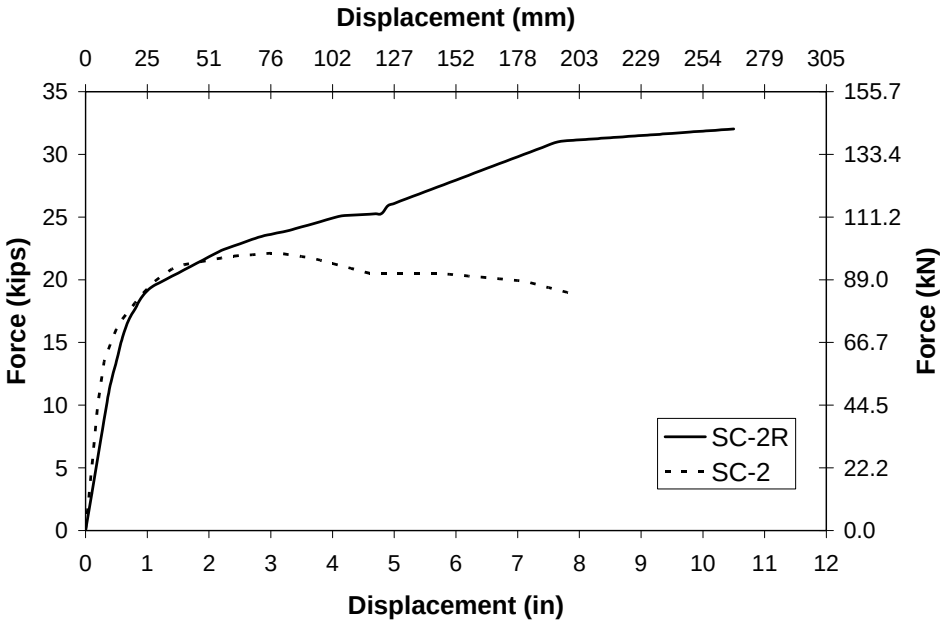


Fig. 4-7. Comparison of Backbone Curves in SC-2R and SC-2

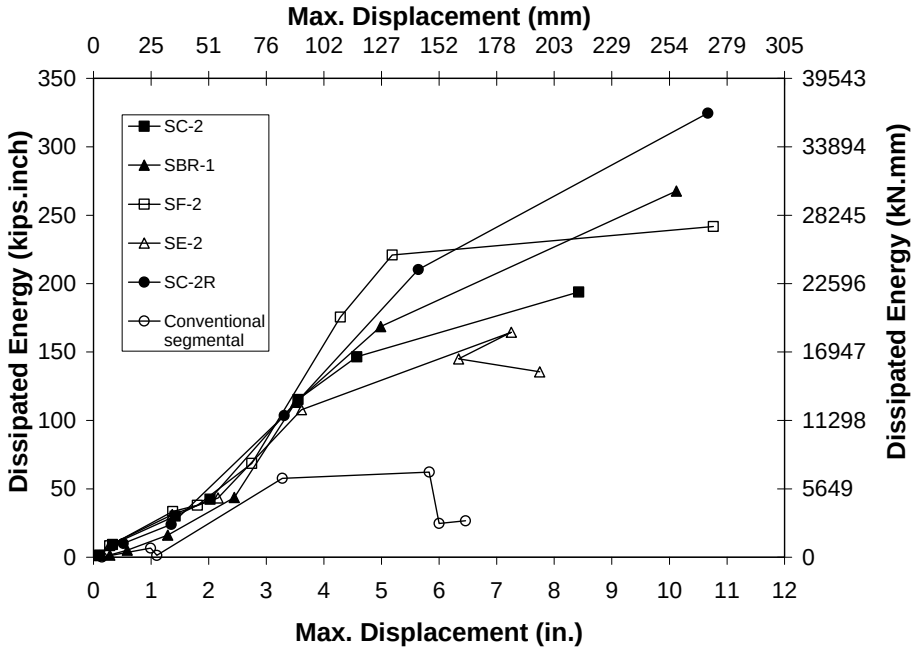


Fig. 4-8. Comparison of Dissipated Energy in Segmental Columns

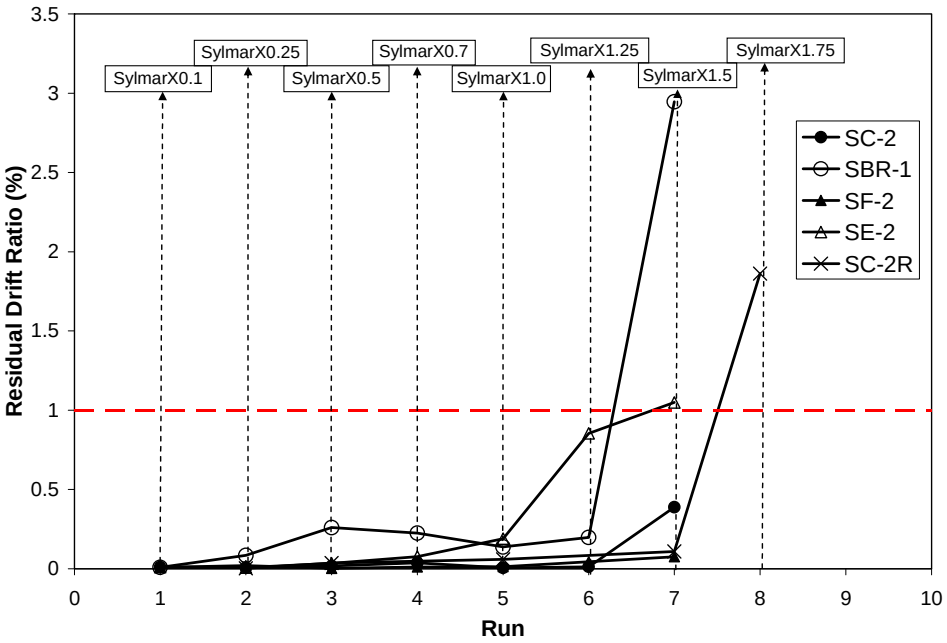


Fig. 4-9. Residual Drift Ratio after each Run in Segmental Columns

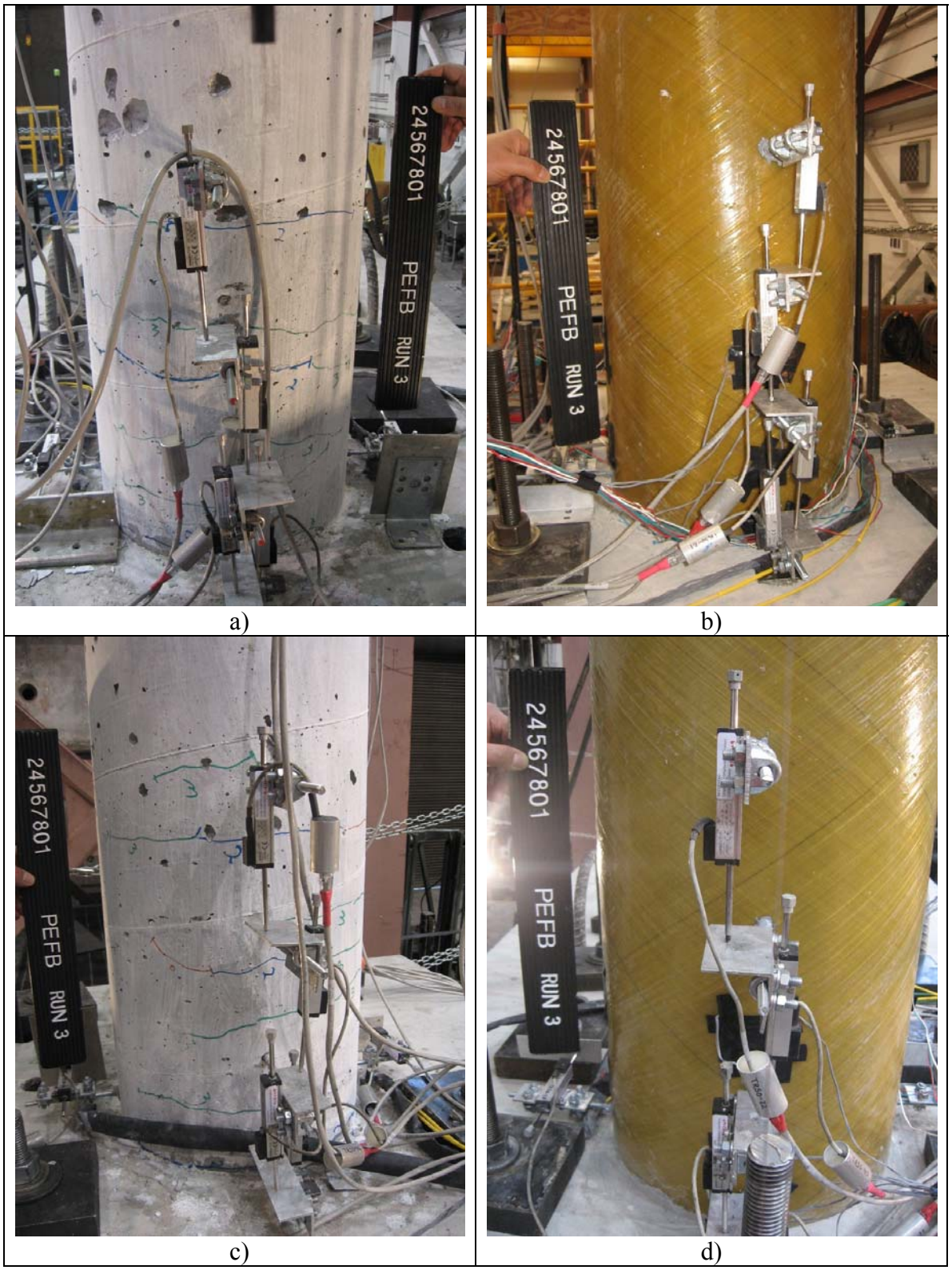


Fig. 4-10. Apparent Damage at 2% Drift for a) RC-ECC, North, b) FRP, North, c) RC-ECC, South, d) FRP, South

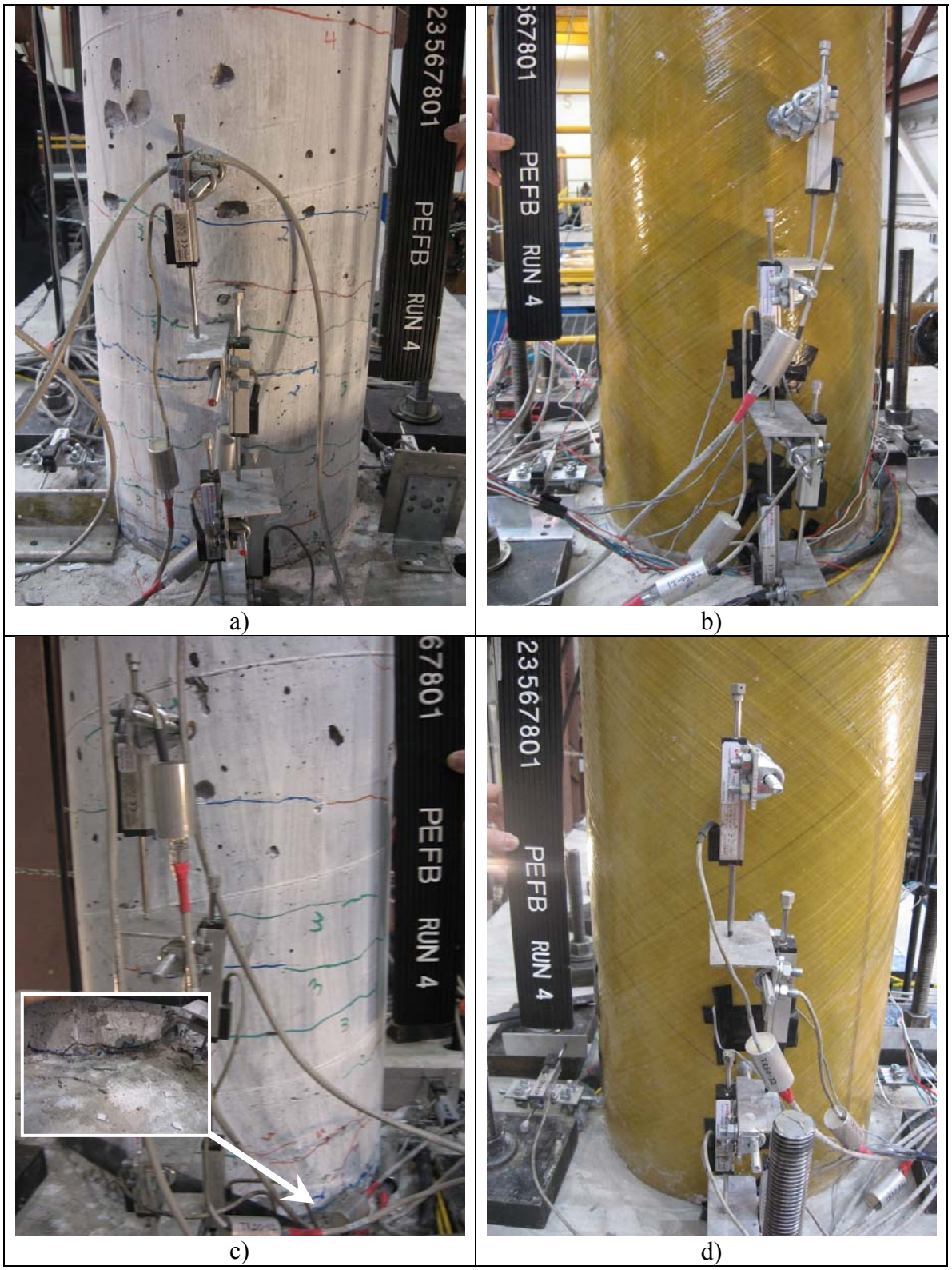


Fig. 4-11. Apparent Damage at 5% Drift for a) RC-ECC, North, b) FRP, North, c) RC-ECC, South, d) FRP, South

a) b) c) d)

Fig. 4-12. Apparent Damage at 10% Drift for a) RC-ECC, North, b) FRP, North, c) RC-ECC, South, d) FRP, South

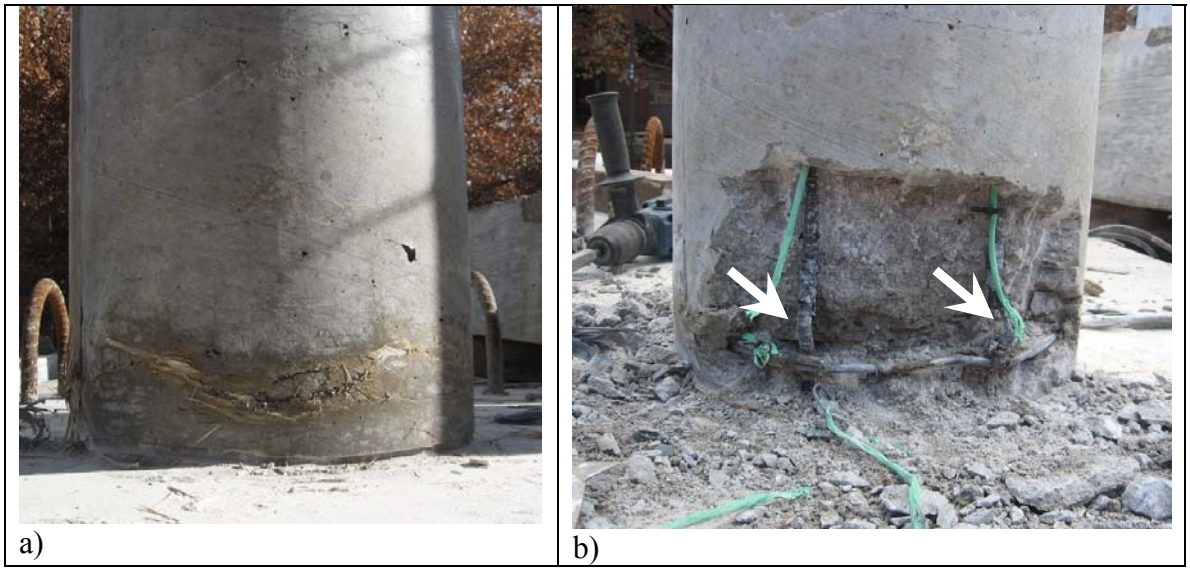


Fig. 4-13. Apparent Damage at 10% Drift for FRP Column after Removing the FRP Tube on the South Side a) Horizontal Cracks b) Buckled Bars

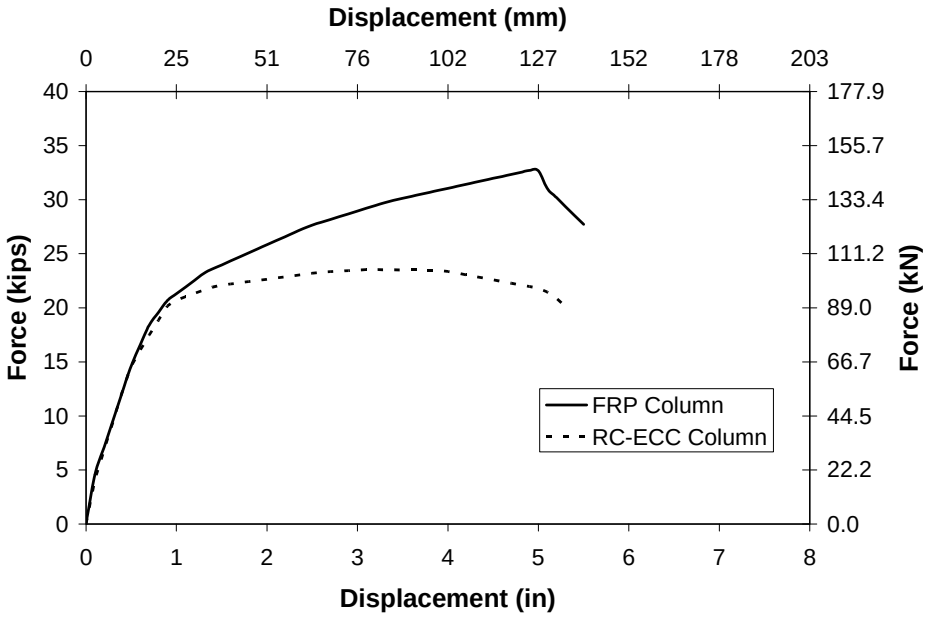


Fig. 4-14. Comparison of Backbone Curves in RC-ECC and FRP Columns

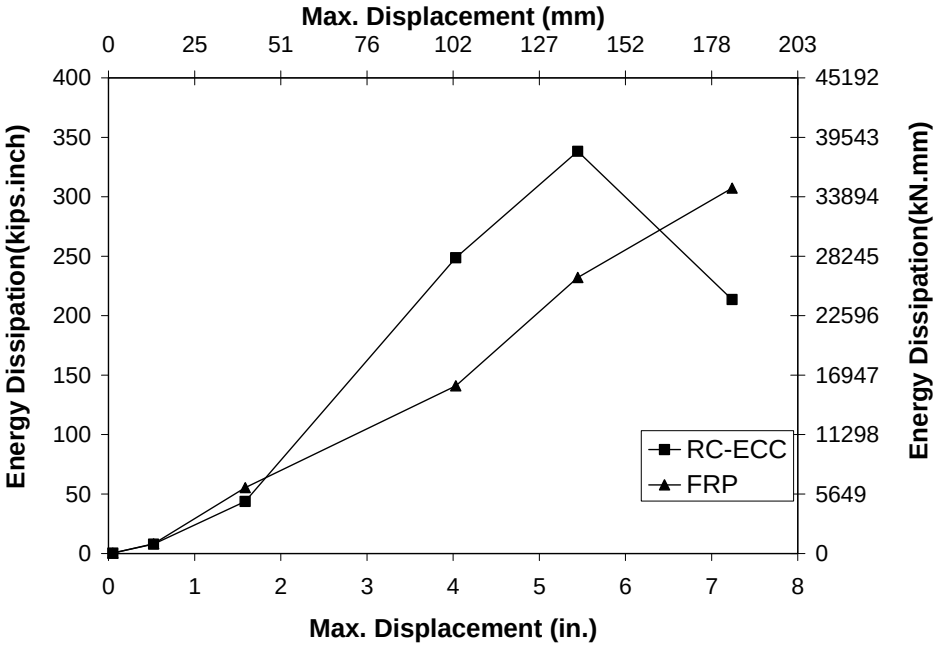
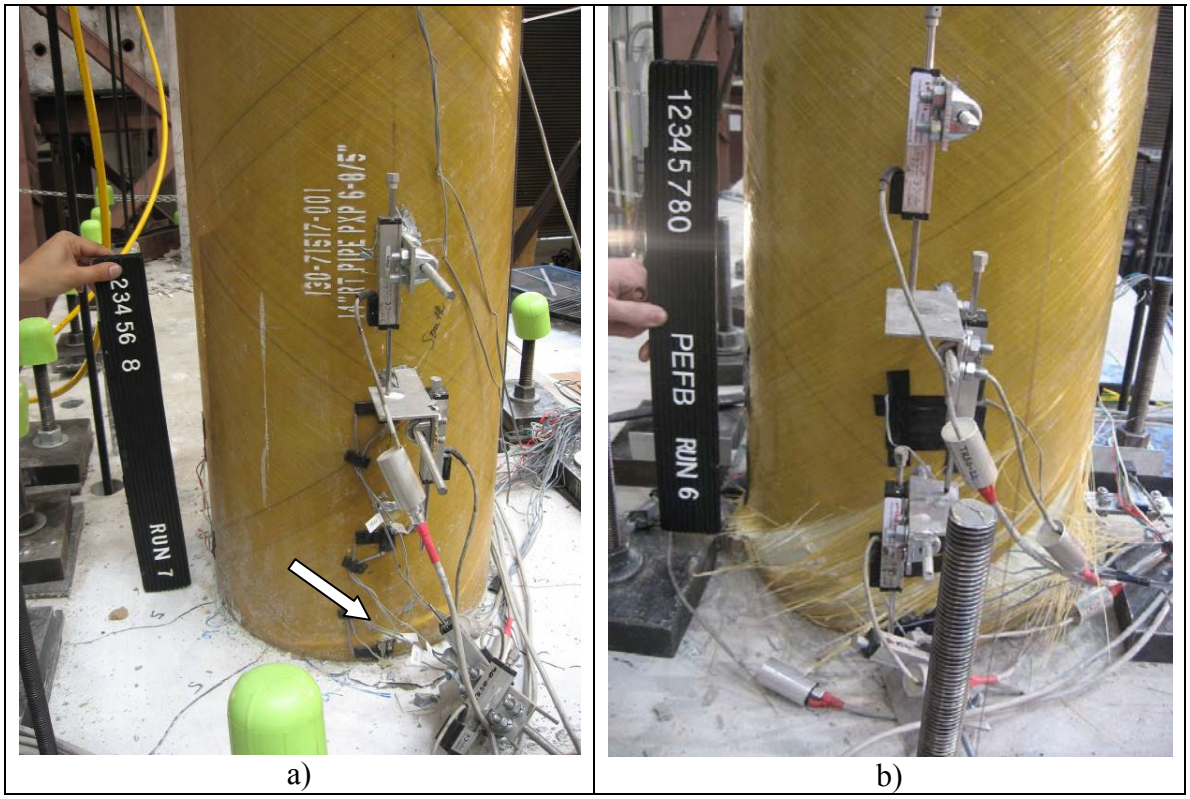
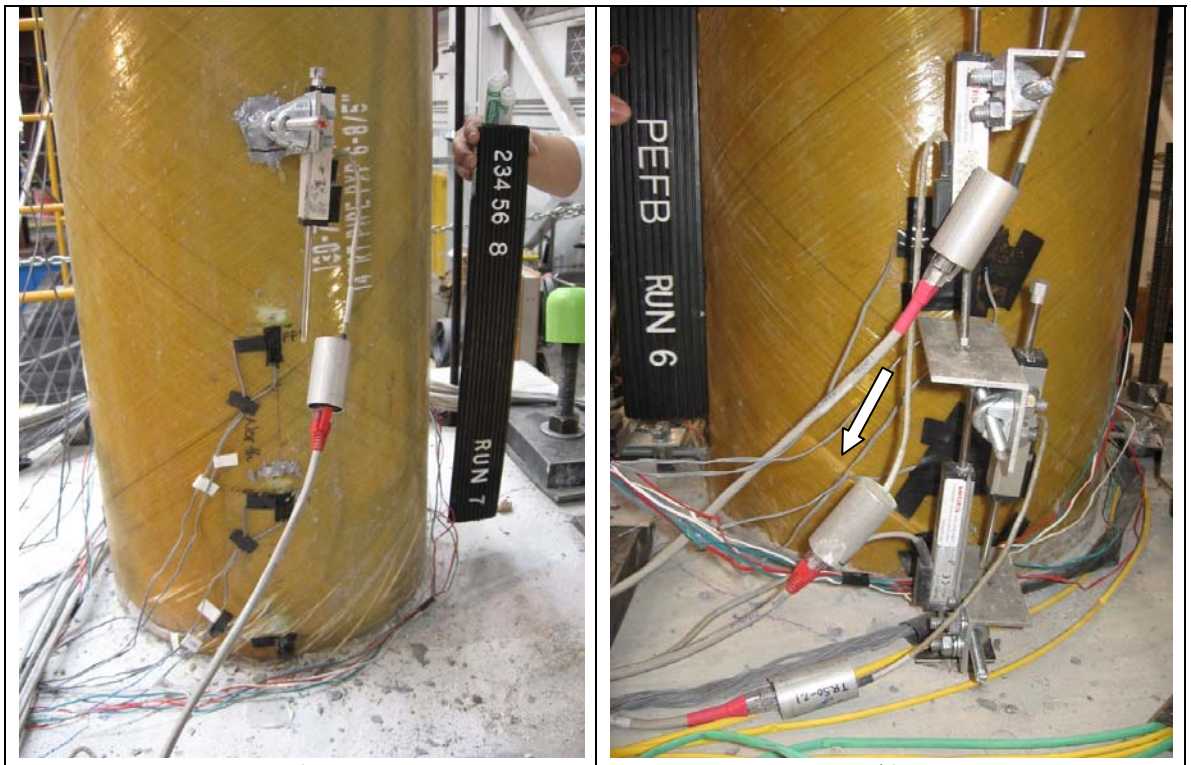


Fig. 4-15. Comparison of Dissipated Energy in RC-ECC and FRP Columns



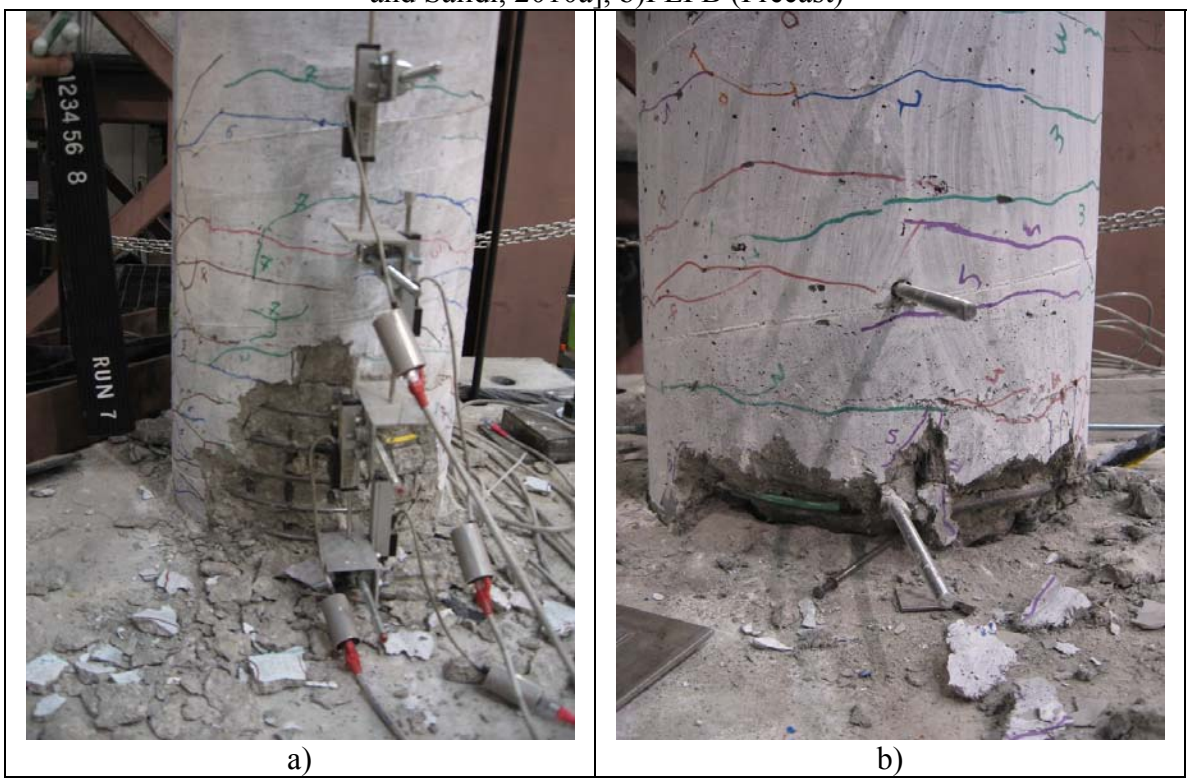
a) b)

Fig. 4-16. Apparent Damage at Failure Point in FRP Columns, South a) PPTC (CIS) [Zaghi and Saiidi, 2010a], b)PEFB (Precast)



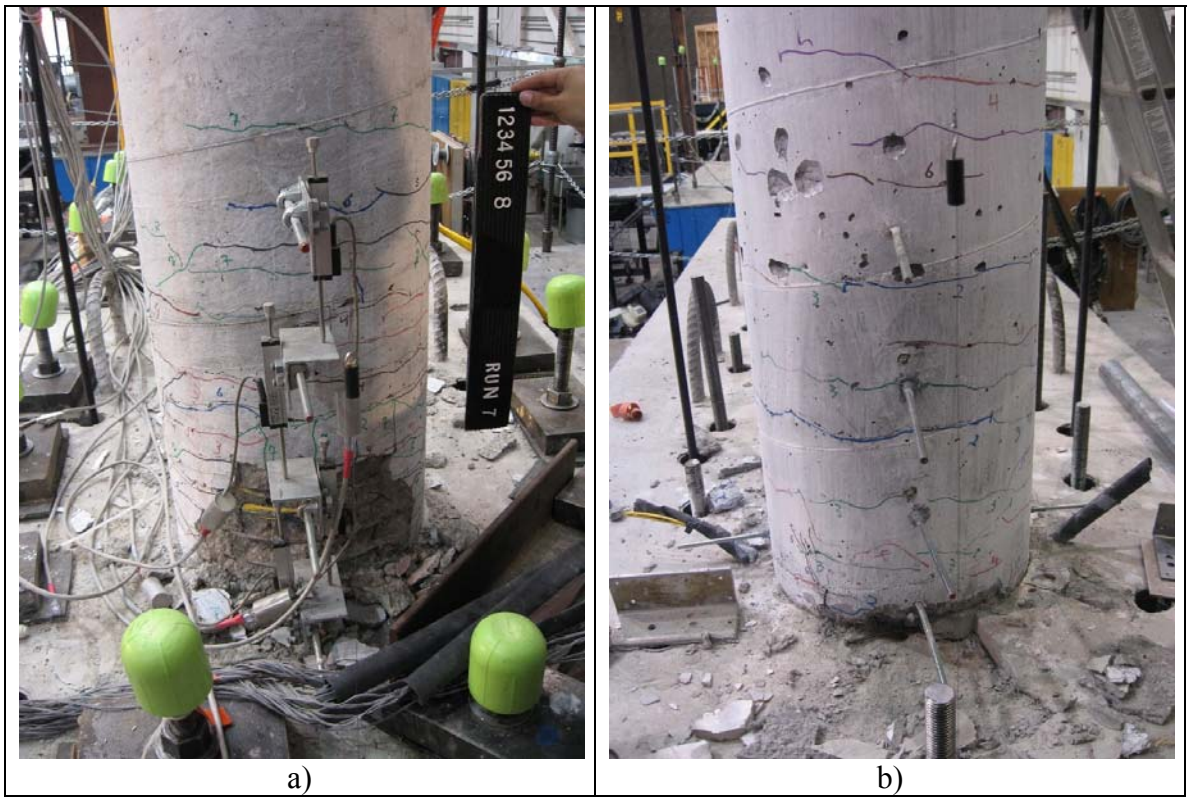
a) b)

Fig. 4-17. Apparent Damage at Failure Point in FRP Columns, North a) PPTC (CIS) [Zaghi and Saiidi, 2010a], b)PEFB (Precast)



a) b)

Fig. 4-18. Apparent Damage at Failure Point in RC and RC-ECC Columns, South a) PPTC (CIS) [Zaghi and Saiidi, 2010a], b)PEFB (Precast)



a) b)

Fig. 4-19. Apparent Damage at Failure Point in RC and RC-ECC Columns, North a) PPTC (CIS) [Zaghi and Saiidi, 2010a], b)PEFB (Precast)

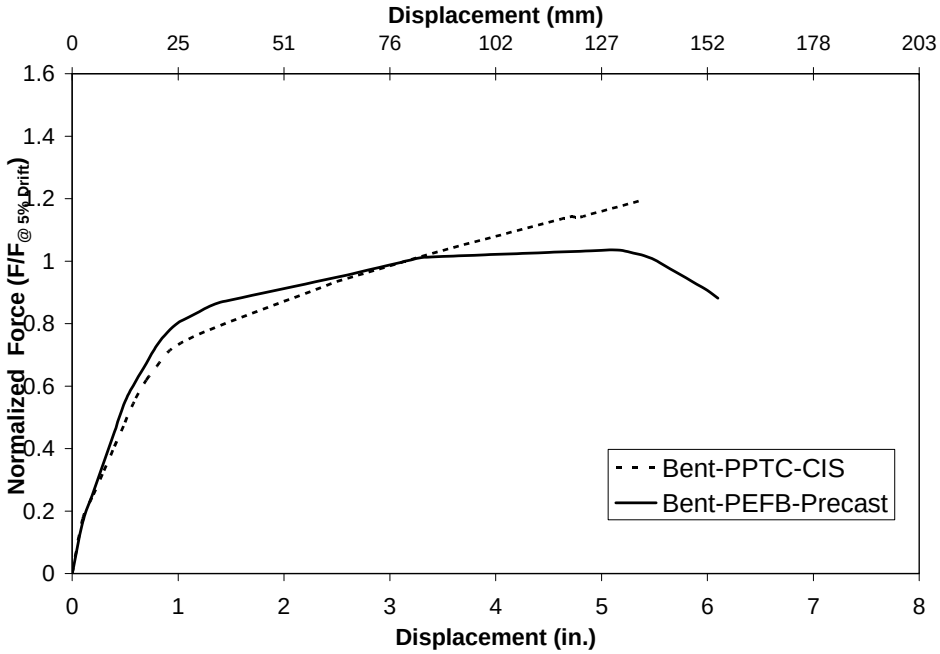


Fig. 4-20. Comparison of Backbone Curves in PEFB and PPTC

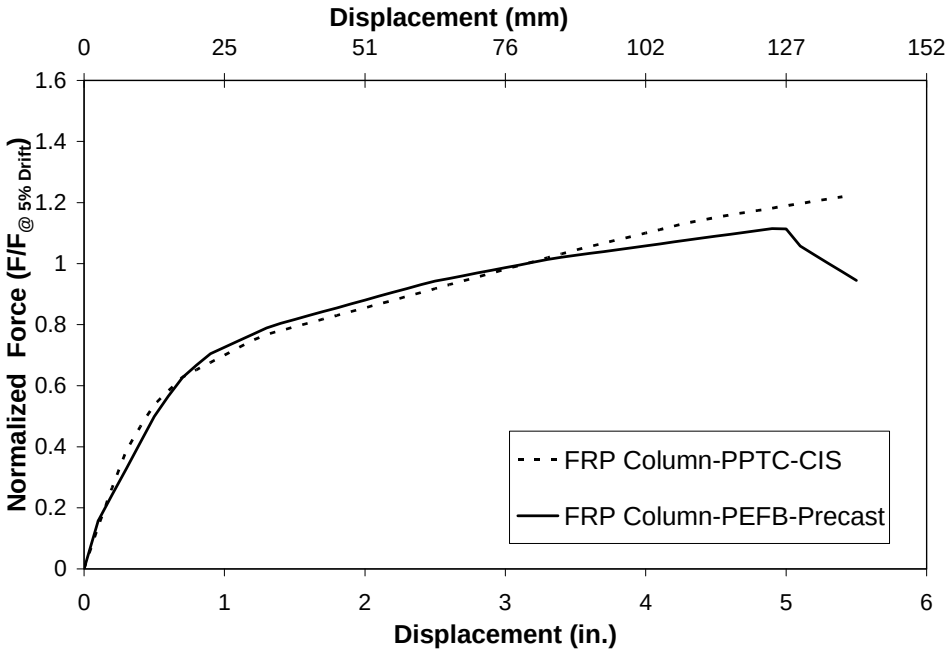


Fig. 4-21. Comparison of Backbone Curves for FRP columns in PEFB and PPTC

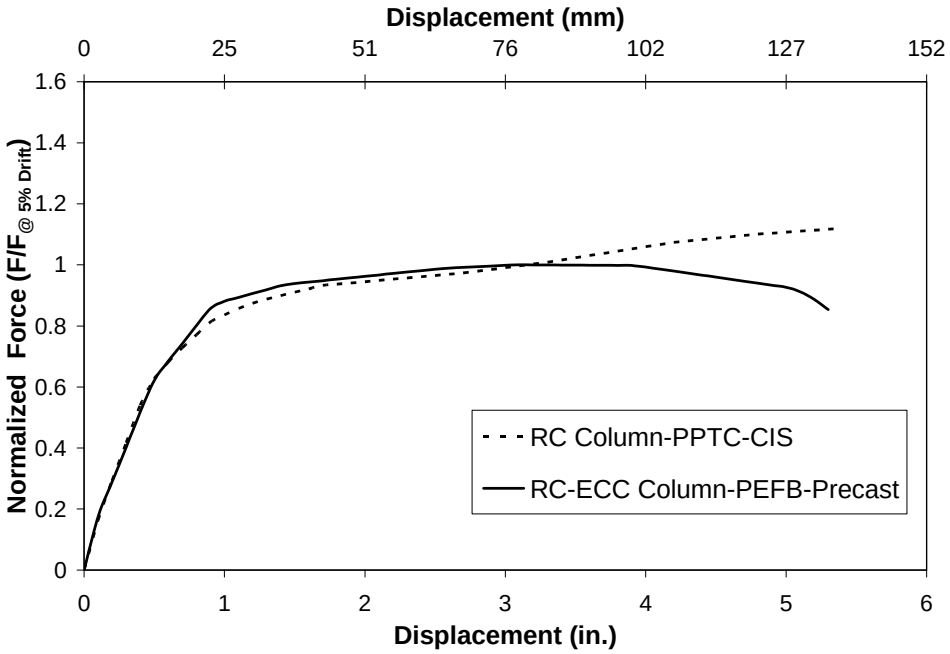


Fig. 4-22. Comparison of Backbone Curves for RC-ECC and RC columns in PEFB and PPTC

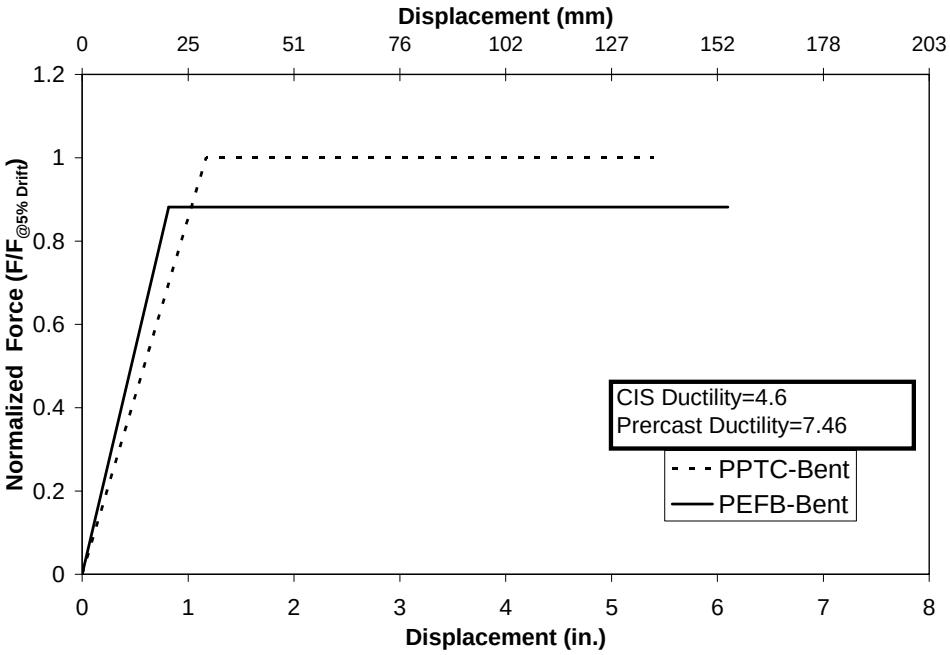


Fig. 4-23. Comparison of Elasto-Plastic Curves in PEFB and PPTC

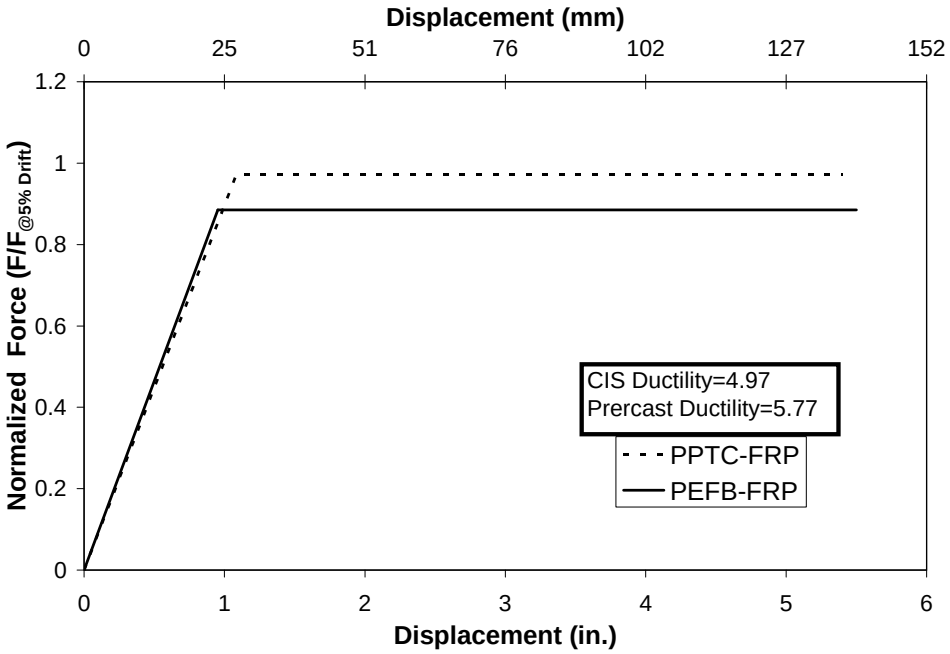


Fig. 4-24. Comparison of Elasto-Plastic Curves for FRP Columns in PEFB and PPTC

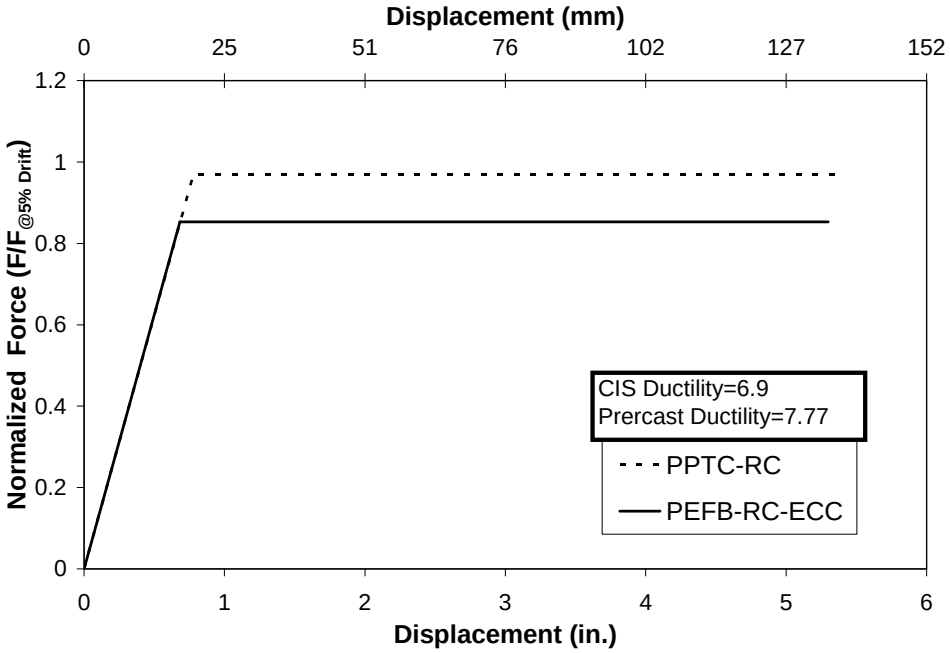


Fig. 4-25. Comparison of Elasto-Plastic Curves for RC-ECC and RC Columns in PEFB and PPTC

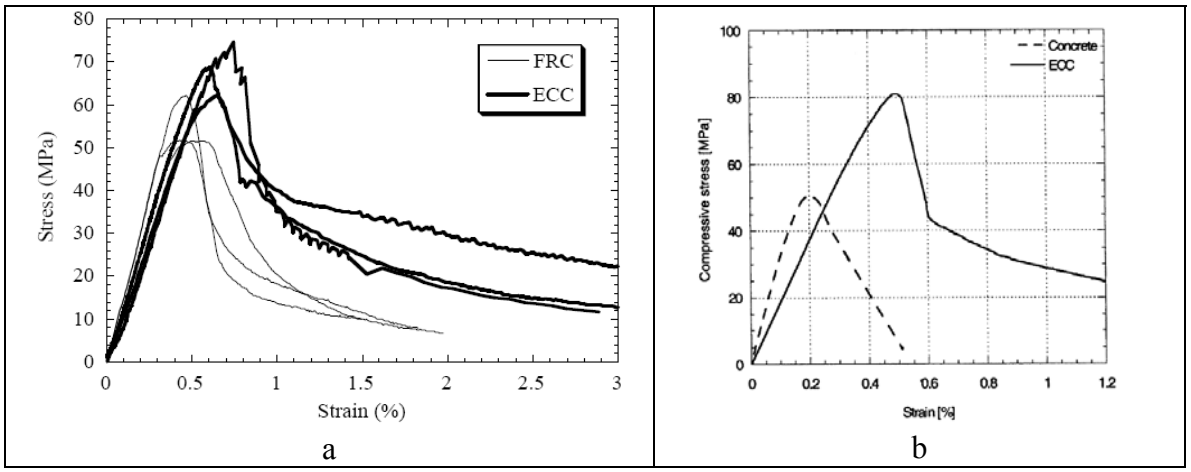


Fig. 5-1. Compression Stress-Strain Curves of ECC [Li, 1998]

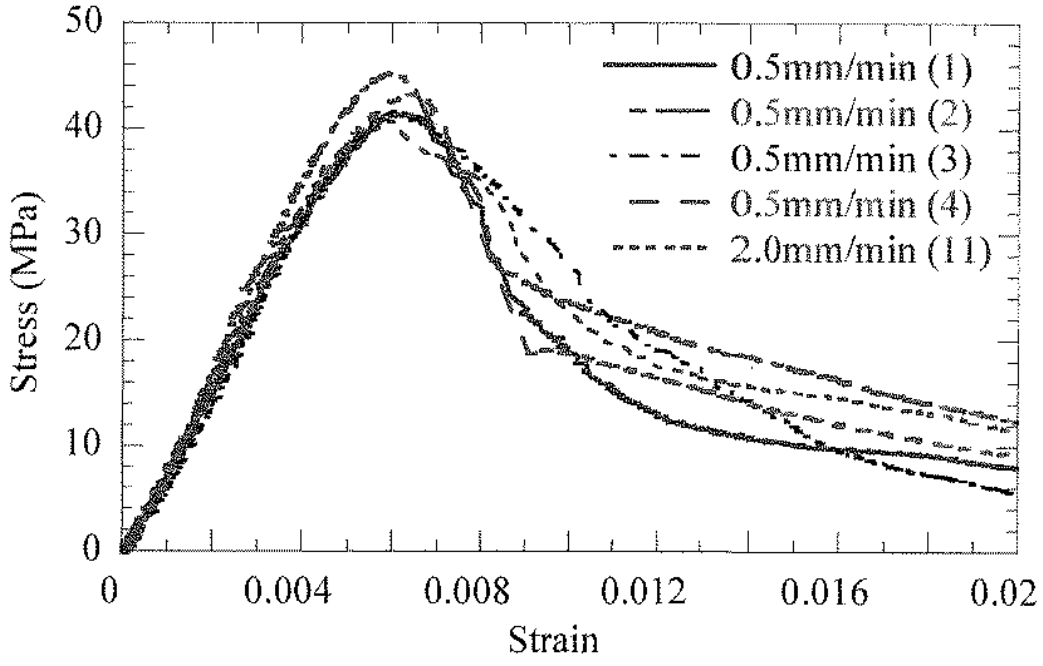


Fig. 5-2. Stress vs. Strain in Monotonic Compression [Zafra, et al., 2010]

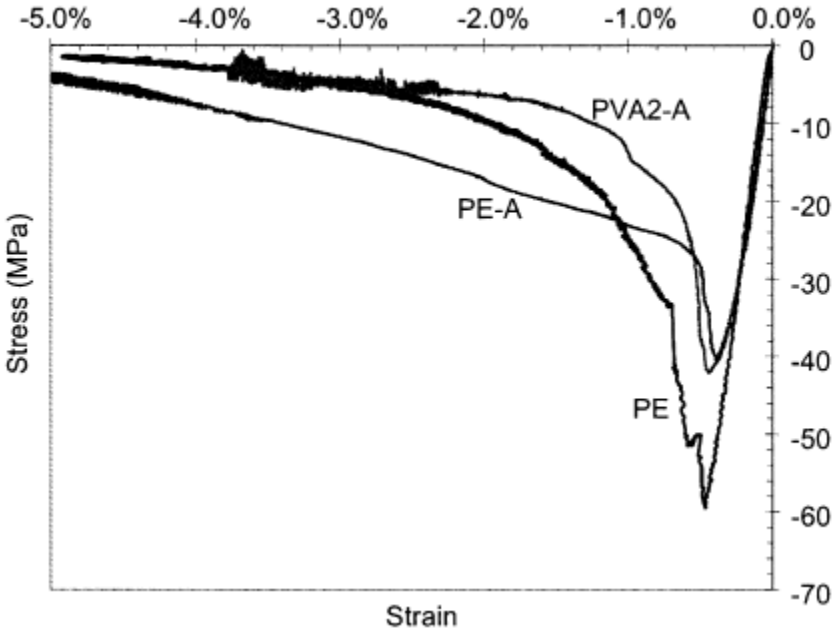


Fig. 5-3. Compressive Response of DFRCC Material with and without Aggregate [Kesner, et al., 2003]

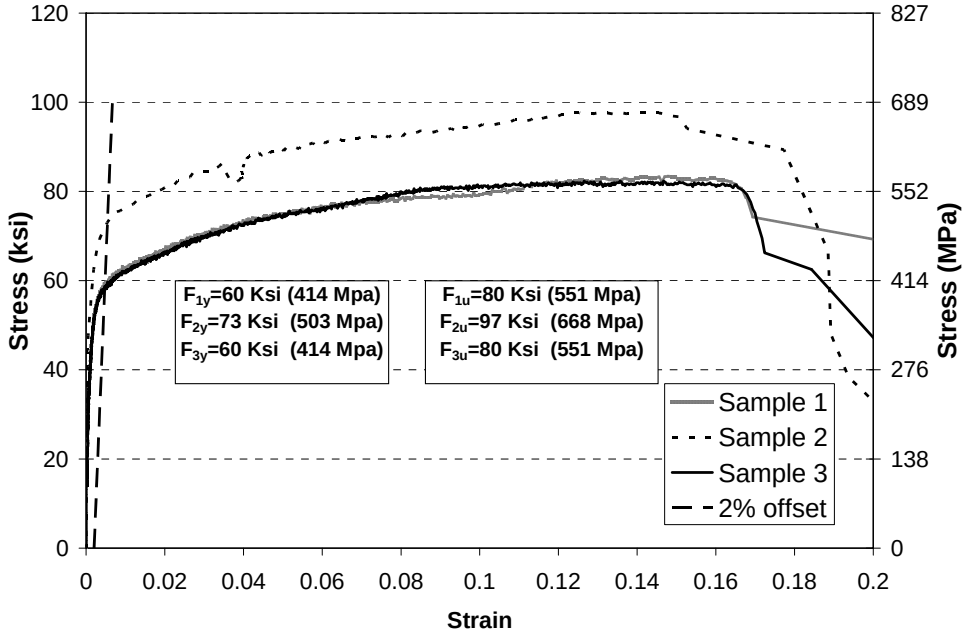


Fig. 5-4. Stress-Strain Curve for 0.135" Diameter Wire Used as Spiral

Fig. 5-5. Testing the Transverse Wires in Tinius Olson Testing Machine

Fig. 5-6. Building the Test Samples Steps a) Rolling the Spirals, b) Adjusting the Spacing, c) Filling with ECC, d) Instrumentation

Fig. 5-7. Test Set up

Fig. 5-8. Alternative Test Set up

Fig. 5-9. ECC Cylinders after Test

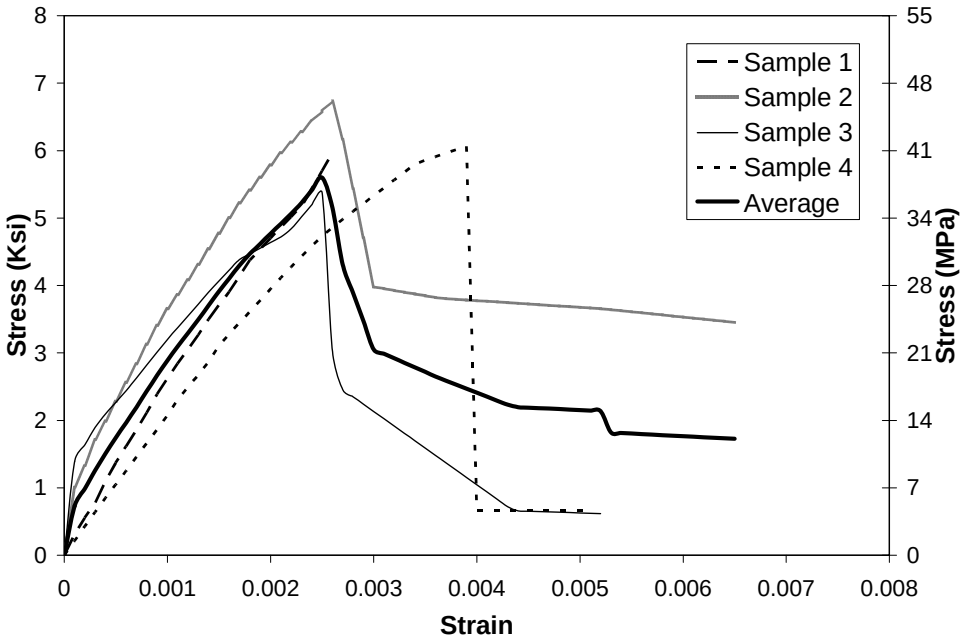


Fig. 5-10. Stress-Strain Curves for Samples with No Confinement

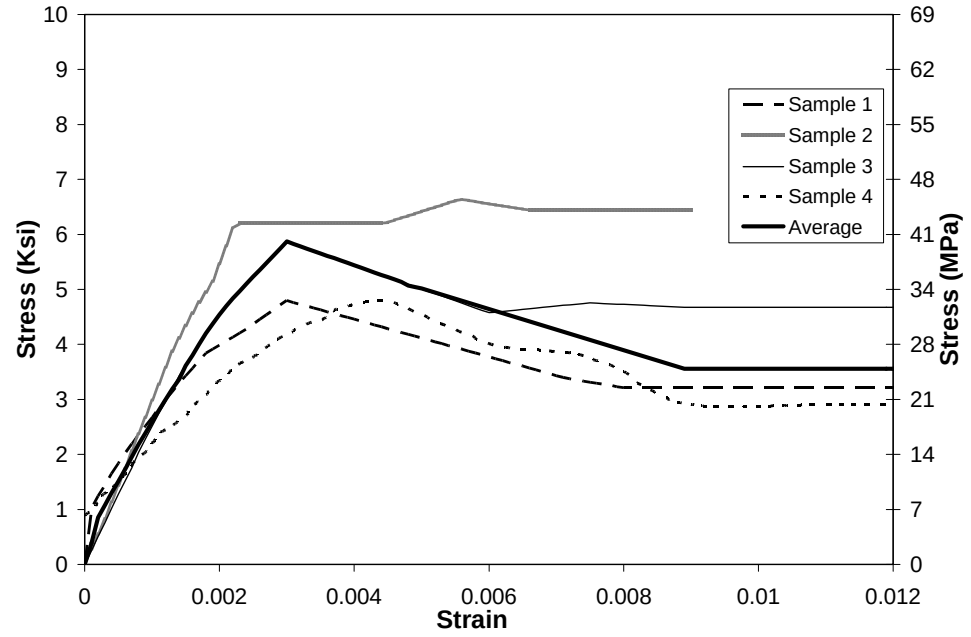


Fig. 5-11. Stress-Strain Curves for Samples with Spirals Spaced @ 2 in. (51 mm)

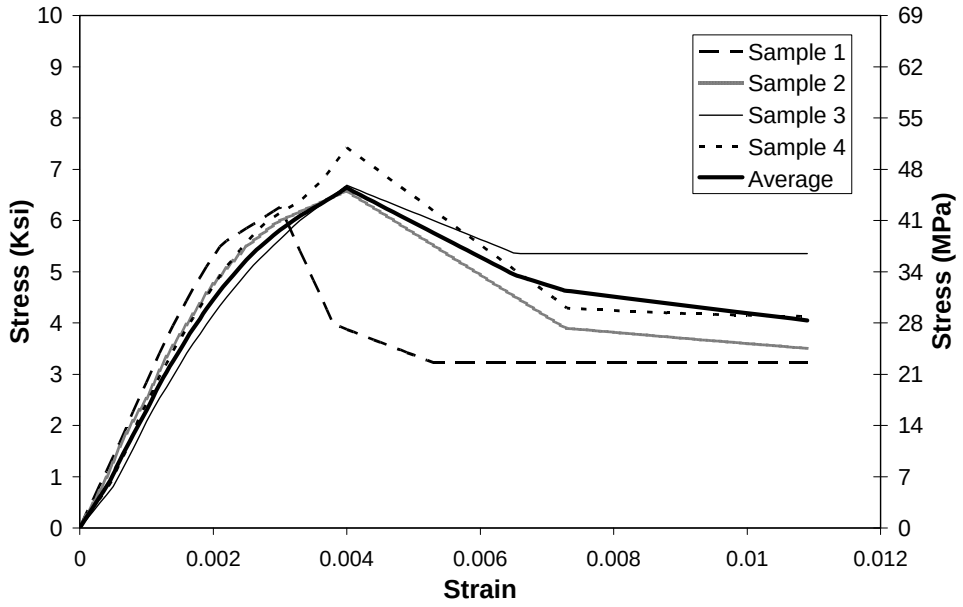


Fig. 5-12. Stress-Strain Curves for Samples with Spirals Spaced @ 1.5 in. (38 mm)

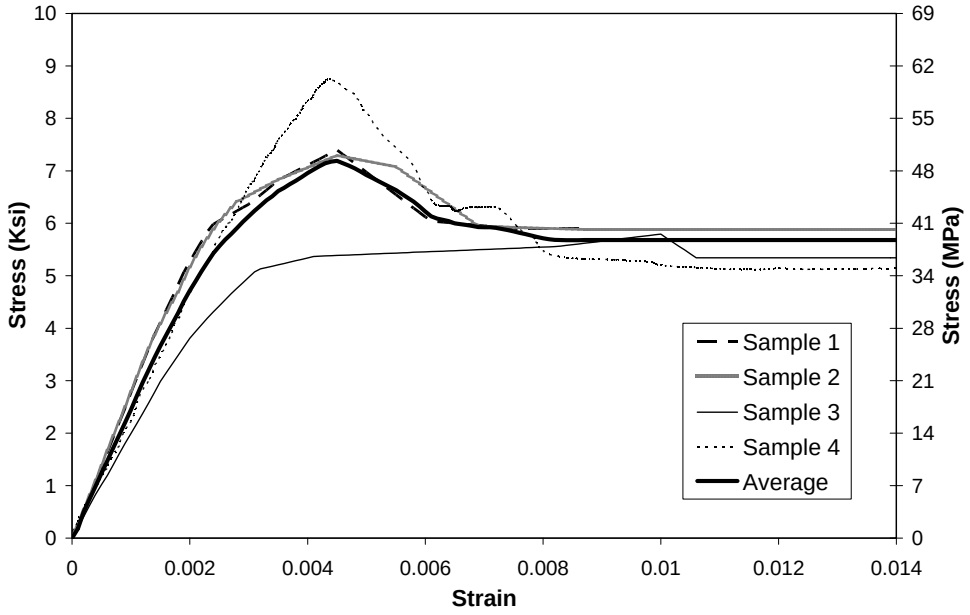


Fig. 5-13. Stress-Strain Curves for Samples with Spirals Spaced @ 1 in. (25 mm)

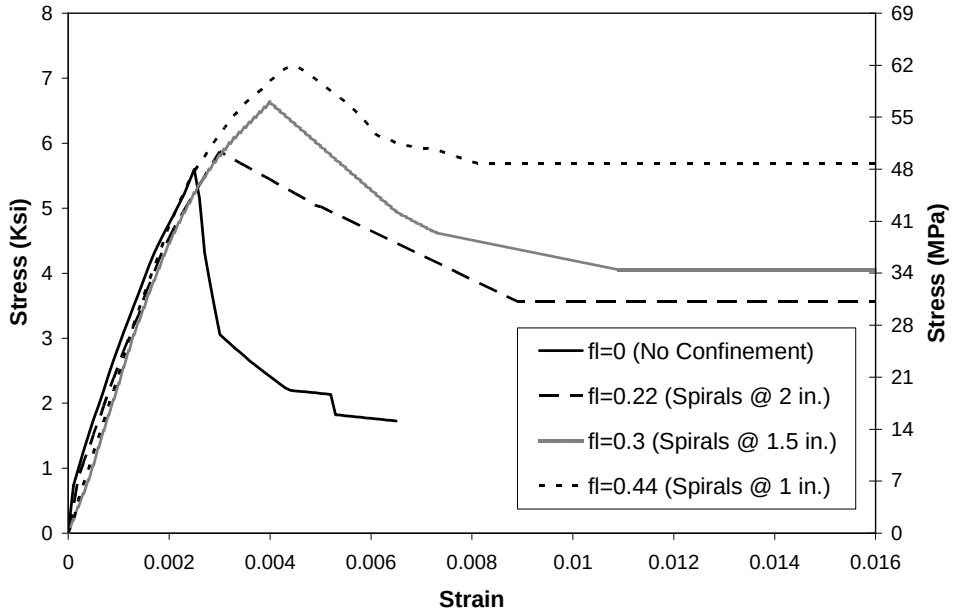


Fig. 5-14. Comparison of Samples with Different Confinement

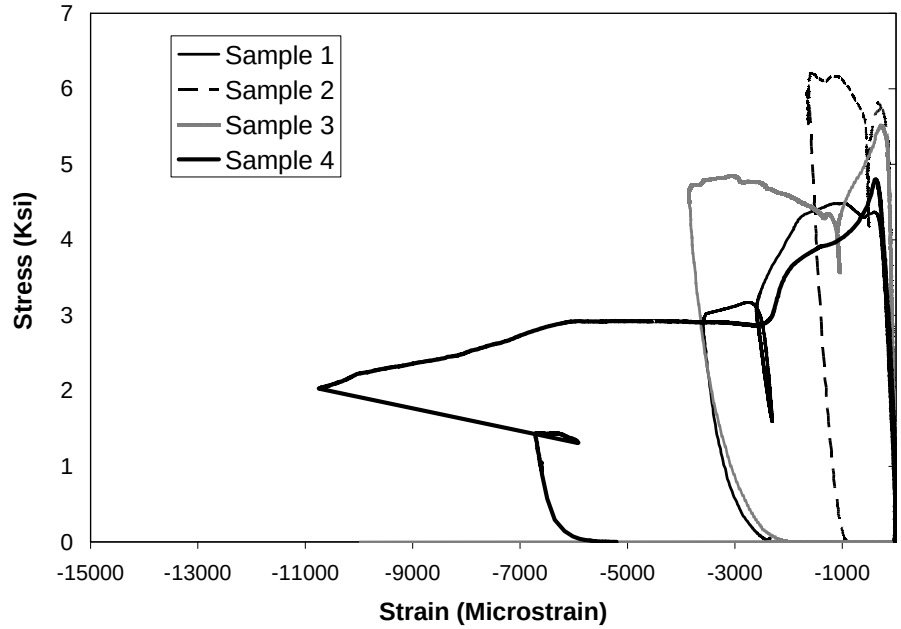


Fig. 5-15. Spirals Strain vs. Compressive Stress for Spacing @ 2 in. (51 mm)

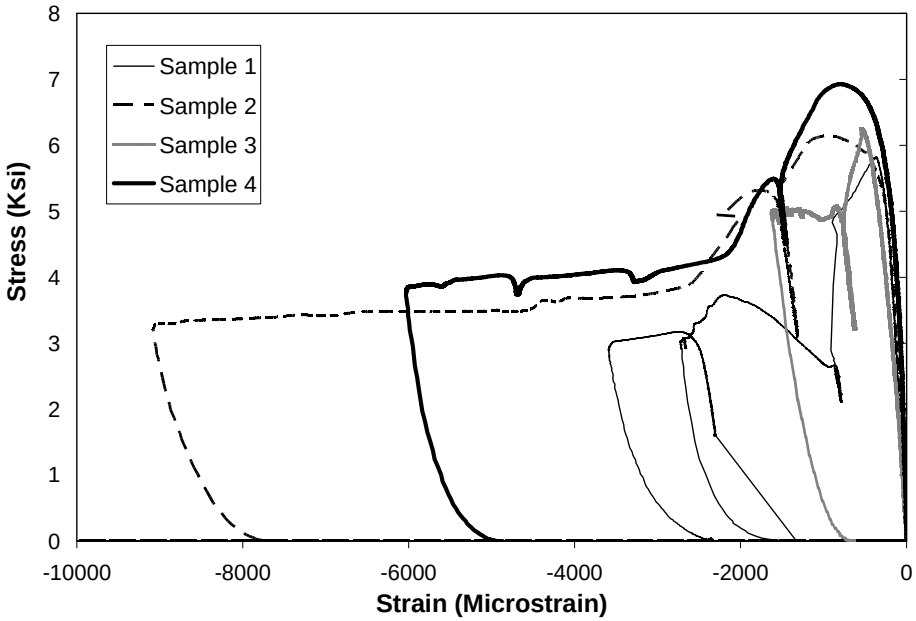


Fig. 5-16. Spirals Strain vs. Compressive Stress for Spacing @ 1.5 in. (38 mm)

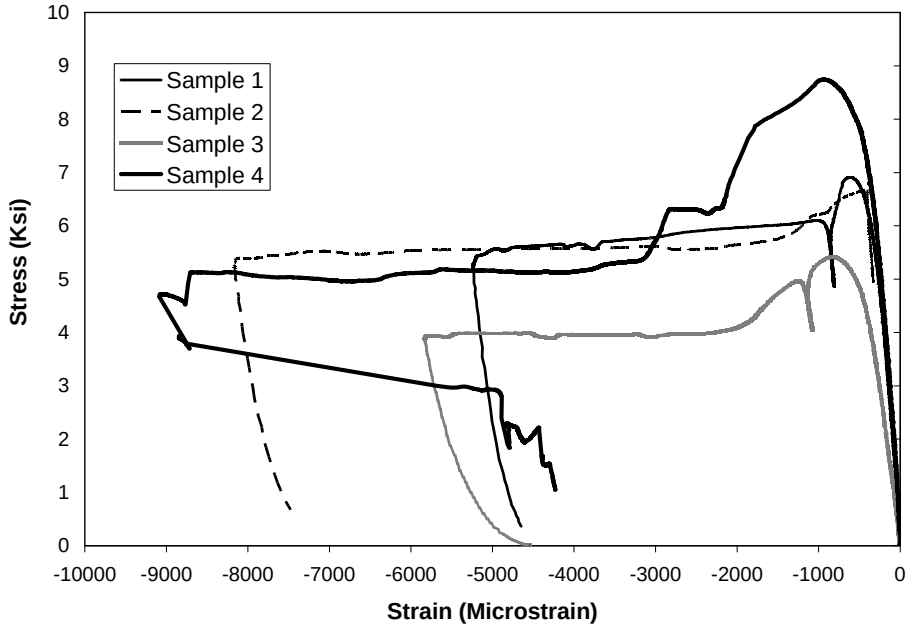


Fig. 5-17. Spirals strain vs. compressive stress for spacing @ 1 in. (25 mm)

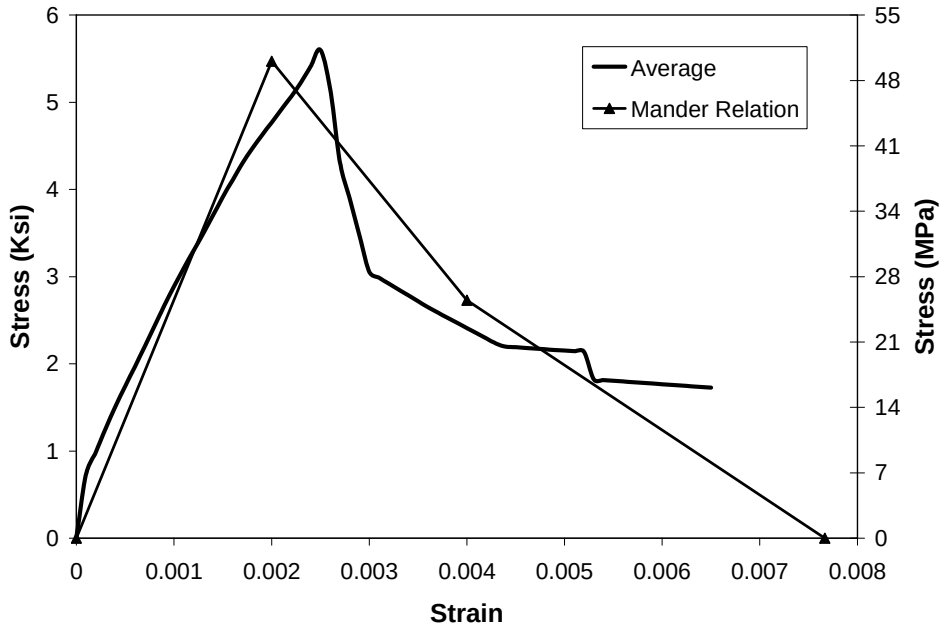


Fig. 5-18. Stress-Strain Curves in Unconfined ECC and Mander's Model for Unconfined

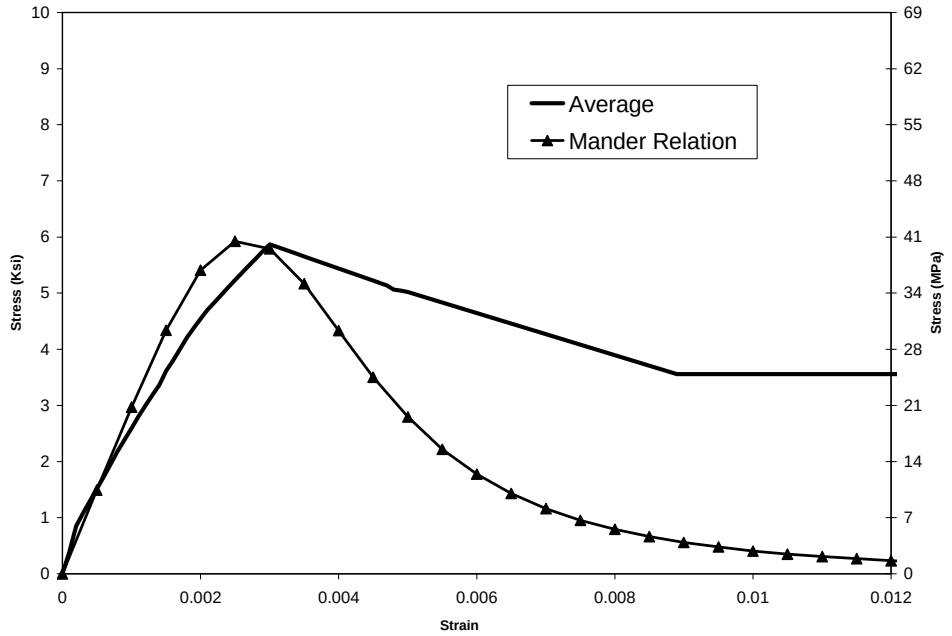


Fig. 5-19. Stress-Strain Curves in Confined ECC and Mander's Model for Spirals Spaced @ 2 in. (51 mm)

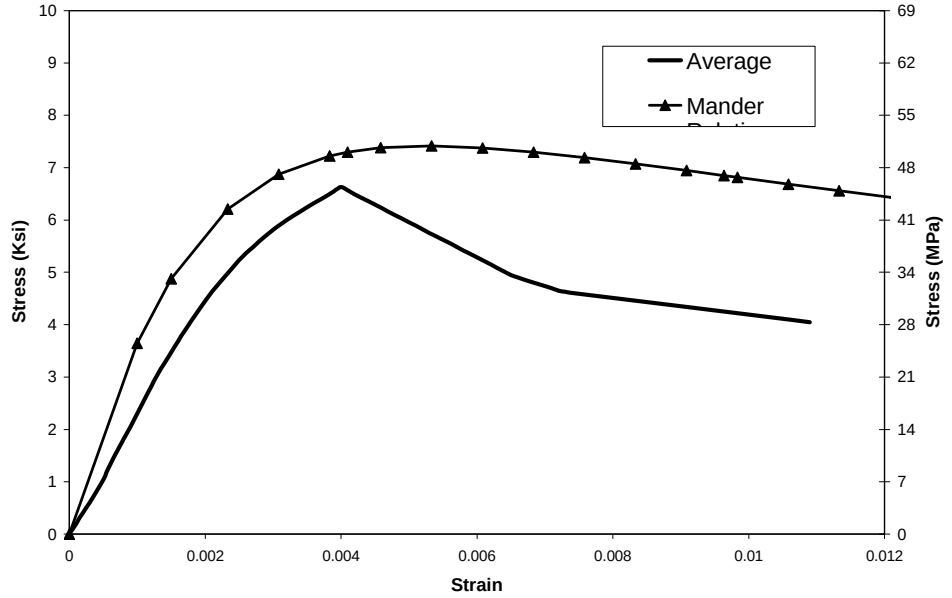


Fig. 5-20. Stress-Strain Curves in Confined ECC and Mander's Model for Spirals Spaced @ 1.5 in. (38 mm)

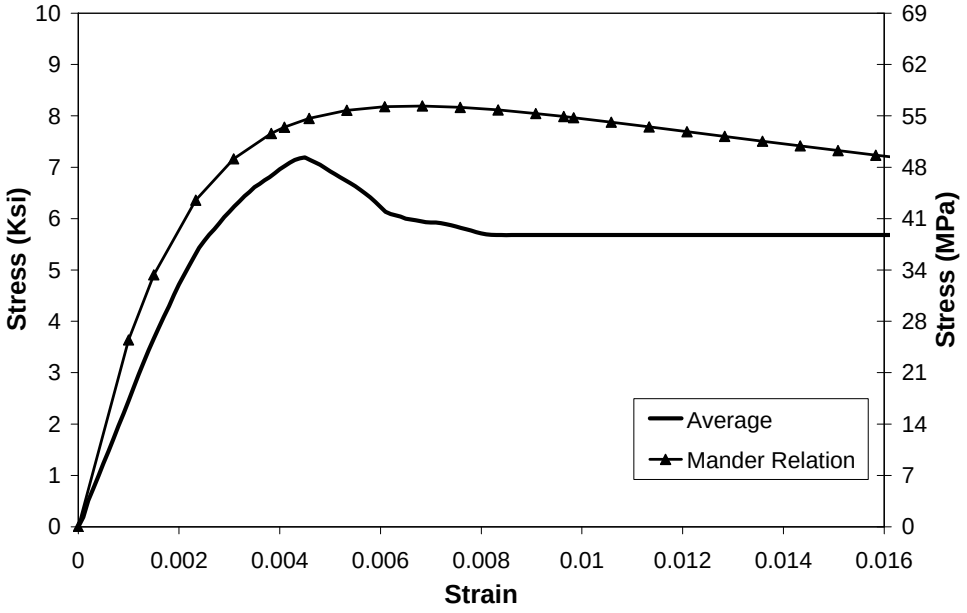


Fig. 5-21. Stress-Strain Curves in Confined ECC and Mander's Model for Spirals Spaced @ 1.0 in. (25 mm)

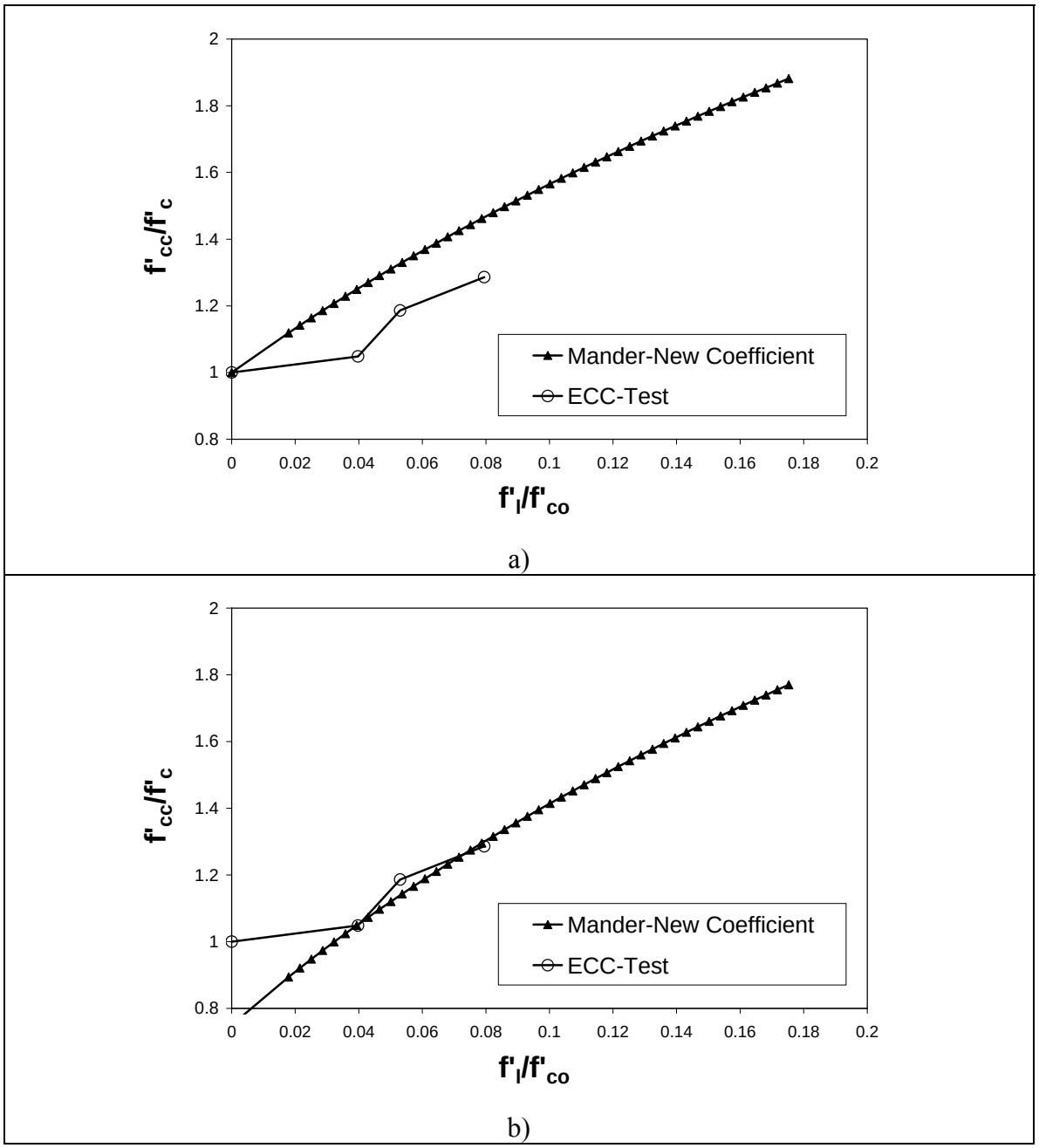


Fig. 5-22. Mander's Model for the Maximum Confined Strength a) Original b) After Adjustment

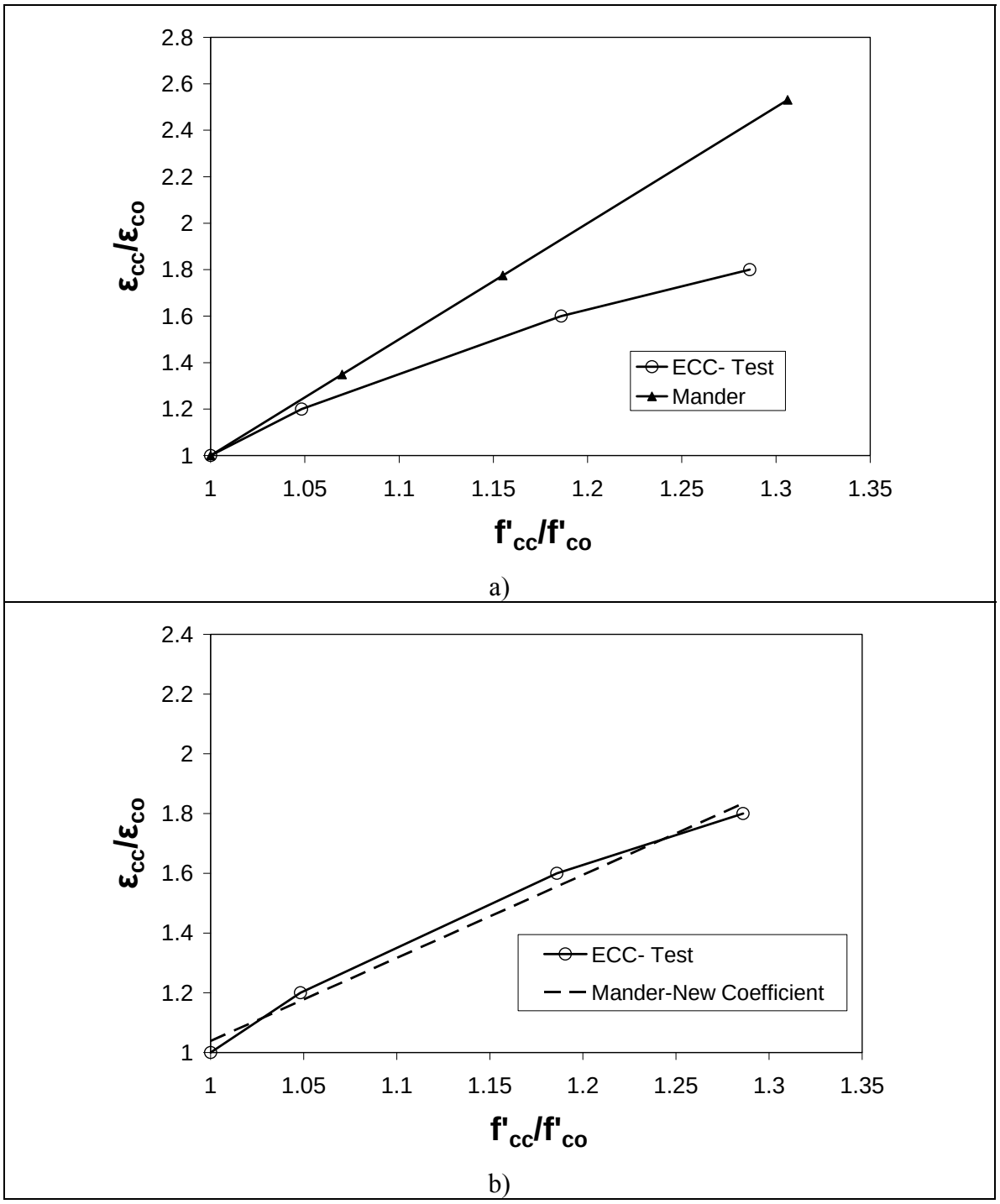


Fig. 5-23. Mander's Model for the Strain at Maximum Confined Strength a) Original b) After Adjustment

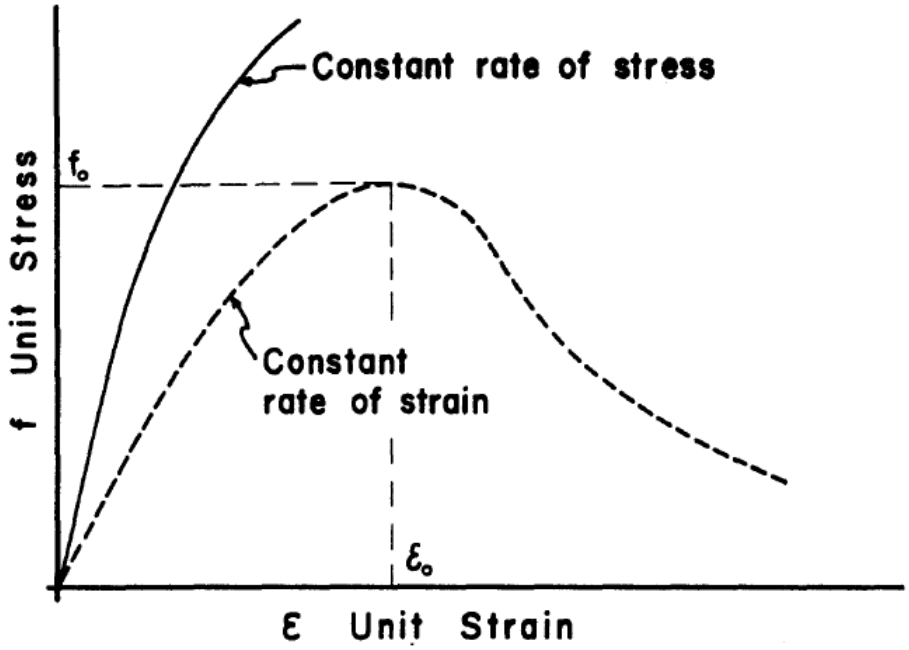


Fig. 5-24. General Stress-Strain Curve by Popovics [Popovics, 1973]

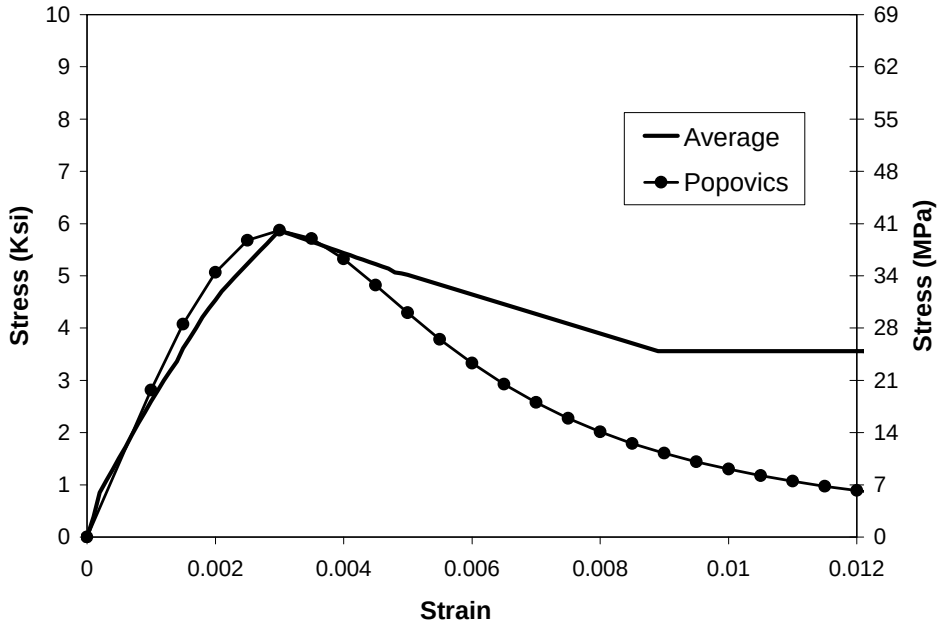


Fig. 5-25. Correlation between Popovics' Stress- Strain Curve and Confined ECC with Spirals Spaced @ 2 in. (51 mm)

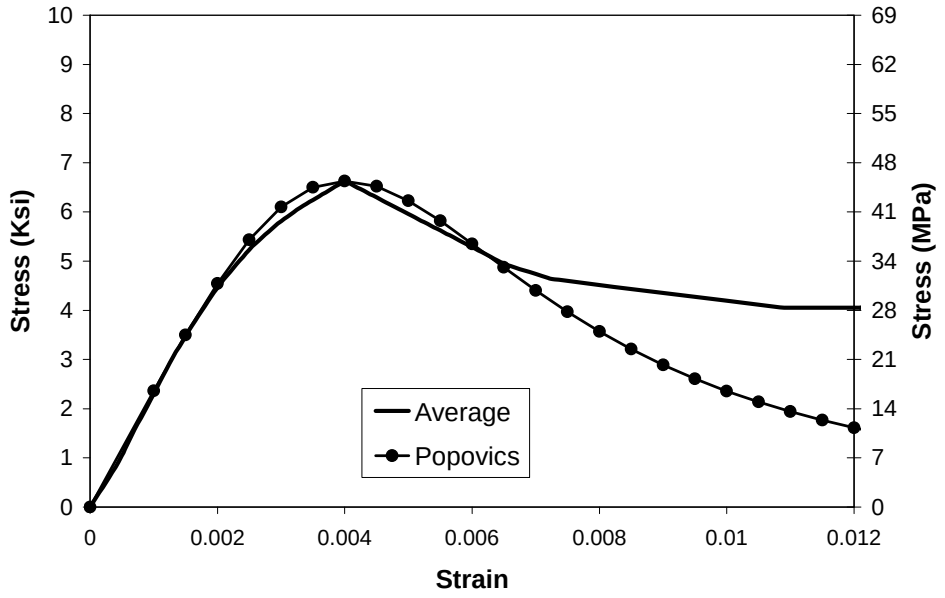


Fig. 5-26. Correlation between Popovics' Stress- Strain Curve and Confined ECC with Spirals Spaced @ 1.5 in. (38 mm)

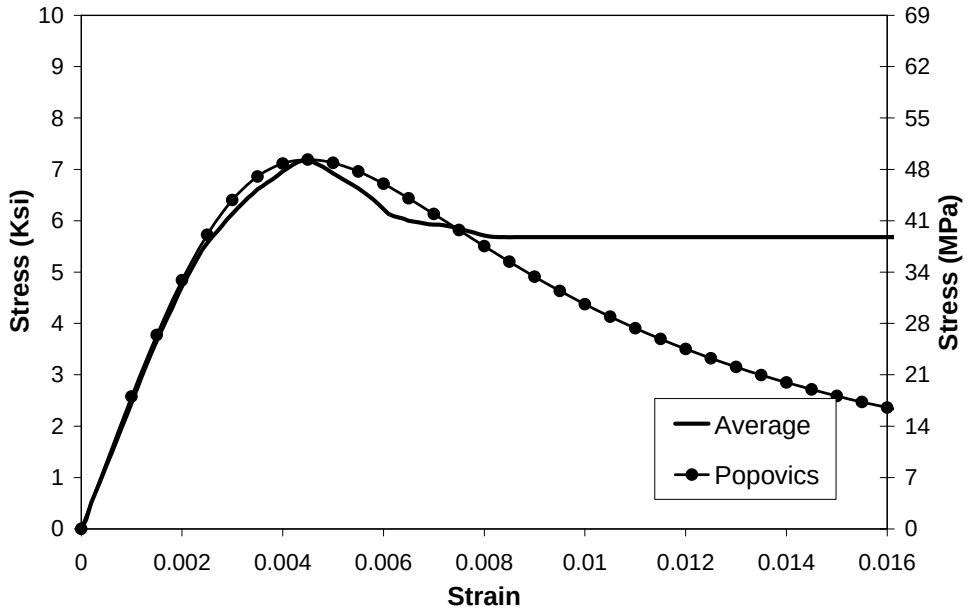


Fig. 5-27. Correlation between Popovics' Stress- Strain Curve and Confined ECC with Spirals Spaced @ 1 in. (25 mm)

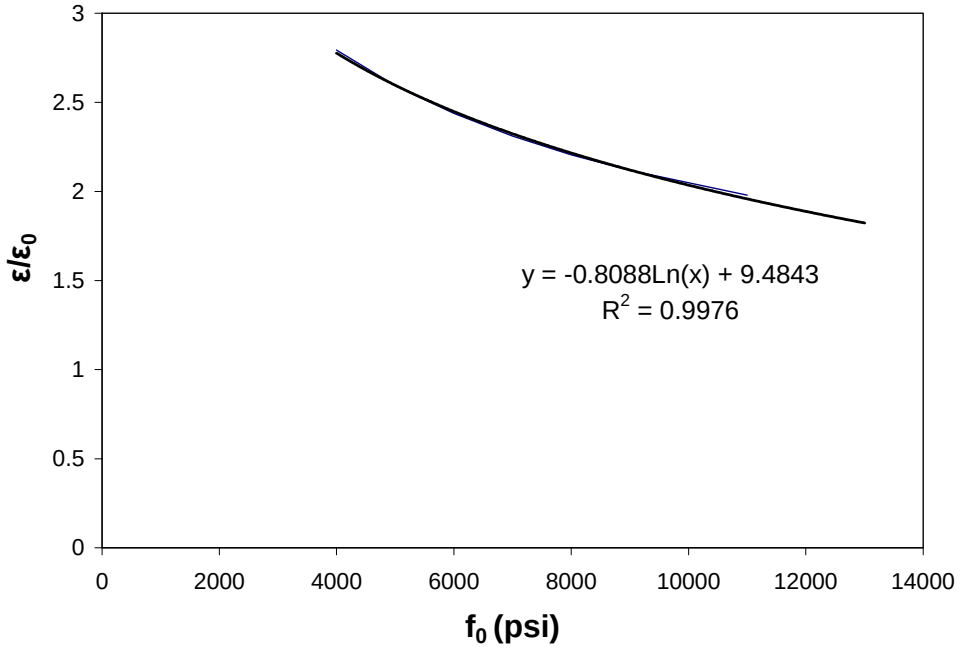


Fig. 5-28. Maximum Strength f_0 and Strain ε Relation

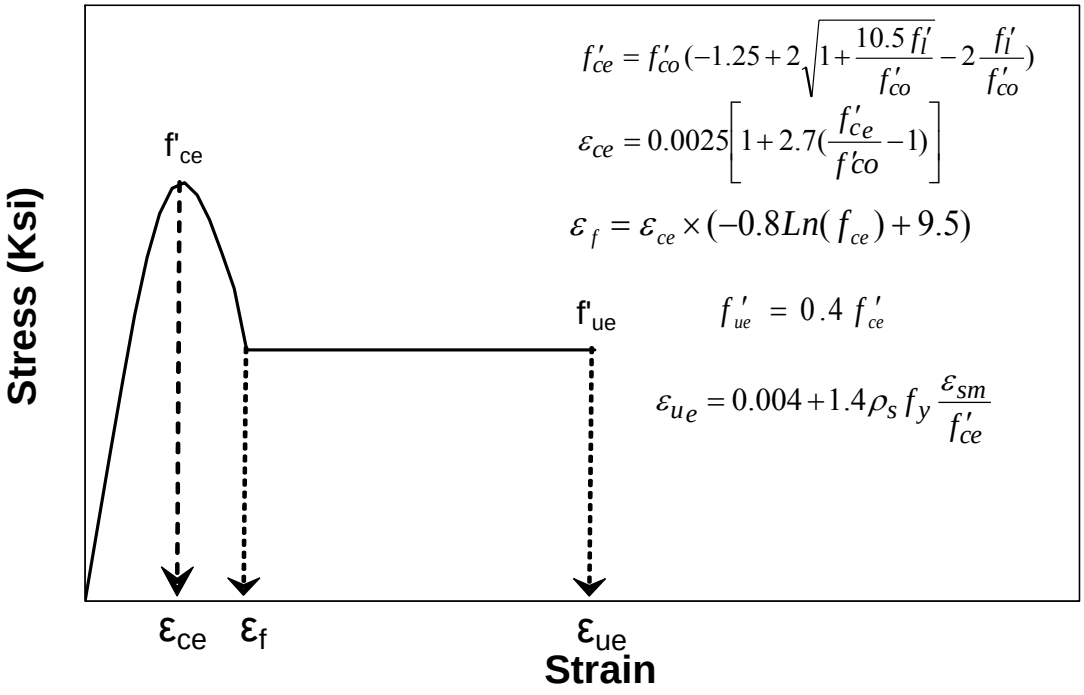
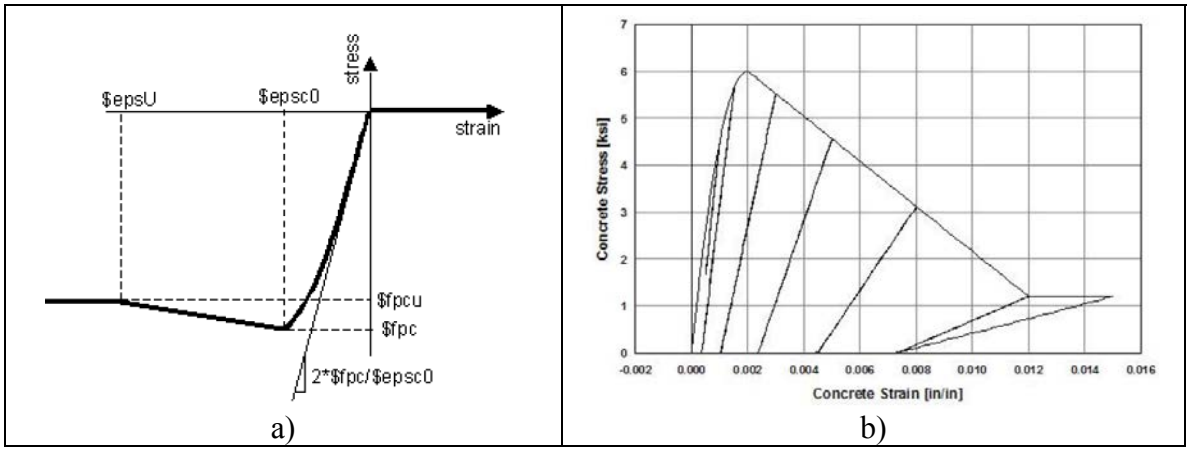
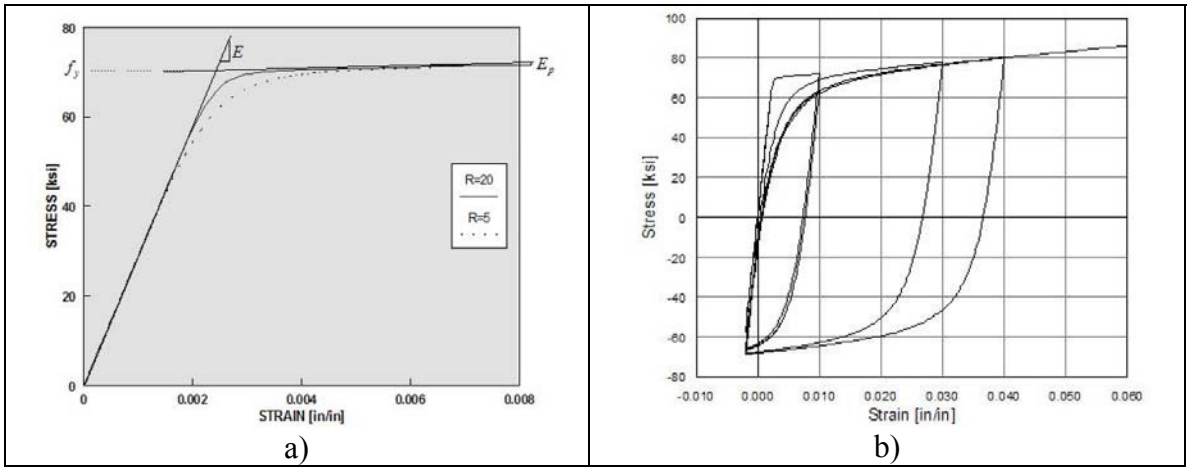


Fig. 5-29. Confined ECC Stress-Strain Relationships Parameters



a) b)

Fig. 6-1. Uniaxial Material Concrete01 in OpenSees a) Material Parameters b) Typical Hysteretic Stress-Strain Relation, [OpenSees Manual, 2005]



a) b)

Fig. 6-2. Uniaxial Material Steel02 in OpenSees a) Material Parameters b) Typical Hysteretic Stress-Strain Relation, [OpenSees Manual, 2005]

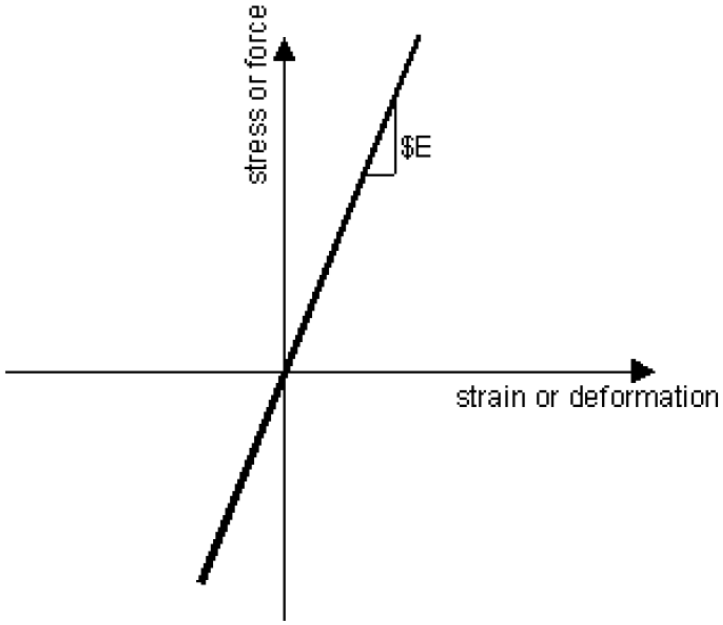


Fig. 6-3. Uniaxial Material Elastic in OpenSees, [OpenSees Manual, 2005]

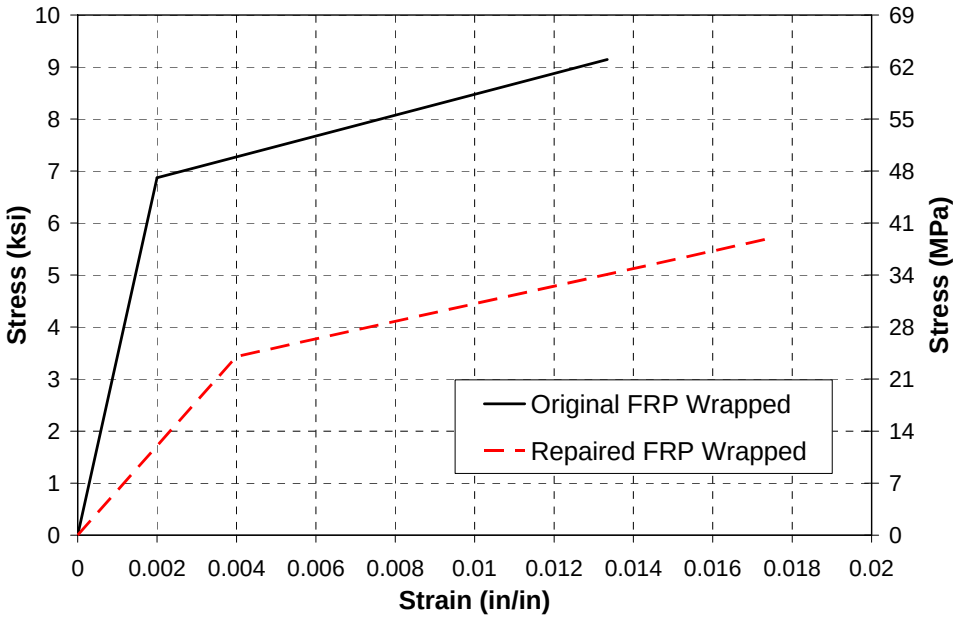


Fig. 6-4. Stress-Strain Curve of Confined Concrete with FRP in SC-2R

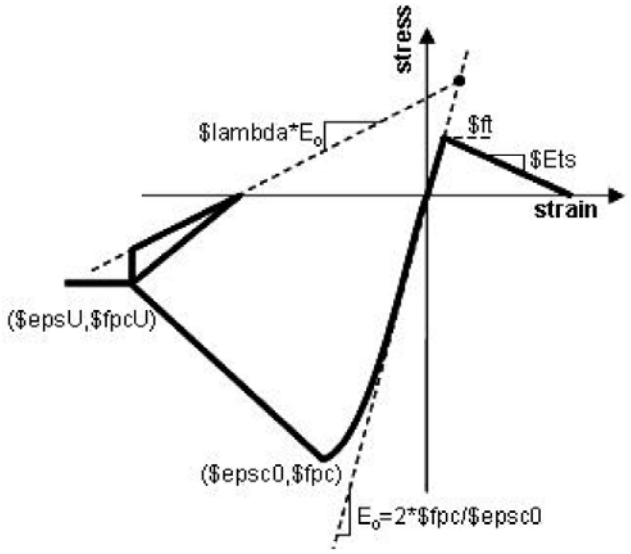


Fig. 6-5. Uniaxial Material Concrete02 in OpenSees, [OpenSees Manual, 2005]

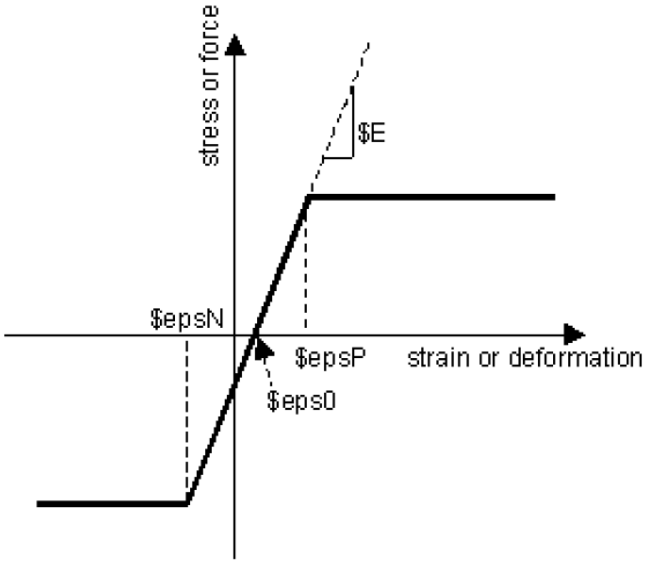


Fig. 6-6. Uniaxial Material ElasticPP (Elastic-Perfectly Plastic) in OpenSees, [OpenSees Manual, 2005]

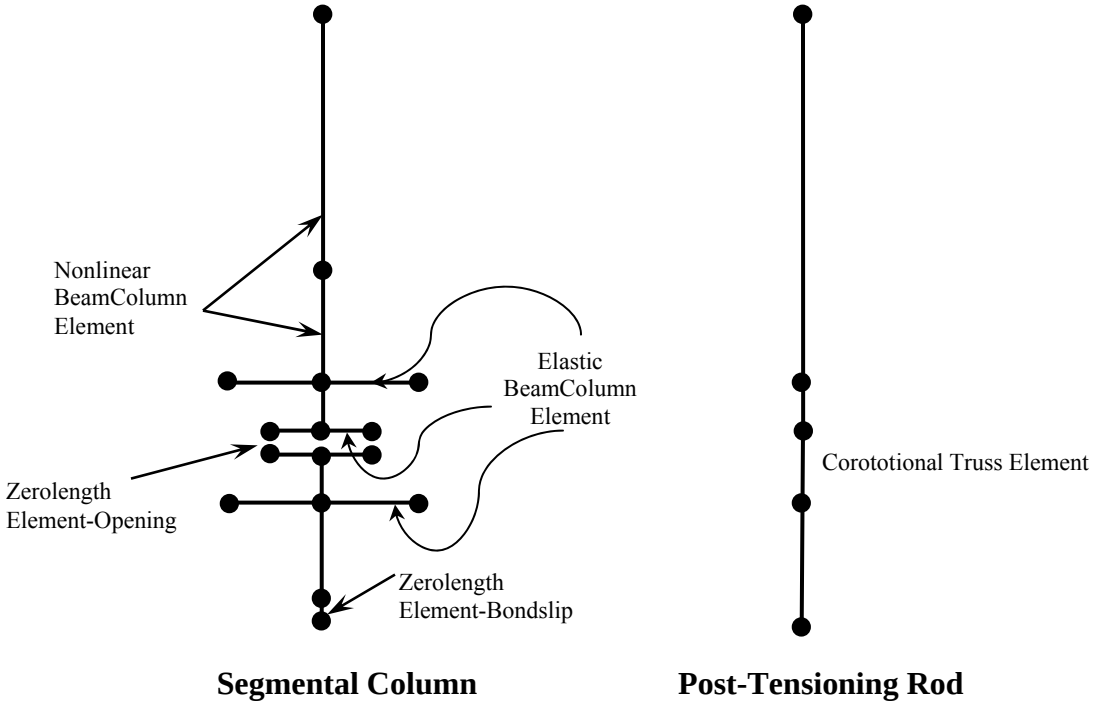


Fig. 6-7. Schematic Analytical Model for Segmental Columns

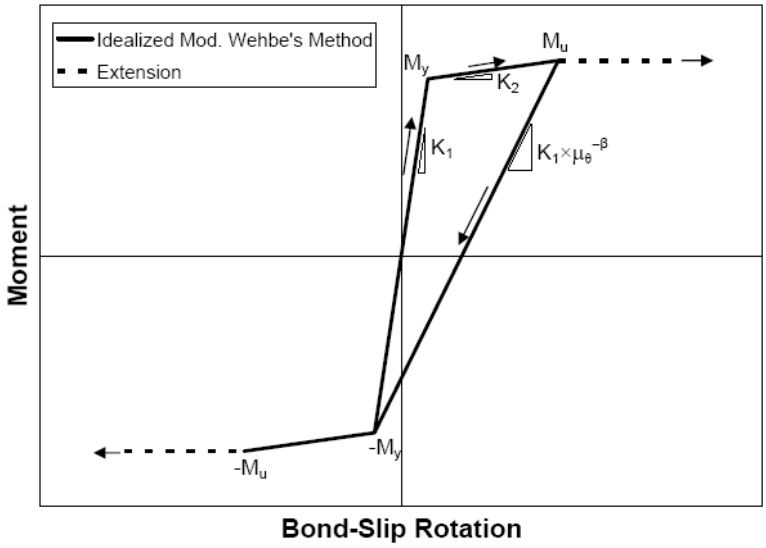


Fig. 6-8. Hysteresis Model for Bond-Slip Rotation and Moment Relationship, [Vossoghi and Saiidi, 2010]

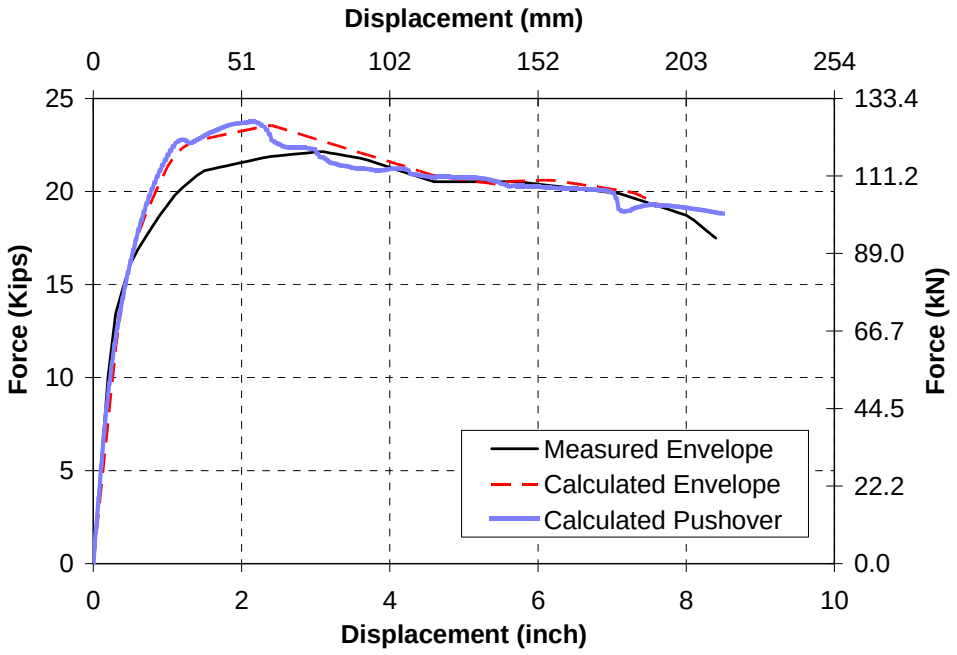


Fig. 6-9. Pushover and Average Backbone Curves of SC-2

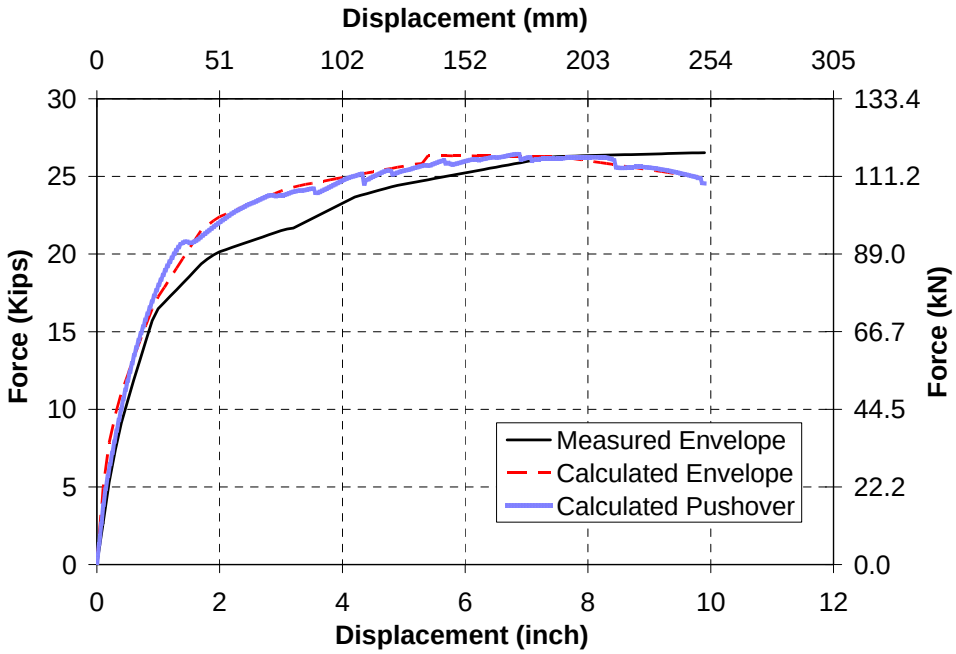


Fig. 6-10. Pushover and Average Backbone Curves of SBR-1

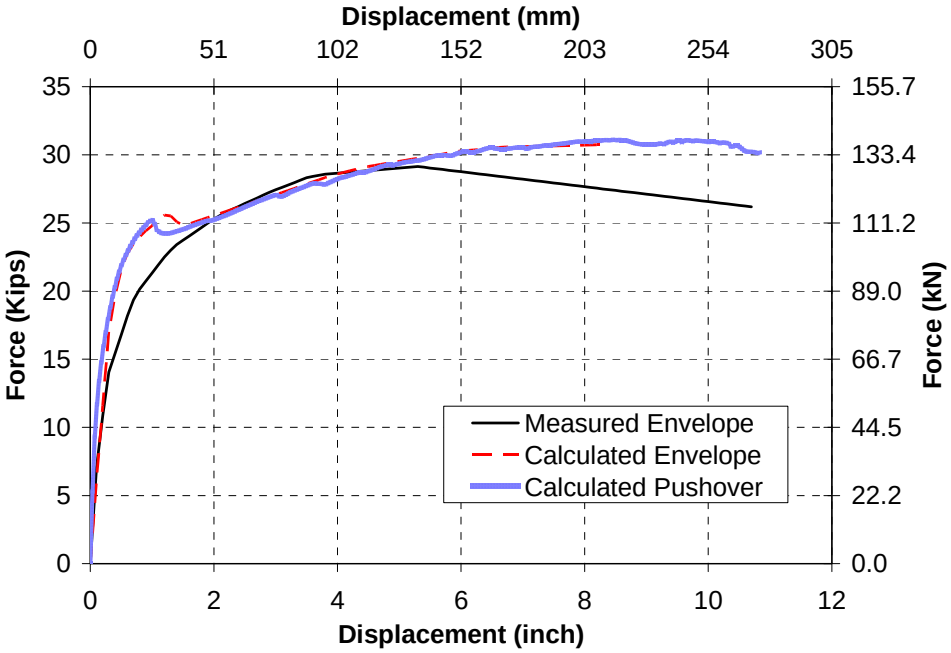


Fig. 6-11. Pushover and Average Backbone Curves of SF-2

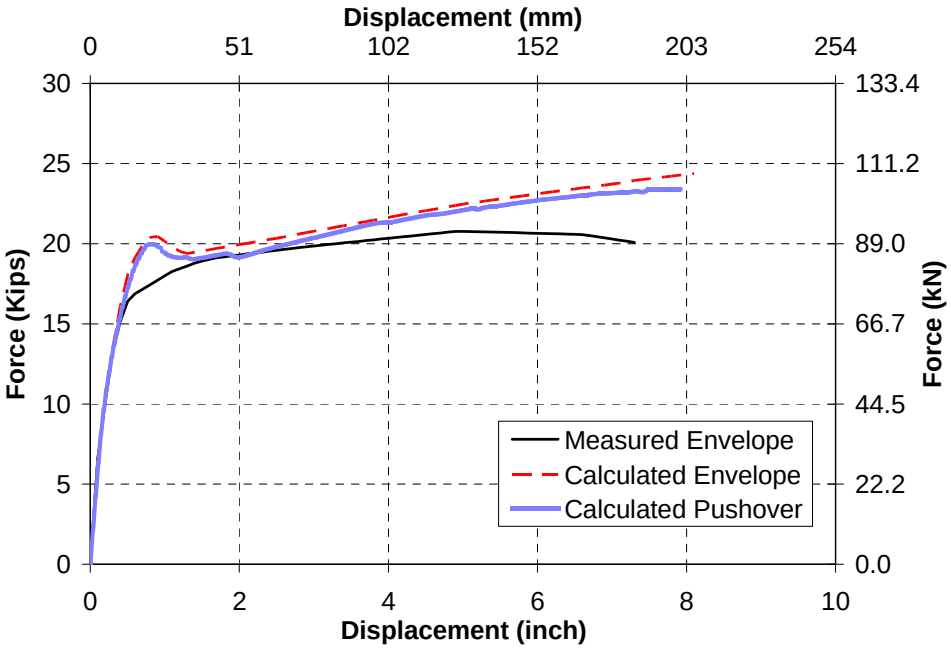


Fig. 6-12. Pushover and Average Backbone Curves of SE-2

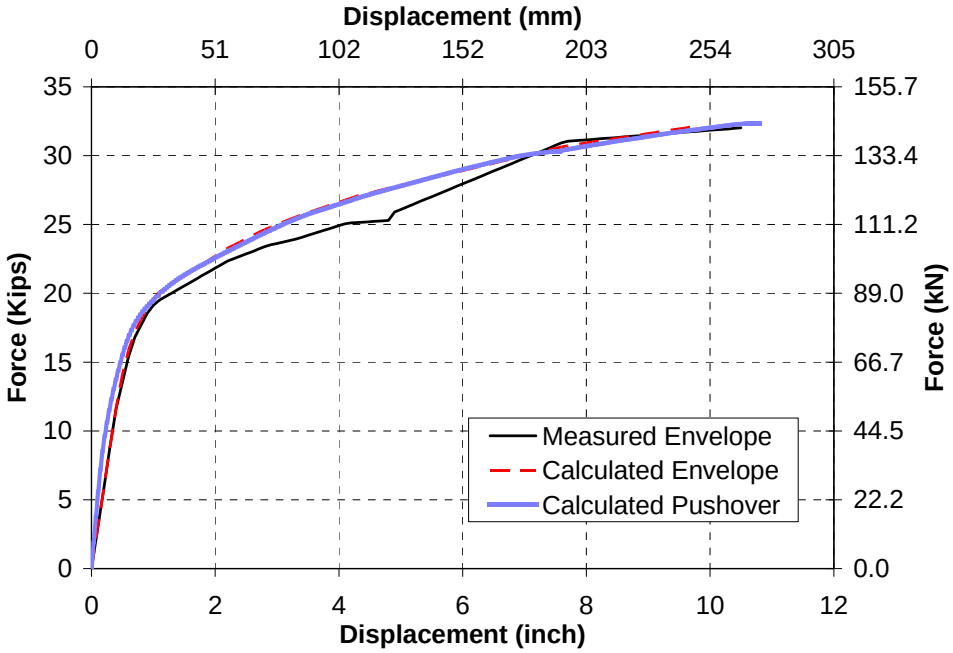


Fig. 6-13. Pushover and Average Backbone Curves of SC-2R

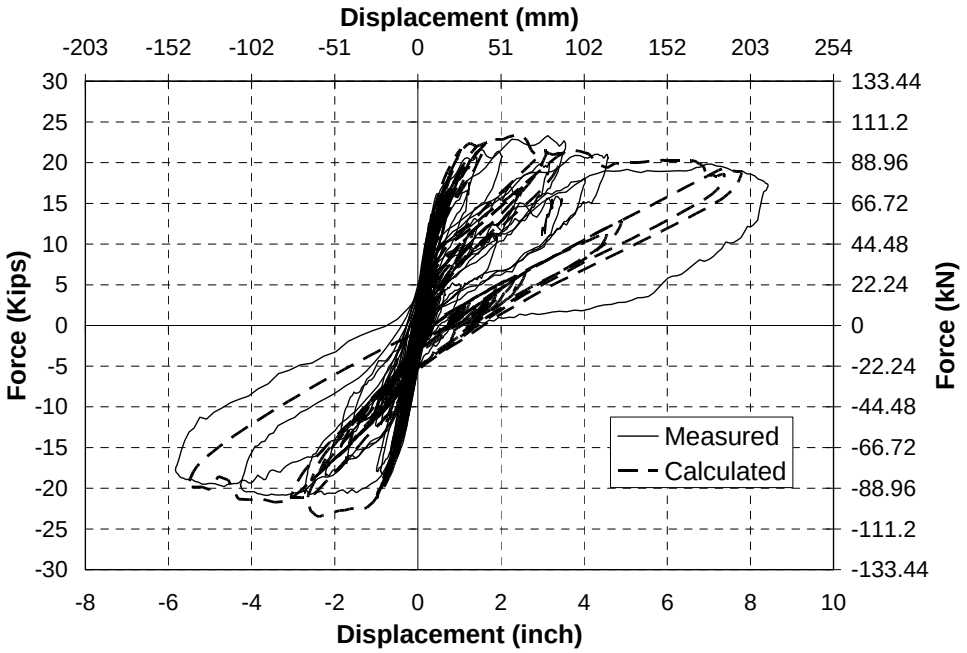


Fig. 6-14. Accumulated Force-Displacement Hysteresis Curves for SC-2

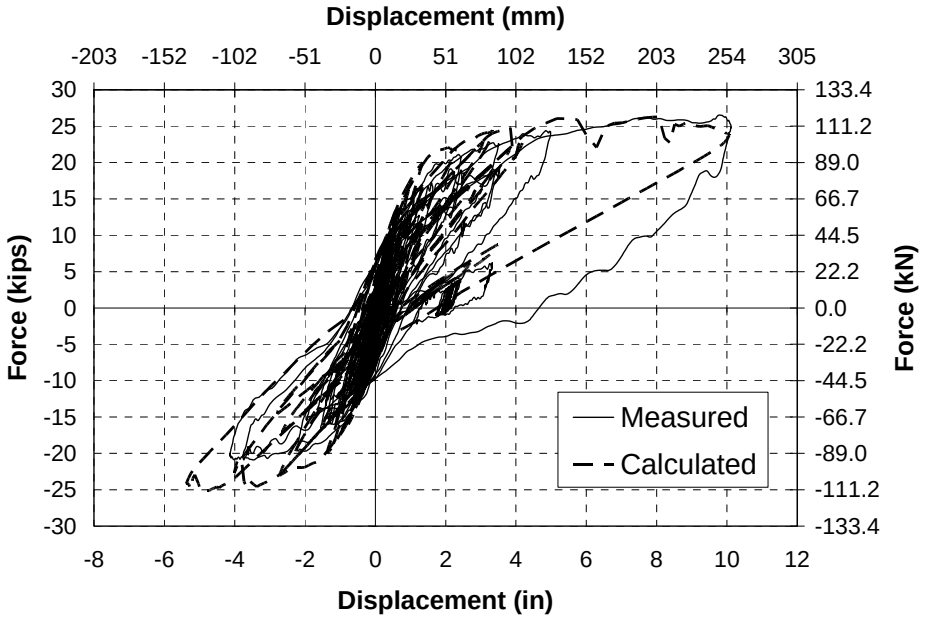


Fig. 6-15. Accumulated Force-Displacement Hysteresis Curves for SBR-1

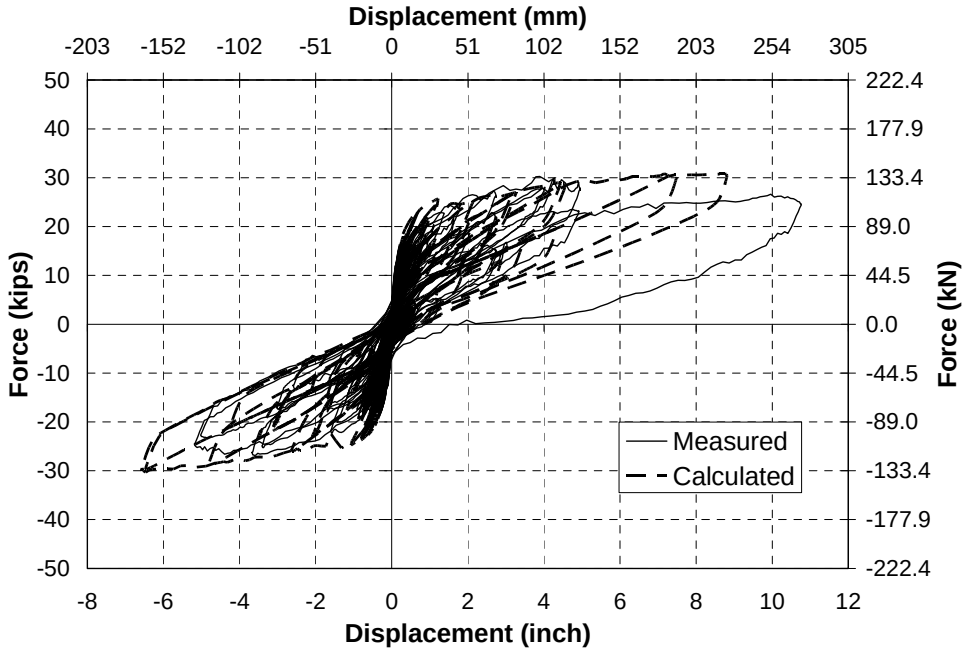


Fig. 6-16. Accumulated Force-Displacement Hysteresis Curves for SF-2

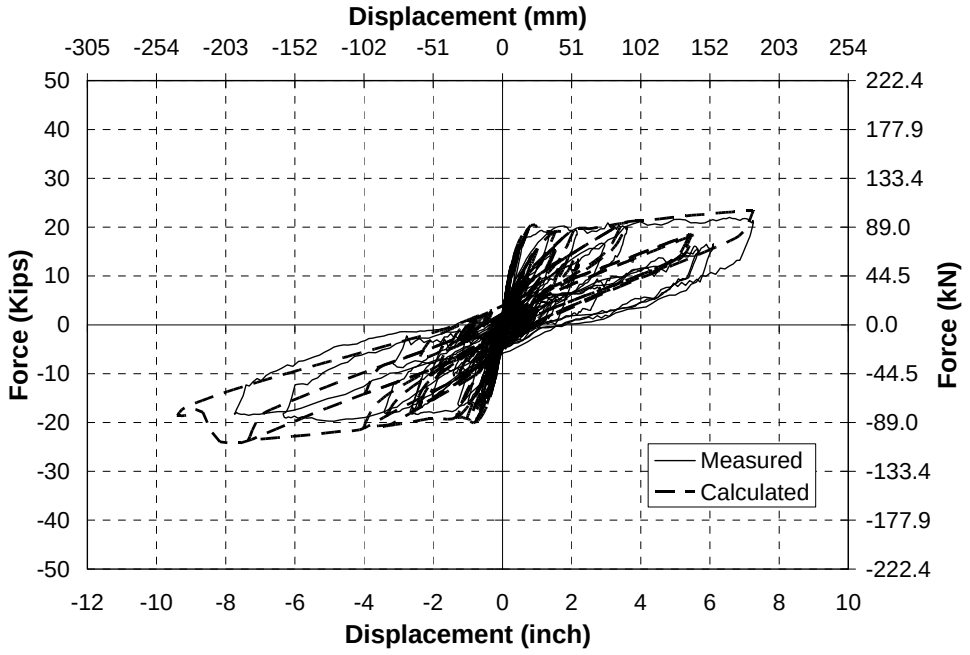


Fig. 6-17. Accumulated Force-Displacement Hysteresis Curves for SE-2

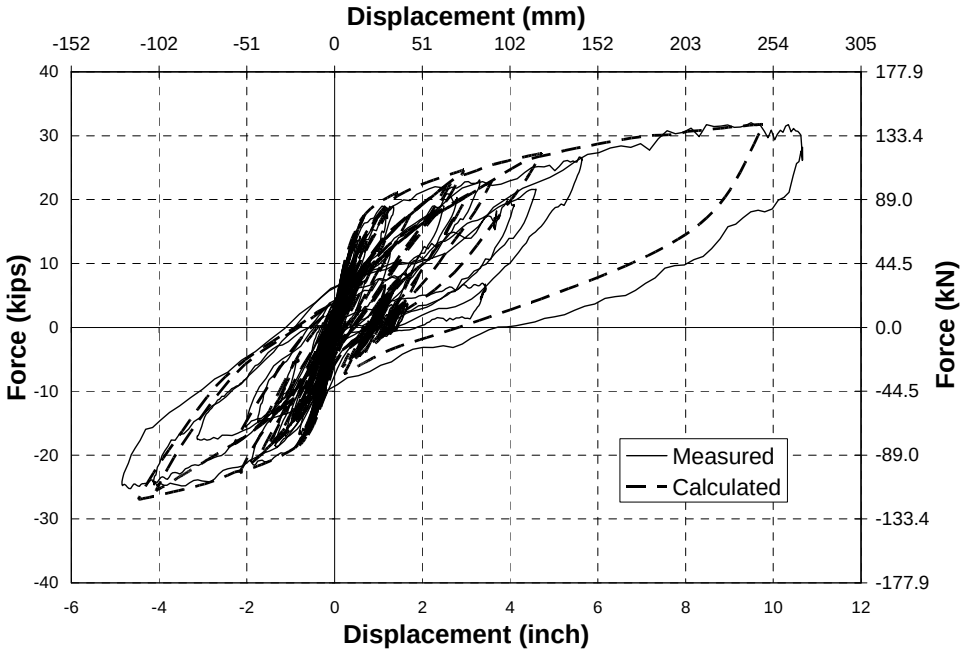


Fig. 6-18. Accumulated Force-Displacement Hysteresis Curves for SC-2R

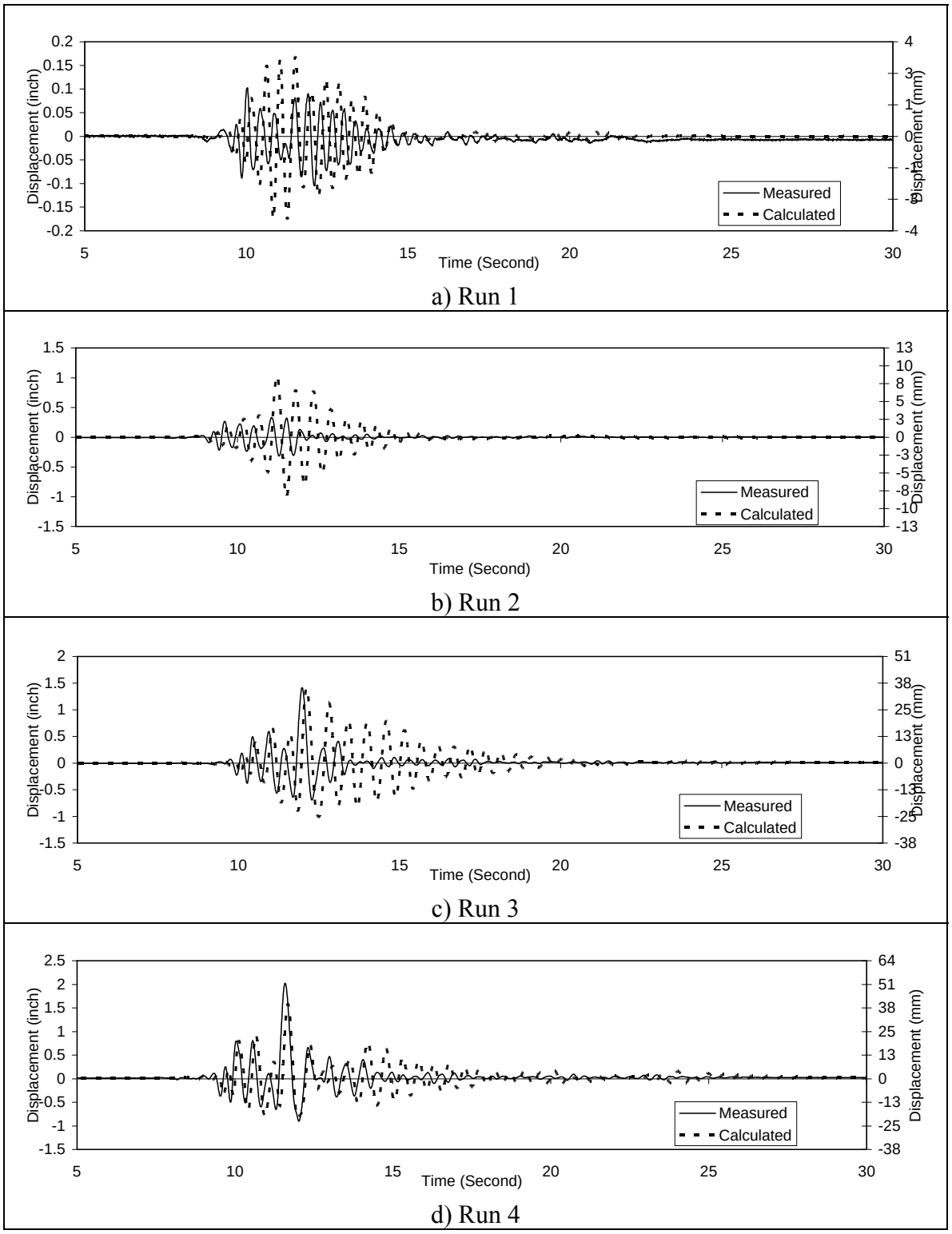


Fig. 6-19. Displacement History of SC-2 for Run 1 through Run 4

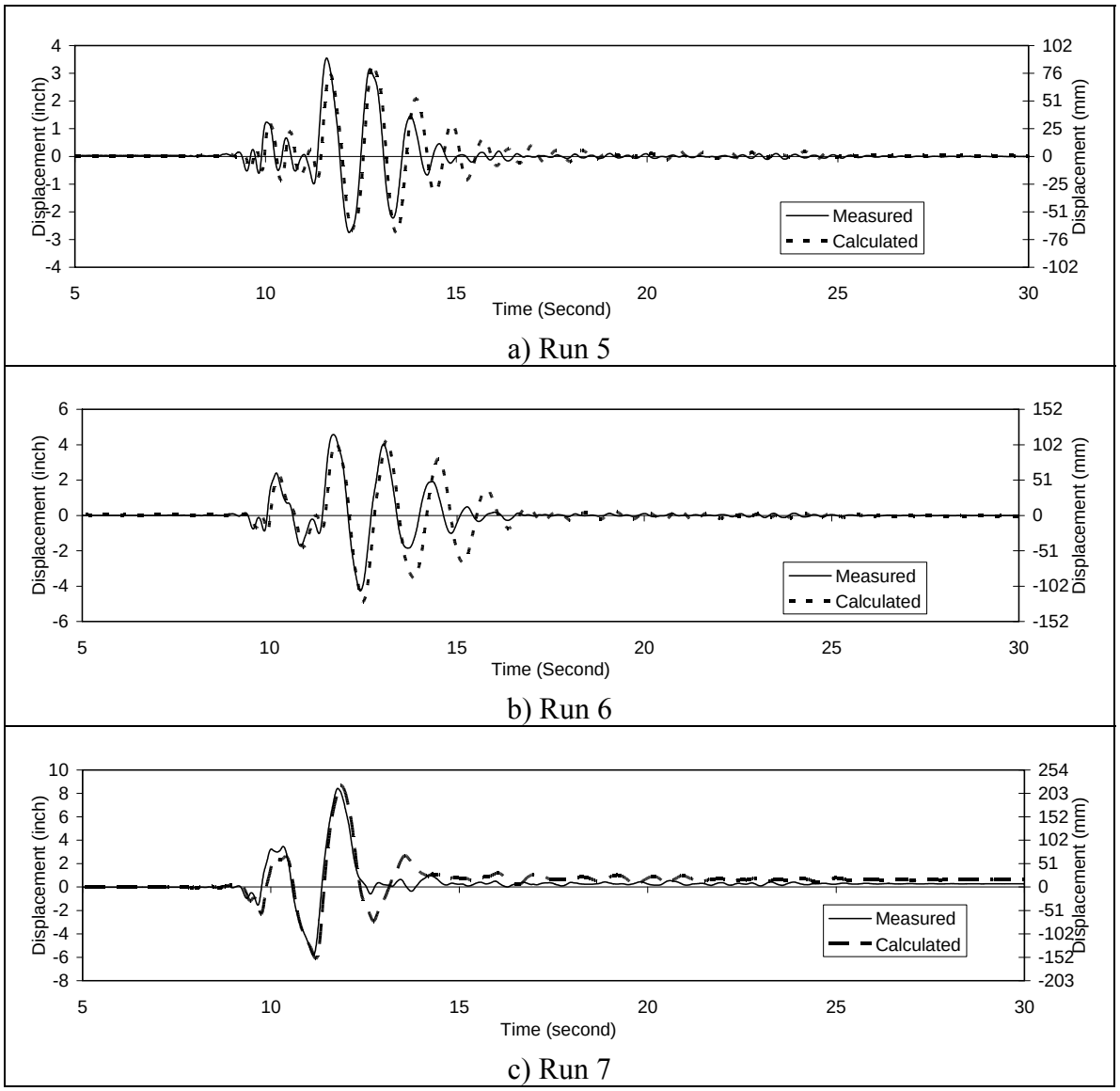


Fig. 6-20. Displacement History of SC-2 for Run 5 through Run 7

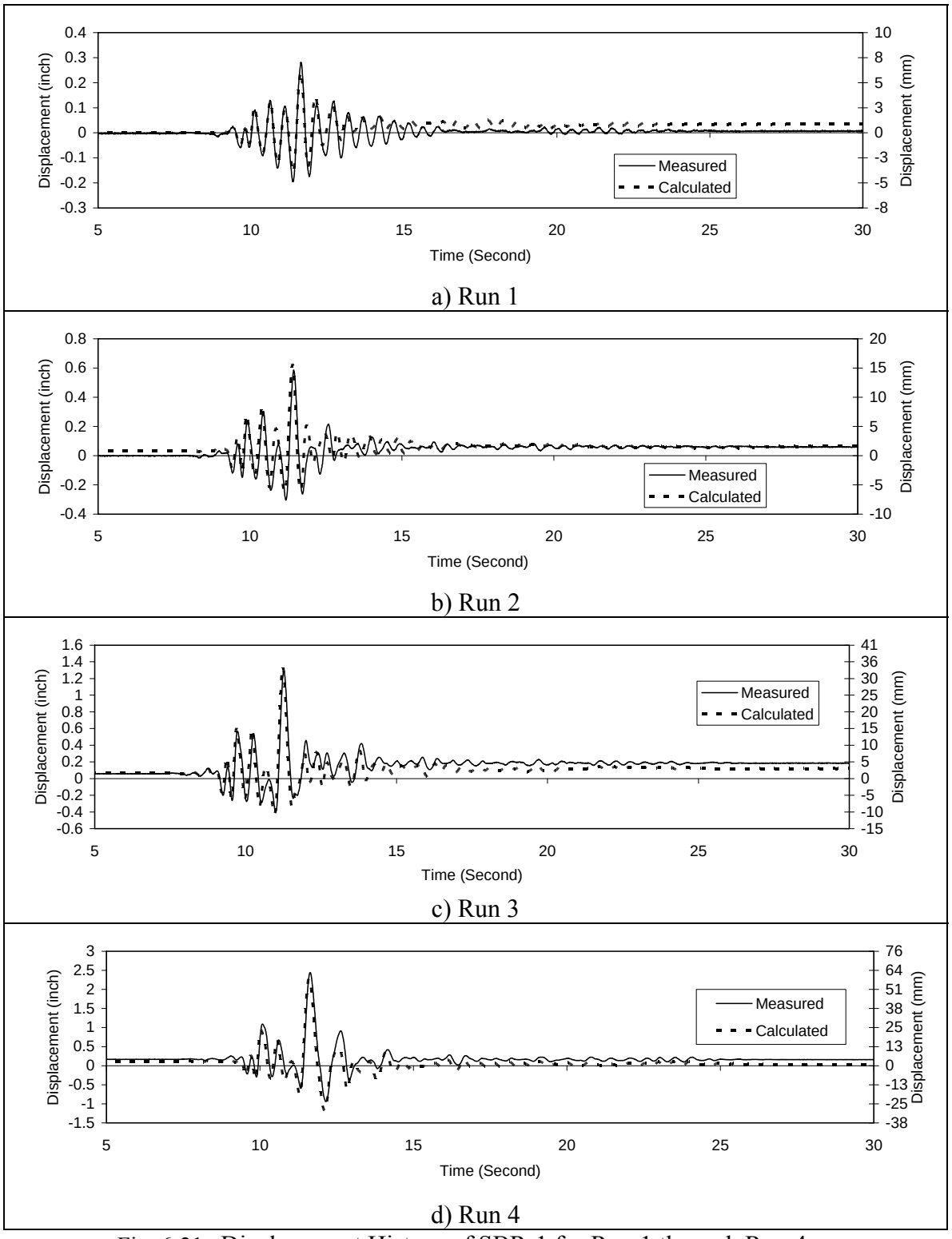


Fig. 6-21. Displacement History of SBR-1 for Run 1 through Run 4

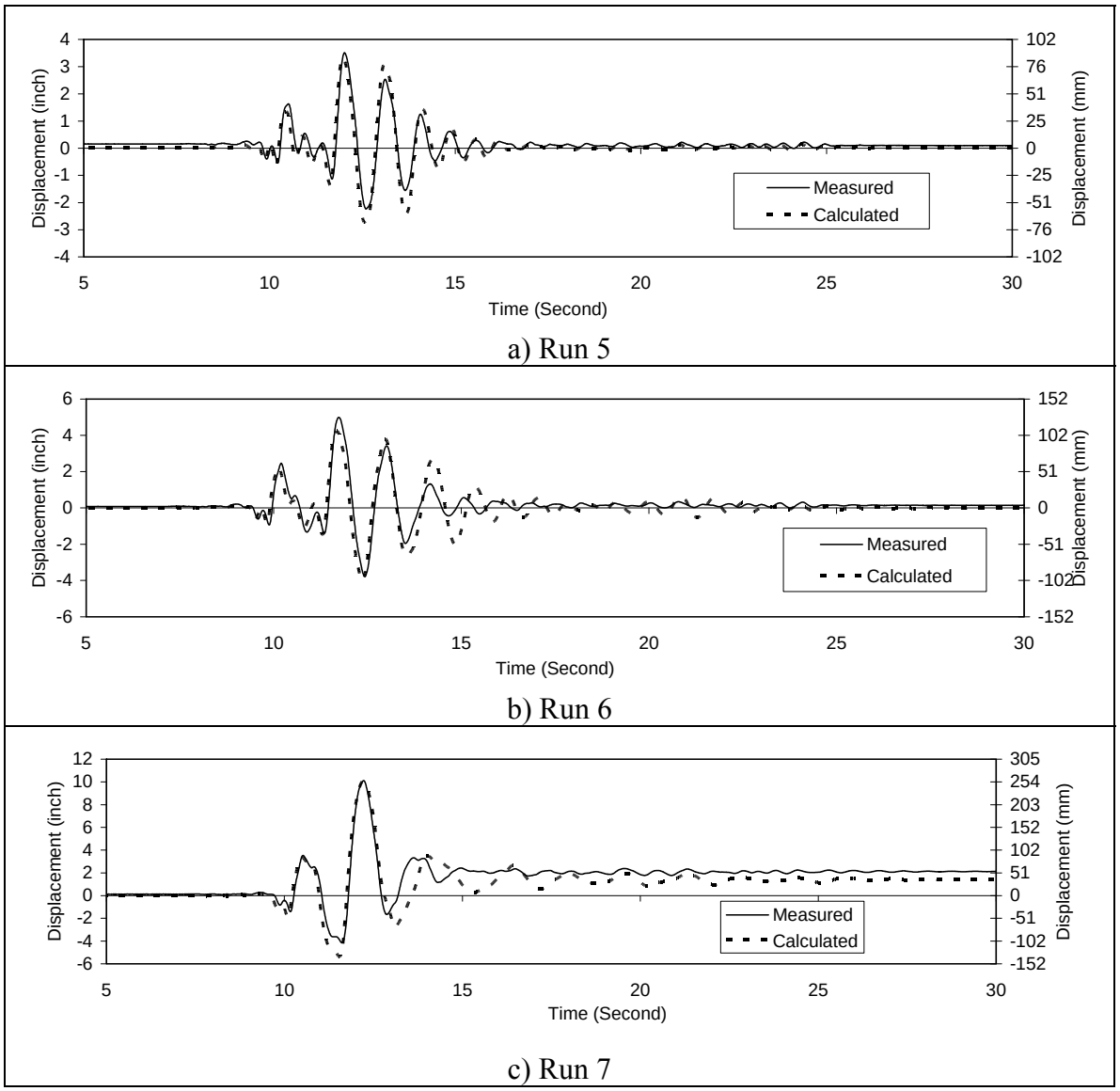


Fig. 6-22. Displacement History of SBR-1 for Run 5 through Run 7

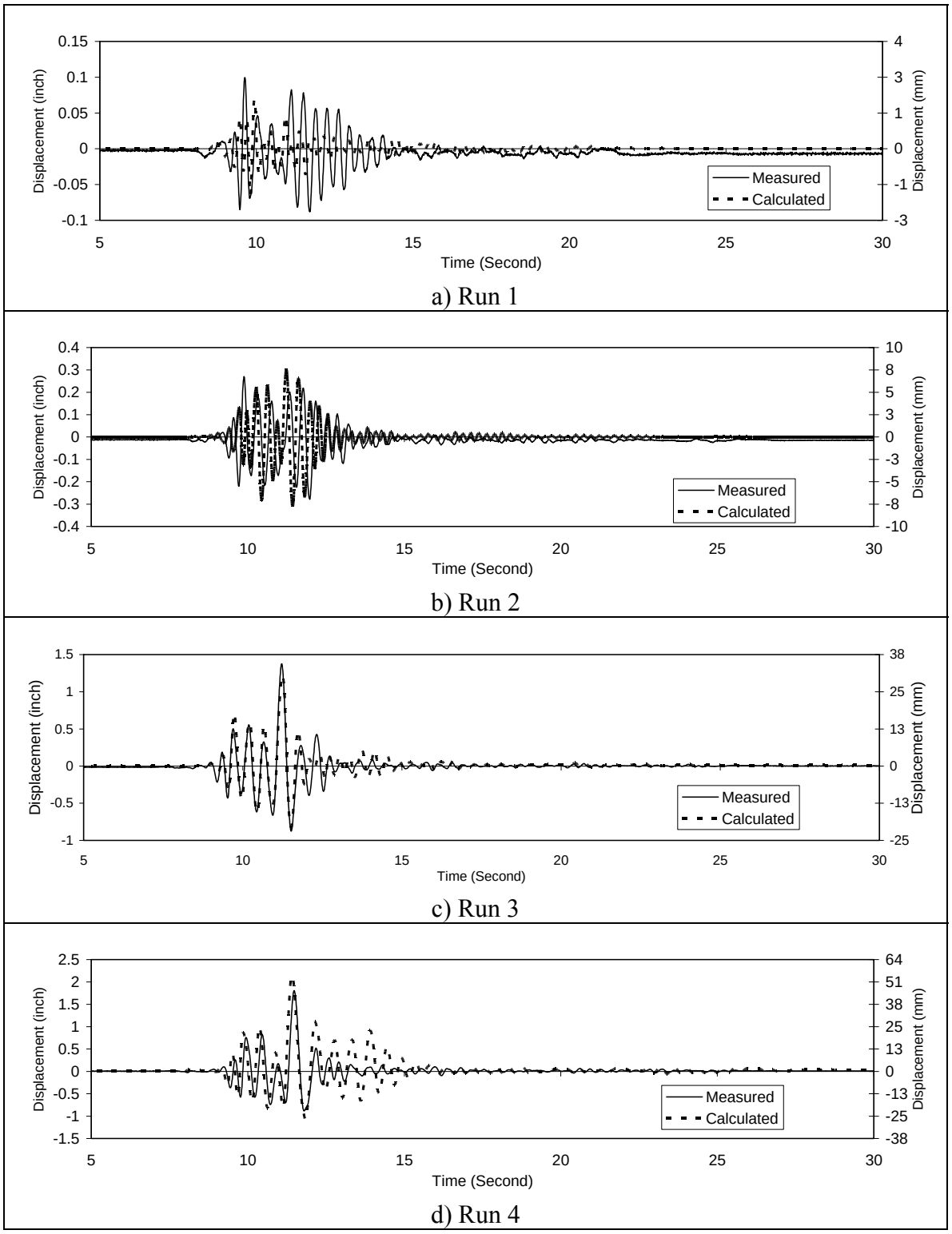


Fig. 6-23. Displacement History of SF-2 for Run 1 through Run 4

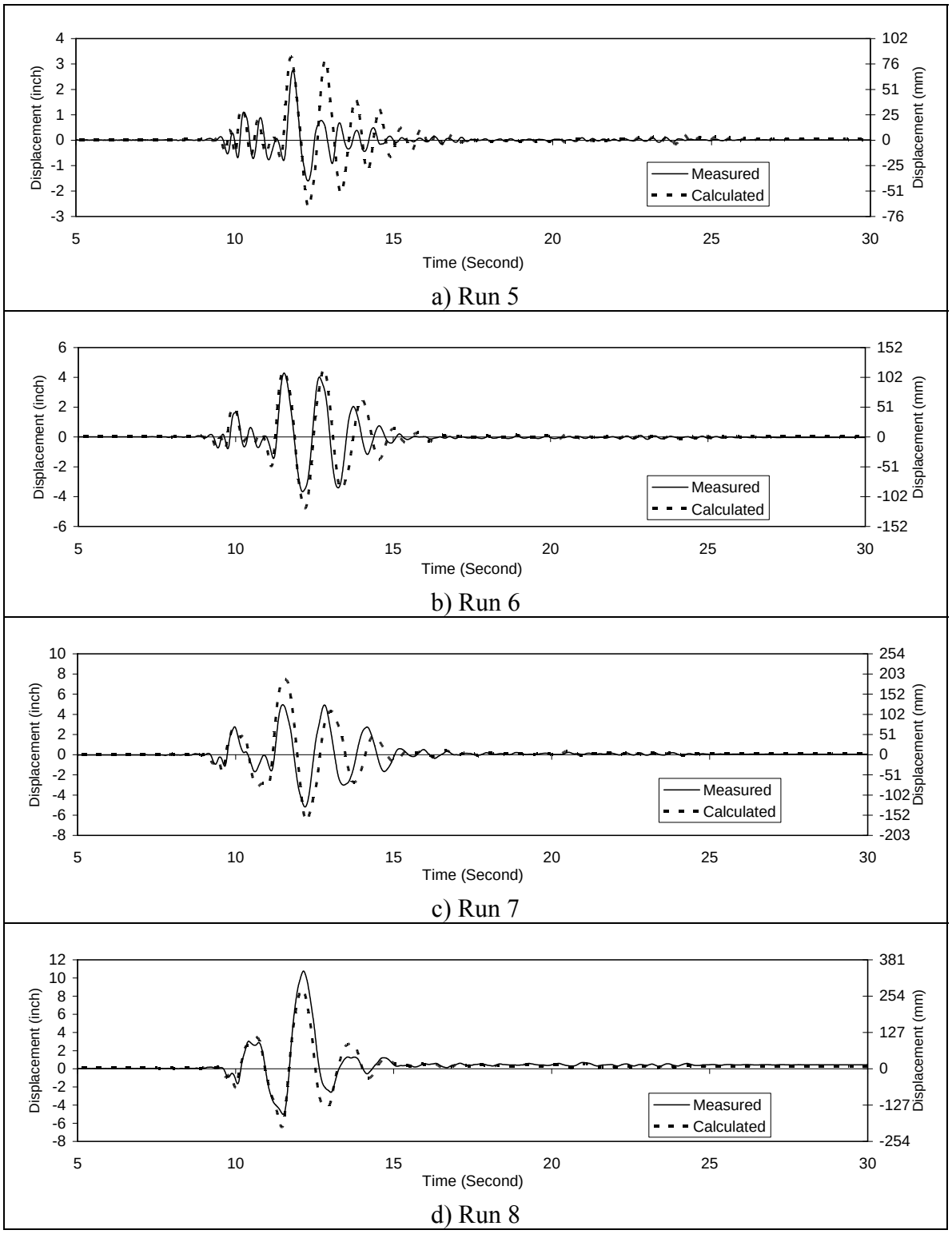


Fig. 6-24. Displacement History of SF-2 for Run 5 through Run 8

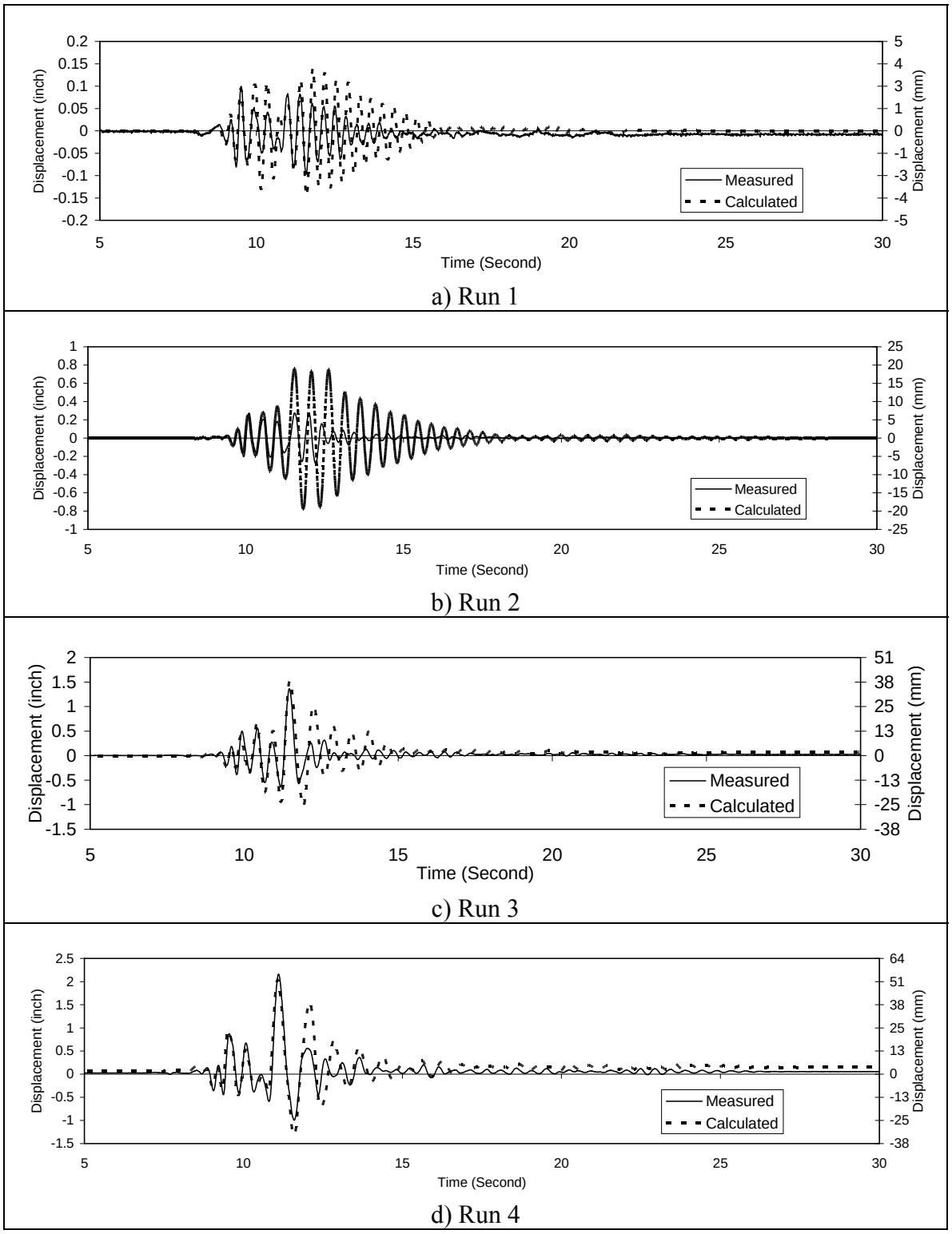


Fig. 6-25. Displacement History of SE-2 for Run 1 through Run 4

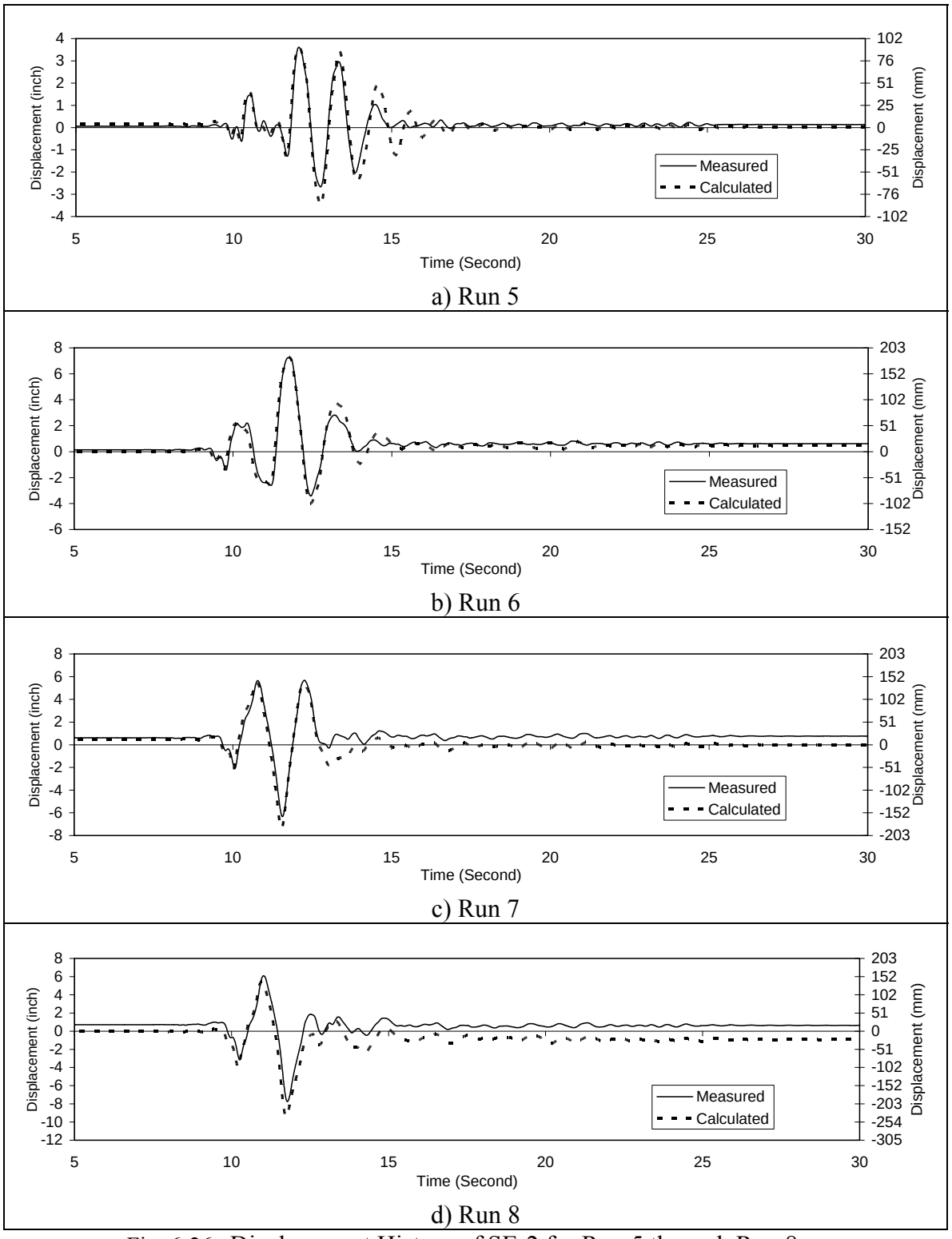


Fig. 6-26. Displacement History of SE-2 for Run 5 through Run 8

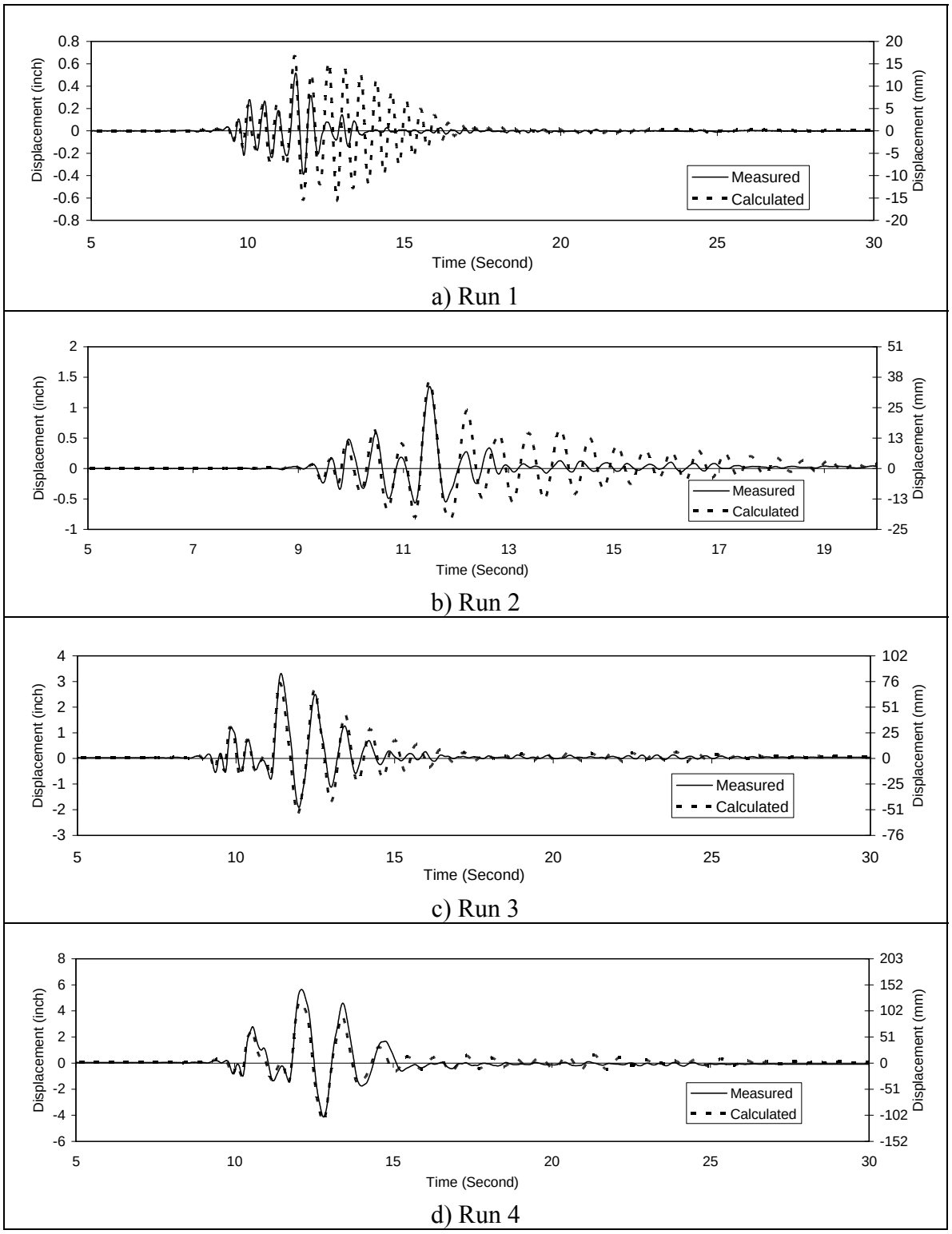


Fig. 6-27. Displacement History of SC-2R for Run 1 through Run 4

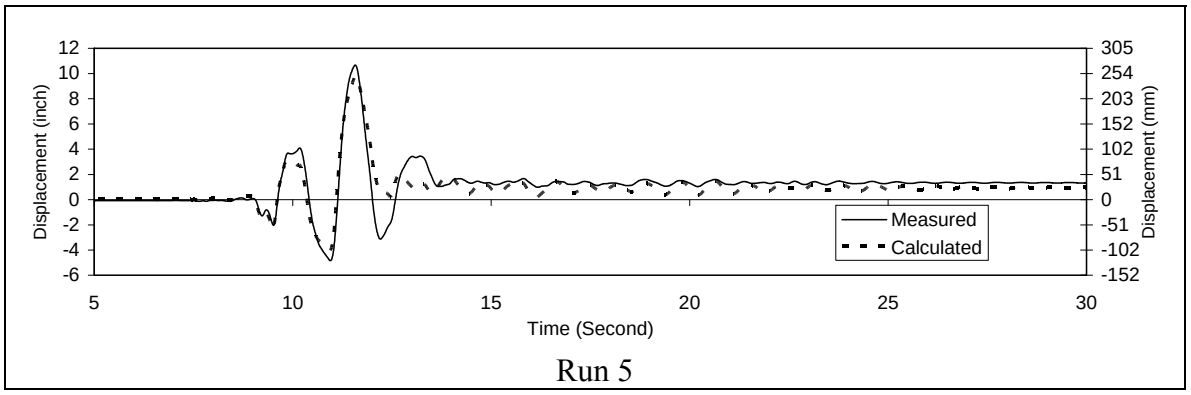


Fig. 6-28. Displacement History of SC-2R for Run 5

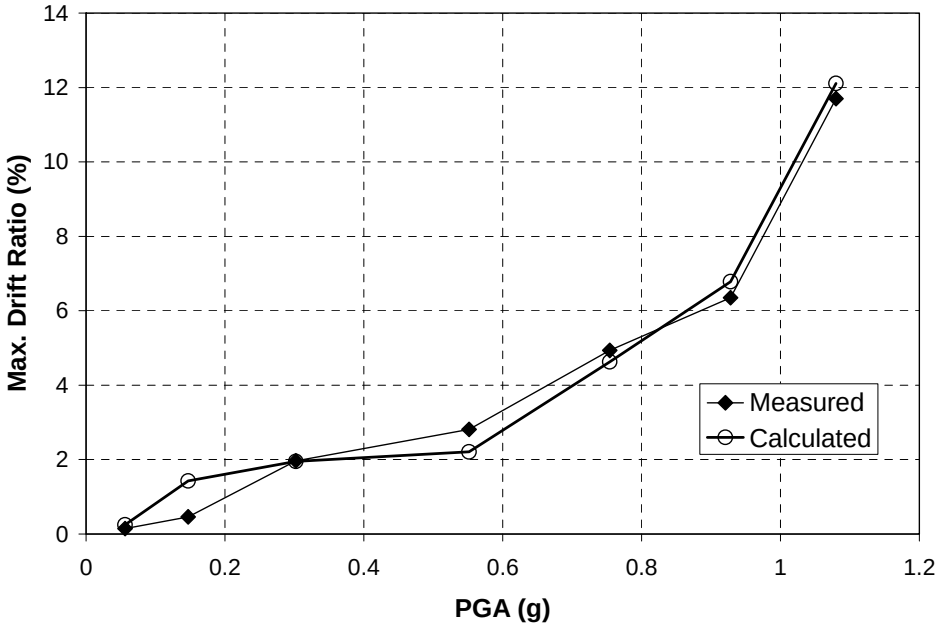


Fig. 6-29. Maximum Drift Ratio vs. PGA in SC-2

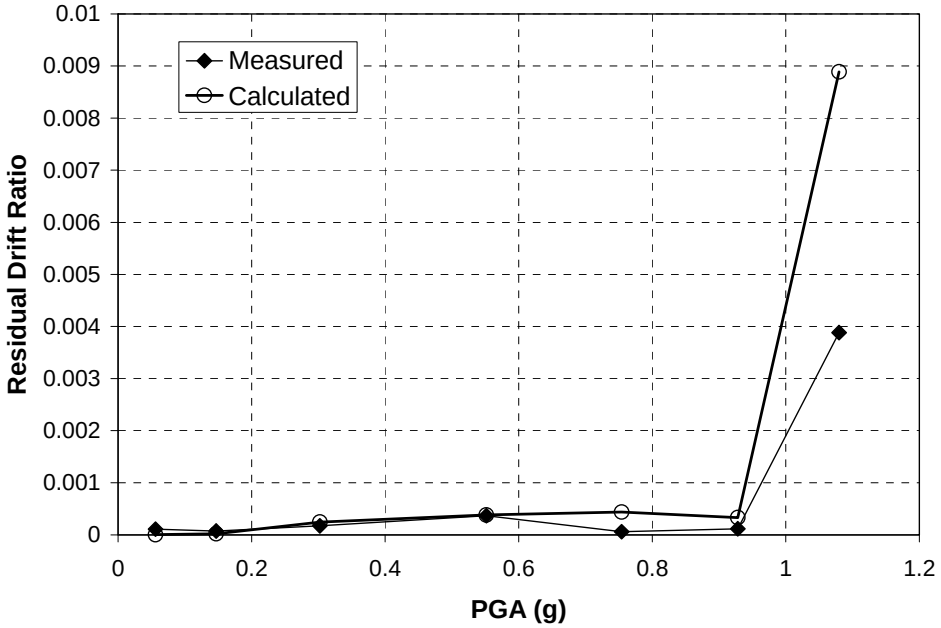


Fig. 6-30. Residual Drift Ratio vs. PGA in SC-2

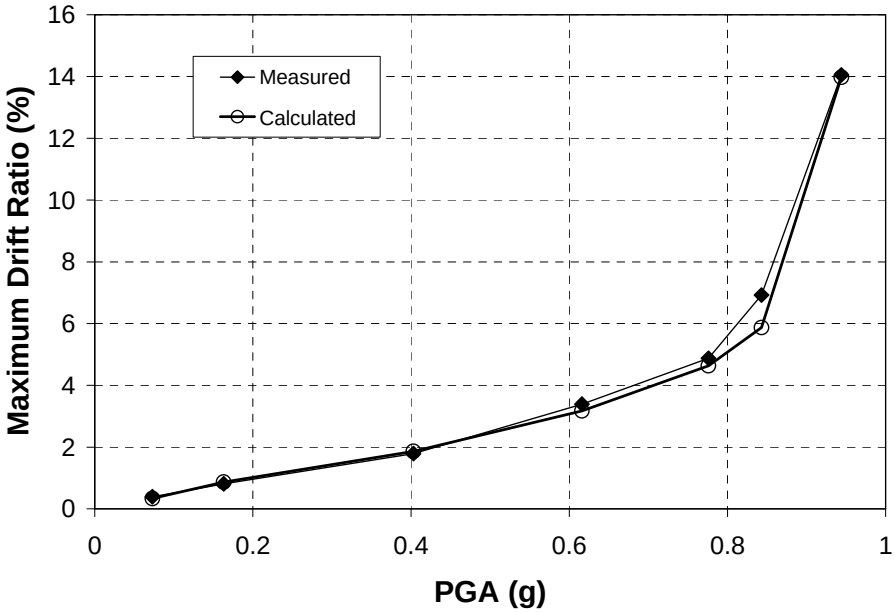


Fig. 6-31. Maximum Drift Ratio vs. PGA in SBR-1

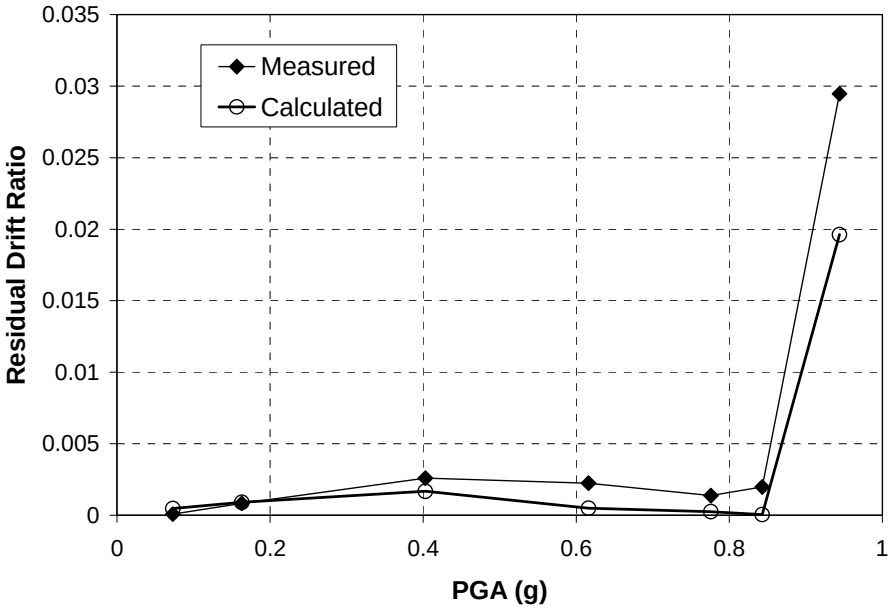


Fig. 6-32. Residual Drift Ratio vs. PGA in SBR-1

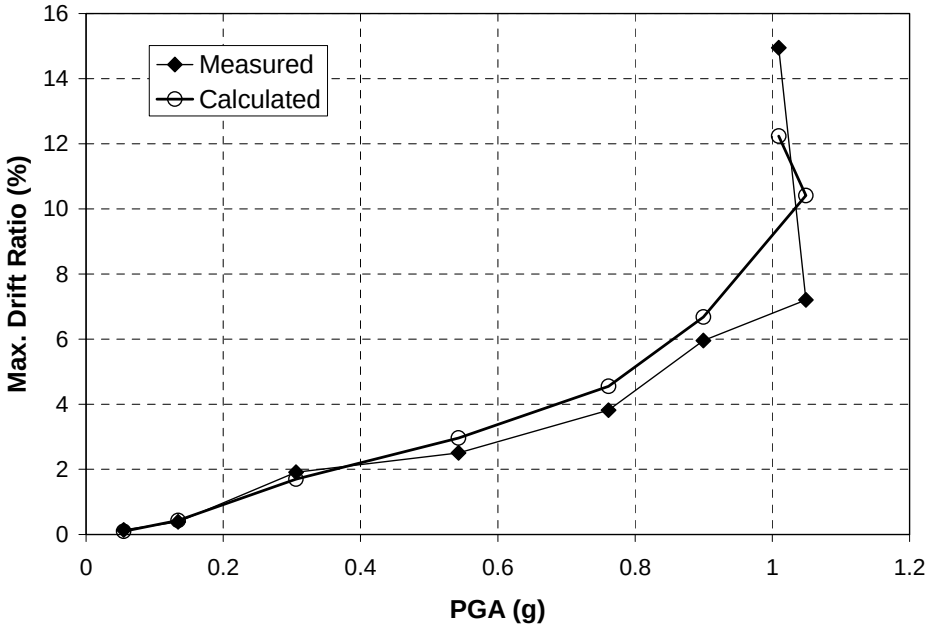


Fig. 6-33. Maximum Drift Ratio vs. PGA in SF-2

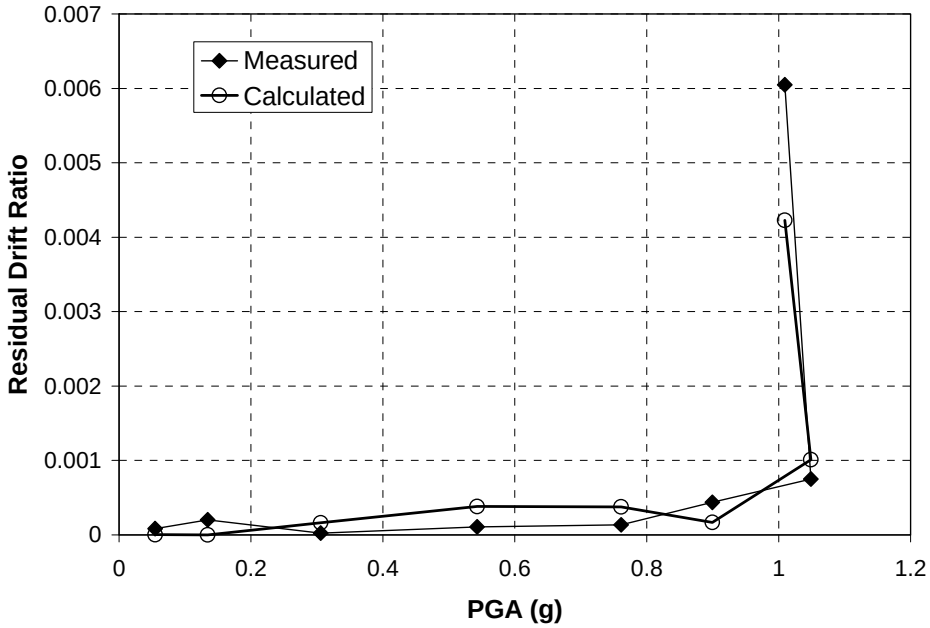


Fig. 6-34. Residual Drift Ratio vs. PGA in SF-2

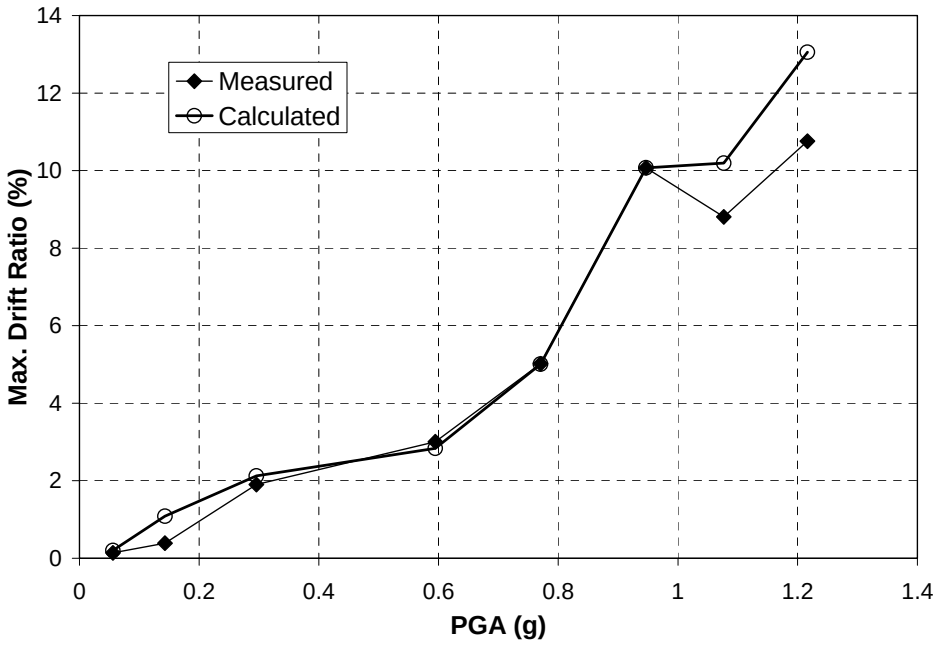


Fig. 6-35. Maximum Drift Ratio vs. PGA in SE-2

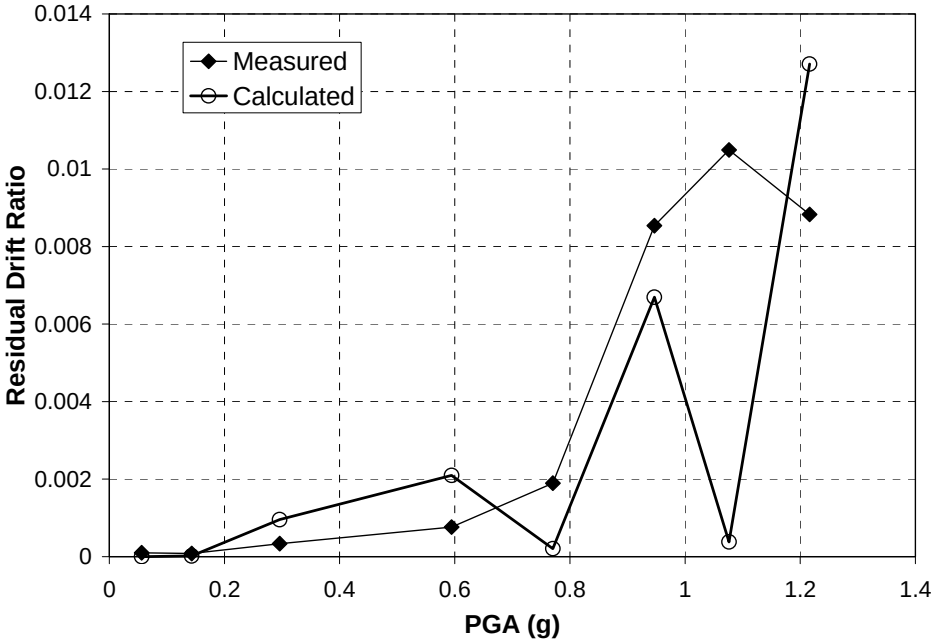


Fig. 6-36. Residual Drift Ratio vs. PGA in SE-2

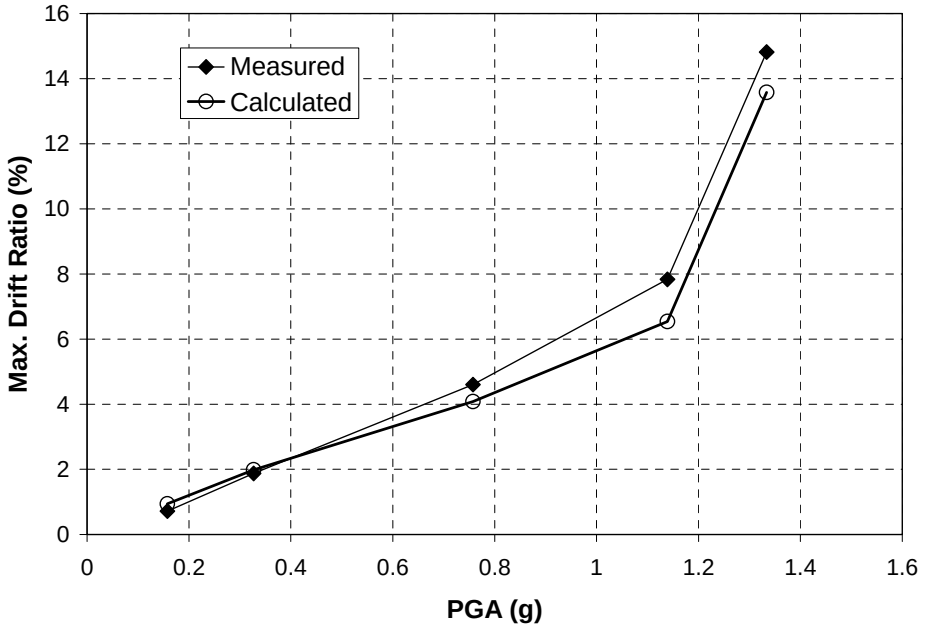


Fig. 6-37. Maximum Drift Ratio vs. PGA in SC-2R

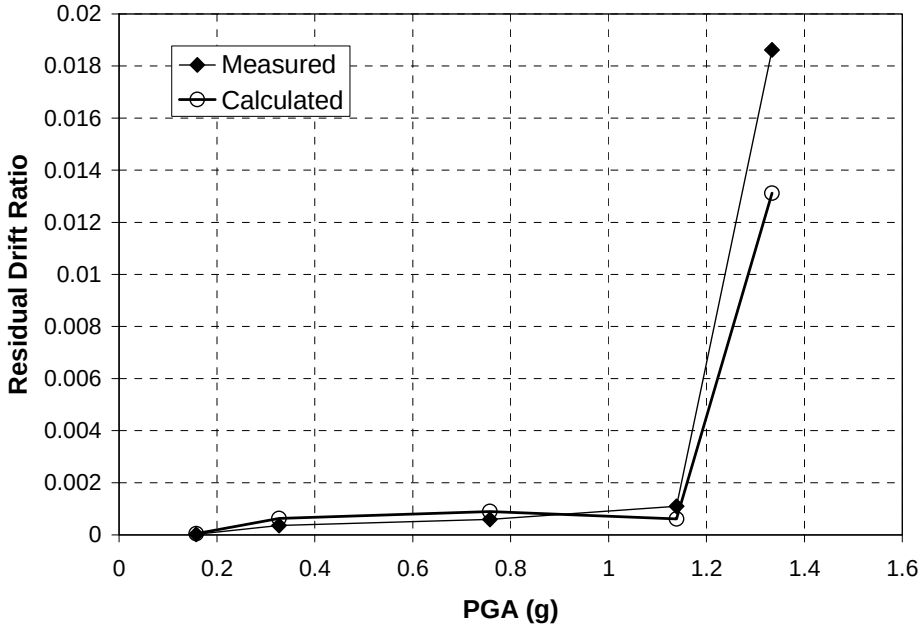


Fig. 6-38. Residual Drift Ratio vs. PGA in SC-2R

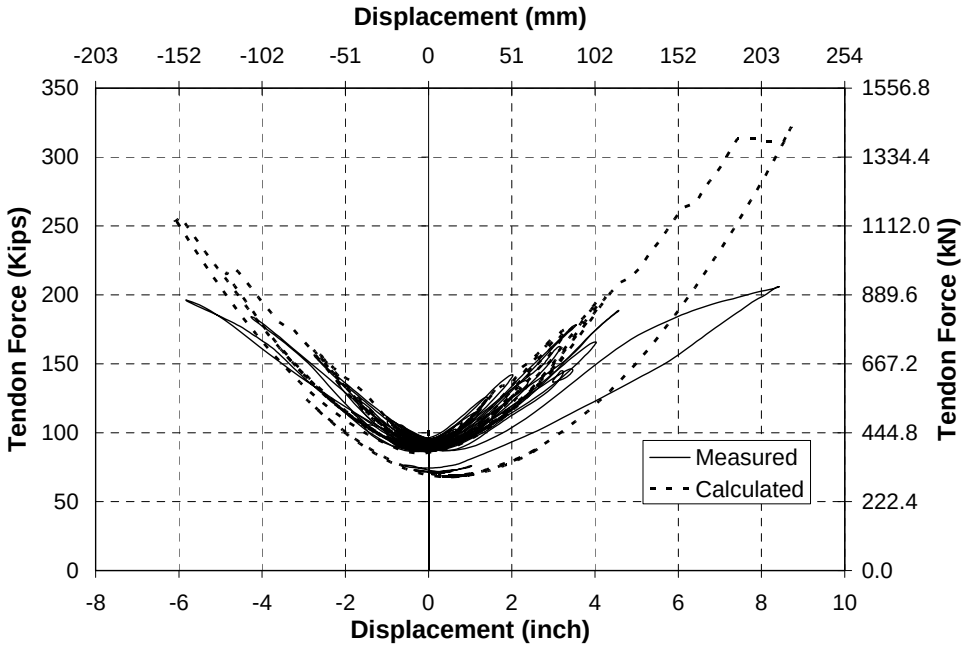


Fig. 6-39. Unbonded PT Rod Force vs. Displacement in SC-2

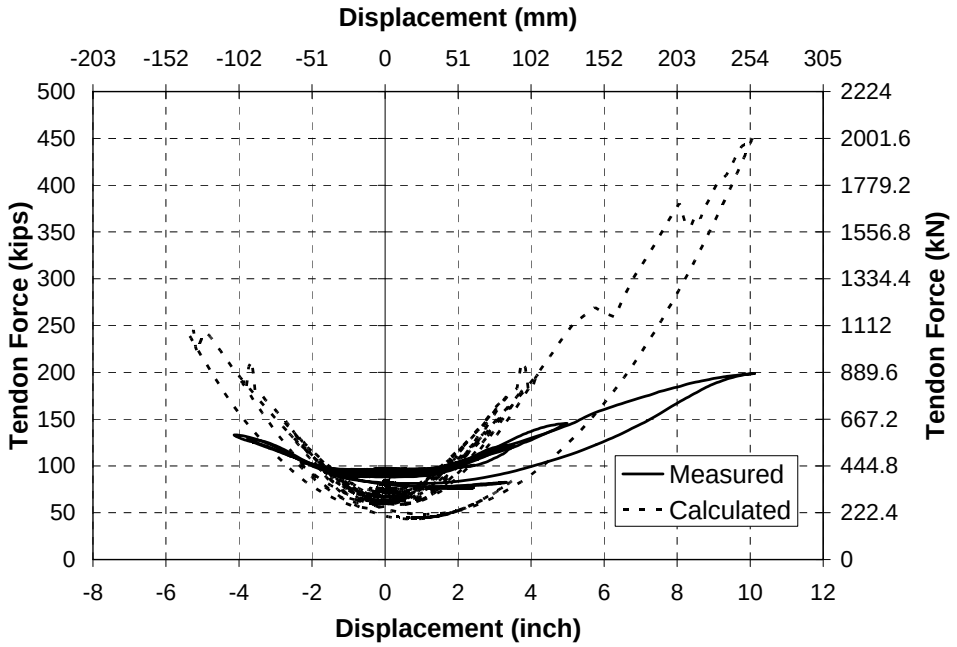


Fig. 6-40. Unbonded PT Rod Force vs. Displacement in SBR-1

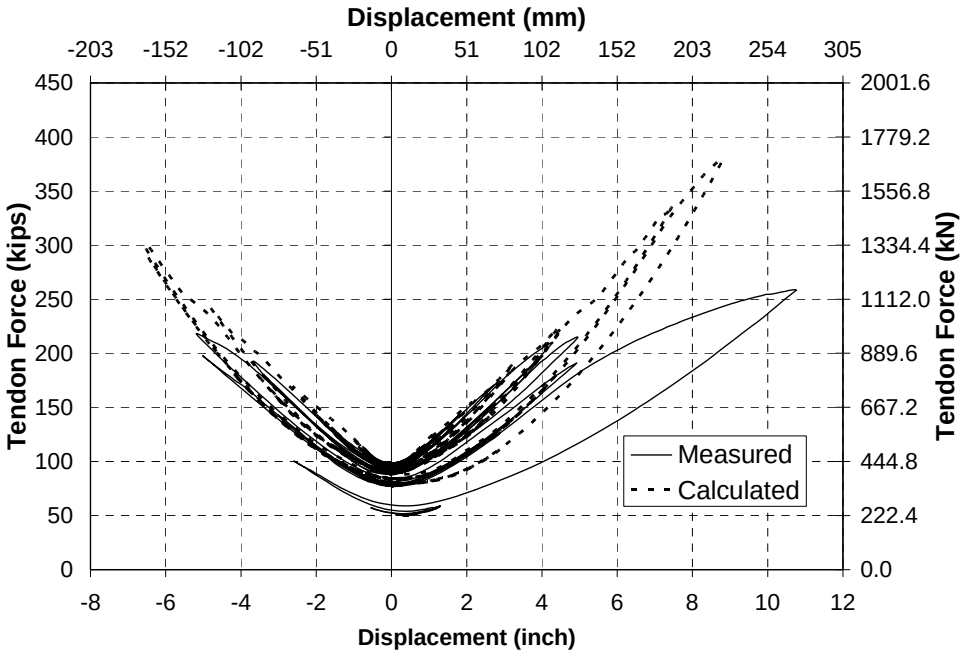


Fig. 6-41. Unbonded PT Rod Force vs. Displacement in SF-2

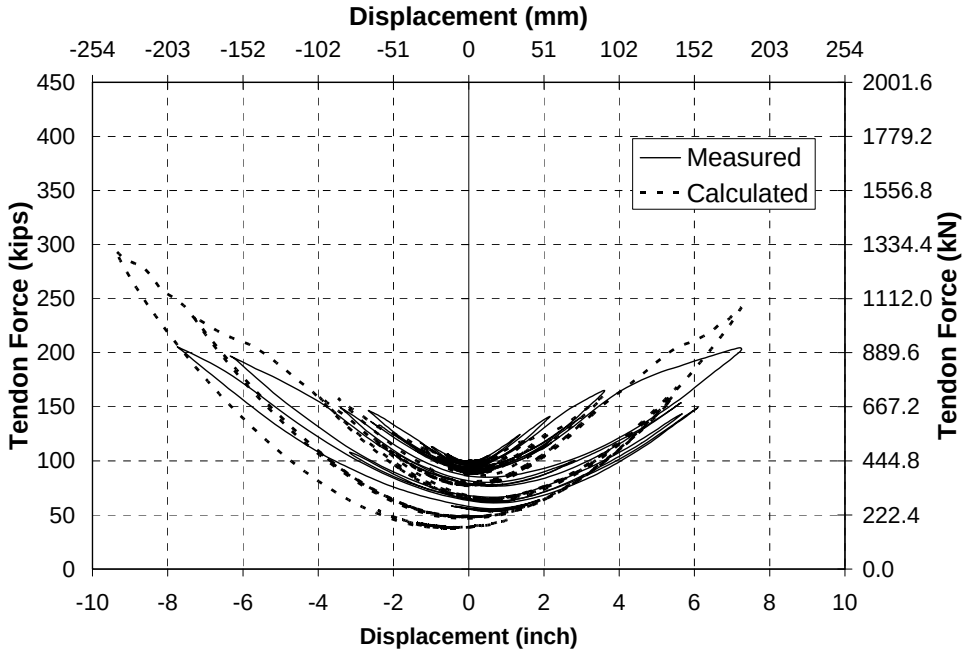


Fig. 6-42. Unbonded PT Rod Force vs. Displacement in SE-2

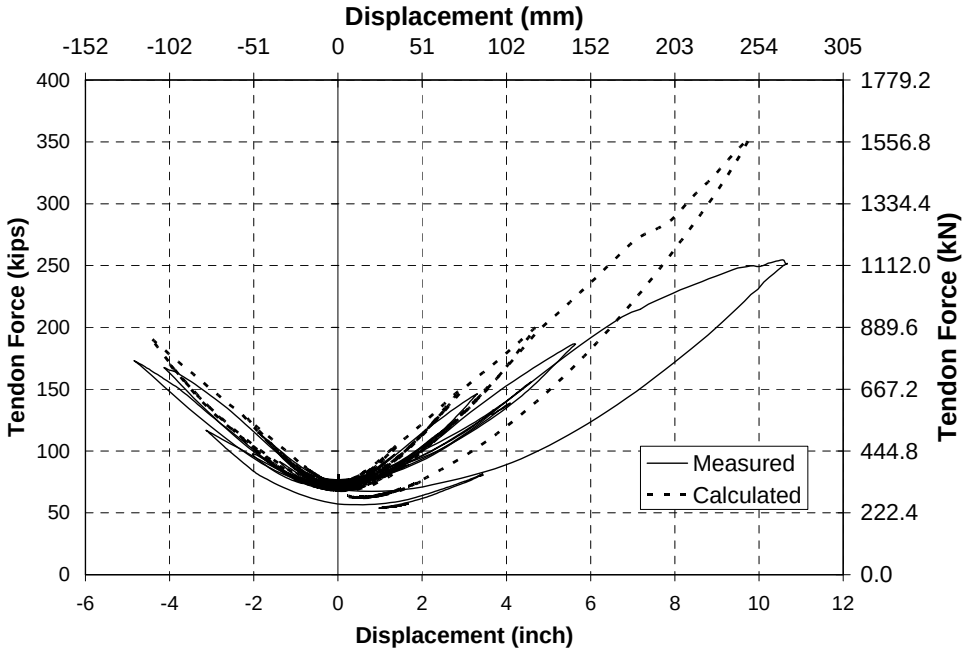


Fig. 6-43. Unbonded PT Rod Force vs. Displacement in SC-2R

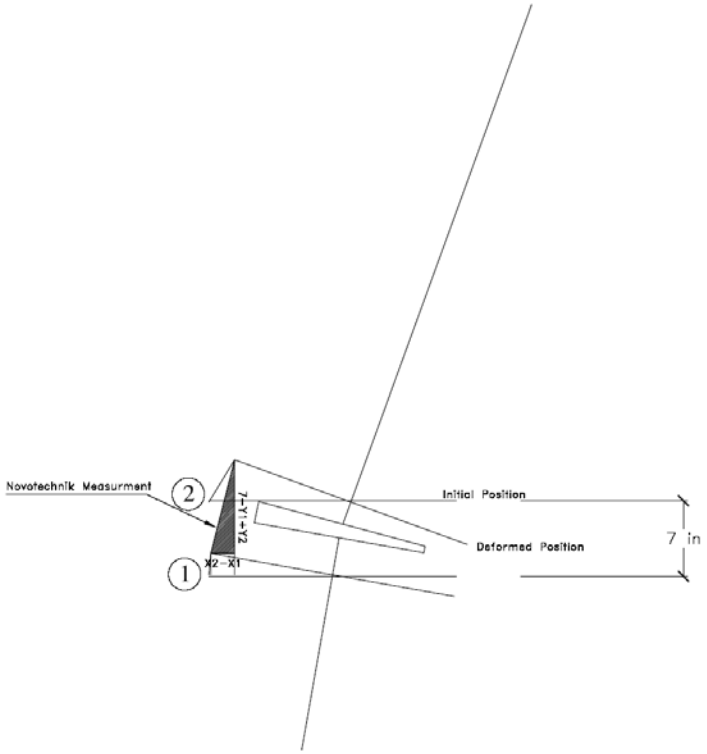


Fig. 6-44. Opening Between the Base and Second Segments in OpenSees

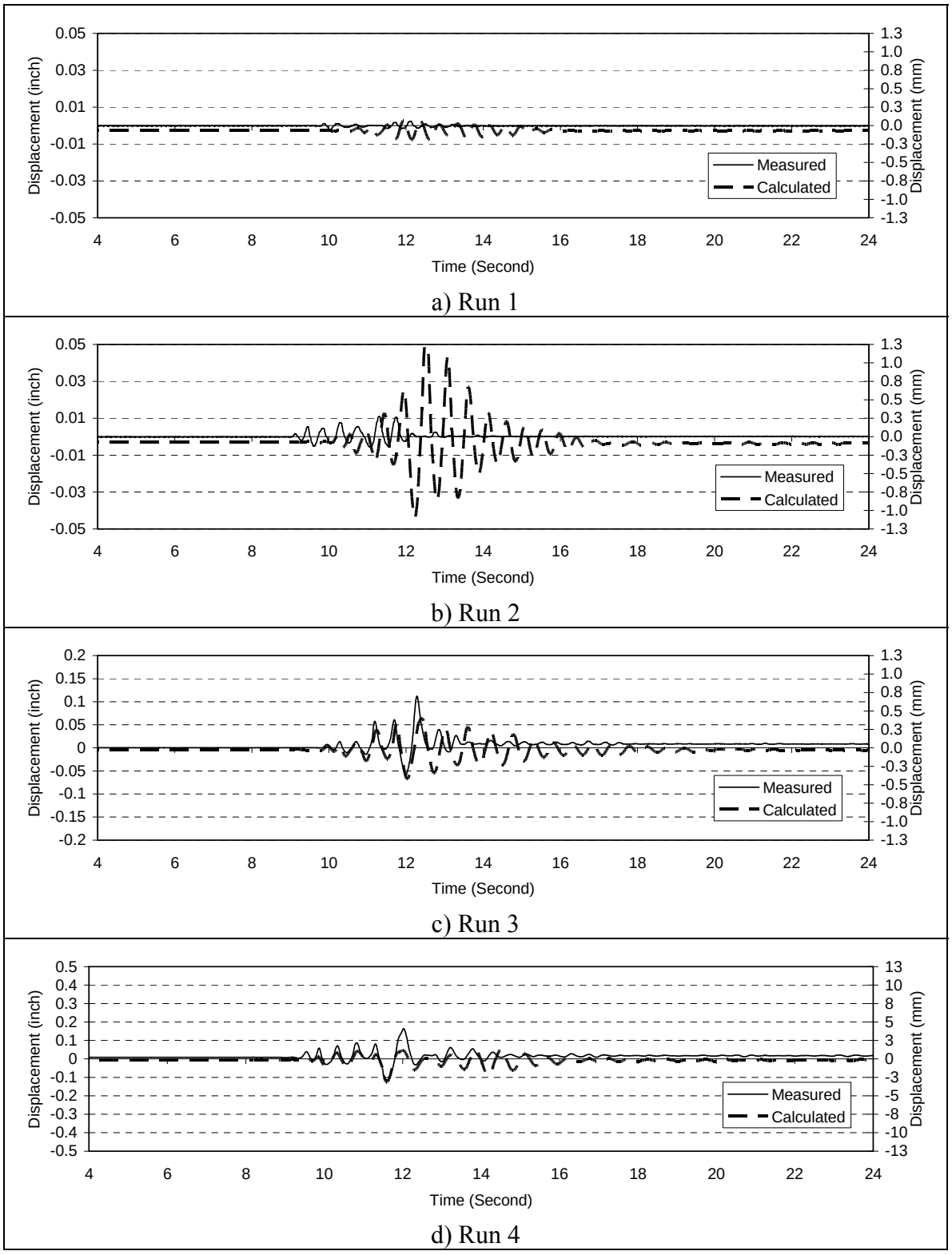


Fig. 6-45. History of Opening at the North Side of the SC-2, Run 1 through Run 4

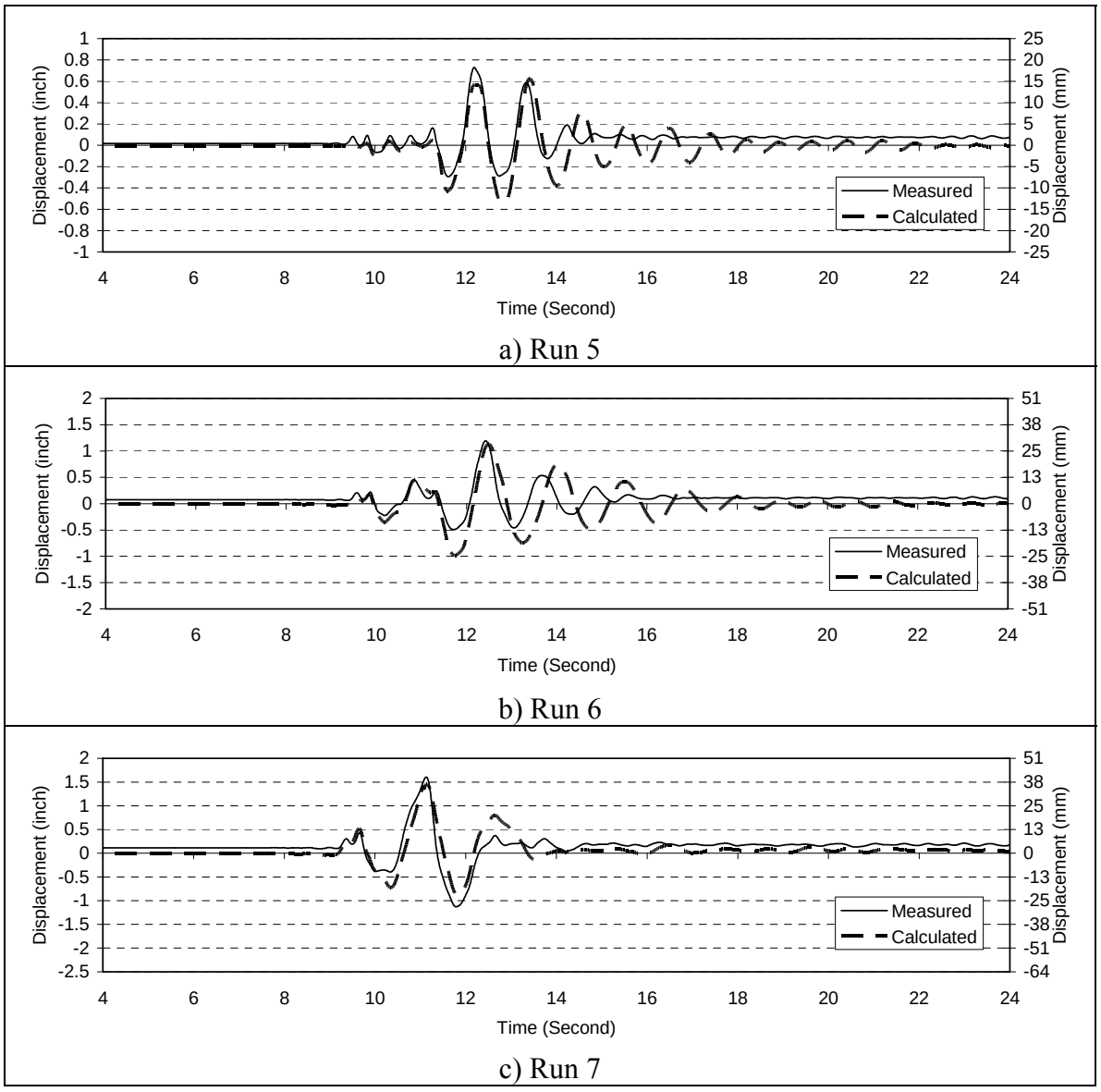


Fig. 6-46. History of Opening at the North Side of the SC-2, Run 5 through Run 7

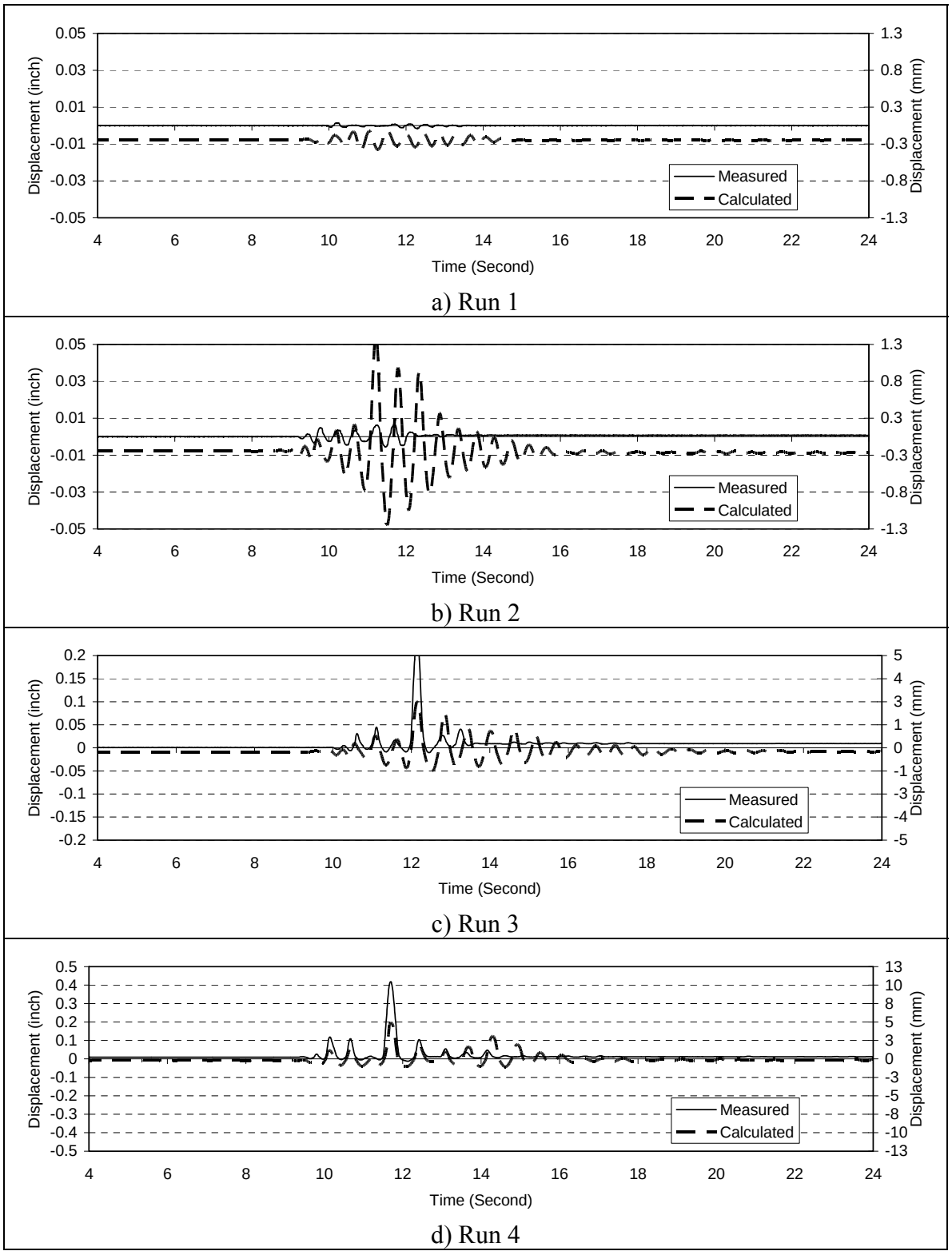


Fig. 6-47. History of Opening at the South Side of the SC-2, Run 1 through Run 4

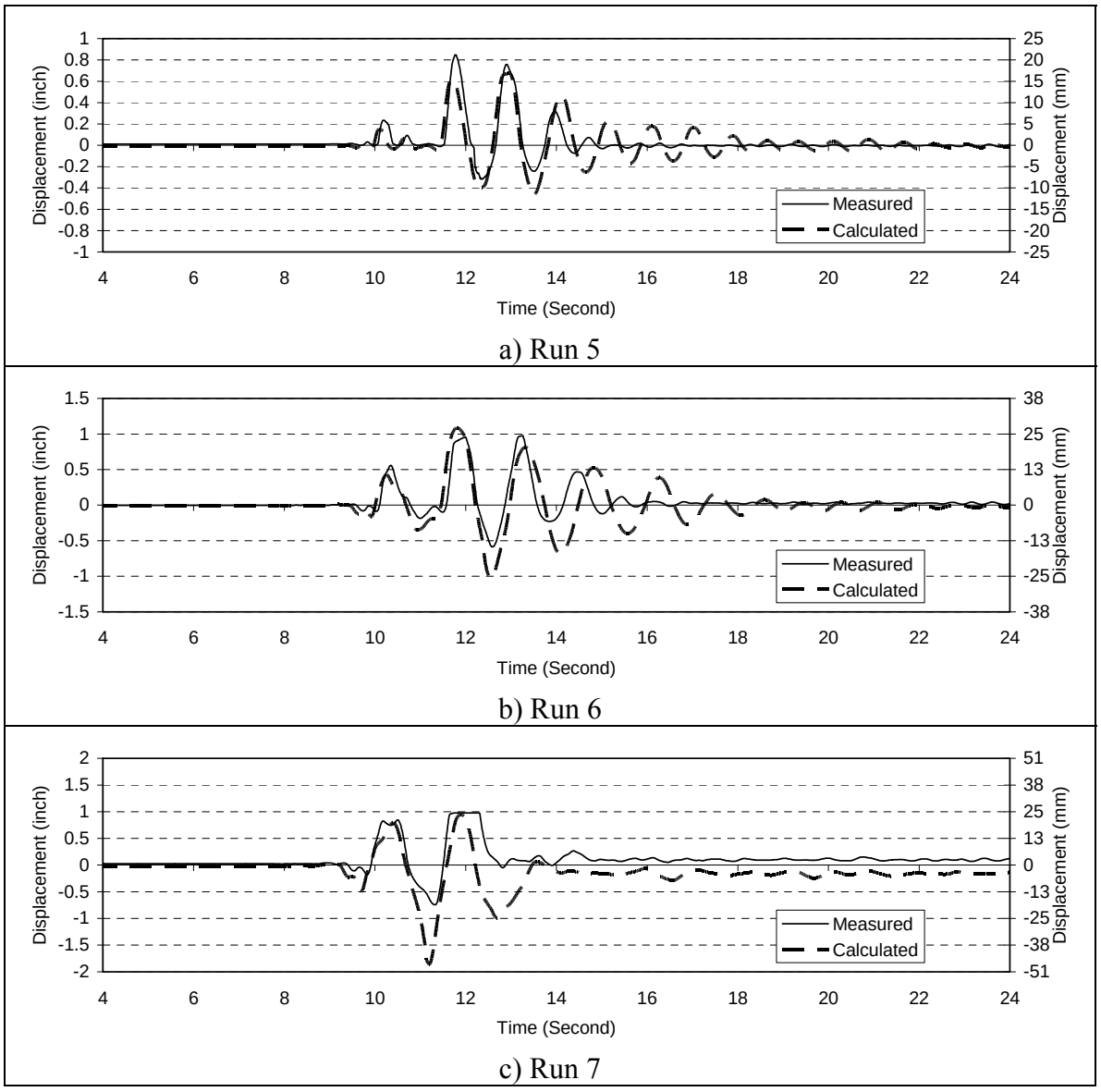


Fig. 6-48. History of Opening at the South Side of the SC-2, Run 5 through Run 7

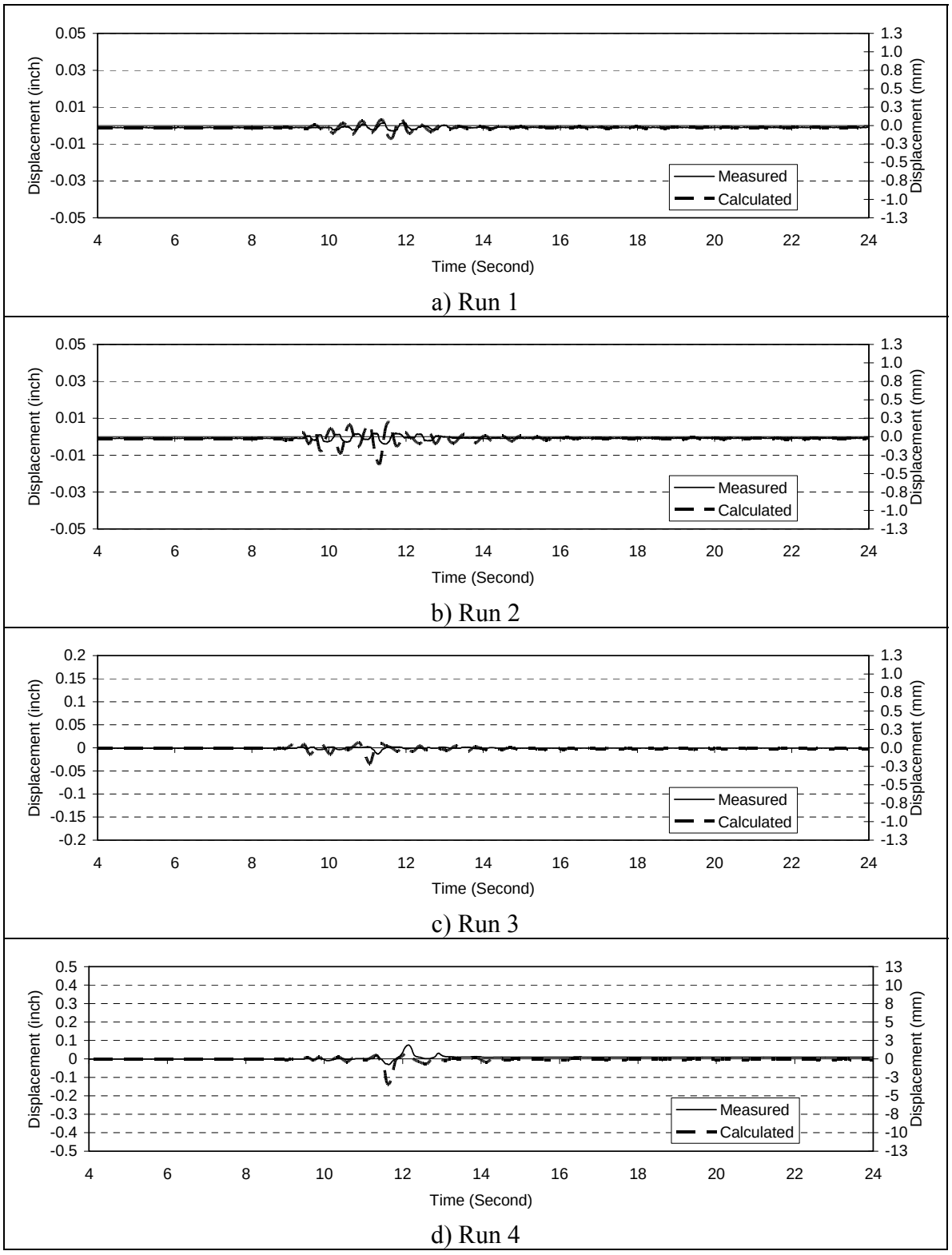


Fig. 6-49. History of Opening at the North Side of the SBR-1, Run 1 through Run 4

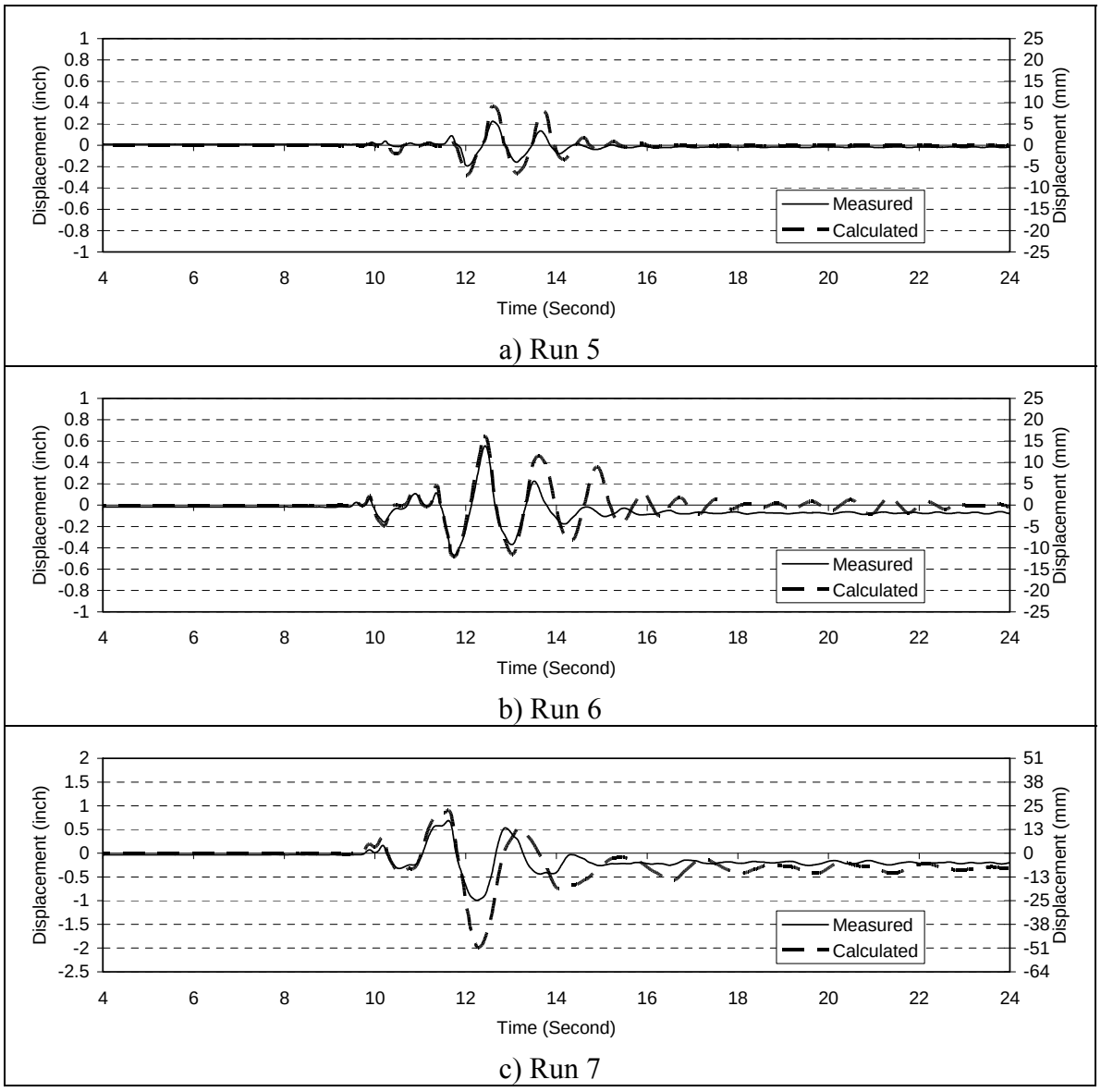


Fig. 6-50. History of Opening at the North Side of the SBR-1, Run 5 through Run 7

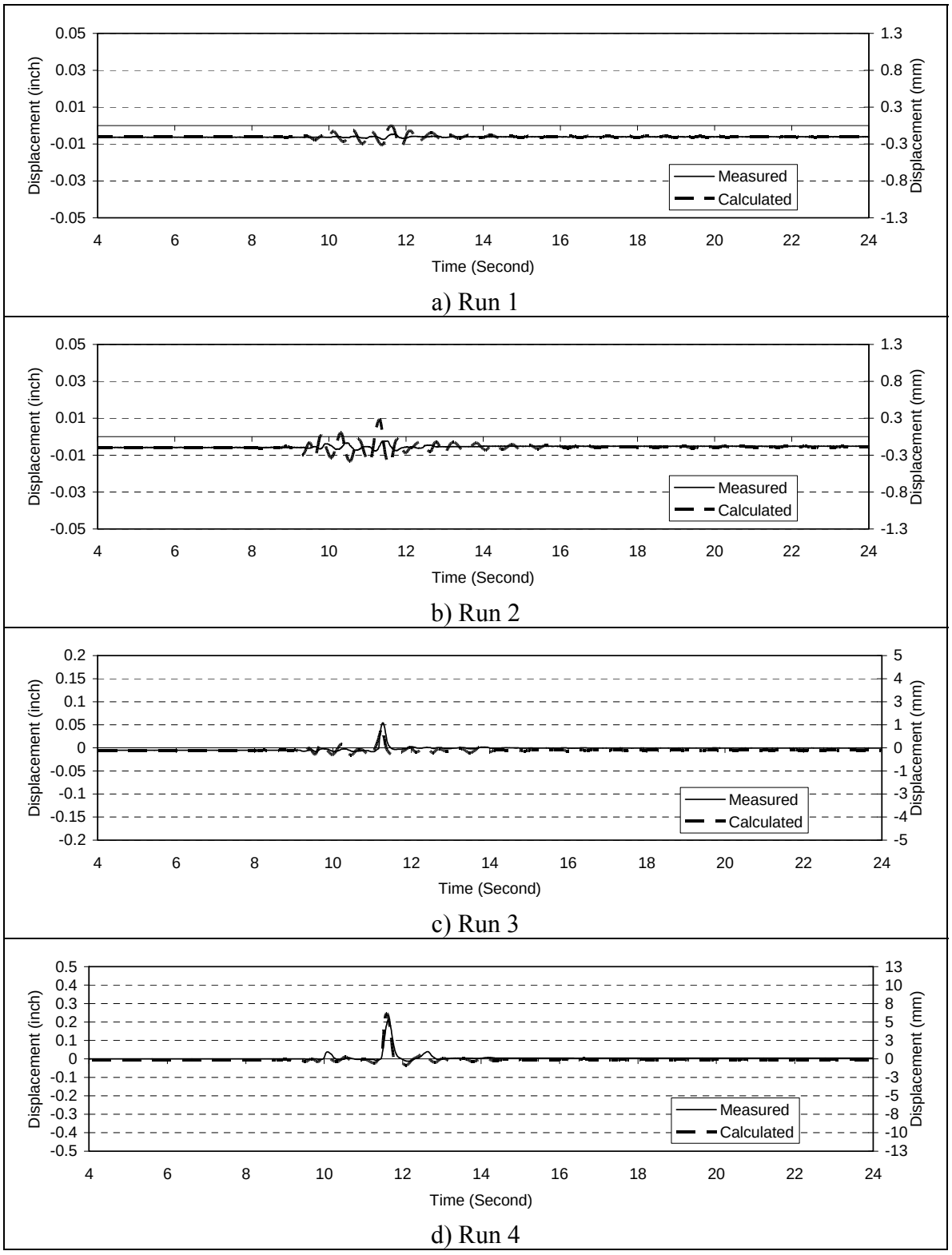


Fig. 6-51. History of Opening at the South Side of the SBR-1, Run 1 through Run 4

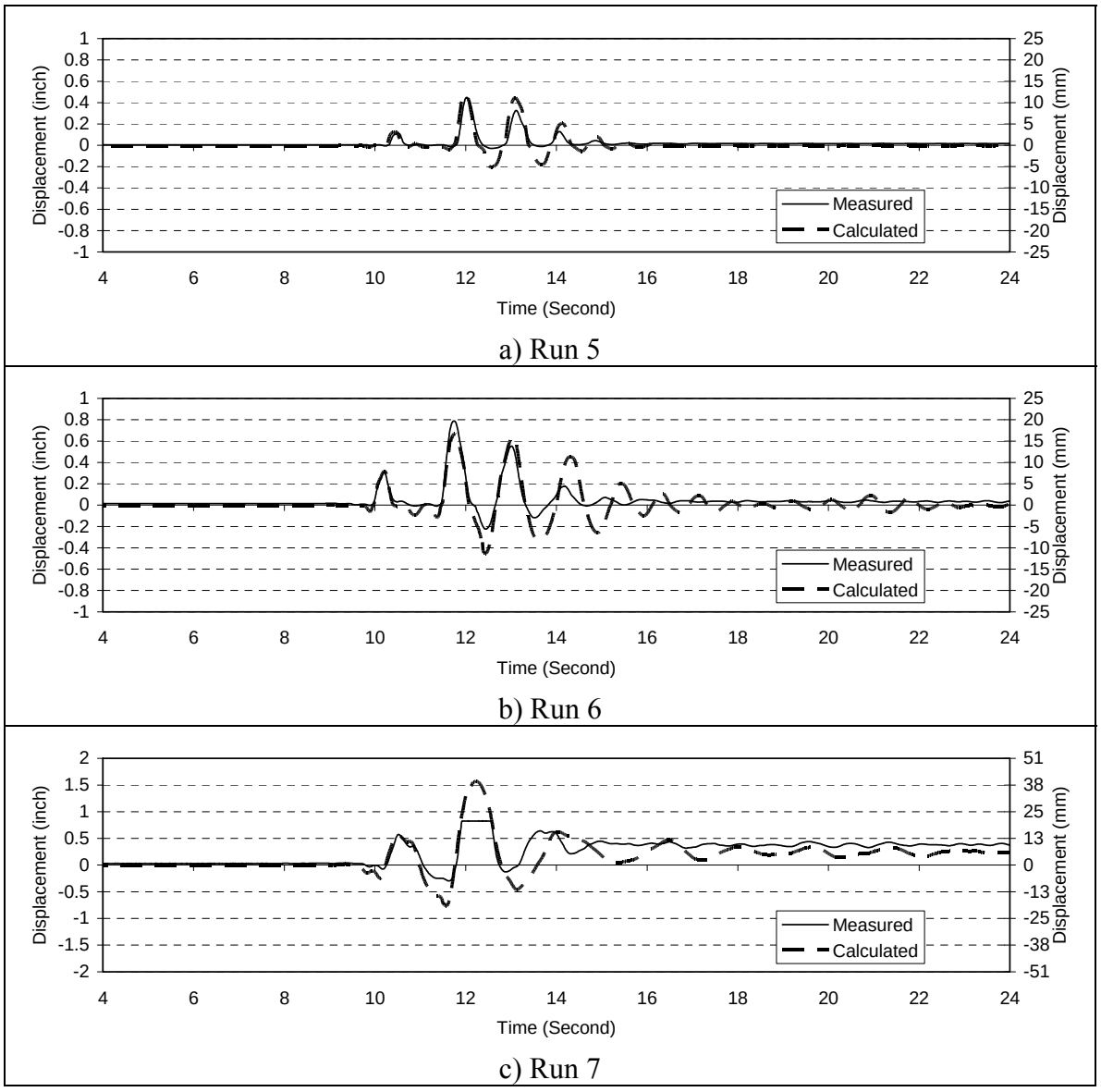


Fig. 6-52. History of Opening at the South Side of the SBR-1, Run 5 through Run 7

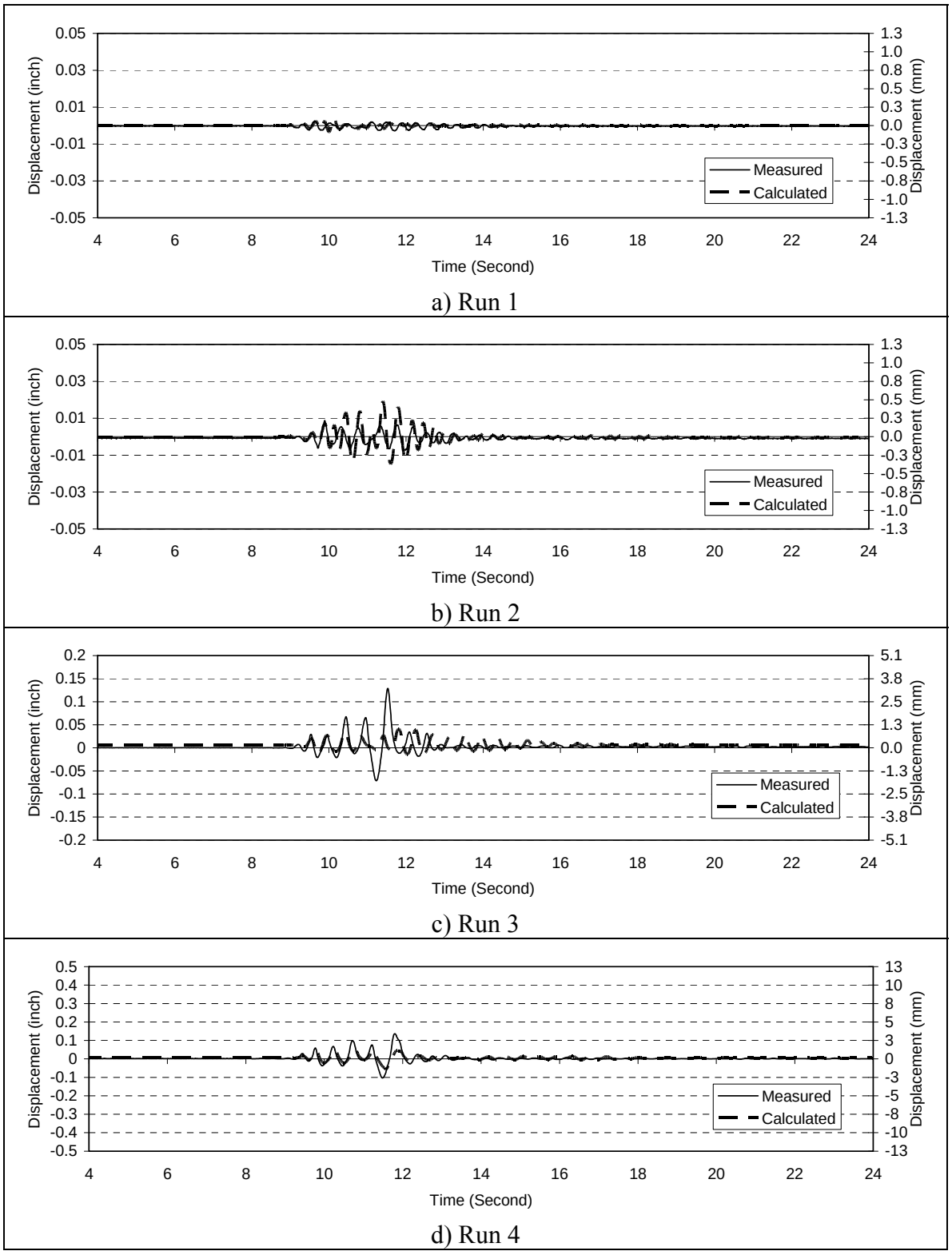


Fig. 6-53. History of Opening at the North Side of the SF-2, Run 1 through Run 4

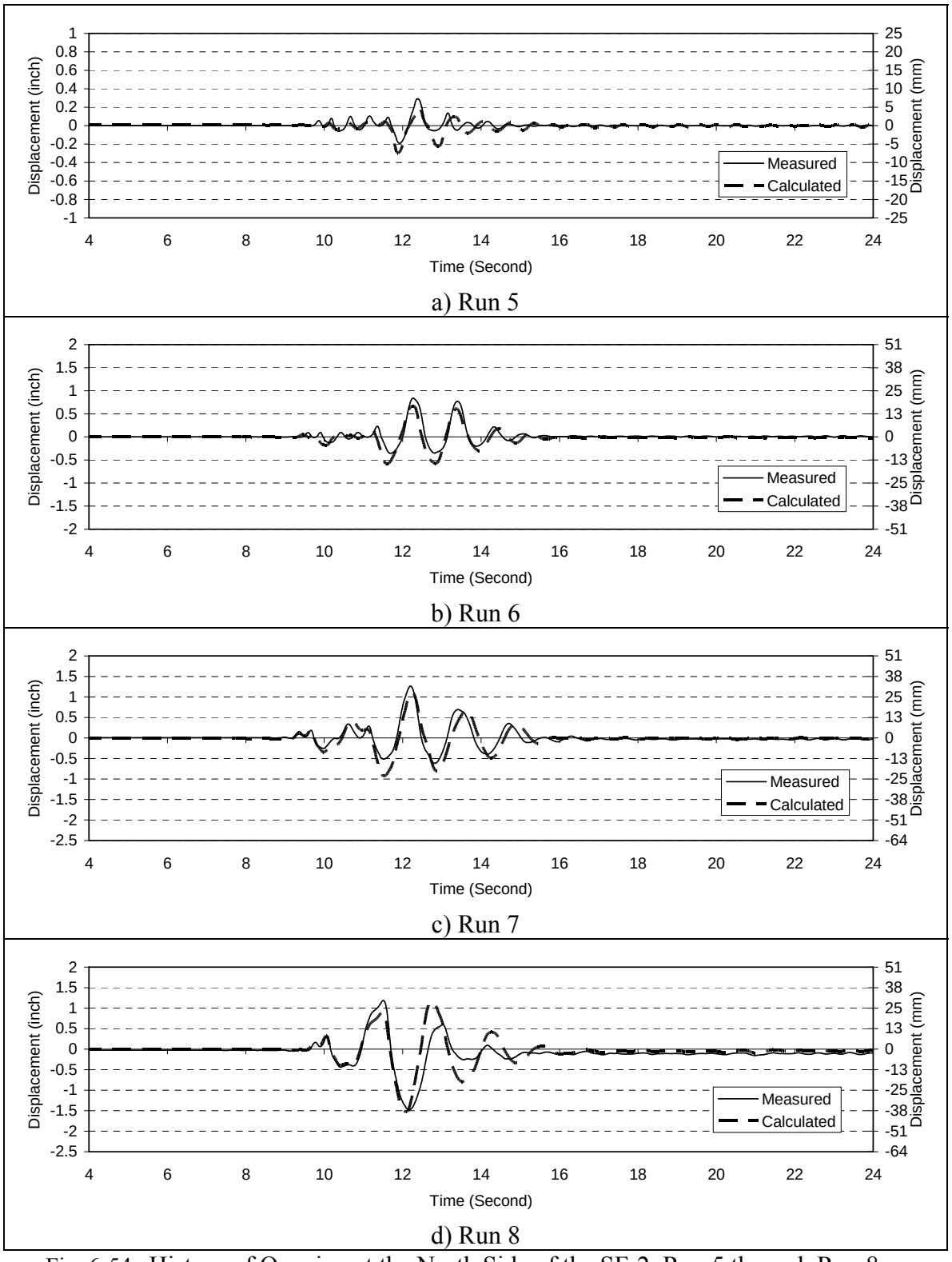


Fig. 6-54. History of Opening at the North Side of the SF-2, Run 5 through Run 8

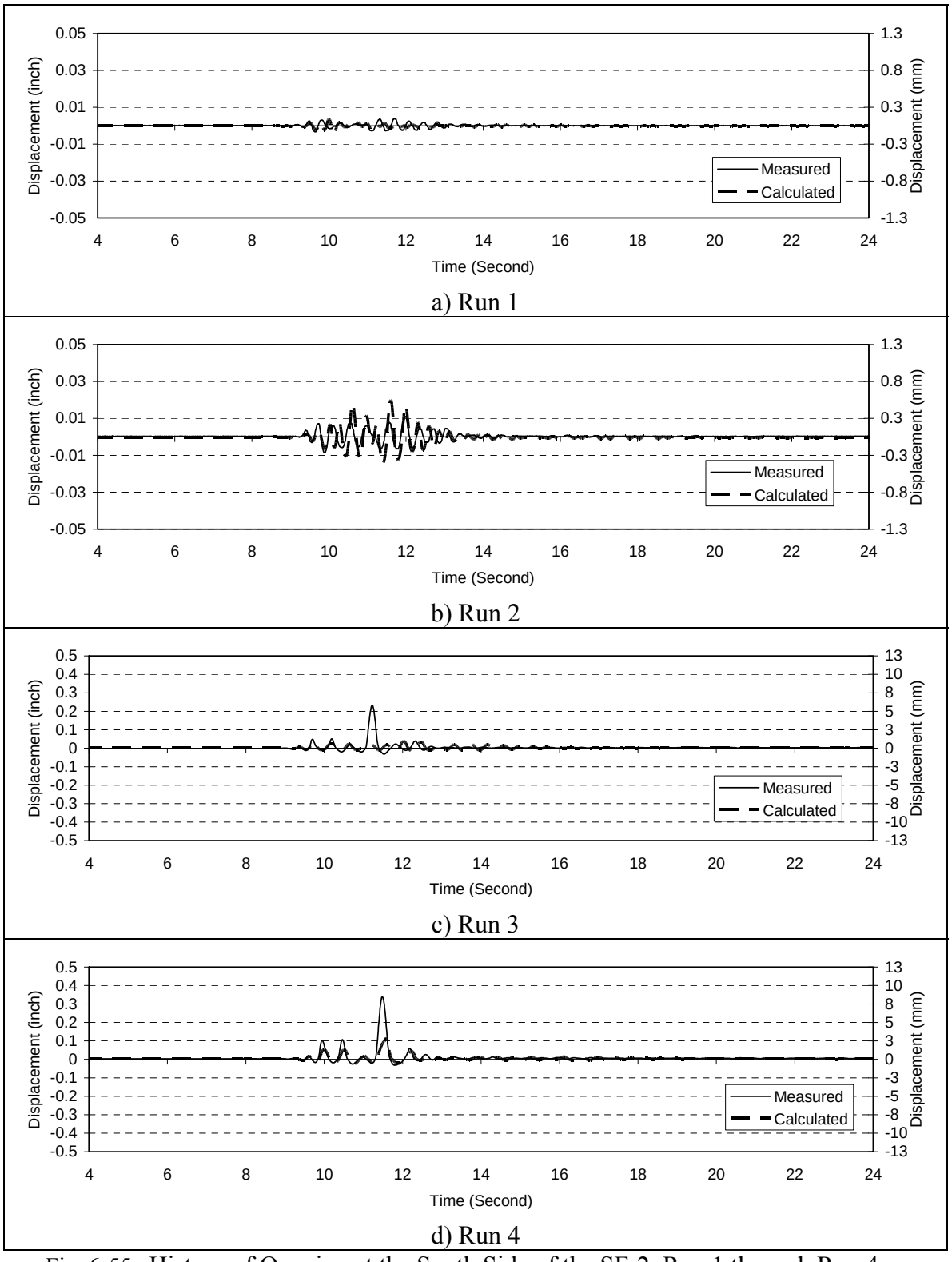


Fig. 6-55. History of Opening at the South Side of the SF-2, Run 1 through Run 4

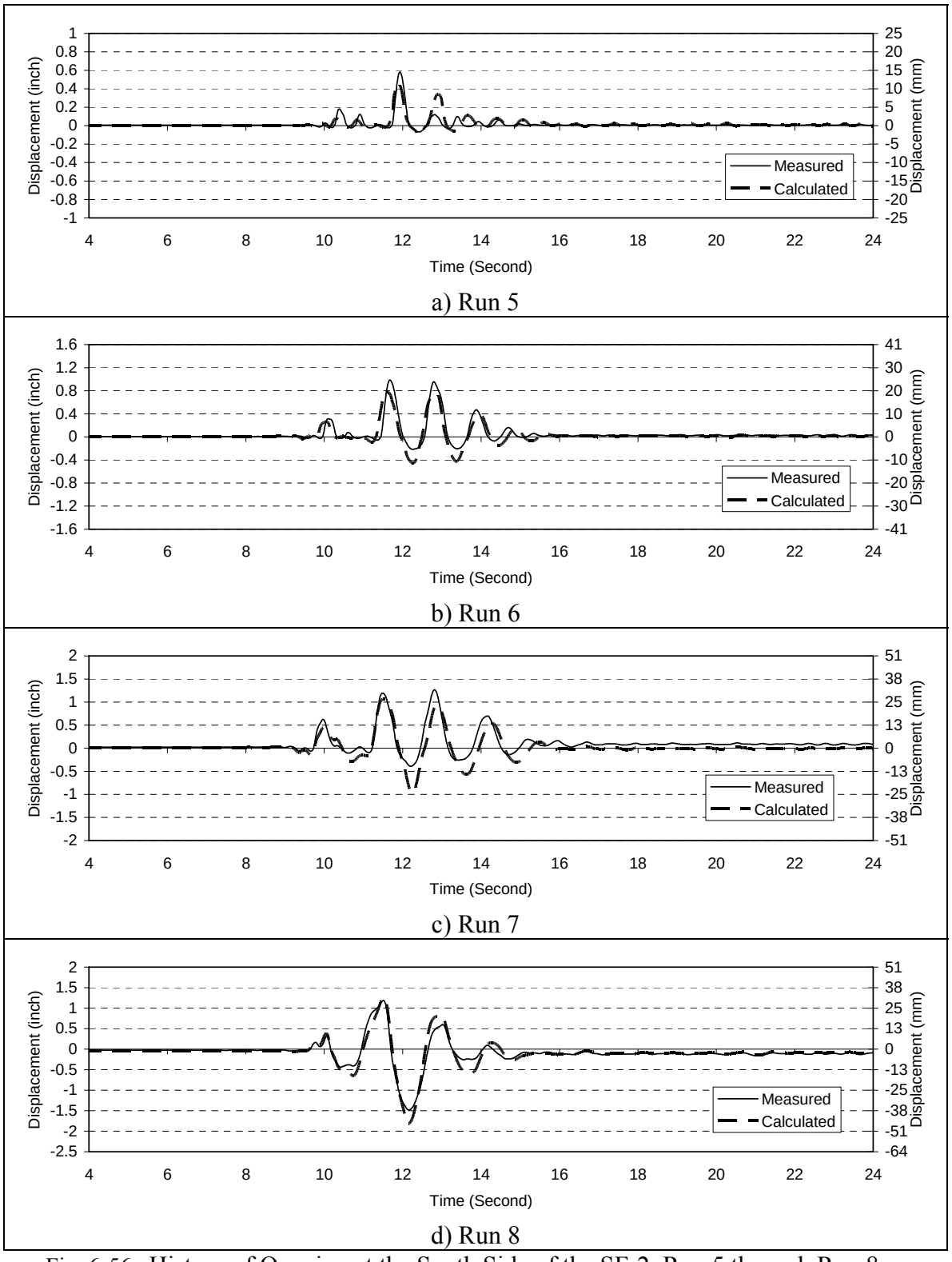


Fig. 6-56. History of Opening at the South Side of the SF-2, Run 5 through Run 8

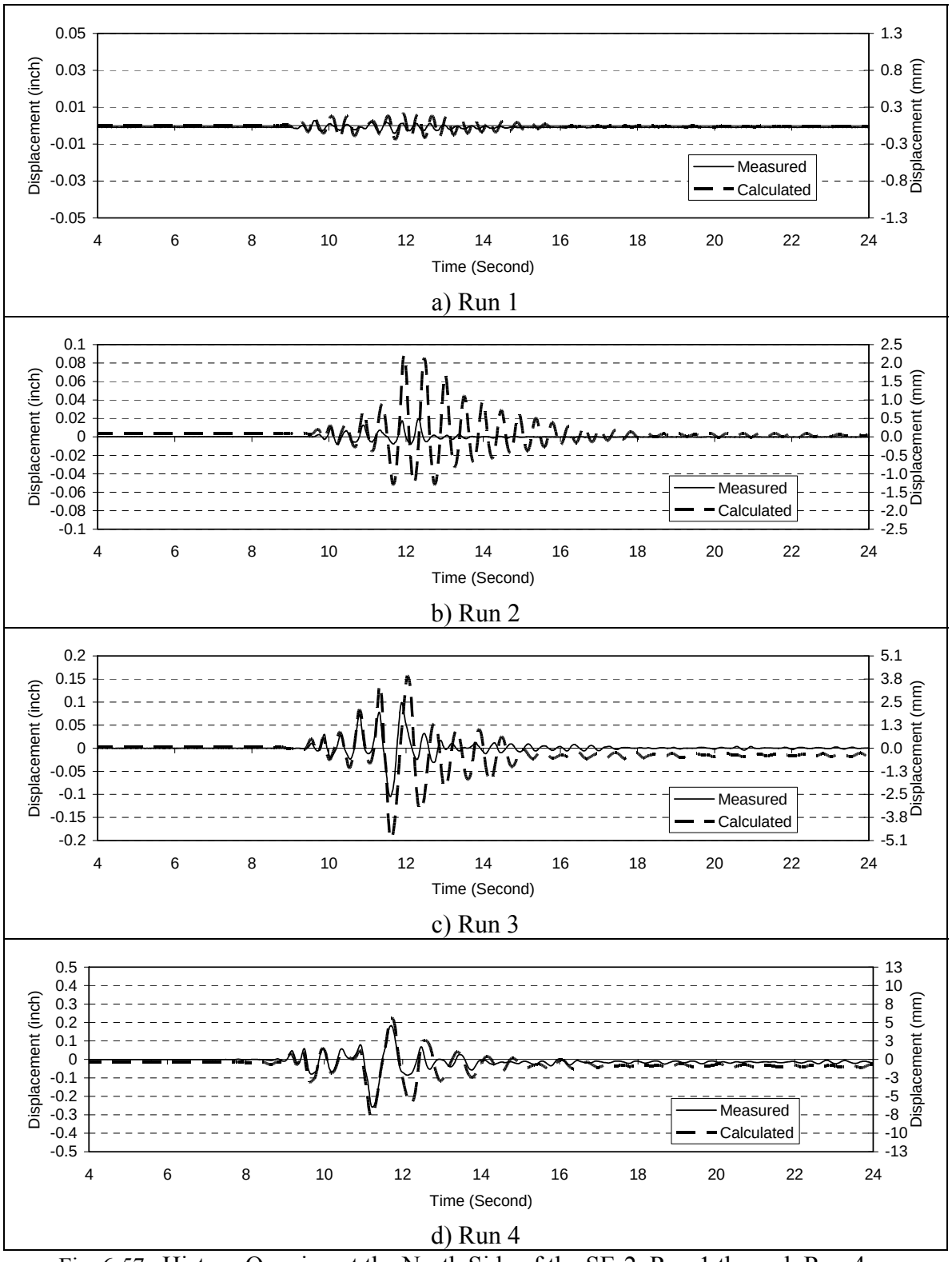


Fig. 6-57. History Opening at the North Side of the SE-2, Run 1 through Run 4

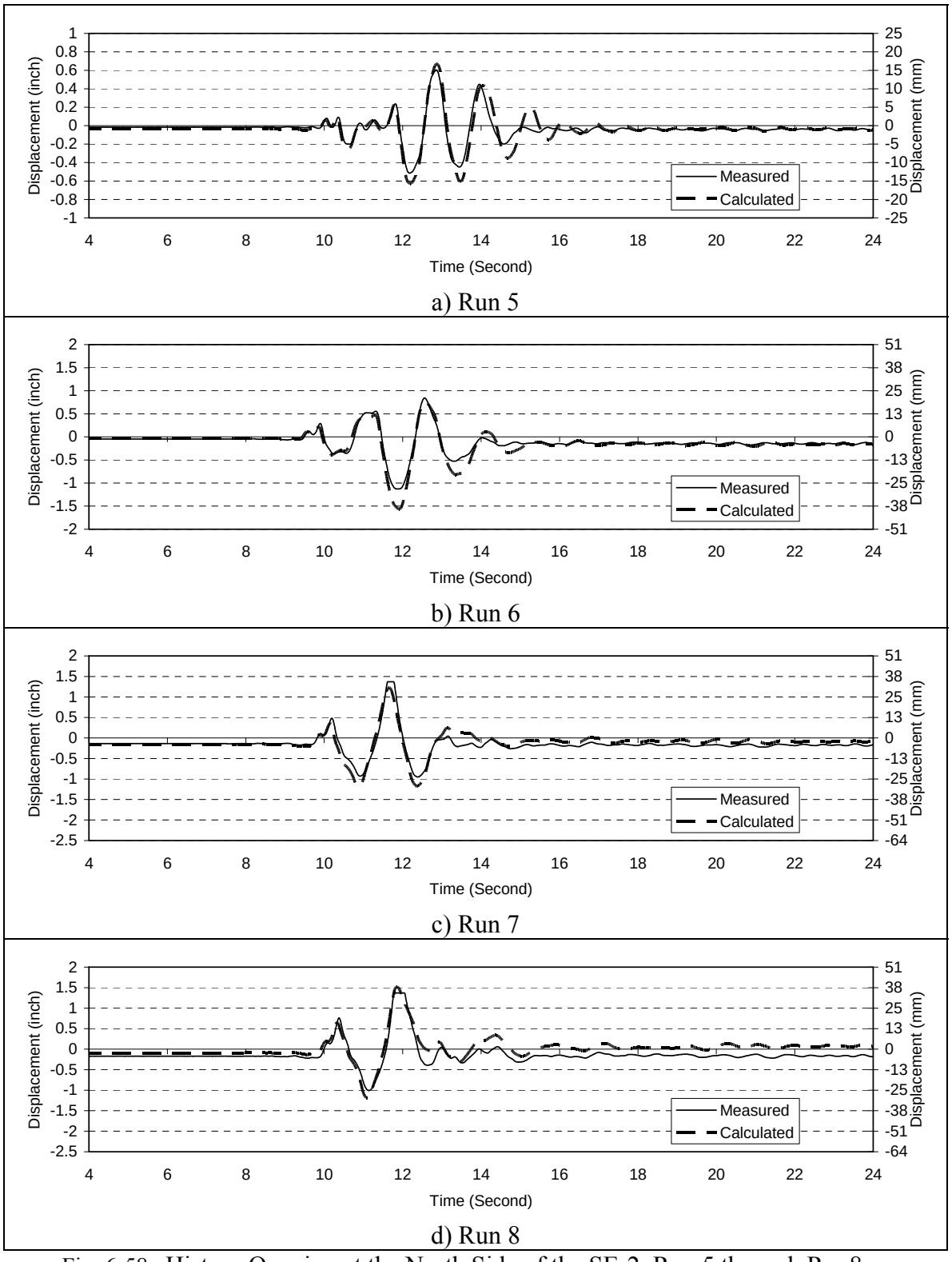


Fig. 6-58. History Opening at the North Side of the SE-2, Run 5 through Run8

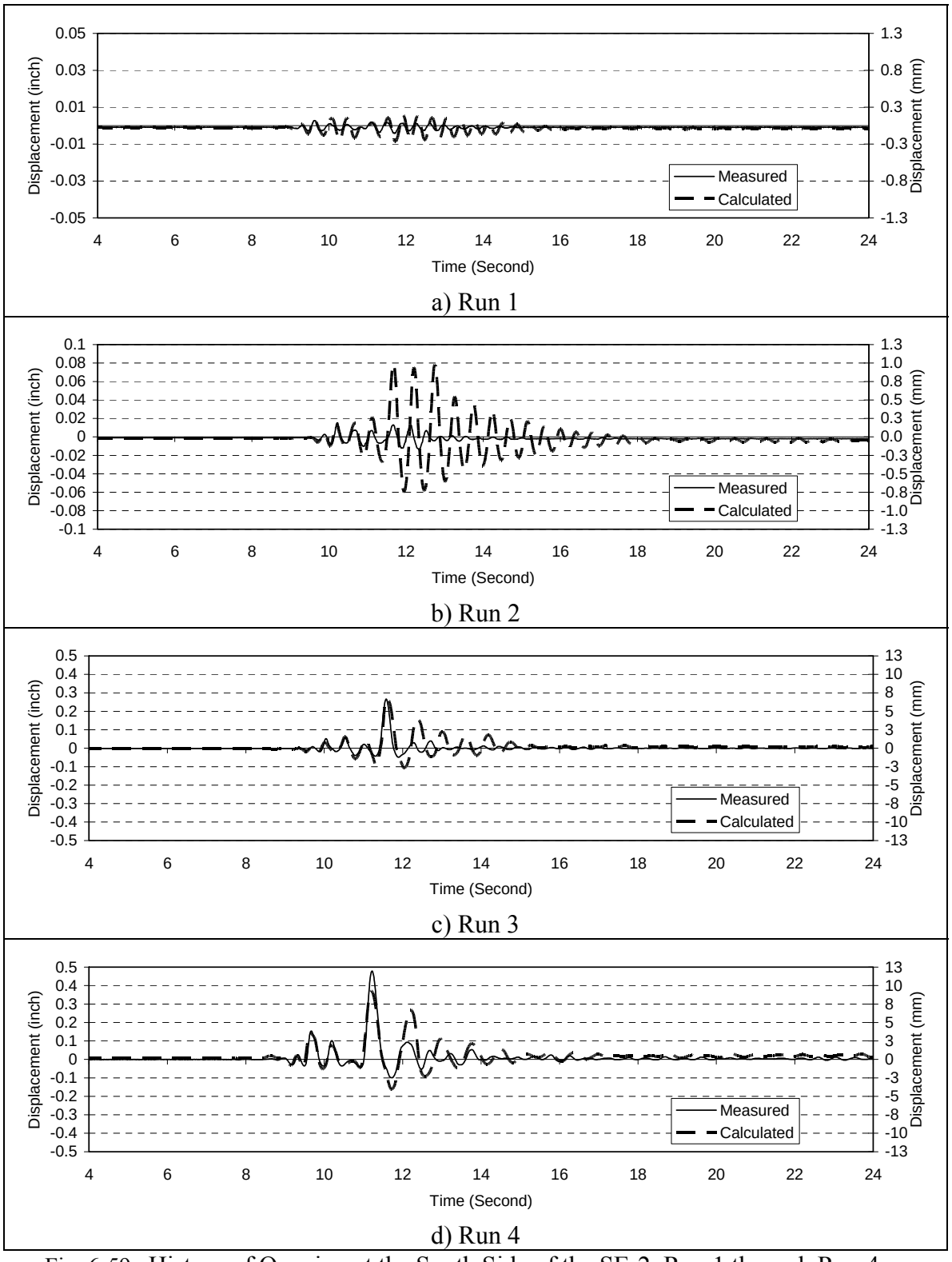


Fig. 6-59. History of Opening at the South Side of the SE-2, Run 1 through Run 4

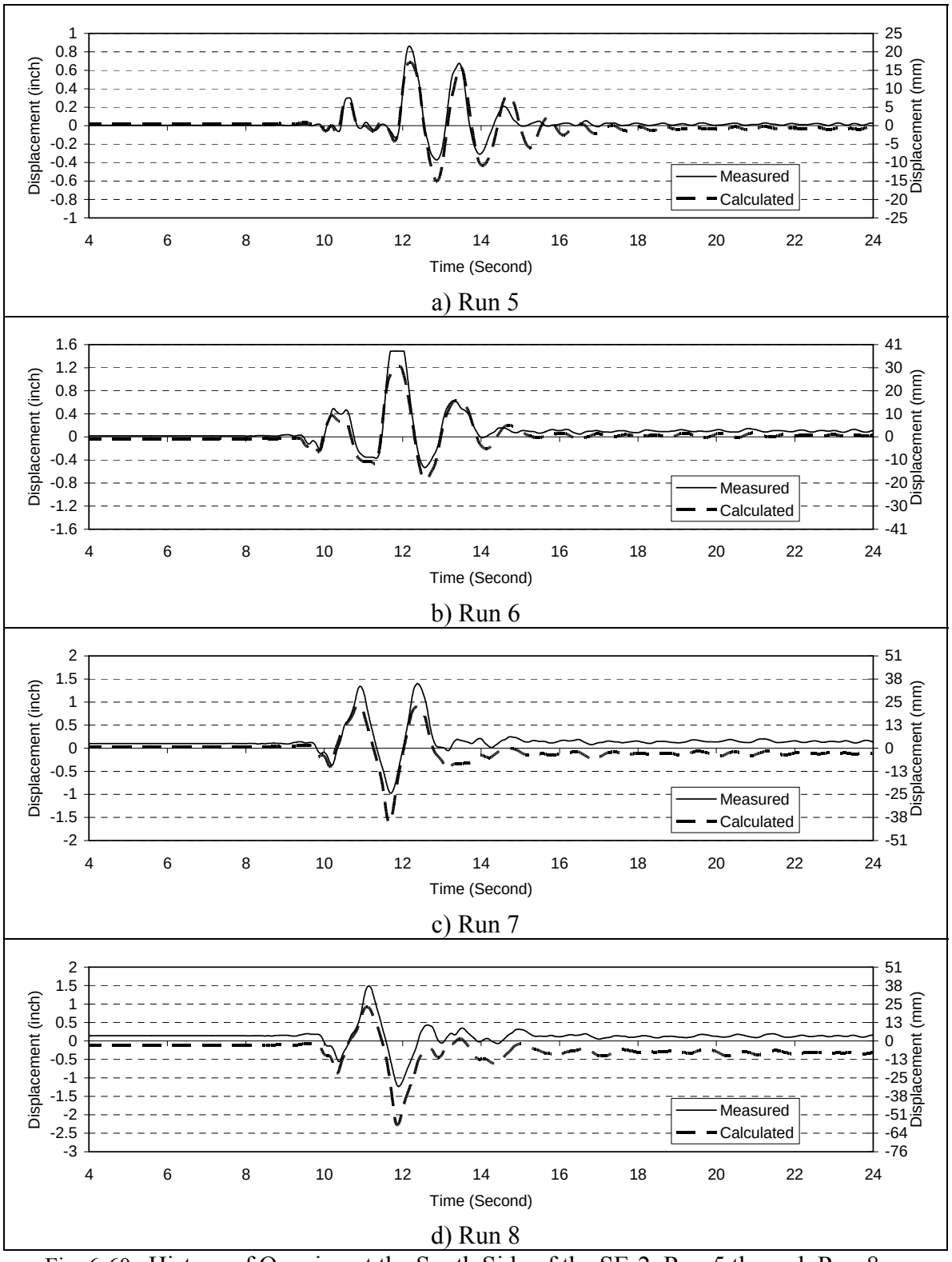


Fig. 6-60. History of Opening at the South Side of the SE-2, Run 5 through Run 8

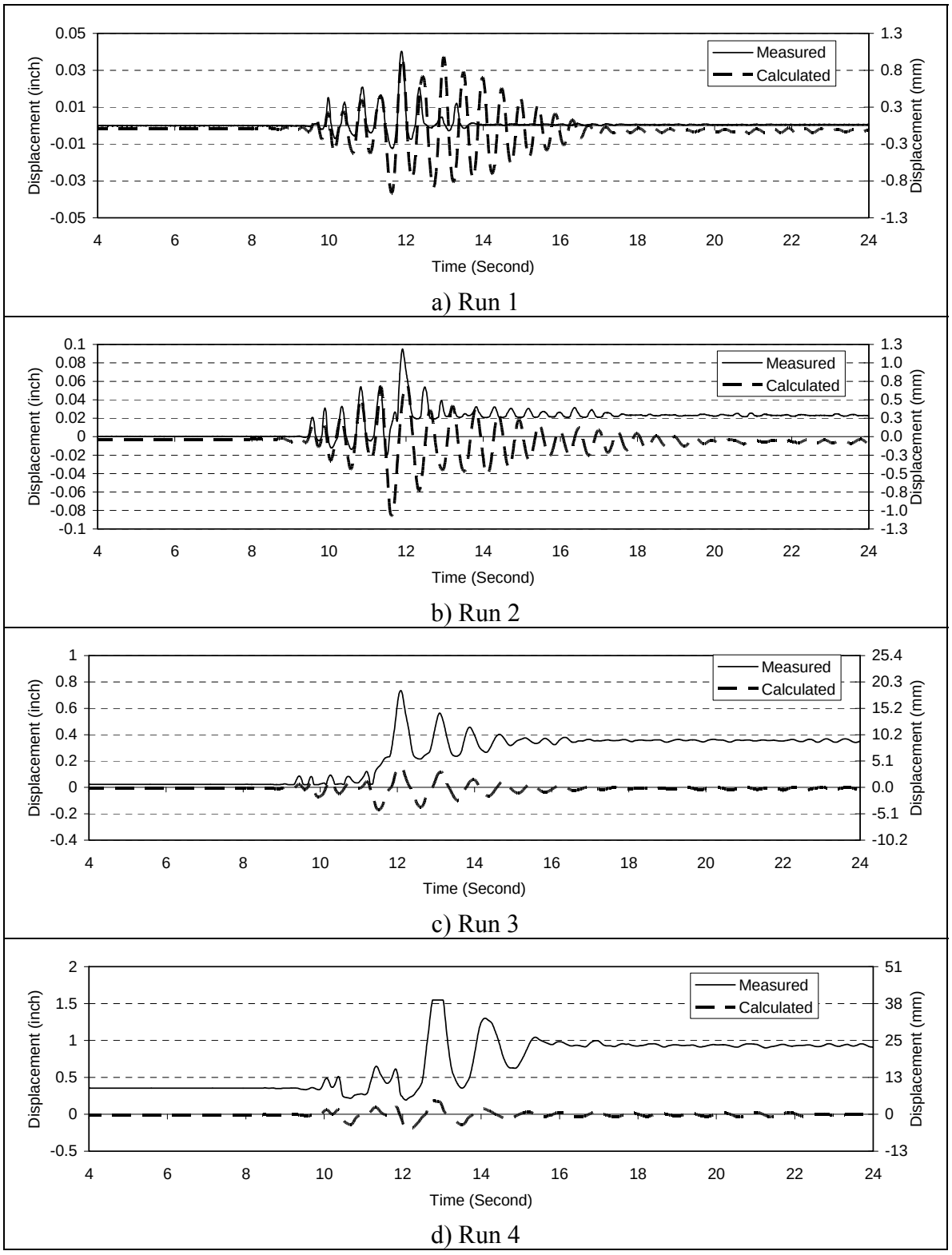
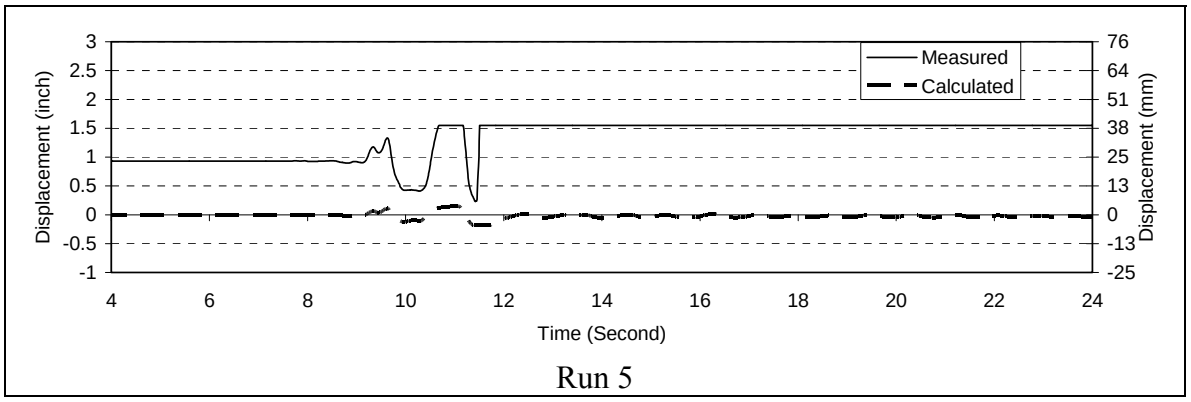


Fig. 6-61. History of Opening at the North Side of the SC-2R, Run 1 through Run 4



Run 5

Fig. 6-62. History of Opening at the North Side of the SC-2R, Run 5

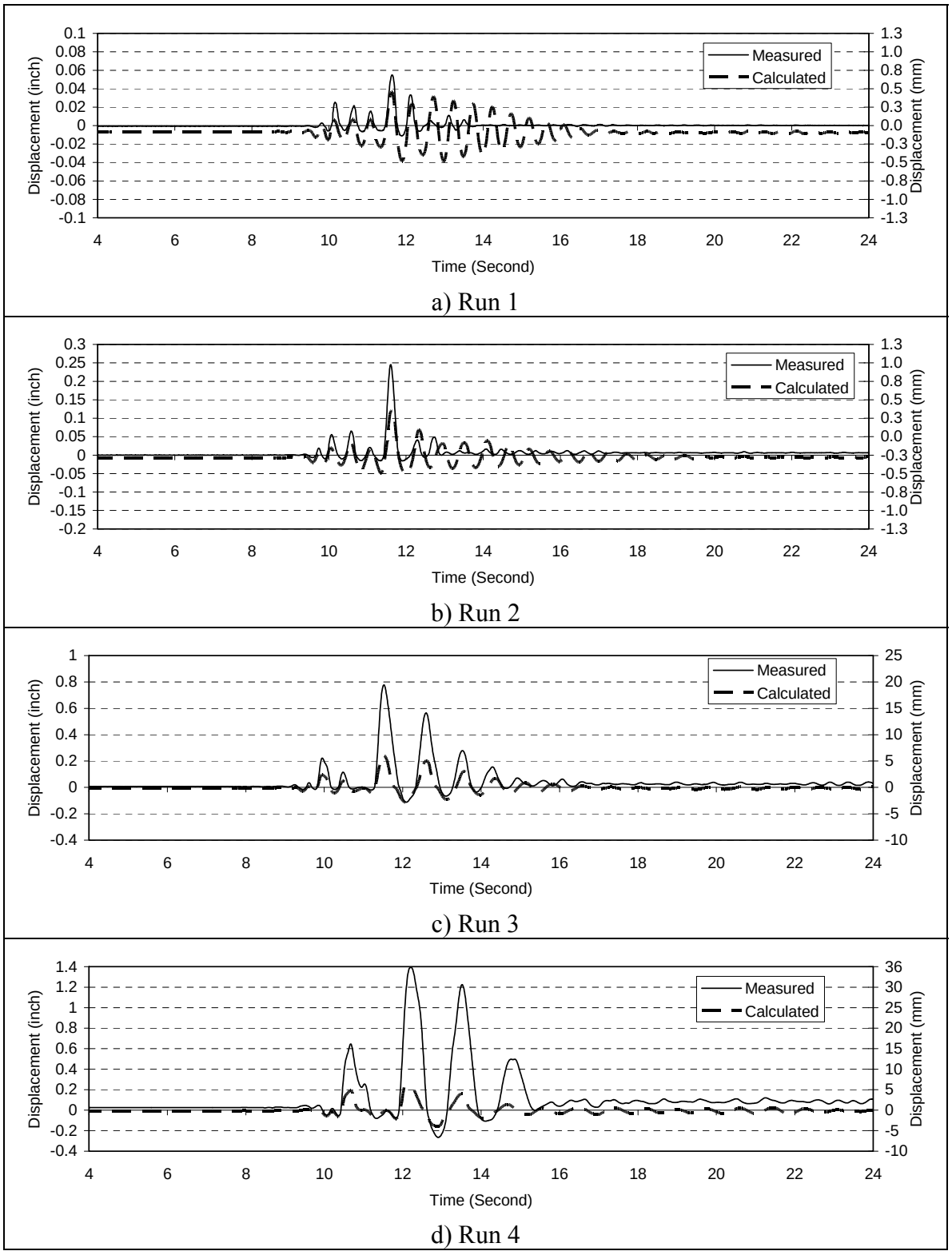
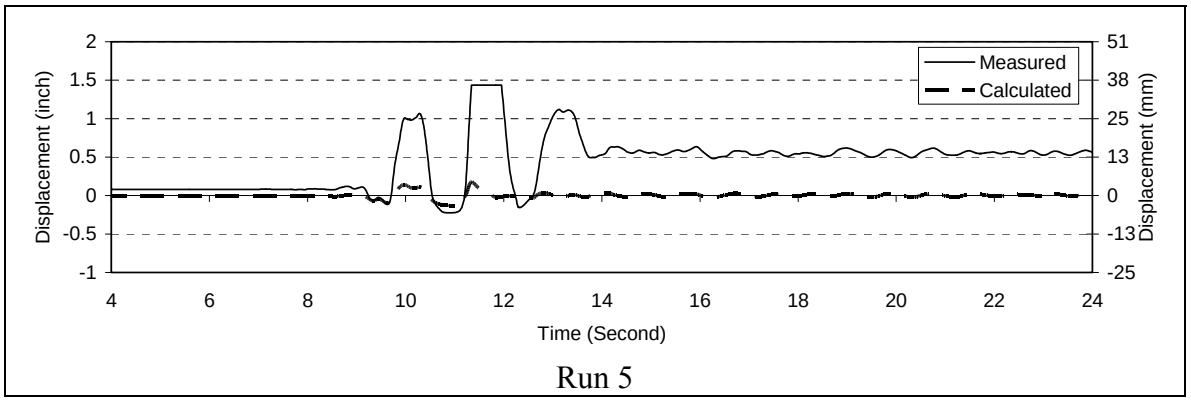


Fig. 6-63. History of Opening at the South Side of the SC-2R, Run 1 through Run 4



Run 5

Fig. 6-64. History of Opening at the South Side of the SC-2R, Run 4

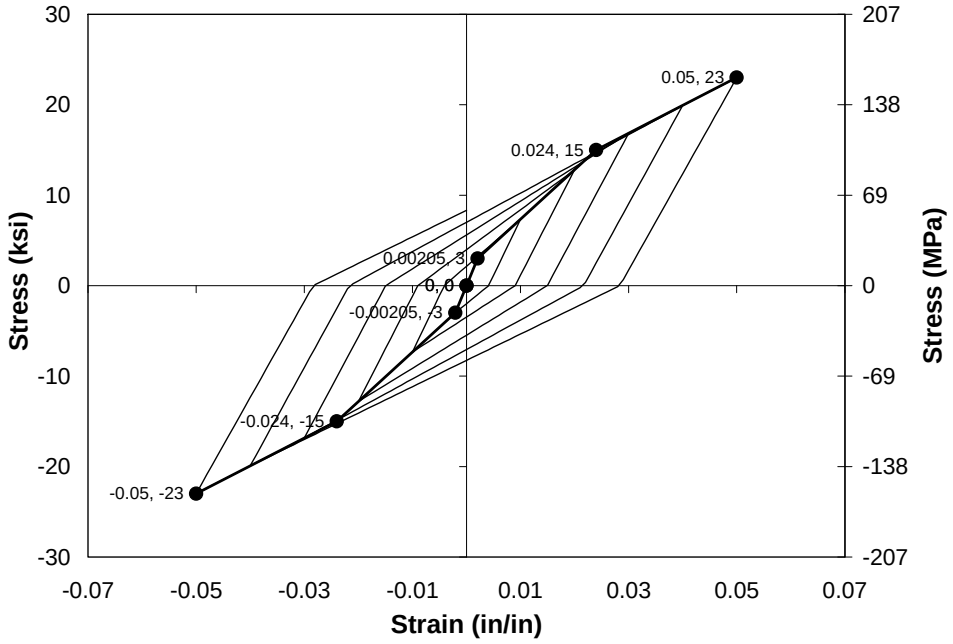


Fig. 6-65. Zhu's FRP Material Model, Longitudinal

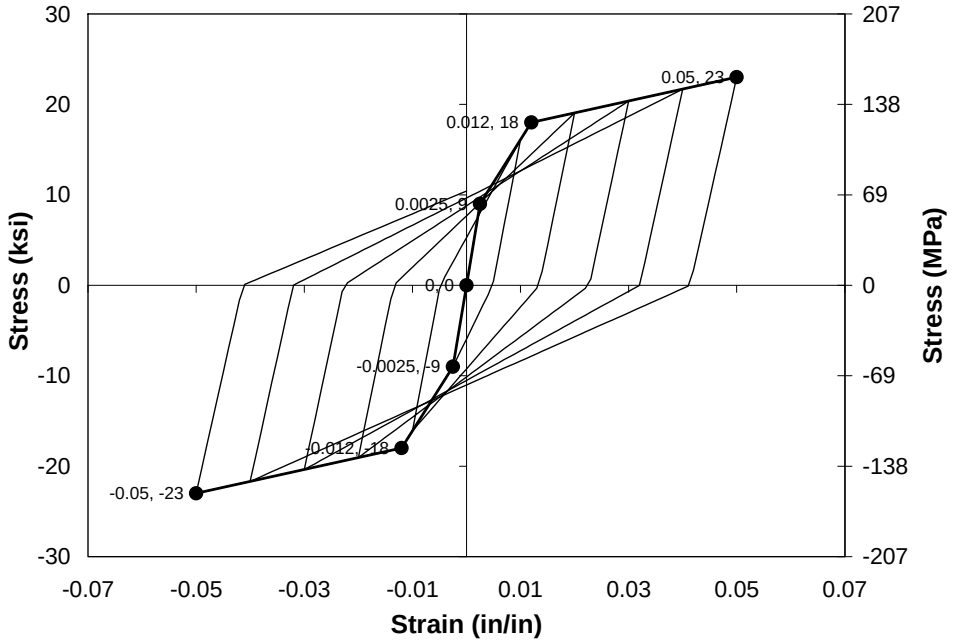


Fig. 6-66. Modified Material Model for FRP Tube, Longitudinal

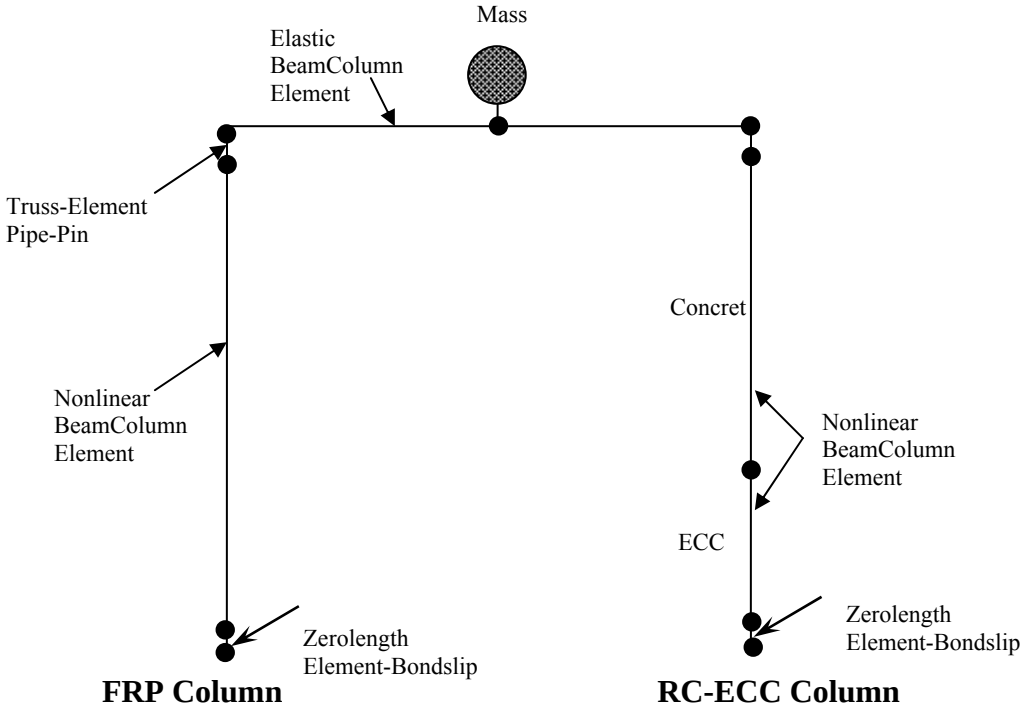


Fig. 6-67. Schematic Analytical Model of PEFB

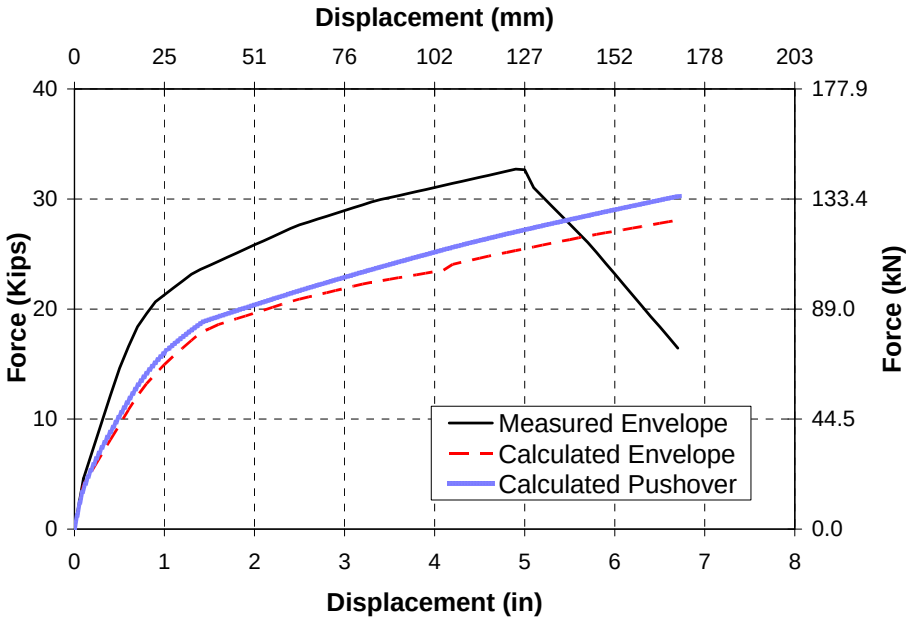


Fig. 6-68. Pushover and Average Backbone Curves of FRP Column, Zhu's FRP Model

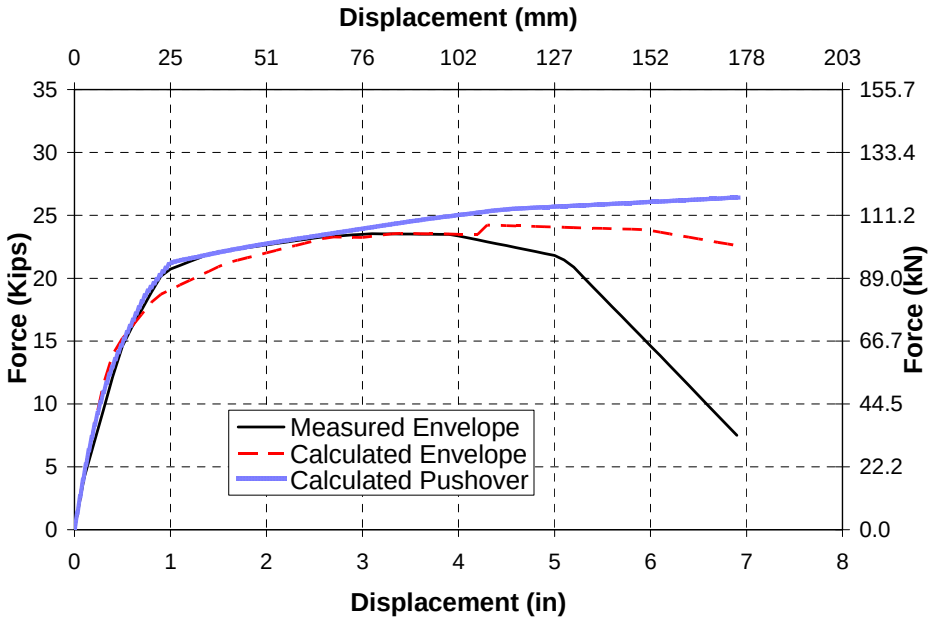


Fig. 6-69. Pushover and Average Backbone Curves of RC-ECC Column, Zhu's FRP Model

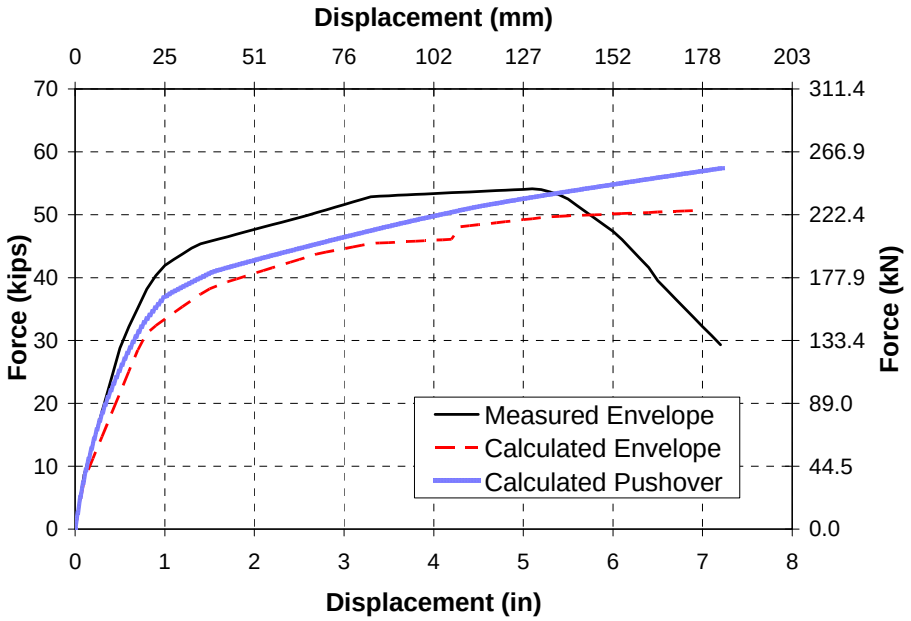


Fig. 6-70. Pushover and Average Backbone Curves of the Bent, Zhu's FRP Model

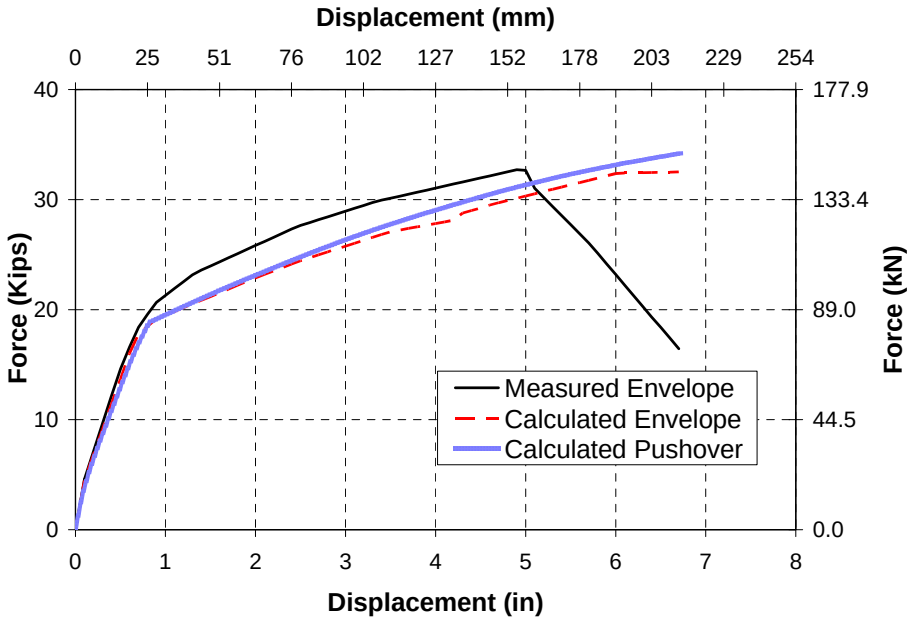


Fig. 6-71. Pushover and Average Backbone Curves of FRP Column, Modified FRP Model

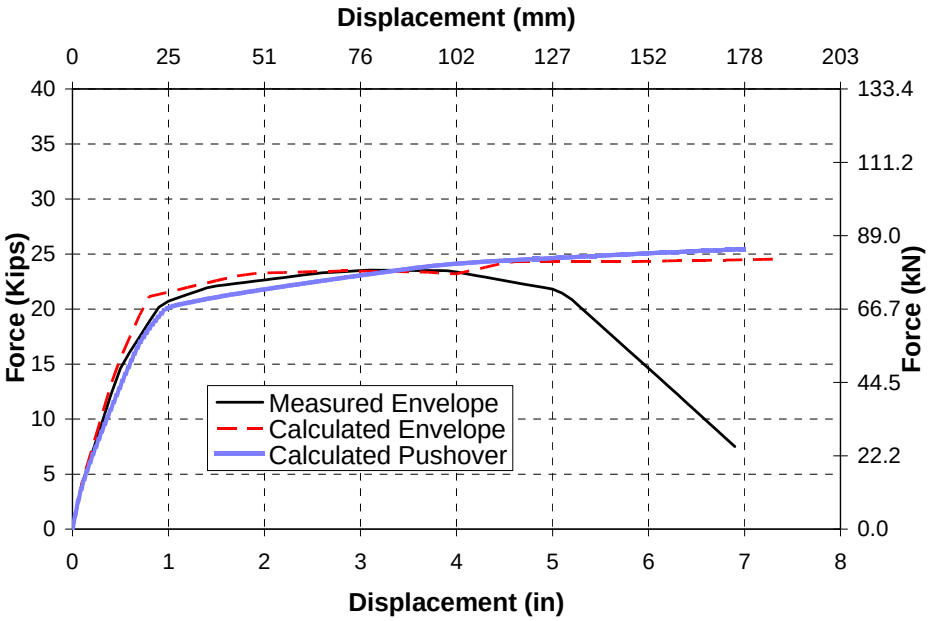


Fig. 6-72. Pushover and Average Backbone Curves of RC-ECC Column, Modified FRP Model

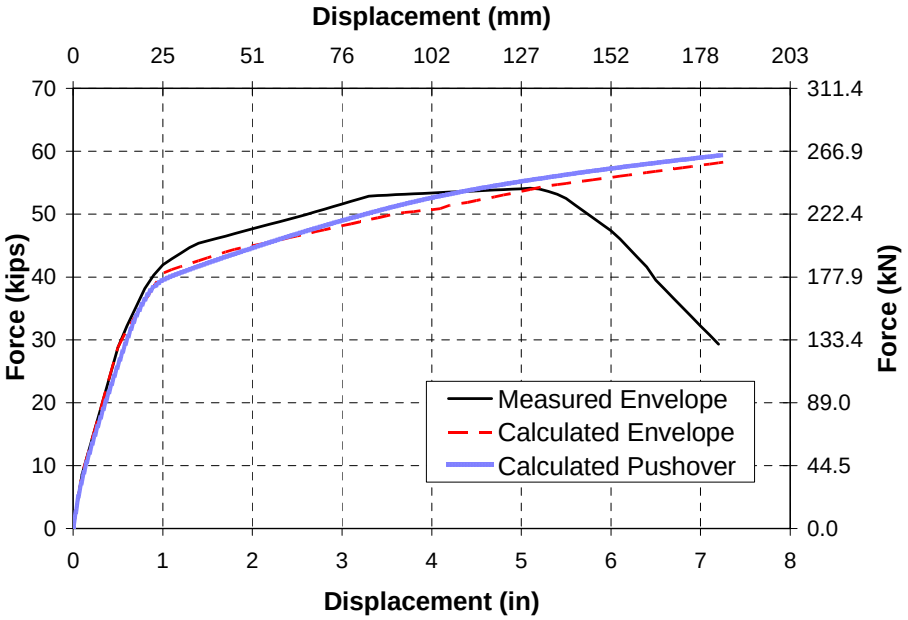


Fig. 6-73. Pushover and Average Backbone Curves of Bent, Modified FRP Model

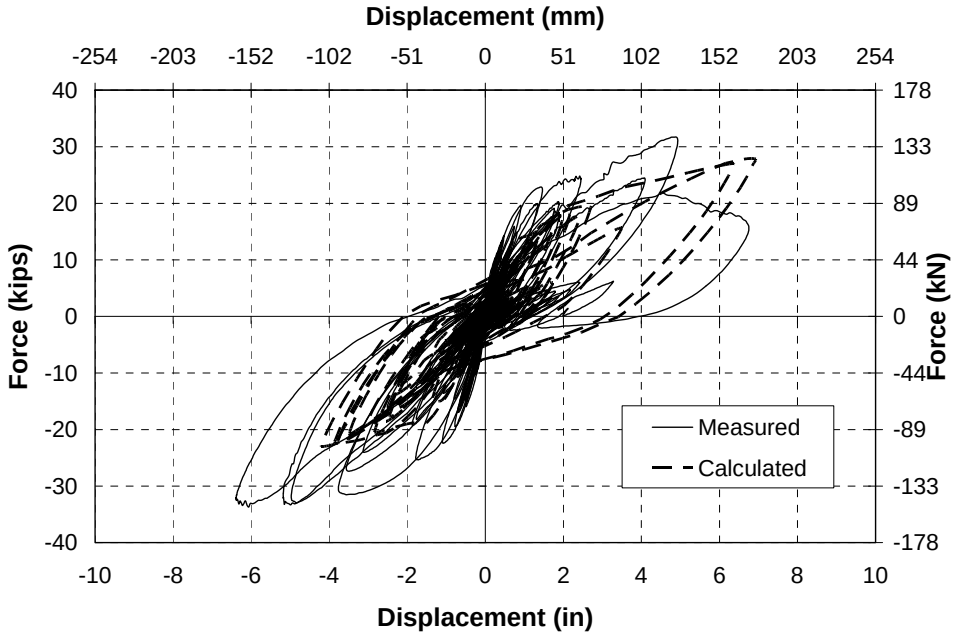


Fig. 6-74. Accumulated Force-Displacement Hysteresis Curves for FRP Column, Zhu's FRP Model

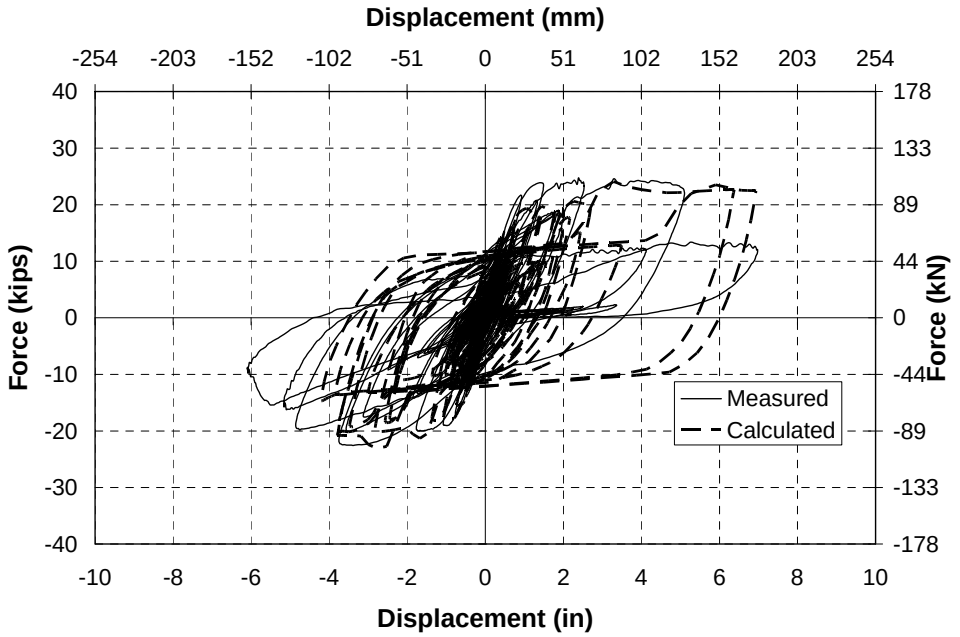


Fig. 6-75. Accumulated Force-Displacement Hysteresis Curves for the RC-ECC Column, Zhu's FRP Model

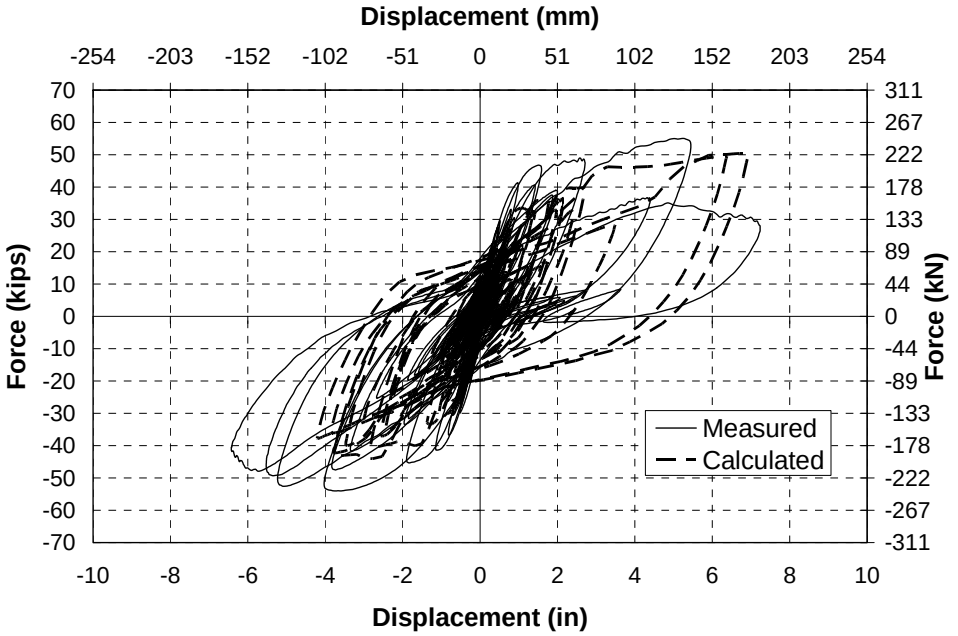


Fig. 6-76. Accumulated Force-Displacement Hysteresis Curves for the Bent, Zhu's FRP Model

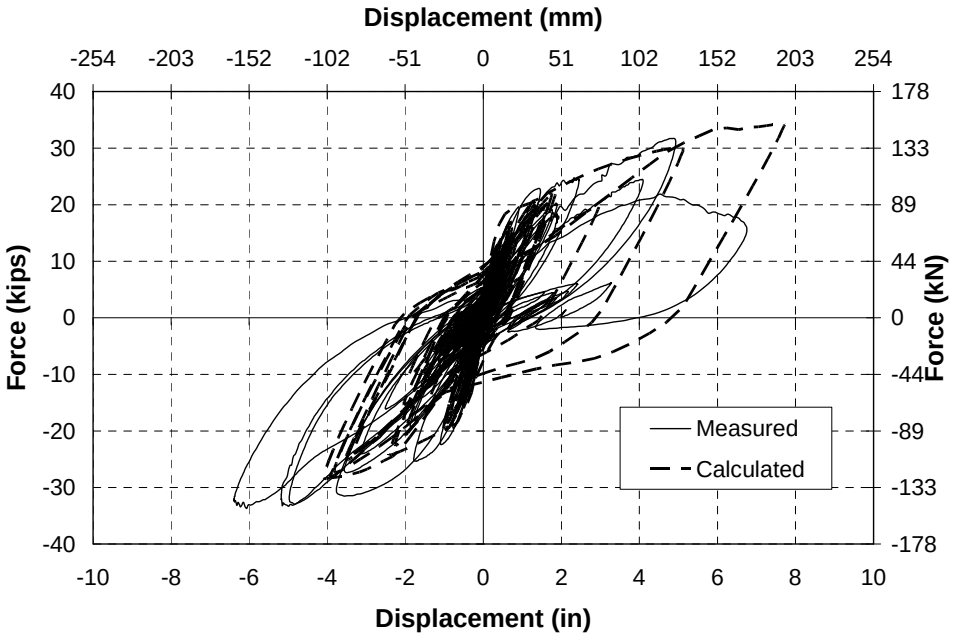


Fig. 6-77. Accumulated Force-Displacement Hysteresis Curves for FRP Column, Modified FRP Model

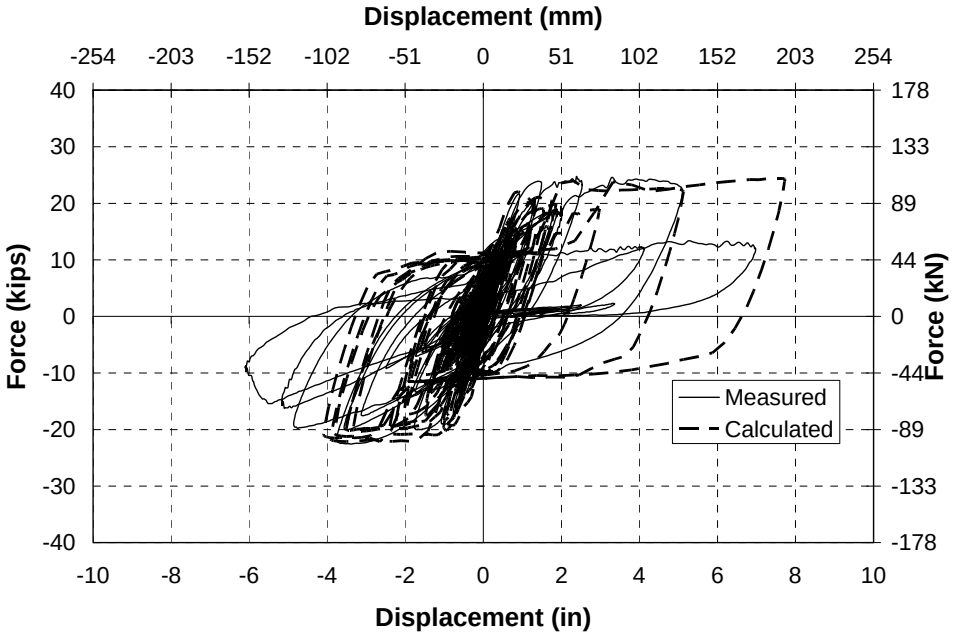


Fig. 6-78. Accumulated Force-Displacement Hysteresis Curves for the RC-ECC Column, Modified FRP Model

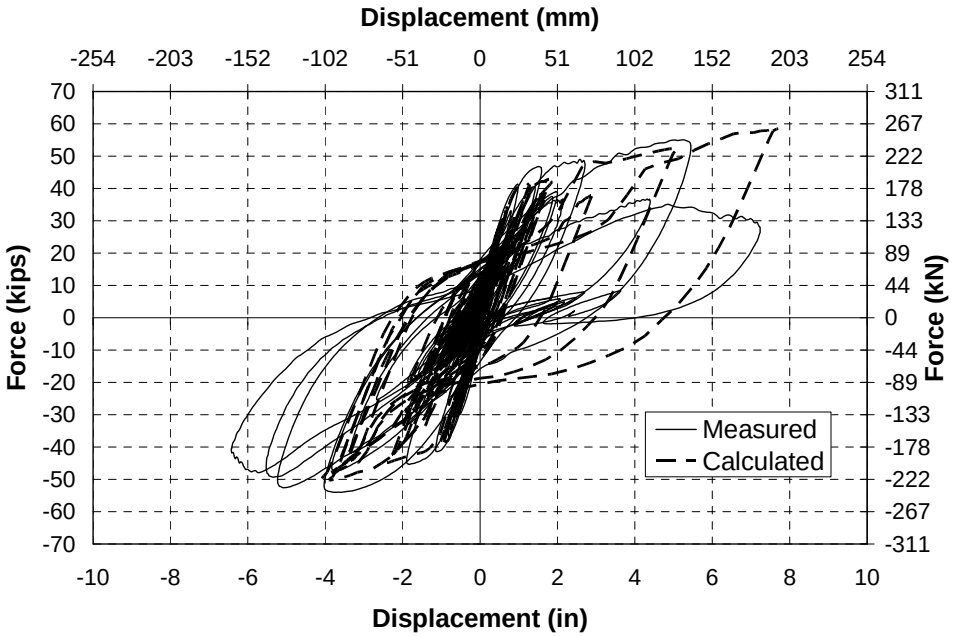


Fig. 6-79. Accumulated Force-Displacement Hysteresis Curves for the Bent, Modified FRP Model

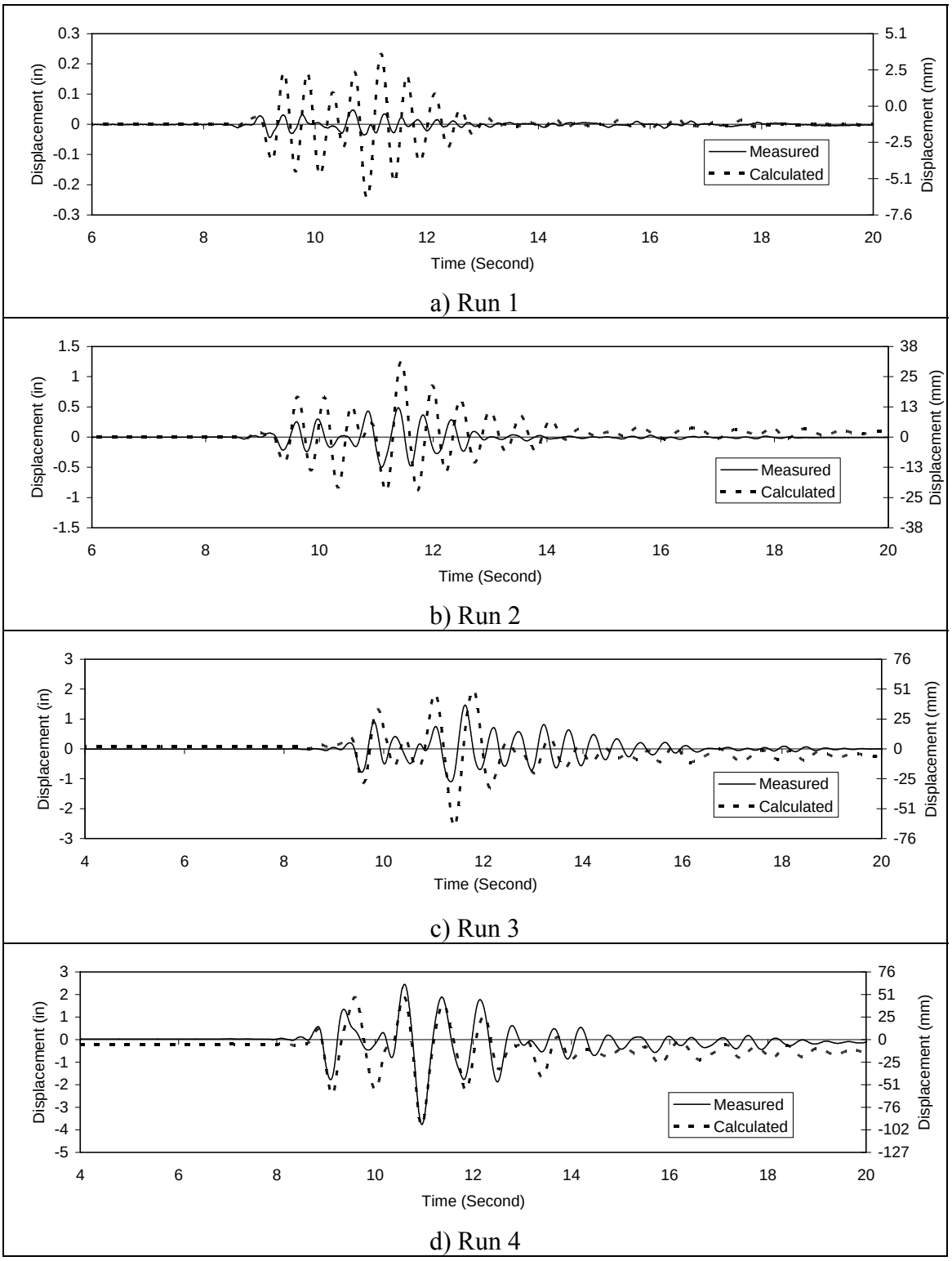


Fig. 6-80. Displacement History of the Bent Column for Run 1 through Run 4

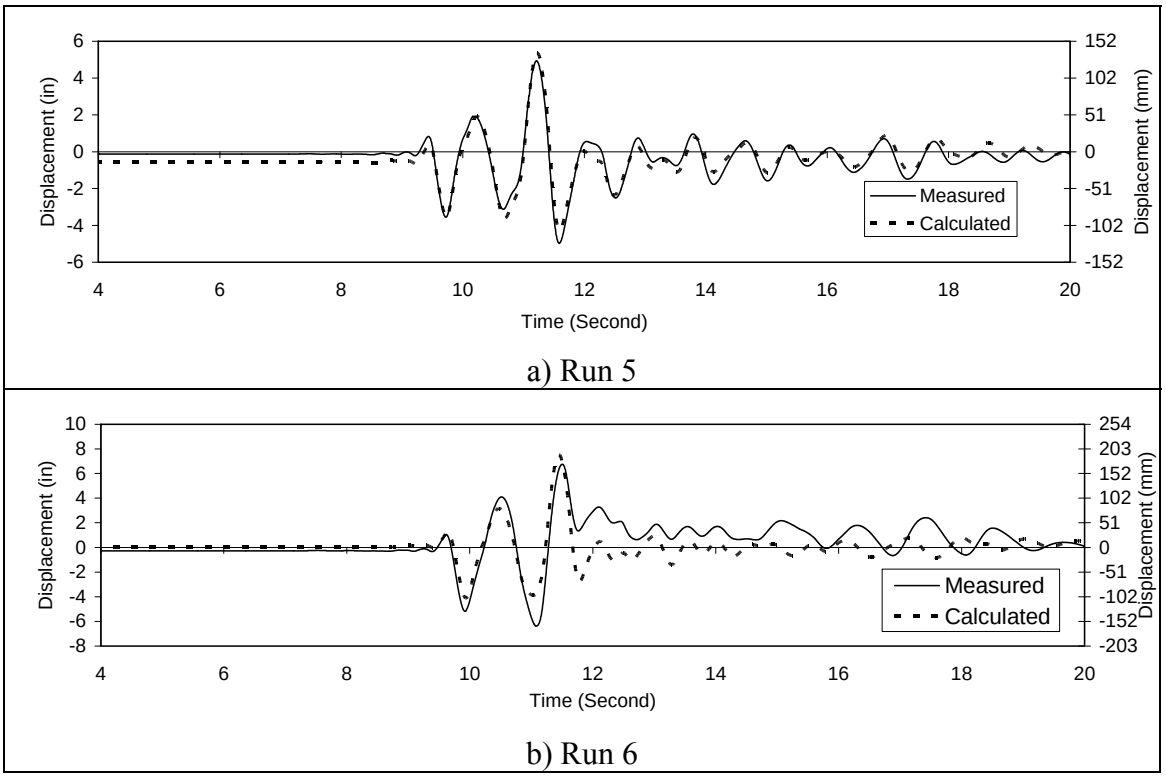


Fig. 6-81. Displacement History of the Bent Column for Run 5 and Run 6

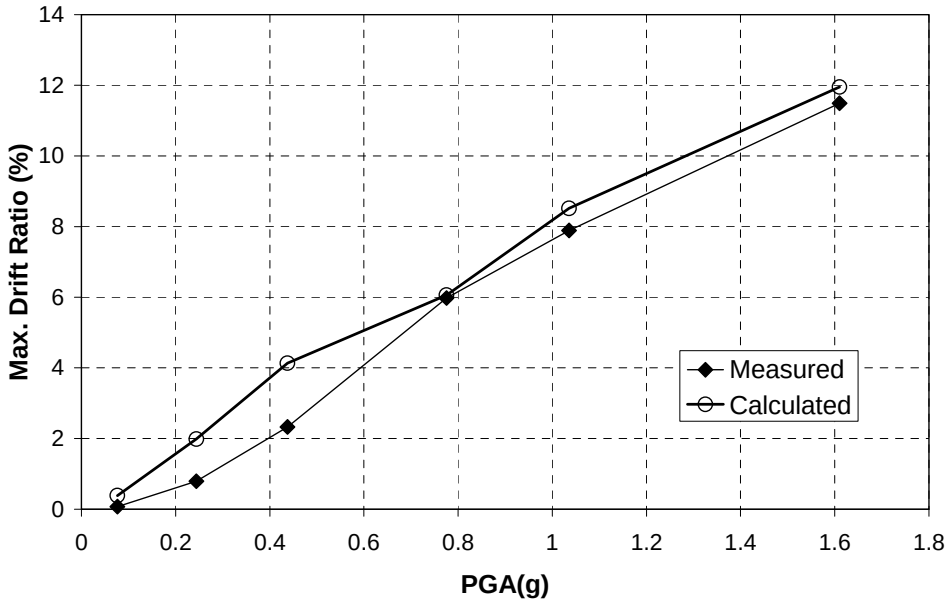


Fig. 6-82. Maximum Drift Ratio vs. PGA in the Bent

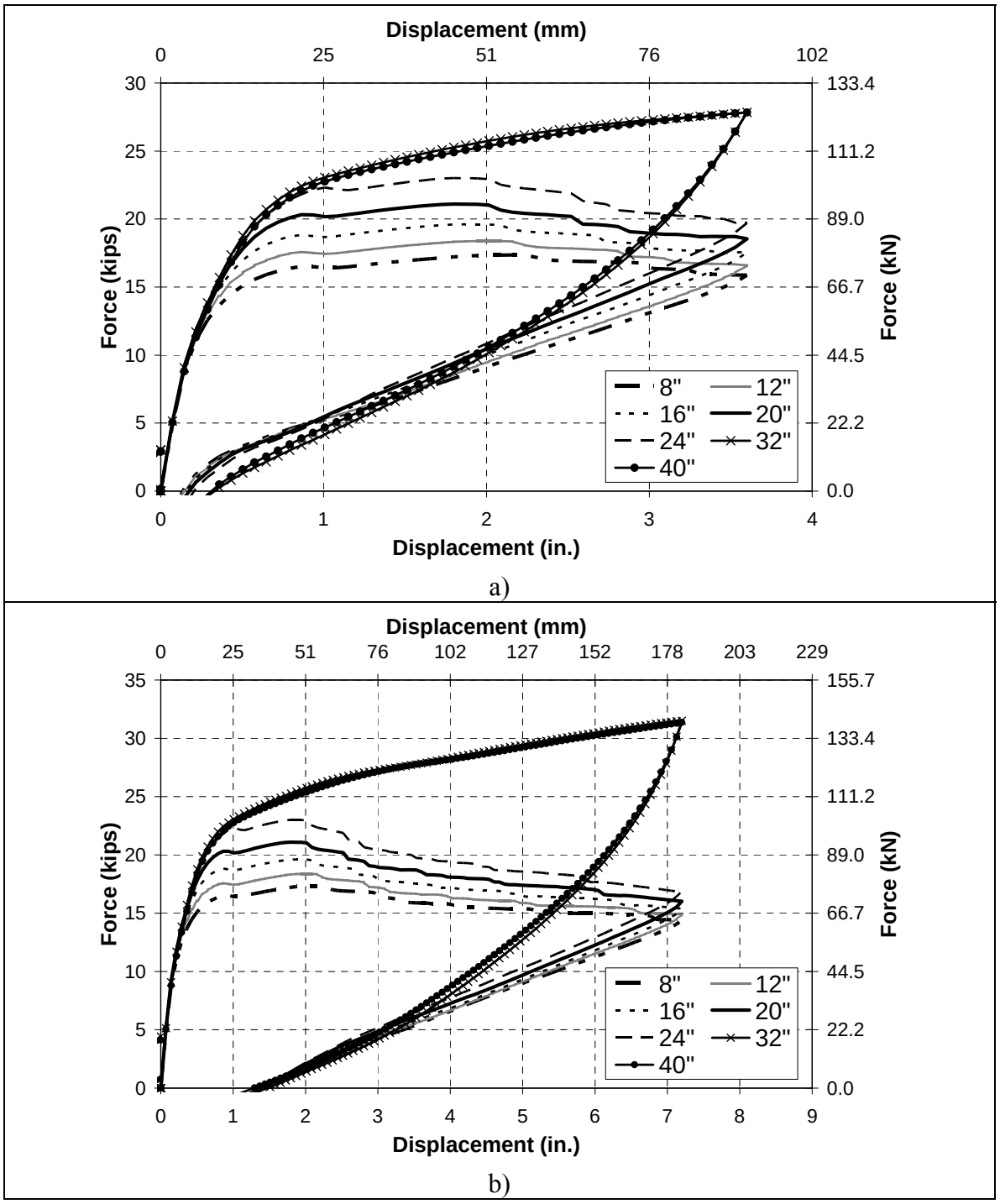


Fig. 7-1. Force-Displacement Cyclic Curve for SC-2 with Different Base Segment Heights a)5% Drift Ratio, b) 10% Drift Ratio (1% Steel Ratio)

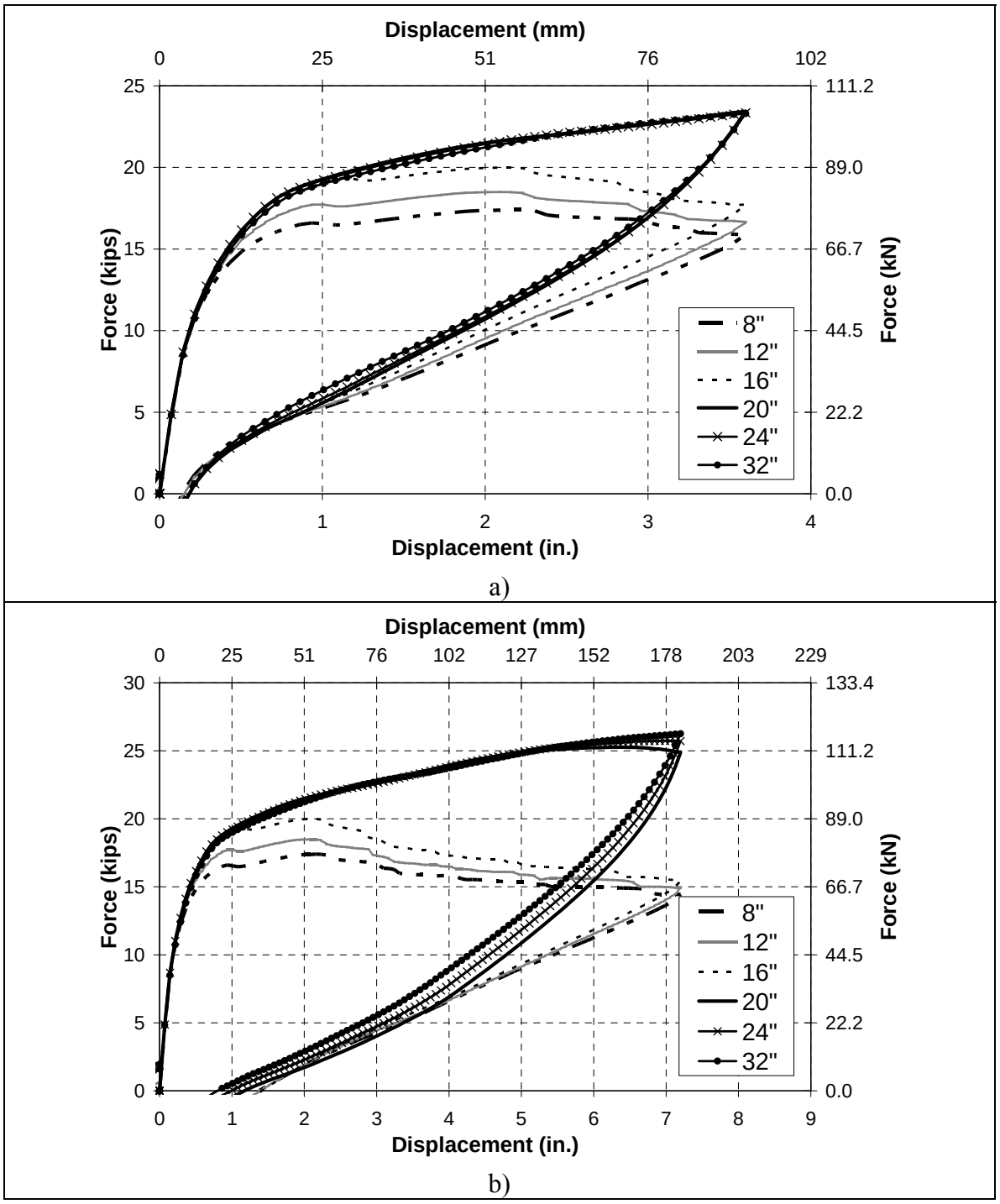


Fig. 7-2. Force-Displacement Cyclic Curve for SC-2 with Different Base Segment Heights a)5% Drift Ratio, b) 10% Drift Ratio(0.5% Steel Ratio)

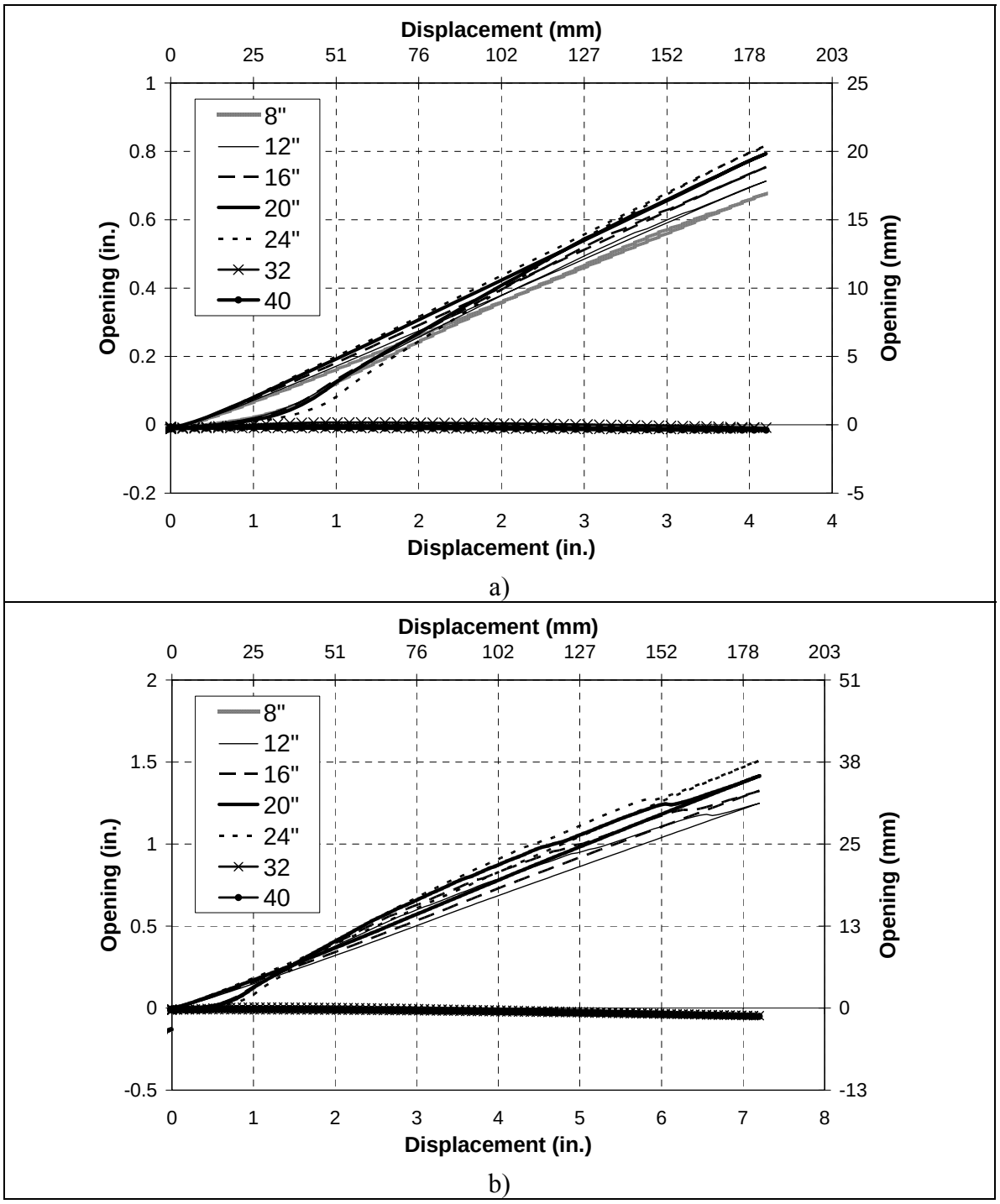


Fig. 7-3. Segment Separation for SC-2 with Different Base Segment Heights a)5% Drift Ratio, b) 10% Drift Ratio (1% Steel Ratio)

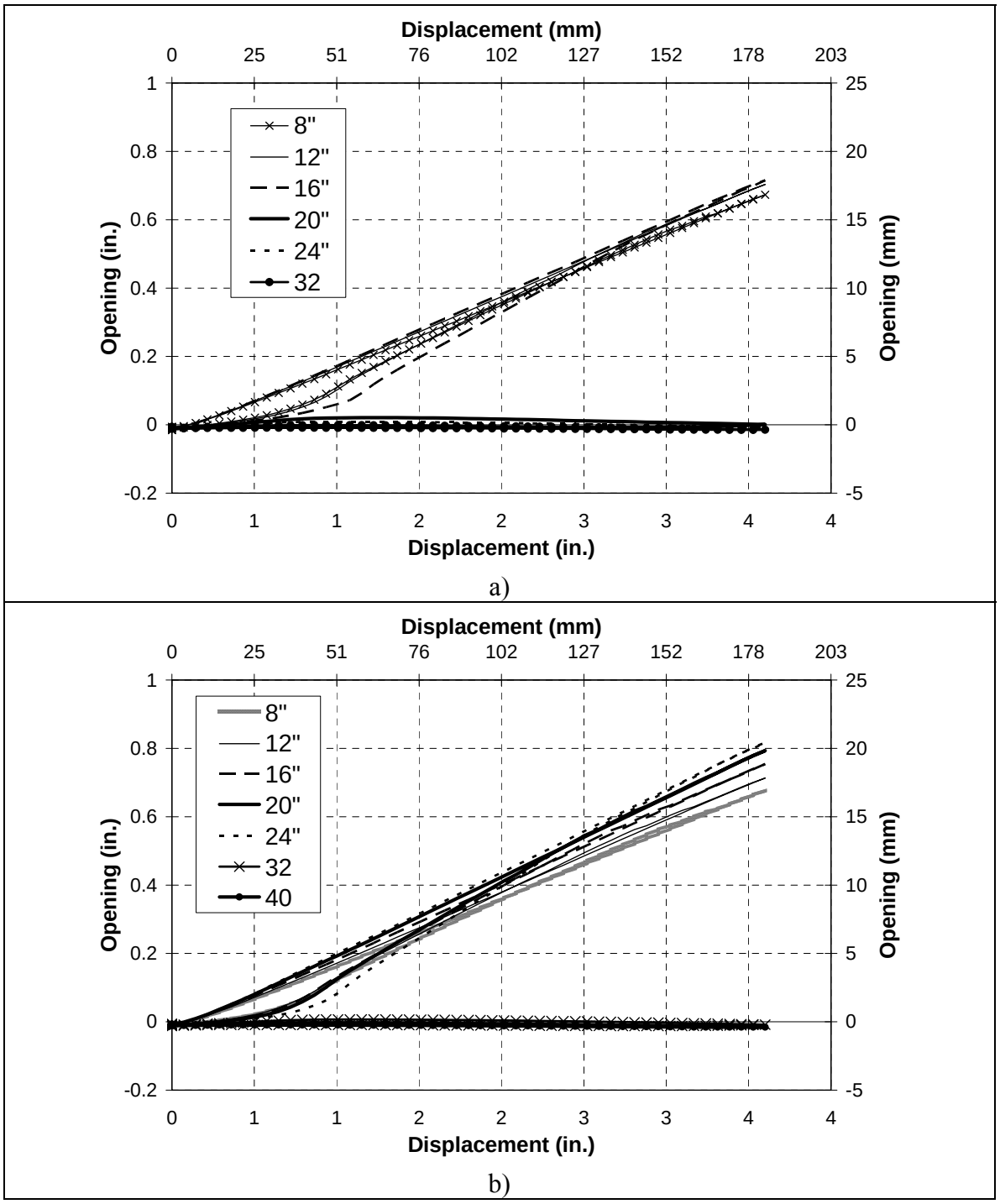


Fig. 7-4. Segment Separation for SC-2 with Different Base Segment Heights, a)5% Drift Ratio, b) 10% Drift Ratio (0.5% Steel Ratio)

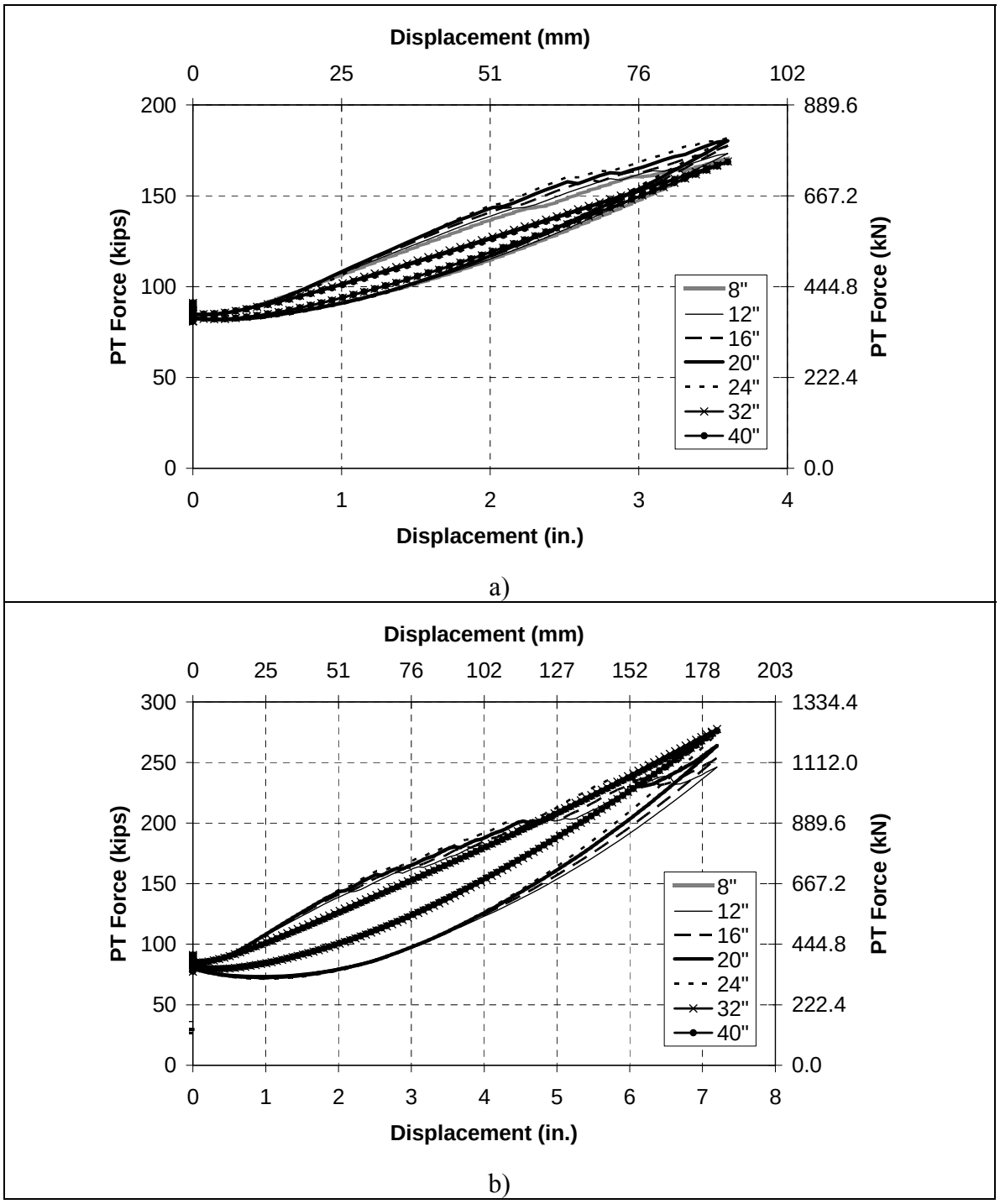


Fig. 7-5. PT Force vs. Displacement for SC-2 with Different Base Segment Heights, a)5% Drift Ratio, b) 10% Drift Ratio (1% Steel Ratio)

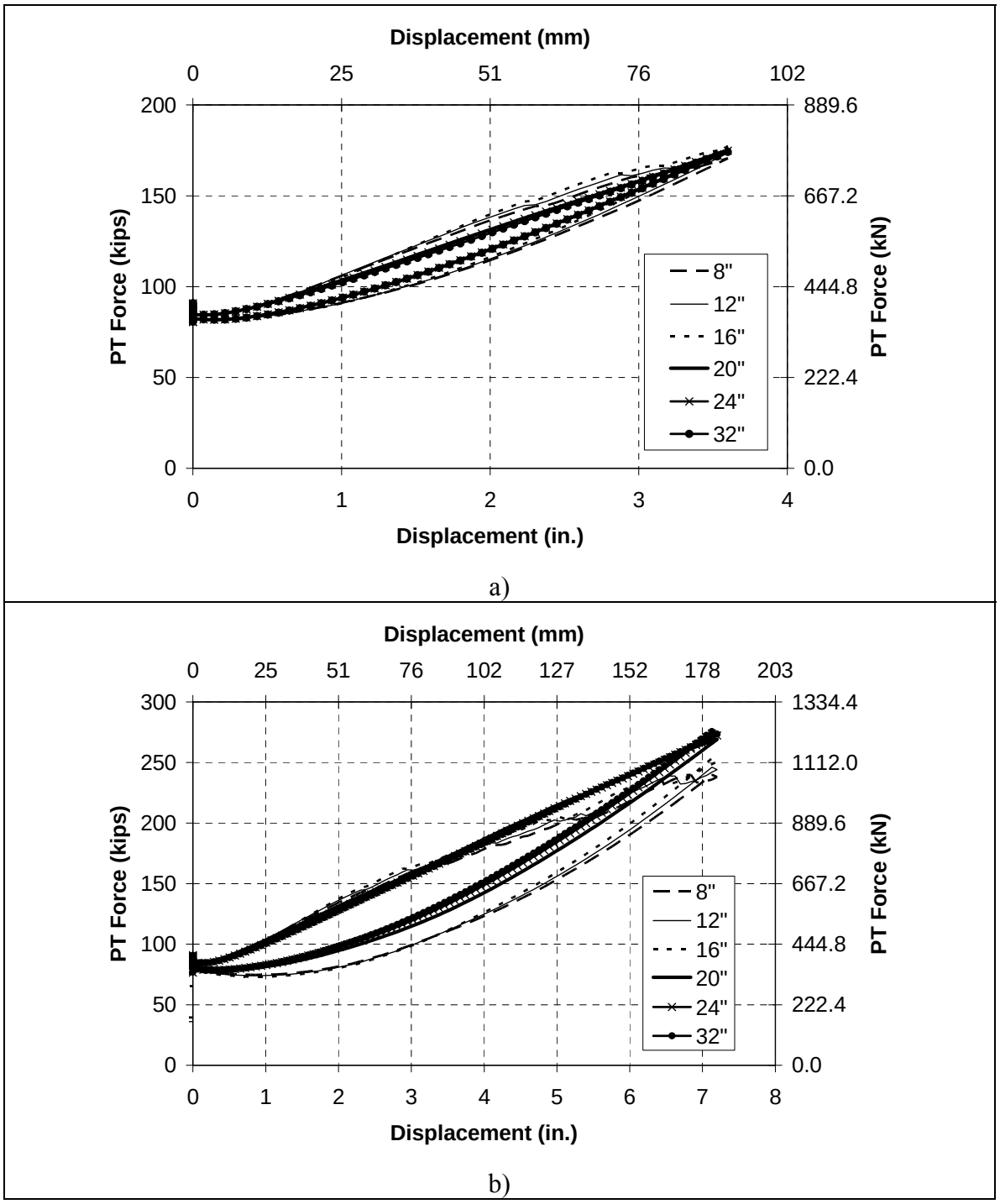


Fig. 7-6. PT Force vs. Displacement for SC-2 with Different Base Segment Heights, a) 5% Drift Ratio, b) 10% Drift Ratio (0.5% Steel Ratio)

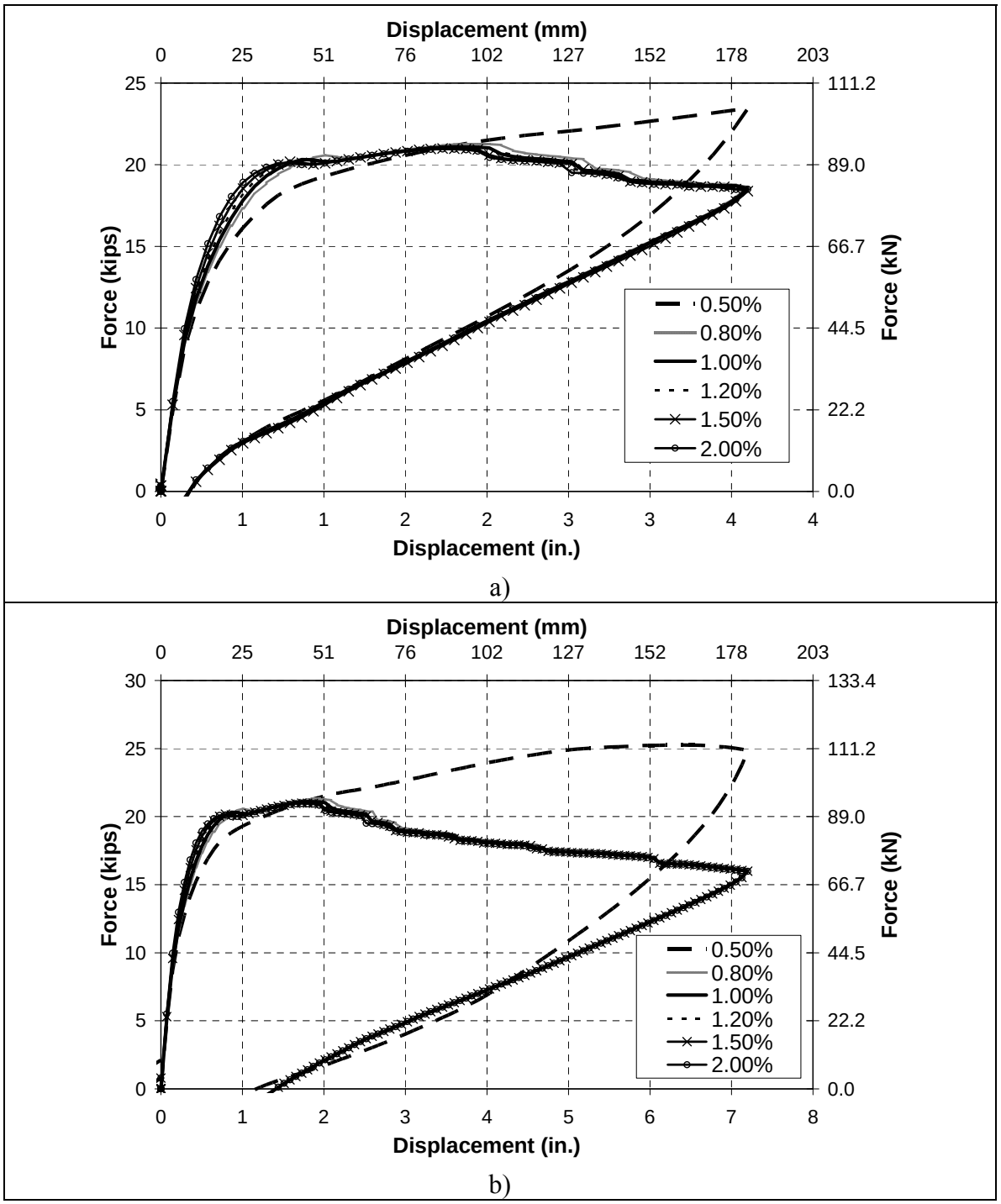


Fig. 7-7. Force-Displacement Cyclic Curve for SC-2 with Different Steel Ratio, a)5% Drift Ratio, b) 10% Drift Ratio

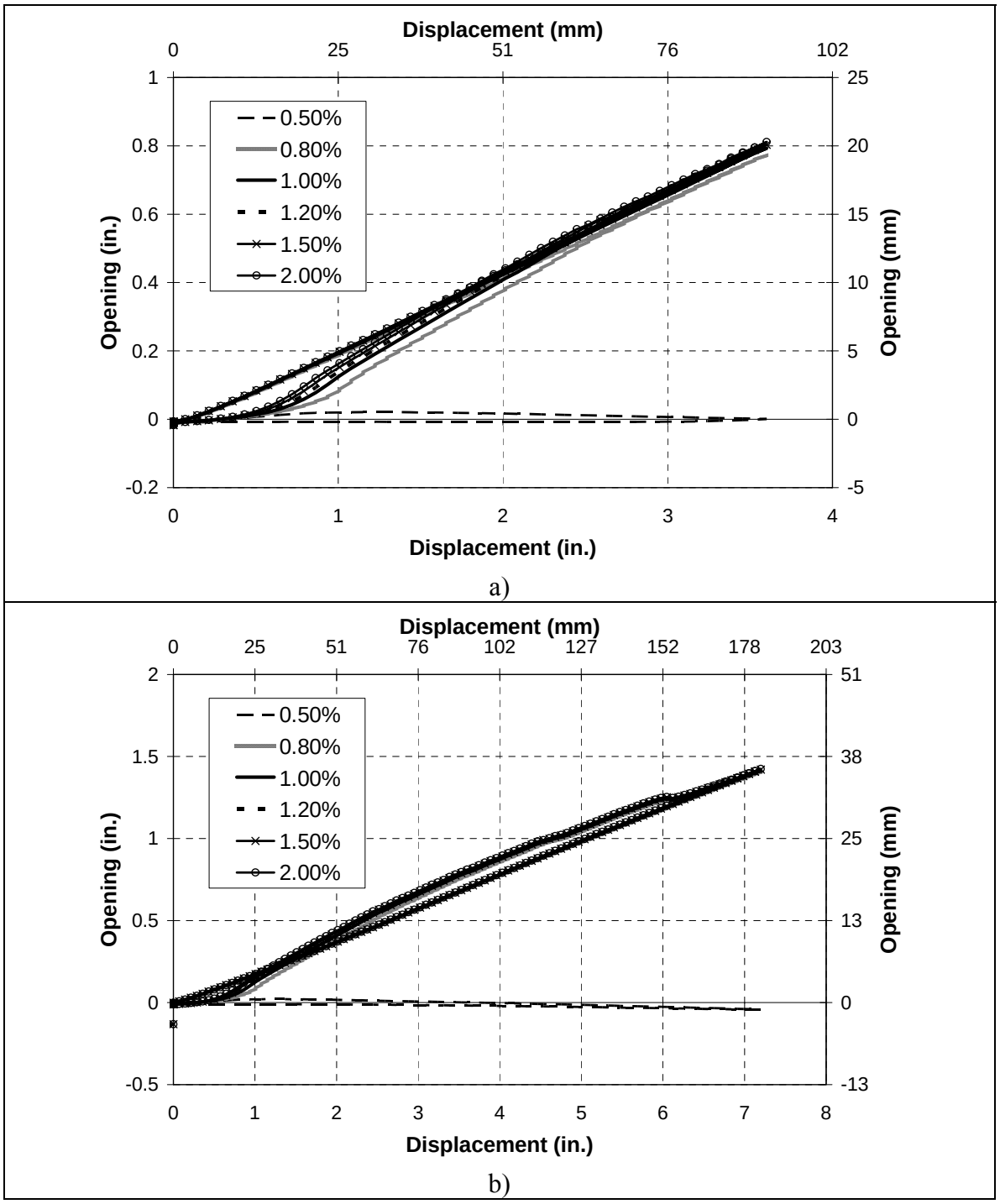


Fig. 7-8. Segment Separation for SC-2 with Different Steel Ratios, a)5% Drift Ratio, b) 10% Drift Ratio

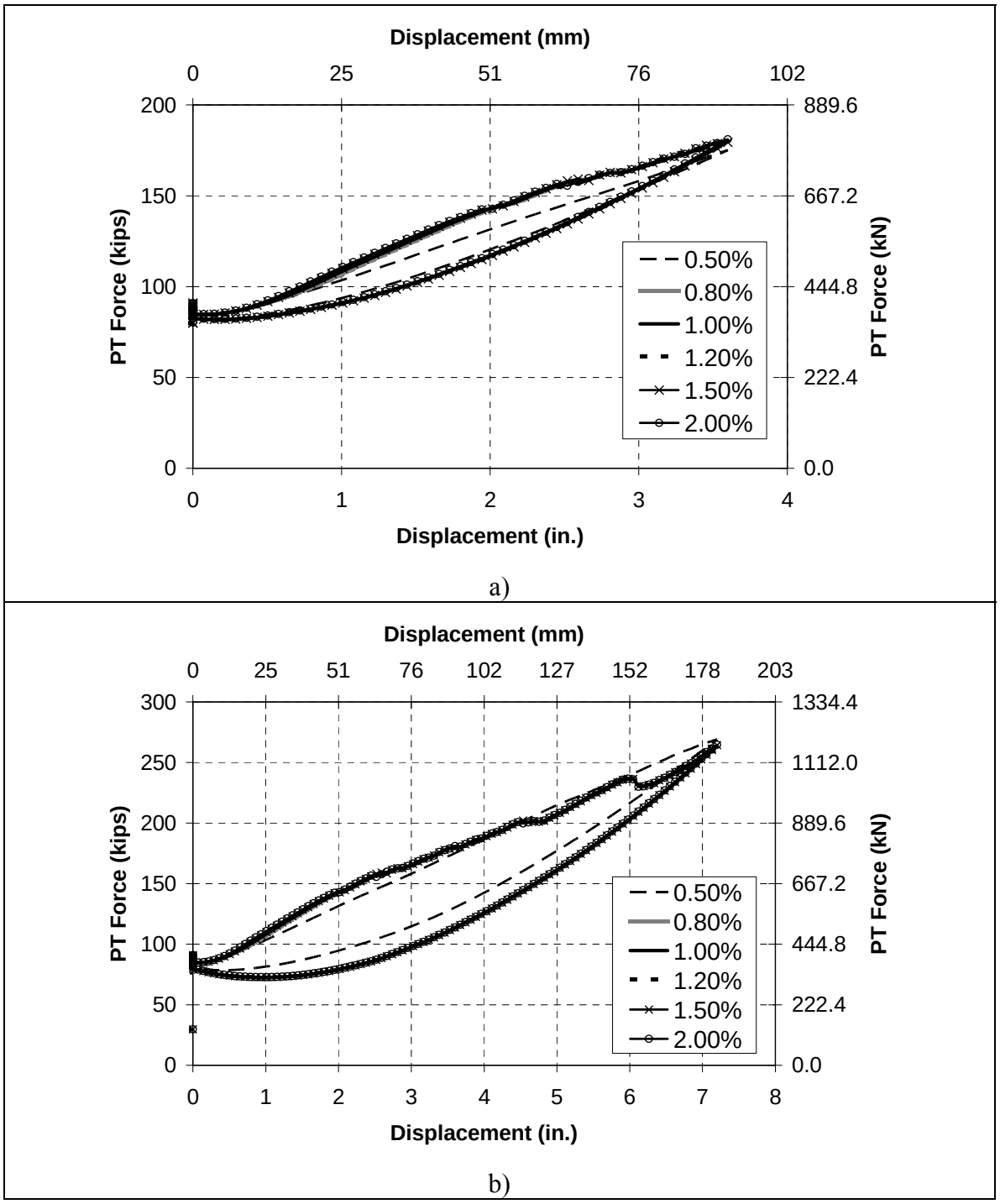


Fig. 7-9. PT Force vs. Displacement for SC-2 with Different Steel Ratios, a)5% Drift Ratio, b) 10% Drift Ratio

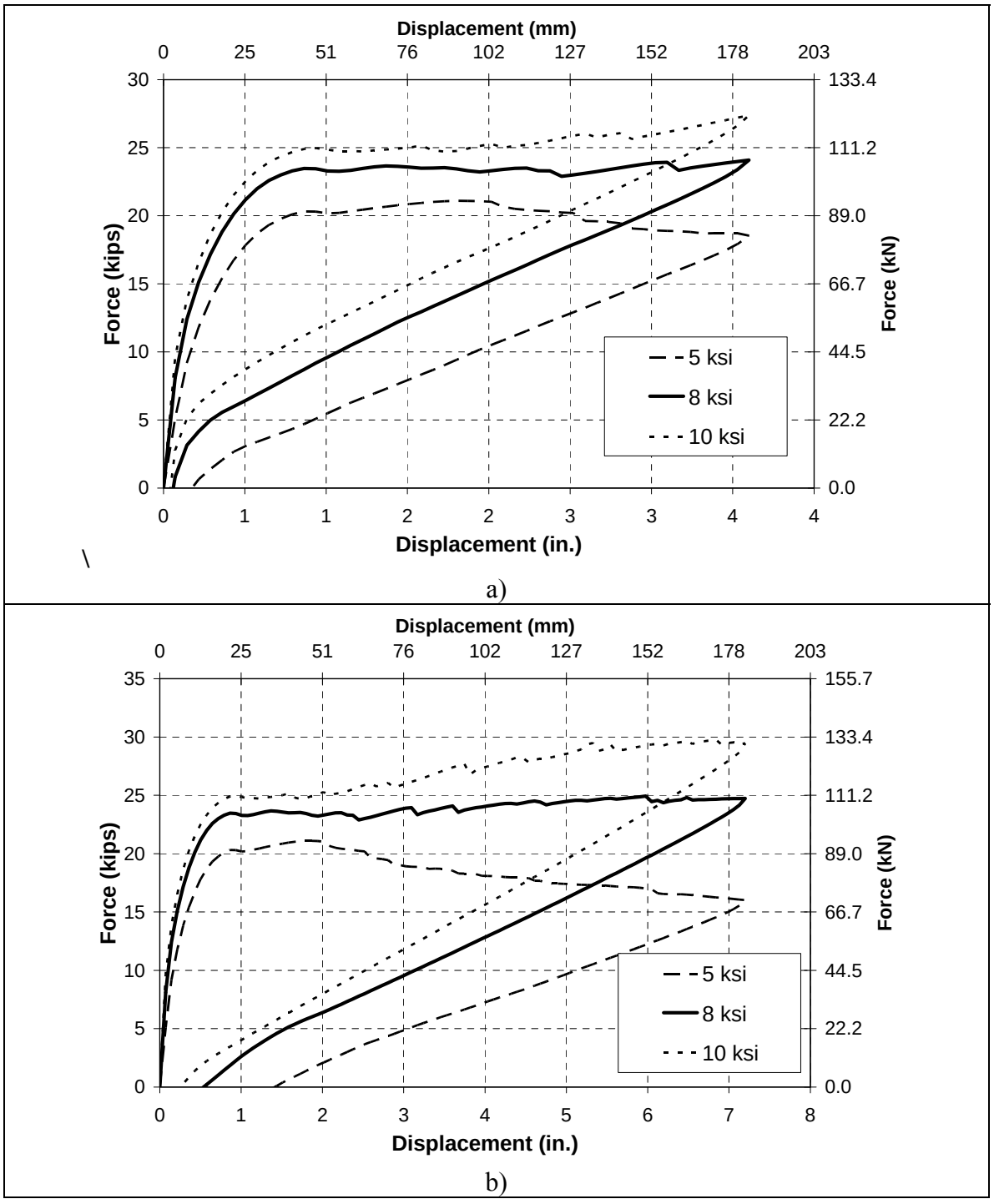


Fig. 7-10. Force-Displacement Cyclic Curve for SC-2 with Different Concrete Strengths, a)5% Drift Ratio, b) 10% Drift Ratio

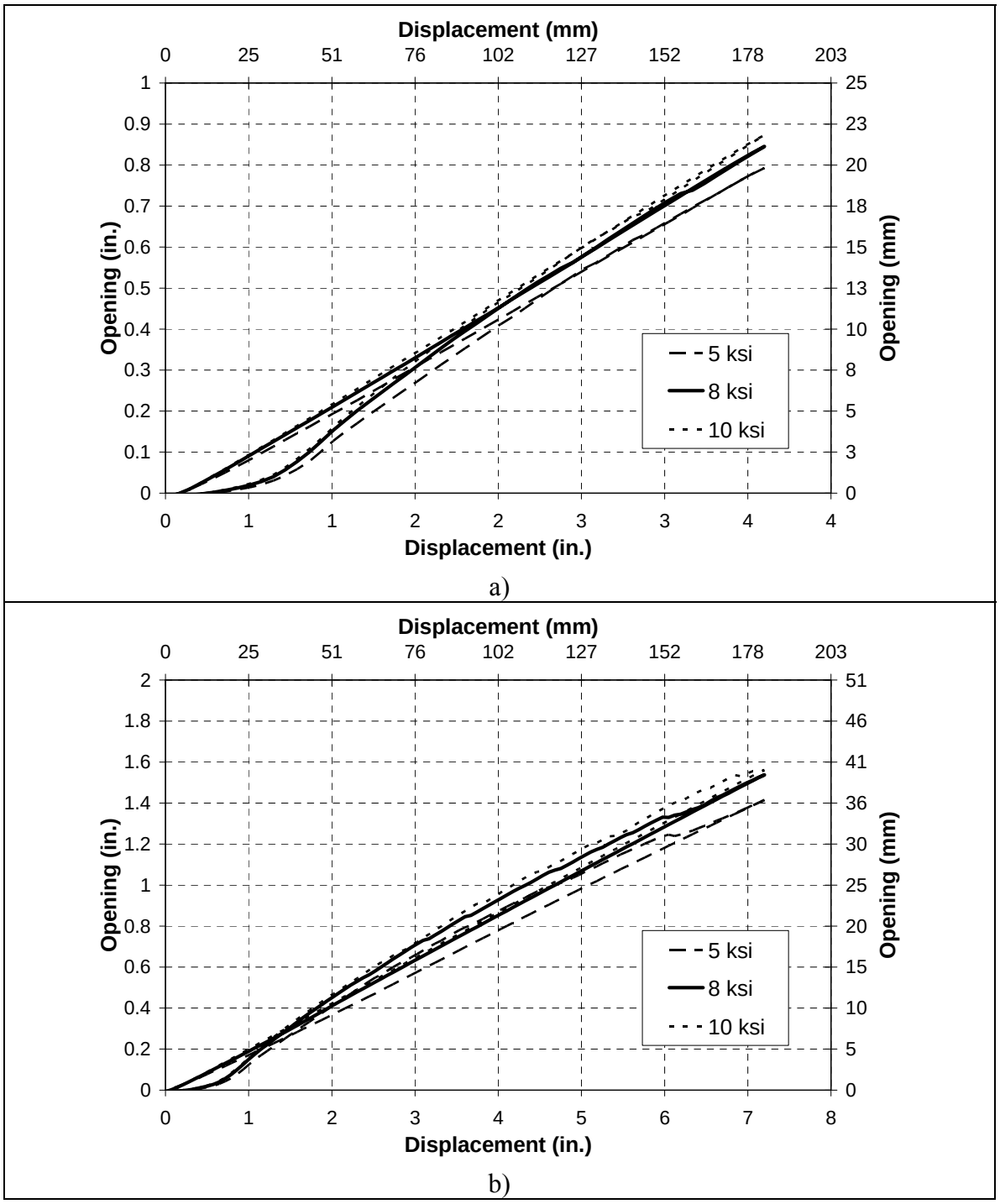


Fig. 7-11. Segment Separation for SC-2 with Different Concrete Strengths, a)5% Drift Ratio, b) 10% Drift Ratio

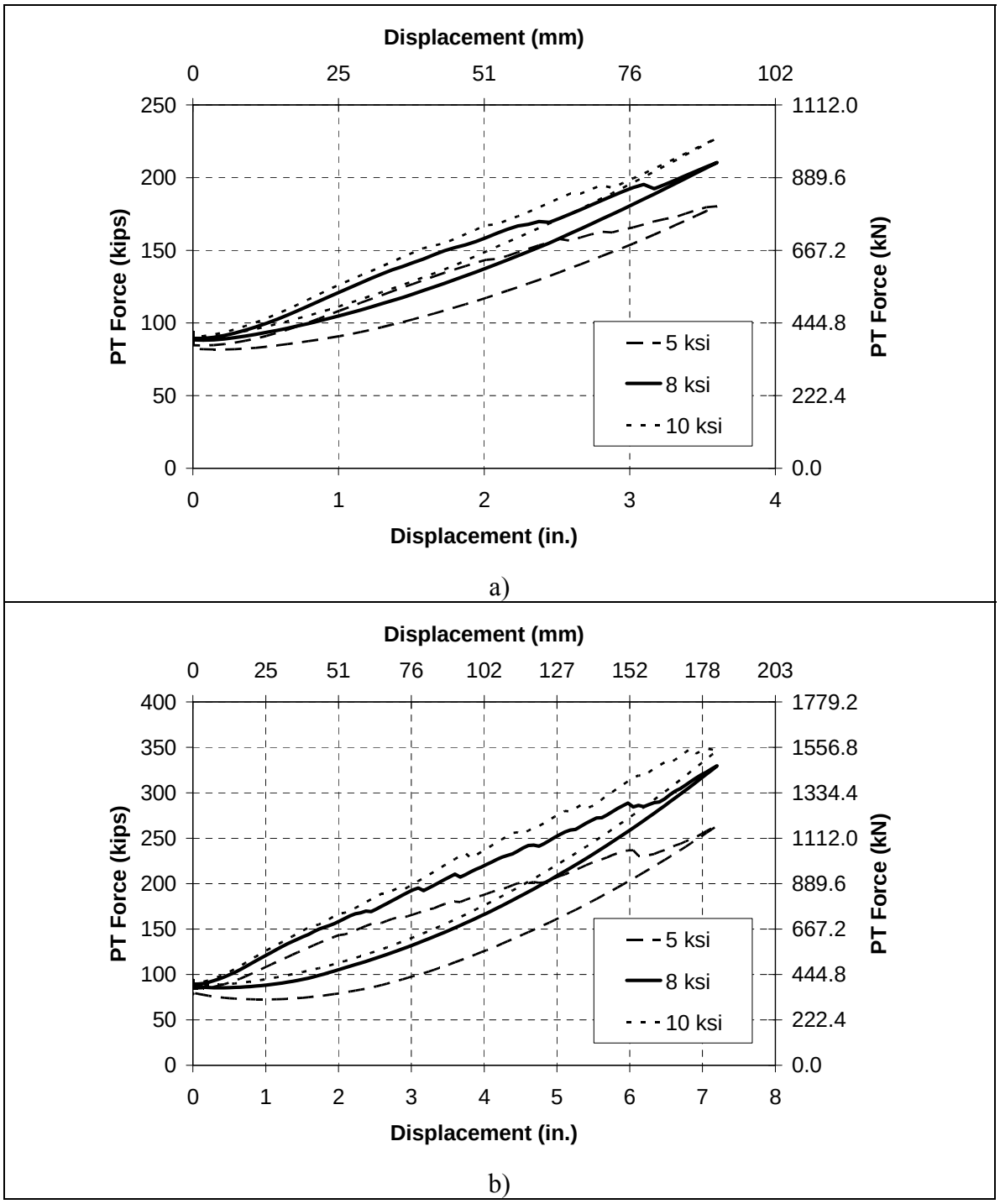


Fig. 7-12. PT Force vs. Displacement for SC-2 with Different Concrete Strengths, a)5% Drift Ratio, b) 10% Drift Ratio

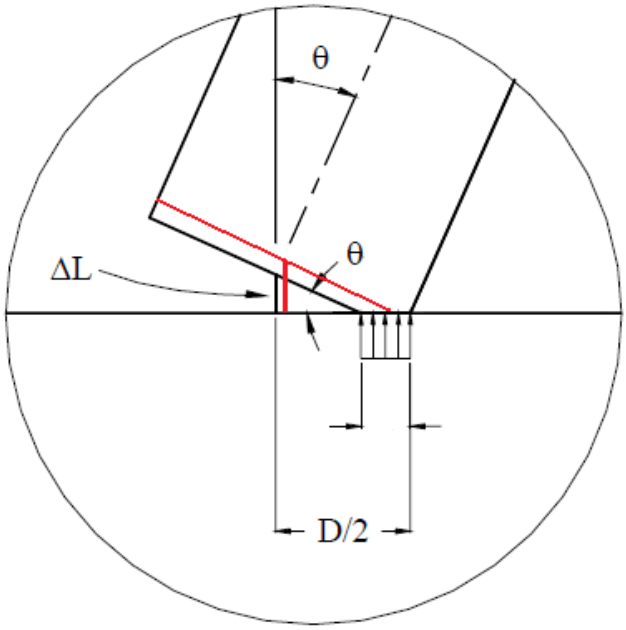


Fig. 7-13. Larger Elongation of PT Rod in Columns with Shorter Compressive Zone

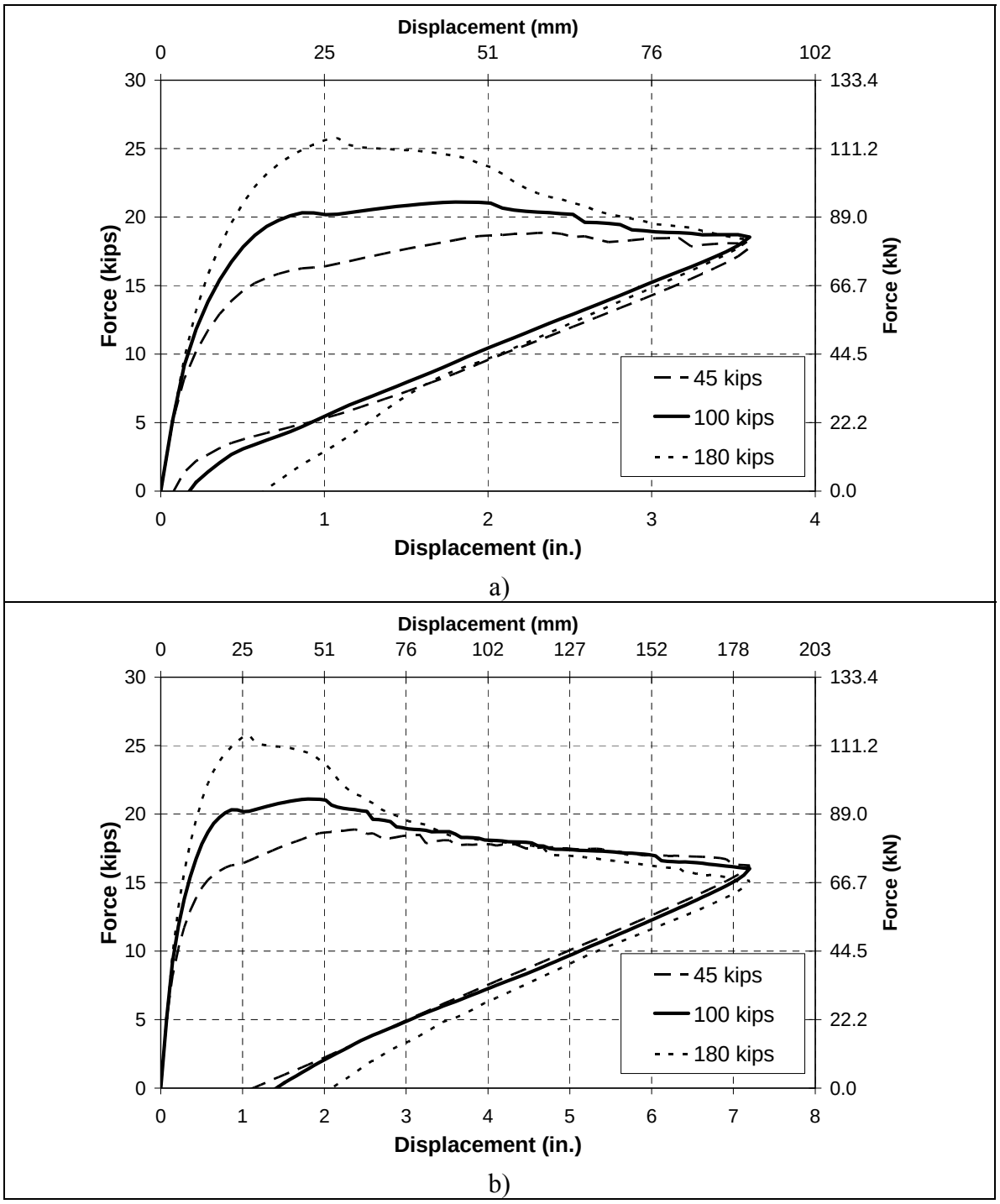


Fig. 7-14. Force-Displacement Cyclic Curve for SC-2 with Different PT Force Levels, a)5% Drift Ratio, b) 10% Drift Ratio

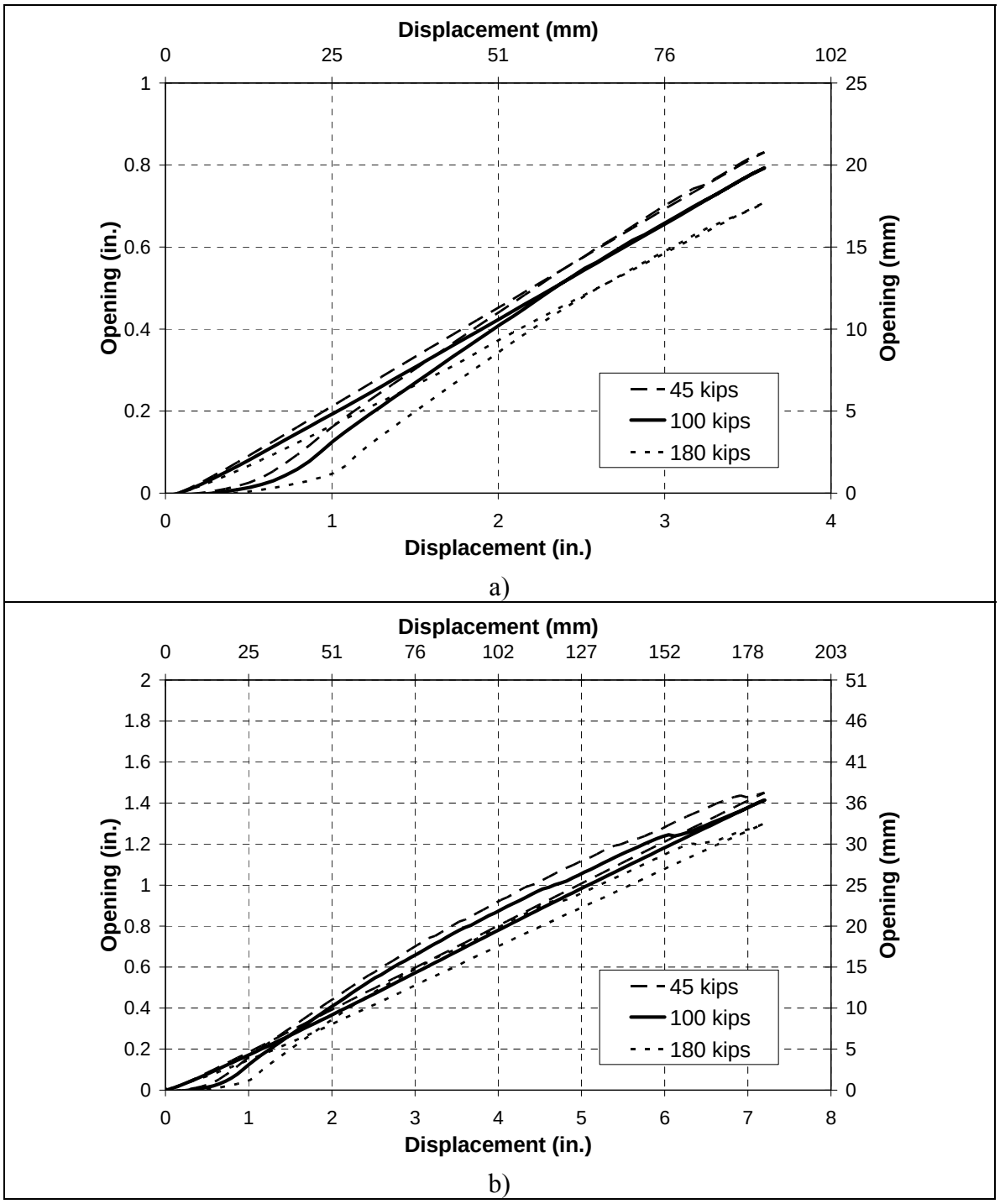


Fig. 7-15. Segment Separation for SC-2 with Different PT Force Levels, a)5% Drift Ratio, b) 10% Drift Ratio

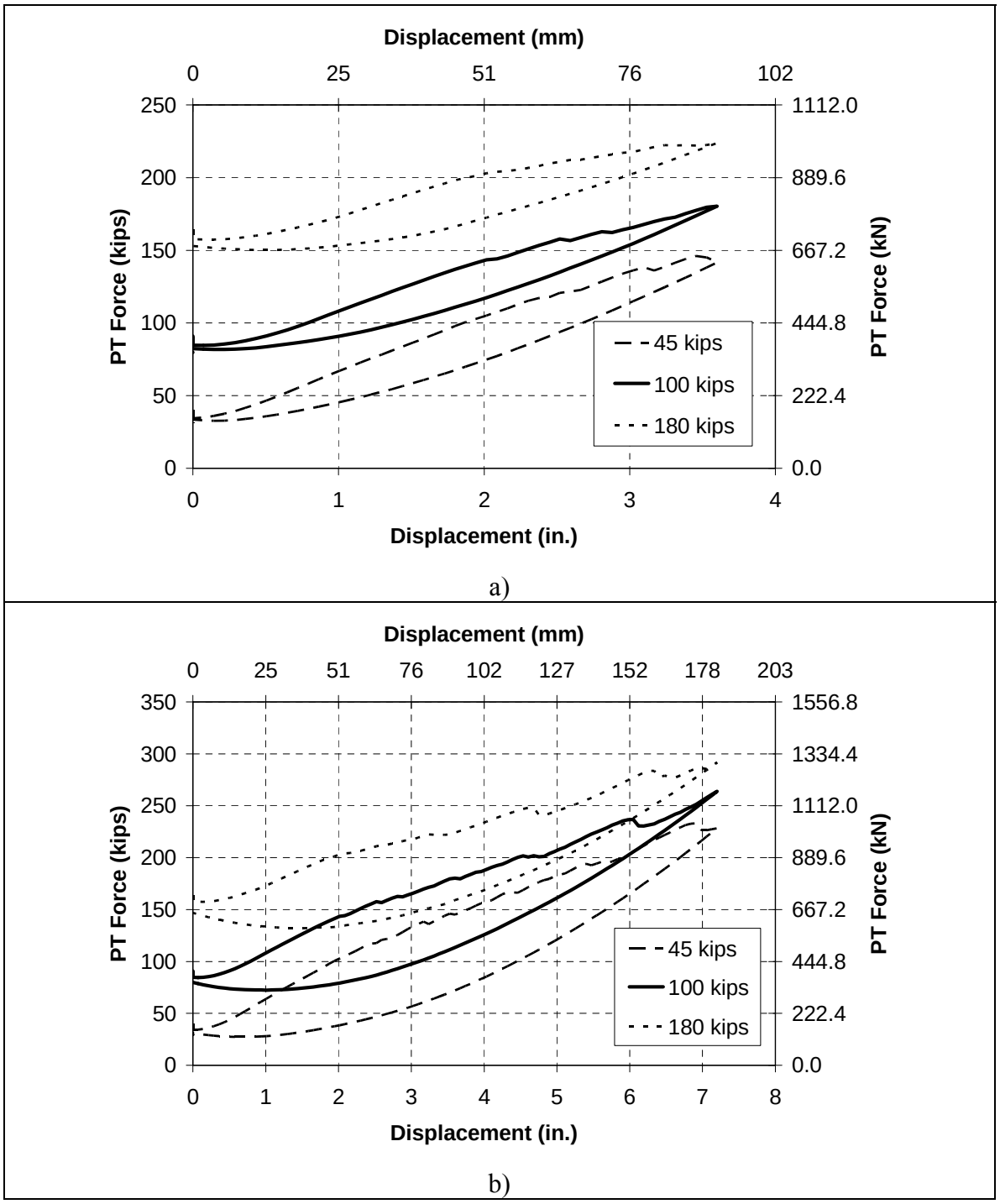


Fig. 7-16. PT Force vs. Displacement for SC-2 with Different PT Force Levels, a)5% Drift Ratio, b) 10% Drift Ratio

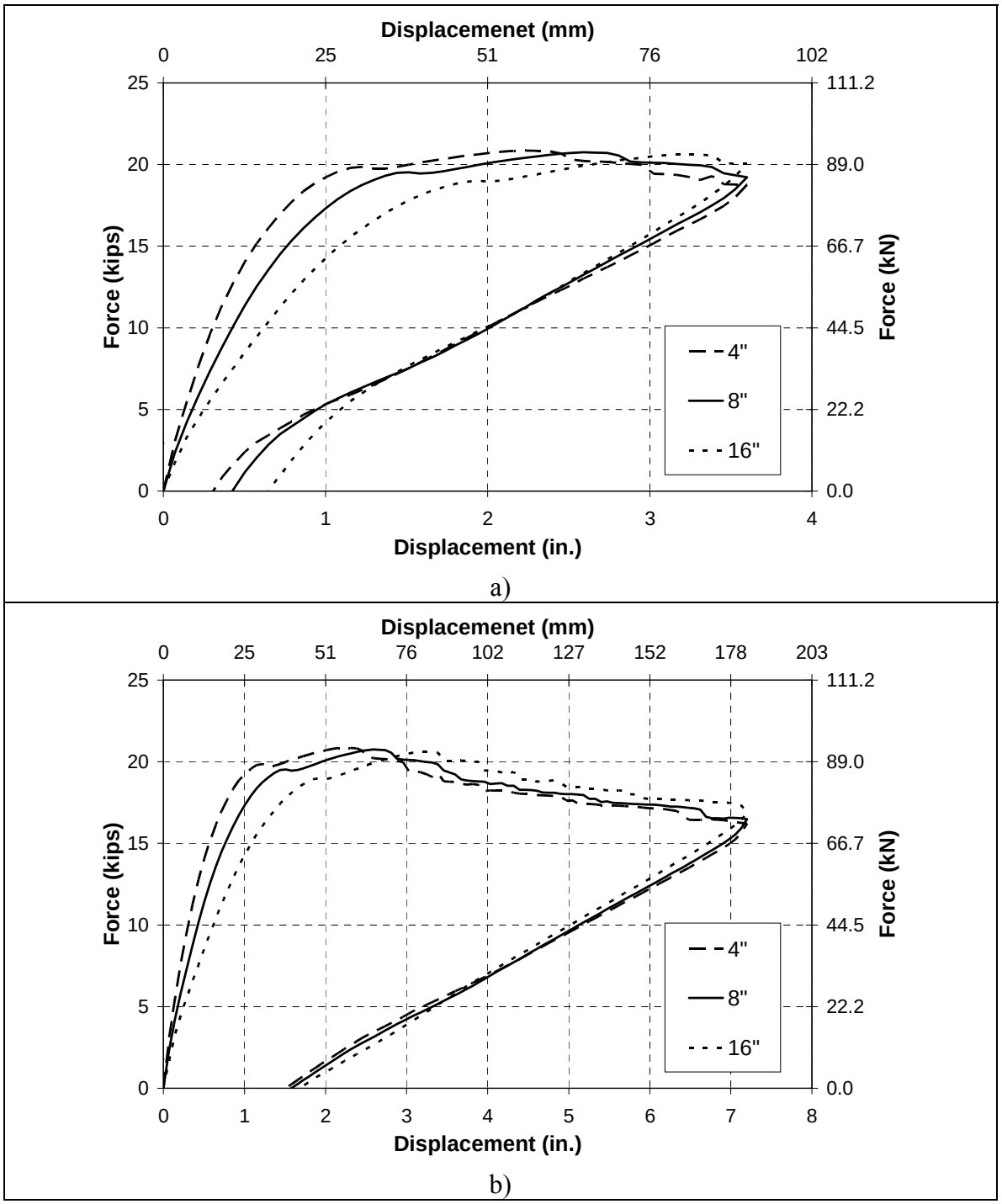


Fig. 7-17. Force-Displacement Cyclic Curve for SBR-1 with Different Rubber Pad Heights, a)5% Drift Ratio, b) 10% Drift Ratio

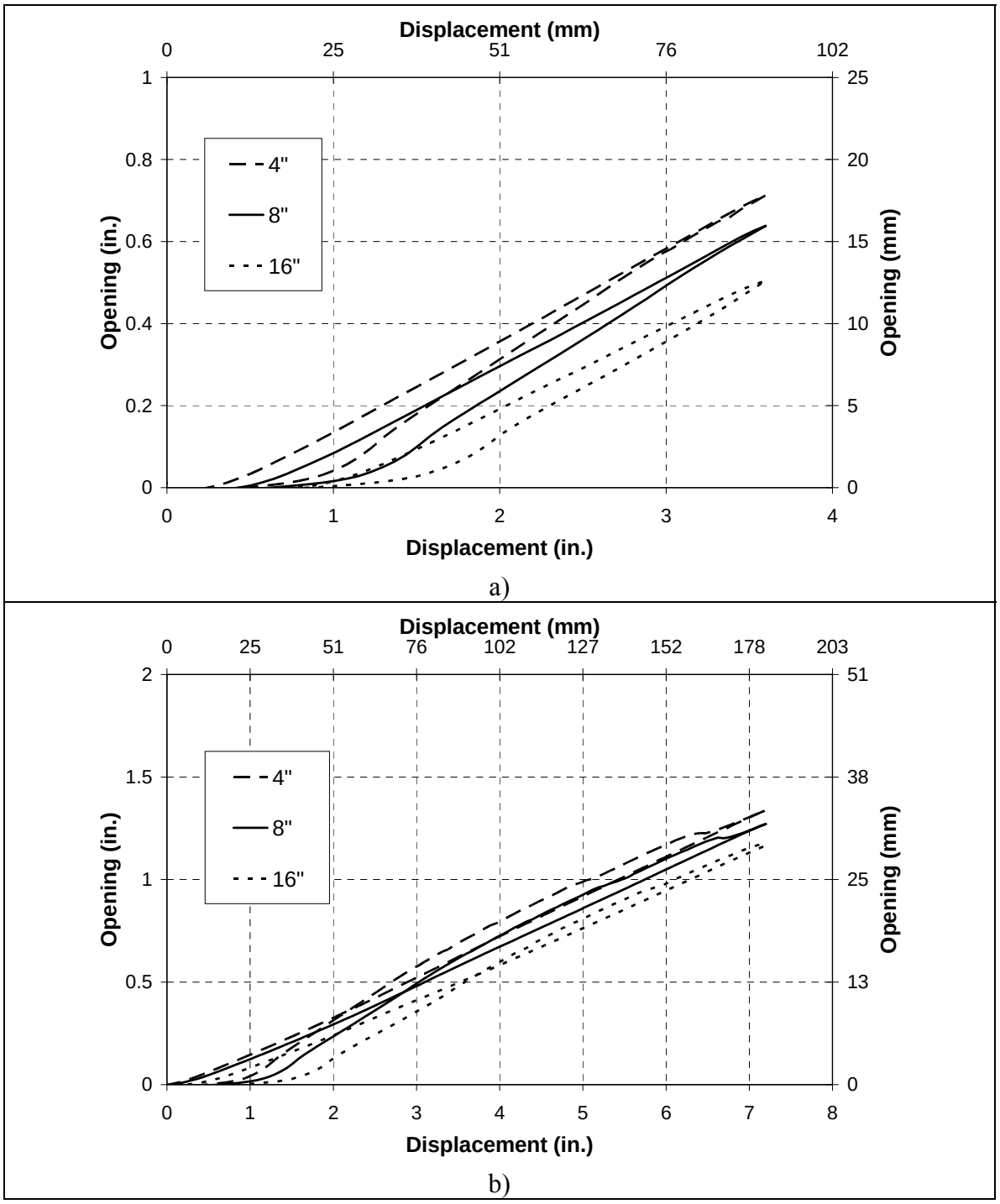


Fig. 7-18. Segment Separation for SBR-1 with Different Rubber Pad Heights, a)5% Drift Ratio, b) 10% Drift Ratio

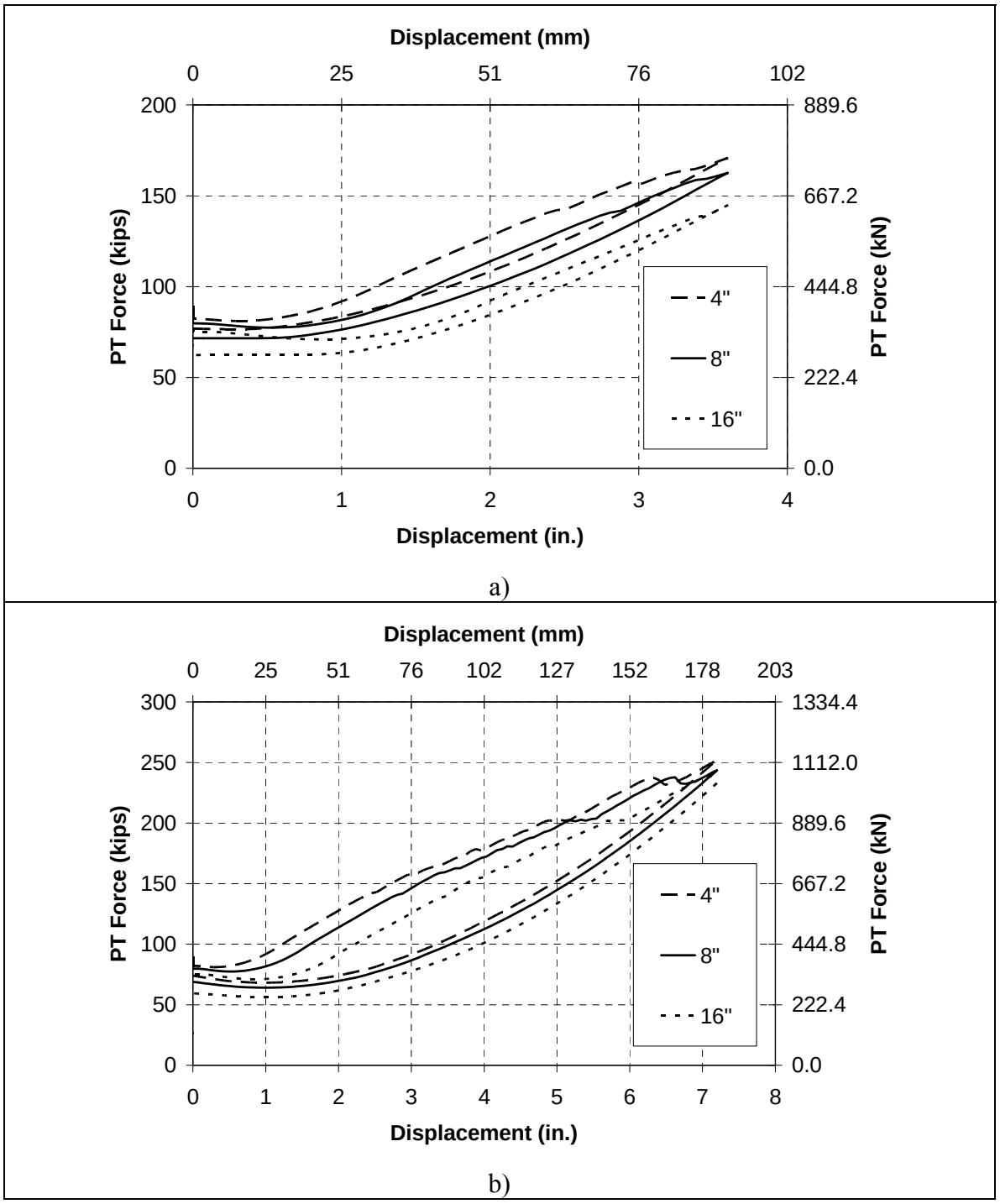


Fig. 7-19. PT Force vs. Displacement for SBR-1 with Different Rubber Pad Heights, a)5% Drift Ratio, b) 10% Drift Ratio

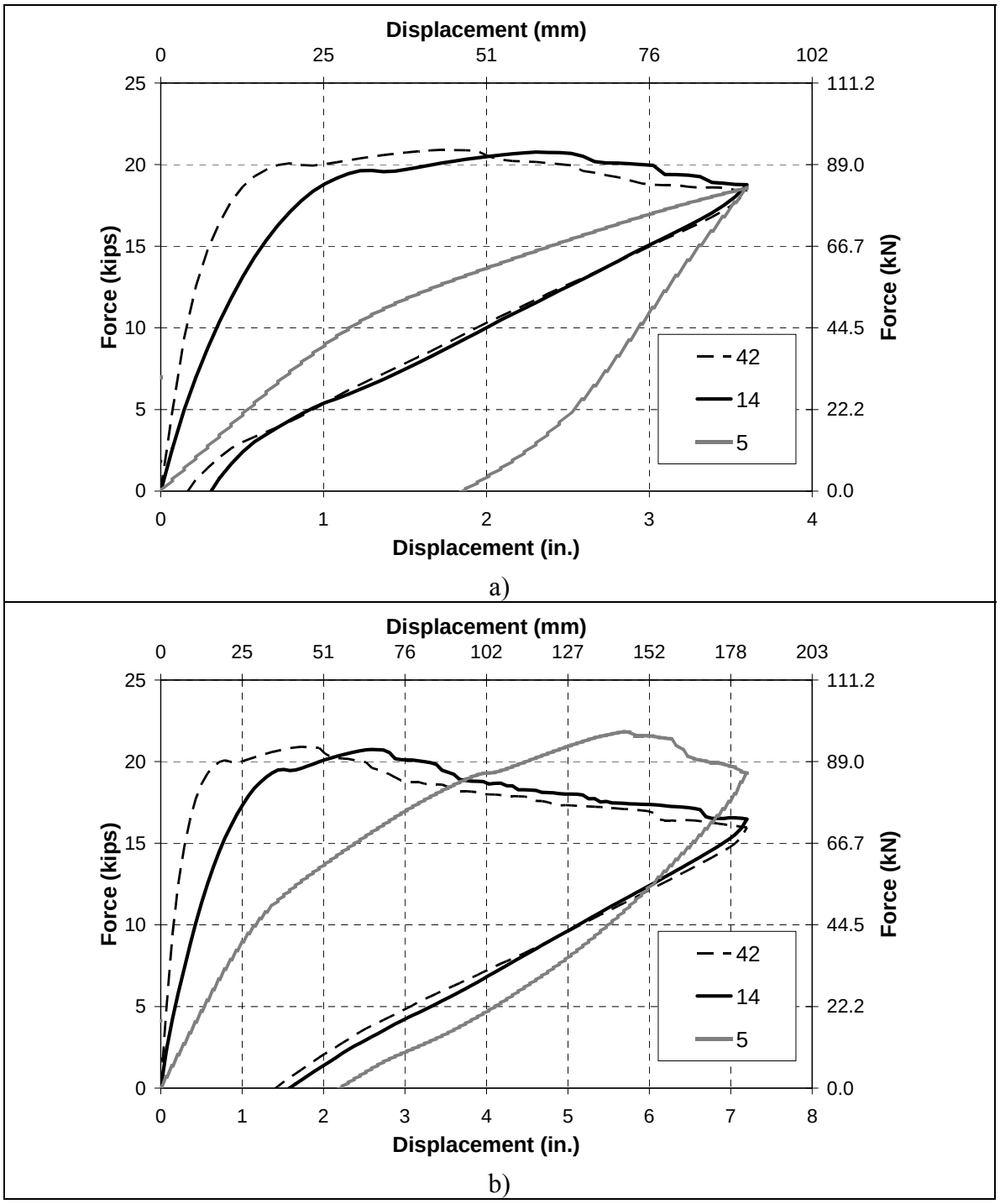


Fig. 7-20. Force-Displacement Cyclic Curve for SBR-1 with Different Shape Factors of Rubber Pad, a)5% Drift Ratio, b) 10% Drift Ratio

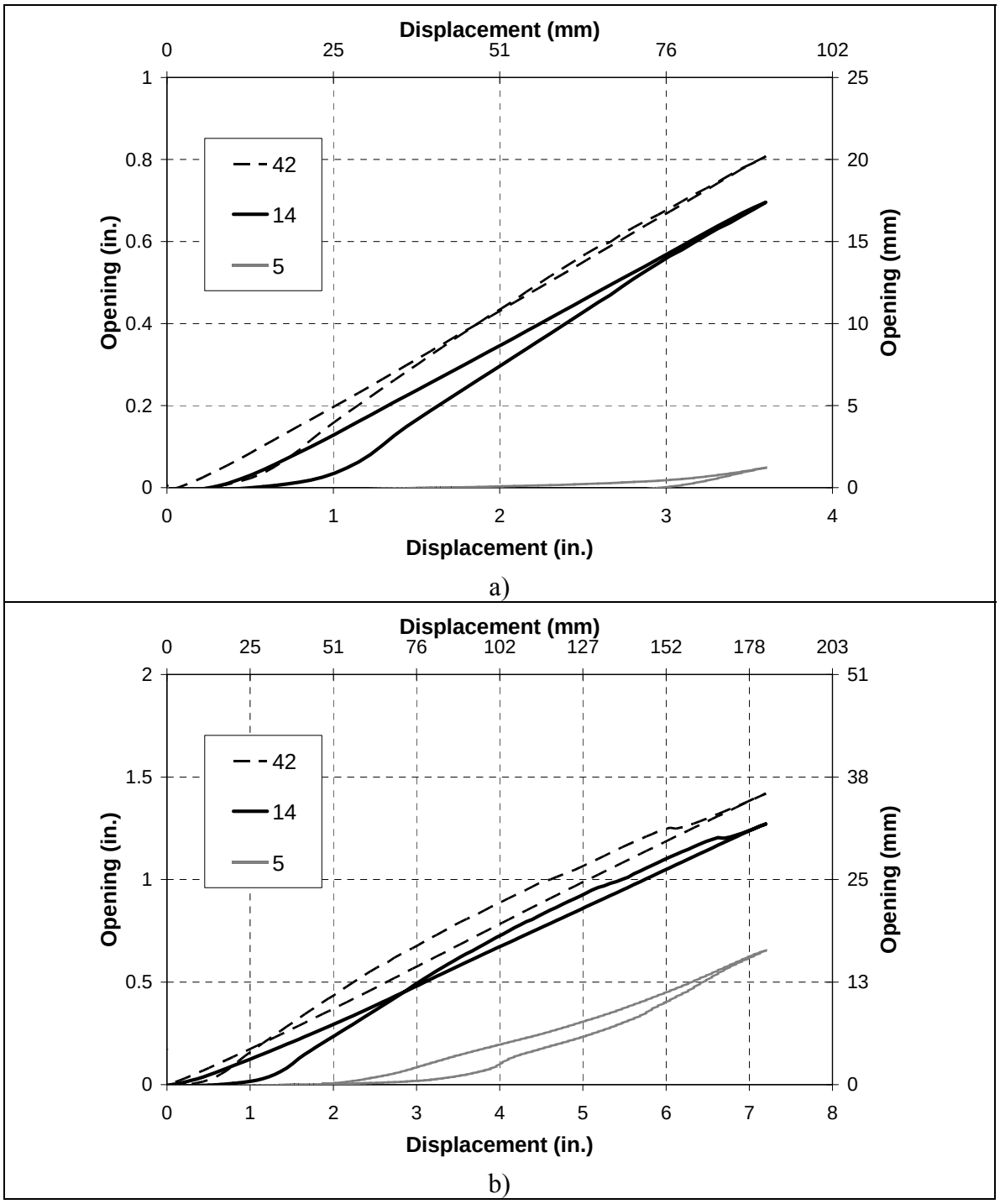


Fig. 7-21. Segment Separation for SBR-1 with Different Shape Factors of Rubber Pad, a)5% Drift Ratio, b) 10% Drift Ratio

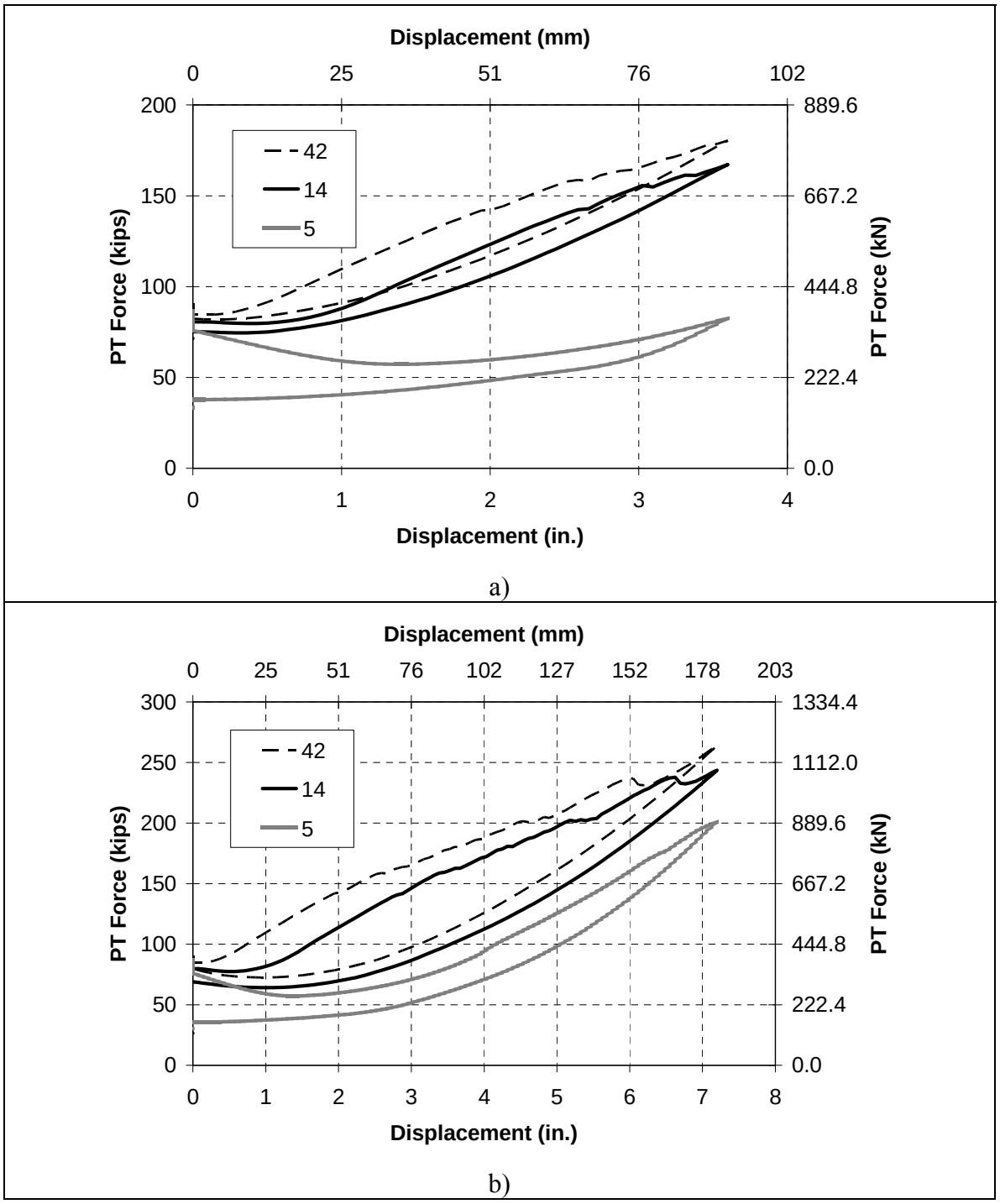


Fig. 7-22. PT Force vs. Displacement for SBR-1 with Different Shape Factors of Rubber Pad, a)5% Drift Ratio, b) 10% Drift Ratio

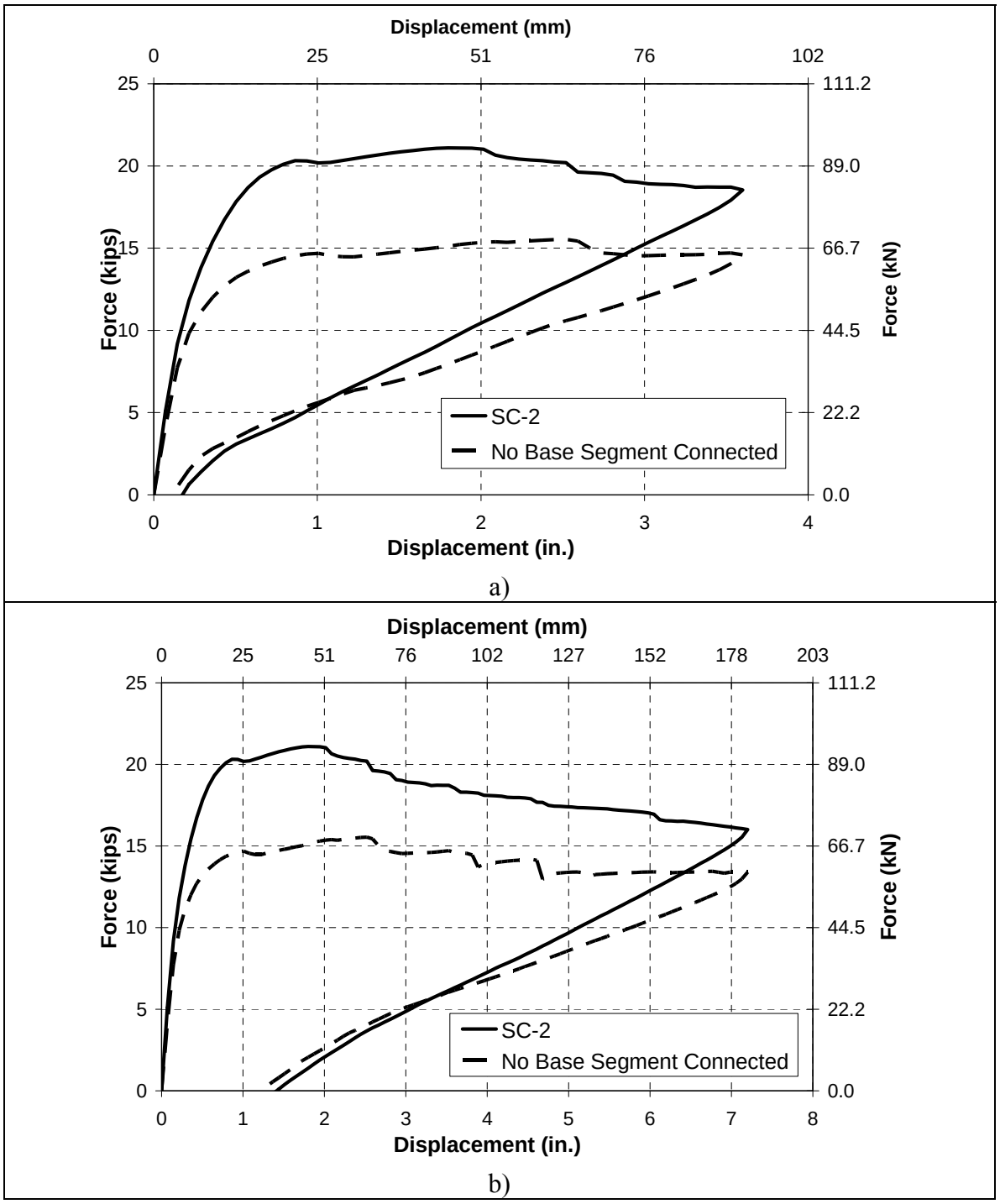


Fig. 7-23. Comparison between the Force-Displacement Cyclic Curves of SC-2 and Conventional Segmental Column with , a)5% Drift Ratio, b) 10% Drift Ratio

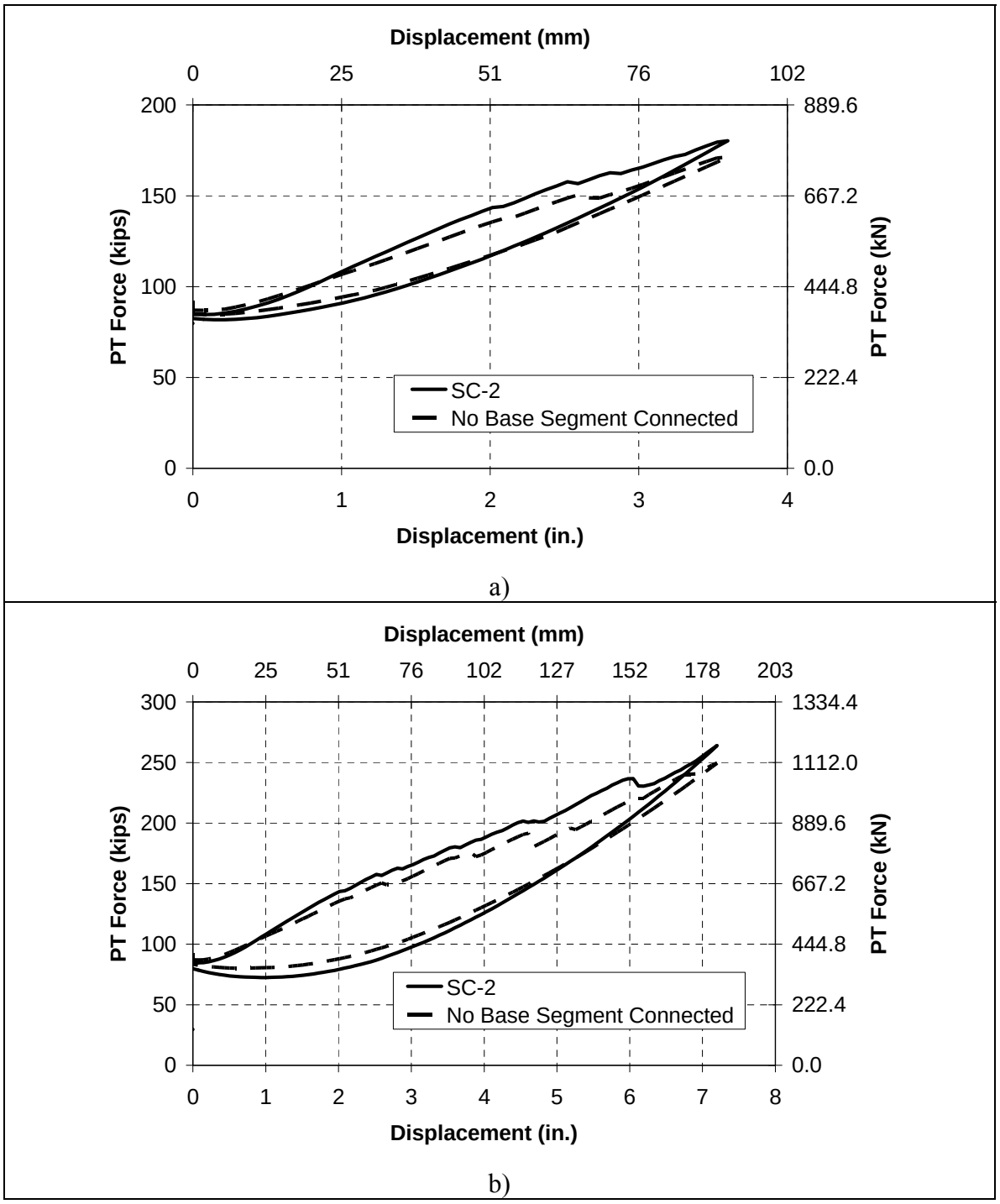


Fig. 7-24. Comparison between the PT Force vs. Displacement of SC-2 and Conventional Segmental Column with , a)5% Drift Ratio, b) 10% Drift Ratio

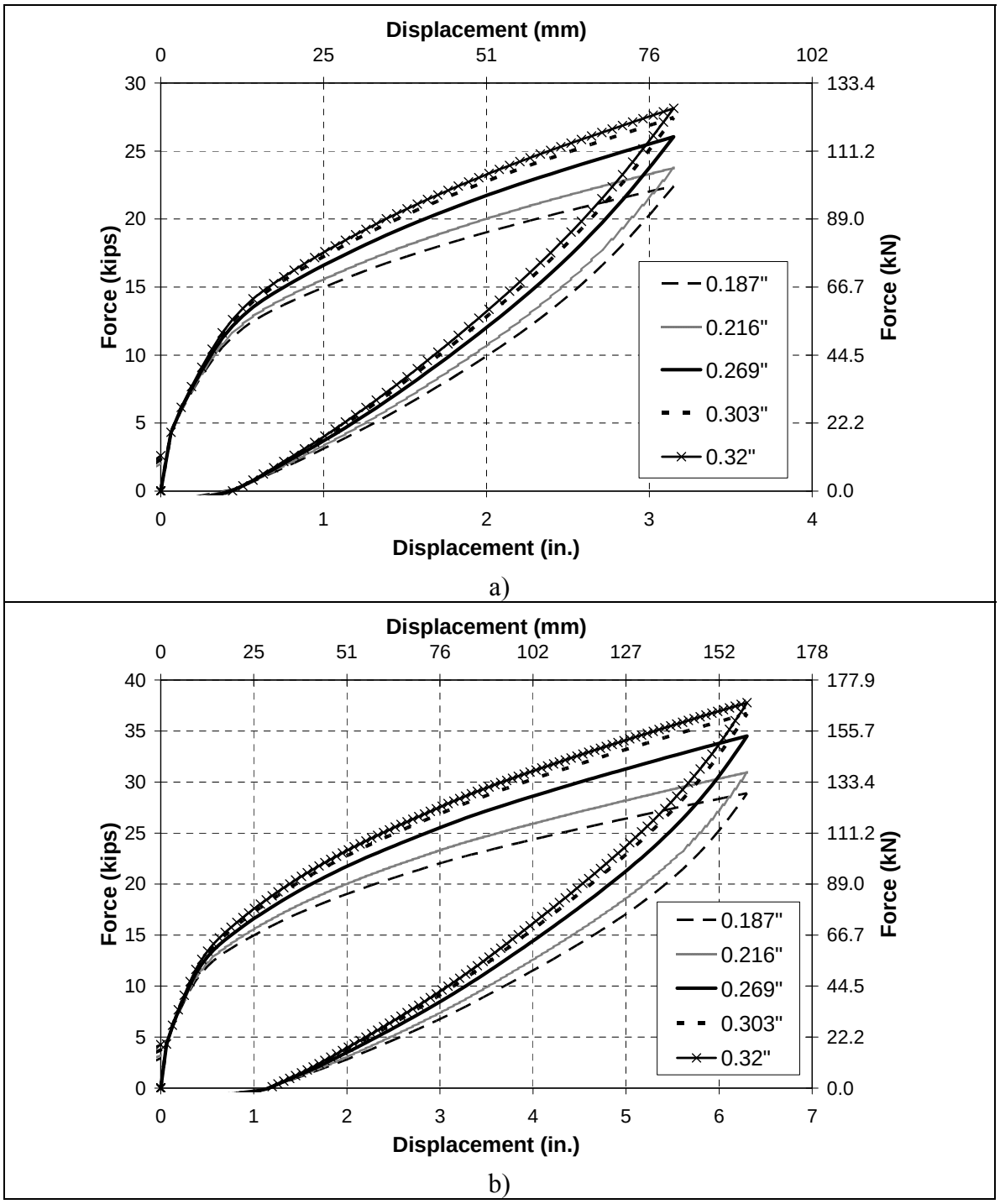


Fig. 7-25. Force-Displacement Cyclic Curve for FRP Column with Different Tube Thickness, a)5% Drift Ratio, b) 10% Drift Ratio

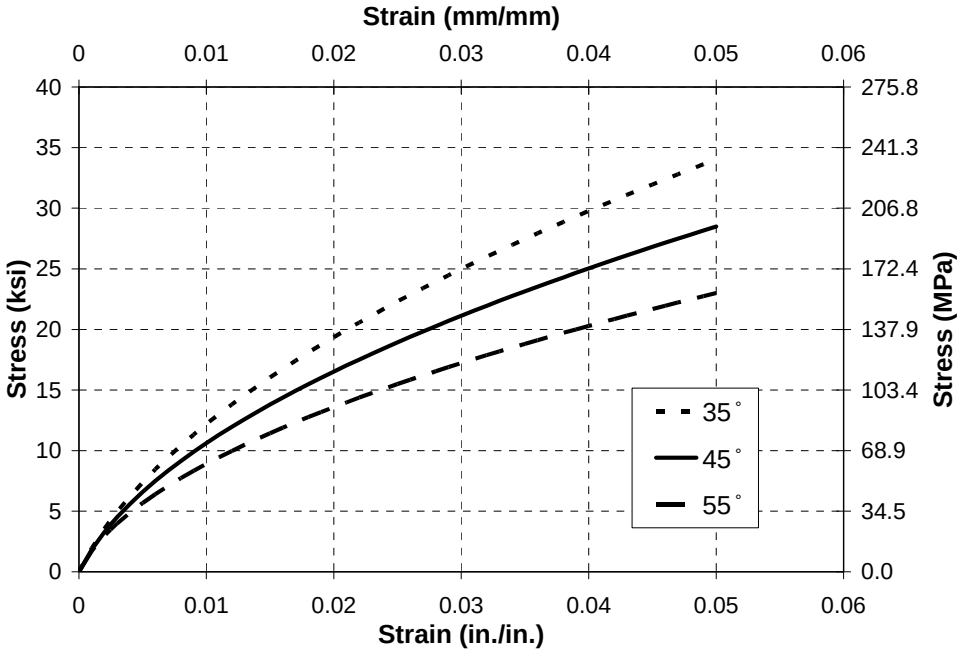


Fig. 7-26. Stress-Strain Curves of FRP Tube in Longitudinal Direction with Different Fiber Orientations

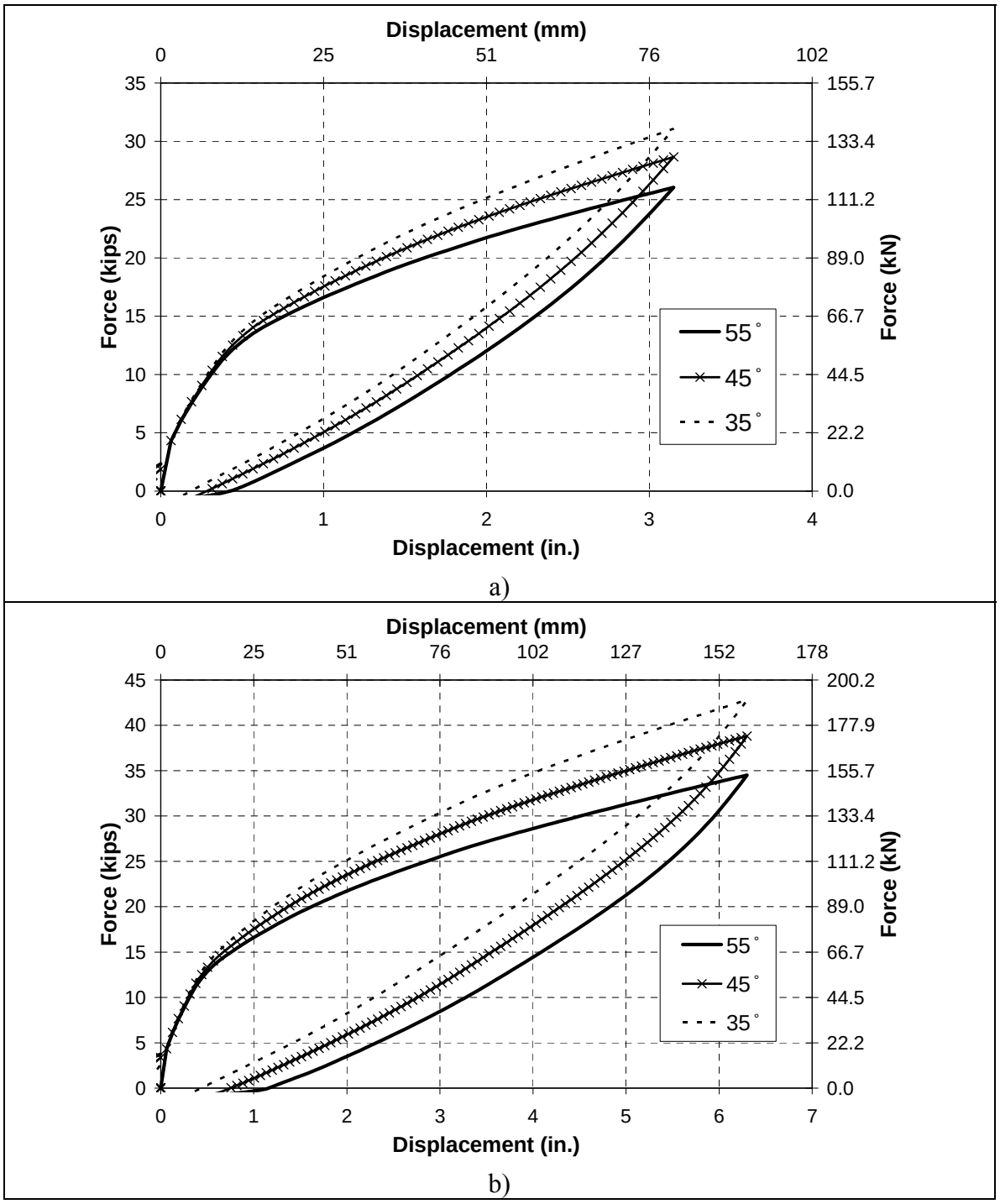


Fig. 7-27. Force-Displacement Cyclic Curve for FRP Column with Different Fiber Orientations, a)5% Drift Ratio, b) 10% Drift Ratio

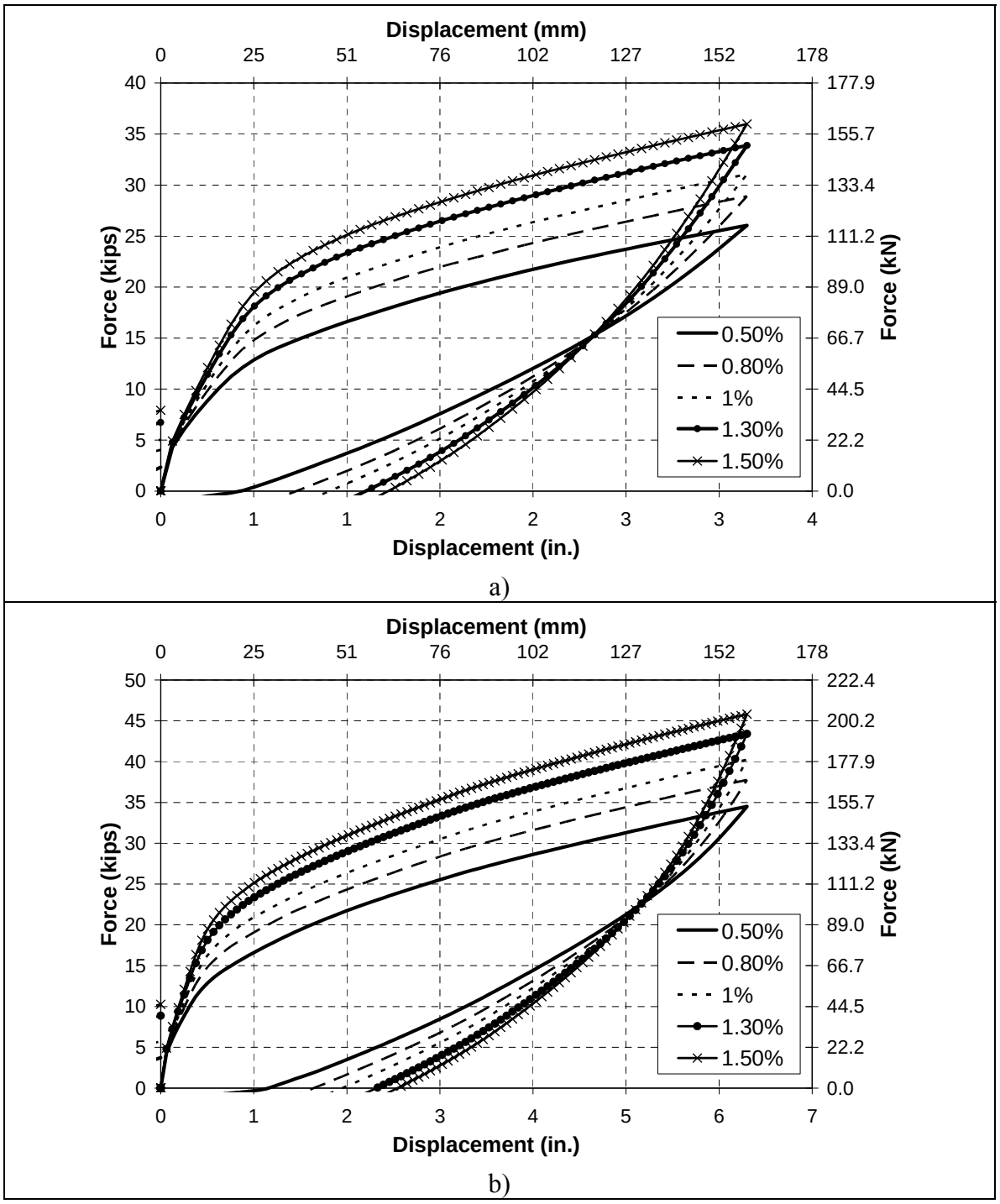


Fig. 7-28. Force-Displacement Cyclic Curve for FRP Column with Different Steel Ratios, a)5% Drift Ratio, b) 10% Drift Ratio

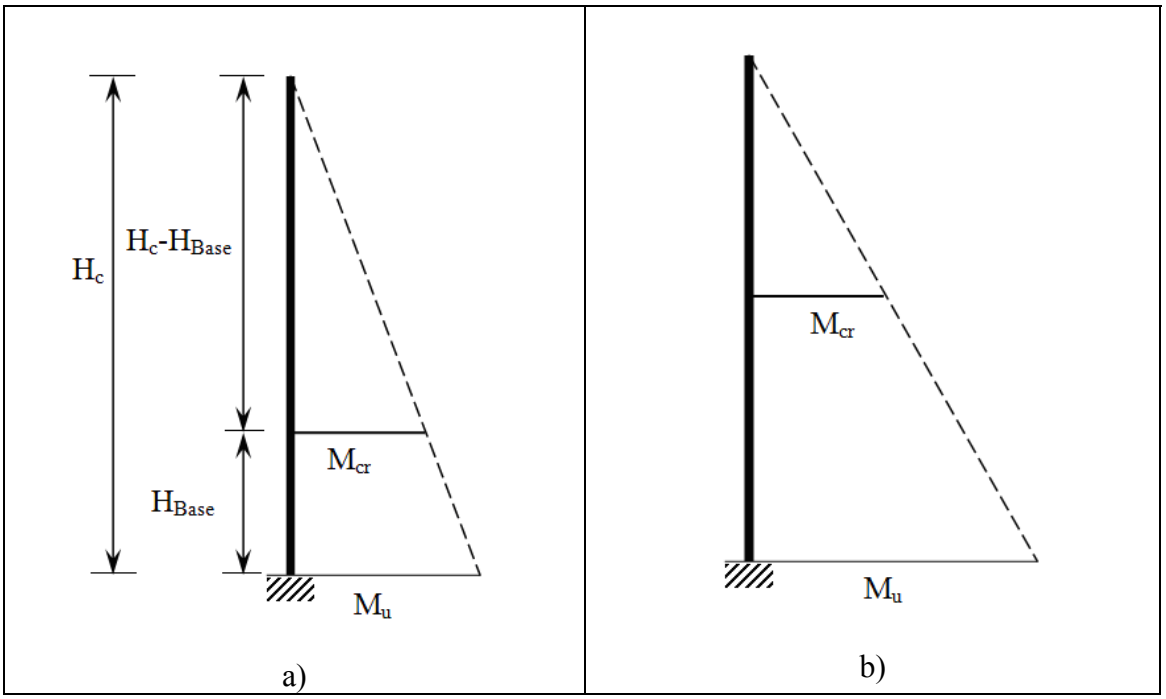


Fig. 8-1. The Ultimate and Cracking Moments along the Column Height (a) Low Longitudinal Steel Ratio, (b) High Longitudinal Steel Ratio

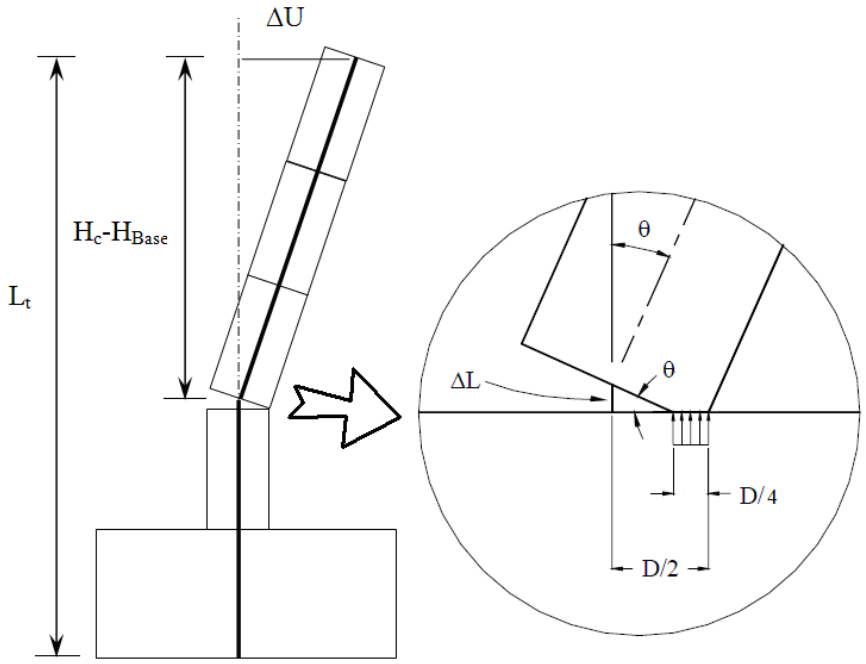


Fig. 8-2. Post-Tensioning Rod Elongation under Lateral Drift During Joint Opening

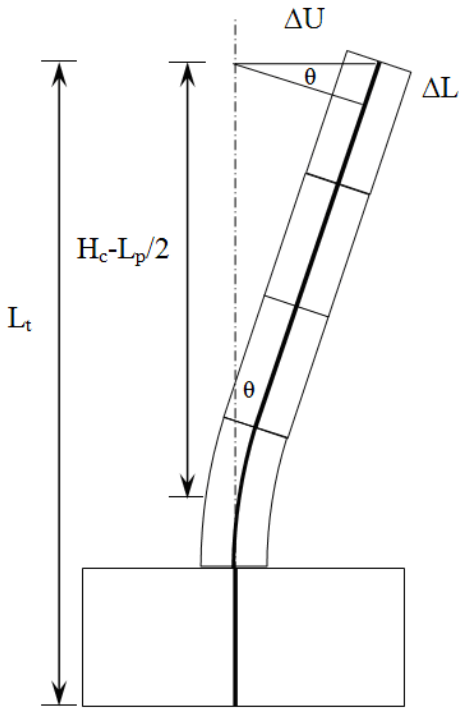


Fig. 8-3. Post-Tensioning Rod Elongation under Lateral Drift with No Joint Opening

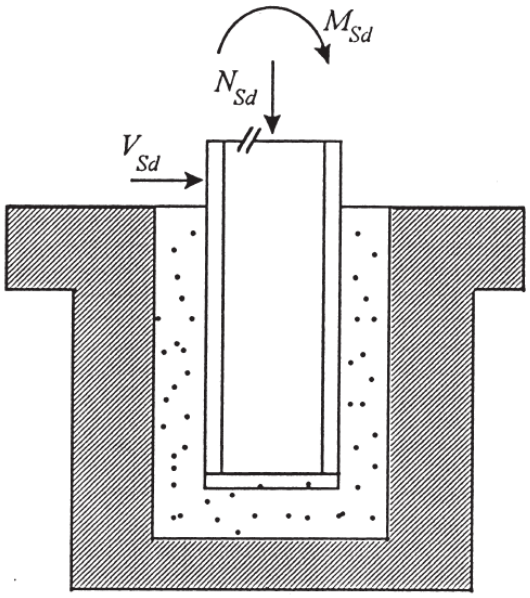


Fig. 8-4. Embedded Column Base, (Petrold et al. 2000b)

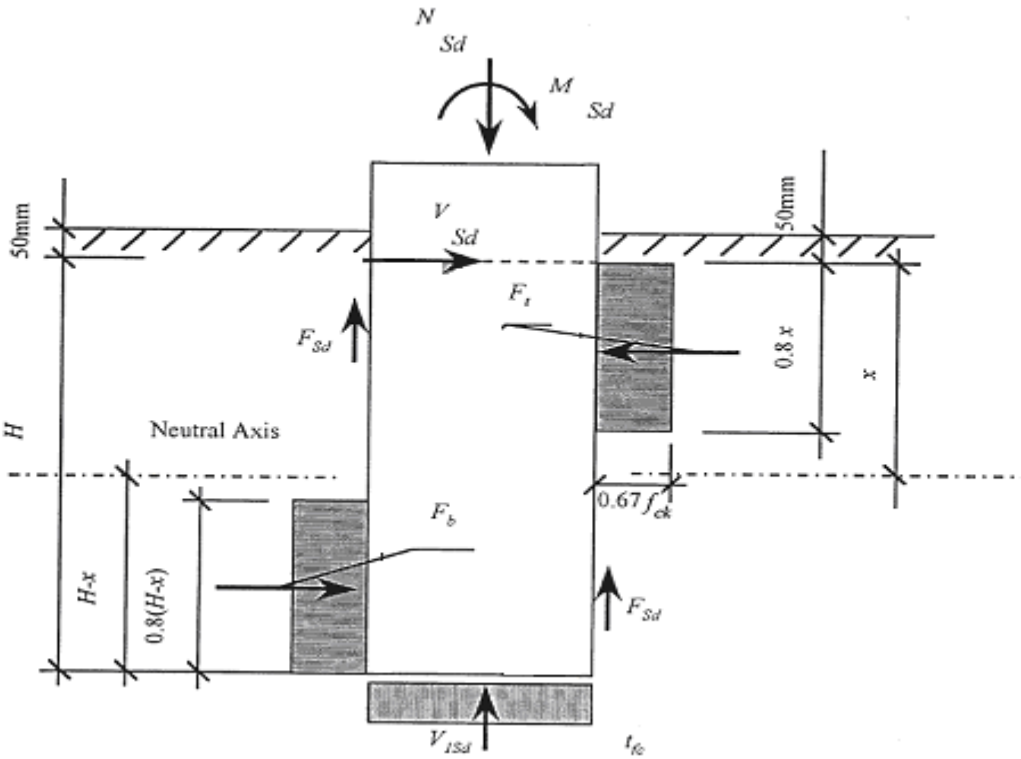


Fig. 8-5. Stress Distribution in Column Base, (Petrold et al. 2000b)

APPENDIX A: STRAIN RESULTS

Table A-1. SC-2 Maximum and Minimum in Longitudinal Bars Strains

Long. Bars	Run 1		Run 2		Run 3		Run 4		Run 5		Run 6		Run 7	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
sg 1	85	-33	163	-111	281	-157	327	-209	360	-229	360	-229	340	-190
sg 2	111	-33	216	-111	392	-183	445	-229	490	-294	464	-275	445	-248
sg 3	91	-26	163	-91	255	-183	288	-196	379	-190	412	-183	392	-144
sg 4	92	-26	157	-92	196	-177	222	-183	320	-177	353	-144	360	-124
sg 5	235	13	399	-209	621	-477	647	-608	699	-765	654	-745	621	-634
sg 6	268	-33	530	-353	869	-739	915	-935	961	-1157	883	-1131	804	-987
sg 7	203	-33	412	-307	667	-627	712	-758	771	-941	725	-922	673	-784
sg 8	288	-124	549	-680	713	-1530	765	-1556	948	-1543	968	-1223	915	-987
sg 9	275	-177	595	-745	876	-1759	1013	-1818	1249	-1883	1282	-1641	1236	-1373
sg 10	307	-65	543	-621	693	-1497	732	-1523	889	-1517	935	-1190	896	-948
sg 11	366	-131	660	-941	1091	-1627	1176	-1849	1267	-2156	1137	-1960	1006	-1568
sg 12	418	-209	837	-1190	1490	-1961	1523	-2222	0	-72	-7	-85	-7	-92
sg 13	405	-157	752	-1085	1248	-1849	1327	-2104	1412	-2451	1248	-2300	1098	-1863
sg 14	346	-190	654	-1131	830	-2621	895	-2627	1105	-2542	1137	-1889	1059	-1464
sg 15	451	-281	915	-1497	1249	-2975	1353	-2942	1615	-2877	1582	-2236	1465	-1693
sg 16	**Dead**													
sg 17	491	-118	1014	-1053	1969	-1674	2073	-1929	2250	-2315	1988	-2217	1740	-1785
sg 18	543	-170	1217	-1112	3911	-1602	4376	-1472	4788	-2152	3735	-1858	3251	-1302
sg 19	471	-124	1007	-1144	1975	-1791	2105	-2040	2243	-2393	1948	-2334	1700	-1942
sg 20	451	-144	974	-647	1327	-1694	1478	-1700	1975	-1700	2066	-1354	1962	-1092
sg 21	438	-190	974	-700	1471	-1621	1654	-1641	2072	-1661	2079	-1438	1916	-1092
sg 22	405	-190	889	-647	1242	-1543	1393	-1569	1851	-1582	1949	-1255	1837	-987
sg 23	451	-98	942	-589	2263	-798	2583	-739	3093	-942	2596	-876	2066	-739
sg 24	484	-150	1045	-719	2940	-961	3509	-778	4763	-791	3711	-379	3881	-196

Table A-1. SC-2 Maximum and Minimum Strains in Longitudinal Bars (Continue)

Long. Bars	Run 1		Run 2		Run 3		Run 4		Run 5		Run 6		Run 7	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
sg 25	458	-85	915	-510	1948	-745	2105	-856	2281	-1229	1811	-1229	1464	-1092
sg 26	373	-118	811	-647	1353	-1418	1530	-1432	2497	-1432	2575	-1052	2562	-896
sg 27	353	-157	817	-654	1498	-1262	1759	-1288	2557	-1327	2766	-1341	2583	-745
sg 28	412	-164	857	-739	1439	-1524	1622	-1537	3205	-1570	3552	-863	3199	-445
sg 29	490	-65	934	-712	3078	-908	6738	26	7933	3287	7103	3666	7679	3856
sg 30	**Dead**													
sg 31	523	-118	974	-909	3086	-1105	6270	-52	8794	2328	7198	3393	6728	3498
sg 32	431	-98	811	-719	1340	-1092	1543	-1131	5348	-1164	6145	1366	16363	2347
sg 33	399	-216	922	-909	1758	-1216	2118	-1275	13301	-1314	15439	6589	14589	10079
sg 34	399	-150	811	-824	1347	-1144	1549	-1177	7694	-1216	9067	3275	8910	4707
sg 35	360	-118	739	-654	1125	-955	1249	-804	1426	-935	870	-1001	615	-1033
sg 36	366	-124	713	-654	1092	-916	1210	-608	1361	-661	968	-720	700	-700
sg 37	412	-46	772	-549	1602	-562	1595	-464	1465	-536	1112	-595	876	-595
sg 38	445	-33	876	-517	1713	-837	1570	-974	1373	-1197	661	-1190	360	-1184

Table A-2. SC-2 Maximum and Minimum Strains in Transverse Bars

Trans. Bars	Run 1		Run 2		Run 3		Run 4		Run 5		Run 6		Run 7	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
sg 39	**Dead**													
sg 40	33	-46	33	-39	33	-65	33	-65	39	-65	39	-72	26	-72
sg 41	33	-46	46	-52	33	-39	33	-46	33	-52	39	-52	20	-52
sg 42	52	-33	46	-39	39	-85	26	-92	26	-105	20	-98	20	-78
sg 43	65	-20	65	-39	78	-52	78	-20	85	-33	59	-26	59	-20
sg 44	46	-33	52	-39	46	-46	46	-52	52	-72	52	-65	46	-59
sg 45	33	-39	39	-46	39	-33	52	-26	59	-26	46	-26	46	-33
sg 46	46	-33	46	-118	65	-163	72	-157	78	-137	72	-91	65	-65
sg 47	183	-78	177	-85	177	-92	177	-85	177	-92	177	-92	177	-92
sg 48	20	-65	26	-98	13	-190	13	-209	13	-235	7	-229	-7	-222
sg 49	26	-59	52	-59	72	-59	20	-72	33	-65	13	-72	20	-65
sg 50	52	-39	98	-92	98	-170	111	-209	111	-320	65	-392	78	-360
sg 51	13	-59	20	-65	26	-150	-7	-111	20	-124	7	-124	13	-190
sg 52	26	-59	33	-85	13	-366	-33	-536	-65	-602	-98	-497	-118	-1497
sg 53	20	-59	33	-52	46	-190	-72	-222	-92	-216	-98	-229	-118	-288
sg 54	26	-72	46	-131	26	-248	13	-314	0	-804	26	-745	72	-569
sg 55	13	-65	7	-72	26	-85	20	-92	20	-98	-26	-124	-26	-111
sg 56	26	-52	13	-72	26	-98	0	-105	0	-137	-26	-157	-20	-157
sg 57	20	-59	26	-85	7	-85	13	-85	13	-118	20	-98	20	-78
sg 58	39	-59	20	-52	13	-65	20	-72	0	-72	-7	-85	-7	-92

Table A-3. SBR-1 Maximum and Minimum Strains in Longitudinal Bars

Long. Bars	Run 1		Run 2		Run 3		Run 4		Run 5		Run 6		Run 7	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
sg 1	-249	-550	-38	-618	143	-889	369	-851	640	-994	723	-1009	745	-1100
sg 2	-226	-557	90	-618	218	-866	602	-896	911	-1024	994	-1062	1001	-1167
sg 3	68	-731	316	-595	685	-633	1039	-942	1265	-1009	1205	-1062	1205	-1024
sg 4	-211	-505	128	-452	279	-512	565	-715	685	-828	768	-858	783	-881
sg 5	-309	-1499	112	-1876	753	-2320	2146	-2742	52914	-3081	47673	-3691	62863	-4354
sg 6	-308	-1573	662	-1979	1370	-2408	2965	-2807	4839	-3229	5735	-3740	5374	-4199
sg 7	-437	-1340	0	-1746	376	-2138	1355	-2514	2296	-2762	2506	-3033	2371	-3289
sg 8	-248	-1212	445	-1385	1386	-1551	2305	-1972	2628	-2387	3020	-2718	3314	-2801
sg 9	-22	-1227	1009	-1385	1890	-1536	2545	-1875	2824	-2259	3148	-2372	3592	-2379
sg 10	-165	-1129	535	-1091	1400	-1234	2311	-1422	2590	-1625	2687	-1678	2755	-1678
sg 11	-399	-1363	53	-1702	618	-2093	2034	-2357	4007	-2402	5543	-2568	5551	-3585
sg 12	-181	-2025	662	-2409	1272	-3026	2634	-3711	4163	-4125	8799	-4622	9710	-6173
sg 13	-391	-1279	46	-1603	520	-1987	1807	-2220	2967	-2394	2952	-2665	2718	-3485
sg 14	-196	-1325	482	-1491	1799	-1649	3155	-1844	3659	-2296	4412	-2597	5330	-2703
sg 15	136	-1401	1197	-1581	2252	-1724	3246	-2327	4006	-3456	5316	-4413	6431	-4179
sg 16	-189	-1348	504	-1506	1724	-1672	2823	-1785	3056	-2184	3546	-2455	4201	-2440
sg 17	-368	-813	-52	-993	286	-1362	987	-1528	1657	-1746	1943	-2002	1875	-3139
sg 18	-113	-1136	256	-1392	723	-2040	2372	-2890	3463	-4245	2462	-6436	2025	-11510
sg 19	-234	-640	60	-836	316	-1227	918	-1453	1393	-1762	994	-2447	798	-249787
sg 20	-151	-693	414	-724	934	-814	1318	-1288	1431	-1537	1604	-1740	1807	-1778
sg 21	1134	-364	1291	-1684	150	-1862	920	-1320	1419	-2226	1548	-3696	1041	-3610
sg 22	-257	-942	207	-1013	834	-1113	1205	-1676	1291	-1940	1505	-2247	1819	-2197
sg 23	-477	-805	-370	-991	-256	-1340	79	-1825	179	-1775	222	-1661	243	-1661
sg 24	-235	-485	-178	-585	-92	-749	72	-1013	122	-1105	143	-1070	221	-1234
sg 25	**Dead**													
sg 26	-520	-863	-328	-941	-156	-998	-64	-1319	-14	-1805	143	-1926	229	-1776

Table A-4. SF-2 Maximum and Minimum Strains in Longitudinal Bars

Long. Bars	Run 1		Run 2		Run 3		Run 4		Run 5		Run 6		Run 7		Run 8	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
sg 1	79	-13	124	-52	190	-111	216	-105	268	-105	366	-105	425	-105	366	-92
sg 2	111	7	222	-46	372	-163	399	-170	470	-176	621	-190	627	-190	575	-163
sg 3	124	-7	196	-72	504	-190	582	-203	647	-281	739	-366	765	-379	726	-353
sg 4	118	20	163	-33	327	-118	399	-131	490	-170	582	-229	601	-222	595	-209
sg 5	268	-26	536	-392	915	-1692	961	-1960	1157	-2235	1503	-2424	1477	-2294	1353	-1457
sg 6	235	-26	444	-288	817	-1216	902	-1327	1111	-1418	1425	-1529	1405	-1503	1268	-1105
sg 7	242	-46	484	-347	844	-1380	916	-1498	1118	-1609	1432	-1726	1445	-1668	1308	-1138
sg 8	275	-20	491	-412	936	-1237	1047	-1283	1198	-1663	1584	-1970	1552	-2010	1466	-1656
sg 9	333	-92	634	-745	1196	-1882	1333	-1908	1490	-2366	1895	-3288	1745	-3307	1510	-2647
sg 10	288	-39	536	-640	915	-1673	1006	-1673	1131	-2255	1516	-3104	1510	-2856	1457	-2144
sg 11	399	-78	817	-961	1360	-2765	1334	-3255	1222	-5158	1026	-8230	484	-6256	150	-3523
sg 12	406	-144	850	-1204	1289	-5861	399	-9014	-648	-10669	203	-12494	-288	-10781	-739	-6404
sg 13	347	-105	765	-1060	1164	-4212	746	-6829	-262	-8556	510	-10629	307	-9014	-20	-4945
sg 14	373	-72	719	-1098	1523	-2569	1680	-2549	1941	-6733	1798	-11466	-235	-9420	-961	-7040
sg 15	451	-124	942	-1347	2236	-3767	2642	-3897	3263	-9338	3826	-14158	1739	-11346	373	-8030
sg 16	379	-105	693	-746	1256	-2119	1399	-2138	1635	-2779	2217	-3741	2367	-3531	2237	-2564
sg 17	438	-92	830	-503	1393	-1641	1464	-1824	1811	-2027	2622	-2197	2595	-2079	2301	-1275
sg 18	484	-170	967	-621	1908	-2000	1980	-2150	2536	-2339	7045	-2575	6692	-1693	5894	425
sg 19	425	-131	817	-536	1471	-1922	1543	-2079	1929	-2229	2883	-2432	3086	-2367	2720	-1223
sg 20	445	-85	850	-451	1720	-1334	1935	-1353	2249	-1791	2981	-2347	3073	-2151	2668	-1648
sg 21	974	-614	2321	-1504	2752	-1497	3857	-1843	5387	-2380	5079	-2033	4275	-1379	0	0
sg 22	405	-98	752	-471	1347	-1236	1484	-1275	1739	-1719	2105	-2242	2197	-2053	2242	-1569
sg 23	445	-59	817	-451	1615	-1687	1798	-2047	2217	-2386	3328	-2785	3590	-2713	3335	-1164
sg 24	471	-144	942	-641	2099	-1897	2152	-2198	2924	-2498	6239	-3336	6154	-3126	5605	-549
sg 25	**Dead**															

Table A-4. SF-2 Maximum and Minimum Strains in Longitudinal Bars (Continue)

Long. Bars	Run 1		Run 2		Run 3		Run 4		Run 5		Run 6		Run 7		Run 8	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
sg 26	399	-65	732	-372	1823	-1222	2143	-1209	2489	-1692	3718	-2613	4070	-1973	4044	-1156
sg 27	451	-118	890	-478	2839	-1413	3748	-1295	5299	-2093	6614	-3716	6692	-2558	6705	-1210
sg 28	360	-65	634	-392	1151	-1321	1236	-1321	1392	-1687	1647	-2223	1896	-1928	2674	-1373
sg 29	425	-46	785	-405	1654	-1118	1772	-1321	2406	-1471	6532	-1608	7454	281	7003	2177
sg 30	445	-124	876	-536	2184	-1242	2262	-1366	4871	-1543	10598	-974	11696	1504	11029	4753
sg 31	373	-98	719	-464	1465	-1059	1524	-1242	2073	-1425	5833	-1530	6323	641	5637	2563
sg 32	425	-33	778	-405	2322	-602	2792	-556	5781	-438	9921	1092	12040	3649	13125	5866
sg 33	471	-105	889	-575	4895	-719	7183	686	9621	1993	13667	2536	16353	4778	20118	8078
sg 34	353	-46	621	-445	994	-883	1020	-876	1249	-1144	1681	-1628	2067	-1471	7174	-1053
sg 35	445	20	758	-242	1752	-255	1935	-209	2132	-268	2367	-248	1968	-307	1210	-438
sg 36	431	-52	771	-366	1870	-458	2111	-405	2700	-412	7760	-183	7498	4406	6419	4354
sg 37	418	13	739	-288	1399	-366	1412	-347	1772	-373	2334	-432	2020	-458	1687	-497
sg 38	386	-20	687	-288	1230	-334	1217	-320	1517	-399	1916	-536	1642	-648	1164	-680

Table A-5. SE-2 Maximum and Minimum Strains in Longitudinal Bars

Long. Bars	Run 1		Run 2		Run 3		Run 4		Run 5		Run 6		Run 7		Run 8	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
sg 1	144	-13	242	-85	301	-177	334	-190	412	-177	419	-177	478	-144	471	-150
sg 2	157	0	262	-78	386	-163	419	-183	490	-183	477	-177	556	-150	549	-157
sg 3	105	-26	177	-92	314	-118	360	-131	379	-150	432	-150	314	-157	314	-137
sg 4	98	-26	170	-92	288	-137	307	-150	333	-183	373	-190	262	-183	275	-157
sg 5	176	-33	294	-163	373	-425	392	-536	471	-510	471	-477	549	-281	555	-307
sg 6	196	-65	353	-196	432	-562	471	-693	582	-654	576	-628	667	-366	654	-399
sg 7	209	-52	347	-203	438	-504	458	-634	549	-595	549	-569	628	-347	615	-379
sg 8	170	-65	294	-196	471	-347	497	-418	510	-536	556	-536	399	-562	412	-497
sg 9	209	-124	405	-301	700	-621	739	-745	771	-961	811	-974	582	-1013	601	-922
sg 10	170	-65	321	-203	549	-445	602	-523	628	-706	674	-720	510	-765	510	-680
sg 11	385	-111	673	-751	817	-1620	843	-1686	1013	-1581	1013	-1496	1156	-941	1156	-1013
sg 12	510	-176	856	-967	1111	-2039	1170	-2144	1425	-2000	1432	-1928	1615	-1249	1582	-1353
sg 13	386	-124	660	-915	863	-2079	935	-2158	1118	-2020	1138	-1975	1275	-1295	1249	-1386
sg 14	360	-177	686	-719	1151	-1268	1223	-1386	1262	-1615	1360	-1628	941	-1693	1000	-1543
sg 15	418	-268	850	-942	1497	-1543	1602	-1595	1654	-1850	1739	-1850	1223	-1935	1288	-1778
sg 16	346	-170	640	-666	1065	-1091	1130	-1124	1163	-1294	1196	-1294	869	-1352	895	-1254
sg 17	314	-72	562	-386	660	-1046	687	-1118	850	-1066	857	-1033	1000	-693	1027	-765
sg 18	425	-118	778	-510	1027	-1275	1086	-1360	1334	-1308	1347	-1282	1530	-909	1511	-961
sg 19	379	-98	680	-405	843	-1007	915	-1085	1105	-1033	1124	-1033	1275	-726	1255	-758
sg 20	288	-157	569	-471	962	-798	1027	-863	1079	-1105	1164	-1132	831	-1204	857	-1132
sg 21	379	-222	752	-634	1353	-1072	1451	-1137	1470	-1418	1542	-1457	1078	-1549	1131	-1483
sg 22	301	-137	563	-458	949	-824	1001	-890	1034	-1079	1093	-1086	779	-1145	805	-1099
sg 23	**Dead**															
sg 24	412	-105	739	-425	1001	-850	1086	-889	1354	-883	1393	-896	1596	-693	1589	-752
sg 25	392	-91	719	-379	928	-745	1052	-784	1300	-791	1320	-804	1431	-686	1372	-712

Table A-5. SE-2 Maximum and Minimum Strains in Longitudinal Bars (Continue)

Long. Bars	Run 1		Run 2		Run 3		Run 4		Run 5		Run 6		Run 7		Run 8	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
sg 26	314	-170	595	-575	1098	-902	1176	-882	1241	-1019	1346	-1032	941	-1091	974	-1059
sg 27	392	-216	772	-726	1523	-1033	1635	-981	1622	-1144	1667	-1177	1098	-1249	1151	-1242
sg 28	314	-118	582	-464	1047	-792	1112	-792	1151	-909	1204	-929	844	-988	863	-975
sg 29	373	-65	673	-307	993	-379	1085	-399	1353	-399	1379	-412	1660	-373	1595	-392
sg 30	418	-92	726	-301	961	-405	994	-431	1445	-458	1523	-490	1647	-516	1562	-543
sg 31	399	-72	713	-327	1013	-405	1183	-418	1582	-451	1602	-503	1510	-621	1157	-621
sg 32	281	-150	536	-392	987	-438	1092	-431	1144	-497	1111	-543	621	-569	673	-562
sg 33	347	-222	713	-491	1648	-543	1818	-497	1707	-602	1576	-772	831	-772	896	-804
sg 34	340	-144	647	-451	1321	-523	1445	-490	1498	-562	1458	-674	772	-713	817	-732
sg 35	431	-39	784	-307	994	-516	1039	-536	1301	-549	1347	-582	1562	-654	1255	-680
sg 36	392	-59	634	-294	739	-379	719	-399	804	-425	759	-451	1144	-425	1158	-320
sg 37	366	-150	739	-445	1439	-536	1596	-543	1667	-641	1877	-719	1334	-765	1439	-778
sg 38	327	-196	-262	-1406	1301	-549	1295	-660	1170	-824	1739	-4440	1105	-10933	1118	-102479

Table A-6. SC-2R Maximum and Minimum Strains in Longitudinal Bars

Long. Bars	Run 1		Run 2		Run 3		Run 4		Run 5	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
sg 1	170	-216	229	-248	307	-340	366	-412	477	-418
sg 2	261	-255	353	-294	451	-405	523	-451	647	-477
sg 3	163	-222	203	-268	320	-288	418	-294	431	-294
sg 4	144	-190	177	-255	255	-262	347	-268	379	-268
sg 5	386	-523	497	-667	608	-1065	719	-1235	863	-1294
sg 6	-412	-1693	65	-1817	530	-2072	791	-2425	1020	-2667
sg 7	425	-608	556	-784	693	-1255	797	-1477	961	-1503
sg 8	432	-1099	530	-1661	811	-1916	1053	-2047	1086	-2308
sg 9	687	-1203	857	-1831	1229	-2053	1465	-2132	1471	-2190
sg 10	451	-1033	556	-1588	797	-1804	987	-1902	1007	-2020
sg 11	608	-1117	902	-1542	1130	-2607	1307	-3913	1339	-4142
sg 12	758	-1392	1209	-1882	1523	-3150	1719	-7543	1262	-7713
sg 13	719	-1287	1059	-1764	1346	-3045	1562	-5725	1301	-6065
sg 14	464	-1634	588	-2699	948	-3104	1209	-3320	1255	-4294
sg 15	739	-1876	922	-3092	1510	-3772	1955	-4524	1961	-8434
sg 16	**Dead**									
sg 17	1020	-1145	1550	-1557	2021	-2773	2433	-3368	4330	-3532
sg 18	2374	26	3368	-608	4480	-2590	5265	-3859	5932	-4121
sg 19	1046	-1157	1602	-1615	2125	-2779	2615	-3720	5126	-4119
sg 20	706	-1210	942	-1890	1582	-2217	2164	-2354	2315	-2590
sg 21	785	-1223	1066	-1863	1896	-2105	2412	-2177	2484	-2295
sg 22	759	-1053	981	-1667	1602	-1942	2243	-2086	2367	-2321
sg 23	883	-602	1890	-765	2845	-1190	3427	-1975	5408	-2158
sg 24	2437	640	3633	399	4731	-797	5345	-2117	6207	-2352

Table A-6. SC-2R Maximum and Minimum Strains in Longitudinal Bars (Continue)

Long. Bars	Run 1		Run 2		Run 3		Run 4		Run 5	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
sg 25	667	-778	1327	-928	2124	-1497	2654	-2360	4131	-2432
sg 26	569	-935	739	-1438	1536	-1739	2687	-1883	2759	-2053
sg 27	857	-700	1138	-1184	2400	-1393	3407	-1445	3342	-1707
sg 28	1236	-399	1413	-948	2446	-1433	3722	-1661	3840	-1910
sg 29	4463	3509	4744	3039	7019	2941	8031	2843	11704	2496
sg 30	**Dead**									
sg 31	6303	4943	7741	4838	10402	4734	11585	4191	13508	4230
sg 32	12866	12062	13036	11918	13833	11630	14873	11244	15128	10996
sg 33	6941	6085	7151	6000	7157	5216	7177	5007	6085	4883
sg 34	6557	5269	6786	5040	7831	4328	10381	4053	11466	5295
sg 35	190	-1053	419	-1027	1112	-1040	1537	-1236	1530	-1589
sg 36	419	-733	641	-706	1341	-693	1845	-903	1766	-1295
sg 37	634	-582	1589	-569	1791	-706	1896	-850	2099	-981
sg 38	98	-1138	1092	-1151	1635	-1256	1668	-1485	3224	-1491

Table A-7. RC-ECC Column Maximum and Minimum Strains in Longitudinal Bars

Longitudinal Bars	Run 1		Run 2		Run 3		Run 4		Run 5		Run 6	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
sg 1	190	13	935	-1856	1883	-3523	2157	-16328	366	-26453	-1438	-3942
sg 2	144	13	536	-1328	1432	-2668	2452	-3159	2616	-18272	1360	-16918
sg 3	124	-7	536	-1151	1170	-2766	3053	-5407	4185	-11854	214790	-12096
sg 4	137	-33	850	-1353	1674	-2654	2471	-24799	765	-38306	-18411	-22177
sg 5	497	98	1948	-2797	4340	-37165	10798	-61623	215098	-213248	215098	-213248
sg 6	549	-7	2602	-3059	10641	-24499	77131	-25146	214522	-213849	214522	214522
sg 7	314	20	1203	-2014	1857	-23515	9035	-44069	215193	-213238	215193	-213238
sg 8	248	-33	1079	-2373	1843	-22794	214422	-213971	214422	-213971	214422	-213971
sg 9	288	-118	1765	-2589	8505	-18344	215401	-213028	215401	-213028	215401	215401
sg 10	222	-72	1092	-2093	1825	-17566	2067	-82102	215188	-213403	215188	-213403
sg 11	333	59	1196	-1726	2105	-3550	6426	-20633	8558	-38788	6891	-14429
sg 12	412	-7	1752	-2137	2490	-13216	15249	-19674	16530	-37800	-11432	-14648
sg 13	347	20	1328	-1995	2368	-4467	4742	-26259	11602	-32695	13022	-28241
sg 14	314	-20	1176	-1987	2268	-3653	4411	-25833	6215	-35453	214384	-213894
sg 15	268	-105	1653	-2444	5378	-5051	8194	-21642	11938	-29953	-2646	-11082
sg 16	**Dead**											
sg 17	314	0	1359	-1921	1980	-3810	2595	-3941	2562	-8306	1653	-1667
sg 18	268	39	961	-1438	1307	-3249	1935	-3628	2281	-4752	2464	-3255
sg 19	333	7	1144	-1654	1935	-2890	2158	-7624	2583	-7245	706	-5898
sg 20	340	-78	1674	-2230	3165	-3669	5500	-12072	5363	-10856	896	-4931
sg 21	327	26	1229	-1621	1739	-3256	2327	-3360	2033	-3400	1549	-1281
sg 22	**Dead**											
sg 23	301	33	961	-1504	1504	-2634	1569	-3497	1870	-3327	214636	-213779
sg 24	249	-46	1158	-1655	2008	-2740	2152	-2949	2302	-2871	1563	-1877

Table A-8. RC-ECC Column Maximum and Minimum Strains in Transverse Bars

Transverse Bars	Run 1		Run 2		Run 3		Run 4		Run 5		Run 6	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
sg 25	33	-52	20	-98	-7	-124	7	-222	137	-340	301	-693
sg 26	39	-26	33	-78	20	-124	13	-137	20	-98	20	-78
sg 27	65	-26	118	-98	510	-190	1393	-307	3963	-1544	3924	1897
sg 28	26	-52	20	-85	-20	-164	124	-222	1027	7	215334	-213430
sg 29	13	-46	26	-105	26	-164	190	-301	190	-2322	216259	-212367
sg 30	**Dead**											
sg 31	20	-39	46	-196	-33	-360	-78	-817	-222	-1144	-248	-471
sg 32	-7	-72	33	-92	39	-170	-65	-96860	-144	-213136	-137	-213136
sg 33	39	-33	26	-92	-13	-183	-65	-262	-118	-353	-124	-281
sg 34	**Dead**											
sg 35	**Dead**											
sg 36	46	-33	98	-26	118	-59	118	-91	137	-118	118	-124

Table A-9. RC-ECC Column Maximum and Minimum Strains on the Steel Pipe

On the Pipe	Run 1		Run 2		Run 3		Run 4		Run 5		Run 6	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
sg 89	33	-39	157	-85	176	-699	399	-1177	1150	-4628	1614	-3680
sg 90	20	-65	111	-209	536	-281	1008	-949	1577	-1446	1773	-1969

Table A-10. FRP Column Maximum and Minimum Strains on the Longitudinal Bars

Longitudinal Bars	Run 1		Run 2		Run 3		Run 4		Run 5		Run 6	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
sg 37	176	-85	791	-1333	1647	-2346	2183	-20214	869	-26129	-1503	-32318
sg 38	353	-163	268	-1112	628	-2203	118024	-2740	214537	-15221	214537	-53222
sg 39	248	-20	804	-1824	1844	-2942	3935	-14362	3027	-26502	3537	-41152
sg 40	203	-52	745	-1667	1536	-2935	2314	-16911	1412	-24729	214732	-213667
sg 41	530	-896	634	-994	2210	-994	1399	-1269	3256	-1792	2151	-2132
sg 42	229	-72	1720	-2348	2766	-2616	9869	-25644	21105	-25703	56984	-35146
sg 43	196	0	432	-1733	1308	-2492	1190	-24767	-1772	-28272	4748	-17043
sg 44	281	0	1301	-2451	2300	-11849	1457	-6829	7738	-4986	10391	-8261
sg 45	170	-144	1229	-2432	20	-24120	4021	-23244	7964	-33920	215750	-212735
sg 46	157	-33	457	-2183	1575	-2366	1993	-23291	137	-30349	214719	-62241
sg 47	288	-65	1922	-2373	3033	-2674	2451	-10910	-4255	-20225	-7393	-34776
sg 48	190	13	497	-2308	1733	-2602	2040	-24351	-1059	-15569	2916	-16243
sg 49	288	0	1359	-2314	2294	-2941	4601	-17927	-523	-4640	215801	-212500
sg 50	**Dead**											
sg 51	196	-59	1184	-1668	2472	-1962	2898	-16208	-412	-21081	-4657	-10138
sg 52	163	20	438	-1184	1236	-2021	1975	-2936	2727	-19606	215173	-213414
sg 53	281	13	981	-1595	2184	-2118	6512	-11200	101643	-20805	215127	-213355
sg 54	235	-20	987	-1766	2099	-2230	3394	-3015	215292	-170060	215292	-213259
sg 55	163	-59	994	-1910	2014	-2250	3048	-11105	2080	-2276	3806	-1517
sg 56	164	7	510	-1662	759	-3814	929	-22196	975	-26115	2152	-31956
sg 57	229	7	975	-1865	1891	-2781	3860	-21801	7295	-34128	8113	-27591
sg 58	235	-7	980	-1823	2104	-2542	4868	-7378	9906	-25211	6417	-21427

Table A-11. FRP Column Maximum and Minimum Strains on the Tube

on the FRP	Run 1		Run 2		Run 3		Run 4		Run 5		Run 6	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
sg 59	**Not Installed**											
sg 60												
sg 61												
sg 62												
sg 63	**Dead**											
sg 64	261	20	1353	-1111	215527	-212841	215527	-212841	215527	-212841	215527	-212841
sg 65	190	-59	1333	-1418	3882	-3157	215606	-212711	215606	-212711	215606	215606
sg 66	39	-46	39	-412	65	-994	72	-3923	-340	-5100	-556	-8225
sg 67	**Dead**											
sg 68	39	-13	105	-438	105	-7758	216650	-211663	216650	-211663	216650	216650
sg 69	85	-20	477	-772	1092	-2439	215616	-212993	215616	-212993	215616	215616
sg 70	124	-26	745	-981	2066	-2753	215838	-212680	215838	215838	215838	215838
sg 71	-13	-72	131	-72	262	-157	366	-719	870	-1079	12852	-1720
sg 72	98	26	137	-314	131	-1190	46	-3754	-85	-6842	221633	-207027
sg 73	222	131	268	-680	347	-3623	177	-6304	124	-14857	220716	-207840
sg 74	13	-39	105	-46	183	-52	876	-190	490	-484	15992	-1425
sg 75	78	-13	118	-353	52	-1779	-46	-4493	-288	-4925	221047	-207555
sg 76	118	65	118	-792	65	-2482	-65	-11578	-511	-12488	220748	-208404
sg 77	85	20	176	-340	190	-1418	229	-3987	215137	-213222	215137	-213222
sg 78	85	-7	314	-562	477	-1811	215627	-212848	215627	-212848	215627	215627
sg 79	72	0	209	-431	222	-1052	183	-6727	215758	-212640	215758	-212640
sg 80	105	-13	510	-745	1020	-1759	215505	-212974	215505	215505	215505	215505
sg 81	-13	-72	98	-137	347	-255	543	-1066	1295	-1805	2040	-3080
sg 82	105	33	170	-386	196	-1053	177	-3663	59	-4290	-124	-4598
sg 83	262	163	333	-647	373	-2942	235	-6401	220840	-207626	220840	-207626
sg 84	13	-46	118	-52	268	-85	556	-438	33	-817	1307	-1255
sg 85	105	26	157	-458	177	-1753	111	-3185	-445	-6775	-438	-5546
sg 86	137	78	124	-542	72	-1634	-20	-8144	220062	-208278	220062	-208278

Table A-12. FRP Column Maximum and Minimum Strains on the Steel Pipe

On the Steel Pipe	Run 1		Run 2		Run 3		Run 4		Run 5		Run 6	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
sg 87	26	-111	307	-353	680	-1105	1811	-1589	1275	-2792	2020	-1223
sg 88	46	-98	177	-373	307	-634	863	-654	1288	-1897	3081	-4258

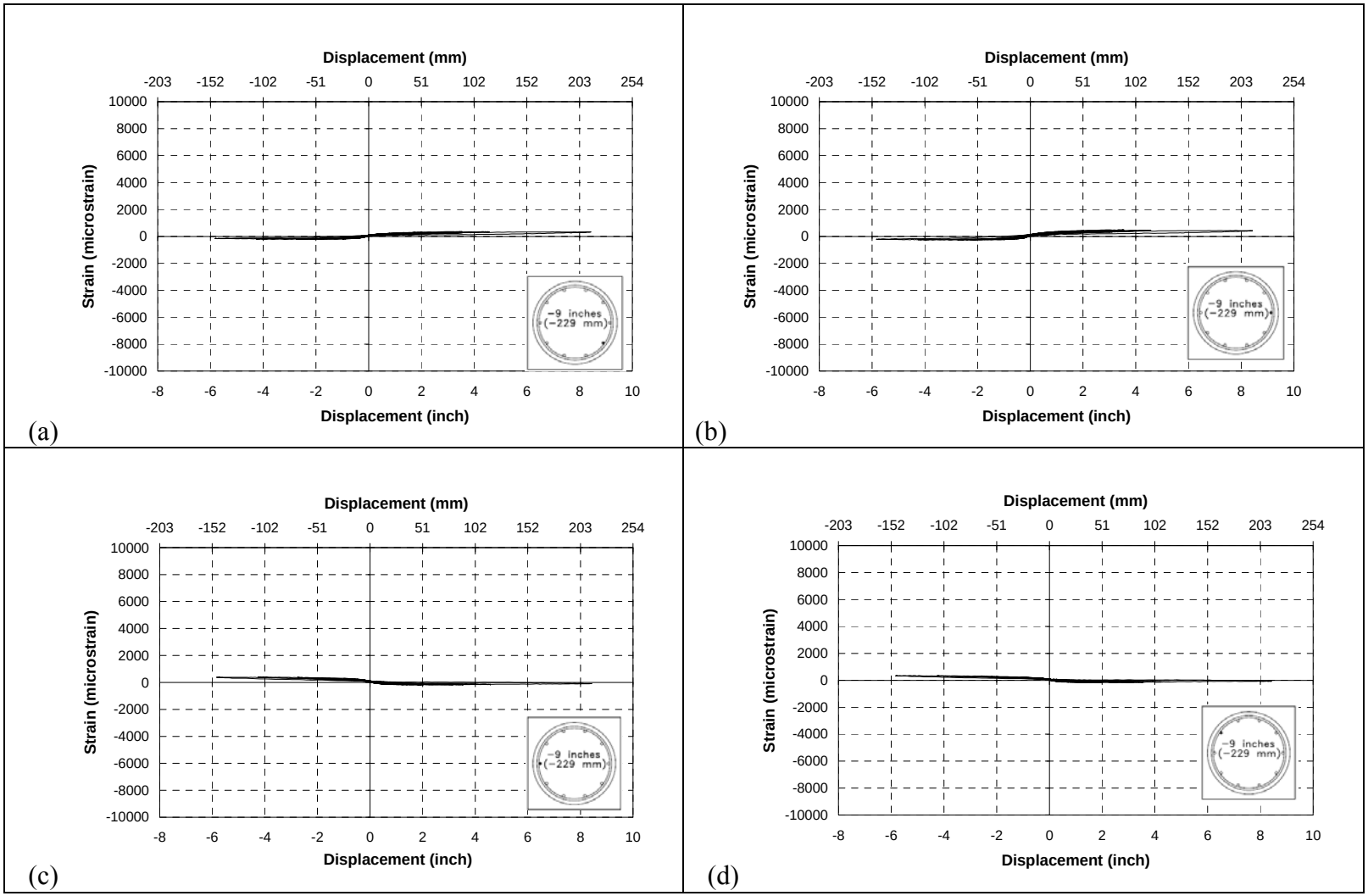


Fig. A-1. a) sg 1, b) sg 2, c) sg 3, d) sg 4 in SC-2

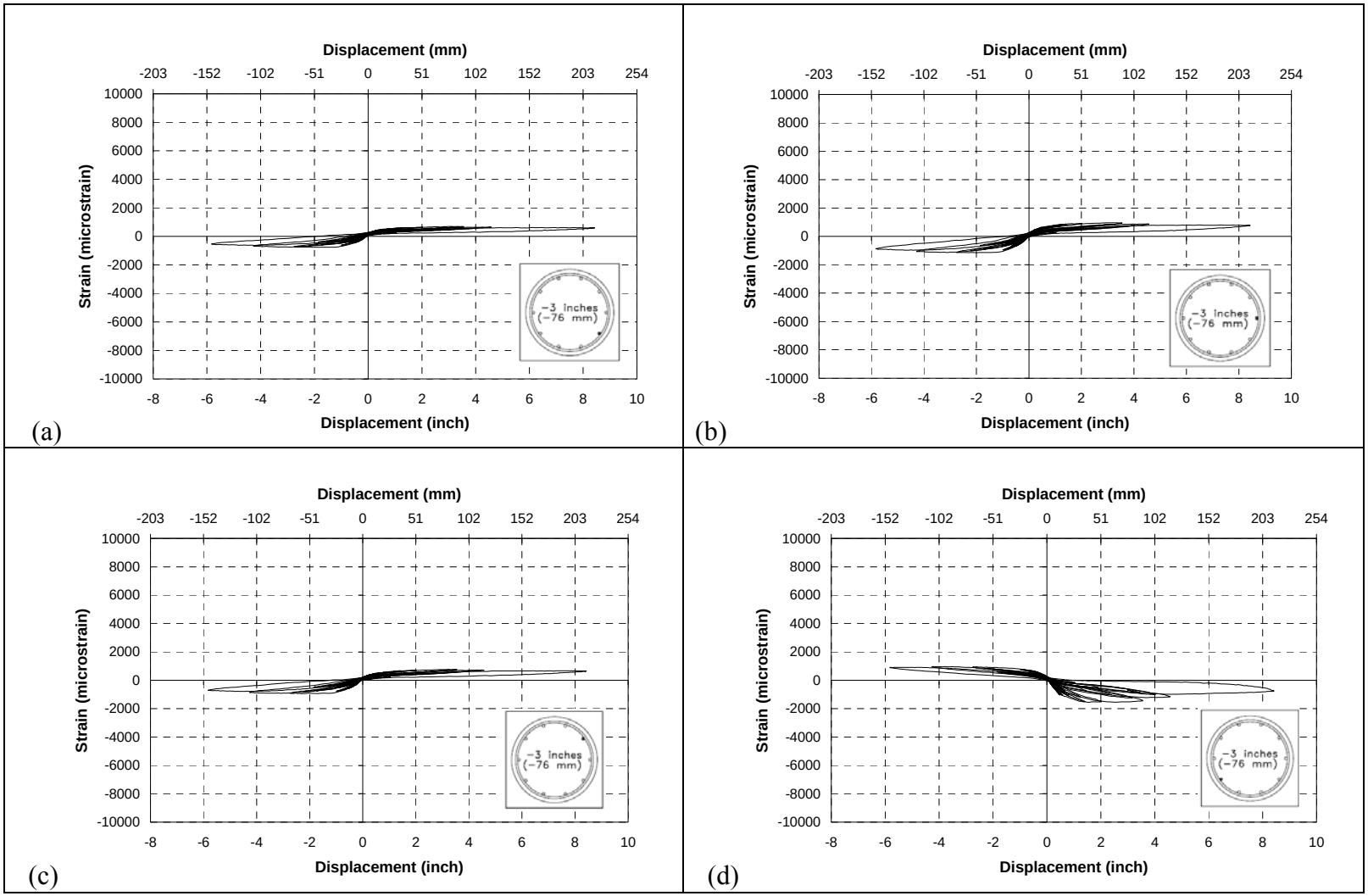


Fig. A-2. a) sg 5, b) sg 6, c) sg 7, d) sg 8 in SC-2

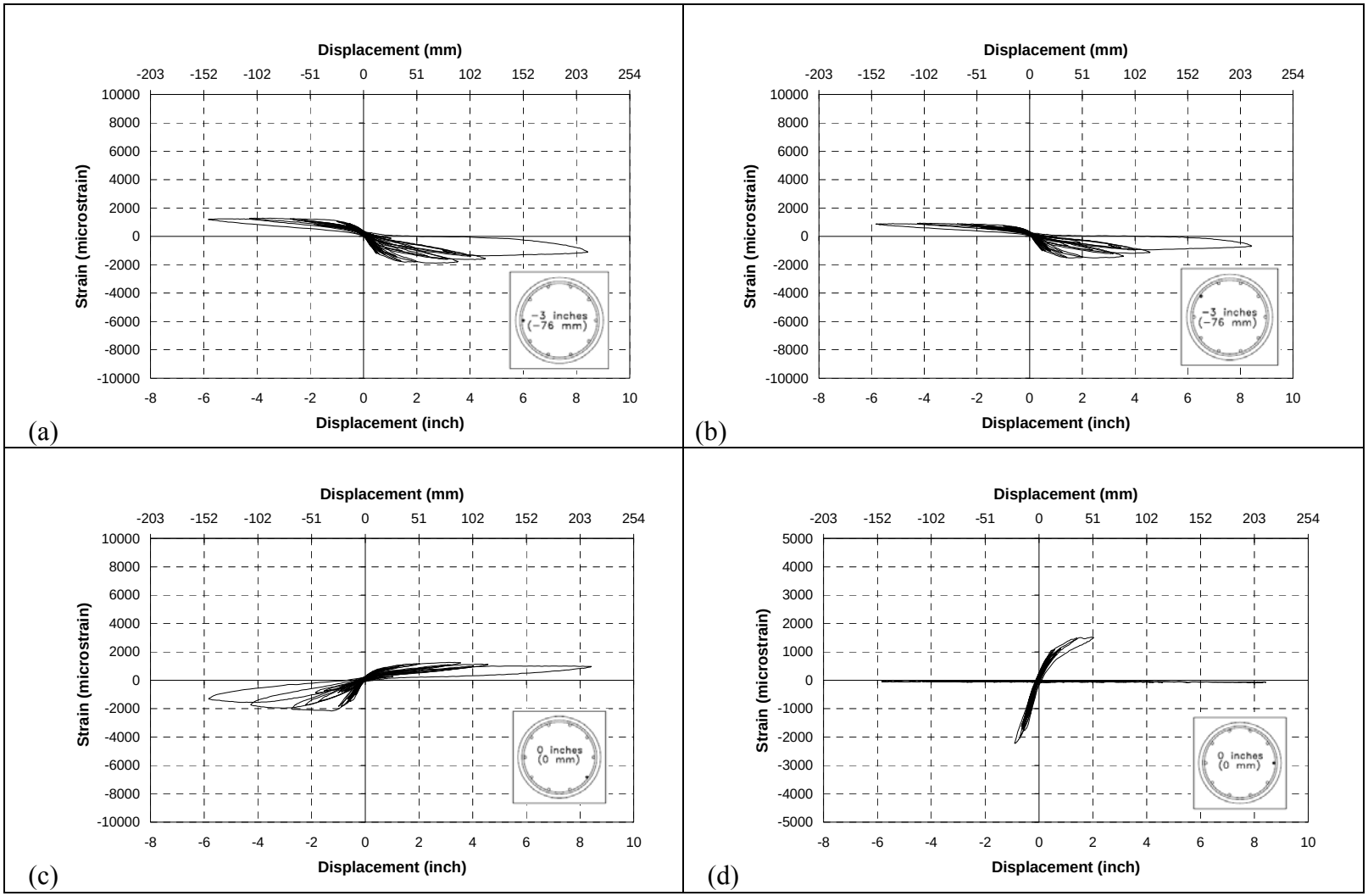


Fig. A-3. a) sg 9, b) sg 10, c) sg 11, d) sg 12 in SC-2

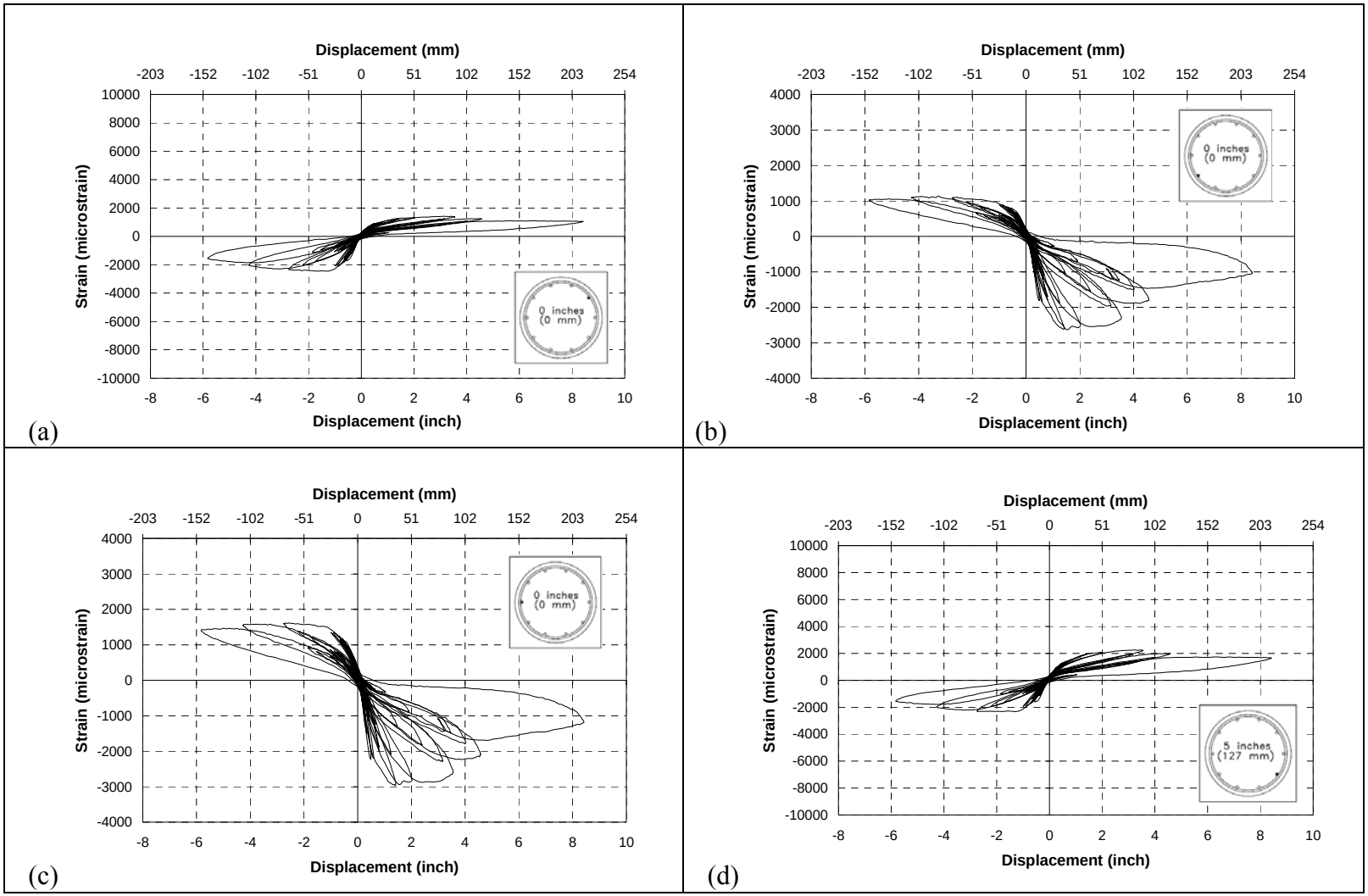


Fig. A-4. a) sg 13, b) sg 14, c) sg 15, d) sg 17 in SC-2

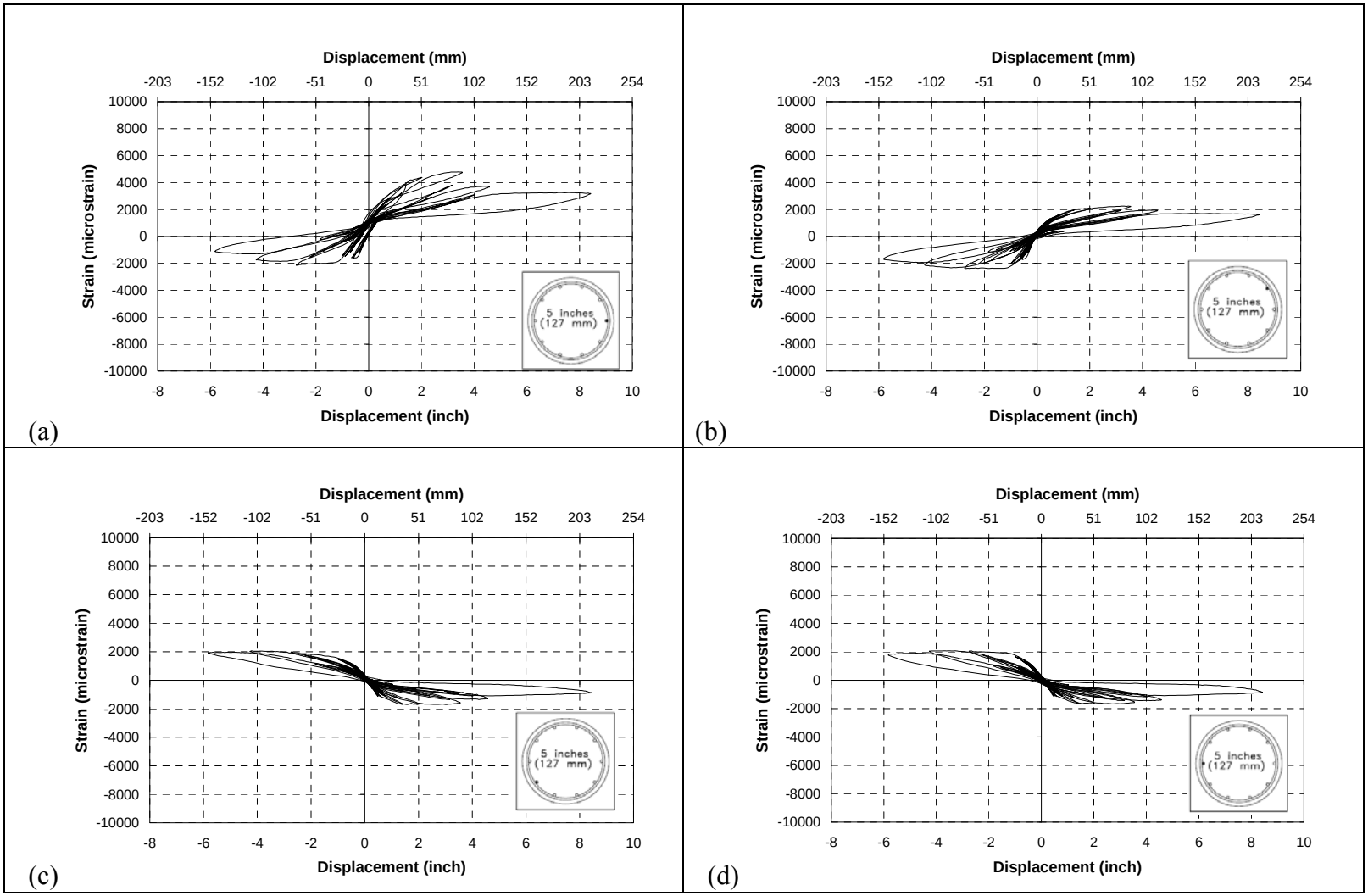


Fig. A-5. a) sg 18, b) sg 19, c) sg 20, d) sg 21 in SC-2