

APPENDIX C: CYCLIC TESTS WITHOUT HOLD-DOWNS

Test:	17	18
Testing Procedure:	Cyclic (ASTM E2126)	Cyclic (ASTM E2126)
Anchorage:	No Hold-down	No Hold-down
Material:	OSB	OSB
Date Constructed:	7/08/02	7/08/02
Date Tested:	7/31/02	7/31/02

Test 17 Observations:

-Nails pulled out, and in some areas ripped through sheathing on the bottom plate.

-All other nails appeared to be minimally affected.

-Mode of failure: The nails pulled through the sheathing on the bottom plate. Because of this separation, the studs separated from the bottom plate.

Test 18 Observations:

-Nails pulled out, and in some areas ripped through sheathing on the bottom plate.

-All other nails appeared to be minimally affected.

-The bottom plate split at the location of the anchor bolts

-Mode of failure: The nails pulled through the sheathing on the bottom plate. Because of this separation, the studs separated from the bottom plate.

Table C.1: EEEP and Performance Parameters for OSB Cyclic Tests

Specimen:		Test Number	
OSB with no Hold-downs		Test 17	Test 18
EEEEP Parameters	units	initial	initial
Peak load, F_{peak}	Kips	0.800	0.602
	KN	3.560	2.678
Drift at peak load, Δ_{peak}	in.	2.090	1.547
	mm	53.07	39.30
Yield load, F_{yield}	Kips	0.630	0.510
	KN	2.802	2.268
Drift at yield load, Δ_{yield}	in.	0.490	0.275
	mm	12.45	6.99
Proportional limit, $0.4F_{peak}$	Kips	0.320	0.241
	KN	1.424	1.071
Drift at prop. limit, $\Delta@0.4F_{peak}$	in.	0.255	0.126
	mm	6.48	3.21
Failure load or $0.8F_{peak}$	Kips	0.640	0.482
	KN	2.847	2.142
Drift at failure, $\Delta_{failure}$	in.	3.396	3.169
	mm	86.25	80.49
Elastic stiffness, K_e $@0.4F_{peak}$	Kip/in.	1.286	1.855
	KN/mm	0.225	0.325
Work until failure	Kip·ft.	2.532	2.090
	KN·m	3.433	2.833
Load @ .32 in. (8.13 mm)	Kips	0.404	0.332
	KN	1.796	1.478
Load @ .48 in. (12.19 mm)	Kips	0.440	0.409
	KN	1.959	1.819
Load @ .96 in. (24.38 mm)	Kips	0.543	0.541
	KN	2.416	2.406
Load @ 1.6 in. (40.64 mm)	Kips	0.653	0.573
	KN	2.904	2.549

		Test 17		Test 18	
EEEEP Parameters	units	negative	positive	negative	positive
F_{yield}	Kips	-0.750	0.711	-0.480	0.540
	KN	-3.336	3.160	-2.135	2.402
V_{yield}	Kips/ft.	-0.188	0.178	-0.122	0.135
	KN/m	2.731	2.592	-1.781	1.966
Δ_{yield}	in.	-0.150	2.066	-0.360	0.320
	mm	-3.81	52.46	-9.14	8.13
$\Delta_{failure}$	in.	-2.463	4.329	-2.795	3.543
	mm	-62.55	109.95	-71.00	89.98

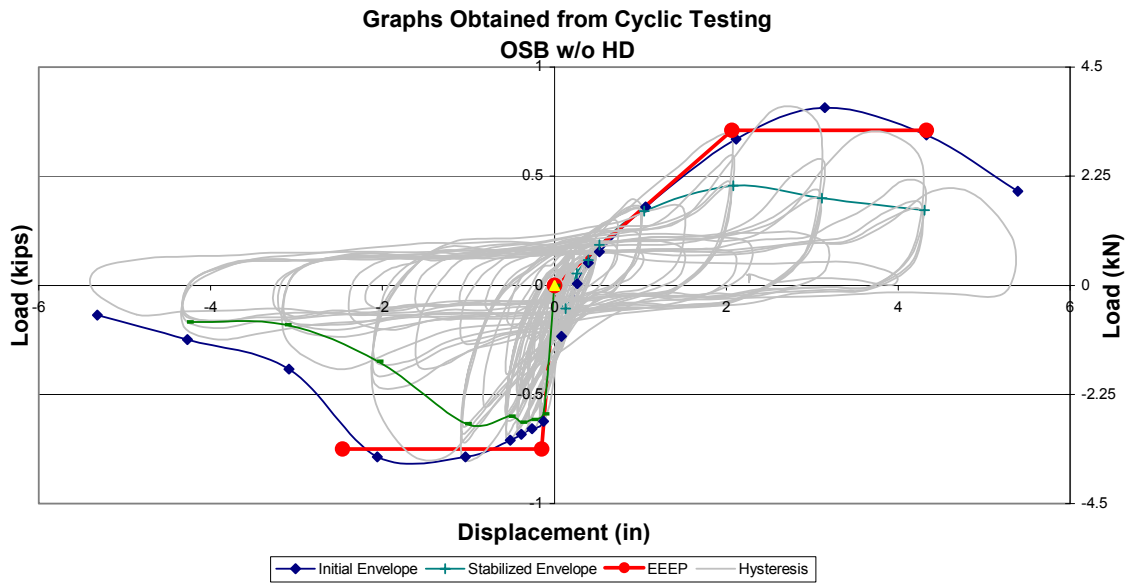


Figure C.1: Load-Displacement graph for OSB cyclic tests (Test 17)

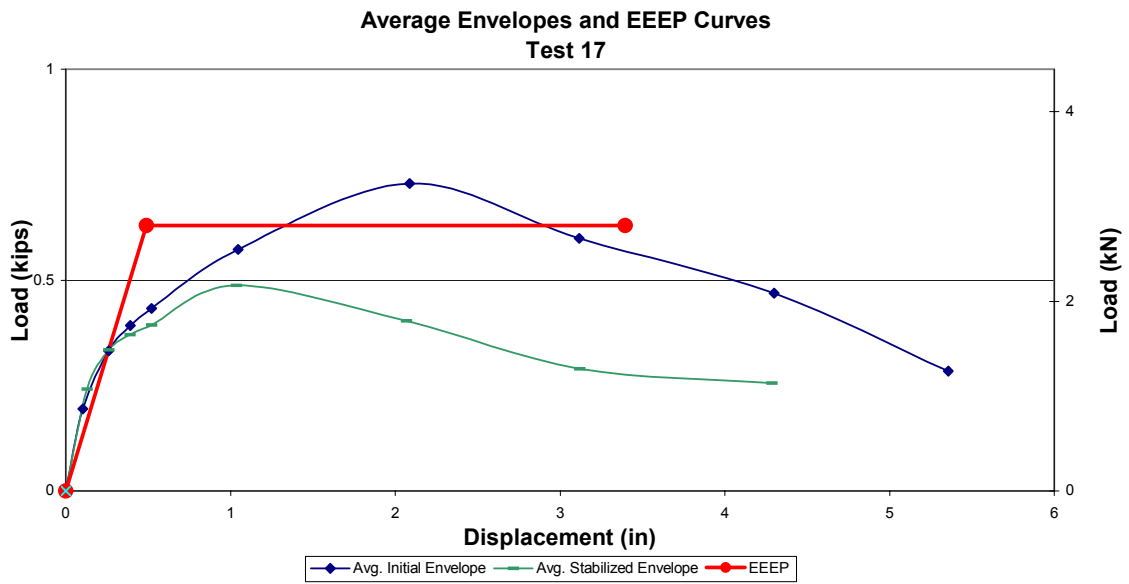


Figure C.2: Average envelope curves and EEEP curve (Test 17)

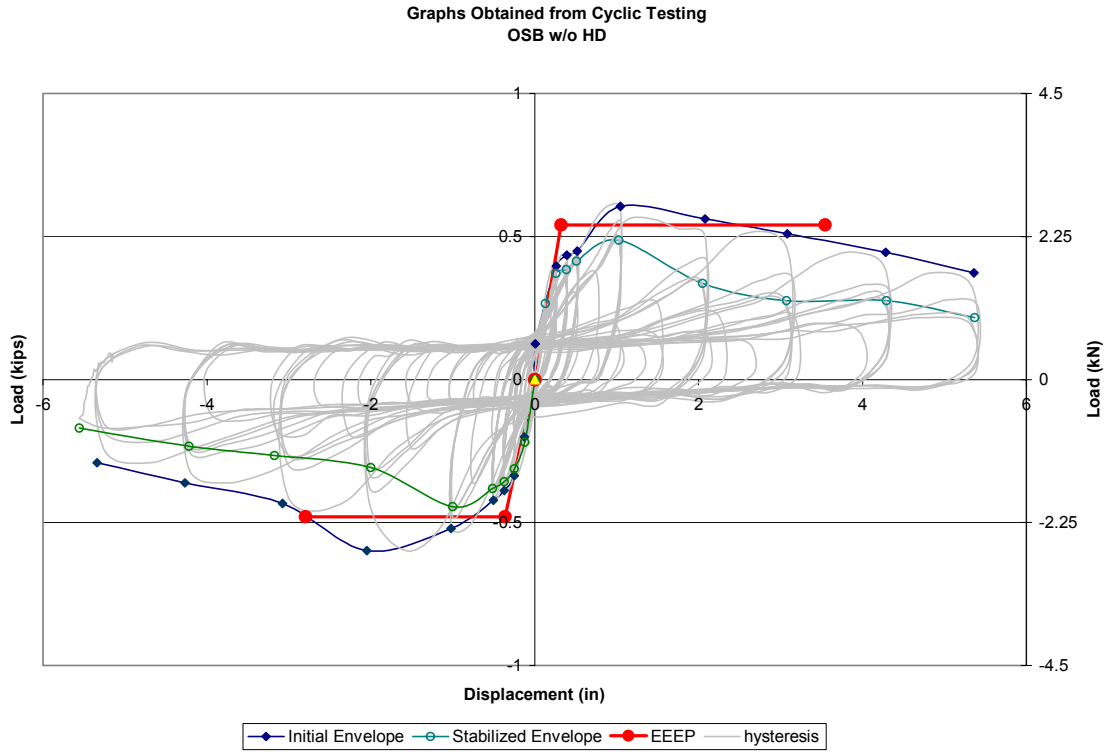


Figure C.3: Load-Displacement graph for OSB cyclic tests (Test 18)

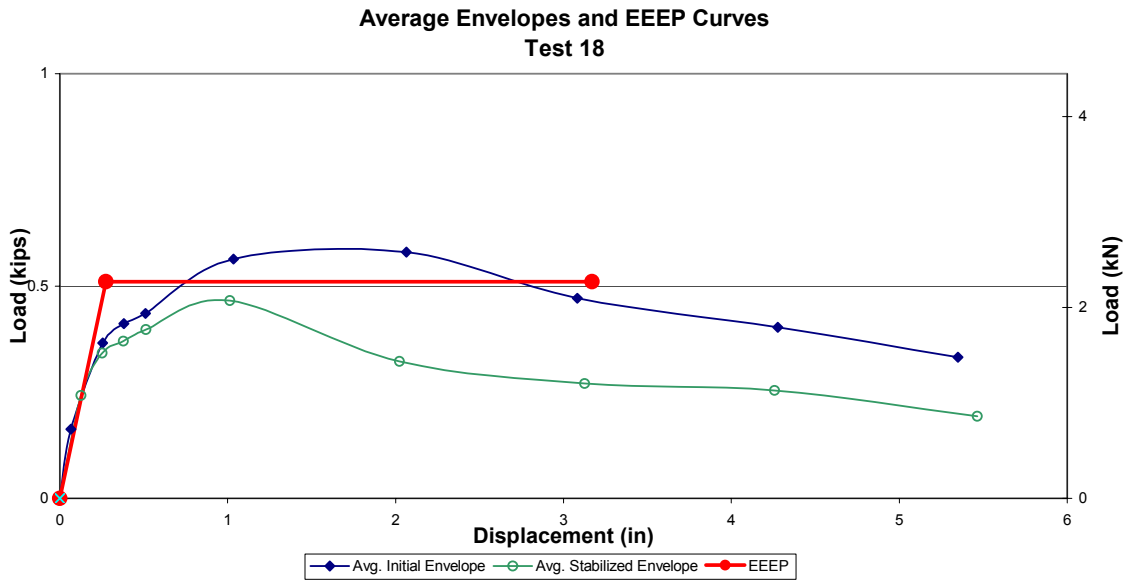


Figure C.4: Average envelope curve and EEEP curve (Test 18)

Test:	19	20
Testing Procedure:	Cyclic (ASTM E2126)	Cyclic (ASTM E2126)
Anchorage:	No Hold-down	No Hold-down
Material:	Hardboard	Hardboard
Date Constructed:	7/30/02	8/01/02
Date Tested:	8/01/02	8/02/02

Test 19 Observations:

- Nails on the bottom plate pulled out of the framing.
- There was no damage to the sheathing panel as the nails pulled out of the framing.
- No damage was apparent to the other nails.
- Mode of failure:** Sheathing nails along bottom plate pulled out of the framing allowing the wall to separate from the bottom plate.

Test 20 Observations:

- Nails on the bottom plate pulled out of the framing.
- There was no damage to the sheathing panel as the nails pulled out of the framing.
- No damage was apparent to the other nails.
- The bottom plate split at the right anchor bolt. There was a large knot at the site, which may have produced a weakness at that point.
- Mode of failure:** Sheathing nails along bottom plate pulled out of the framing allowing the wall to separate from the bottom plate.

Table C.2: EEEP and Performance Parameters for Hardboard Cyclic Tests

Specimen:		Test Number	
Hardboard with no Hold-downs		Test 19	Test 20
EEEEP Parameters	units	initial	initial
Peak load, F_{peak}	Kips	0.692	0.782
	KN	3.078	3.478
Drift at peak load, Δ_{peak}	in.	1.959	1.536
	mm	49.76	39.01
Yield load, F_{yield}	Kips	0.535	0.700
	KN	2.380	3.114
Drift at yield load, Δ_{yield}	in.	0.400	0.510
	mm	10.16	12.95
Proportional limit, $0.4F_{peak}$	Kips	0.277	0.313
	KN	1.231	1.391
Drift at prop. limit, $\Delta@0.4F_{peak}$	in.	0.210	0.230
	mm	5.33	5.84
Failure load or $0.8F_{peak}$	Kips	0.554	0.626
	KN	2.462	2.783
Drift at failure, $\Delta_{failure}$	in.	3.257	2.694
	mm	82.74	68.44
Elastic stiffness, K_e $@0.4F_{peak}$	Kip/in.	1.338	1.350
	KN/mm	19.479	0.236
Work until failure	Kip·ft.	3.299	1.900
	KN·m	4.473	2.576
Load @ .32 in. (8.13 mm)	Kips	0.352	0.367
	KN	1.567	1.633
Load @ .48 in. (12.19 mm)	Kips	0.354	0.458
	KN	1.574	2.036
Load @ .96 in. (24.38 mm)	Kips	0.443	0.693
	KN	1.971	3.081
Load @ 1.6 in. (40.64 mm)	Kips	0.554	0.775
	KN	2.462	3.447

		Test 19		Test 20	
EEEEP Parameters	units	negative	positive	negative	positive
F_{yield}	Kips	-0.502	0.543	-0.597	0.744
	KN	-2.232	2.416	-2.654	3.308
V_{yield}	Kips/ft.	-0.125	0.136	-0.149	0.186
	KN/m	-1.831	1.982	-2.177	2.713
Δ_{yield}	in.	data not available		-0.541	0.241
	mm			-13.74	6.13
$\Delta_{failure}$	in.	-2.326	4.188	-2.525	2.864
	mm	-59.08	106.39	-64.13	72.74

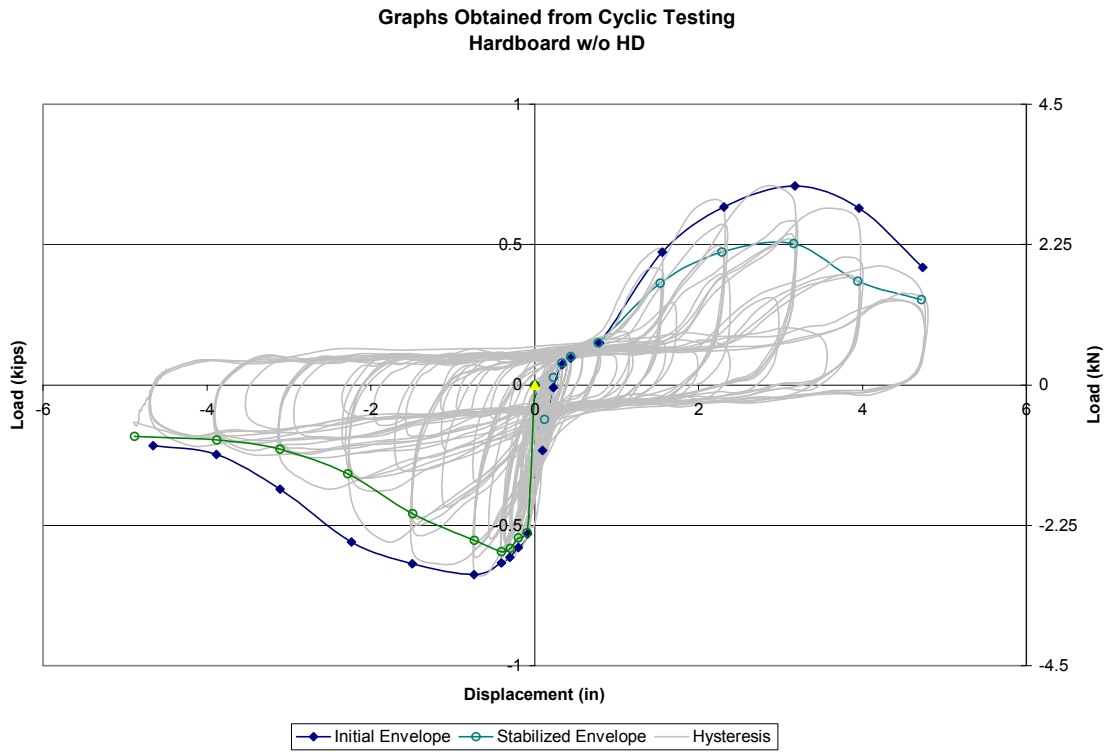


Figure C.5: Load-Displacement graph for Hardboard cyclic tests (Test 19)

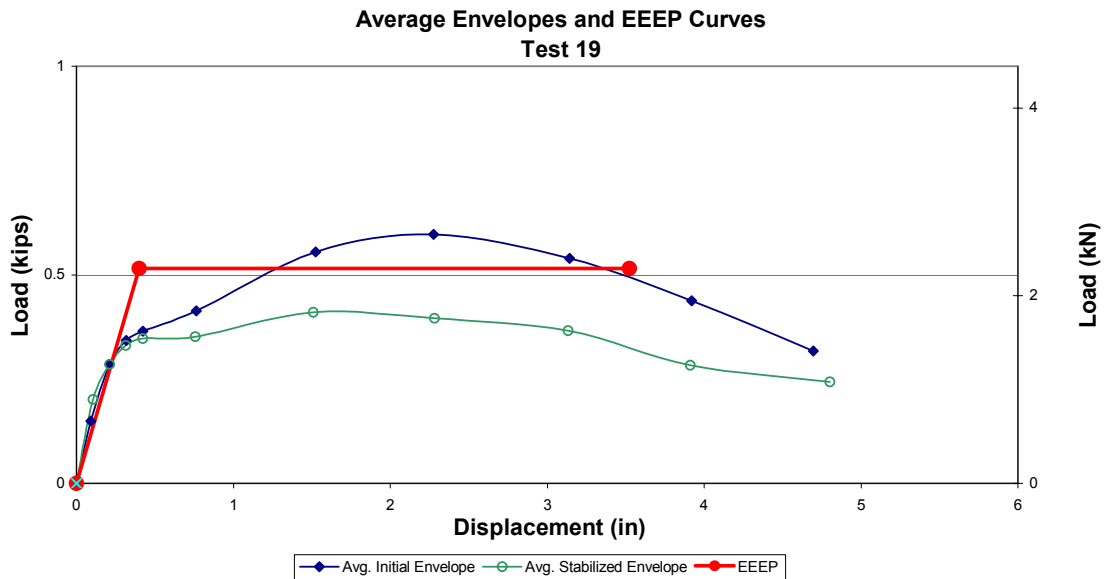


Figure C.6: Average envelope curve and EEEP curve (Test 19)

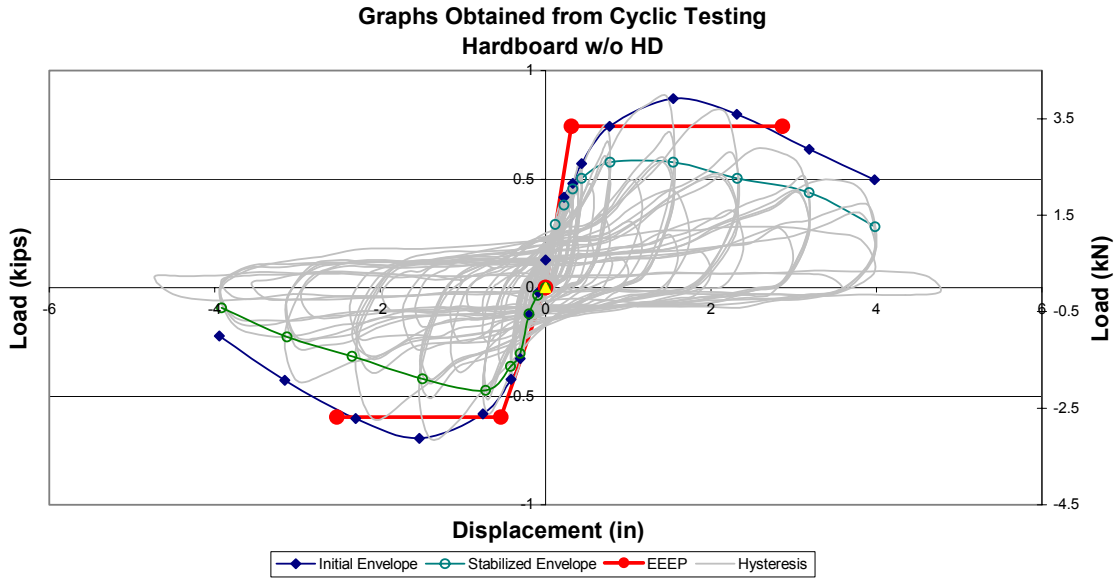


Figure C.7: Load-Displacement graph for Hardboard cyclic tests (Test 20)

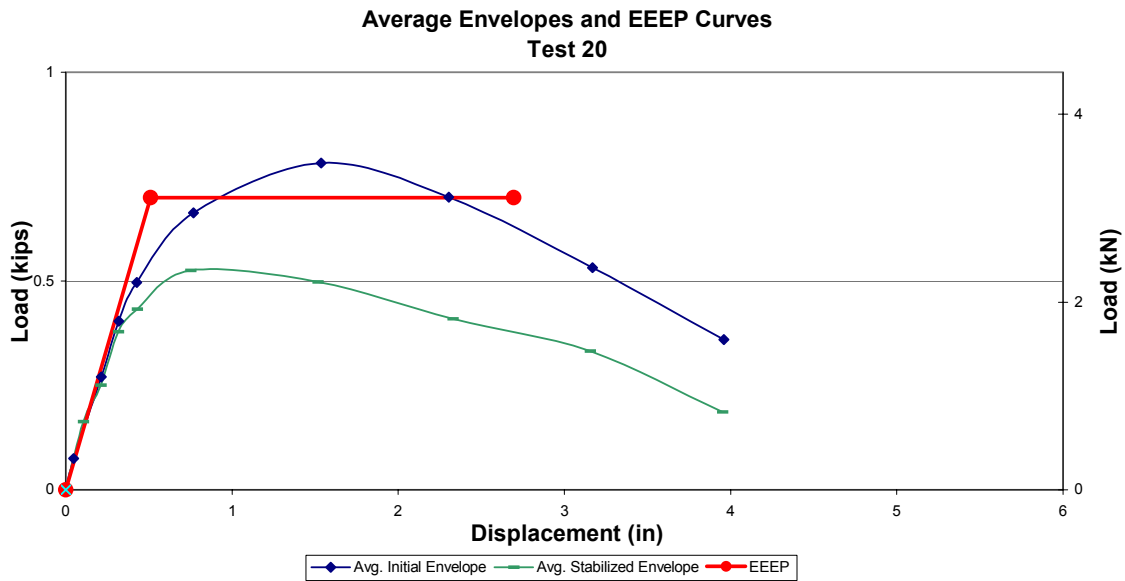


Figure C.8: Average envelope curve and EEEP curve (Test 20)

Test:	21	22
Testing Procedure:	Cyclic (ASTM E2126)	Cyclic (ASTM E2126)
Anchorage:	No Hold-down	No Hold-down
Material:	Fiberboard	Fiberboard
Date Constructed:	8/02/02	8/02/02
Date Tested:	8/03/02	8/03/02

Test 21 Observations:

- The nails on the bottom plate ripped through the edge of the sheathing and totally separated from the framing.
- After the nails unzipped, the studs completely separated from the bottom plate.
- The failure occurred early in the cyclic program. Perhaps the FME was too large for this wall
- Mode of failure:** Sheathing on bottom plate unzipped and studs separated from bottom plate.

Test 22 Observations:

- The nails on the bottom plate ripped through the edge of the sheathing and totally separated from the framing.
- After the nails unzipped, the studs completely separated from the bottom plate.
- The failure occurred early in the cyclic program. Perhaps the FME was too large for this wall
- Mode of failure:** Sheathing on bottom plate unzipped and studs separated from bottom plate.

Table C.3: EEEP and Performance Parameters for Fiberboard Cyclic Tests

Specimen:		Test Number	
Fiberboard with no Hold-downs		Test 21	Test 22
EEEEP Parameters	units	initial	initial
Peak load, F_{peak}	Kips	0.752	0.666
	KN	3.346	2.963
Drift at peak load, Δ_{peak}	in.	1.699	1.266
	mm	43.15	32.16
Yield load, F_{yield}	Kips	0.624	0.573
	KN	2.776	2.549
Drift at yield load, Δ_{yield}	in.	0.554	0.348
	mm	14.08	8.84
Proportional limit, $0.4F_{\text{peak}}$	Kips	0.301	0.266
	KN	1.338	1.185
Drift at prop. limit, $\Delta@0.4F_{\text{peak}}$	in.	0.267	0.161
	mm	6.79	4.09
Failure load or $0.8F_{\text{peak}}$	Kips	0.602	0.533
	KN	2.677	2.370
Drift at failure, Δ_{failure}	in.	2.205	2.359
	mm	56.01	59.91
Elastic stiffness, K_e $@0.4F_{\text{peak}}$	Kip/in.	1.126	1.647
	KN/mm	0.197	0.288
Work until failure	Kip·ft.	1.156	1.960
	KN·m	1.568	2.657
Load @ .32 in. (8.13 mm)	Kips	0.315	0.322
	KN	1.400	1.432
Load @ .48 in. (12.19 mm)	Kips	0.384	0.414
	KN	1.707	1.840
Load @ .96 in. (24.38 mm)	Kips	0.575	0.592
	KN	2.559	2.633
Load @ 1.6 in. (40.64 mm)	Kips	0.728	0.653
	KN	3.236	2.907

EEEEP Parameters	units	Test 21		Test 22	
		negative	positive	negative	positive
F_{yield}	Kips	-0.638	0.610	-0.560	0.623
	KN	-2.838	2.714	-2.491	2.771
V_{yield}	Kips/ft.	-0.160	0.153	-0.140	0.156
	KN/m	-2.328	2.226	2.039	2.273
Δ_{yield}	in.	-0.249	1.014	-0.227	0.673
	mm	-6.34	25.76	-5.77	17.09
Δ_{failure}	in.	-2.248	2.162	-2.044	2.673
	mm	-57.11	54.91	-51.92	67.90

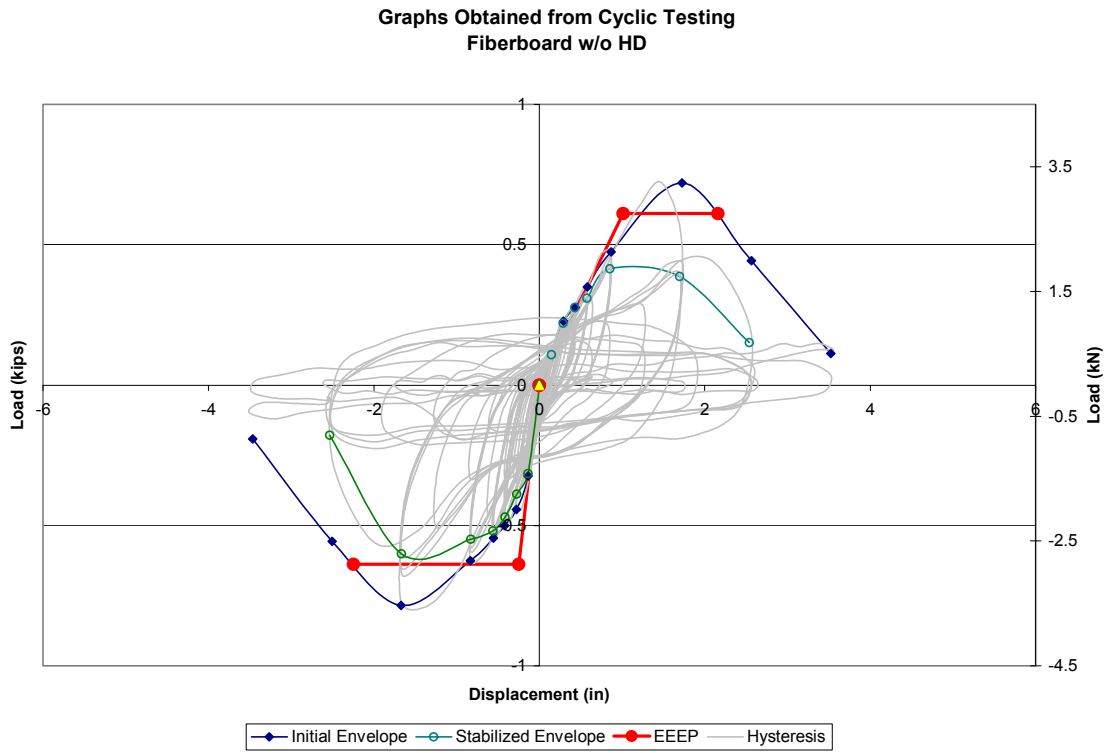


Figure C.9: Load-Displacement graph for Fiberboard cyclic tests (Test 21)

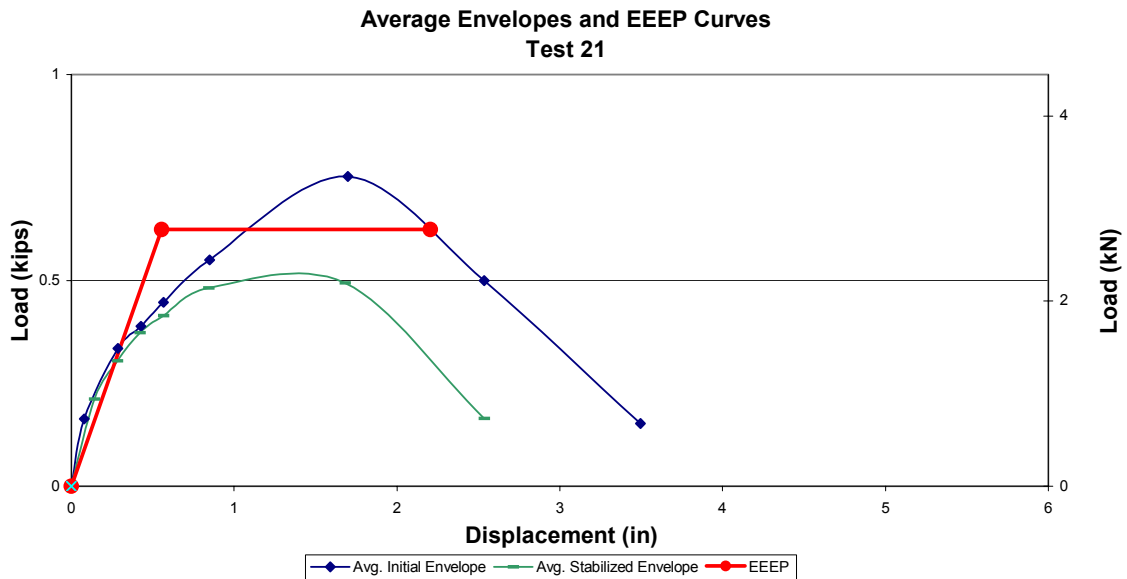


Figure C.10: Average envelope curve and EEEP curve (Test 21)

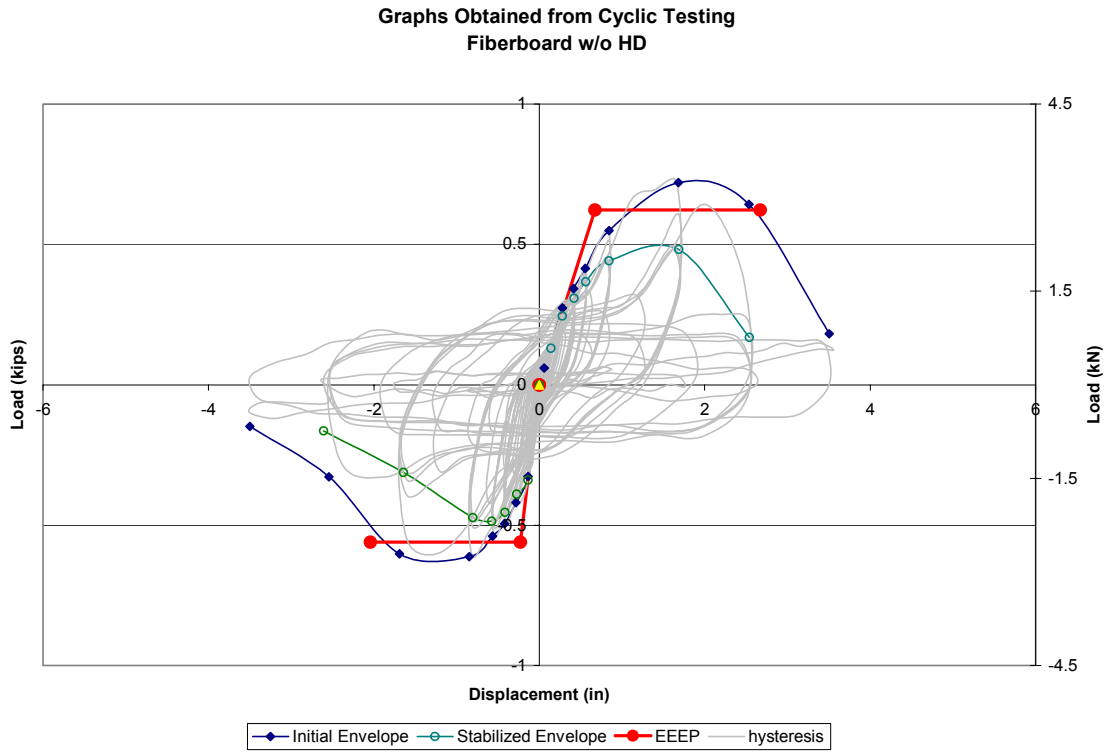


Figure C.11: Load-Displacement graph for Fiberboard cyclic tests (Test 22)

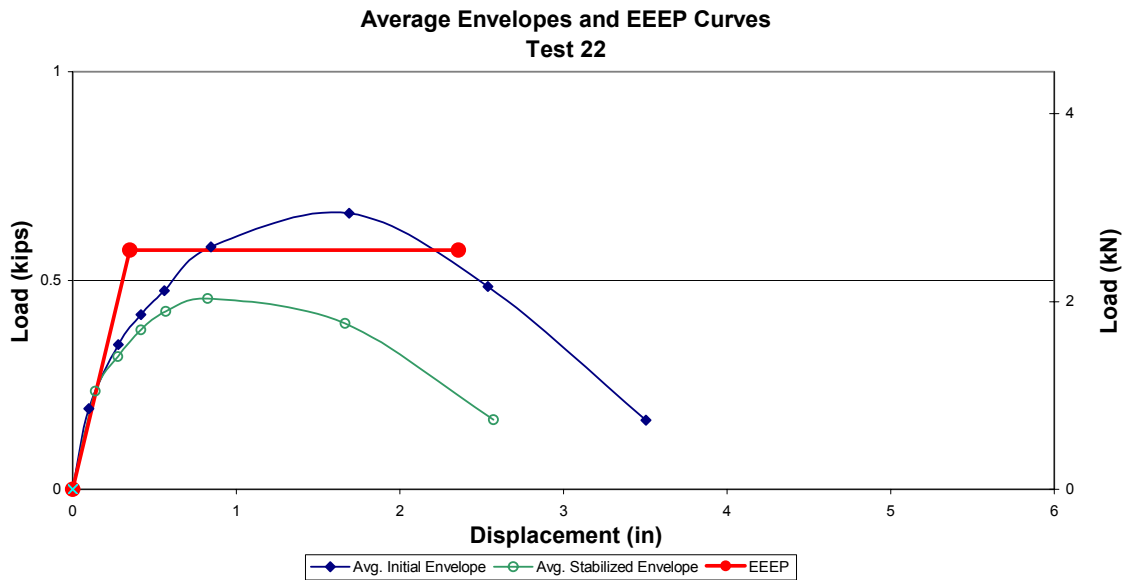


Figure C.12: Average envelope curve and EEEP curve (Test 22)

Test:	23	24
Testing Procedure:	Cyclic (ASTM E2126)	Cyclic (ASTM E2126)
Anchorage:	No Hold-down	No Hold-down
Material:	Gypsum	Gypsum
Date Constructed:	8/02/02	8/02/02
Date Tested:	8/03/02	8/03/02

Test 23 Observations:

-Nails ripped through the edge of the sheathing along the bottom plate.

-After the bottom plate nails unzipped, the studs separated from the bottom plate causing the wall to fall off the foundation.

-Mode of Failure: Sheathing nails along the bottom plate could easily sink through the gypsum or tear through the gypsum, which disallowed the wall to resist shear.

Test 24 Observations:

-Nails ripped through the edge of the sheathing along the bottom plate.

-After the bottom plate nails unzipped, the studs separated from the bottom plate causing the wall to fall off the foundation.

-Mode of Failure: Sheathing nails along the bottom plate could easily sink through the gypsum or tear through the gypsum, which disallowed the wall to resist shear.

Table C.4: EEEP and Performance Parameters for Gypsum Cyclic Tests

Specimen:		Test Number	
Gypsum with no Hold-downs		Test 23	Test 24
EEEEP Parameters	units	initial	initial
Peak load, F_{peak}	Kips	0.423	0.449
	KN	1.880	1.999
Drift at peak load, Δ_{peak}	in.	0.706	2.138
	mm	17.93	54.31
Yield load, F_{yield}	Kips	0.380	0.386
	KN	1.690	1.717
Drift at yield load, Δ_{yield}	in.	0.295	0.320
	mm	7.49	8.13
Proportional limit, $0.4F_{\text{peak}}$	Kips	0.169	0.180
	KN	0.752	0.800
Drift at prop. limit, $\Delta@0.4F_{\text{peak}}$	in.	0.131	0.149
	mm	3.33	3.78
Failure load or $0.8F_{\text{peak}}$	Kips	0.338	0.380
	KN	1.504	1.691
Drift at failure, Δ_{failure}	in.	1.680	2.549
	mm	42.67	64.73
Elastic stiffness, K_e $@0.4F_{\text{peak}}$	Kip/in.	1.288	1.206
	KN/mm	0.226	0.211
Work until failure	Kip·ft.	0.885	1.361
	KN·m	1.200	1.846
Load @ .32 in. (8.13 mm)	Kips	0.242	0.207
	KN	1.075	0.921
Load @ .48 in. (12.19 mm)	Kips	0.319	0.261
	KN	1.421	1.161
Load @ .96 in. (24.38 mm)	Kips	0.410	0.365
	KN	1.822	1.622
Load @ 1.6 in. (40.64 mm)	Kips	0.344	0.425
	KN	1.530	1.891

EEEEP Parameters	units	Test 23		Test 24	
		negative	positive	negative	positive
F_{yield}	Kips	-0.350	0.419	-0.312	0.450
	KN	-1.557	1.864	-1.387	2.002
V_{yield}	Kips/ft.	-0.074	0.093	-0.078	0.113
	KN/m	-1.083	1.363	-1.137	1.638
Δ_{yield}	in.	-0.256	0.296	-0.160	0.320
	mm	-6.50	7.52	-4.05	8.13
Δ_{failure}	in.	-1.400	1.896	-2.097	3.000
	mm	-35.56	48.15	-53.26	76.20

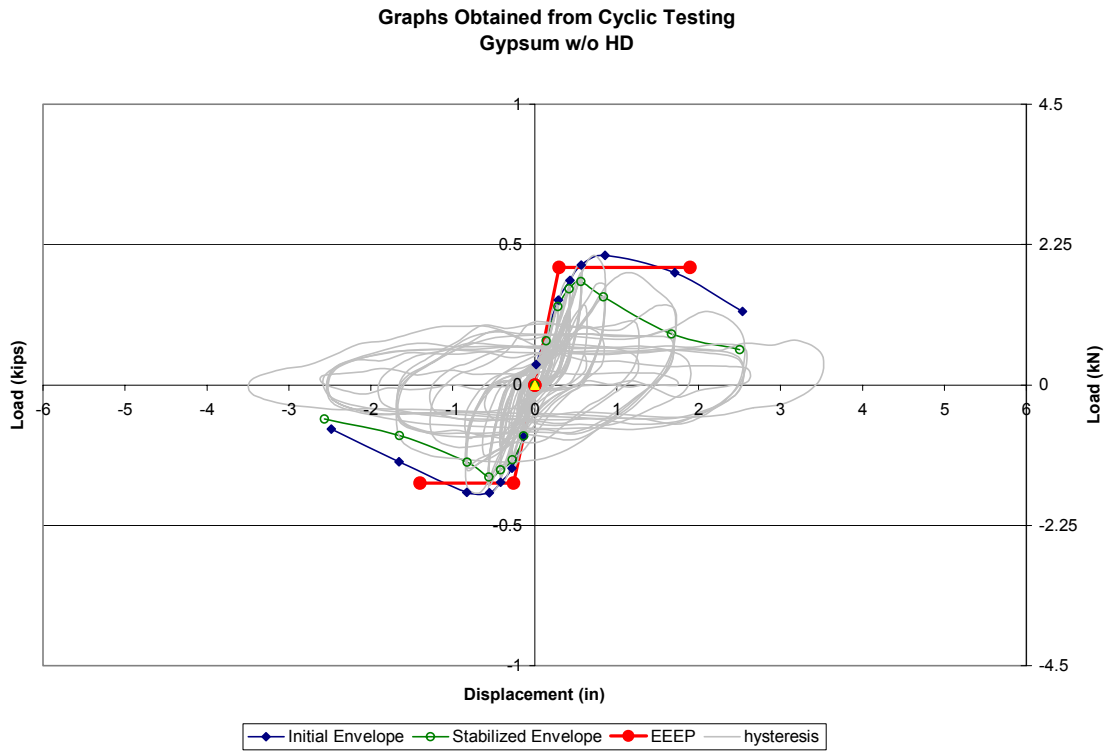


Figure C.13: Load-Displacement graph for Gypsum cyclic tests (Test 23)

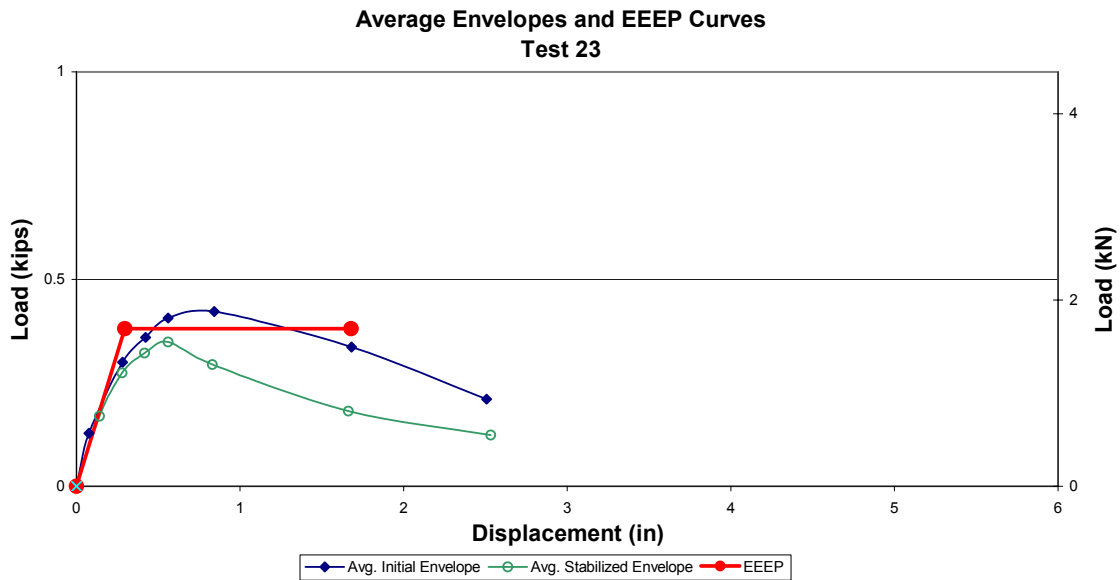


Figure C.14: Average envelope curve and EEEP curve (Test 23)

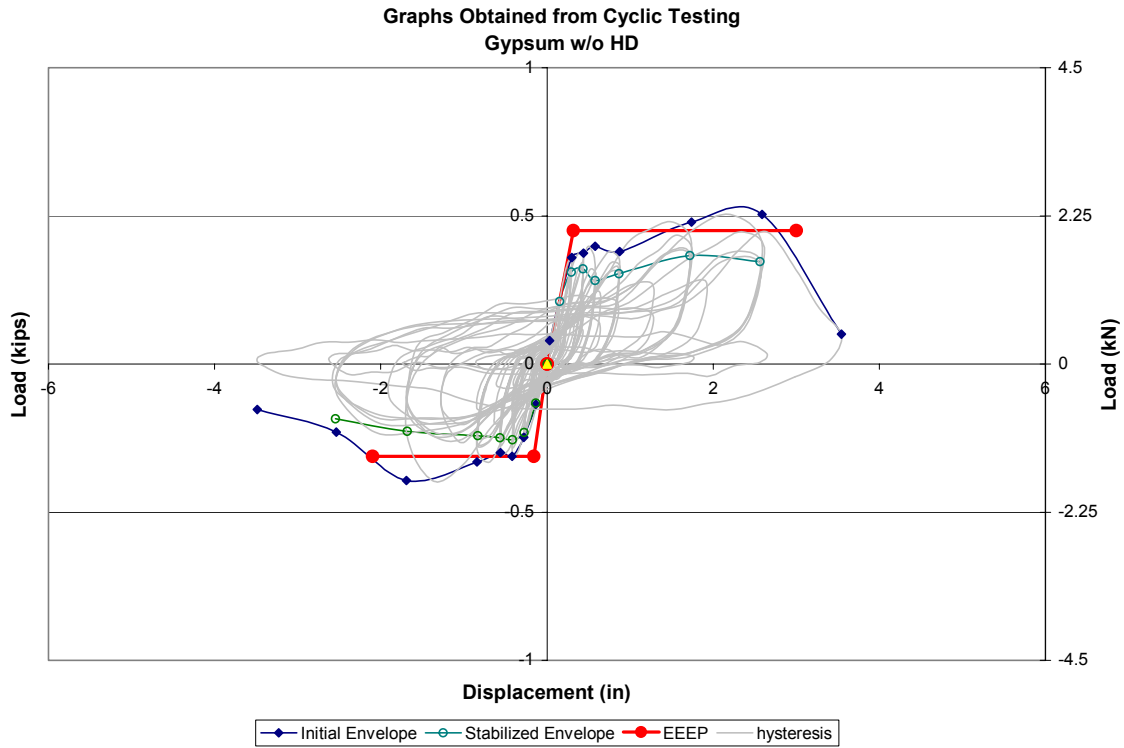


Figure C.15: Load-Displacement graph for Gypsum cyclic tests (Test 24)

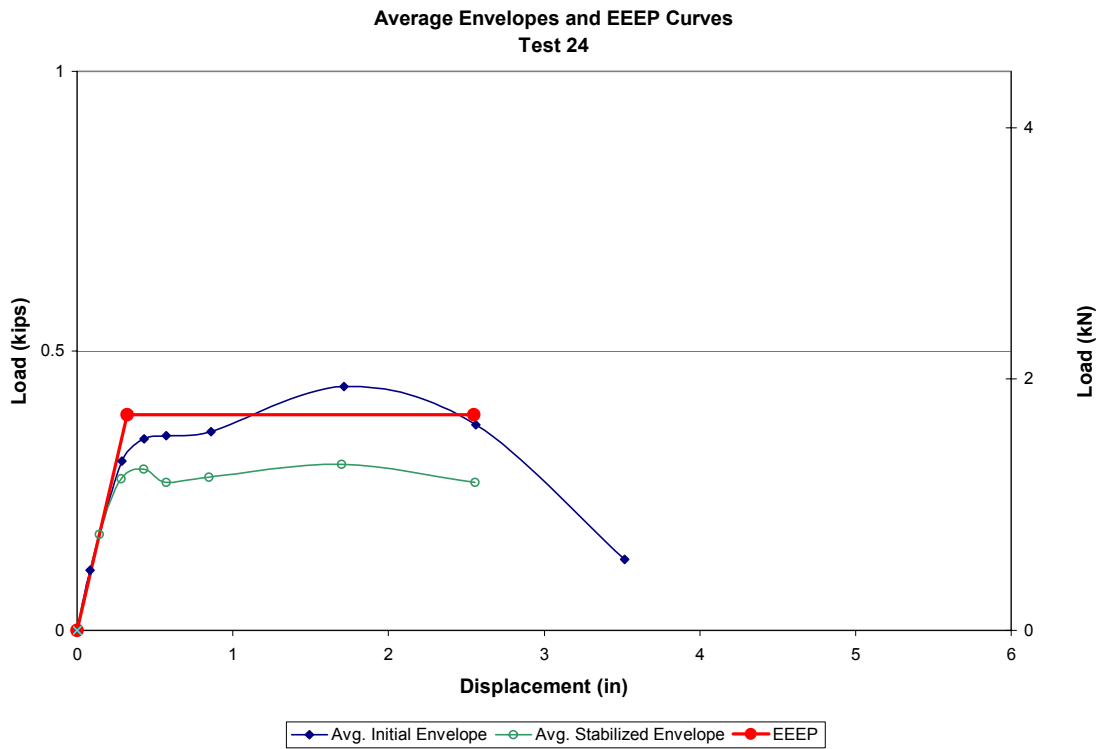


Figure C.16: Average envelope curve and EEEP curve (Test 24)

Test:	37	38
Testing Procedure:	Cyclic (ASTM E2126)	Cyclic (ASTM E2126)
Anchorage:	No Hold-down	No Hold-down
Material:	OSB/GWB	OSB/GWB
Date Constructed:	8/03/02	8/03/02
Date Tested:	8/05/02	8/05/02

Test 37 Observations:

-OSB nails ripped through the sheathing on the bottom plate.

-Gypsum nails bored through sheathing on bottom plate, all other nails did not seem to be effected.

-The right end of the bottom plate split at the anchor bolt. The left end separated from the end stud.

-Mode of failure: OSB sheathing nails along bottom plate either pulled out or tore through the sheathing, allowing the wall to separate from the bottom plate. Gypsum nails performed as in Tests 23 and 24.

Test 38 Observations:

-OSB nails ripped through the sheathing on the bottom plate.

-Gypsum nails bored through sheathing on bottom plate, all other nails did not seem to be effected.

-Both ends of the bottom plate broke at the anchor bolt locations.

-Mode of failure: OSB sheathing nails along bottom plate either pulled out or tore through the sheathing, allowing the wall to separate from the bottom plate. Gypsum nails performed as in Tests 23 and 24.

Table C.5: EEEP and Performance Parameters for OSB/GWB Cyclic Tests

Specimen:		Test Number	
OSB & GWB with no Hold-downs		Test 37	Test 38
EEEEP Parameters	units	initial	initial
Peak load, F_{peak}	Kips	0.805	0.725
	KN	3.580	3.224
Drift at peak load, Δ_{peak}	in.	1.835	1.859
	mm	46.60	47.21
Yield load, F_{yield}	Kips	0.667	0.622
	KN	2.968	2.769
Drift at yield load, Δ_{yield}	in.	0.303	0.360
	mm	7.69	9.14
Proportional limit, $0.4F_{peak}$	Kips	0.322	0.290
	KN	1.432	1.290
Drift at prop. limit, $\Delta@0.4F_{peak}$	in.	0.148	0.167
	mm	3.77	4.24
Failure load or $0.8F_{peak}$	Kips	0.644	0.580
	KN	2.864	2.579
Drift at failure, $\Delta_{failure}$	in.	2.489	2.813
	mm	63.22	71.45
Elastic stiffness, K_e $@0.4F_{peak}$	Kip/in.	2.612	1.729
	KN/mm	0.457	0.303
Work until failure	Kip·ft.	1.363	1.188
	KN·m	1.848	1.610
Load @ .32 in. (8.13 mm)	Kips	0.407	0.299
	KN	1.810	1.332
Load @ .48 in. (12.19 mm)	Kips	0.502	0.401
	KN	2.235	1.784
Load @ .96 in. (24.38 mm)	Kips	0.672	0.633
	KN	2.990	2.816
Load @ 1.6 in. (40.64 mm)	Kips	0.769	0.699
	KN	3.422	3.110

EEEEP Parameters	units	Test 37		Test 38	
		negative	positive	negative	positive
F_{yield}	Kips	-0.608	0.726	-0.482	0.763
	KN	-2.706	3.229	-2.145	3.392
V_{yield}	Kips/ft.	-0.152	0.181	-0.121	0.191
	KN/m	-2.220	2.649	-1.759	2.782
Δ_{yield}	in.	-0.171	0.435	-0.881	0.064
	mm	-4.35	11.04	-22.38	1.64
$\Delta_{failure}$	in.	-2.403	2.575	-3.182	2.444
	mm	-61.04	65.40	-80.82	62.07

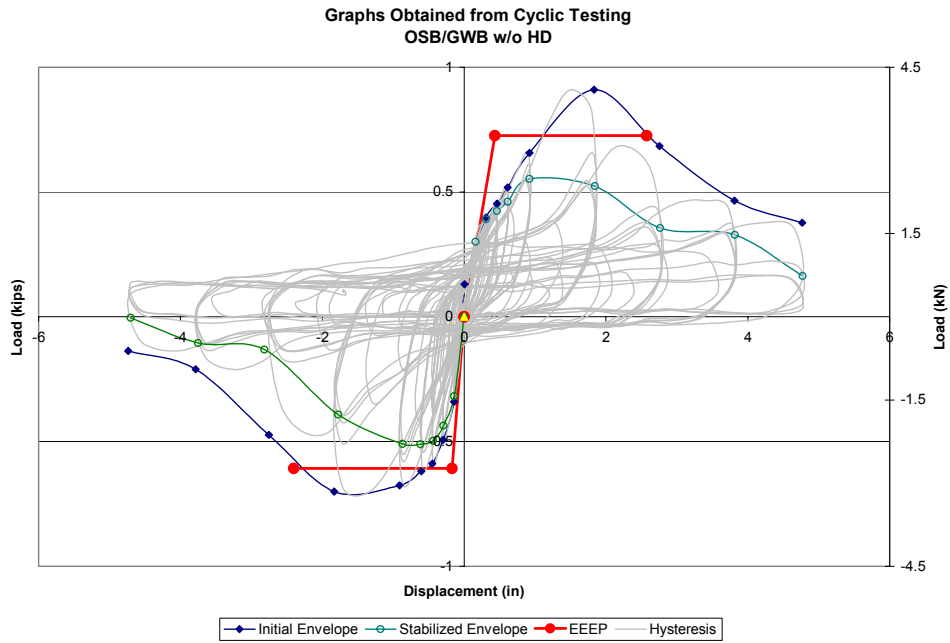


Figure C.17: Load-Displacement graph for OSB/GWB cyclic tests (Test 37)

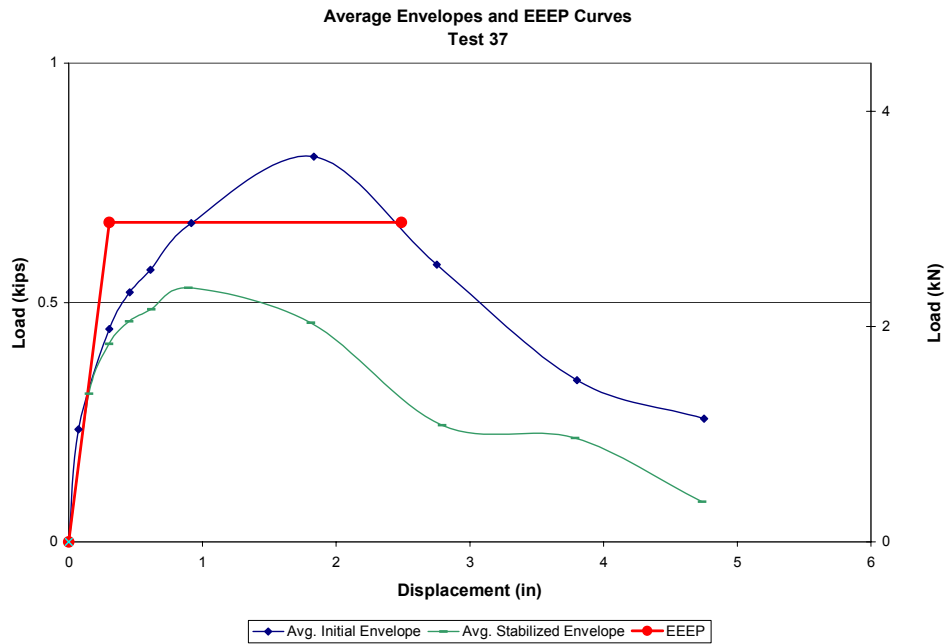


Figure C.18: Average envelope curve and EEEP curve (Test 37)

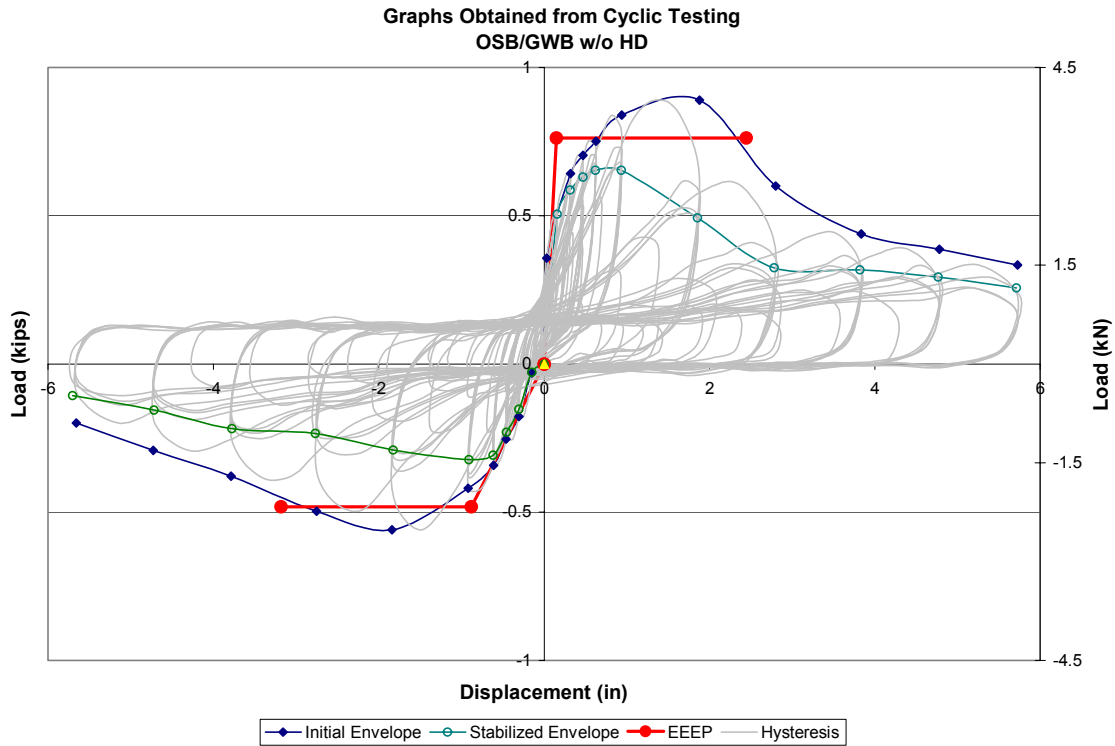


Figure C.19: Load-Displacement graph for OSB/GWB cyclic tests (Test 38)

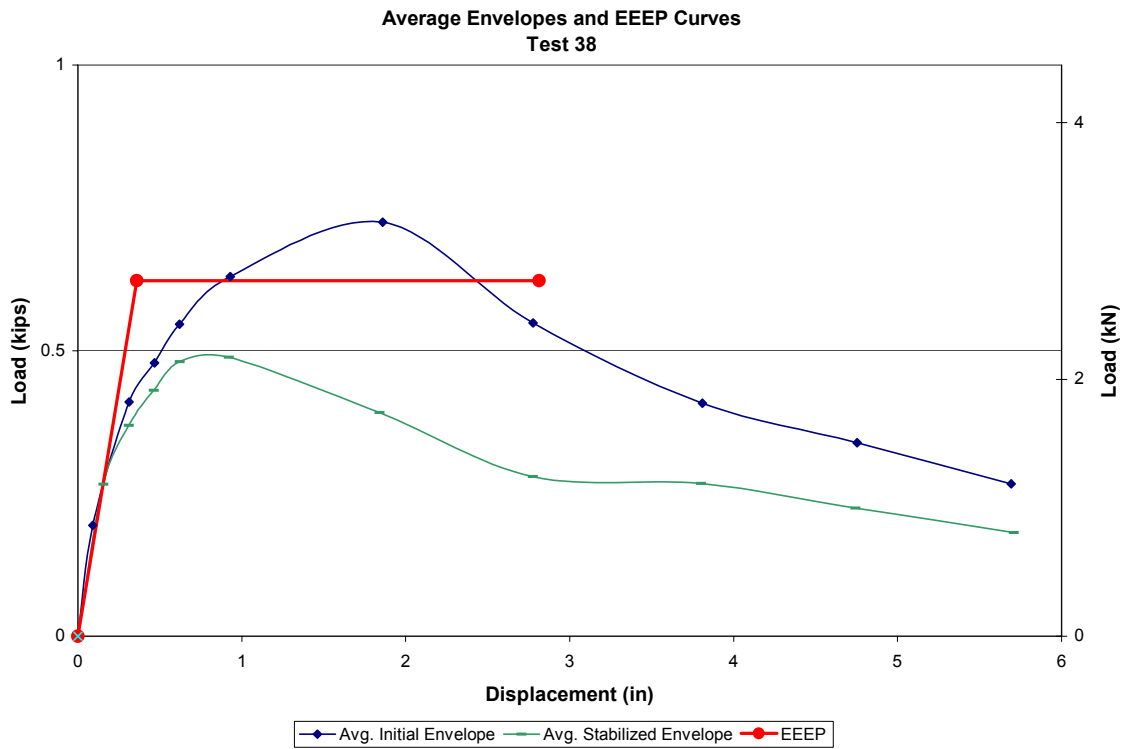


Figure C.20: Average envelope curve and EEEP curve (Test 38)

Test:	39	40
Testing Procedure:	Cyclic (ASTM E2126)	Cyclic (ASTM E2126)
Anchorage:	No Hold-down	No Hold-down
Material:	Hardboard/GWB	Hardboard/GWB
Date Constructed:	8/05/02	8/05/02
Date Tested:	8/06/02	8/06/02

Test 39 Observations:

-Hardboard nails pulled out of the framing and bent in typical S-shape along the bottom plate. There was no damage to the sheathing as usual.

-Entire row of gypsum nails ripped through sheathing suddenly at first large displacement.

-The bottom plate split at the left anchor bolt location. The split was parallel to the grain, but did not break before end stud separated from the bottom plate.

-Mode of failure: Hardboard sheathing nails along bottom plate pulled out of the framing allowing the wall to separate from the bottom plate. The gypsum nails behaved similar to Tests 23 and 24.

Test 40 Observations:

-Hardboard nails pulled out of the framing and bent in typical S-shape along the bottom plate. There was no damage to the sheathing as usual.

-Entire row of gypsum nails ripped through sheathing suddenly at first large displacement.

-The end stud separated from the bottom plate on the right side of the wall. The bottom plate split parallel to grain on the left side.

-Mode of failure: Hardboard sheathing nails along bottom plate pulled out of the framing allowing the wall to separate from the bottom plate. The gypsum nails behaved similar to Tests 23 and 24.

Table C.6: EEEP and Performance Parameters for Hardboard/GWB Cyclic Tests

Specimen:		Test Number	
Hardboard & GWB with no HD		Test 39	Test 40
EEEEP Parameters	units	initial	initial
Peak load, F_{peak}	Kips	0.820	0.835
	KN	3.648	3.713
Drift at peak load, Δ_{peak}	in.	1.273	1.720
	mm	32.33	43.69
Yield load, F_{yield}	Kips	0.724	0.739
	KN	3.219	3.286
Drift at yield load, Δ_{yield}	in.	0.281	0.311
	mm	7.14	7.90
Proportional limit, $0.4F_{\text{peak}}$	Kips	0.328	0.334
	KN	1.459	1.485
Drift at prop. limit, $\Delta@0.4F_{\text{peak}}$	in.	0.154	0.141
	mm	3.91	3.57
Failure load or $0.8F_{\text{peak}}$	Kips	0.656	0.668
	KN	2.918	2.970
Drift at failure, Δ_{failure}	in.	2.418	2.732
	mm	61.42	69.39
Elastic stiffness, K_e $@0.4F_{\text{peak}}$	Kip/in.	2.577	2.377
	KN/mm	0.451	0.416
Work until failure	Kip·ft.	1.115	2.135
	KN·m	1.511	2.895
Load @ .32 in. (8.13 mm)	Kips	0.444	0.432
	KN	1.973	1.920
Load @ .48 in. (12.19 mm)	Kips	0.594	0.559
	KN	2.643	2.488
Load @ .96 in. (24.38 mm)	Kips	0.752	0.732
	KN	3.345	3.254
Load @ 1.6 in. (40.64 mm)	Kips	0.804	0.818
	KN	3.576	3.640

EEEEP Parameters	units	Test 39		Test 40	
		negative	positive	negative	positive
F_{yield}	Kips	-0.676	0.772	-0.750	0.727
	KN	-3.005	3.433	-3.338	3.235
V_{yield}	Kips/ft.	-0.169	0.193	-0.188	0.182
	KN/m	-2.465	2.816	-2.737	2.653
Δ_{yield}	in.	-0.123	0.547	-0.179	0.581
	mm	-3.12	13.90	-4.54	14.75
Δ_{failure}	in.	-2.358	2.479	-2.327	3.137
	mm	-59.88	62.97	-59.11	79.68

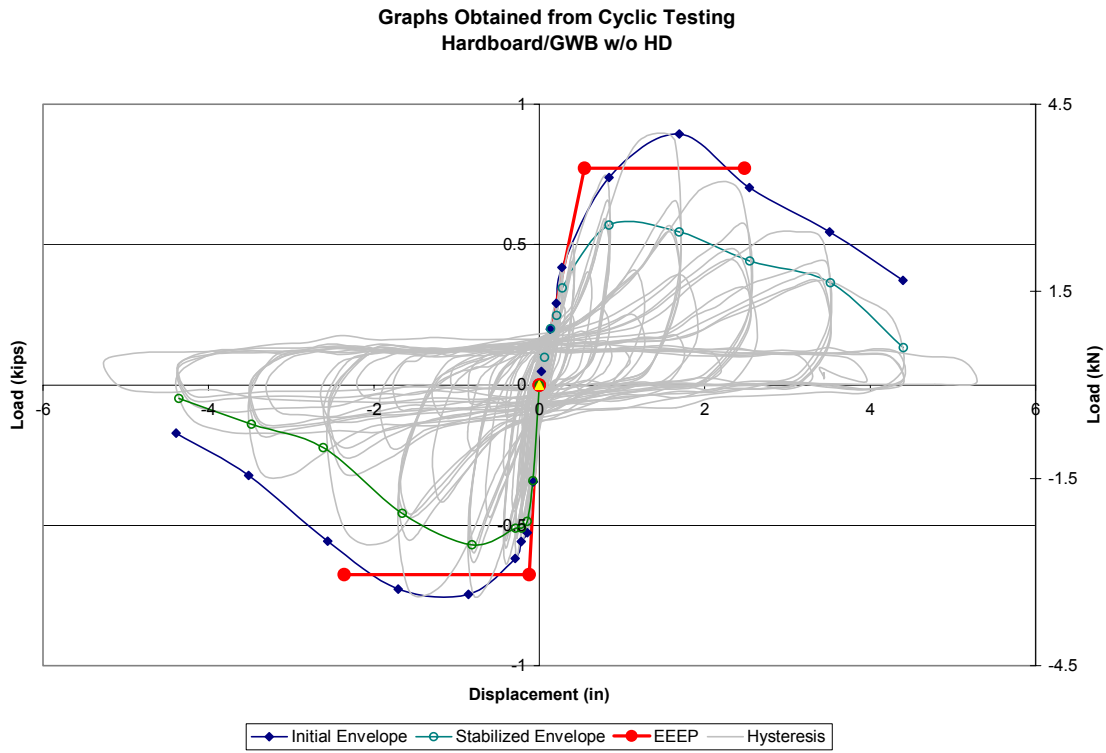


Figure C.21: Load-Displacement graph for Hardboard/GWB cyclic tests (Test 39)

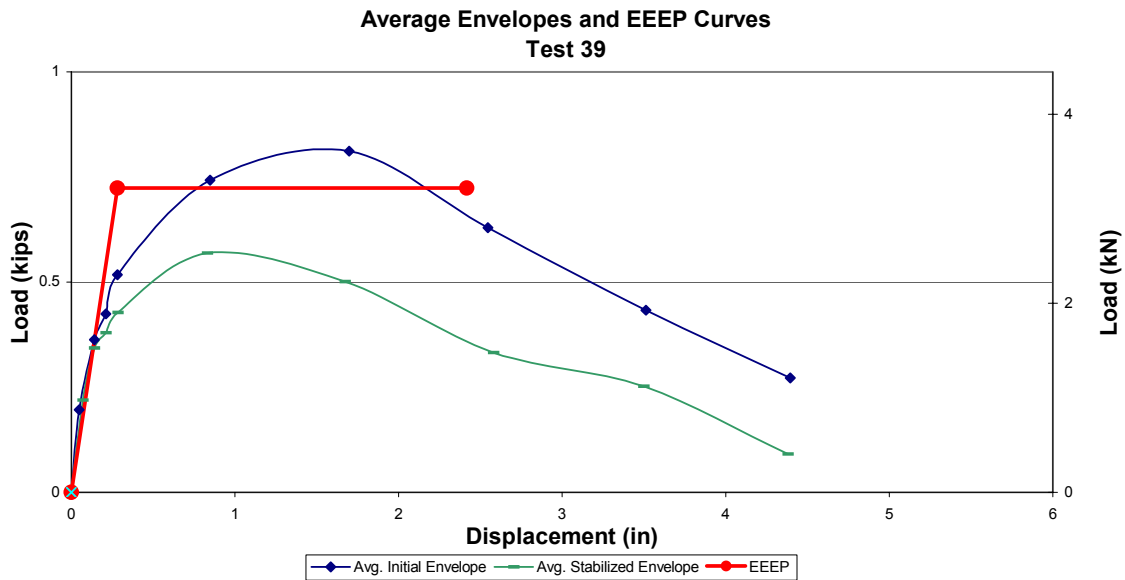


Figure C.22: Average envelope curve and EEEP curve (Test 39)

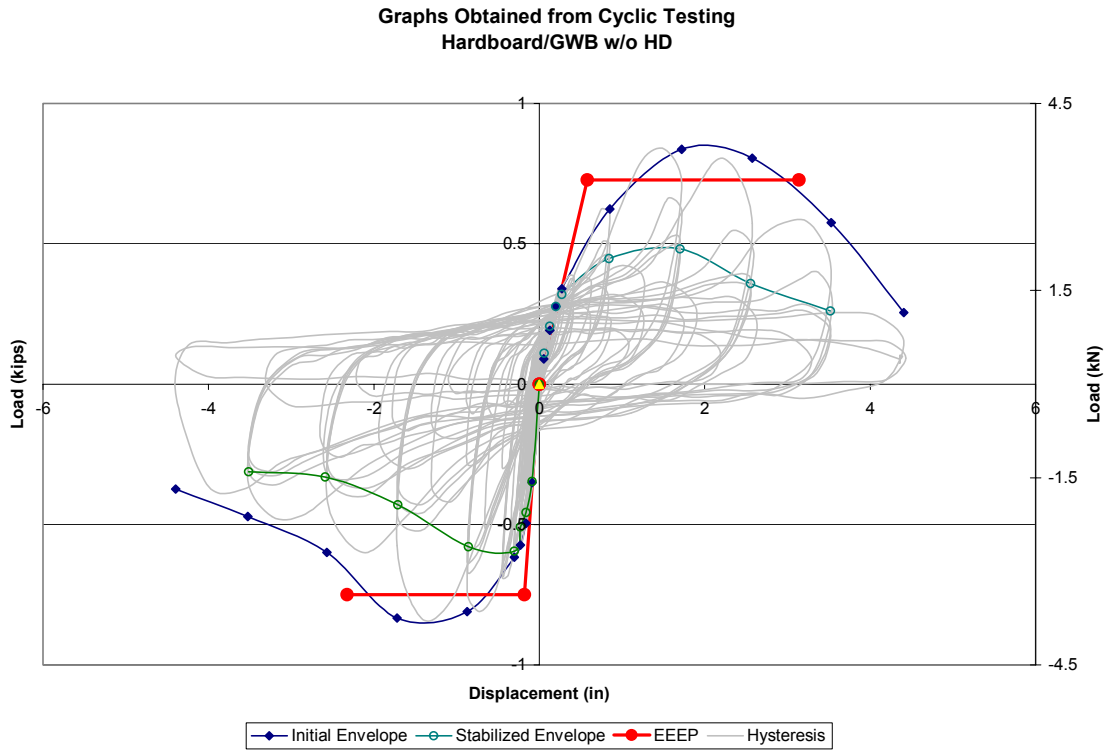


Figure C.23: Load-Displacement graph for Hardboard/GWB cyclic tests (Test 40)

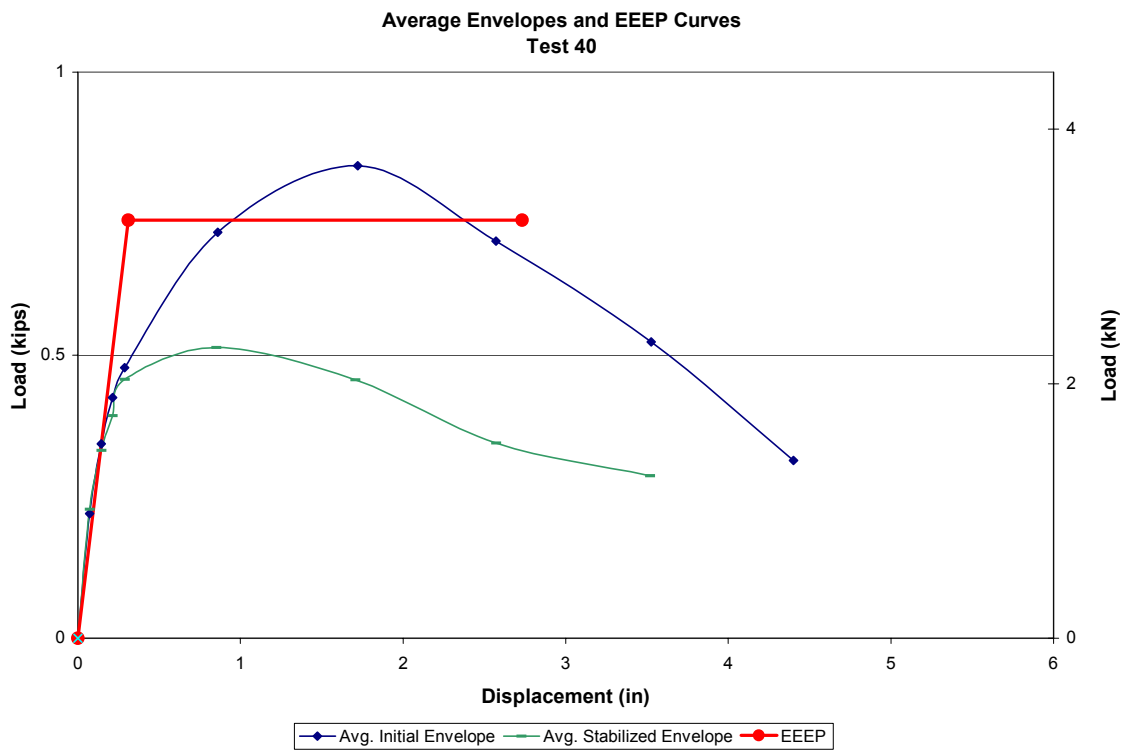


Figure C.24: Average envelope curve and EEEP curve (Test 40)

Test:	41	42
Testing Procedure:	Cyclic (ASTM E2126)	Cyclic (ASTM E2126)
Anchorage:	No Hold-down	No Hold-down
Material:	Fiberboard/GWB	Fiberboard/GWB
Date Constructed:	8/03/02	8/03/02
Date Tested:	8/07/02	8/07/02

Test 41 Observations:

-The nails on both sides ripped through edge of sheathing along the bottom plate, as was typically observed with fiberboard and gypsum.

-End studs pulled out of bottom plate after nails had ripped through sheathing.

-Mode of failure: Nails on bottom plate unzipped and studs separated from the bottom plate. Gypsum sheathing nails behaved in similar manner to Tests 23 and 24.

Test 42 Observations:

-The nails on both sides ripped through edge of sheathing along the bottom plate, as was typically observed with fiberboard and gypsum.

-End studs pulled out of bottom plate after nails had ripped through sheathing.

-Mode of failure: Nails on bottom plate unzipped and studs separated from the bottom plate. Gypsum sheathing nails behaved in similar manner to Tests 23 and 24.

Table C.7: EEEP and Performance Parameters for Fiberboard/GWB Cyclic Tests

Specimen:		Test Number	
Fiberboard & GWB with no HD		Test 41	Test 42
EEEEP Parameters	units	initial	initial
Peak load, F_{peak}	Kips	0.674	0.694
	KN	2.997	3.085
Drift at peak load, Δ_{peak}	in.	1.297	1.291
	mm	32.94	32.79
Yield load, F_{yield}	Kips	0.617	0.592
	KN	2.744	2.634
Drift at yield load, Δ_{yield}	in.	0.333	0.228
	mm	8.46	5.78
Proportional limit, $0.4F_{peak}$	Kips	0.269	0.277
	KN	1.199	1.234
Drift at prop. limit, $\Delta@0.4F_{peak}$	in.	0.145	0.109
	mm	3.69	2.77
Failure load or $0.8F_{peak}$	Kips	0.539	0.555
	KN	2.397	2.468
Drift at failure, $\Delta_{failure}$	in.	2.252	2.030
	mm	57.20	51.55
Elastic stiffness, K_e $@0.4F_{peak}$	Kip/in.	1.853	2.596
	KN/mm	0.325	0.455
Work until failure	Kip·ft.	1.555	1.433
	KN·m	2.109	1.942
Load @ .32 in. (8.13 mm)	Kips	0.404	0.404
	KN	1.797	1.798
Load @ .48 in. (12.19 mm)	Kips	0.492	0.479
	KN	2.188	2.129
Load @ .96 in. (24.38 mm)	Kips	0.641	0.649
	KN	2.853	2.886
Load @ 1.6 in. (40.64 mm)	Kips	0.639	0.650
	KN	2.844	2.892

EEEEP Parameters	units	Test 41		Test 42	
		negative	positive	negative	positive
F_{yield}	Kips	-0.532	0.647	-0.507	0.677
	KN	-2.365	2.878	-2.256	3.012
V_{yield}	Kips/ft.	-0.133	0.162	-0.127	0.169
	KN/m	-1.940	2.361	-1.850	2.470
Δ_{yield}	in.	-0.343	0.114	-0.317	0.138
	mm	-8.70	2.89	-8.06	3.51
$\Delta_{failure}$	in.	-2.475	2.029	-1.937	2.122
	mm	-62.86	51.55	-49.21	53.89

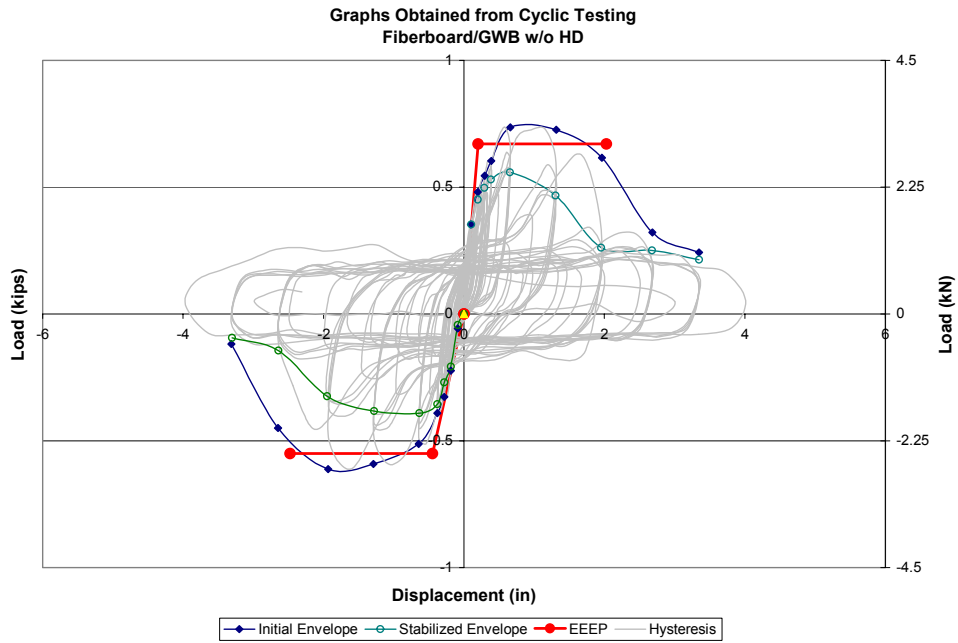


Figure C.25: Load-Displacement graph for Fiberboard/GWB cyclic tests (Test 41)

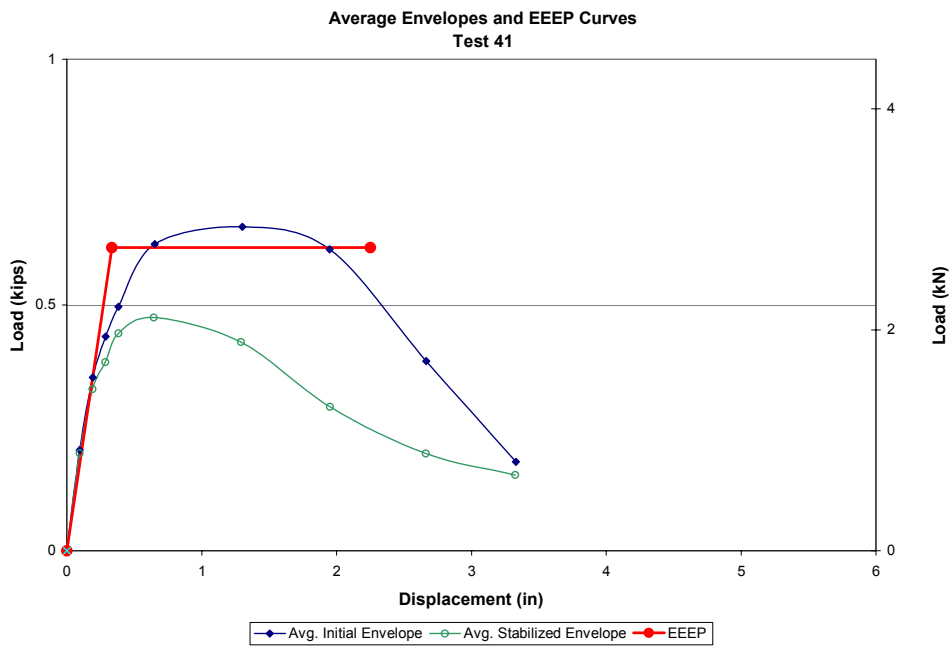


Figure C.26: Average envelope curve and EEEP curve (Test 41)

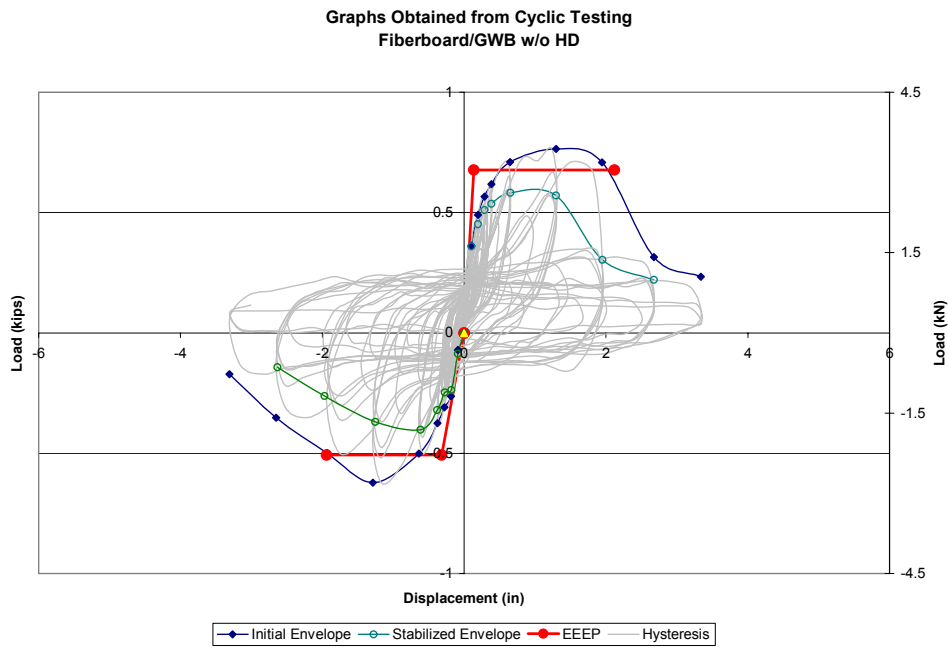


Figure C.27: Load-Displacement graph for Fiberboard/GWB cyclic tests (Test 42)

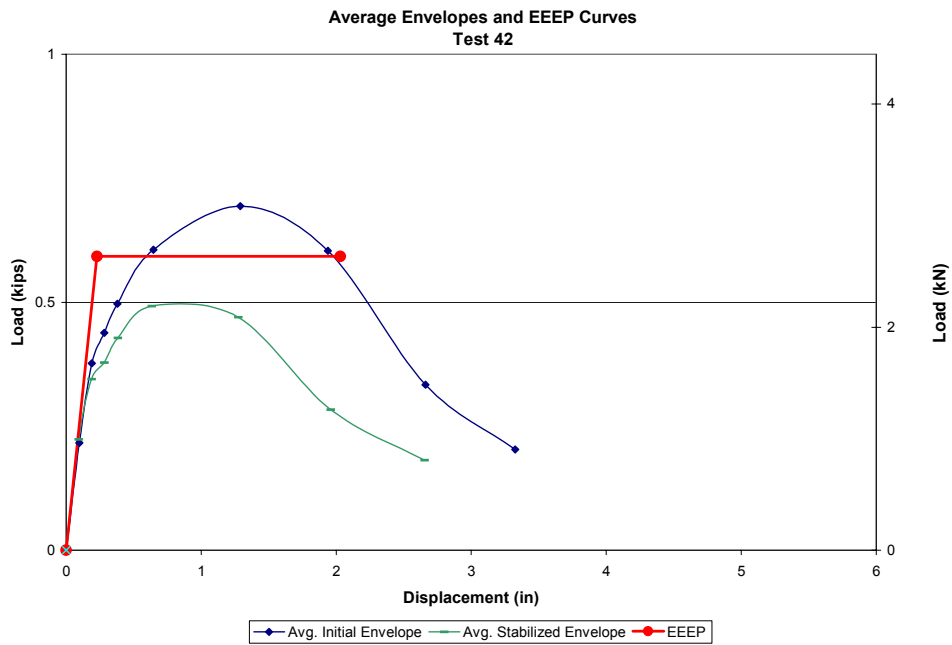


Figure C.28: Average envelope curve and EEEP curve (Test 42)