

Concrete Mixes Used for Each Test

Test or Test Series	Lab	Mix	Test or Test Series	Lab	Mix
01-A-88-1	UF	A	01-C-80-1	UF	B
01-A-88-2	UF	A	01-C-79-2	UF	B
01-A-87-3	UF	A	01-C-72-3	UF	F
01-A-76-4	UF	F	01-C-72-4	UF	F
01-A-68-5	UF	F	01-C-72-5	UF	F
01-A-57-6	UF	F	01-C-71-6	UF	B
01-A-57-7	UF	A	01-C-70-7	UF	C
01-A-57-8	UF	A	01-C-68-8	UF	C
01-A-57-9	UF	A	01-C-59-9	UF	C
01-A-46-10	UF	B	01-C-52-10	UF	A
01-A-46-11	UF	B	01-C-50-11	UF	A
01-A-46-12	UF	B	01-C-47-12	UF	A
01-A-36-13	UF	E	01-C-44-13	UF	A
01-A-36-14	UF	E	01-C-44-14	UF	A
01-A-36-15	UF	E	01-C-44-15	UF	A
01-B-81-1	UF	B	02-A	US	A
01-B-81-2	UF	B	02-B	US	A
01-B-75-3	UF	B	02-C	US	A
01-B-73-4	UF	G	03-B	US	B
01-B-72-5	UF	G	04-B	US	B
01-B-70-6	UF	B	05-A	US	A
01-B-70-7	UF	B	06-A	US	A
01-B-68-8	UF	G	07-A	UF	C
01-B-67-9	UF	B	08-B	US	B
01-B-56-10	UF	A	09-C	UF	D
01-B-55-11	UF	A	10-A	US	B
01-B-53-12	UF	A	11-B	US	B
01-B-45-13	UF	B	12-A	UF	J
01-B-45-14	UF	B	13-B	UF	G
01-B-44-15	UF	B	14-B	UF	H
			15-A	UF	I
			16-C-73-1	UF	C
			16-C-72-2	UF	G
			16-C-69-3	UF	C
			16-C-71-4	UF	F
			16-C-69-5	UF	F
			16-C-69-6	UF	F

Trial Batch Worksheet - Calculations and Data Collection

(Saturated, Surface-dry Aggregates)

Batch Size (ft ³):	16.0	Batch Size (yd ³):	0.5926
Cement Content (lb/yd ³):	450	SSD Moisture (wt%)	
Target w/cm (lbs/lbs):	0.671	Manufactured Sand:	0.20
Coarse Agg. Grade:	#89 / #7	#89 Stone:	1.10
Target Air Content (%):	2.5 to 5.0	#7 Stone:	0.70
Target Slump (in):	3 to 4	Verified Moisture (wt%)	
FA / (FA+CA) (lb/lb):	0.476	Manufactured Sand:	0.00
FA / (Total) (ft ³ /ft ³):	0.335	#89 Stone:	0.94
CA / (Total) (ft ³ /ft ³):	0.369	#7 Stone:	0.60
(FA+CA) / (Total) (ft ³ /ft ³):	0.704		

Date: **May 18, 2010**

Project: **NCHRP - Anchors**

Product: **450 @ 0.67**

Batch: **A-1**

Company: _____

Batch Size: **16.0 cubic feet**

Water Added (ml):		0.00
Water Withheld (ml):		0.00
Admixture Water (lb):		0.000
Actual w/cm (lb/lb):		0.671

Raw Material	Material Source / Mine	16 ft ³ Adjusted Batch Wt. (lb)	16 ft ³ Unadjusted Batch Wt. (lb)	1 yd ³ Unadjusted Batch Wt. (lb)	SSD Bulk Specific Gravity (g/cm ³)	Solids Content (wt%)	1 yd ³ Batch Volume (yd ³)	Remarks
Cement	Florida Rock	266.7	266.7	450	3.15		2.29	
Slag	SuperCem (FL Rock)	0.0	0.0		2.86			
Fly Ash	Boral Crystal River	0.0	0.0		2.24			
Water	Local	181.9	179.0	302	1.00		4.84	
Manufactured Sand		884.0	885.8	1494.7	2.643		9.06	1.8 lb water deficit
#89 Stone	Conrad Yelvington	405.3	406.0	685.1	2.594		4.23	0.6 lb water deficit
#7 Stone	Conrad Yelvington	553.0	553.6	934.2	2.613		5.73	0.6 lb water deficit
Air Entrainer	Vinsol Resin				1.03	12.00		
Admixture								
Admixture								
Corrosion Inhibitor								
Entrained Air							0.86	3.2 vol% air
TOTAL		2291.0	2291.0	3866.0			27.00	

Batching & Mixing

Mix Design By: _____

Weights By: _____

Mixing By: _____

Aggregate Moisture By: _____

Aggregate Moisture	Manufactured Sand	#89 Stone	#7 Stone
Wet Weight:			
Dry Weight:			
Moisture Content:	0.00		

Plastic Properties

Slump (in):	2.25"	By: _____
Air (%):	3.5% w/o ACF	By: _____
Mix Temp (°F):	78.6°	By: _____
Air Temp (°F):		By: _____
Unit Weight (lb/ft ³):	142.56	By: _____

Initial Set (min):		By: _____
Final Set (min):		By: _____
Start Time:	10:45 AM	
End Time:	10:53 AM	
Workability:	Very Good	

Trial Batch Worksheet - Calculations and Data Collection

(Saturated, Surface-dry Aggregates)

Batch Size (ft ³):	16.0	Batch Size (yd ³):	0.5926
Cement Content (lb/yd ³):	450	SSD Moisture (wt%)	
Target w/cm (lbs/lbs):	0.671	Manufactured Sand:	0.20
Coarse Agg. Grade:	#89 / #7	#89 Stone:	1.10
Target Air Content (%):	2.5 to 5.0	#7 Stone:	0.70
Target Slump (in):	3 to 4	Verified Moisture (wt%)	
FA / (FA+CA) (lb/lb):	0.476	Manufactured Sand:	0.00
FA / (Total) (ft ³ /ft ³):	0.335	#89 Stone:	0.94
CA / (Total) (ft ³ /ft ³):	0.369	#7 Stone:	0.60
(FA+CA) / (Total) (ft ³ /ft ³):	0.704		

Date: **May 18, 2010**

Project: **NCHRP - Anchors**

Product: **450 @ 0.67**

Batch: **A-2**

Company: _____

Batch Size: **16.0 cubic feet**

Water Added (ml):		0.00
Water Withheld (ml):		0.00
Admixture Water (lb):		0.000
Actual w/cm (lb/lb):		0.671

Raw Material	Material Source / Mine	16 ft ³ Adjusted Batch Wt. (lb)	16 ft ³ Unadjusted Batch Wt. (lb)	1 yd ³ Unadjusted Batch Wt. (lb)	SSD Bulk Specific Gravity (g/cm ³)	Solids Content (wt%)	1 yd ³ Batch Volume (yd ³)	Remarks
Cement	Florida Rock	266.7	266.7	450	3.15		2.29	
Slag	SuperCem (FL Rock)	0.0	0.0		2.86			
Fly Ash	Boral Crystal River	0.0	0.0		2.24			
Water	Local	181.9	179.0	302	1.00		4.84	
Manufactured Sand		884.0	885.8	1494.7	2.643		9.06	1.8 lb water deficit
#89 Stone	Conrad Yelvington	405.3	406.0	685.1	2.594		4.23	0.6 lb water deficit
#7 Stone	Conrad Yelvington	553.0	553.6	934.2	2.613		5.73	0.6 lb water deficit
Air Entrainer	Vinsol Resin				1.03	12.00		
Admixture								
Admixture								
Corrosion Inhibitor								
Entrained Air							0.86	3.2 vol% air
TOTAL		2291.0	2291.0	3866.0			27.00	

Batching & Mixing

Mix Design By: _____

Weights By: _____

Mixing By: _____

Aggregate Moisture By: _____

Aggregate Moisture	Manufactured Sand	#89 Stone	#7 Stone
Wet Weight:			
Dry Weight:			
Moisture Content:	0.00		

Plastic Properties

Slump (in):	2.25"	By: _____
Air (%):	3.7% w/o ACF	By: _____
Mix Temp (°F):	78.4°	By: _____
Air Temp (°F):		By: _____
Unit Weight (lb/ft ³):	143.68	By: _____

Initial Set (min):		By: _____
Final Set (min):		By: _____
Start Time:	11:15 AM	
End Time:	11:23 AM	
Workability:	Very Good	

Trial Batch Worksheet - Calculations and Data Collection

(Saturated, Surface-dry Aggregates)

Batch Size (ft ³):	16.0	Batch Size (yd ³):	0.5926
Cement Content (lb/yd ³):	450	SSD Moisture (wt%)	
Target w/cm (lbs/lbs):	0.671	Manufactured Sand:	0.20
Coarse Agg. Grade:	#89 / #7	#89 Stone:	1.10
Target Air Content (%):	2.5 to 5.0	#7 Stone:	0.70
Target Slump (in):	3 to 4	Verified Moisture (wt%)	
FA / (FA+CA) (lb/lb):	0.476	Manufactured Sand:	0.00
FA / (Total) (ft ³ /ft ³):	0.335	#89 Stone:	0.94
CA / (Total) (ft ³ /ft ³):	0.369	#7 Stone:	0.60
(FA+CA) / (Total) (ft ³ /ft ³):	0.704		

Date: **May 18, 2010**

Project: **NCHRP - Anchors**

Product: **450 @ 0.67**

Batch: **A-3**

Company: _____

Batch Size: **16.0 cubic feet**

Water Added (ml):		0.00
Water Withheld (ml):		0.00
Admixture Water (lb):		0.000
Actual w/cm (lb/lb):		0.671

Raw Material	Material Source / Mine	16 ft ³ Adjusted Batch Wt. (lb)	16 ft ³ Unadjusted Batch Wt. (lb)	1 yd ³ Unadjusted Batch Wt. (lb)	SSD Bulk Specific Gravity (g/cm ³)	Solids Content (wt%)	1 yd ³ Batch Volume (yd ³)	Remarks
Cement	Florida Rock	266.7	266.7	450	3.15		2.29	
Slag	SuperCem (FL Rock)	0.0	0.0		2.86			
Fly Ash	Boral Crystal River	0.0	0.0		2.24			
Water	Local	181.9	179.0	302	1.00		4.84	
Manufactured Sand		884.0	885.8	1494.7	2.643		9.06	1.8 lb water deficit
#89 Stone	Conrad Yelvington	405.3	406.0	685.1	2.594		4.23	0.6 lb water deficit
#7 Stone	Conrad Yelvington	553.0	553.6	934.2	2.613		5.73	0.6 lb water deficit
Air Entrainer	Vinsol Resin				1.03	12.00		
Admixture								
Admixture								
Corrosion Inhibitor								
Entrained Air							0.86	3.2 vol% air
TOTAL		2291.0	2291.0	3866.0			27.00	

Batching & Mixing

Mix Design By: _____

Weights By: _____

Mixing By: _____

Aggregate Moisture By: _____

Aggregate Moisture	Manufactured Sand	#89 Stone	#7 Stone
Wet Weight:			
Dry Weight:			
Moisture Content:	0.00		

Plastic Properties

Slump (in):	3.00"	By: _____
Air (%):	3.4% w/o ACF	By: _____
Mix Temp (°F):	79.0°	By: _____
Air Temp (°F):		By: _____
Unit Weight (lb/ft ³):	143.04	By: _____

Initial Set (min):		By: _____
Final Set (min):		By: _____
Start Time:	11:39 AM	
End Time:	11:47 AM	
Workability:	Very Good	

Trial Batch Worksheet - Calculations and Data Collection

(Saturated, Surface-dry Aggregates)

Batch Size (ft ³):	16.0	Batch Size (yd ³):	0.5926
Cement Content (lb/yd ³):	450	SSD Moisture (wt%)	
Target w/cm (lbs/lbs):	0.671	Manufactured Sand:	0.20
Coarse Agg. Grade:	#89 / #7	#89 Stone:	1.10
Target Air Content (%):	2.5 to 5.0	#7 Stone:	0.70
Target Slump (in):	3 to 4	Verified Moisture (wt%)	
FA / (FA+CA) (lb/lb):	0.476	Manufactured Sand:	0.00
FA / (Total) (ft ³ /ft ³):	0.335	#89 Stone:	0.59
CA / (Total) (ft ³ /ft ³):	0.369	#7 Stone:	0.42
(FA+CA) / (Total) (ft ³ /ft ³):	0.704		

Date: **May 26, 2010**

Project: **NCHRP - Anchors**

Product: **450 @ 0.67**

Batch: **B-1**

Company: _____

Batch Size: **16.0 cubic feet**

Water Added (ml):		0.00
Water Withheld (ml):		0.00
Admixture Water (lb):		0.000
Actual w/cm (lb/lb):		0.671

Raw Material	Material Source / Mine	16 ft ³ Adjusted Batch Wt. (lb)	16 ft ³ Unadjusted Batch Wt. (lb)	1 yd ³ Unadjusted Batch Wt. (lb)	SSD Bulk Specific Gravity (g/cm ³)	Solids Content (wt%)	1 yd ³ Batch Volume (yd ³)	Remarks
Cement	Florida Rock	266.7	266.7	450	3.15		2.29	
Slag	SuperCem (FL Rock)	0.0	0.0		2.86			
Fly Ash	Boral Crystal River	0.0	0.0		2.24			
Water	Local	184.3	179.0	302	1.00		4.84	
Manufactured Sand		884.0	885.8	1494.72	2.643		9.06	1.8 lb water deficit
#89 Stone	Conrad Yelvington	403.9	406.0	685.08	2.594		4.23	2.1 lb water deficit
#7 Stone	Conrad Yelvington	552.1	553.6	934.20	2.613		5.73	1.5 lb water deficit
Air Entrainer	Vinsol Resin				1.03	12.00		
Admixture								
Admixture								
Corrosion Inhibitor								
Entrained Air							0.86	3.2 vol% air
TOTAL		2291.0	2291.0	3866.0			27.00	

Batching & Mixing

Mix Design By: _____

Weights By: _____

Mixing By: _____

Aggregate Moisture By: _____

Aggregate Moisture	Manufactured Sand	#89 Stone	#7 Stone
Wet Weight:		23.70	23.80
Dry Weight:		23.56	23.70
Moisture Content:	0.00	0.59	0.42

Plastic Properties

Slump (in):	4.25"	By: _____
Air (%):	3.4% w/o ACF	By: _____
Mix Temp (°F):	78°	By: _____
Air Temp (°F):		By: _____
Unit Weight (lb/ft ³):	143.52	By: _____

Initial Set (min):		By: _____
Final Set (min):		By: _____
Start Time:	9:38 AM	
End Time:	9:46 AM	
Workability:	Very Good	

Trial Batch Worksheet - Calculations and Data Collection

(Saturated, Surface-dry Aggregates)

Batch Size (ft ³):	16.0	Batch Size (yd ³):	0.5926
Cement Content (lb/yd ³):	450	SSD Moisture (wt%)	
Target w/cm (lbs/lbs):	0.671	Manufactured Sand:	0.20
Coarse Agg. Grade:	#89 / #7	#89 Stone:	1.10
Target Air Content (%):	2.5 to 5.0	#7 Stone:	0.70
Target Slump (in):	3 to 4	Verified Moisture (wt%)	
FA / (FA+CA) (lb/lb):	0.476	Manufactured Sand:	0.00
FA / (Total) (ft ³ /ft ³):	0.335	#89 Stone:	0.59
CA / (Total) (ft ³ /ft ³):	0.369	#7 Stone:	0.42
(FA+CA) / (Total) (ft ³ /ft ³):	0.704		

Date: **May 26, 2010**

Project: **NCHRP - Anchors**

Product: **450 @ 0.67**

Batch: **B-2**

Company: _____

Batch Size: **16.0 cubic feet**

Water Added (ml):		0.00
Water Withheld (ml):		0.00
Admixture Water (lb):		0.000
Actual w/cm (lb/lb):		0.671

Raw Material	Material Source / Mine	16 ft ³ Adjusted Batch Wt. (lb)	16 ft ³ Unadjusted Batch Wt. (lb)	1 yd ³ Unadjusted Batch Wt. (lb)	SSD Bulk Specific Gravity (g/cm ³)	Solids Content (wt%)	1 yd ³ Batch Volume (yd ³)	Remarks
Cement	Florida Rock	266.7	266.7	450	3.15		2.29	
Slag	SuperCem (FL Rock)	0.0	0.0		2.86			
Fly Ash	Boral Crystal River	0.0	0.0		2.24			
Water	Local	184.3	179.0	302	1.00		4.84	
Manufactured Sand		884.0	885.8	1494.72	2.643		9.06	1.8 lb water deficit
#89 Stone	Conrad Yelvington	403.9	406.0	685.08	2.594		4.23	2.1 lb water deficit
#7 Stone	Conrad Yelvington	552.1	553.6	934.20	2.613		5.73	1.5 lb water deficit
Air Entrainer	Vinsol Resin				1.03	12.00		
Admixture								
Admixture								
Corrosion Inhibitor								
Entrained Air							0.86	3.2 vol% air
TOTAL		2291.0	2291.0	3866.0			27.00	

Batching & Mixing

Mix Design By: _____

Weights By: _____

Mixing By: _____

Aggregate Moisture By: _____

Aggregate Moisture	Manufactured Sand	#89 Stone	#7 Stone
Wet Weight:		23.70	23.80
Dry Weight:		23.56	23.70
Moisture Content:	0.00	0.59	0.42

Plastic Properties

Slump (in):	3.25"	By: _____
Air (%):	3.7% w/o ACF	By: _____
Mix Temp (°F):	79°	By: _____
Air Temp (°F):		By: _____
Unit Weight (lb/ft ³):	142.88	By: _____

Initial Set (min):		By: _____
Final Set (min):		By: _____
Start Time:	10:02 AM	
End Time:	10:10 AM	
Workability:	Very Good	

Trial Batch Worksheet - Calculations and Data Collection

(Saturated, Surface-dry Aggregates)

Batch Size (ft ³):	16.0	Batch Size (yd ³):	0.5926
Cement Content (lb/yd ³):	450	SSD Moisture (wt%)	
Target w/cm (lbs/lbs):	0.671	Manufactured Sand:	0.20
Coarse Agg. Grade:	#89 / #7	#89 Stone:	1.10
Target Air Content (%):	2.5 to 5.0	#7 Stone:	0.70
Target Slump (in):	3 to 4	Verified Moisture (wt%)	
FA / (FA+CA) (lb/lb):	0.476	Manufactured Sand:	0.00
FA / (Total) (ft ³ /ft ³):	0.335	#89 Stone:	0.59
CA / (Total) (ft ³ /ft ³):	0.369	#7 Stone:	0.42
(FA+CA) / (Total) (ft ³ /ft ³):	0.704		

Date: **May 26, 2010**

Project: **NCHRP - Anchors**

Product: **450 @ 0.67**

Batch: **B-3**

Company: _____

Batch Size: **16.0 cubic feet**

Water Added (ml):		0.00
Water Withheld (ml):		0.00
Admixture Water (lb):		0.000
Actual w/cm (lb/lb):		0.671

Raw Material	Material Source / Mine	16 ft ³ Adjusted Batch Wt. (lb)	16 ft ³ Unadjusted Batch Wt. (lb)	1 yd ³ Unadjusted Batch Wt. (lb)	SSD Bulk Specific Gravity (g/cm ³)	Solids Content (wt%)	1 yd ³ Batch Volume (yd ³)	Remarks
Cement	Florida Rock	266.7	266.7	450	3.15		2.29	
Slag	SuperCem (FL Rock)	0.0	0.0		2.86			
Fly Ash	Boral Crystal River	0.0	0.0		2.24			
Water	Local	184.3	179.0	302	1.00		4.84	
Manufactured Sand		884.0	885.8	1494.72	2.643		9.06	1.8 lb water deficit
#89 Stone	Conrad Yelvington	403.9	406.0	685.08	2.594		4.23	2.1 lb water deficit
#7 Stone	Conrad Yelvington	552.1	553.6	934.20	2.613		5.73	1.5 lb water deficit
Air Entrainer	Vinsol Resin				1.03	12.00		
Admixture								
Admixture								
Corrosion Inhibitor								
Entrained Air							0.86	3.2 vol% air
TOTAL		2291.0	2291.0	3866.0			27.00	

Batching & Mixing

Mix Design By: _____

Weights By: _____

Mixing By: _____

Aggregate Moisture By: _____

Aggregate Moisture	Manufactured Sand	#89 Stone	#7 Stone
Wet Weight:		23.70	23.80
Dry Weight:		23.56	23.70
Moisture Content:	0.00	0.59	0.42

Plastic Properties

Slump (in):	3.75"	By: _____
Air (%):	3.3% w/o ACF	By: _____
Mix Temp (°F):	79°	By: _____
Air Temp (°F):		By: _____
Unit Weight (lb/ft ³):	143.36	By: _____

Initial Set (min):		By: _____
Final Set (min):		By: _____
Start Time:	10:27 AM	
End Time:	10:35 AM	
Workability:	Very Good	

Trial Batch Worksheet - Calculations and Data Collection

(Saturated, Surface-dry Aggregates)

Batch Size (ft ³):	16.0	Batch Size (yd ³):	0.5926
Cement Content (lb/yd ³):	450	SSD Moisture (wt%)	
Target w/cm (lbs/lbs):	0.671	Manufactured Sand:	0.20
Coarse Agg. Grade:	#89 / #7	#89 Stone:	1.10
Target Air Content (%):	2.5 to 5.0	#7 Stone:	0.70
Target Slump (in):	3 to 4	Verified Moisture (wt%)	
FA / (FA+CA) (lb/lb):	0.476	Manufactured Sand:	0.00
FA / (Total) (ft ³ /ft ³):	0.335	#89 Stone:	1.43
CA / (Total) (ft ³ /ft ³):	0.369	#7 Stone:	0.56
(FA+CA) / (Total) (ft ³ /ft ³):	0.704		

Date: **June 2, 2010**

Project: **NCHRP - Anchors**

Product: **450 @ 0.67**

Batch: **C-1**

Company: _____

Batch Size: **16.0 cubic feet**

Water Added (ml):		0.00
Water Withheld (ml):		0.00
Admixture Water (lb):		0.000
Actual w/cm (lb/lb):		0.671

Raw Material	Material Source / Mine	16 ft ³ Adjusted Batch Wt. (lb)	16 ft ³ Unadjusted Batch Wt. (lb)	1 yd ³ Unadjusted Batch Wt. (lb)	SSD Bulk Specific Gravity (g/cm ³)	Solids Content (wt%)	1 yd ³ Batch Volume (yd ³)	Remarks
Cement	Florida Rock	266.7	266.7	450	3.15		2.29	
Slag	SuperCem (FL Rock)	0.0	0.0		2.86			
Fly Ash	Boral Crystal River	0.0	0.0		2.24			
Water	Local	180.2	179.0	302	1.00		4.84	
Manufactured Sand		884.0	885.8	1494.7	2.643		9.06	1.8 lb water deficit
#89 Stone	Conrad Yelvington	407.3	406.0	685.1	2.594		4.23	-1.3 lb water deficit
#7 Stone	Conrad Yelvington	552.8	553.6	934.2	2.613		5.73	0.8 lb water deficit
Air Entrainer	Vinsol Resin				1.03	12.00		
Admixture								
Admixture								
Corrosion Inhibitor								
Entrained Air							0.86	3.2 vol% air
TOTAL		2291.0	2291.0	3866.0			27.00	

Batching & Mixing

Mix Design By: _____

Weights By: _____

Mixing By: _____

Aggregate Moisture By: _____

Aggregate Moisture	Manufactured Sand	#89 Stone	#7 Stone
Wet Weight:		24.14	25.06
Dry Weight:		23.80	24.92
Moisture Content:	0.00	1.43	0.56

Plastic Properties

Slump (in):	4.00"	By: _____
Air (%):	3.5% w/o ACF	By: _____
Mix Temp (°F):	77°	By: _____
Air Temp (°F):		By: _____
Unit Weight (lb/ft ³):	142.88	By: _____

Initial Set (min):	By: _____
Final Set (min):	By: _____
Start Time:	_____
End Time:	_____
Workability:	Very Good

Trial Batch Worksheet - Calculations and Data Collection

(Saturated, Surface-dry Aggregates)

Batch Size (ft ³):	16.0	Batch Size (yd ³):	0.5926
Cement Content (lb/yd ³):	450	SSD Moisture (wt%)	
Target w/cm (lbs/lbs):	0.671	Manufactured Sand:	0.20
Coarse Agg. Grade:	#89 / #7	#89 Stone:	1.10
Target Air Content (%):	2.5 to 5.0	#7 Stone:	0.70
Target Slump (in):	3 to 4	Verified Moisture (wt%)	
FA / (FA+CA) (lb/lb):	0.476	Manufactured Sand:	0.00
FA / (Total) (ft ³ /ft ³):	0.335	#89 Stone:	1.43
CA / (Total) (ft ³ /ft ³):	0.369	#7 Stone:	0.56
(FA+CA) / (Total) (ft ³ /ft ³):	0.704		

Date: **June 2, 2010**

Project: **NCHRP - Anchors**

Product: **450 @ 0.67**

Batch: **C-2**

Company: _____

Batch Size: **16.0 cubic feet**

Water Added (ml):		0.00
Water Withheld (ml):		0.00
Admixture Water (lb):		0.000
Actual w/cm (lb/lb):		0.671

Raw Material	Material Source / Mine	16 ft ³ Adjusted Batch Wt. (lb)	16 ft ³ Unadjusted Batch Wt. (lb)	1 yd ³ Unadjusted Batch Wt. (lb)	SSD Bulk Specific Gravity (g/cm ³)	Solids Content (wt%)	1 yd ³ Batch Volume (yd ³)	Remarks
Cement	Florida Rock	266.7	266.7	450	3.15		2.29	
Slag	SuperCem (FL Rock)	0.0	0.0		2.86			
Fly Ash	Boral Crystal River	0.0	0.0		2.24			
Water	Local	180.2	179.0	302	1.00		4.84	
Manufactured Sand		884.0	885.8	1494.7	2.643		9.06	1.8 lb water deficit
#89 Stone	Conrad Yelvington	407.3	406.0	685.1	2.594		4.23	-1.3 lb water deficit
#7 Stone	Conrad Yelvington	552.8	553.6	934.2	2.613		5.73	0.8 lb water deficit
Air Entrainer	Vinsol Resin				1.03	12.00		
Admixture								
Admixture								
Corrosion Inhibitor								
Entrained Air							0.86	3.2 vol% air
TOTAL		2291.0	2291.0	3866.0			27.00	

Batching & Mixing

Mix Design By: _____

Weights By: _____

Mixing By: _____

Aggregate Moisture By: _____

Aggregate Moisture	Manufactured Sand	#89 Stone	#7 Stone
Wet Weight:		24.14	25.06
Dry Weight:		23.80	24.92
Moisture Content:	0.00	1.43	0.56

Plastic Properties

Slump (in):	3.00"	By: _____
Air (%):	3.1% w/o ACF	By: _____
Mix Temp (°F):	79.0°	By: _____
Air Temp (°F):		By: _____
Unit Weight (lb/ft ³):	143.68	By: _____

Initial Set (min):	By: _____
Final Set (min):	By: _____
Start Time:	_____
End Time:	_____
Workability:	Very Good

Trial Batch Worksheet - Calculations and Data Collection

(Saturated, Surface-dry Aggregates)

Batch Size (ft ³):	16.0	Batch Size (yd ³):	0.5926
Cement Content (lb/yd ³):	450	SSD Moisture (wt%)	
Target w/cm (lbs/lbs):	0.671	Manufactured Sand:	0.20
Coarse Agg. Grade:	#89 / #7	#89 Stone:	1.10
Target Air Content (%):	2.5 to 5.0	#7 Stone:	0.70
Target Slump (in):	3 to 4	Verified Moisture (wt%)	
FA / (FA+CA) (lb/lb):	0.476	Manufactured Sand:	0.00
FA / (Total) (ft ³ /ft ³):	0.335	#89 Stone:	1.43
CA / (Total) (ft ³ /ft ³):	0.369	#7 Stone:	0.56
(FA+CA) / (Total) (ft ³ /ft ³):	0.704		

Date: **June 2, 2010**

Project: **NCHRP - Anchors**

Product: **450 @ 0.67**

Batch: **C-3**

Company: _____

Batch Size: **16.0 cubic feet**

Water Added (ml):		0.00
Water Withheld (ml):		0.00
Admixture Water (lb):		0.000
Actual w/cm (lb/lb):		0.671

Raw Material	Material Source / Mine	16 ft ³ Adjusted Batch Wt. (lb)	16 ft ³ Unadjusted Batch Wt. (lb)	1 yd ³ Unadjusted Batch Wt. (lb)	SSD Bulk Specific Gravity (g/cm ³)	Solids Content (wt%)	1 yd ³ Batch Volume (yd ³)	Remarks
Cement	Florida Rock	266.7	266.7	450	3.15		2.29	
Slag	SuperCem (FL Rock)	0.0	0.0		2.86			
Fly Ash	Boral Crystal River	0.0	0.0		2.24			
Water	Local	180.2	179.0	302	1.00		4.84	
Manufactured Sand		884.0	885.8	1494.7	2.643		9.06	1.8 lb water deficit
#89 Stone	Conrad Yelvington	407.3	406.0	685.1	2.594		4.23	-1.3 lb water deficit
#7 Stone	Conrad Yelvington	552.8	553.6	934.2	2.613		5.73	0.8 lb water deficit
Air Entrainer	Vinsol Resin				1.03	12.00		
Admixture								
Admixture								
Corrosion Inhibitor								
Entrained Air							0.86	3.2 vol% air
TOTAL		2291.0	2291.0	3866.0			27.00	

Batching & Mixing

Mix Design By: _____

Weights By: _____

Mixing By: _____

Aggregate Moisture By: _____

Aggregate Moisture	Manufactured Sand	#89 Stone	#7 Stone
Wet Weight:		24.14	25.06
Dry Weight:		23.80	24.92
Moisture Content:	0.00	1.43	0.56

Plastic Properties

Slump (in):	2.75"	By: _____
Air (%):	3.5% w/o ACF	By: _____
Mix Temp (°F):	78.0°	By: _____
Air Temp (°F):		By: _____
Unit Weight (lb/ft ³):	143.52	By: _____

Initial Set (min):	By: _____
Final Set (min):	By: _____
Start Time:	_____
End Time:	_____
Workability:	Very Good

Trial Batch Worksheet - Calculations and Data Collection

(Saturated, Surface-dry Aggregates)

Batch Size (ft ³):	13.0	Batch Size (yd ³):	0.4815
Cement Content (lb/yd ³):	450	SSD Moisture (wt%)	
Target w/cm (lbs/lbs):	0.671	Manufactured Sand:	0.20
Coarse Agg. Grade:	#89 / #7	#89 Stone:	1.10
Target Air Content (%):	2.5 to 5.0	#7 Stone:	0.70
Target Slump (in):	3 to 4	Verified Moisture (wt%)	
FA / (FA+CA) (lb/lb):	0.476	Manufactured Sand:	0.00
FA / (Total) (ft ³ /ft ³):	0.335	#89 Stone:	0.67
CA / (Total) (ft ³ /ft ³):	0.369	#7 Stone:	0.25
(FA+CA) / (Total) (ft ³ /ft ³):	0.704		

Date: **June 15, 2010**

Project: **NCHRP - Anchors**

Product: **450 @ 0.67**

Batch: **D-1**

Company: _____

Batch Size: **13.0 cubic feet**

Water Added (ml):		0.00
Water Withheld (ml):		0.00
Admixture Water (lb):		0.000
Actual w/cm (lb/lb):		0.671

Raw Material	Material Source / Mine	13 ft ³ Adjusted Batch Wt. (lb)	13 ft ³ Unadjusted Batch Wt. (lb)	1 yd ³ Unadjusted Batch Wt. (lb)	SSD Bulk Specific Gravity (g/cm ³)	Solids Content (wt%)	1 yd ³ Batch Volume (yd ³)	Remarks
Cement	Florida Rock	216.7	216.7	450	3.15		2.29	
Slag	SuperCem (FL Rock)	0.0	0.0		2.86			
Fly Ash	Boral Crystal River	0.0	0.0		2.24			
Water	Local	150.3	145.4	302	1.00		4.84	
Manufactured Sand		718.2	719.7	1494.7	2.643		9.06	1.4 lb water deficit
#89 Stone	Conrad Yelvington	328.4	329.9	685.1	2.594		4.23	1.4 lb water deficit
#7 Stone	Conrad Yelvington	447.8	449.8	934.2	2.613		5.73	2.0 lb water deficit
Air Entrainment	Vinsol Resin				1.03	12.00		
Admixture								
Admixture								
Corrosion Inhibitor								
Entrained Air							0.86	3.2 vol% air
TOTAL		1861.4	1861.4	3866.0			27.00	

Batching & Mixing

Mix Design By: _____

Weights By: _____

Mixing By: _____

Aggregate Moisture By: _____

Aggregate Moisture	Manufactured Sand	#89 Stone	#7 Stone
Wet Weight:		24.10	23.62
Dry Weight:		23.94	23.56
Moisture Content:	0.00	0.67	0.25

Plastic Properties

Slump (in):	3.50"	By: _____
Air (%)	3.0% w/o ACF	By: _____
Mix Temp (°F):	79.0°	By: _____
Air Temp (°F):		By: _____
Unit Weight (lb/ft ³):	144.08	By: _____

Initial Set (min):		By: _____
Final Set (min):		By: _____
Start Time:	1:30 PM	
End Time:	1:38 PM	
Workability:	Very Good	

Trial Batch Worksheet - Calculations and Data Collection

(Saturated, Surface-dry Aggregates)

Batch Size (ft ³):	13.0	Batch Size (yd ³):	0.4815
Cement Content (lb/yd ³):	450	SSD Moisture (wt%)	
Target w/cm (lbs/lbs):	0.671	Manufactured Sand:	0.20
Coarse Agg. Grade:	#89 / #7	#89 Stone:	1.10
Target Air Content (%):	2.5 to 5.0	#7 Stone:	0.70
Target Slump (in):	3 to 4	Verified Moisture (wt%)	
FA / (FA+CA) (lb/lb):	0.476	Manufactured Sand:	0.00
FA / (Total) (ft ³ /ft ³):	0.335	#89 Stone:	0.67
CA / (Total) (ft ³ /ft ³):	0.369	#7 Stone:	0.25
(FA+CA) / (Total) (ft ³ /ft ³):	0.704		

Date: **June 15, 2010**
 Project: **NCHRP - Anchors**
 Product: **450 @ 0.67**
 Batch: **D-2**
 Company: _____
 Batch Size: **13.0 cubic feet**

Water Added (ml):		0.00
Water Withheld (ml):		0.00
Admixture Water (lb):		0.000
Actual w/cm (lb/lb):		0.671

Raw Material	Material Source / Mine	13 ft ³ Adjusted Batch Wt. (lb)	13 ft ³ Unadjusted Batch Wt. (lb)	1 yd ³ Unadjusted Batch Wt. (lb)	SSD Bulk Specific Gravity (g/cm ³)	Solids Content (wt%)	1 yd ³ Batch Volume (yd ³)	Remarks
Cement	Florida Rock	216.7	216.7	450	3.15		2.29	
Slag	SuperCem (FL Rock)	0.0	0.0		2.86			
Fly Ash	Boral Crystal River	0.0	0.0		2.24			
Water	Local	150.3	145.4	302	1.00		4.84	
Manufactured Sand		718.2	719.7	1494.7	2.643		9.06	1.4 lb water deficit
#89 Stone	Conrad Yelvington	328.4	329.9	685.1	2.594		4.23	1.4 lb water deficit
#7 Stone	Conrad Yelvington	447.8	449.8	934.2	2.613		5.73	2.0 lb water deficit
Air Entrainment	Vinsol Resin				1.03	12.00		
Admixture								
Admixture								
Corrosion Inhibitor								
Entrained Air							0.86	3.2 vol% air
TOTAL		1861.4	1861.4	3866.0			27.00	

Batching & Mixing

Mix Design By: _____
 Weights By: _____
 Mixing By: _____
 Aggregate Moisture By: _____

Aggregate Moisture	Manufactured Sand	#89 Stone	#7 Stone
Wet Weight:		24.10	23.62
Dry Weight:		23.94	23.56
Moisture Content:	0.00	0.67	0.25

Plastic Properties

Slump (in):	3.5"	By: _____
Air (%):	3.0% w/o ACF	By: _____
Mix Temp (°F):	79.0°	By: _____
Air Temp (°F):		By: _____
Unit Weight (lb/ft ³):	144.16	By: _____

Initial Set (min):		By: _____
Final Set (min):		By: _____
Start Time:	1:57 PM	
End Time:	2:05 PM	
Workability:	Very Good	

Trial Batch Worksheet - Calculations and Data Collection

(Saturated, Surface-dry Aggregates)

Batch Size (ft ³):	13.0	Batch Size (yd ³):	0.4815
Cement Content (lb/yd ³):	450	SSD Moisture (wt%)	
Target w/cm (lbs/lbs):	0.671	Manufactured Sand:	0.20
Coarse Agg. Grade:	#89 / #7	#89 Stone:	1.10
Target Air Content (%):	2.5 to 5.0	#7 Stone:	0.70
Target Slump (in):	3 to 4	Verified Moisture (wt%)	
FA / (FA+CA) (lb/lb):	0.476	Manufactured Sand:	0.00
FA / (Total) (ft ³ /ft ³):	0.335	#89 Stone:	0.67
CA / (Total) (ft ³ /ft ³):	0.369	#7 Stone:	0.25
(FA+CA) / (Total) (ft ³ /ft ³):	0.704		

Date: **June 15, 2010**

Project: **NCHRP - Anchors**

Product: **450 @ 0.67**

Batch: **D-3**

Company: _____

Batch Size: **13.0 cubic feet**

Water Added (ml):		0.00
Water Withheld (ml):		0.00
Admixture Water (lb):		0.000
Actual w/cm (lb/lb):		0.671

Raw Material	Material Source / Mine	13 ft ³ Adjusted Batch Wt. (lb)	13 ft ³ Unadjusted Batch Wt. (lb)	1 yd ³ Unadjusted Batch Wt. (lb)	SSD Bulk Specific Gravity (g/cm ³)	Solids Content (wt%)	1 yd ³ Batch Volume (yd ³)	Remarks
Cement	Florida Rock	216.7	216.7	450	3.15		2.29	
Slag	SuperCem (FL Rock)	0.0	0.0		2.86			
Fly Ash	Boral Crystal River	0.0	0.0		2.24			
Water	Local	150.3	145.4	302	1.00		4.84	
Manufactured Sand		718.2	719.7	1494.7	2.643		9.06	1.4 lb water deficit
#89 Stone	Conrad Yelvington	328.4	329.9	685.1	2.594		4.23	1.4 lb water deficit
#7 Stone	Conrad Yelvington	447.8	449.8	934.2	2.613		5.73	2.0 lb water deficit
Air Entrainment	Vinsol Resin				1.03	12.00		
Admixture								
Admixture								
Corrosion Inhibitor								
Entrained Air							0.86	3.2 vol% air
TOTAL		1861.4	1861.4	3866.0			27.00	

Batching & Mixing

Mix Design By: _____

Weights By: _____

Mixing By: _____

Aggregate Moisture By: _____

Aggregate Moisture	Manufactured Sand	#89 Stone	#7 Stone
Wet Weight:		24.10	23.62
Dry Weight:		23.94	23.56
Moisture Content:	0.00	0.67	0.25

Plastic Properties

Slump (in):	3.5"	By: _____
Air (%):	3.0% w/o ACF	By: _____
Mix Temp (°F):	79.0°	By: _____
Air Temp (°F):		By: _____
Unit Weight (lb/ft ³):	143.92	By: _____

Initial Set (min):		By: _____
Final Set (min):		By: _____
Start Time:	2:24 PM	
End Time:	2:32 PM	
Workability:	Very Good	

Trial Batch Worksheet - Calculations and Data Collection

(Saturated, Surface-dry Aggregates)

Batch Size (ft ³):	13.0	Batch Size (yd ³):	0.4815
Cement Content (lb/yd ³):	450	SSD Moisture (wt%)	
Target w/cm (lbs/lbs):	0.671	Manufactured Sand:	0.20
Coarse Agg. Grade:	#89 / #7	#89 Stone:	1.10
Target Air Content (%):	2.5 to 5.0	#7 Stone:	0.70
Target Slump (in):	3 to 4	Verified Moisture (wt%)	
FA / (FA+CA) (lb/lb):	0.476	Manufactured Sand:	0.00
FA / (Total) (ft ³ /ft ³):	0.335	#89 Stone:	1.01
CA / (Total) (ft ³ /ft ³):	0.369	#7 Stone:	0.50
(FA+CA) / (Total) (ft ³ /ft ³):	0.704		

Date: **June 22, 2010**
 Project: **NCHRP - Anchors**
 Product: **450 @ 0.67**
 Batch: **E-1**
 Company: _____
 Batch Size: **13.0 cubic feet**

Water Added (ml):		0.00
Water Withheld (ml):		0.00
Admixture Water (lb):		0.000
Actual w/cm (lb/lb):		0.671

Raw Material	Material Source / Mine	13 ft ³ Adjusted Batch Wt. (lb)	13 ft ³ Unadjusted Batch Wt. (lb)	1 yd ³ Unadjusted Batch Wt. (lb)	SSD Bulk Specific Gravity (g/cm ³)	Solids Content (wt%)	1 yd ³ Batch Volume (yd ³)	Remarks
Cement	Florida Rock	216.7	216.7	450	3.15		2.29	
Slag	SuperCem (FL Rock)	0.0	0.0		2.86			
Fly Ash	Boral Crystal River	0.0	0.0		2.24			
Water	Local	148.1	145.4	302	1.00		4.84	
Manufactured Sand		718.2	719.7	1494.7	2.643		9.06	1.4 lb water deficit
#89 Stone	Conrad Yelvington	329.5	329.9	685.1	2.594		4.23	0.3 lb water deficit
#7 Stone	Conrad Yelvington	448.9	449.8	934.2	2.613		5.73	0.9 lb water deficit
Air Entrainment	Vinsol Resin				1.03	12.00		
Admixture								
Admixture								
Corrosion Inhibitor								
Entrained Air							0.86	3.2 vol% air
TOTAL		1861.4	1861.4	3866.0			27.00	

Batching & Mixing

Mix Design By: _____
 Weights By: _____
 Mixing By: _____
 Aggregate Moisture By: _____

Aggregate Moisture	Manufactured Sand	#89 Stone	#7 Stone
Wet Weight:		24.06	24.24
Dry Weight:		23.82	24.12
Moisture Content:	0.00	1.01	0.50

Plastic Properties

Slump (in):	4.00"	By: _____
Air (%):	3.6% w/o ACF	By: _____
Mix Temp (°F):	79.0°	By: _____
Air Temp (°F):		By: _____
Unit Weight (lb/ft ³):	142.96	By: _____

Initial Set (min):		By: _____
Final Set (min):		By: _____
Start Time:	1:40 PM	
End Time:	1:48 PM	
Workability:	Very Good	

Trial Batch Worksheet - Calculations and Data Collection

(Saturated, Surface-dry Aggregates)

Batch Size (ft ³):	13.0	Batch Size (yd ³):	0.4815
Cement Content (lb/yd ³):	450	SSD Moisture (wt%)	
Target w/cm (lbs/lbs):	0.671	Manufactured Sand:	0.20
Coarse Agg. Grade:	#89 / #7	#89 Stone:	1.10
Target Air Content (%):	2.5 to 5.0	#7 Stone:	0.70
Target Slump (in):	3 to 4	Verified Moisture (wt%)	
FA / (FA+CA) (lb/lb):	0.476	Manufactured Sand:	0.00
FA / (Total) (ft ³ /ft ³):	0.335	#89 Stone:	1.01
CA / (Total) (ft ³ /ft ³):	0.369	#7 Stone:	0.50
(FA+CA) / (Total) (ft ³ /ft ³):	0.704		

Date: **June 22, 2010**

Project: **NCHRP - Anchors**

Product: **450 @ 0.67**

Batch: **E-2**

Company: _____

Batch Size: **13.0 cubic feet**

Water Added (ml):		0.00
Water Withheld (ml):		0.00
Admixture Water (lb):		0.000
Actual w/cm (lb/lb):		0.671

Raw Material	Material Source / Mine	13 ft ³ Adjusted Batch Wt. (lb)	13 ft ³ Unadjusted Batch Wt. (lb)	1 yd ³ Unadjusted Batch Wt. (lb)	SSD Bulk Specific Gravity (g/cm ³)	Solids Content (wt%)	1 yd ³ Batch Volume (yd ³)	Remarks
Cement	Florida Rock	216.7	216.7	450	3.15		2.29	
Slag	SuperCem (FL Rock)	0.0	0.0		2.86			
Fly Ash	Boral Crystal River	0.0	0.0		2.24			
Water	Local	148.1	145.4	302	1.00		4.84	
Manufactured Sand		718.2	719.7	1494.7	2.643		9.06	1.4 lb water deficit
#89 Stone	Conrad Yelvington	329.5	329.9	685.1	2.594		4.23	0.3 lb water deficit
#7 Stone	Conrad Yelvington	448.9	449.8	934.2	2.613		5.73	0.9 lb water deficit
Air Entrainment	Vinsol Resin				1.03	12.00		
Admixture								
Admixture								
Corrosion Inhibitor								
Entrained Air							0.86	3.2 vol% air
TOTAL		1861.4	1861.4	3866.0			27.00	

Batching & Mixing

Mix Design By: _____

Weights By: _____

Mixing By: _____

Aggregate Moisture By: _____

Aggregate Moisture	Manufactured Sand	#89 Stone	#7 Stone
Wet Weight:		24.06	24.24
Dry Weight:		23.82	24.12
Moisture Content:	0.00	1.01	0.50

Plastic Properties

Slump (in):	3.25"	By: _____
Air (%):	3.5% w/o ACF	By: _____
Mix Temp (°F):	79.0°	By: _____
Air Temp (°F):		By: _____
Unit Weight (lb/ft ³):	143.04	By: _____

Initial Set (min):		By: _____
Final Set (min):		By: _____
Start Time:	2:06 PM	
End Time:	2:14 PM	
Workability:	Very Good	

Trial Batch Worksheet - Calculations and Data Collection

(Saturated, Surface-dry Aggregates)

Batch Size (ft ³):	13.0	Batch Size (yd ³):	0.4815
Cement Content (lb/yd ³):	450	SSD Moisture (wt%)	
Target w/cm (lbs/lbs):	0.671	Manufactured Sand:	0.20
Coarse Agg. Grade:	#89 / #7	#89 Stone:	1.10
Target Air Content (%):	2.5 to 5.0	#7 Stone:	0.70
Target Slump (in):	3 to 4	Verified Moisture (wt%)	
FA / (FA+CA) (lb/lb):	0.476	Manufactured Sand:	0.00
FA / (Total) (ft ³ /ft ³):	0.335	#89 Stone:	1.01
CA / (Total) (ft ³ /ft ³):	0.369	#7 Stone:	0.50
(FA+CA) / (Total) (ft ³ /ft ³):	0.704		

Date: **June 22, 2010**
 Project: **NCHRP - Anchors**
 Product: **450 @ 0.67**
 Batch: **E-3**
 Company: _____
 Batch Size: **13.0 cubic feet**

Water Added (ml):		0.00
Water Withheld (ml):		0.00
Admixture Water (lb):		0.000
Actual w/cm (lb/lb):		0.671

Raw Material	Material Source / Mine	13 ft ³ Adjusted Batch Wt. (lb)	13 ft ³ Unadjusted Batch Wt. (lb)	1 yd ³ Unadjusted Batch Wt. (lb)	SSD Bulk Specific Gravity (g/cm ³)	Solids Content (wt%)	1 yd ³ Batch Volume (yd ³)	Remarks
Cement	Florida Rock	216.7	216.7	450	3.15		2.29	
Slag	SuperCem (FL Rock)	0.0	0.0		2.86			
Fly Ash	Boral Crystal River	0.0	0.0		2.24			
Water	Local	148.1	145.4	302	1.00		4.84	
Manufactured Sand		718.2	719.7	1494.7	2.643		9.06	1.4 lb water deficit
#89 Stone	Conrad Yelvington	329.5	329.9	685.1	2.594		4.23	0.3 lb water deficit
#7 Stone	Conrad Yelvington	448.9	449.8	934.2	2.613		5.73	0.9 lb water deficit
Air Entrainment	Vinsol Resin				1.03	12.00		
Admixture								
Admixture								
Corrosion Inhibitor								
Entrained Air							0.86	3.2 vol% air
TOTAL		1861.4	1861.4	3866.0			27.00	

Batching & Mixing

Mix Design By: _____
 Weights By: _____
 Mixing By: _____
 Aggregate Moisture By: _____

Aggregate Moisture	Manufactured Sand	#89 Stone	#7 Stone
Wet Weight:		24.06	24.24
Dry Weight:		23.82	24.12
Moisture Content:	0.00	1.01	0.50

Plastic Properties

Slump (in):	4.00"	By: _____
Air (%):	3.1% w/o ACF	By: _____
Mix Temp (°F):	79.0°	By: _____
Air Temp (°F):		By: _____
Unit Weight (lb/ft ³):	143.52	By: _____

Initial Set (min):		By: _____
Final Set (min):		By: _____
Start Time:	2:29 PM	
End Time:	2:38 PM	
Workability:	Very Good	

Trial Batch Worksheet - Calculations and Data Collection

(Saturated, Surface-dry Aggregates)

Batch Size (ft ³):	13.0	Batch Size (yd ³):	0.4815
Cement Content (lb/yd ³):	450	SSD Moisture (wt%)	
Target w/cm (lbs/lbs):	0.671	Manufactured Sand:	0.20
Coarse Agg. Grade:	#89 / #7	#89 Stone:	1.10
Target Air Content (%):	2.5 to 5.0	#7 Stone:	0.70
Target Slump (in):	3 to 4	Verified Moisture (wt%)	
FA / (FA+CA) (lb/lb):	0.476	Manufactured Sand:	0.00
FA / (Total) (ft ³ /ft ³):	0.335	#89 Stone:	0.94
CA / (Total) (ft ³ /ft ³):	0.369	#7 Stone:	0.40
(FA+CA) / (Total) (ft ³ /ft ³):	0.704		

Date: **June 29, 2010**
 Project: **NCHRP - Anchors**
 Product: **450 @ 0.67**
 Batch: **F-1**
 Company: _____
 Batch Size: **13.0 cubic feet**

Water Added (ml):		0.00
Water Withheld (ml):		0.00
Admixture Water (lb):		0.000
Actual w/cm (lb/lb):		0.671

Raw Material	Material Source / Mine	13 ft ³ Adjusted Batch Wt. (lb)	13 ft ³ Unadjusted Batch Wt. (lb)	1 yd ³ Unadjusted Batch Wt. (lb)	SSD Bulk Specific Gravity (g/cm ³)	Solids Content (wt%)	1 yd ³ Batch Volume (yd ³)	Remarks
Cement	Florida Rock	216.7	216.7	450	3.15		2.29	
Slag	SuperCem (FL Rock)	0.0	0.0		2.86			
Fly Ash	Boral Crystal River	0.0	0.0		2.24			
Water	Local	148.7	145.4	302	1.00		4.84	
Manufactured Sand		718.2	719.7	1494.7	2.643		9.06	1.4 lb water deficit
#89 Stone	Conrad Yelvington	329.3	329.9	685.1	2.594		4.23	0.5 lb water deficit
#7 Stone	Conrad Yelvington	448.4	449.8	934.2	2.613		5.73	1.4 lb water deficit
Air Entrainment	Vinsol Resin				1.03	12.00		
Admixture								
Admixture								
Corrosion Inhibitor								
Entrained Air							0.86	3.2 vol% air
TOTAL		1861.4	1861.4	3866.0			27.00	

Batching & Mixing

Mix Design By: _____
 Weights By: _____
 Mixing By: _____
 Aggregate Moisture By: _____

Aggregate Moisture	Manufactured Sand	#89 Stone	#7 Stone
Wet Weight:		23.52	25.12
Dry Weight:		23.30	25.02
Moisture Content:	0.00	0.94	0.40

Plastic Properties

Slump (in):	3.75"	By: _____
Air (%):	3.3% w/o ACF	By: _____
Mix Temp (°F):	79°	By: _____
Air Temp (°F):		By: _____
Unit Weight (lb/ft ³):	143.52	By: _____

Initial Set (min):		By: _____
Final Set (min):		By: _____
Start Time:	1:41 PM	
End Time:	1:49 PM	
Workability:		

Trial Batch Worksheet - Calculations and Data Collection

(Saturated, Surface-dry Aggregates)

Batch Size (ft ³):	13.0	Batch Size (yd ³):	0.4815
Cement Content (lb/yd ³):	450	SSD Moisture (wt%)	
Target w/cm (lbs/lbs):	0.671	Manufactured Sand:	0.20
Coarse Agg. Grade:	#89 / #7	#89 Stone:	1.10
Target Air Content (%):	2.5 to 5.0	#7 Stone:	0.70
Target Slump (in):	3 to 4	Verified Moisture (wt%)	
FA / (FA+CA) (lb/lb):	0.476	Manufactured Sand:	0.00
FA / (Total) (ft ³ /ft ³):	0.335	#89 Stone:	0.94
CA / (Total) (ft ³ /ft ³):	0.369	#7 Stone:	0.40
(FA+CA) / (Total) (ft ³ /ft ³):	0.704		

Date: **June 29, 2010**

Project: **NCHRP - Anchors**

Product: **450 @ 0.67**

Batch: **F-2**

Company: _____

Batch Size: **13.0 cubic feet**

Water Added (ml):		0.00
Water Withheld (ml):		0.00
Admixture Water (lb):		0.000
Actual w/cm (lb/lb):		0.671

Raw Material	Material Source / Mine	13 ft ³ Adjusted Batch Wt. (lb)	13 ft ³ Unadjusted Batch Wt. (lb)	1 yd ³ Unadjusted Batch Wt. (lb)	SSD Bulk Specific Gravity (g/cm ³)	Solids Content (wt%)	1 yd ³ Batch Volume (yd ³)	Remarks
Cement	Florida Rock	216.7	216.7	450	3.15		2.29	
Slag	SuperCem (FL Rock)	0.0	0.0		2.86			
Fly Ash	Boral Crystal River	0.0	0.0		2.24			
Water	Local	148.7	145.4	302	1.00		4.84	
Manufactured Sand		718.2	719.7	1494.7	2.643		9.06	1.4 lb water deficit
#89 Stone	Conrad Yelvington	329.3	329.9	685.1	2.594		4.23	0.5 lb water deficit
#7 Stone	Conrad Yelvington	448.4	449.8	934.2	2.613		5.73	1.4 lb water deficit
Air Entrainment	Vinsol Resin				1.03	12.00		
Admixture								
Admixture								
Corrosion Inhibitor								
Entrained Air							0.86	3.2 vol% air
TOTAL		1861.4	1861.4	3866.0			27.00	

Batching & Mixing

Mix Design By: _____

Weights By: _____

Mixing By: _____

Aggregate Moisture By: _____

Aggregate Moisture	Manufactured Sand	#89 Stone	#7 Stone
Wet Weight:		23.52	25.12
Dry Weight:		23.30	25.02
Moisture Content:	0.00	0.94	0.40

Plastic Properties

Slump (in):	2.75"	By: _____
Air (%):	3.5% w/o ACF	By: _____
Mix Temp (°F):	79°	By: _____
Air Temp (°F):		By: _____
Unit Weight (lb/ft ³):	142.96	By: _____

Initial Set (min):	By: _____
Final Set (min):	By: _____
Start Time:	_____
End Time:	_____
Workability:	_____

Trial Batch Worksheet - Calculations and Data Collection

(Saturated, Surface-dry Aggregates)

Batch Size (ft ³):	13.0	Batch Size (yd ³):	0.4815
Cement Content (lb/yd ³):	450	SSD Moisture (wt%)	
Target w/cm (lbs/lbs):	0.671	Manufactured Sand:	0.20
Coarse Agg. Grade:	#89 / #7	#89 Stone:	1.10
Target Air Content (%):	2.5 to 5.0	#7 Stone:	0.70
Target Slump (in):	3 to 4	Verified Moisture (wt%)	
FA / (FA+CA) (lb/lb):	0.476	Manufactured Sand:	0.00
FA / (Total) (ft ³ /ft ³):	0.335	#89 Stone:	0.94
CA / (Total) (ft ³ /ft ³):	0.369	#7 Stone:	0.40
(FA+CA) / (Total) (ft ³ /ft ³):	0.704		

Date: **June 29, 2010**
 Project: **NCHRP - Anchors**
 Product: **450 @ 0.67**
 Batch: **F-3**
 Company: _____
 Batch Size: **13.0 cubic feet**

Water Added (ml):		0.00
Water Withheld (ml):		0.00
Admixture Water (lb):		0.000
Actual w/cm (lb/lb):		0.671

Raw Material	Material Source / Mine	13 ft ³ Adjusted Batch Wt. (lb)	13 ft ³ Unadjusted Batch Wt. (lb)	1 yd ³ Unadjusted Batch Wt. (lb)	SSD Bulk Specific Gravity (g/cm ³)	Solids Content (wt%)	1 yd ³ Batch Volume (yd ³)	Remarks
Cement	Florida Rock	216.7	216.7	450	3.15		2.29	
Slag	SuperCem (FL Rock)	0.0	0.0		2.86			
Fly Ash	Boral Crystal River	0.0	0.0		2.24			
Water	Local	148.7	145.4	302	1.00		4.84	
Manufactured Sand		718.2	719.7	1494.7	2.643		9.06	1.4 lb water deficit
#89 Stone	Conrad Yelvington	329.3	329.9	685.1	2.594		4.23	0.5 lb water deficit
#7 Stone	Conrad Yelvington	448.4	449.8	934.2	2.613		5.73	1.4 lb water deficit
Air Entrainment	Vinsol Resin				1.03	12.00		
Admixture								
Admixture								
Corrosion Inhibitor								
Entrained Air							0.86	3.2 vol% air
TOTAL		1861.4	1861.4	3866.0			27.00	

Batching & Mixing

Mix Design By: _____
 Weights By: _____
 Mixing By: _____
 Aggregate Moisture By: _____

Aggregate Moisture	Manufactured Sand	#89 Stone	#7 Stone
Wet Weight:		23.52	25.12
Dry Weight:		23.30	25.02
Moisture Content:	0.00	0.94	0.40

Plastic Properties

Slump (in):	1.5"	By: _____
Air (%)	3.6% w/o ACF	By: _____
Mix Temp (°F):	80°	By: _____
Air Temp (°F):		By: _____
Unit Weight (lb/ft ³):	142.56	By: _____

Initial Set (min):	By: _____
Final Set (min):	By: _____
Start Time:	_____
End Time:	_____
Workability:	_____

Trial Batch Worksheet - Calculations and Data Collection

(Saturated, Surface-dry Aggregates)

Batch Size (ft ³):	13.0	Batch Size (yd ³):	0.4815
Cement Content (lb/yd ³):	450	SSD Moisture (wt%)	
Target w/cm (lbs/lbs):	0.671	Manufactured Sand:	0.20
Coarse Agg. Grade:	#89 / #7	#89 Stone:	1.10
Target Air Content (%):	2.5 to 5.0	#7 Stone:	0.70
Target Slump (in):	3 to 4	Verified Moisture (wt%)	
FA / (FA+CA) (lb/lb):	0.476	Manufactured Sand:	0.00
FA / (Total) (ft ³ /ft ³):	0.335	#89 Stone:	0.32
CA / (Total) (ft ³ /ft ³):	0.369	#7 Stone:	0.00
(FA+CA) / (Total) (ft ³ /ft ³):	0.704		

Date: **July 27, 2010**

Project: **NCHRP - Anchors**

Product: **450 @ 0.67**

Batch: **G-1**

Company: _____

Batch Size: **13.0 cubic feet**

Water Added (ml):		0.00
Water Withheld (ml):		0.00
Admixture Water (lb):		0.000
Actual w/cm (lb/lb):		0.671

Raw Material	Material Source / Mine	13 ft ³ Adjusted Batch Wt. (lb)	13 ft ³ Unadjusted Batch Wt. (lb)	1 yd ³ Unadjusted Batch Wt. (lb)	SSD Bulk Specific Gravity (g/cm ³)	Solids Content (wt%)	1 yd ³ Batch Volume (yd ³)	Remarks
Cement	Florida Rock	216.7	216.7	450	3.15		2.29	
Slag	SuperCem (FL Rock)	0.0	0.0		2.86			
Fly Ash	Boral Crystal River	0.0	0.0		2.24			
Water	Local	152.6	145.4	302	1.00		4.84	
Manufactured Sand		718.2	719.7	1494.7	2.643		9.06	1.4 lb water deficit
#89 Stone	Conrad Yelvington	327.3	329.9	685.1	2.594		4.23	2.6 lb water deficit
#7 Stone	Conrad Yelvington	446.7	449.8	934.2	2.613		5.73	3.1 lb water deficit
Air Entrainment	Vinsol Resin				1.03	12.00		
Admixture								
Admixture								
Corrosion Inhibitor								
Entrained Air							0.86	3.2 vol% air
TOTAL		1861.4	1861.4	3866.0			27.00	

Batching & Mixing

Mix Design By: _____

Weights By: _____

Mixing By: _____

Aggregate Moisture By: _____

Aggregate Moisture	Manufactured Sand	#89 Stone	#7 Stone
Wet Weight:		25.00	25.00
Dry Weight:		24.92	25.00
Moisture Content:	0.00	0.32	0.00

Plastic Properties

Slump (in):	3.25	By: _____
Air (%):	3.5 % w/o ACF	By: _____
Mix Temp (°F):	76	By: _____
Air Temp (°F):		By: _____
Unit Weight (lb/ft ³):	143.92	By: _____

Initial Set (min):	By: _____
Final Set (min):	By: _____
Start Time:	_____
End Time:	_____
Workability:	_____

Trial Batch Worksheet - Calculations and Data Collection

(Saturated, Surface-dry Aggregates)

Batch Size (ft ³):	13.0	Batch Size (yd ³):	0.4815
Cement Content (lb/yd ³):	450	SSD Moisture (wt%)	
Target w/cm (lbs/lbs):	0.671	Manufactured Sand:	0.20
Coarse Agg. Grade:	#89 / #7	#89 Stone:	1.10
Target Air Content (%):	2.5 to 5.0	#7 Stone:	0.70
Target Slump (in):	3 to 4	Verified Moisture (wt%)	
FA / (FA+CA) (lb/lb):	0.476	Manufactured Sand:	0.00
FA / (Total) (ft ³ /ft ³):	0.335	#89 Stone:	0.32
CA / (Total) (ft ³ /ft ³):	0.369	#7 Stone:	0.00
(FA+CA) / (Total) (ft ³ /ft ³):	0.704		

Date: **July 27, 2010**

Project: **NCHRP - Anchors**

Product: **450 @ 0.67**

Batch: **G-2**

Company: _____

Batch Size: **13.0 cubic feet**

Water Added (ml):		0.00
Water Withheld (ml):		0.00
Admixture Water (lb):		0.000
Actual w/cm (lb/lb):		0.671

Raw Material	Material Source / Mine	13 ft ³ Adjusted Batch Wt. (lb)	13 ft ³ Unadjusted Batch Wt. (lb)	1 yd ³ Unadjusted Batch Wt. (lb)	SSD Bulk Specific Gravity (g/cm ³)	Solids Content (wt%)	1 yd ³ Batch Volume (yd ³)	Remarks
Cement	Florida Rock	216.7	216.7	450	3.15		2.29	
Slag	SuperCem (FL Rock)	0.0	0.0		2.86			
Fly Ash	Boral Crystal River	0.0	0.0		2.24			
Water	Local	152.6	145.4	302	1.00		4.84	
Manufactured Sand		718.2	719.7	1494.7	2.643		9.06	1.4 lb water deficit
#89 Stone	Conrad Yelvington	327.3	329.9	685.1	2.594		4.23	2.6 lb water deficit
#7 Stone	Conrad Yelvington	446.7	449.8	934.2	2.613		5.73	3.1 lb water deficit
Air Entrainment	Vinsol Resin				1.03	12.00		
Admixture								
Admixture								
Corrosion Inhibitor								
Entrained Air							0.86	3.2 vol% air
TOTAL		1861.4	1861.4	3866.0			27.00	

Batching & Mixing

Mix Design By: _____

Weights By: _____

Mixing By: _____

Aggregate Moisture By: _____

Aggregate Moisture	Manufactured Sand	#89 Stone	#7 Stone
Wet Weight:		25.00	25.00
Dry Weight:		24.92	25.00
Moisture Content:	0.00	0.32	0.00

Plastic Properties

Slump (in):	1.75	By: _____
Air (%):	3.7 % w/o ACF	By: _____
Mix Temp (°F):	78	By: _____
Air Temp (°F):		By: _____
Unit Weight (lb/ft ³):	144.56	By: _____

Initial Set (min):	By: _____
Final Set (min):	By: _____
Start Time:	_____
End Time:	_____
Workability:	_____

Trial Batch Worksheet - Calculations and Data Collection

(Saturated, Surface-dry Aggregates)

Batch Size (ft ³):	13.0	Batch Size (yd ³):	0.4815
Cement Content (lb/yd ³):	450	SSD Moisture (wt%)	
Target w/cm (lbs/lbs):	0.671	Manufactured Sand:	0.20
Coarse Agg. Grade:	#89 / #7	#89 Stone:	1.10
Target Air Content (%):	2.5 to 5.0	#7 Stone:	0.70
Target Slump (in):	3 to 4	Verified Moisture (wt%)	
FA / (FA+CA) (lb/lb):	0.476	Manufactured Sand:	0.00
FA / (Total) (ft ³ /ft ³):	0.335	#89 Stone:	0.32
CA / (Total) (ft ³ /ft ³):	0.369	#7 Stone:	0.00
(FA+CA) / (Total) (ft ³ /ft ³):	0.704		

Date: **July 27, 2010**
 Project: **NCHRP - Anchors**
 Product: **450 @ 0.67**
 Batch: **G-3**
 Company: _____
 Batch Size: **13.0 cubic feet**

Water Added (ml):		0.00
Water Withheld (ml):		0.00
Admixture Water (lb):		0.000
Actual w/cm (lb/lb):		0.671

Raw Material	Material Source / Mine	13 ft ³ Adjusted Batch Wt. (lb)	13 ft ³ Unadjusted Batch Wt. (lb)	1 yd ³ Unadjusted Batch Wt. (lb)	SSD Bulk Specific Gravity (g/cm ³)	Solids Content (wt%)	1 yd ³ Batch Volume (yd ³)	Remarks
Cement	Florida Rock	216.7	216.7	450	3.15		2.29	
Slag	SuperCem (FL Rock)	0.0	0.0		2.86			
Fly Ash	Boral Crystal River	0.0	0.0		2.24			
Water	Local	152.6	145.4	302	1.00		4.84	
Manufactured Sand		718.2	719.7	1494.7	2.643		9.06	1.4 lb water deficit
#89 Stone	Conrad Yelvington	327.3	329.9	685.1	2.594		4.23	2.6 lb water deficit
#7 Stone	Conrad Yelvington	446.7	449.8	934.2	2.613		5.73	3.1 lb water deficit
Air Entrainment	Vinsol Resin				1.03	12.00		
Admixture								
Admixture								
Corrosion Inhibitor								
Entrained Air							0.86	3.2 vol% air
TOTAL		1861.4	1861.4	3866.0			27.00	

Batching & Mixing

Mix Design By: _____
 Weights By: _____
 Mixing By: _____
 Aggregate Moisture By: _____

Aggregate Moisture	Manufactured Sand	#89 Stone	#7 Stone
Wet Weight:		25.00	25.00
Dry Weight:		24.92	25.00
Moisture Content:	0.00	0.32	0.00

Plastic Properties

Slump (in):	2.5	By: _____
Air (%):	3.5 % w/o ACF	By: _____
Mix Temp (°F):	79	By: _____
Air Temp (°F):		By: _____
Unit Weight (lb/ft ³):	144.8	By: _____

Initial Set (min):	By: _____
Final Set (min):	By: _____
Start Time:	_____
End Time:	_____
Workability:	_____

Trial Batch Worksheet - Calculations and Data Collection

(Saturated, Surface-dry Aggregates)

Batch Size (ft ³):	15.0	Batch Size (yd ³):	0.5556
Cement Content (lb/yd ³):	450	SSD Moisture (wt%)	
Target w/cm (lbs/lbs):	0.650	Manufactured Sand:	0.20
Coarse Agg. Grade:	#89 / #7	#89 Stone:	1.10
Target Air Content (%):	2.5 to 5.0	#7 Stone:	0.70
Target Slump (in):	3 to 4	Verified Moisture (wt%)	
FA / (FA+CA) (lb/lb):	0.477	Manufactured Sand:	0.00
FA / (Total) (ft ³ /ft ³):	0.335	#89 Stone:	1.05
CA / (Total) (ft ³ /ft ³):	0.368	#7 Stone:	0.48
(FA+CA) / (Total) (ft ³ /ft ³):	0.703		

Date: **August 3, 2010**

Project: **NCHRP - Anchors**

Product: **450 Fly Ash @ 0.65**

Batch: **H-1**

Company: _____

Batch Size: **15.0 cubic feet**

Water Added (ml):	0 ml	0.00 lb
Water Withheld (ml):	0 ml	0.00 lb
Admixture Water (lb):	0.000	
Actual w/cm (lb/lb):	0.650	

Raw Material	Material Source / Mine	15 ft ³ Adjusted Batch Wt. (lb)	15 ft ³ Unadjusted Batch Wt. (lb)	1 yd ³ Unadjusted Batch Wt. (lb)	SSD Bulk Specific Gravity (g/cm ³)	Solids Content (wt%)	1 yd ³ Batch Volume (yd ³)	Remarks
Cement	Florida Rock	200.0	200.0	360.0	3.15		1.83	
Slag	SuperCem (FL Rock)	0.0	0.0	0.0	2.86			
Fly Ash	Boral Crystal River	50.0	50.0	90	2.24		0.64	
Water	Local	165.5	162.5	292.5	1.00		4.69	
Manufactured Sand		827.8	829.4	1493.0	2.643		9.05	1.7 lb water deficit
#89 Stone	Conrad Yelvington	379.3	379.4	683.0	2.594		4.22	0.2 lb water deficit
#7 Stone	Conrad Yelvington	516.7	517.8	932.0	2.613		5.71	1.1 lb water deficit
Air Entrainer								
Admixture								
Admixture								
Corrosion Inhibitor								
Entrained Air							0.86	3.2 vol% air
TOTAL		2139.2	2139.2	3850.5			27.00	

Batching & Mixing

Mix Design By: _____

Weights By: _____

Mixing By: _____

Aggregate Moisture By: _____

Aggregate Moisture	Manufactured Sand	#89 Stone	#7 Stone
Wet Weight:		25.00	25.00
Dry Weight:		24.74	24.88
Moisture Content:	0.00	1.05	0.48

Plastic Properties	Value	Operator
Slump (in):	1.25 in	
Air (%):	3.0 % w/o ACF	
Mix Temp (°F):	93.0 °F	
Air Temp (°F):		
Unit Weight (lb/ft ³):	143.04 lb/ft ³	

	Value	Operator
Initial Set (min):		
Final Set (min):		
Start Time:		
End Time:		
Workability:		

Trial Batch Worksheet - Calculations and Data Collection

(Saturated, Surface-dry Aggregates)

Batch Size (ft ³):	15.0	Batch Size (yd ³):	0.5556
Cement Content (lb/yd ³):	450	SSD Moisture (wt%)	
Target w/cm (lbs/lbs):	0.650	Manufactured Sand:	0.20
Coarse Agg. Grade:	#89 / #7	#89 Stone:	1.10
Target Air Content (%):	2.5 to 5.0	#7 Stone:	0.70
Target Slump (in):	3 to 4	Verified Moisture (wt%)	
FA / (FA+CA) (lb/lb):	0.477	Manufactured Sand:	0.00
FA / (Total) (ft ³ /ft ³):	0.335	#89 Stone:	1.05
CA / (Total) (ft ³ /ft ³):	0.368	#7 Stone:	0.48
(FA+CA) / (Total) (ft ³ /ft ³):	0.703		

Date: **August 3, 2010**
 Project: **NCHRP - Anchors**
 Product: **450 Fly Ash @ 0.65**
 Batch: **H-2**
 Company: _____
 Batch Size: **15.0 cubic feet**

Water Added (ml):	0 ml	0.00 lb
Water Withheld (ml):	0 ml	0.00 lb
Admixture Water (lb):	0.000	
Actual w/cm (lb/lb):	0.650	

Raw Material	Material Source / Mine	15 ft ³ Adjusted Batch Wt. (lb)	15 ft ³ Unadjusted Batch Wt. (lb)	1 yd ³ Unadjusted Batch Wt. (lb)	SSD Bulk Specific Gravity (g/cm ³)	Solids Content (wt%)	1 yd ³ Batch Volume (yd ³)	Remarks
Cement	Florida Rock	200.0	200.0	360.0	3.15		1.83	
Slag	SuperCem (FL Rock)	0.0	0.0	0.0	2.86			
Fly Ash	Boral Crystal River	50.0	50.0	90	2.24		0.64	
Water	Local	165.5	162.5	292.5	1.00		4.69	
Manufactured Sand		827.8	829.4	1493.0	2.643		9.05	1.7 lb water deficit
#89 Stone	Conrad Yelvington	379.3	379.4	683.0	2.594		4.22	0.2 lb water deficit
#7 Stone	Conrad Yelvington	516.7	517.8	932.0	2.613		5.71	1.1 lb water deficit
Air Entrainer								
Admixture								
Admixture								
Corrosion Inhibitor								
Entrained Air							0.86	3.2 vol% air
TOTAL		2139.2	2139.2	3850.5			27.00	

Batching & Mixing

Mix Design By: _____
 Weights By: _____
 Mixing By: _____
 Aggregate Moisture By: _____

Aggregate Moisture	Manufactured Sand	#89 Stone	#7 Stone
Wet Weight:		25.00	25.00
Dry Weight:		24.74	24.88
Moisture Content:	0.00	1.05	0.48

Plastic Properties	Value	Operator
Slump (in):	1.25 in	
Air (%):	3.2 % w/o ACF	
Mix Temp (°F):	81.0 °F	
Air Temp (°F):		
Unit Weight (lb/ft ³):	143.52 lb/ft ³	

	Value	Operator
Initial Set (min):		
Final Set (min):		
Start Time:		
End Time:		
Workability:		

Trial Batch Worksheet - Calculations and Data Collection

(Saturated, Surface-dry Aggregates)

Batch Size (ft ³):	15.0	Batch Size (yd ³):	0.5556
Cement Content (lb/yd ³):	450	SSD Moisture (wt%)	
Target w/cm (lbs/lbs):	0.650	Manufactured Sand:	0.20
Coarse Agg. Grade:	#89 / #7	#89 Stone:	1.10
Target Air Content (%):	2.5 to 5.0	#7 Stone:	0.70
Target Slump (in):	3 to 4	Verified Moisture (wt%)	
FA / (FA+CA) (lb/lb):	0.477	Manufactured Sand:	0.00
FA / (Total) (ft ³ /ft ³):	0.335	#89 Stone:	1.05
CA / (Total) (ft ³ /ft ³):	0.368	#7 Stone:	0.48
(FA+CA) / (Total) (ft ³ /ft ³):	0.703		

Date: **August 3, 2010**
 Project: **NCHRP - Anchors**
 Product: **450 Fly Ash @ 0.65**
 Batch: **H-3**
 Company: _____
 Batch Size: **15.0 cubic feet**

Water Added (ml):	0 ml	0.00 lb
Water Withheld (ml):	0 ml	0.00 lb
Admixture Water (lb):	0.000	
Actual w/cm (lb/lb):	0.650	

Raw Material	Material Source / Mine	15 ft ³ Adjusted Batch Wt. (lb)	15 ft ³ Unadjusted Batch Wt. (lb)	1 yd ³ Unadjusted Batch Wt. (lb)	SSD Bulk Specific Gravity (g/cm ³)	Solids Content (wt%)	1 yd ³ Batch Volume (yd ³)	Remarks
Cement	Florida Rock	200.0	200.0	360.0	3.15		1.83	
Slag	SuperCem (FL Rock)	0.0	0.0	0.0	2.86			
Fly Ash	Boral Crystal River	50.0	50.0	90	2.24		0.64	
Water	Local	165.5	162.5	292.5	1.00		4.69	
Manufactured Sand		827.8	829.4	1493.0	2.643		9.05	1.7 lb water deficit
#89 Stone	Conrad Yelvington	379.3	379.4	683.0	2.594		4.22	0.2 lb water deficit
#7 Stone	Conrad Yelvington	516.7	517.8	932.0	2.613		5.71	1.1 lb water deficit
Air Entrainer								
Admixture								
Admixture								
Corrosion Inhibitor								
Entrained Air							0.86	3.2 vol% air
TOTAL		2139.2	2139.2	3850.5			27.00	

Batching & Mixing

Mix Design By: _____
 Weights By: _____
 Mixing By: _____
 Aggregate Moisture By: _____

Aggregate Moisture	Manufactured Sand	#89 Stone	#7 Stone
Wet Weight:		25.00	25.00
Dry Weight:		24.74	24.88
Moisture Content:	0.00	1.05	0.48

Plastic Properties

	Value	Operator
Slump (in):	1.25 in	
Air (%):	3.0 % w/o ACF	
Mix Temp (°F):	78.0 °F	
Air Temp (°F):		
Unit Weight (lb/ft ³):	143.84 lb/ft ³	

	Value	Operator
Initial Set (min):		
Final Set (min):		
Start Time:		
End Time:		
Workability:		

Trial Batch Worksheet - Calculations and Data Collection

(Saturated, Surface-dry Aggregates)

Batch Size (ft ³):	15.0	Batch Size (yd ³):	0.5556
Cement Content (lb/yd ³):	450	SSD Moisture (wt%)	
Target w/cm (lbs/lbs):	0.650	Manufactured Sand:	0.20
Coarse Agg. Grade:	#89 / #7	#89 Stone:	1.10
Target Air Content (%):	2.5 to 5.0	#7 Stone:	0.70
Target Slump (in):	3 to 4	Verified Moisture (wt%)	
FA / (FA+CA) (lb/lb):	0.477	Manufactured Sand:	0.00
FA / (Total) (ft ³ /ft ³):	0.336	#89 Stone:	0.16
CA / (Total) (ft ³ /ft ³):	0.369	#7 Stone:	0.24
(FA+CA) / (Total) (ft ³ /ft ³):	0.706		

Date: **August 10, 2010**
 Project: **NCHRP - Anchors**
 Product: **450 Fly Ash @ 0.65**
 Batch: **I-1 Slag**
 Company: _____
 Batch Size: **15.0 cubic feet**

Water Added (ml):	0 ml	0.00 lb
Water Withheld (ml):	0 ml	0.00 lb
Admixture Water (lb):	0.000	
Actual w/cm (lb/lb):	0.650	

Raw Material	Material Source / Mine	15 ft ³ Adjusted Batch Wt. (lb)	15 ft ³ Unadjusted Batch Wt. (lb)	1 yd ³ Unadjusted Batch Wt. (lb)	SSD Bulk Specific Gravity (g/cm ³)	Solids Content (wt%)	1 yd ³ Batch Volume (yd ³)	Remarks
Cement	Florida Rock	125.0	125.0	225.0	3.15		1.14	
Slag	SuperCem (FL Rock)	125.0	125.0	225.0	2.86		1.26	
Fly Ash	Boral Crystal River	0.0	0.0	0.0	2.24			
Water	Local	170.1	162.5	292.5	1.00		4.69	
Manufactured Sand		830.6	832.2	1498.0	2.643		9.08	1.7 lb water deficit
#89 Stone	Conrad Yelvington	377.5	381.1	686.0	2.594		4.24	3.6 lb water deficit
#7 Stone	Conrad Yelvington	517.1	519.4	935.0	2.613		5.73	2.4 lb water deficit
Air Entrainer								
Admixture								
Admixture								
Corrosion Inhibitor								
Entrained Air							0.86	3.2 vol% air
TOTAL		2145.3	2145.3	3861.5			27.00	

Batching & Mixing

Mix Design By: _____
 Weights By: _____
 Mixing By: _____
 Aggregate Moisture By: _____

Aggregate Moisture	Manufactured Sand	#89 Stone	#7 Stone
Wet Weight:		25.00	25.00
Dry Weight:		24.96	24.94
Moisture Content:	0.00	0.16	0.24

Plastic Properties	Value	Operator
Slump (in):	1.50 in	
Air (%):	3.5 % w/o ACF	
Mix Temp (°F):	76.0 °F	
Air Temp (°F):		
Unit Weight (lb/ft ³):	143.16 lb/ft ³	

	Value	Operator
Initial Set (min):		
Final Set (min):		
Start Time:		
End Time:		
Workability:		

Trial Batch Worksheet - Calculations and Data Collection

(Saturated, Surface-dry Aggregates)

Batch Size (ft ³):	15.0	Batch Size (yd ³):	0.5556
Cement Content (lb/yd ³):	450	SSD Moisture (wt%)	
Target w/cm (lbs/lbs):	0.650	Manufactured Sand:	0.20
Coarse Agg. Grade:	#89 / #7	#89 Stone:	1.10
Target Air Content (%):	2.5 to 5.0	#7 Stone:	0.70
Target Slump (in):	3 to 4	Verified Moisture (wt%)	
FA / (FA+CA) (lb/lb):	0.477	Manufactured Sand:	0.00
FA / (Total) (ft ³ /ft ³):	0.336	#89 Stone:	0.16
CA / (Total) (ft ³ /ft ³):	0.369	#7 Stone:	0.24
(FA+CA) / (Total) (ft ³ /ft ³):	0.706		

Date: **August 10, 2010**
 Project: **NCHRP - Anchors**
 Product: **450 Fly Ash @ 0.65**
 Batch: **I-2 Slag**
 Company: _____
 Batch Size: **15.0 cubic feet**

Water Added (ml):	0 ml	0.00 lb
Water Withheld (ml):	0 ml	0.00 lb
Admixture Water (lb):	0.000	
Actual w/cm (lb/lb):	0.650	

Raw Material	Material Source / Mine	15 ft ³ Adjusted Batch Wt. (lb)	15 ft ³ Unadjusted Batch Wt. (lb)	1 yd ³ Unadjusted Batch Wt. (lb)	SSD Bulk Specific Gravity (g/cm ³)	Solids Content (wt%)	1 yd ³ Batch Volume (yd ³)	Remarks
Cement	Florida Rock	125.0	125.0	225.0	3.15		1.14	
Slag	SuperCem (FL Rock)	125.0	125.0	225.0	2.86		1.26	
Fly Ash	Boral Crystal River	0.0	0.0	0.0	2.24			
Water	Local	170.1	162.5	292.5	1.00		4.69	
Manufactured Sand		830.6	832.2	1498.0	2.643		9.08	1.7 lb water deficit
#89 Stone	Conrad Yelvington	377.5	381.1	686.0	2.594		4.24	3.6 lb water deficit
#7 Stone	Conrad Yelvington	517.1	519.4	935.0	2.613		5.73	2.4 lb water deficit
Air Entrainer								
Admixture								
Admixture								
Corrosion Inhibitor								
Entrained Air							0.86	3.2 vol% air
TOTAL		2145.3	2145.3	3861.5			27.00	

Batching & Mixing

Mix Design By: _____
 Weights By: _____
 Mixing By: _____
 Aggregate Moisture By: _____

Aggregate Moisture	Manufactured Sand	#89 Stone	#7 Stone
Wet Weight:		25.00	25.00
Dry Weight:		24.96	24.94
Moisture Content:	0.00	0.16	0.24

Plastic Properties	Value	Operator
Slump (in):	1.00 in	
Air (%):	3.5 % w/o ACF	
Mix Temp (°F):	77.0 °F	
Air Temp (°F):		
Unit Weight (lb/ft ³):	142.48 lb/ft ³	

	Value	Operator
Initial Set (min):		
Final Set (min):		
Start Time:		
End Time:		
Workability:		

Trial Batch Worksheet - Calculations and Data Collection

(Saturated, Surface-dry Aggregates)

Batch Size (ft ³):	15.0	Batch Size (yd ³):	0.5556
Cement Content (lb/yd ³):	450	SSD Moisture (wt%)	
Target w/cm (lbs/lbs):	0.650	Manufactured Sand:	0.20
Coarse Agg. Grade:	#89 / #7	#89 Stone:	1.10
Target Air Content (%):	2.5 to 5.0	#7 Stone:	0.70
Target Slump (in):	3 to 4	Verified Moisture (wt%)	
FA / (FA+CA) (lb/lb):	0.477	Manufactured Sand:	0.00
FA / (Total) (ft ³ /ft ³):	0.336	#89 Stone:	0.16
CA / (Total) (ft ³ /ft ³):	0.369	#7 Stone:	0.24
(FA+CA) / (Total) (ft ³ /ft ³):	0.706		

Date: **August 10, 2010**
 Project: **NCHRP - Anchors**
 Product: **450 Fly Ash @ 0.65**
 Batch: **I-3 Slag**
 Company: _____
 Batch Size: **15.0 cubic feet**

Water Added (ml):	0 ml	0.00 lb
Water Withheld (ml):	0 ml	0.00 lb
Admixture Water (lb):	0.000	
Actual w/cm (lb/lb):	0.650	

Raw Material	Material Source / Mine	15 ft ³ Adjusted Batch Wt. (lb)	15 ft ³ Unadjusted Batch Wt. (lb)	1 yd ³ Unadjusted Batch Wt. (lb)	SSD Bulk Specific Gravity (g/cm ³)	Solids Content (wt%)	1 yd ³ Batch Volume (yd ³)	Remarks
Cement	Florida Rock	125.0	125.0	225.0	3.15		1.14	
Slag	SuperCem (FL Rock)	125.0	125.0	225.0	2.86		1.26	
Fly Ash	Boral Crystal River	0.0	0.0	0.0	2.24			
Water	Local	170.1	162.5	292.5	1.00		4.69	
Manufactured Sand		830.6	832.2	1498.0	2.643		9.08	1.7 lb water deficit
#89 Stone	Conrad Yelvington	377.5	381.1	686.0	2.594		4.24	3.6 lb water deficit
#7 Stone	Conrad Yelvington	517.1	519.4	935.0	2.613		5.73	2.4 lb water deficit
Air Entrainer								
Admixture								
Admixture								
Corrosion Inhibitor								
Entrained Air							0.86	3.2 vol% air
TOTAL		2145.3	2145.3	3861.5			27.00	

Batching & Mixing

Mix Design By: _____
 Weights By: _____
 Mixing By: _____
 Aggregate Moisture By: _____

Aggregate Moisture	Manufactured Sand	#89 Stone	#7 Stone
Wet Weight:		25.00	25.00
Dry Weight:		24.96	24.94
Moisture Content:	0.00	0.16	0.24

Plastic Properties	Value	Operator
Slump (in):	1.25 in	
Air (%):	3.3 % w/o ACF	
Mix Temp (°F):	76.0 °F	
Air Temp (°F):		
Unit Weight (lb/ft ³):	142.72 lb/ft ³	

	Value	Operator
Initial Set (min):		
Final Set (min):		
Start Time:		
End Time:		
Workability:		



FLORIDA ROCK INDUSTRIES INC

North Central Division

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1005 Kissimmee Street, Tallahassee, FL (850) 576-4141

1215 Wyandotte Drive, Albany, GA (229) 434-4769

GENERAL MIX DESIGNS

March 24, 2011

Re: UF CIVIL ENGINEERING DEPT.

Attn: Todd Davis

Enclosed please find the following for your approval:

<u>Product</u>	<u>Strength</u>	<u>Description</u>
JD52AC	5000 psi	@ 5000 PSI UF SPECIAL

Please direct inquiries or replies to:

Gene Engle

The recipient acknowledges and confirms that this information is confidential and is being disclosed to the recipient for purposes of review only. By accepting this information, the recipient agrees:

- to maintain this information in confidence at all times;
- to not disclose this information, in whole or in part, by way of summary or analysis, to anyone except as explicitly agreed to by Florida Rock Industries, Inc.

Florida Rock Industries, Inc. has no knowledge or authority regarding placement location of the above mix designs. It is the responsibility of the engineer/architect and/or contractor to determine that the above mix designs are in compliance with all applicable building codes and standards for all properties, environments and uses.

ACI 302.1 recommends that an air-entrainment not be used when a smooth, dense, hard-troweled finish is desired.

Contractor assumes responsibility for ordering and placing by Mix Number, as approved by the engineer/architect. Changes in mix properties may require a change in the Mix Number.

By accepting this information, the recipient agrees to insure copies of the test results are supplied to Florida Rock Industries, Inc. as soon as they become available.



GENERAL MIX DESIGNS

March 24, 2011

Re: UF CIVIL ENGINEERING DEPT.

Concrete Mixtures

			Mixture Proportions †
Mix Number			JD52AC
Strength (psi)			5000
W/C Ratio			.41
Slump (in)			4 +/- 1"
Air Content (%)			5.0 +/- 1.0
Plastic Unit Weight (lbs/cf)			143.4 +/- 1.5
Material	ASTM	Type	
Cement	C 150	II	520
Cement	C 618	F ASH	130
Water	--	--	267
Fine Aggregate	C 33	Sand	1085
AGGREGATE	C 33	#57GRANIT	1868
Admixture	C 260	AIR	‡
Admixture	C 494	W/Reducer	‡

† quantities may vary in accordance with ACI 301 4.2.3.6.a & 4.2.3.6.b, ACI 318 5.6.3.4 and ASTM C 94.

‡ admixture dosage rates in accordance with manufactures recommendations.

The recipient acknowledges and confirms that this information is confidential and is being disclosed to the recipient for purposes of review only. By accepting this information, the recipient agrees:

- to maintain this information in confidence at all times;
- to not disclose this information, in whole or in part, by way of summary or analysis, to anyone except as explicitly agreed to by Florida Rock Industries, Inc.

Concrete mixtures were developed based on the specifications, written and/or verbal, as supplied to Florida Rock Industries, Inc. for the referenced project.

Florida Rock Industries, Inc. can be responsible for concrete strength only:

- if sampling, specimen molding, curing and testing of specimens are done by certified personnel and an accredited laboratory;
- if testing conforms with applicable ASTM standards (ASTM C 31, C 39, C 94 and C 1077) for Standard Cured specimens under ASTM C 31;
- if the maximum slump and air content are not exceeded;
- if we are supplied a copy of all test results as they become available.

Florida Rock Industries, Inc. is not responsible for concrete strength as tested by Field Cured specimens under ASTM C 31 or results of testing in accordance with ASTM C 42. If core results are equal to or greater than 75% of f'c, Florida Rock Industries, Inc. v

University of Stuttgart Concrete Mix Design

Concrete mix design of mix US-A:

Cement:	kg/m ³	lbs/CY
CEM I 32,5 R	240	405
Aggregate (according to EN 12620):		
0 - 2 mm	797	1343
2 - 8 mm	502	846
8 - 16 mm	742	1251
Water (aggregate moisture + water):		
Total	173	291
w/c:	0.718	



Concrete mix design of mix US-B:




Cement:	kg/m ³	lbs/CY
CEM I 32,5 R	239	403
Aggregate (according to EN 12620):		
0 - 2 mm	785	1323
2 - 8 mm	504	850
8 - 16 mm	747	1259
Water (aggregate moisture + water):		
Total	180	303
w/c:	0.753	




ADHESIVE ANCHOR POST-TEST SPLIT-CORE INVESTIGATIONS

Following anchor failure several of the anchors were cored from their concrete specimen using a Cincinnati-Bickford core machine and a 2.5" core bit. The cores were then saw-cut along their length on opposing sides to the depth of the steel anchor. The sawn cores were then split open with a wide chisel and hammer.




The discussion lists the specimen name, test description, and whether it failed or was terminated. The load, time, and displacement values are the recordings at failure or when the test was terminated.




Split Core Photo	Discussion
	<p>01-A-76-4 Baseline A</p> <p>Failure Load = 76% mean static load Time = 0.17 hours Displacement = 0.074 in</p> <p>Failure mode:</p> <ul style="list-style-type: none">• Concrete-adhesive bond failure• Anchor detached from both sides of split core
	<p>01-A-68-5 Baseline A</p> <p>Failure Load = 68% mean static load Time = 0.14 hours Displacement = 0.059 in</p> <p>Failure mode:</p> <ul style="list-style-type: none">• Concrete-adhesive bond failure• Anchor attached to one side of split core

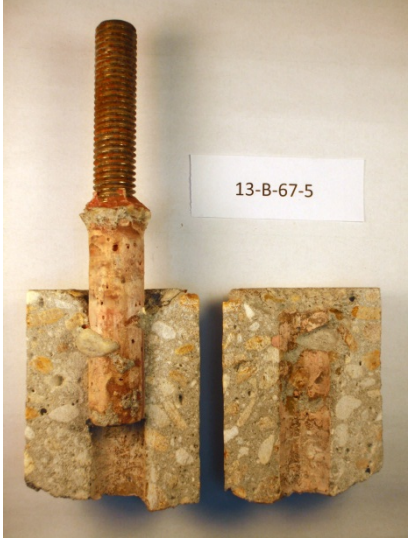

Split Core Photo	Discussion
	<p>01-A-57-6 Baseline A</p> <p>Failure Load = 57% mean static load Time = 36 hours Displacement = 0.070 in</p> <p>Failure mode:</p> <ul style="list-style-type: none"> • Adhesive shearing failure at threads • Anchor attached to one side of split core
	<p>01-A-57-8 Baseline A</p> <p>Failure Load = 57% mean static load Time = 55 hours Displacement = 0.050 in</p> <p>Failure mode:</p> <ul style="list-style-type: none"> • Creep of epoxy • Anchor attached to one side of split core
	<p>01-B-68-8 Baseline B</p> <p>Failed during loading Load = 68% mean static load Time = 0.02 hours Displacement = 0.073 in</p> <p>Failure mode:</p> <ul style="list-style-type: none"> • Adhesive/anchor plug slipped in hole and stopped due to friction and reduction of load • Adhesive reattached and concrete fractured at splitting • Anchor attached to one side of split core

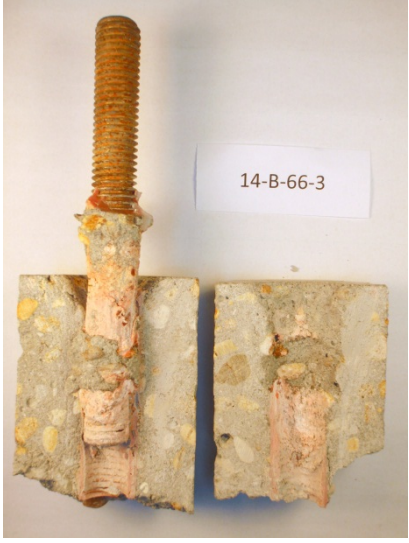
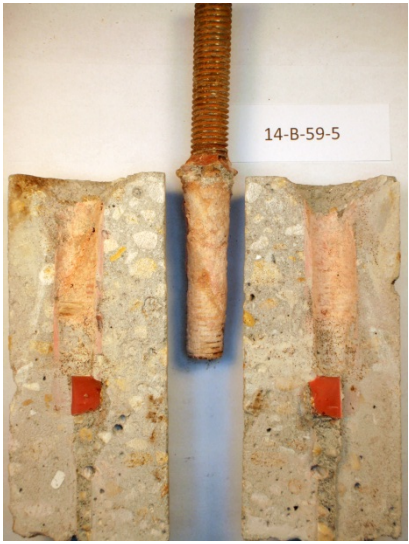

Split Core Photo	Discussion
 <p>01-B-55-11</p>	<p>01-B-55-11 Baseline B</p> <p>Terminated Load = 55% mean static load Time = 13,198 hours Displacement = 0.106 in</p> <p>Description:</p> <ul style="list-style-type: none"> Fracture of concrete when splitting core
 <p>01-B-45-14</p>	<p>01-B-45-14 Baseline B</p> <p>Terminated Load = 45% mean static load Time = 10,751 hours Displacement = 0.071 in</p> <p>Description:</p> <ul style="list-style-type: none"> Fracture of concrete when splitting core
 <p>01-B-44-15</p>	<p>01-B-44-15 Baseline B</p> <p>Terminated Load = 44% mean static load Time = 10,751 hours Displacement = 0.078 in</p> <p>Description:</p> <ul style="list-style-type: none"> Fracture of concrete when splitting core


Split Core Photo	Discussion
	<p>01-C-44-13 Baseline C</p> <p>Terminated Load = 44% mean static load Time = 10,752 hours Displacement = 0.081 in</p> <p>Description:</p> <ul style="list-style-type: none"> • Creep of epoxy • Separation of adhesive from steel when splitting core • Anchor attached to one side of split core
	<p>01-C-44-14 Baseline C</p> <p>Terminated Load = 44% mean static load Time = 10,752 hours Displacement = 0.085 in</p> <p>Description:</p> <ul style="list-style-type: none"> • Creep of epoxy • Separation of adhesive from steel when splitting core • Anchor attached to one side of split core
	<p>12-A-70-3 DOT Mix</p> <p>Failure Load = 70% mean static load Time = 26 hours Displacement = 0.045 in</p> <p>Failure mode:</p> <ul style="list-style-type: none"> • Adhesive shearing failure at threads • Anchor attached to one side of split core



Split Core Photo	Discussion
 <p>12-A-64-5</p>	<p>12-A-64-5 DOT Mix</p> <p>Failure Load = 64% mean static load Time = 2.8 hours Displacement = 0.173 in</p> <p>Failure mode:</p> <ul style="list-style-type: none"> • Mixed - Concrete-adhesive failure • Mixed - Adhesive shearing failure at threads • Anchor attached to one side of split core
 <p>12-A-61-6</p>	<p>12-A-61-6 DOT Mix</p> <p>Failed during loading Load = 61% mean static load Time = 0.10 hours Displacement = 0.249 in</p> <p>Failure mode:</p> <ul style="list-style-type: none"> • Concrete-adhesive failure (predominate) • Adhesive shearing failure at threads in lower 0.6in of anchor • Anchor attached to one side of split core
 <p>12-A-60-7</p>	<p>12-A-60-7 DOT Mix</p> <p>Failure Load = 60% mean static load Time = 0.23 hours Displacement = 0.040 in</p> <p>Failure mode:</p> <ul style="list-style-type: none"> • Concrete-adhesive failure • Anchor attached to one side of split core


Split Core Photo	Discussion
	<p>12-A-57-9 DOT Mix</p> <p>Failure Load = 57% mean static load Time = 193 hours Displacement = 0.080 in</p> <p>Failure mode:</p> <ul style="list-style-type: none"> • Adhesive/anchor plug slipped in hole and stopped due to friction and reduction of load • Adhesive reattached and threads exposed at splitting • Anchor detached from both sides of split core
	<p>13-B-72-1 Core drill</p> <p>Failure Load = 72% mean static load Time = 0.08 hours Displacement = 0.139 in</p> <p>Failure mode:</p> <ul style="list-style-type: none"> • Adhesive/anchor plug slipped in hole and stopped due to friction and reduction of load • Portions of adhesive fractured within bond line • Adhesive reattached and threads exposed at splitting • Anchor attached to one side of split core
	<p>13-B-68-3 Core drill</p> <p>Failure Load = 68% mean static load Time = 0.03 hours Displacement = 0.053 in</p> <p>Failure mode:</p> <ul style="list-style-type: none"> • Adhesive/anchor plug slipped in hole and stopped due to friction and reduction of load • Portions of adhesive fractured within bond line • Adhesive reattached and concrete and adhesive fractured at splitting • Anchor attached to one side of split core

Split Core Photo	Discussion
	<p>13-B-67-5 Core drill</p> <p>Failure Load = 67% mean static load Time = 0.16 hours Displacement = 0.069 in</p> <p>Failure mode:</p> <ul style="list-style-type: none"> • Concrete-adhesive failure • Anchor attached to one side of split core
	<p>13-B-57-6 Core drill</p> <p>Failure Load = 57% mean static load Time = 21 hours Displacement = 0.171 in</p> <p>Failure mode:</p> <ul style="list-style-type: none"> • Concrete-adhesive failure • Anchor attached to one side of split core
	<p>14-B-70-1 Fly ash</p> <p>Failure Load = 70% mean static load Time = 60 hours Displacement = 0.134 in</p> <p>Failure mode:</p> <ul style="list-style-type: none"> • Concrete-adhesive failure • Cracking within adhesive • Anchor attached to one side of split core

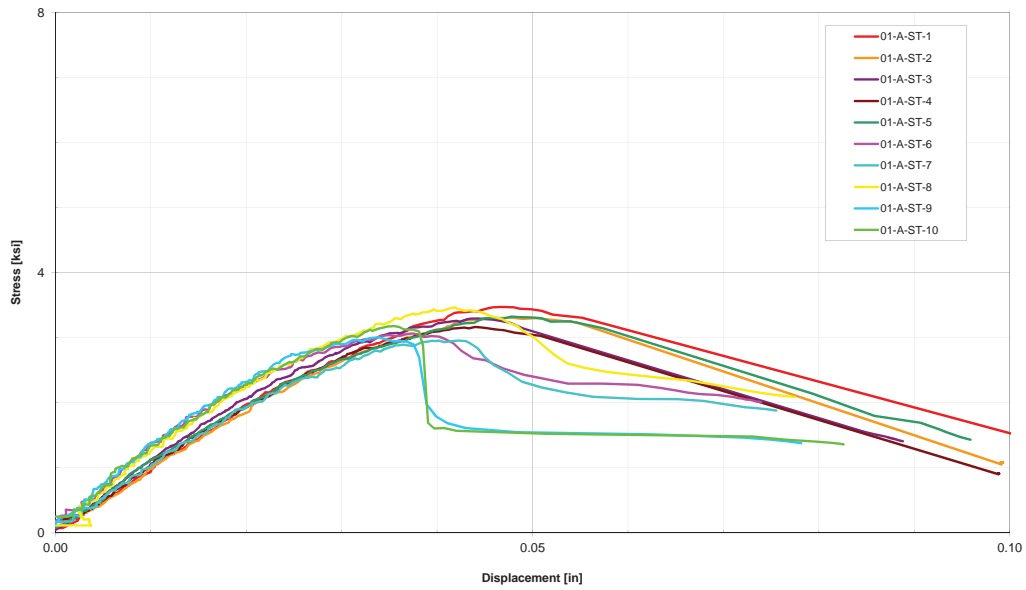
Split Core Photo	Discussion
	<p>14-B-66-3 Fly ash</p> <p>Failure Load = 66% mean static load Time = 5 hours Displacement = 0.122 in</p> <p>Failure mode:</p> <ul style="list-style-type: none"> • Adhesive/anchor plug slipped in hole and stopped due to friction and reduction of load • Adhesive reattached and concrete fractured at splitting • Anchor attached to one side of split core
	<p>14-B-59-5 Fly ash</p> <p>Failure Load = 59% mean static load Time = 472 hours Displacement = 0.098 in</p> <p>Failure mode:</p> <ul style="list-style-type: none"> • Adhesive/anchor plug slipped in hole and stopped due to friction and reduction of load • Adhesive reattached and threads exposed at splitting • Anchor attached to one side of split core
	<p>14-B-53-7 Fly ash</p> <p>Failure Load = 53% mean static load Time = 833 hours Displacement = 0.227 in</p> <p>Failure mode:</p> <ul style="list-style-type: none"> • Adhesive/anchor plug slipped in hole and stopped due to friction and reduction of load • Adhesive reattached and concrete fractured at splitting • Anchor attached to one side of split core

Split Core Photo	Discussion
 <p>15-A-69-1</p>	<p>15-A-69-1 Blast Furnace Slag</p> <p>Failure Load = 69% mean static load Time = 562 hours Displacement = 0.053 in</p> <p>Failure mode:</p> <ul style="list-style-type: none"> • Adhesive shearing failure at threads • Anchor attached to one side of split core
 <p>15-A-67-3</p>	<p>15-A-67-3 Blast Furnace Slag</p> <p>Failure Load = 67% mean static load Time = 157 hours Displacement = 0.076 in</p> <p>Failure mode:</p> <ul style="list-style-type: none"> • Adhesive shearing failure at threads • Anchor detached from both sides of split core
 <p>15-A-57-5</p>	<p>15-A-57-5 Blast Furnace Slag</p> <p>Failure Load = 57% mean static load Time = 124 hours Displacement = 0.047 in</p> <p>Failure mode:</p> <ul style="list-style-type: none"> • Concrete-adhesive failure • Cracking within adhesive at bottom half of anchor • Anchor detached from both sides of split core

Split Core Photo	Discussion
	<p>15-A-56-6 Blast Furnace Slag</p> <p>Failure Load = 56% mean static load Time = 1,446 hours Displacement = 0.059 in</p> <p>Failure mode:</p> <ul style="list-style-type: none"> • Adhesive shearing failure at threads • Anchor attached to one side of split core
	<p>12-C-ST-2 DOT mix</p> <p>Failure Load = 100% mean static load Time = 0.03 hours Displacement = 0.031 in</p> <p>Failure mode:</p> <ul style="list-style-type: none"> • Concrete-adhesive failure
	<p>12-C-ST-4 DOT mix</p> <p>Failure Load = 100% mean static load Time = 0.03 hours Displacement = 0.035 in</p> <p>Failure mode:</p> <ul style="list-style-type: none"> • Concrete-adhesive failure

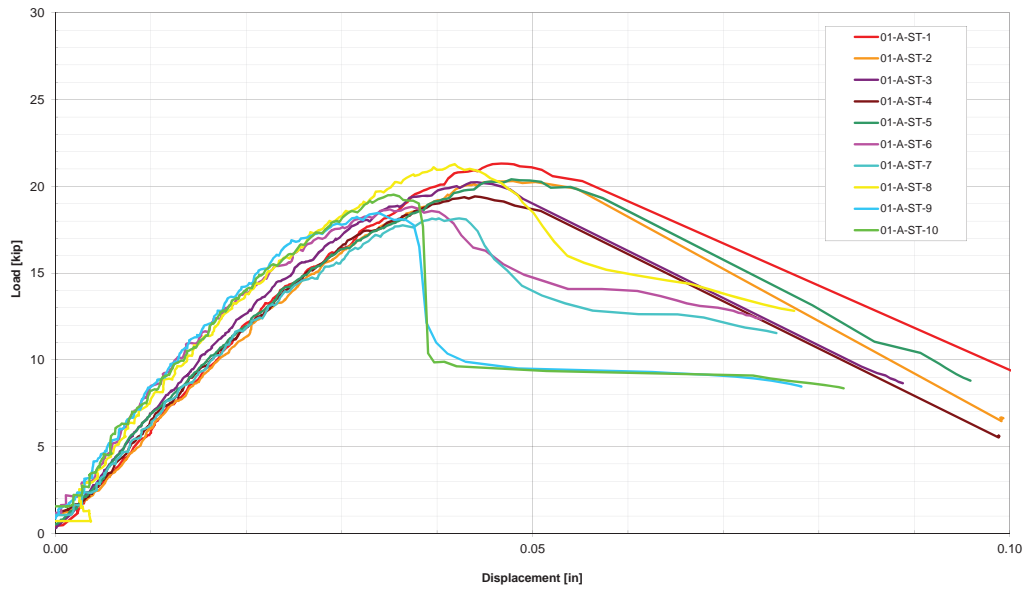
Split Core Photo	Discussion
	<p>12-C-ST-5 DOT mix</p> <p>Failure Load = 100% mean static load Time = 0.03 hours Displacement = 0.032 in</p> <p>Failure mode:</p> <ul style="list-style-type: none"> • Concrete-adhesive failure

01-A-ST



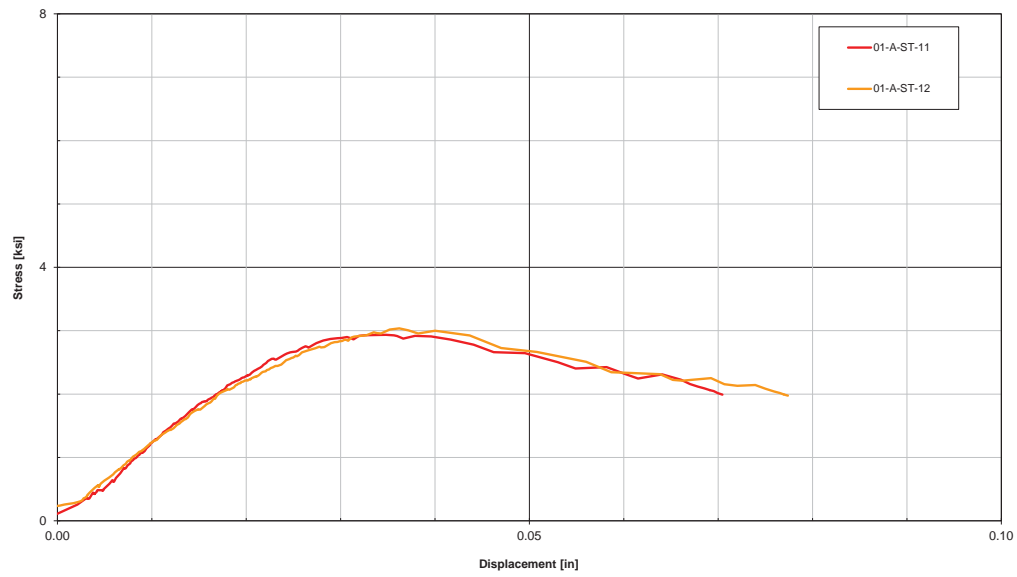
Test	01-A-ST-1	01-A-ST-2	01-A-ST-3	01-A-ST-4	01-A-ST-5	01-A-ST-6	01-A-ST-7	01-A-ST-8	01-A-ST-9	01-A-ST-10	Mean	std. dev.	COV
Max Stress (ksi)	3.47	3.31	3.30	3.17	3.33	3.07	2.96	3.47	3.01	3.18	3.23	0.18	0.06
Displacement (in)	0.047	0.048	0.044	0.044	0.048	0.040	0.043	0.044	0.037	0.038	0.043	0.004	0.09

01-A-ST

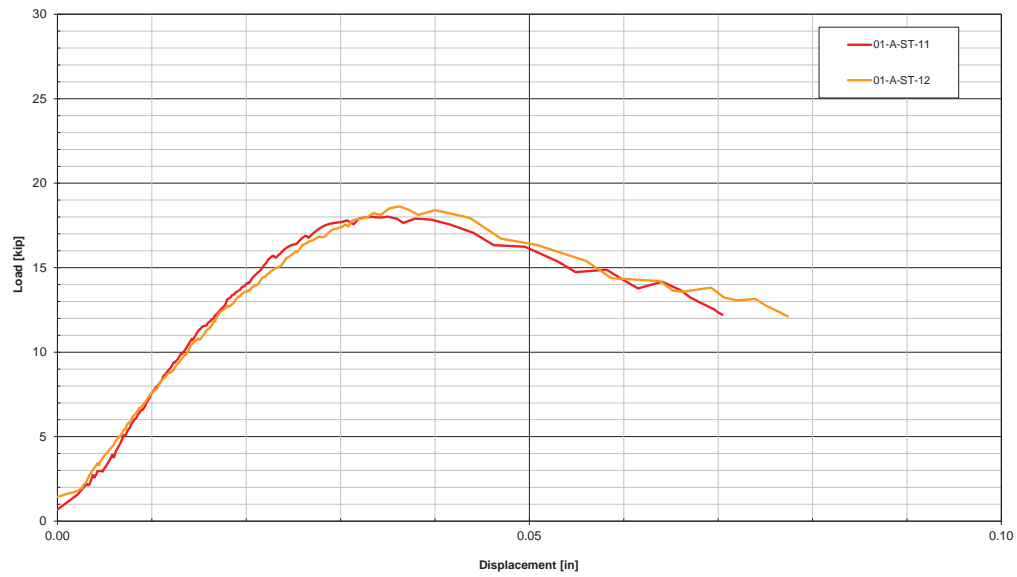


Test	01-A-ST-1	01-A-ST-2	01-A-ST-3	01-A-ST-4	01-A-ST-5	01-A-ST-6	01-A-ST-7	01-A-ST-8	01-A-ST-9	01-A-ST-10	Mean	std. dev.	COV
Max Load (kips)	21.3	20.3	20.2	19.4	20.4	18.8	18.2	21.3	18.5	19.5	19.8	1.1	0.06
Displacement (in)	0.047	0.048	0.044	0.044	0.048	0.040	0.043	0.044	0.037	0.038	0.043	0.004	0.09

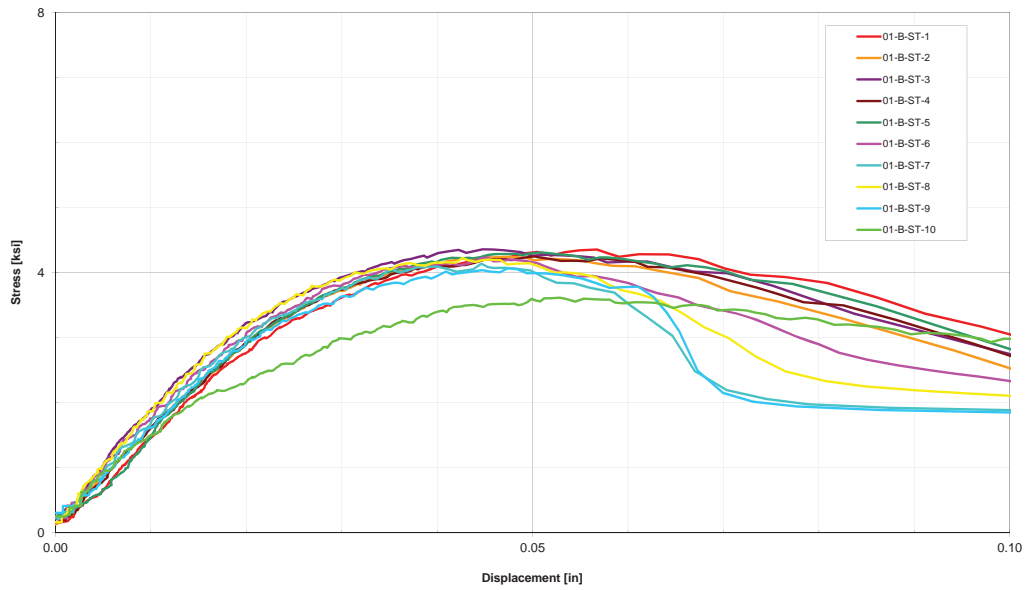
01-A-ST FINAL



01-A-ST FINAL

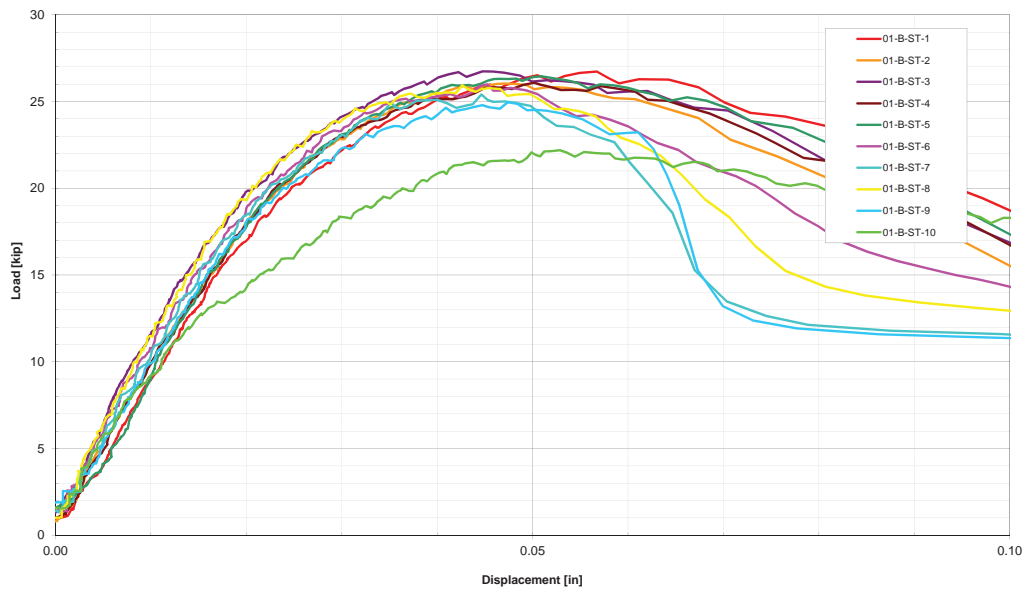


01-B-ST



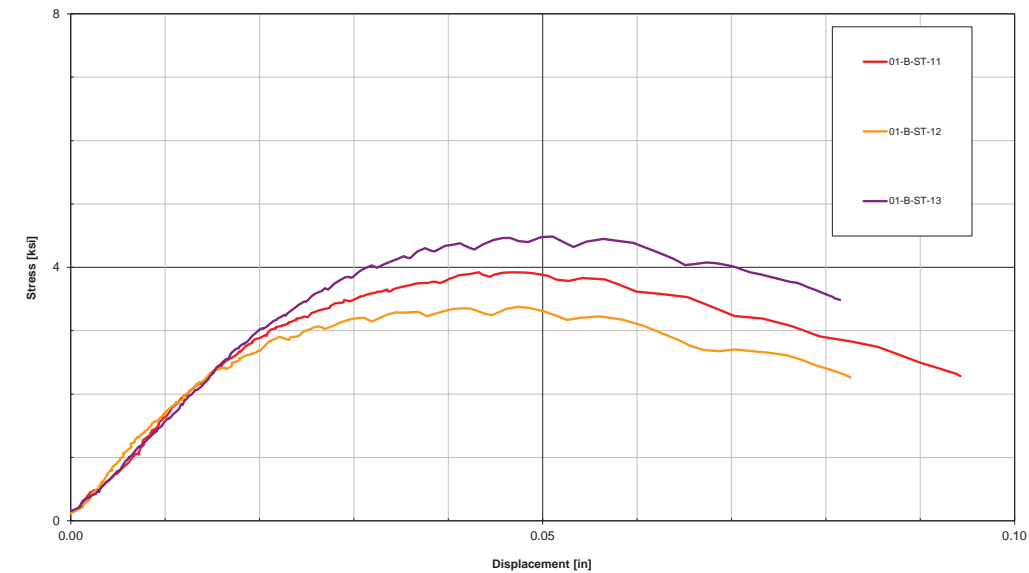
Test	01-B-ST-1	01-B-ST-2	01-B-ST-3	01-B-ST-4	01-B-ST-5	01-B-ST-6	01-B-ST-7	01-B-ST-8	01-B-ST-9	01-B-ST-10	Mean	std. dev.	COV
Max Stress (ksi)	4.36	4.24	4.36	4.25	4.31	4.24	4.14	4.23	4.07	3.62	4.16	0.22	0.05
Displacement (in)	0.057	0.047	0.045	0.050	0.051	0.051	0.050	0.047	0.053	0.057	0.051	0.004	0.08

01-B-ST



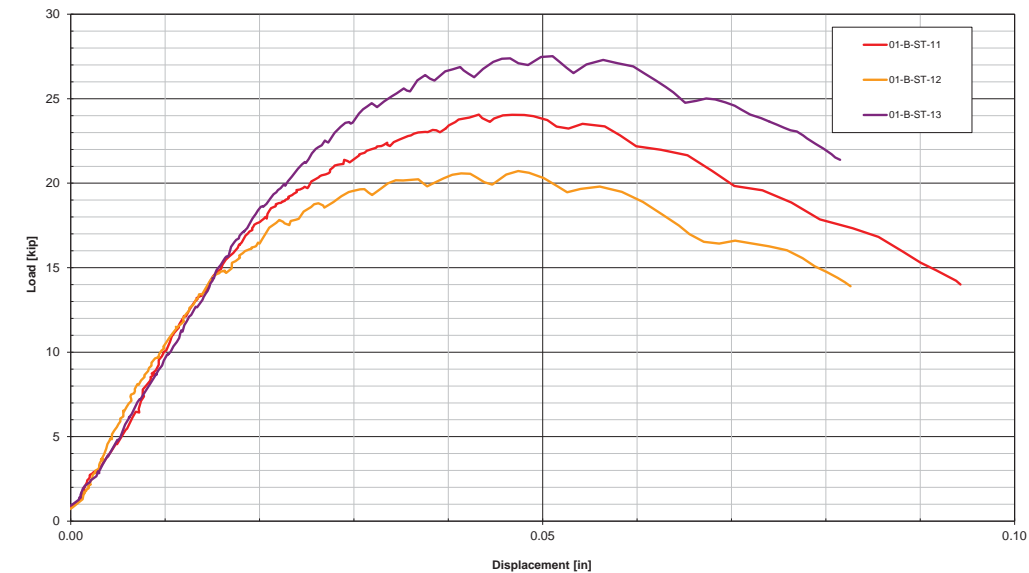
Test	01-B-ST-1	01-B-ST-2	01-B-ST-3	01-B-ST-4	01-B-ST-5	01-B-ST-6	01-B-ST-7	01-B-ST-8	01-B-ST-9	01-B-ST-10	Mean	std. dev.	COV
Max Load (kips)	26.7	26.0	26.7	26.1	26.5	26.0	25.4	25.9	25.0	22.2	25.7	1.3	0.05
Displacement (in)	0.057	0.047	0.045	0.050	0.051	0.051	0.050	0.047	0.053	0.057	0.051	0.004	0.08

01-B-ST FINAL



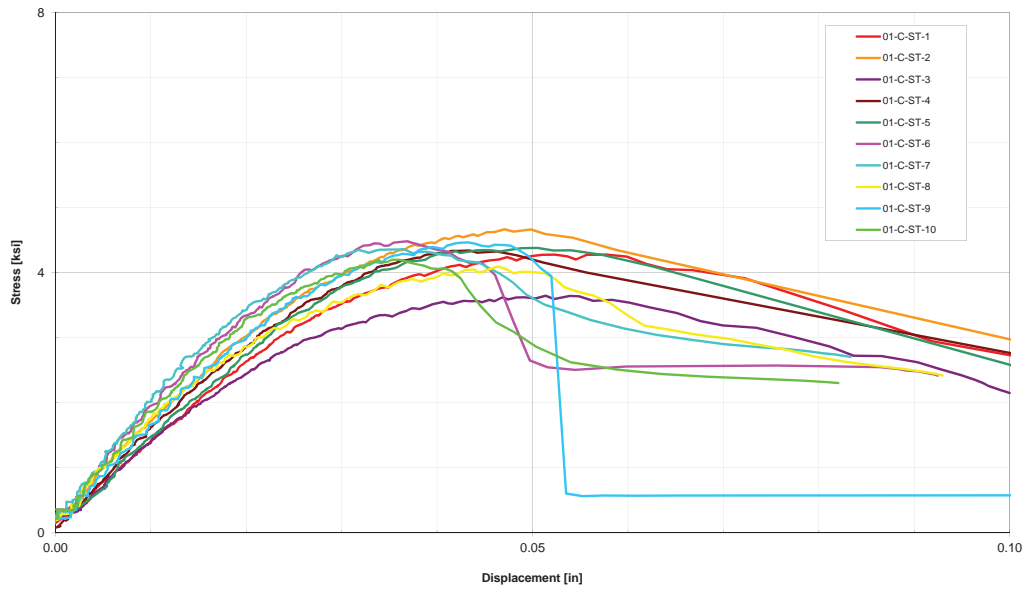
Test	01-B-ST-11	01-B-ST-12	01-B-ST-13	Mean	std. dev.	COV
Max Stress (ksi)	3.92	3.38	4.49	3.93	0.55	0.14
Displacement (in)	0.043	0.047	0.051	0.047	0.004	0.08

01-B-ST FINAL



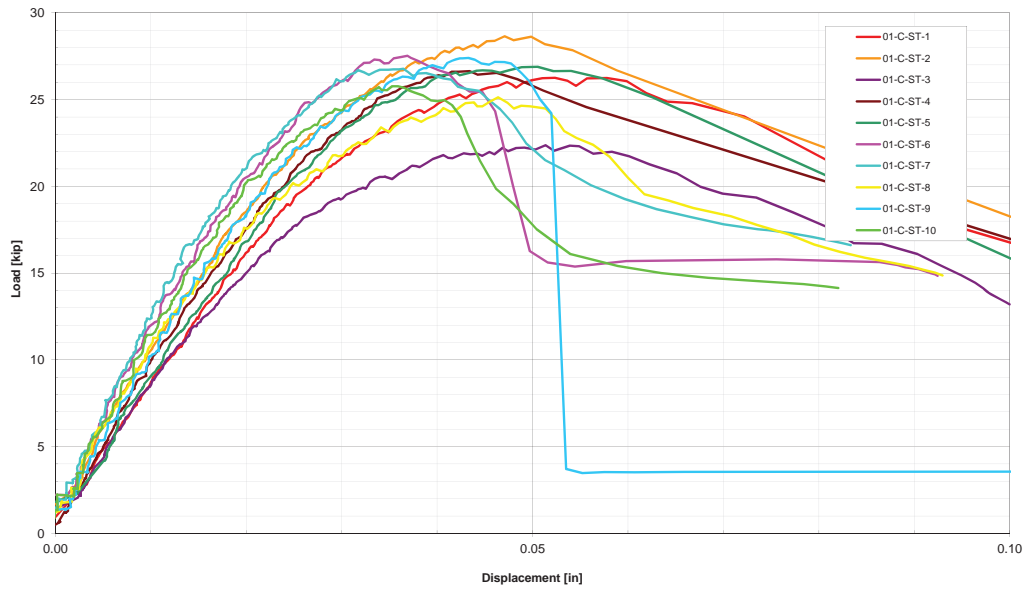
Test	01-B-ST-11	01-B-ST-12	01-B-ST-13	Mean	std. dev.	COV
Max Load (kips)	24.1	20.7	27.5	24.1	3.4	0.14
Displacement (in)	0.043	0.047	0.051	0.047	0.004	0.08

01-C-ST



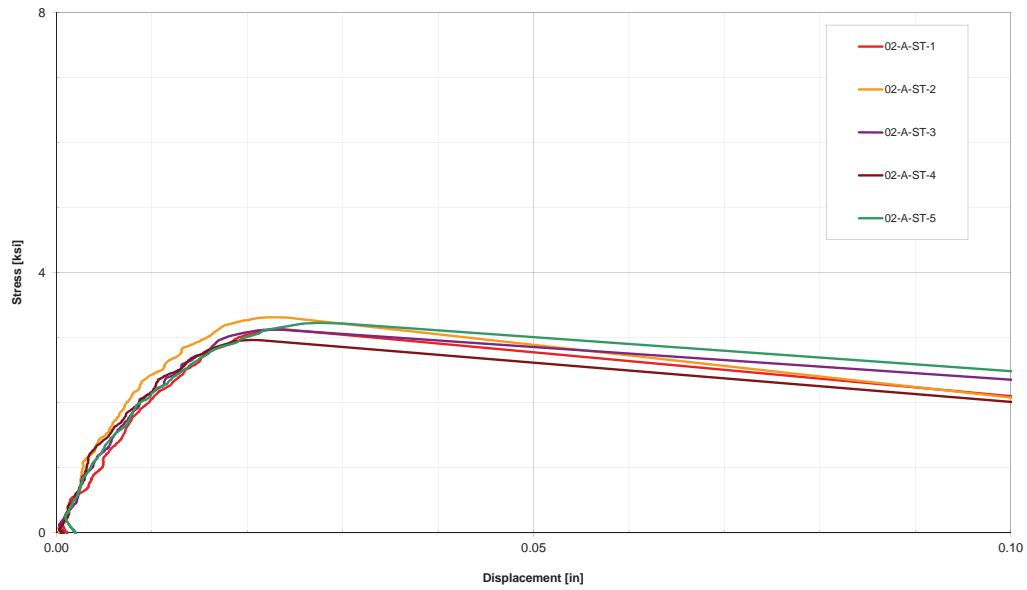
Test	01-C-ST-1	01-C-ST-2	01-C-ST-3	01-C-ST-4	01-C-ST-5	01-C-ST-6	01-C-ST-7	01-C-ST-8	01-C-ST-9	01-C-ST-10	Mean	std. dev.	COV
Max Stress (ksi)	4.28	4.67	3.65	4.34	4.38	4.49	4.36	4.10	4.47	4.20	4.29	0.25	0.06
Displacement (in)	0.052	0.047	0.051	0.043	0.051	0.041	0.040	0.051	0.047	0.039	0.046	0.005	0.11

01-C-ST



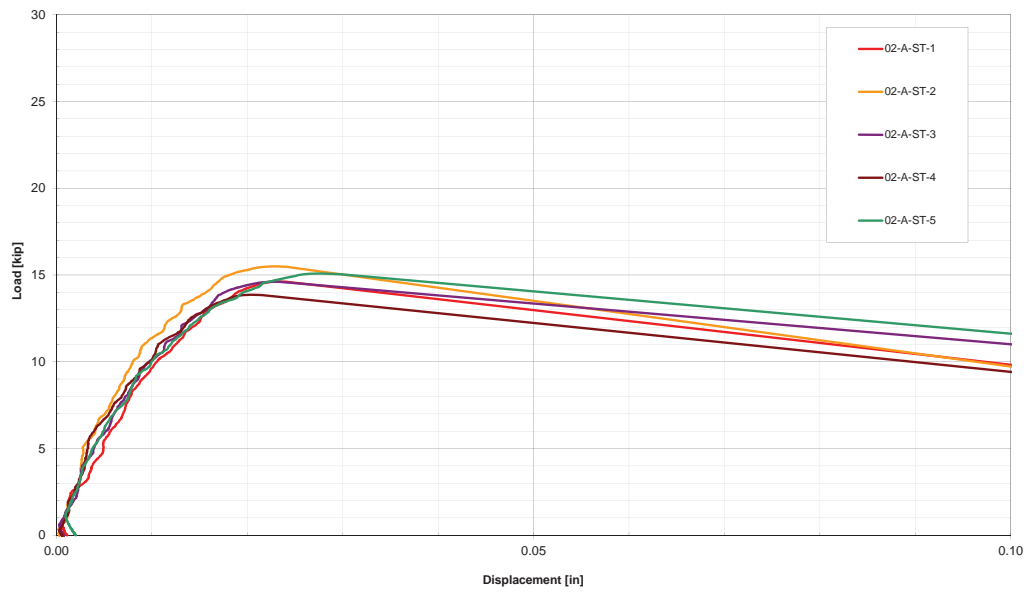
Test	01-C-ST-1	01-C-ST-2	01-C-ST-3	01-C-ST-4	01-C-ST-5	01-C-ST-6	01-C-ST-7	01-C-ST-8	01-C-ST-9	01-C-ST-10	Mean	std. dev.	COV
Max Load (kips)	26.3	28.6	22.4	26.6	26.9	27.5	26.8	25.1	27.4	25.8	26.3	1.7	0.06
Displacement (in)	0.052	0.047	0.051	0.043	0.051	0.041	0.040	0.051	0.047	0.039	0.046	0.005	0.11

02-A-ST



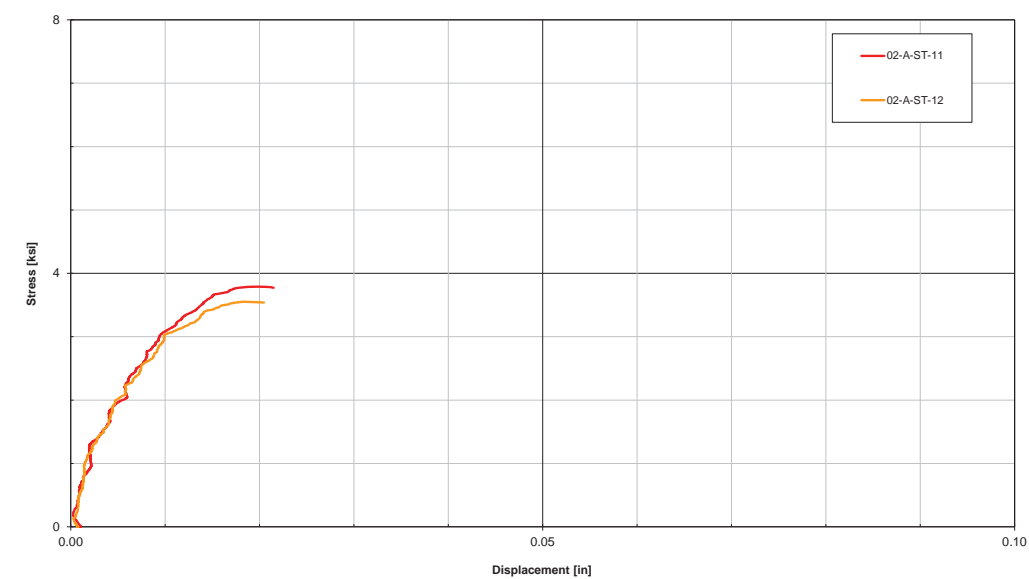
Test	02-A-ST-1	02-A-ST-2	02-A-ST-3	02-A-ST-4	02-A-ST-5	Mean	std. dev.	COV
Max Stress (ksi)	3.13	3.32	3.13	2.97	3.23	3.15	0.13	0.04
Displacement (in)	0.023	0.023	0.023	0.021	0.028	0.024	0.003	0.11

02-A-ST

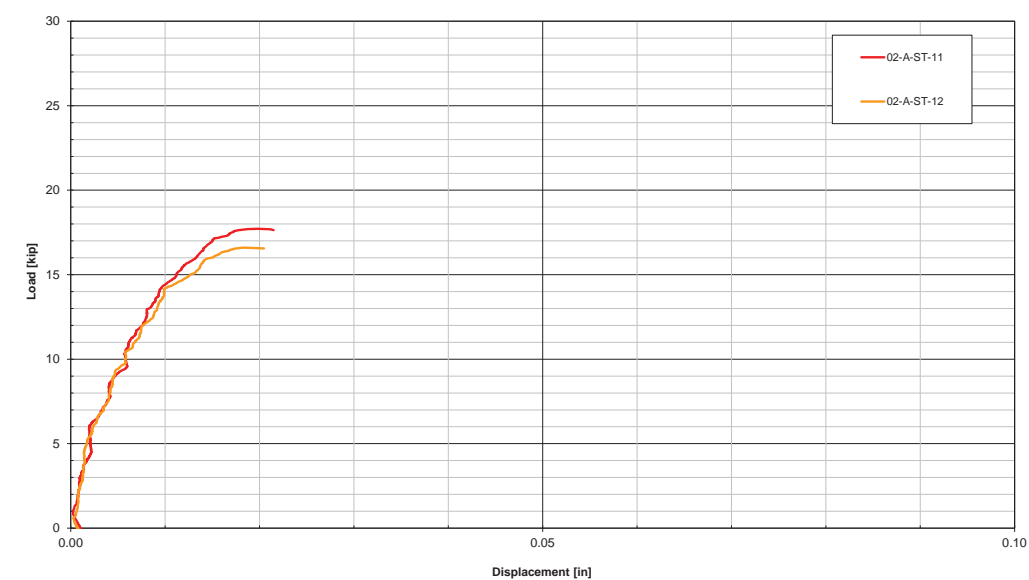


Test	02-A-ST-1	02-A-ST-2	02-A-ST-3	02-A-ST-4	02-A-ST-5	Mean	std. dev.	COV
Max Load (kips)	14.6	15.5	14.6	13.9	15.1	14.7	0.6	0.04
Displacement (in)	0.023	0.023	0.023	0.021	0.028	0.024	0.003	0.11

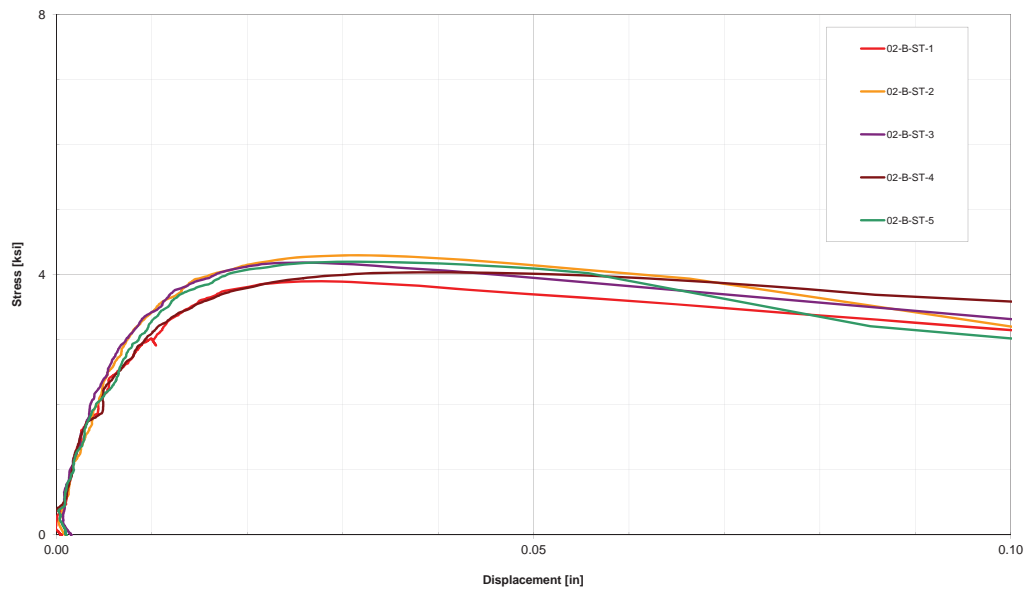
02-A-ST FINAL



02-A-ST FINAL

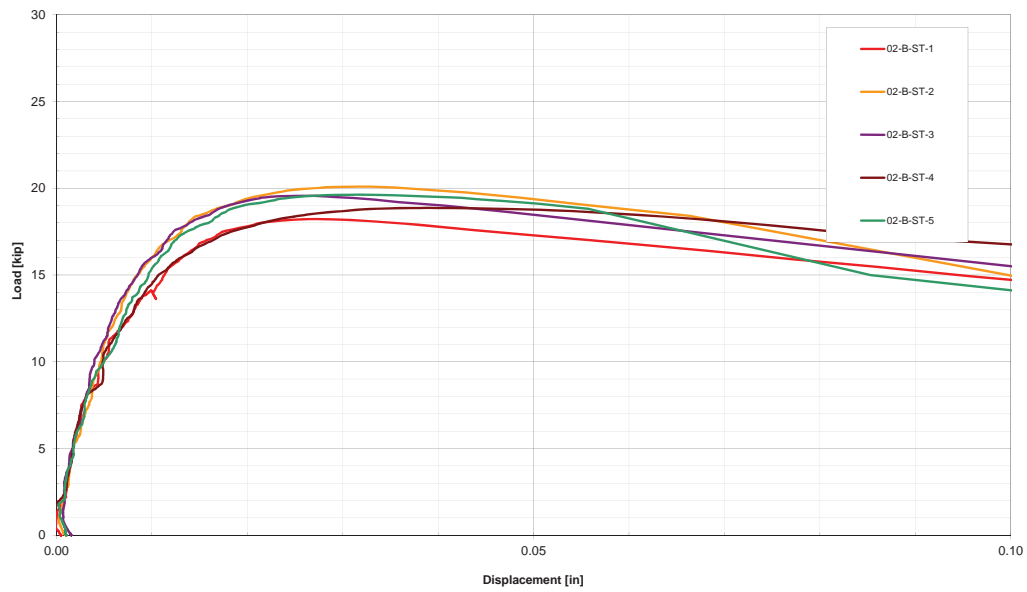


02-B-ST



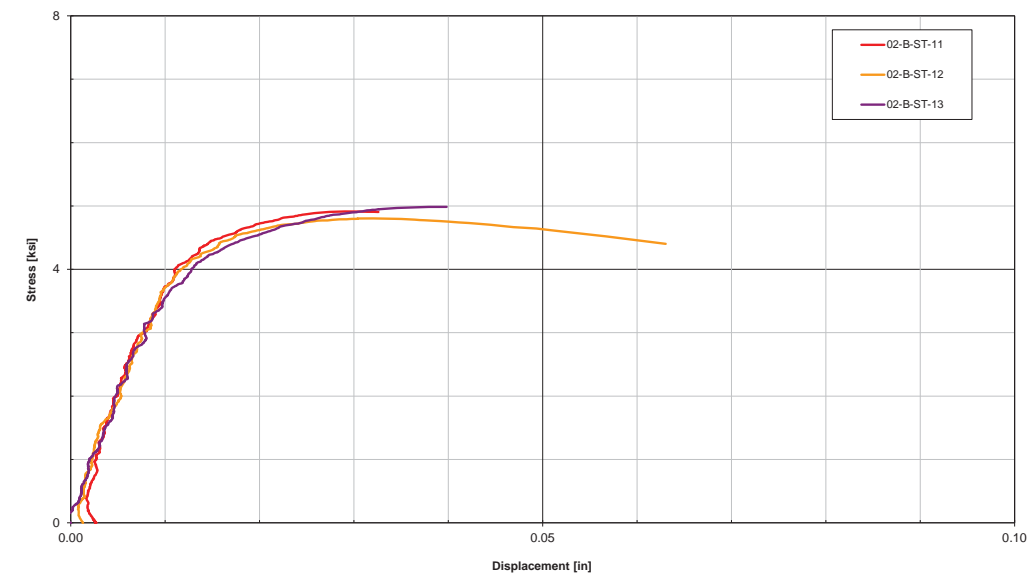
Test	02-B-ST-1	02-B-ST-2	02-B-ST-3	02-B-ST-4	02-B-ST-5	Mean	std. dev.	COV
Max Stress (ksi)	3.90	4.30	4.19	4.04	4.20	4.12	0.16	0.04
Displacement (in)	0.027	0.032	0.026	0.039	0.032	0.031	0.005	0.17

02-B-ST

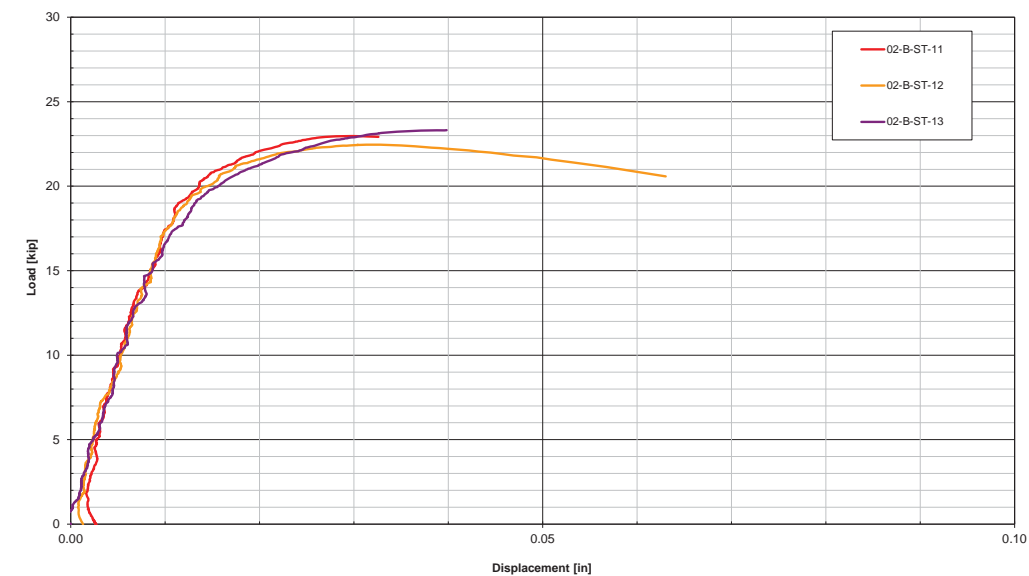


Test	02-B-ST-1	02-B-ST-2	02-B-ST-3	02-B-ST-4	02-B-ST-5	Mean	std. dev.	COV
Max Load (kips)	18.2	20.1	19.6	18.9	19.6	19.3	0.7	0.04
Displacement (in)	0.027	0.032	0.026	0.039	0.032	0.031	0.005	0.17

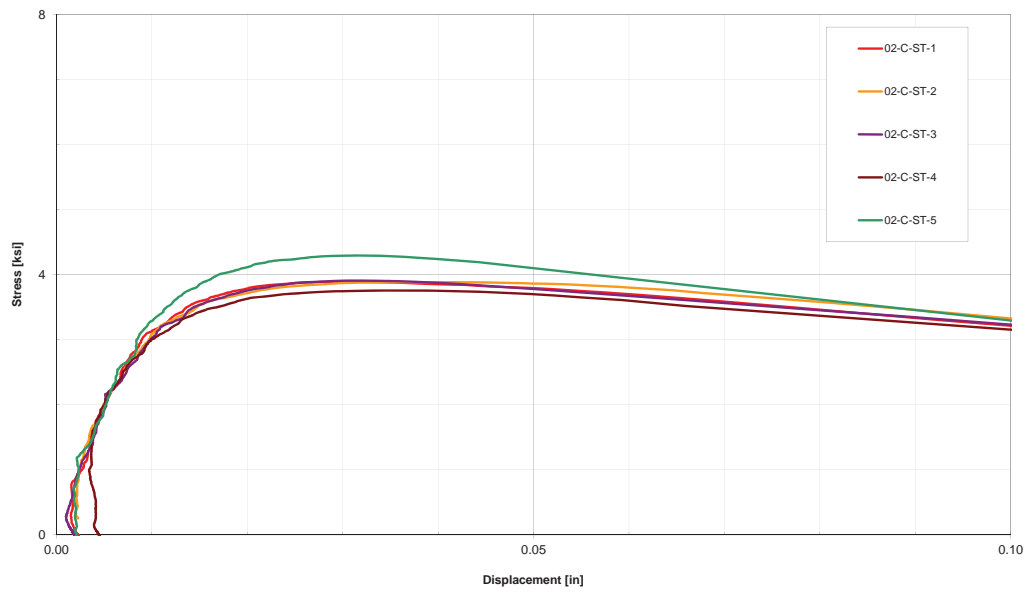
02-B-ST FINAL



02-B-ST FINAL



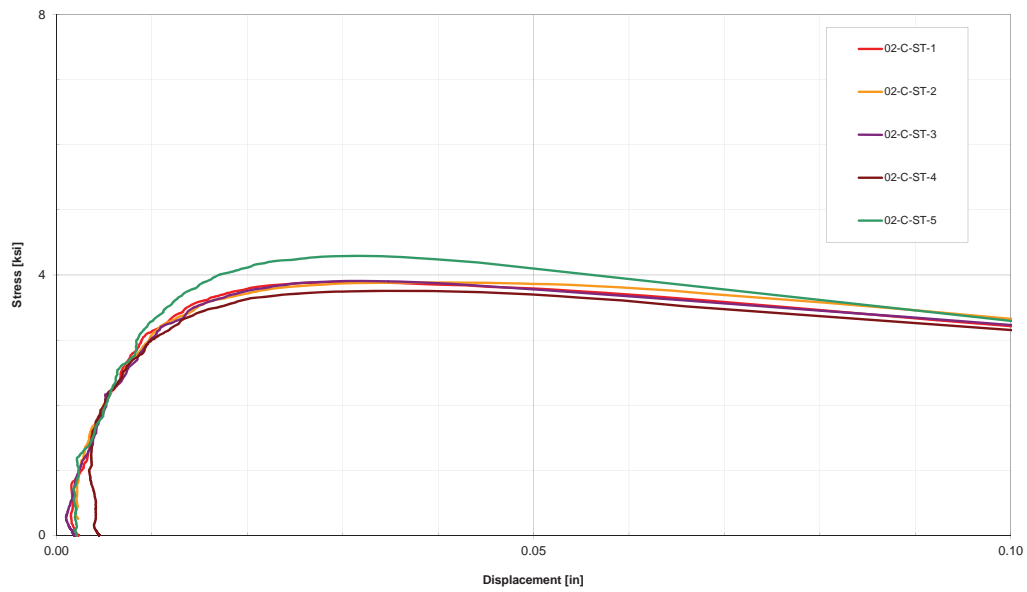
02-C-ST



Test	02-C-ST-1	02-C-ST-2	02-C-ST-3	02-C-ST-4	02-C-ST-5	Mean	std. dev.	COV
Max Stress (ksi)	3.89	3.89	3.91	3.76	4.30	3.95	0.20	0.05
Displacement (in)	0.029	0.039	0.030	0.034	0.032	0.033	0.004	0.12

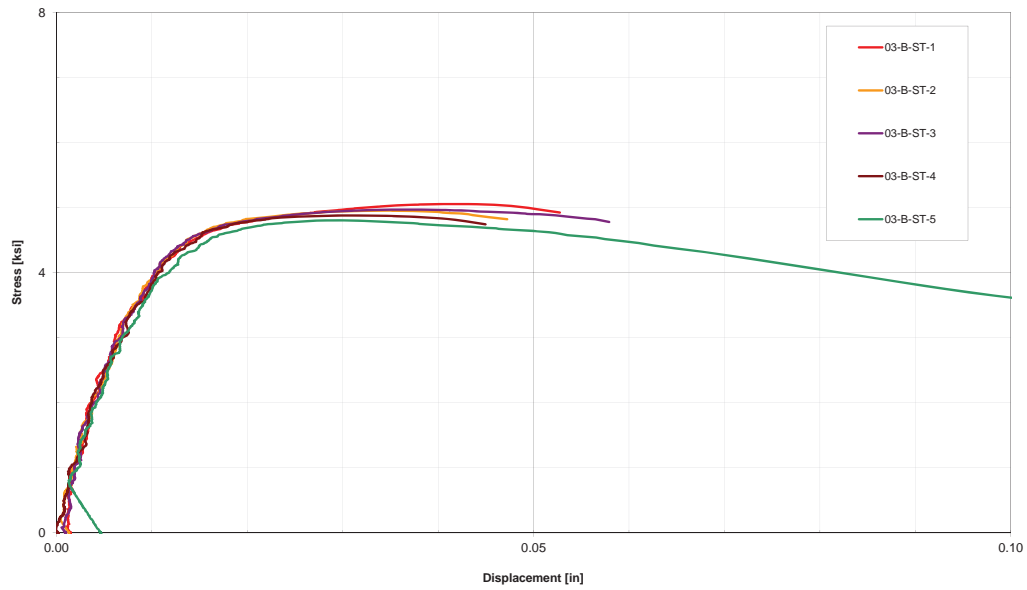
* 02-C-ST-5 is considered an outlier

02-C-ST



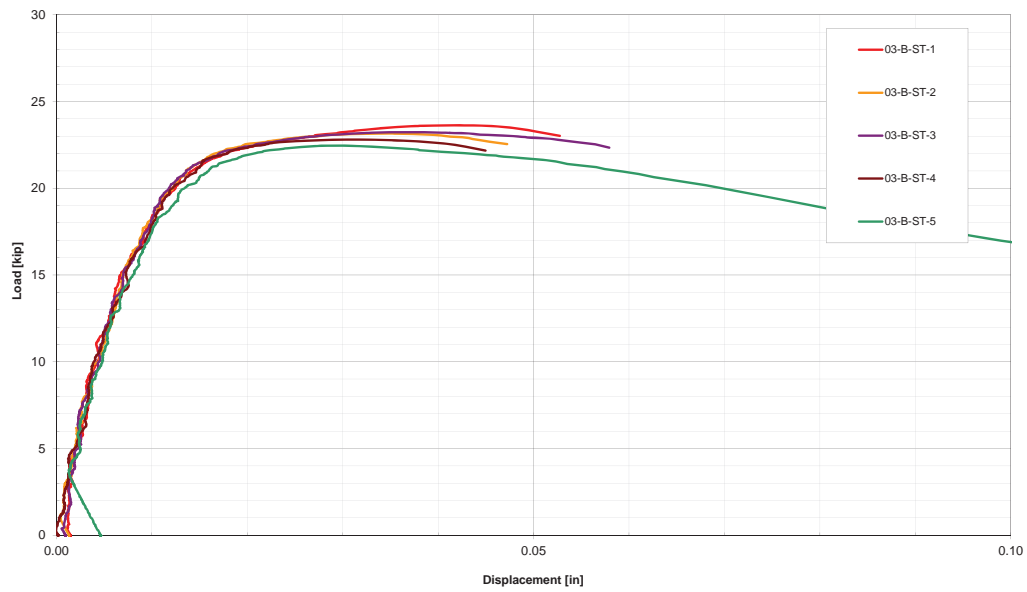
Test	02-C-ST-1	02-C-ST-2	02-C-ST-3	02-C-ST-4	02-C-ST-5	Mean	std. dev.	COV
Max Stress (ksi)	3.89	3.89	3.91	3.76	4.30	3.95	0.20	0.05
Displacement (in)	0.029	0.039	0.030	0.034	0.032	0.033	0.004	0.12

03-B-ST



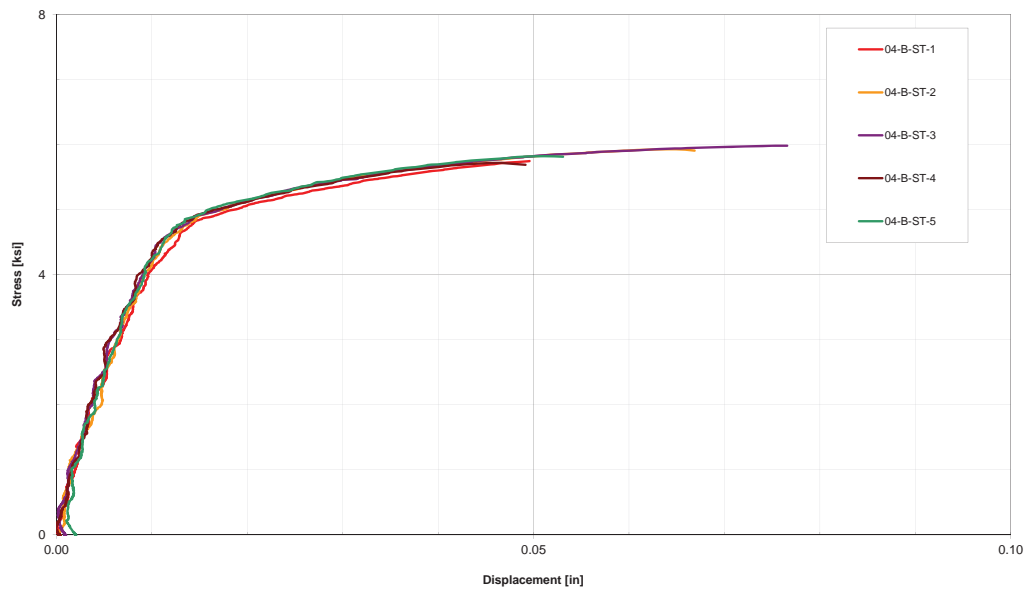
Test	03-B-ST-1	03-B-ST-2	03-B-ST-3	03-B-ST-4	03-B-ST-5	Mean	std. dev.	COV
Max Stress (ksi)	5.06	4.96	4.97	4.88	4.81	4.93	0.09	0.02
Displacement (in)	0.042	0.035	0.037	0.031	0.029	0.035	0.005	0.14

03-B-ST



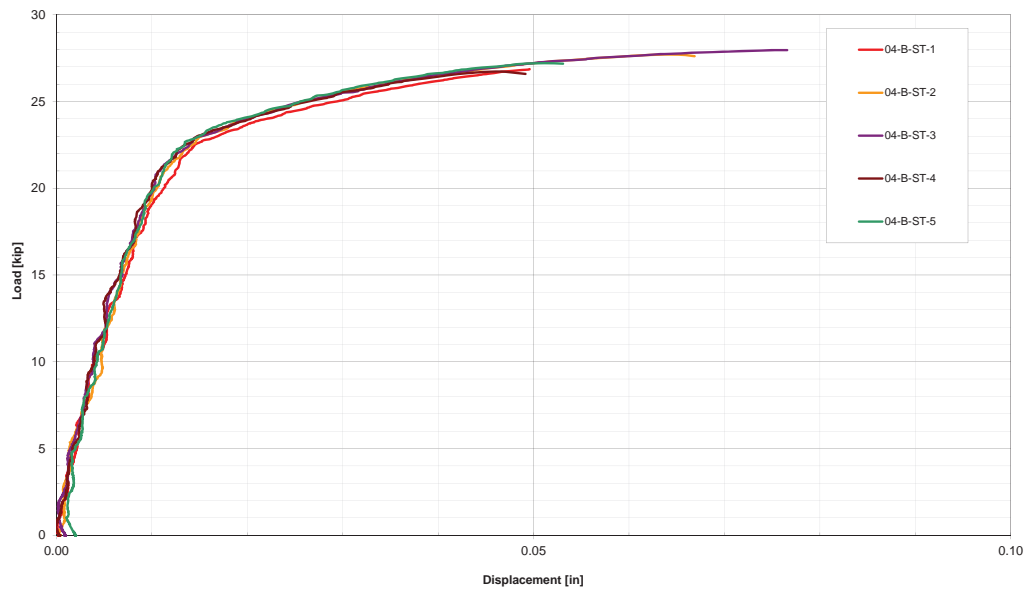
Test	03-B-ST-1	03-B-ST-2	03-B-ST-3	03-B-ST-4	03-B-ST-5	Mean	std. dev.	COV
Max Load (kips)	23.6	23.2	23.2	22.8	22.5	23.1	0.4	0.02
Displacement (in)	0.042	0.035	0.037	0.031	0.029	0.035	0.005	0.14

04-B-ST



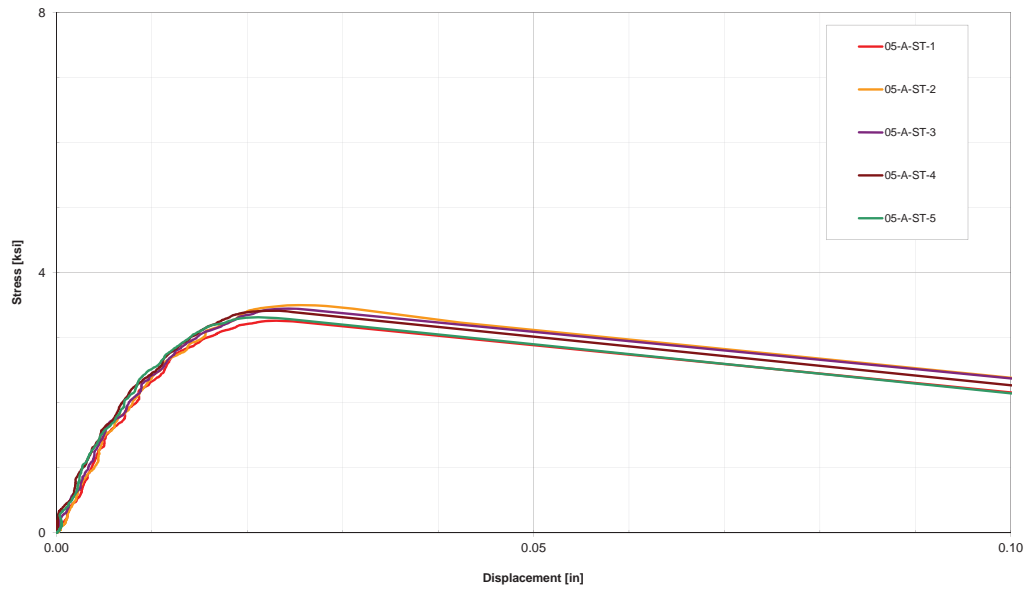
Test	04-B-ST-1	04-B-ST-2	04-B-ST-3	04-B-ST-4	04-B-ST-5	Mean	std. dev.	COV
Max Stress (ksi)	5.67	5.93	5.95	5.72	5.82	5.82	0.12	0.02
Displacement (in)	0.044	0.064	0.067	0.046	0.052	0.055	0.010	0.19

04-B-ST



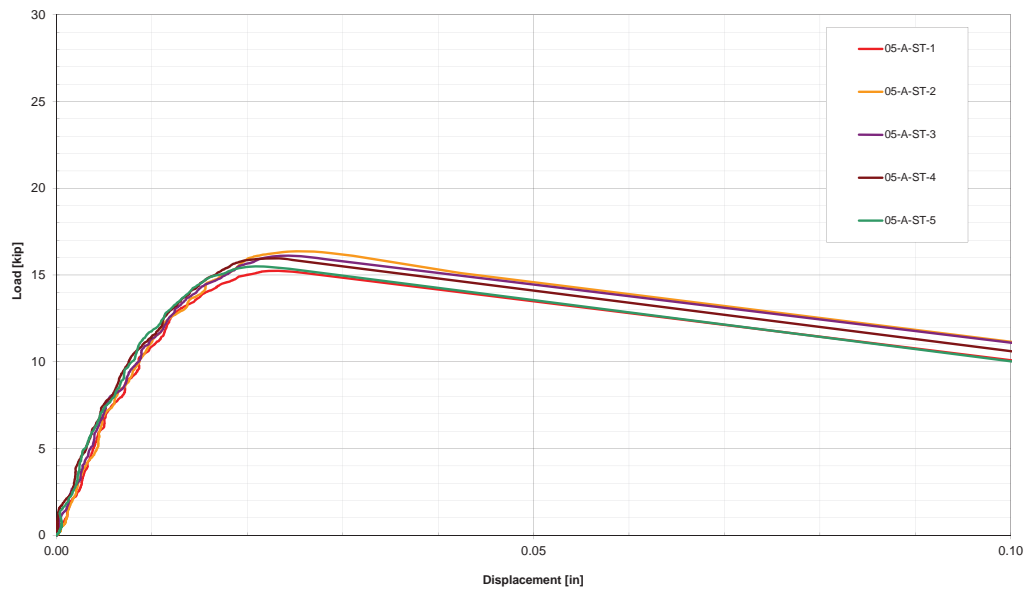
Test	04-B-ST-1	04-B-ST-2	04-B-ST-3	04-B-ST-4	04-B-ST-5	Mean	std. dev.	COV
Max Load (kips)	26.5	27.7	27.8	26.7	27.2	27.2	0.6	0.02
Displacement (in)	0.044	0.064	0.067	0.046	0.052	0.055	0.010	0.19

05-A-ST



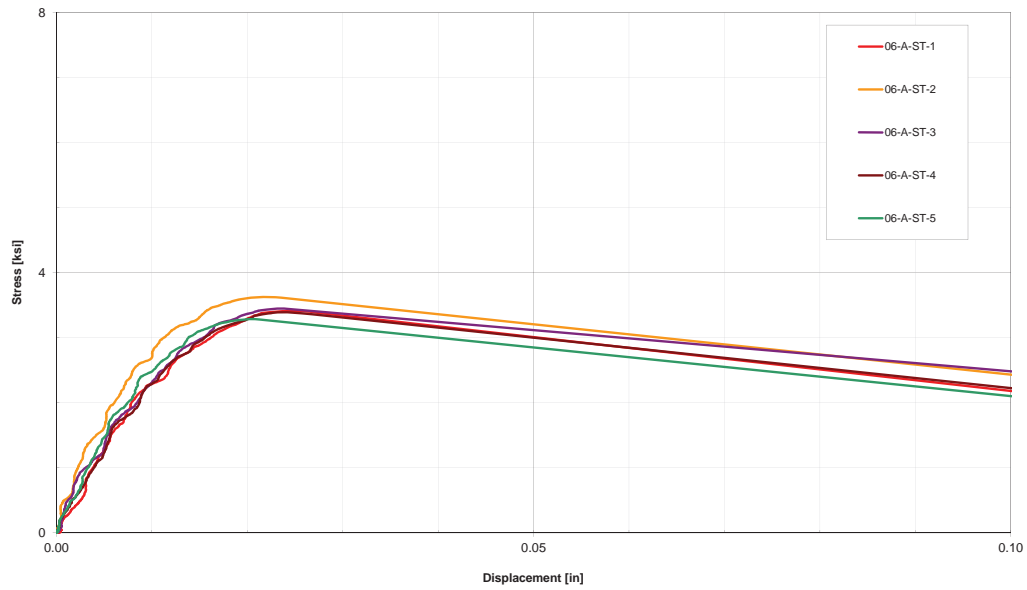
Test	05-A-ST-1	05-A-ST-2	05-A-ST-3	05-A-ST-4	05-A-ST-5	Mean	std. dev.	COV
Max Stress (ksi)	3.26	3.50	3.45	3.41	3.32	3.39	0.10	0.03
Displacement (in)	0.022	0.025	0.024	0.023	0.021	0.023	0.002	0.08

05-A-ST



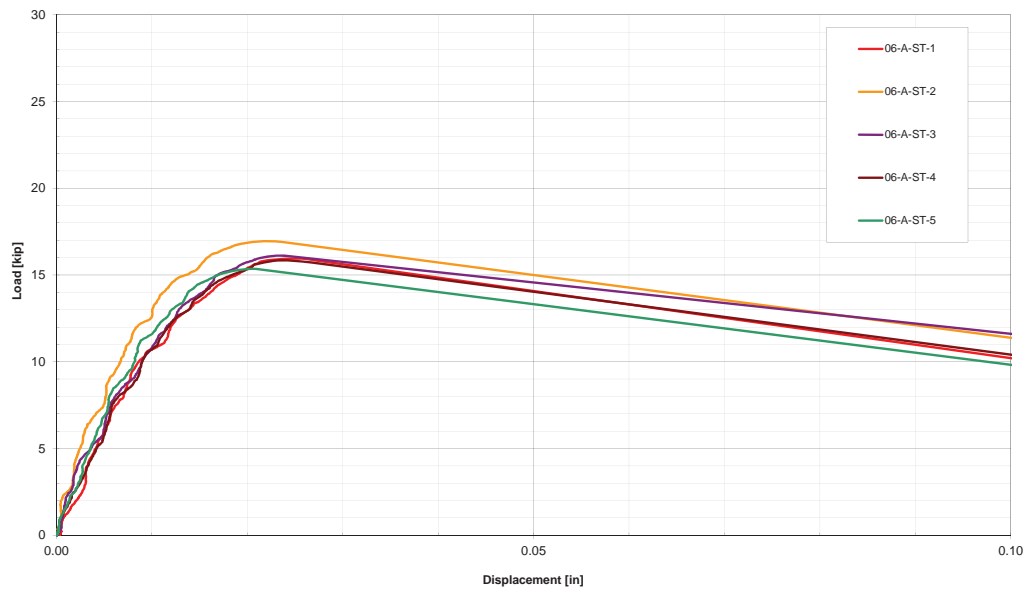
Test	05-A-ST-1	05-A-ST-2	05-A-ST-3	05-A-ST-4	05-A-ST-5	Mean	std. dev.	COV
Max Load (kips)	15.2	16.4	16.1	16.0	15.5	15.8	0.5	0.03
Displacement (in)	0.022	0.025	0.024	0.023	0.021	0.023	0.002	0.08

06-A-ST



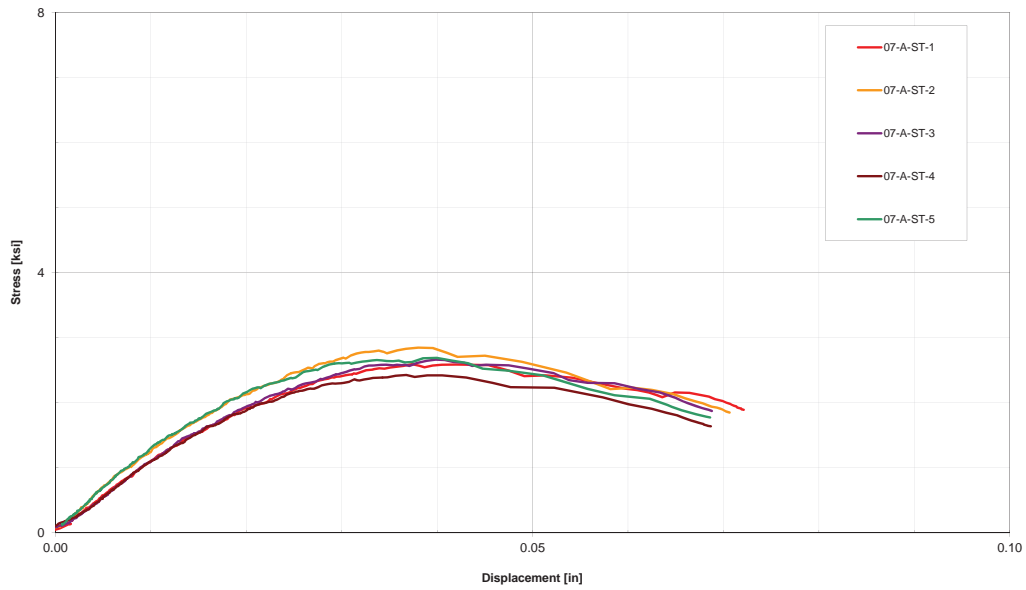
Test	06-A-ST-1	06-A-ST-2	06-A-ST-3	06-A-ST-4	06-A-ST-5	Mean	std. dev.	COV
Max Stress (ksi)	3.41	3.63	3.45	3.39	3.29	3.43	0.12	0.04
Displacement (in)	0.025	0.022	0.023	0.024	0.021	0.023	0.002	0.07

06-A-ST

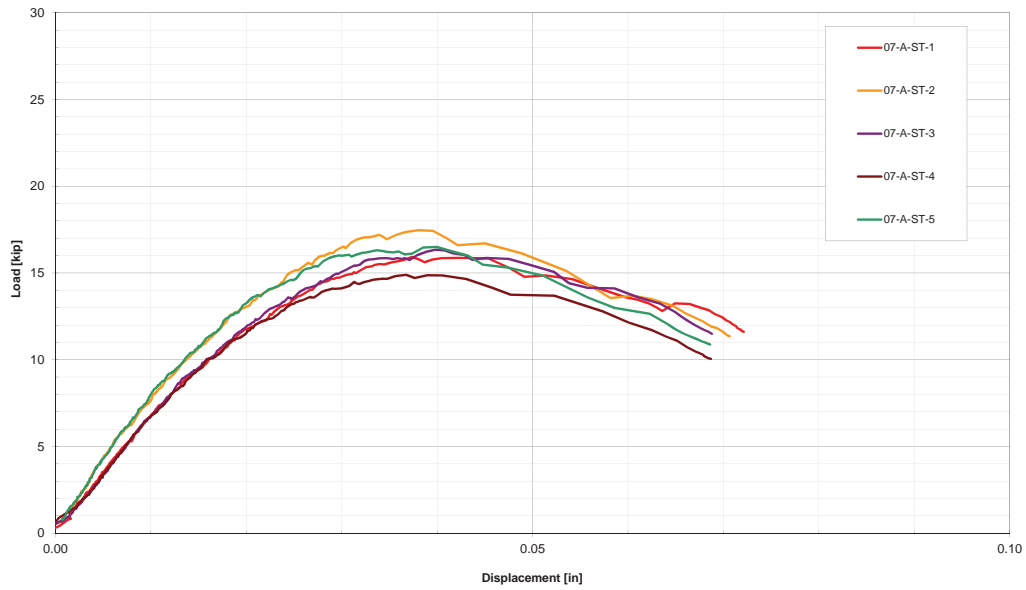


Test	06-A-ST-1	06-A-ST-2	06-A-ST-3	06-A-ST-4	06-A-ST-5	Mean	std. dev.	COV
Max Load (kips)	16.0	17.0	16.1	15.9	15.4	16.1	0.6	0.04
Displacement (in)	0.025	0.022	0.023	0.024	0.021	0.023	0.002	0.07

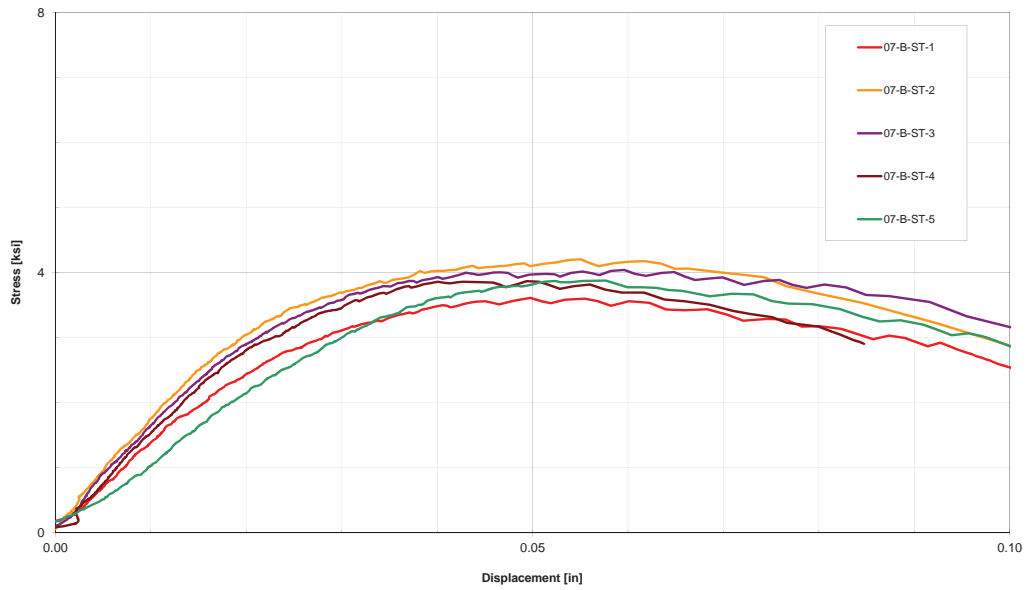
07-A-ST



07-A-ST

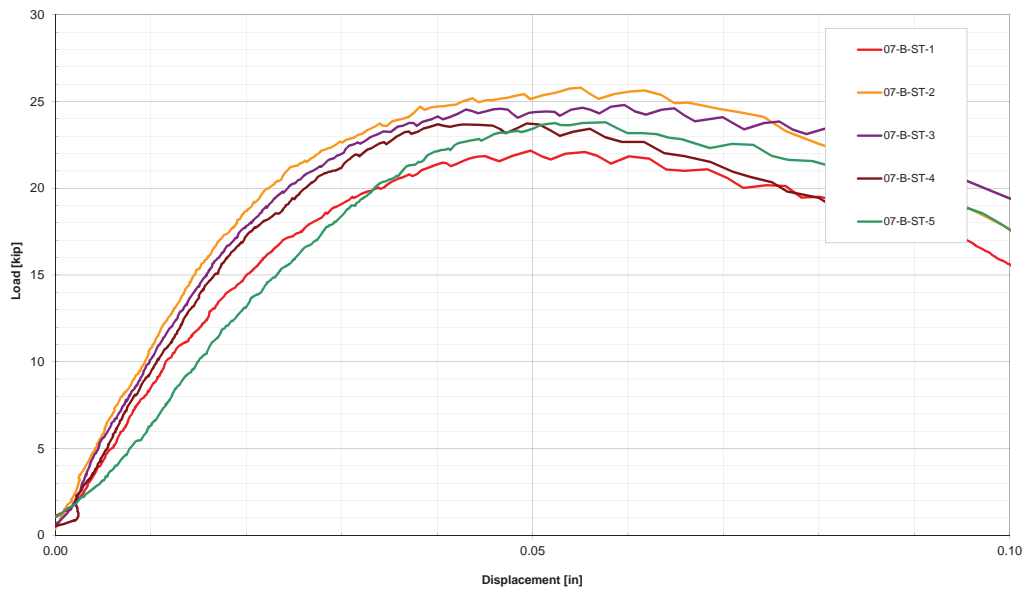


07-B-ST



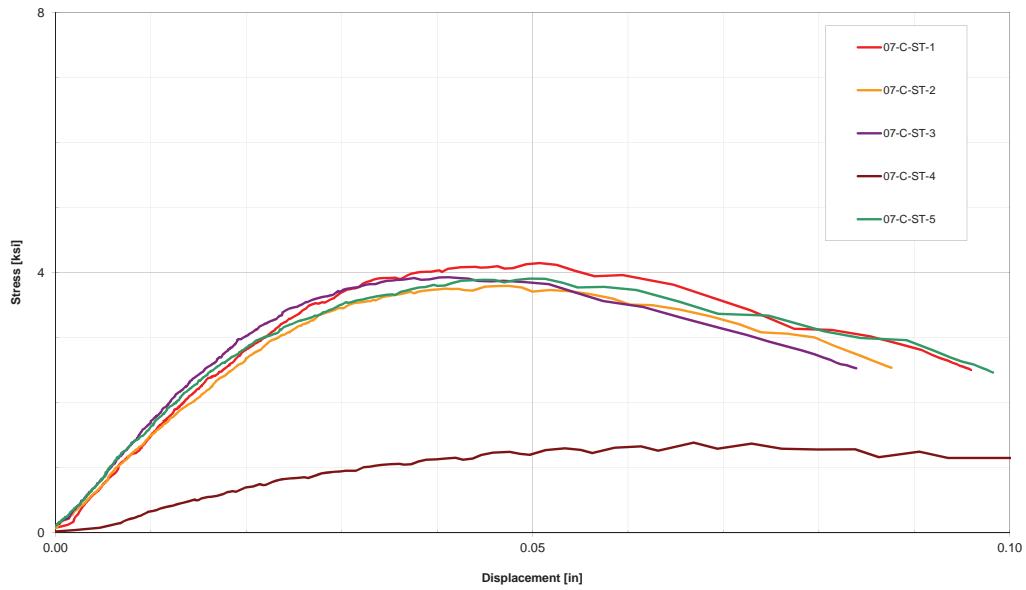
Test	07-B-ST-1	07-B-ST-2	07-B-ST-3	07-B-ST-4	07-B-ST-5	Mean	std. dev.	COV
Max Stress (ksi)	3.61	4.21	4.04	3.87	3.88	3.92	0.22	0.06
Displacement (in)	0.050	0.055	0.060	0.049	0.058	0.054	0.005	0.08

07-B-ST



Test	07-B-ST-1	07-B-ST-2	07-B-ST-3	07-B-ST-4	07-B-ST-5	Mean	std. dev.	COV
Max Load (kips)	22.2	25.8	24.8	23.7	23.8	24.1	1.4	0.06
Displacement (in)	0.050	0.055	0.060	0.049	0.058	0.054	0.005	0.08

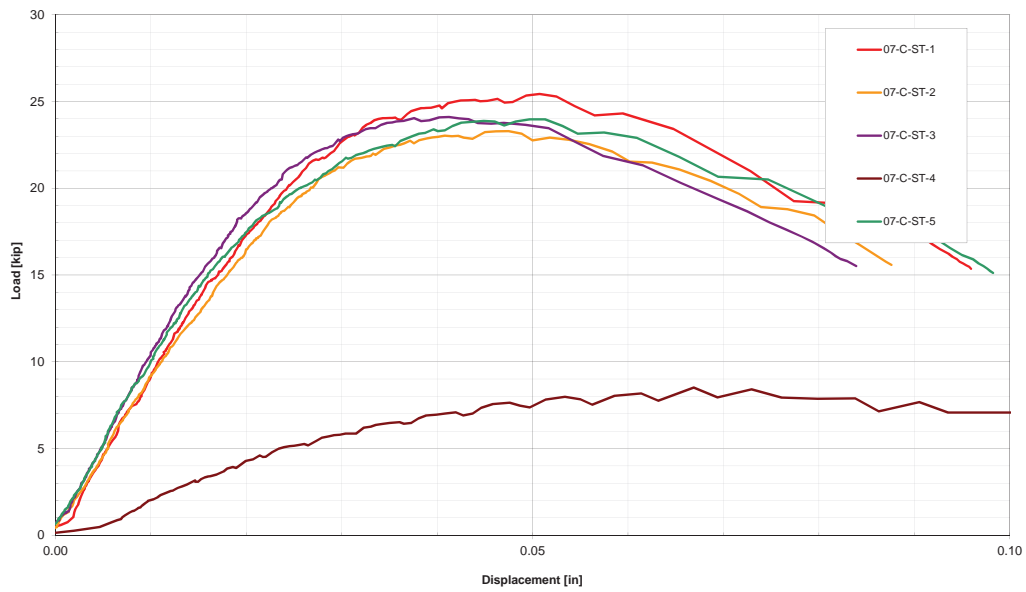
07-C-ST



Test	07-C-ST-1	07-C-ST-2	07-C-ST-3	07-C-ST-4	07-C-ST-5	Mean	std. dev.	COV
Max Stress (ksi)	4.15	3.80	3.93	1.39	3.91	3.95	0.15	0.04
Displacement (in)	0.051	0.047	0.041	0.067	0.050	0.047	0.004	0.09

* 07-C-ST-4 is considered and outlier

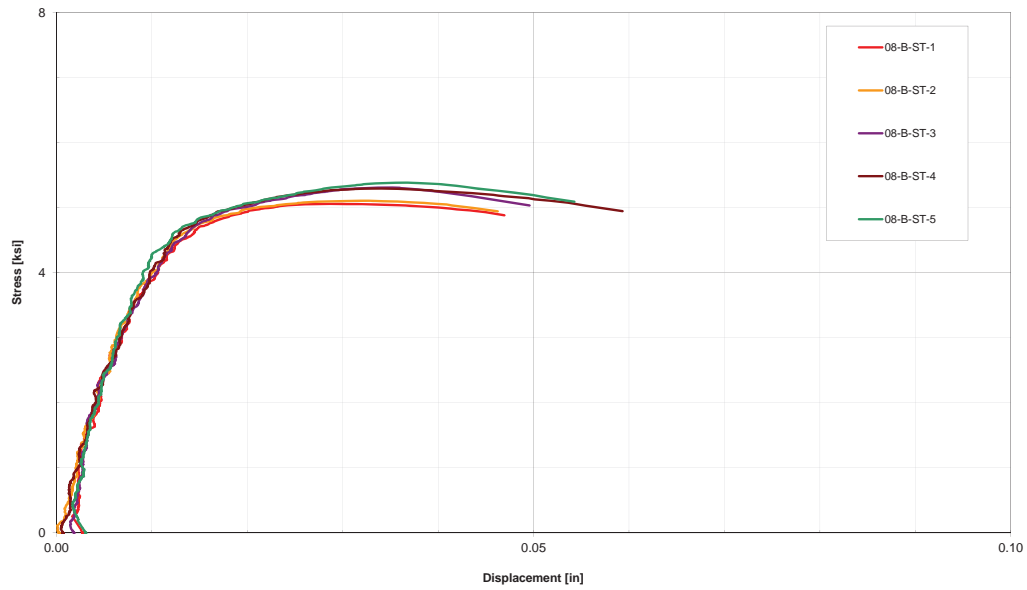
07-C-ST



Test	07-C-ST-1	07-C-ST-2	07-C-ST-3	07-C-ST-4	07-C-ST-5	Mean	std. dev.	COV
Max Load (kips)	25.4	23.3	24.1	8.5	24.0	24.2	0.9	0.04
Displacement (in)	0.051	0.047	0.041	0.067	0.050	0.047	0.004	0.09

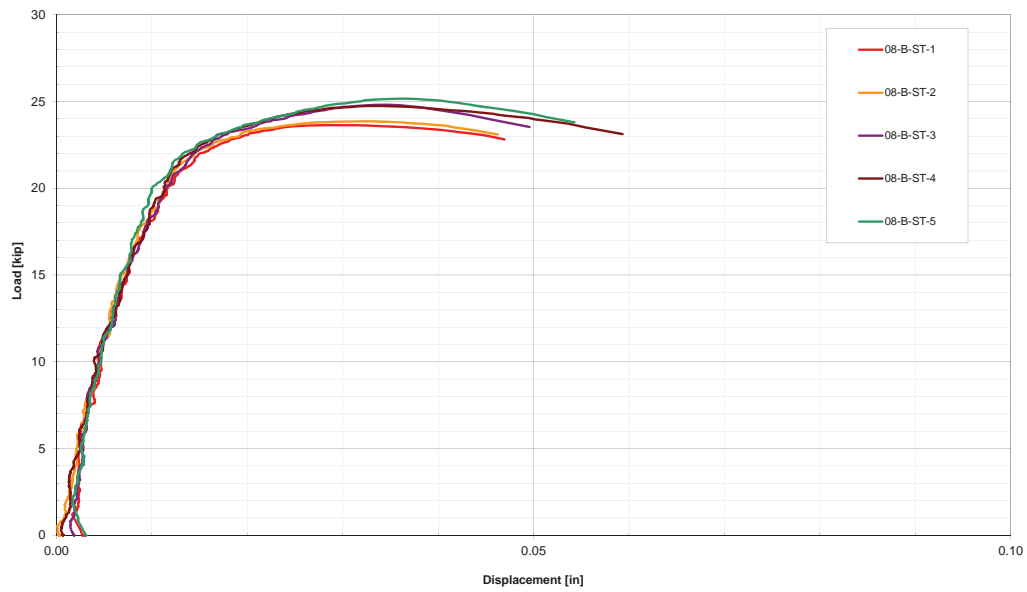
* 07-C-ST-4 is considered and outlier

08-B-ST



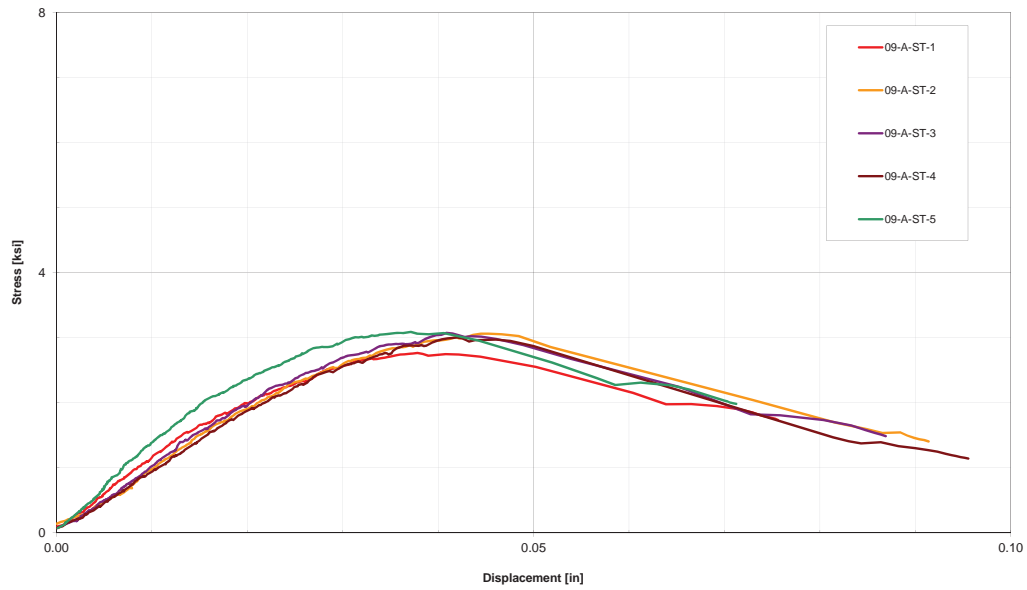
Test	08-B-ST-1	08-B-ST-2	08-B-ST-3	08-B-ST-4	08-B-ST-5	Mean	std. dev.	COV
Max Stress (ksi)	5.06	5.11	5.31	5.29	5.38	5.23	0.14	0.03
Displacement (in)	0.029	0.032	0.035	0.033	0.036	0.033	0.003	0.08

08-B-ST



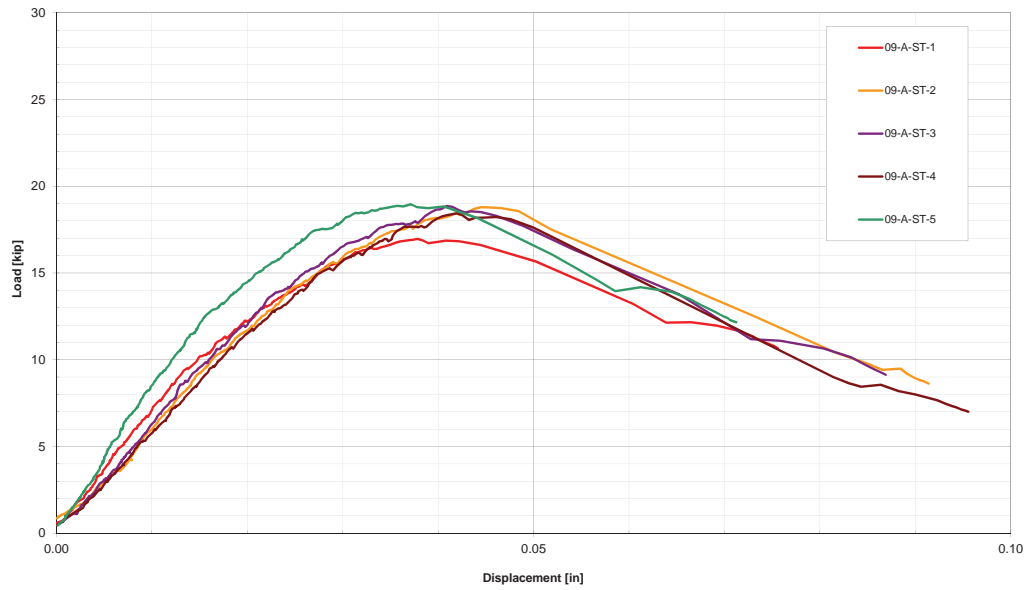
Test	08-B-ST-1	08-B-ST-2	08-B-ST-3	08-B-ST-4	08-B-ST-5	Mean	std. dev.	COV
Max Load (kips)	23.6	23.9	24.8	24.7	25.2	24.4	0.7	0.03
Displacement (in)	0.029	0.032	0.035	0.033	0.036	0.033	0.003	0.08

09-A-ST



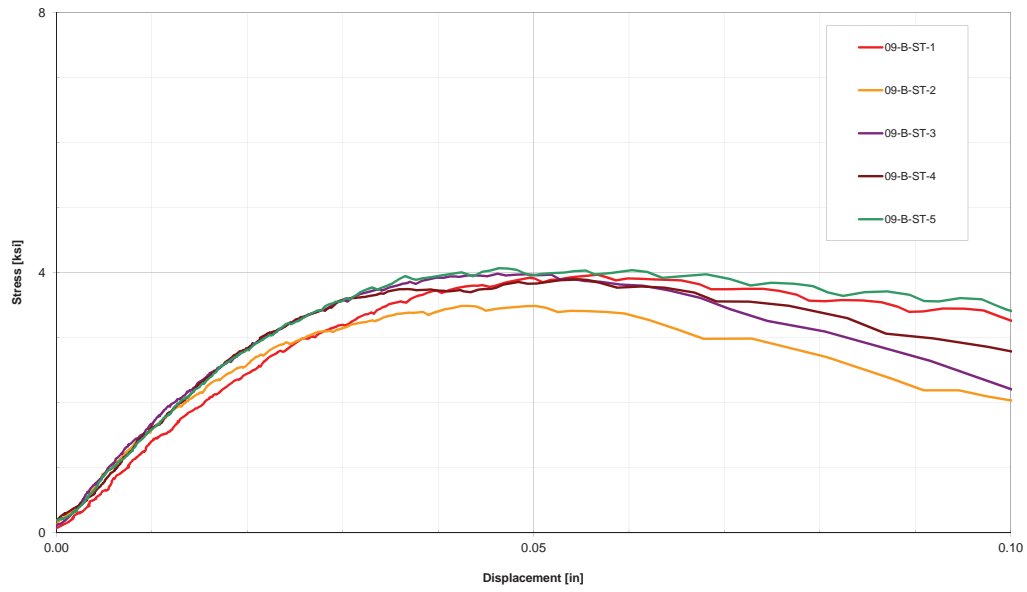
Test	09-A-ST-1	09-A-ST-2	09-A-ST-3	09-A-ST-4	09-A-ST-5	Mean	std. dev.	COV
Max Stress (ksi)	2.77	3.06	3.07	3.01	3.09	3.00	0.13	0.04
Displacement (in)	0.038	0.044	0.041	0.042	0.037	0.040	0.003	0.07

09-A-ST



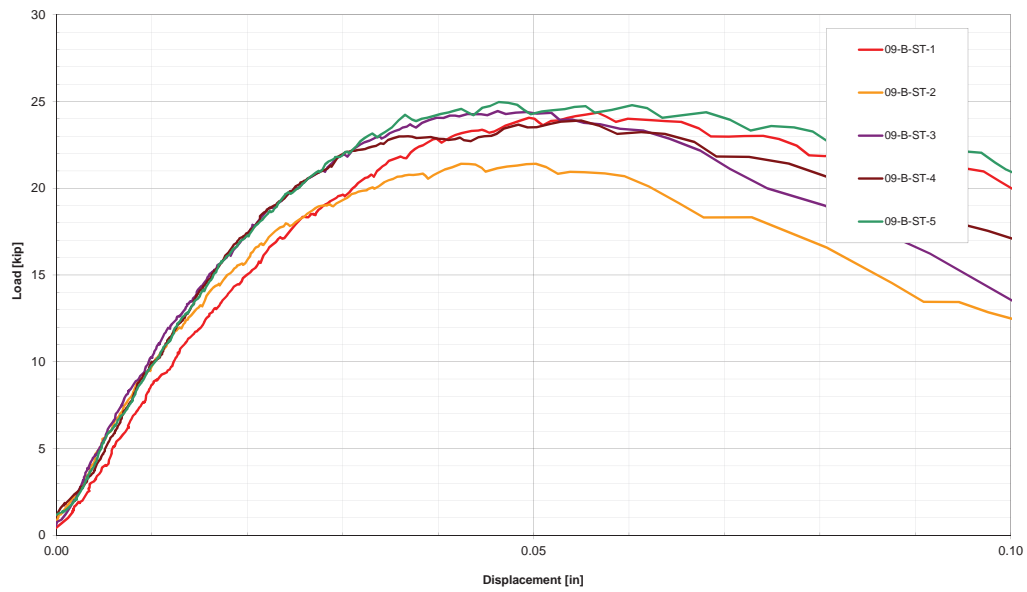
Test	09-A-ST-1	09-A-ST-2	09-A-ST-3	09-A-ST-4	09-A-ST-5	Mean	std. dev.	COV
Max Load (kips)	17.0	18.8	18.9	18.5	19.0	18.4	0.8	0.04
Displacement (in)	0.038	0.044	0.041	0.042	0.037	0.040	0.003	0.07

09-B-ST



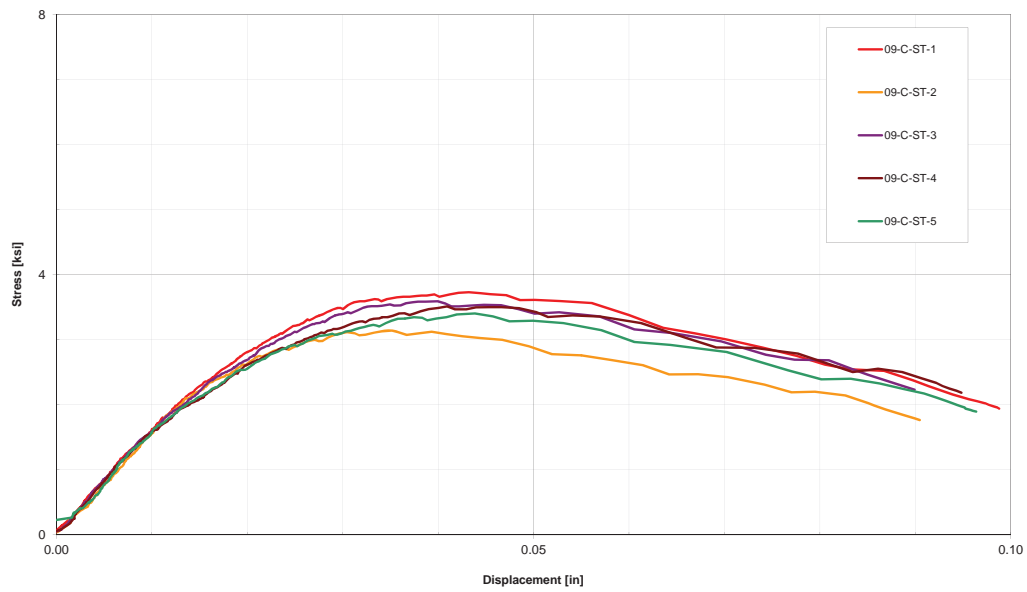
Test	09-B-ST-1	09-B-ST-2	09-B-ST-3	09-B-ST-4	09-B-ST-5	Mean	std. dev.	COV
Max Stress (ksi)	3.97	3.49	3.98	3.90	4.07	3.88	0.23	0.06
Displacement (in)	0.057	0.042	0.046	0.055	0.046	0.049	0.006	0.13

09-B-ST



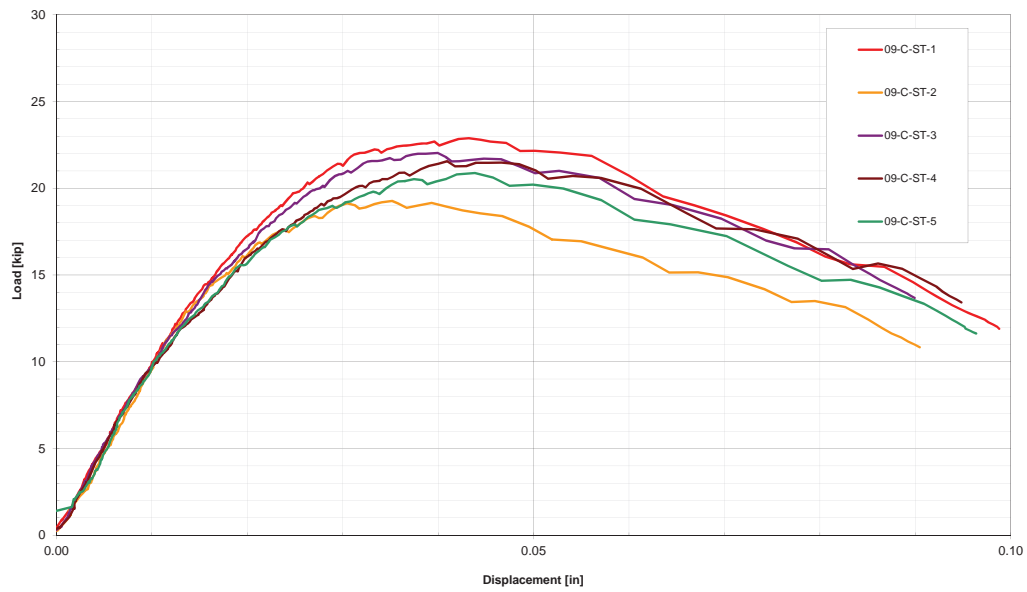
Test	09-B-ST-1	09-B-ST-2	09-B-ST-3	09-B-ST-4	09-B-ST-5	Mean	std. dev.	COV
Max Load (kips)	24.4	21.4	24.4	23.9	25.0	23.8	1.4	0.06
Displacement (in)	0.057	0.042	0.046	0.055	0.046	0.049	0.006	0.13

09-C-ST



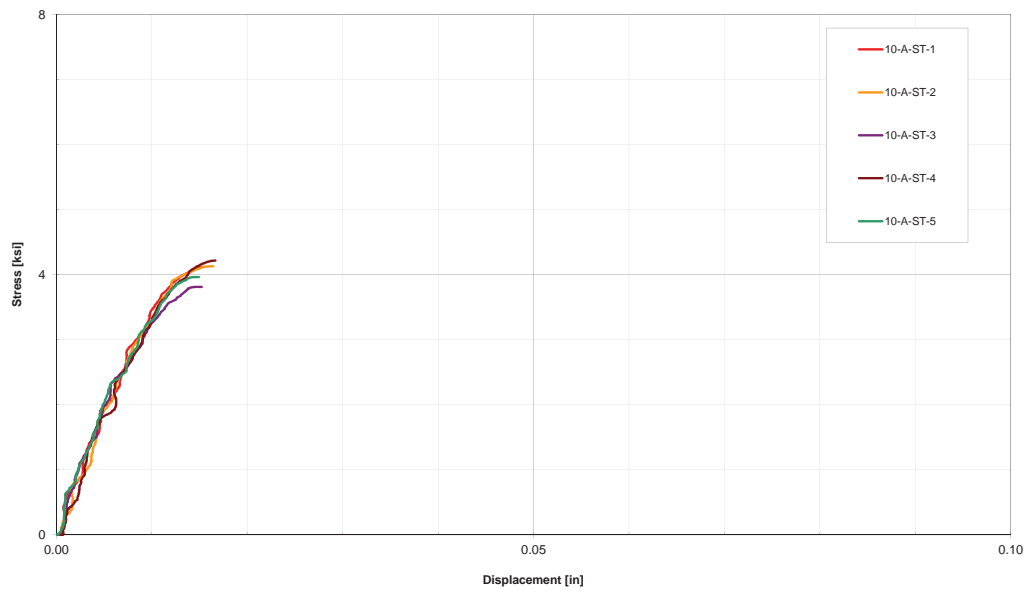
Test	09-C-ST-1	09-C-ST-2	09-C-ST-3	09-C-ST-4	09-C-ST-5	Mean	std. dev.	COV
Max Stress (ksi)	3.73	3.14	3.59	3.51	3.40	3.48	0.22	0.06
Displacement (in)	0.043	0.035	0.040	0.041	0.044	0.041	0.003	0.08

09-C-ST



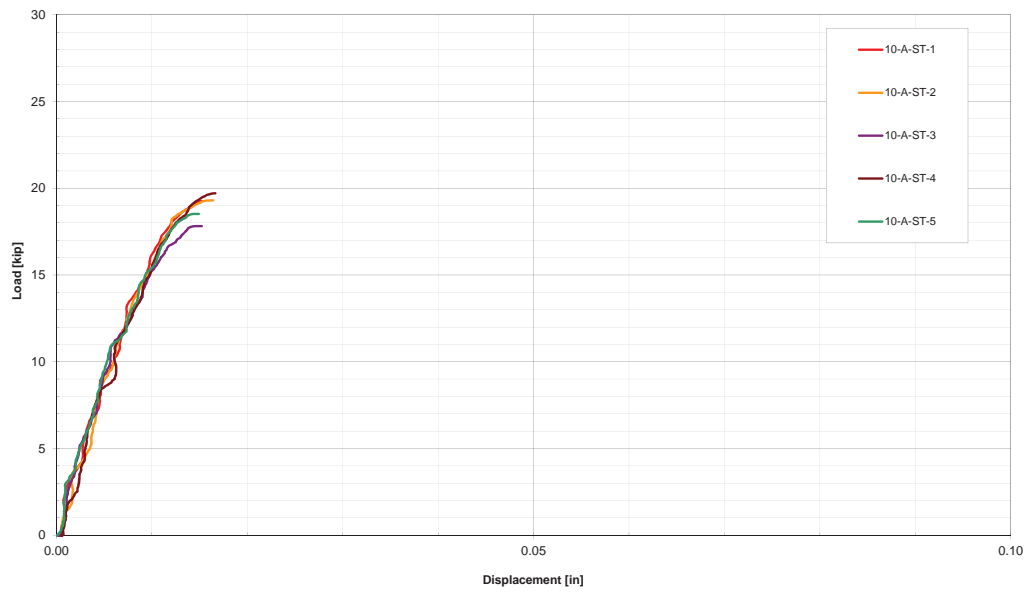
Test	09-C-ST-1	09-C-ST-2	09-C-ST-3	09-C-ST-4	09-C-ST-5	Mean	std. dev.	COV
Max Load (kips)	22.9	19.3	22.0	21.6	20.9	21.3	1.4	0.06
Displacement (in)	0.043	0.035	0.040	0.041	0.044	0.041	0.003	0.08

10-A-ST



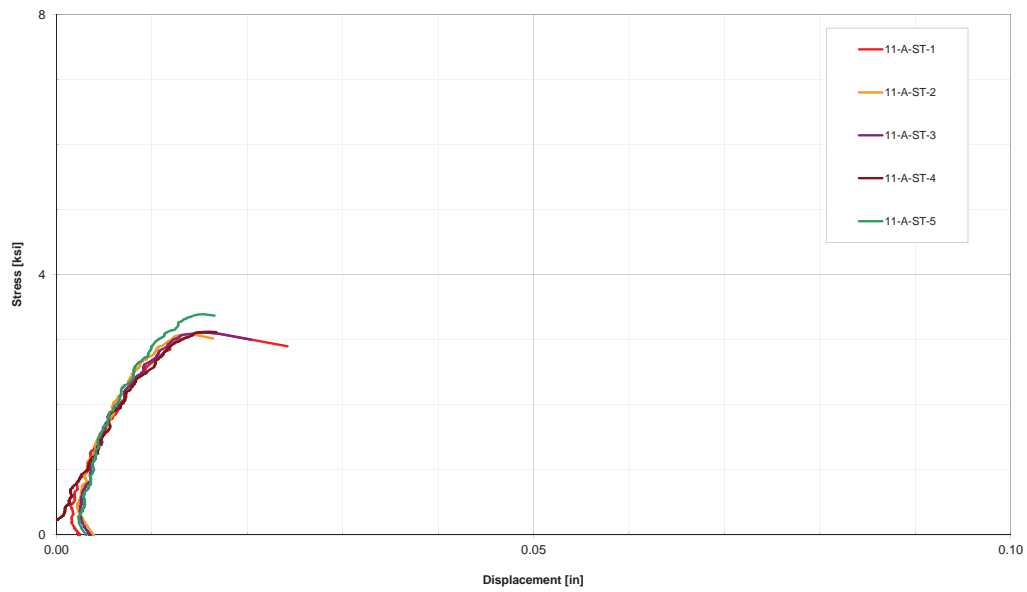
Test	10-A-ST-1	10-A-ST-2	10-A-ST-3	10-A-ST-4	10-A-ST-5	Mean	std. dev.	COV
Max Stress (ksi)	4.12	4.13	3.81	4.22	3.96	4.05	0.16	0.04
Displacement (in)	0.015	0.016	0.015	0.017	0.015	0.016	0.001	0.06

10-A-ST



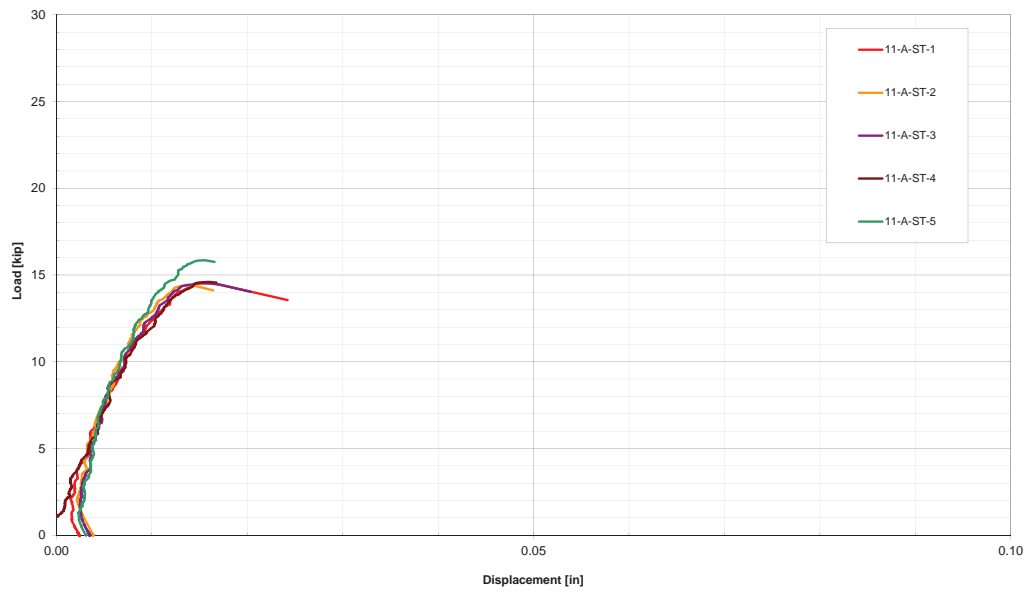
Test	10-A-ST-1	10-A-ST-2	10-A-ST-3	10-A-ST-4	10-A-ST-5	Mean	std. dev.	COV
Max Load (kips)	19.3	19.3	17.8	19.7	18.5	18.9	0.8	0.04
Displacement (in)	0.015	0.016	0.015	0.017	0.015	0.016	0.001	0.06

11-A-ST



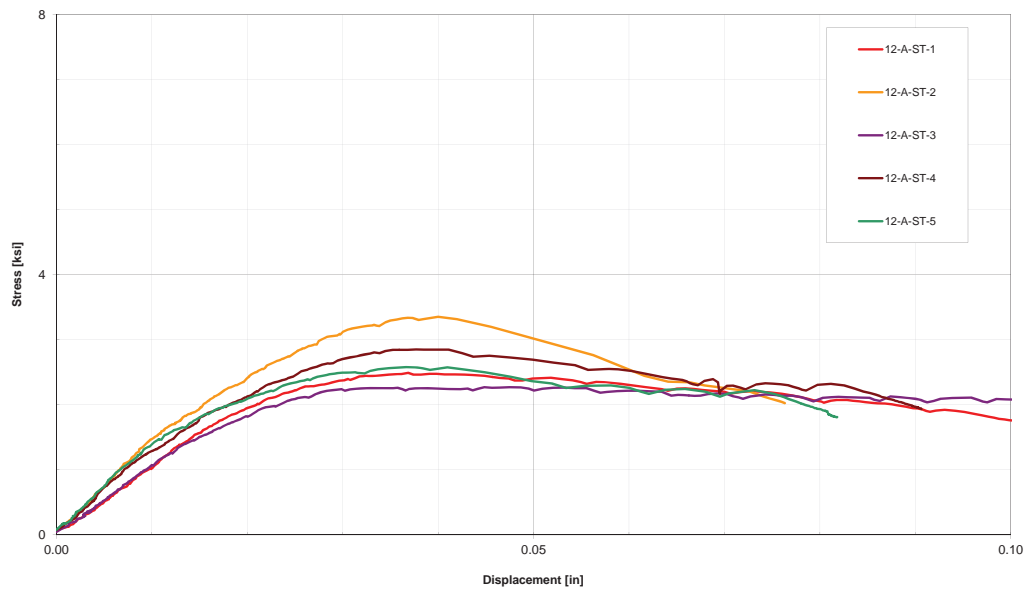
Test	11-A-ST-1	11-A-ST-2	11-A-ST-3	11-A-ST-4	11-A-ST-5	Mean	std. dev.	COV
Max Stress (ksi)	3.11	3.08	3.11	3.12	3.39	3.16	0.13	0.04
Displacement (in)	0.015	0.014	0.015	0.016	0.015	0.015	0.001	0.04

11-A-ST



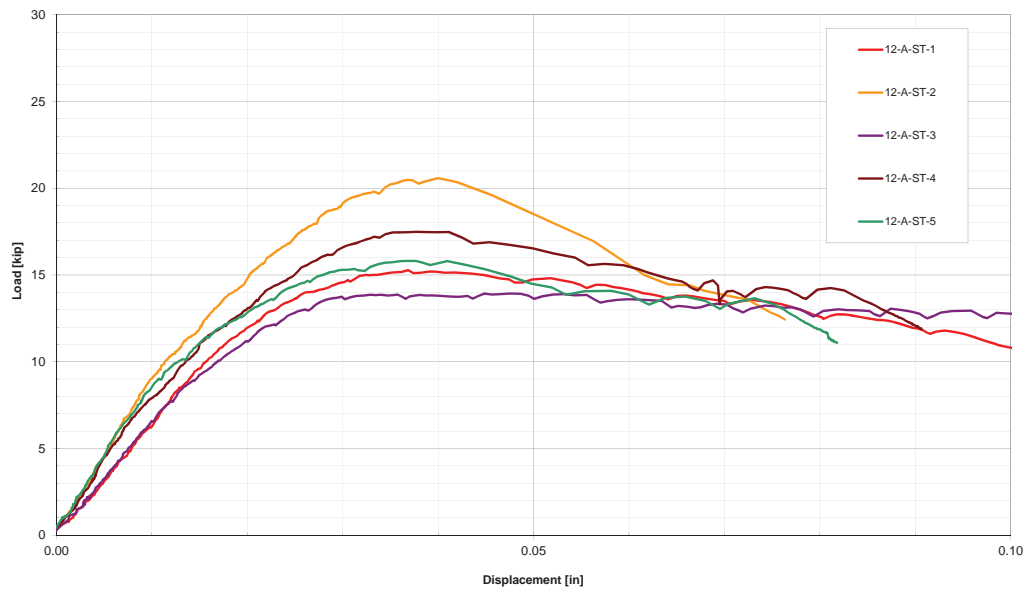
Test	11-A-ST-1	11-A-ST-2	11-A-ST-3	11-A-ST-4	11-A-ST-5	Mean	std. dev.	COV
Max Load (kips)	14.5	14.4	14.6	14.6	15.9	14.8	0.6	0.04
Displacement (in)	0.015	0.014	0.015	0.016	0.015	0.015	0.001	0.04

12-A-ST



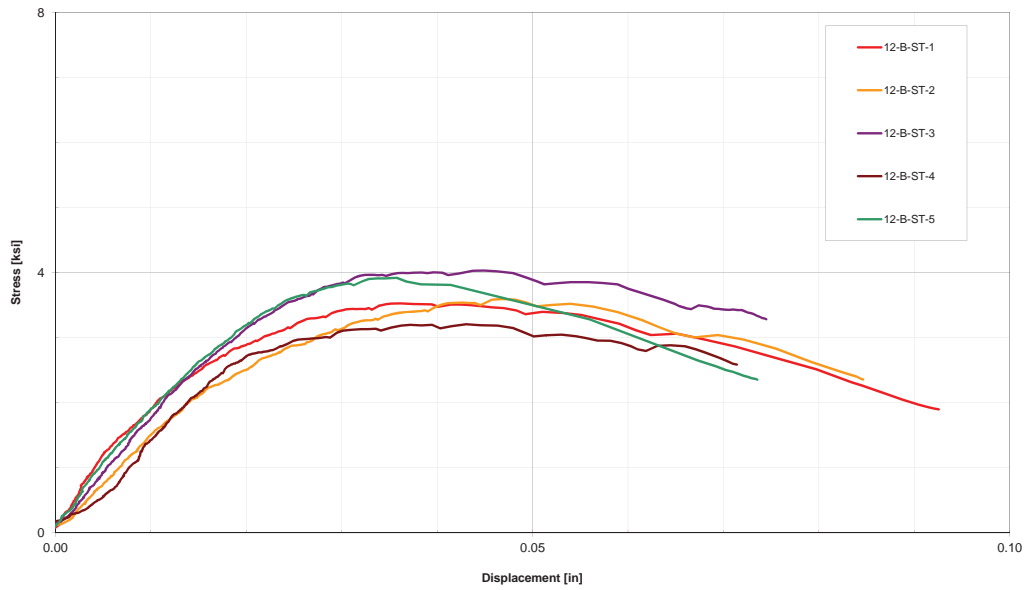
Test	12-A-ST-1	12-A-ST-2	12-A-ST-3	12-A-ST-4	12-A-ST-5	Mean	std. dev.	COV
Max Stress (ksi)	2.49	3.35	2.27	2.85	2.58	2.71	0.42	0.15
Displacement (in)	0.037	0.040	0.047	0.038	0.037	0.040	0.005	0.11

12-A-ST



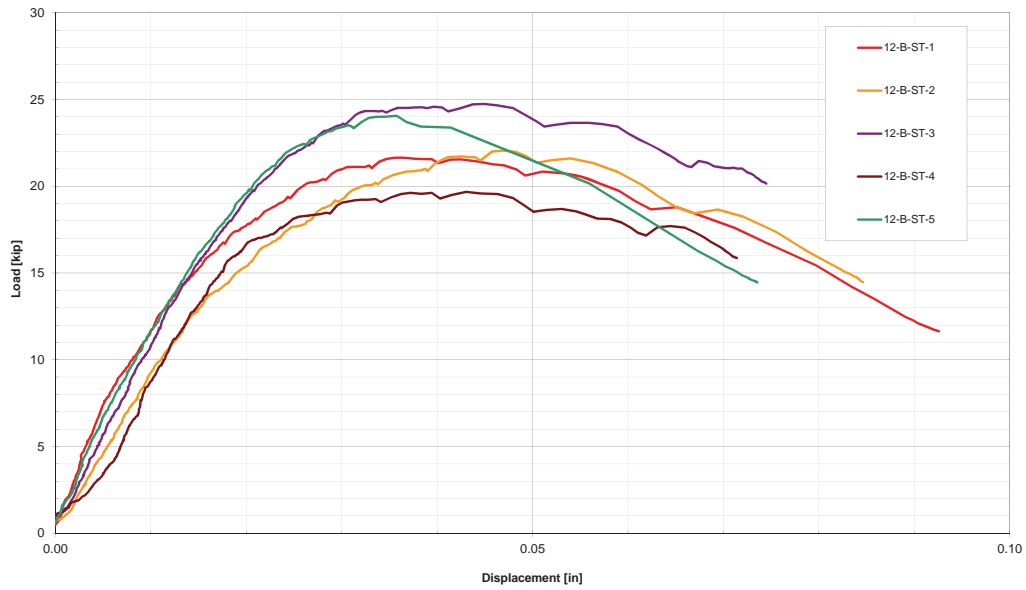
Test	12-A-ST-1	12-A-ST-2	12-A-ST-3	12-A-ST-4	12-A-ST-5	Mean	std. dev.	COV
Max Load (kips)	15.3	20.6	13.9	17.5	15.8	16.6	2.6	0.15
Displacement (in)	0.037	0.040	0.047	0.038	0.037	0.040	0.005	0.11

12-B-ST



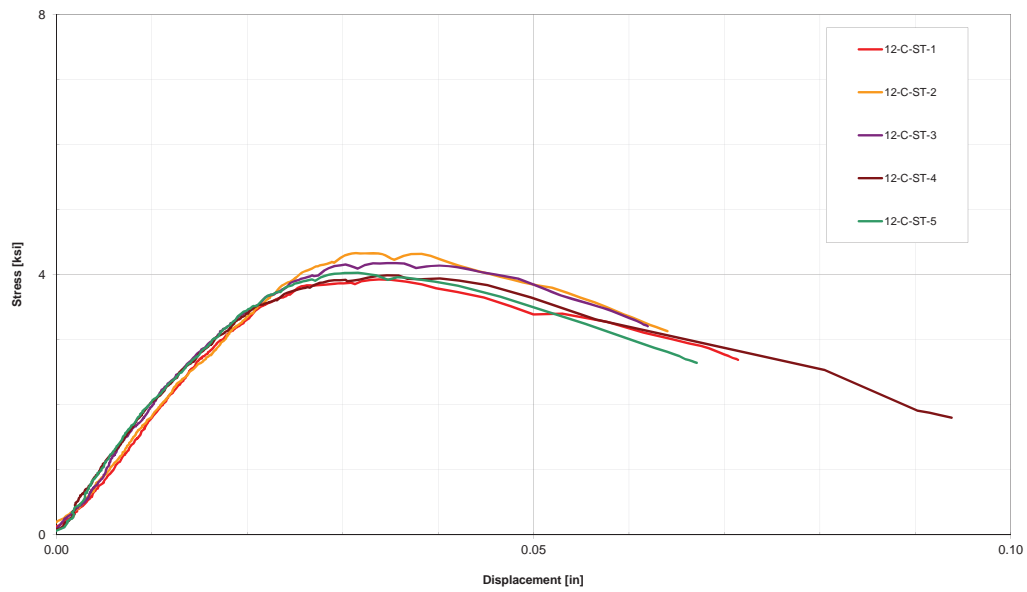
Test	12-B-ST-1	12-B-ST-2	12-B-ST-3	12-B-ST-4	12-B-ST-5	Mean	std. dev.	COV
Max Stress (ksi)	3.53	3.60	4.03	3.21	3.92	3.66	0.33	0.09
Displacement (in)	0.036	0.047	0.045	0.043	0.036	0.041	0.005	0.12

12-B-ST



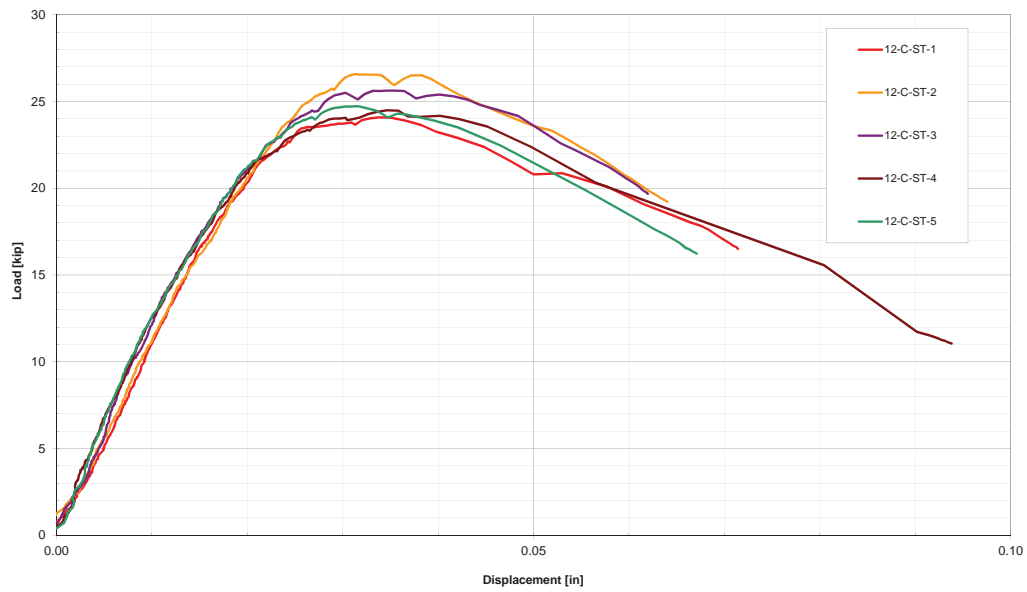
Test	12-B-ST-1	12-B-ST-2	12-B-ST-3	12-B-ST-4	12-B-ST-5	Mean	std. dev.	COV
Max Load (kips)	21.7	22.1	24.8	19.7	24.1	22.4	2.0	0.09
Displacement (in)	0.036	0.047	0.045	0.043	0.036	0.041	0.005	0.12

12-C-ST



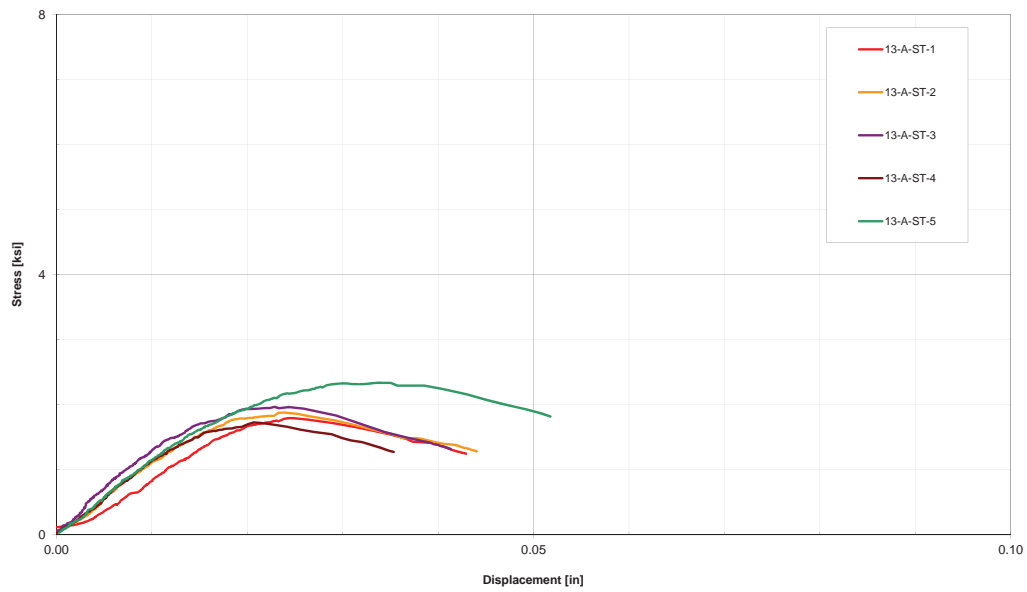
Test	12-C-ST-1	12-C-ST-2	12-C-ST-3	12-C-ST-4	12-C-ST-5	Mean	std. dev.	COV
Max Stress (ksi)	3.93	4.33	4.18	3.99	4.03	4.09	0.16	0.04
Displacement (in)	0.034	0.031	0.035	0.035	0.032	0.033	0.002	0.05

12-C-ST

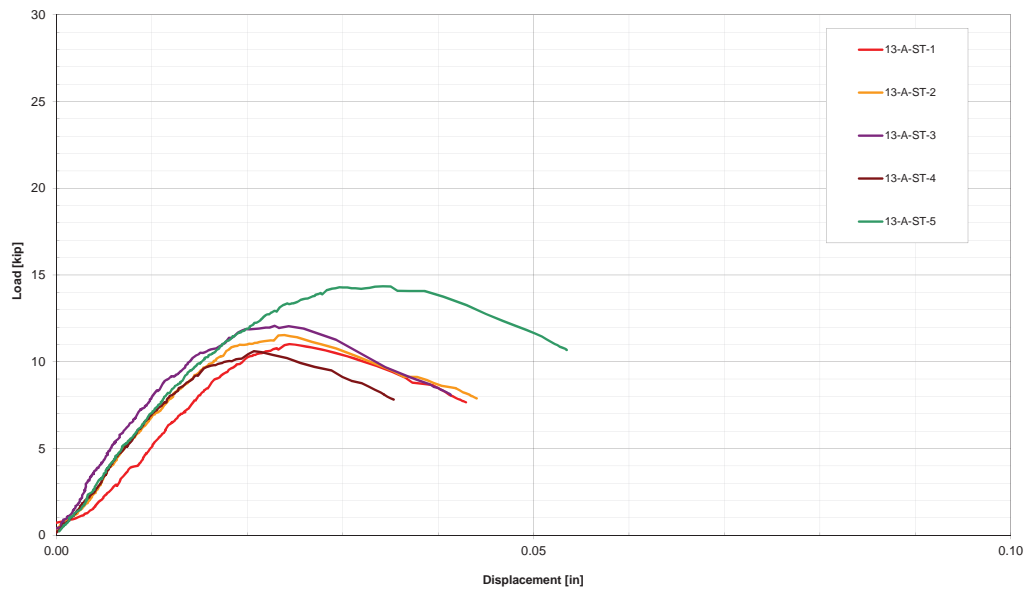


Test	12-C-ST-1	12-C-ST-2	12-C-ST-3	12-C-ST-4	12-C-ST-5	Mean	std. dev.	COV
Max Load (kips)	24.1	26.6	25.6	24.5	24.7	25.1	1.0	0.04
Displacement (in)	0.034	0.031	0.035	0.035	0.032	0.033	0.002	0.05

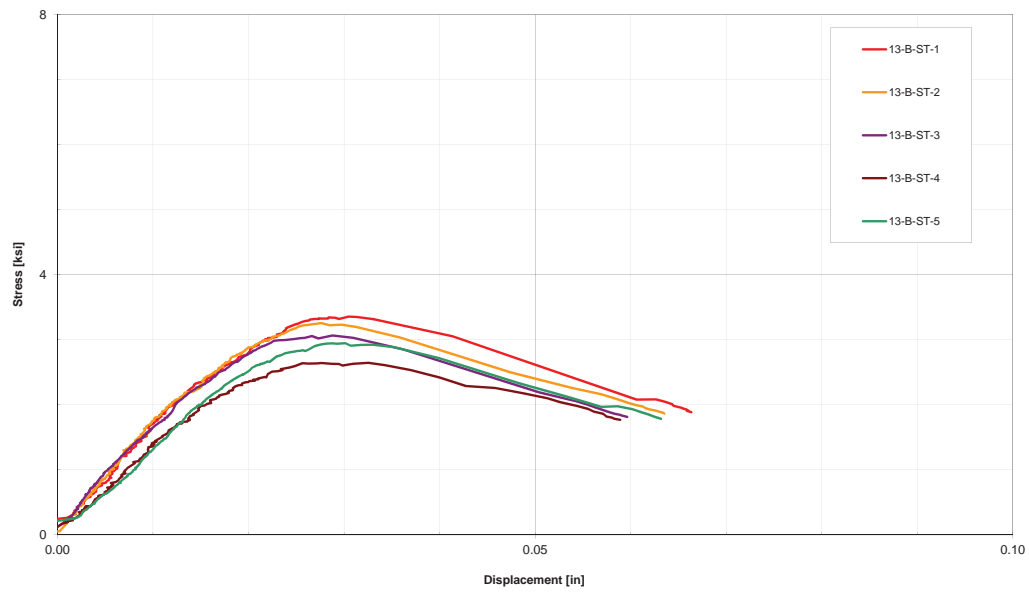
13-A-ST



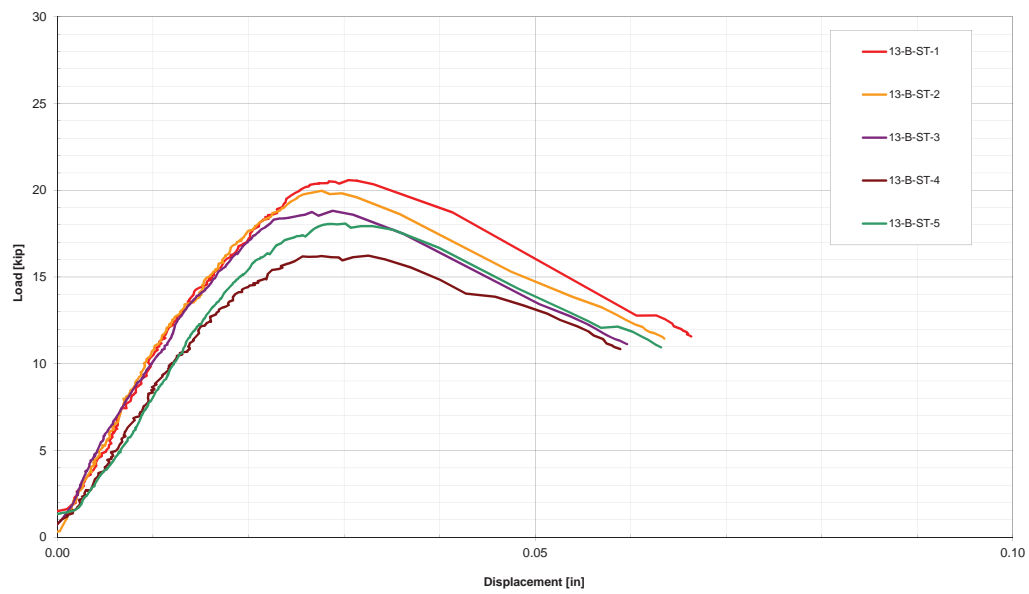
13-A-ST



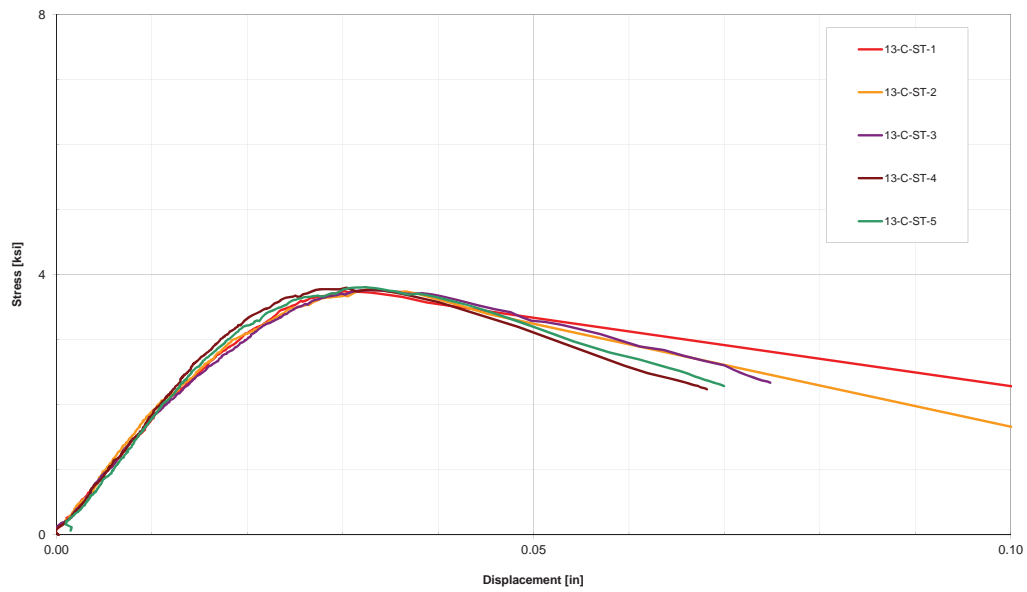
13-B-ST



13-B-ST

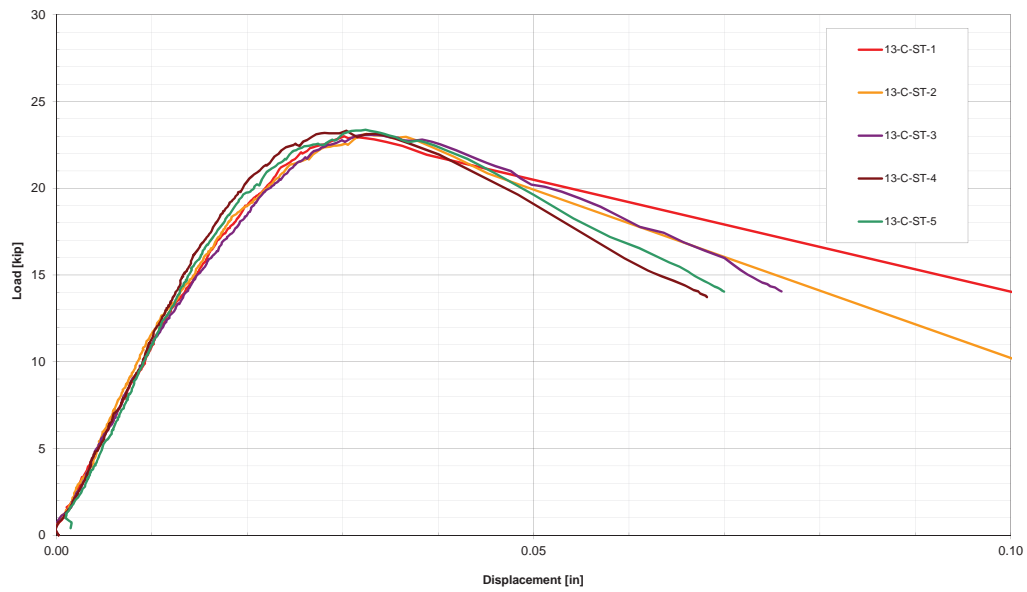


13-C-ST



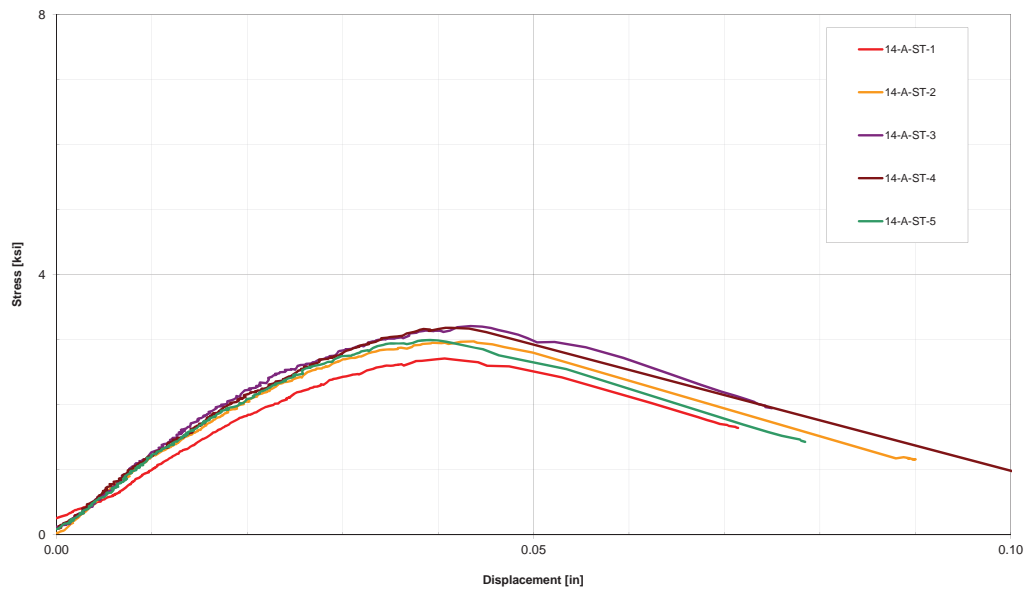
Test	13-C-ST-1	13-C-ST-2	13-C-ST-3	13-C-ST-4	13-C-ST-5	Mean	std. dev.	COV
Max Stress (ksi)	3.75	3.77	3.76	3.80	3.81	3.78	0.03	0.01
Displacement (in)	0.030	0.032	0.033	0.030	0.032	0.032	0.001	0.04

13-C-ST



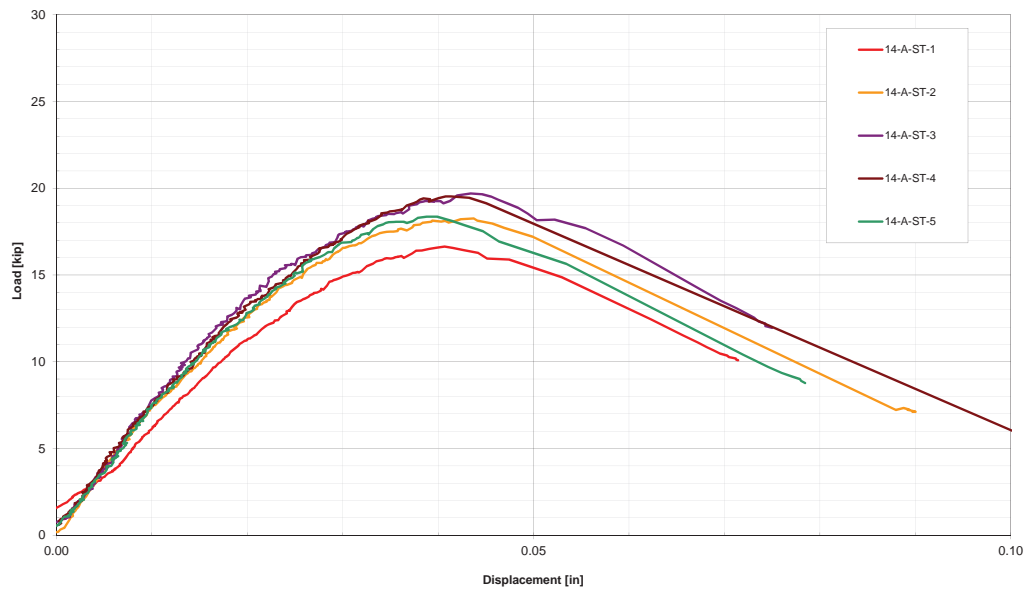
Test	13-C-ST-1	13-C-ST-2	13-C-ST-3	13-C-ST-4	13-C-ST-5	Mean	std. dev.	COV
Max Load (kips)	23.0	23.1	23.1	23.3	23.4	23.2	0.2	0.01
Displacement (in)	0.030	0.032	0.033	0.030	0.032	0.032	0.001	0.04

14-A-ST



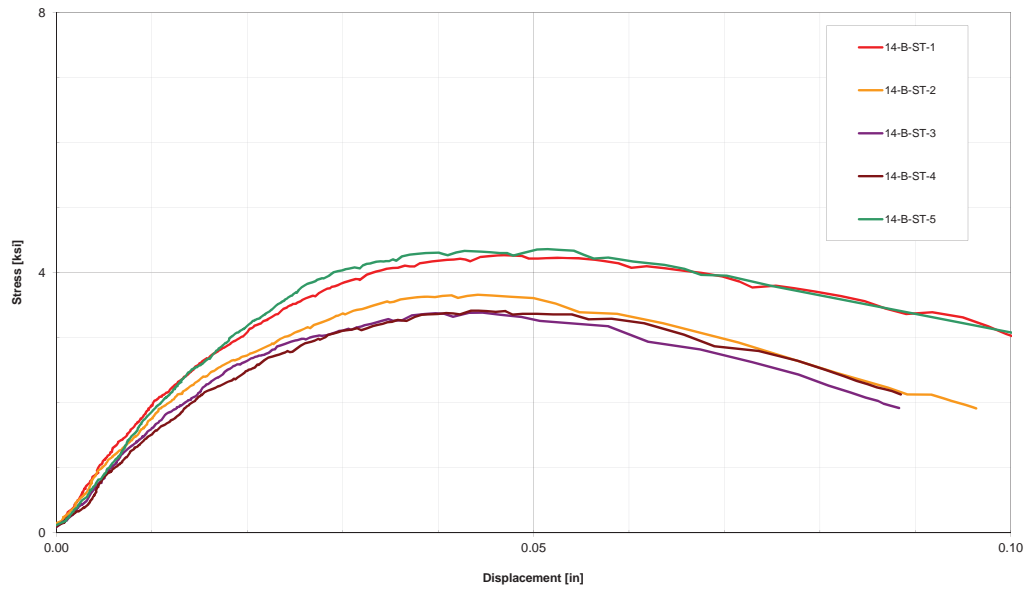
Test	14-A-ST-1	14-A-ST-2	14-A-ST-3	14-A-ST-4	14-A-ST-5	Mean	std. dev.	COV
Max Stress (ksi)	2.71	2.98	3.21	3.18	2.99	3.02	0.20	0.07
Displacement (in)	0.041	0.044	0.043	0.041	0.040	0.042	0.002	0.04

14-A-ST



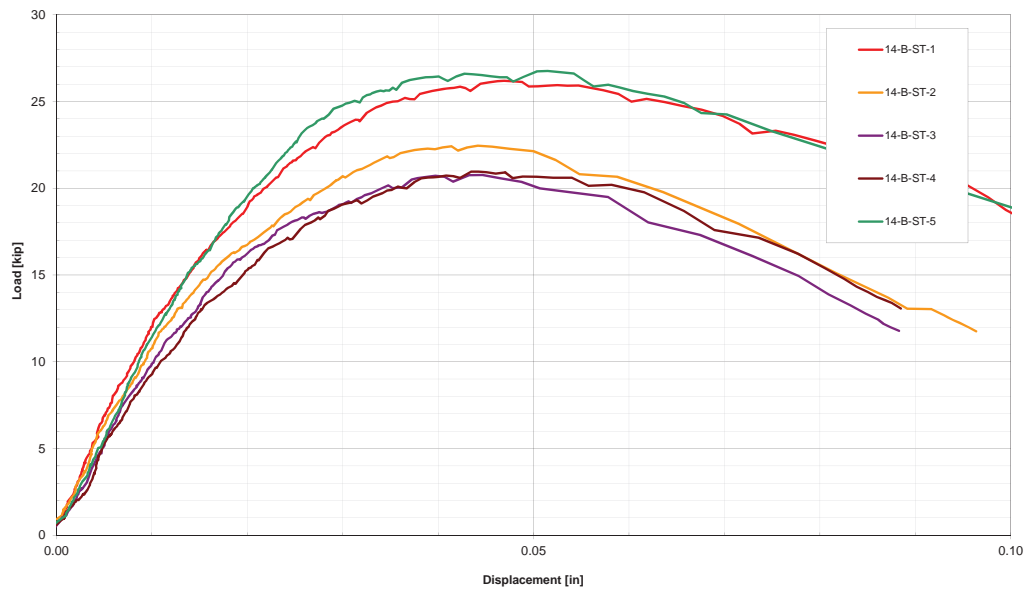
Test	14-A-ST-1	14-A-ST-2	14-A-ST-3	14-A-ST-4	14-A-ST-5	Mean	std. dev.	COV
Max Load (kips)	16.6	18.3	19.7	19.5	18.4	18.5	1.2	0.07
Displacement (in)	0.041	0.044	0.043	0.041	0.040	0.042	0.002	0.04

14-B-ST



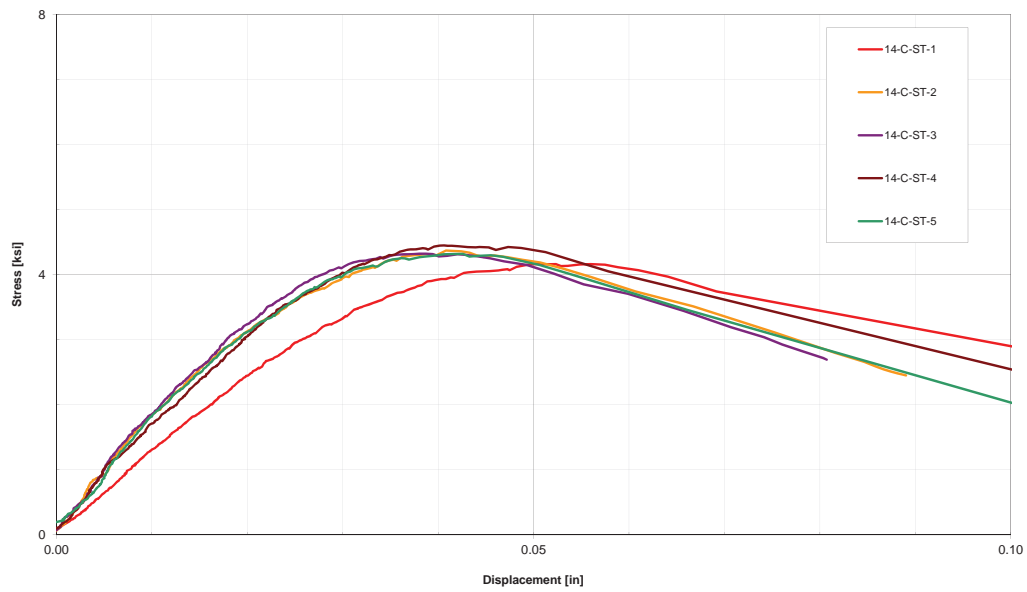
Test	14-B-ST-1	14-B-ST-2	14-B-ST-3	14-B-ST-4	14-B-ST-5	Mean	std. dev.	COV
Max Stress (ksi)	4.27	3.66	3.39	3.42	4.36	3.82	0.47	0.12
Displacement (in)	0.047	0.044	0.045	0.043	0.051	0.046	0.003	0.07

14-B-ST



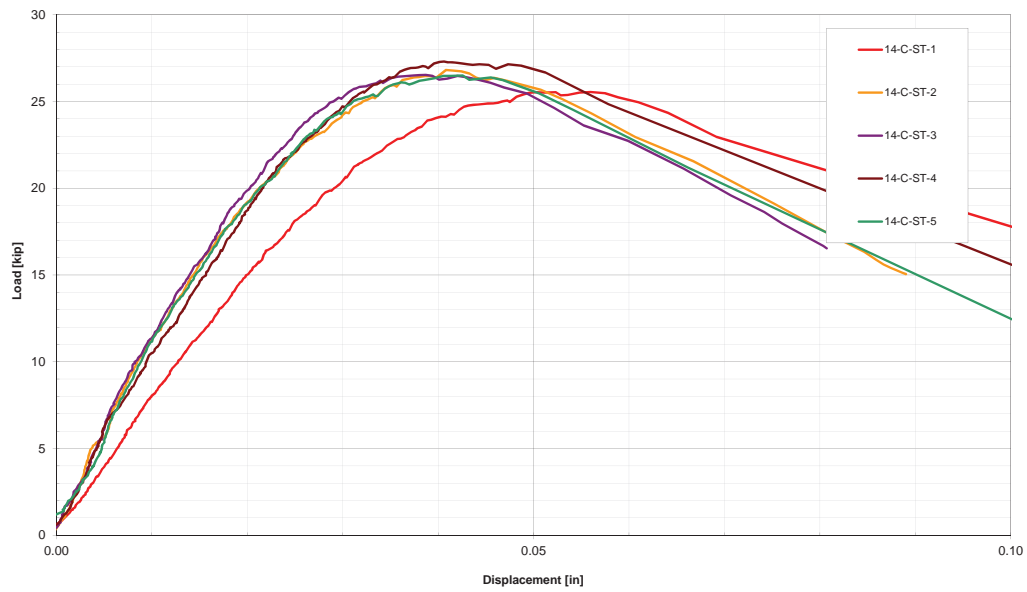
Test	14-B-ST-1	14-B-ST-2	14-B-ST-3	14-B-ST-4	14-B-ST-5	Mean	std. dev.	COV
Max Load (kips)	26.2	22.5	20.8	21.0	26.8	23.4	2.9	0.12
Displacement (in)	0.047	0.044	0.045	0.043	0.051	0.046	0.003	0.07

14-C-ST



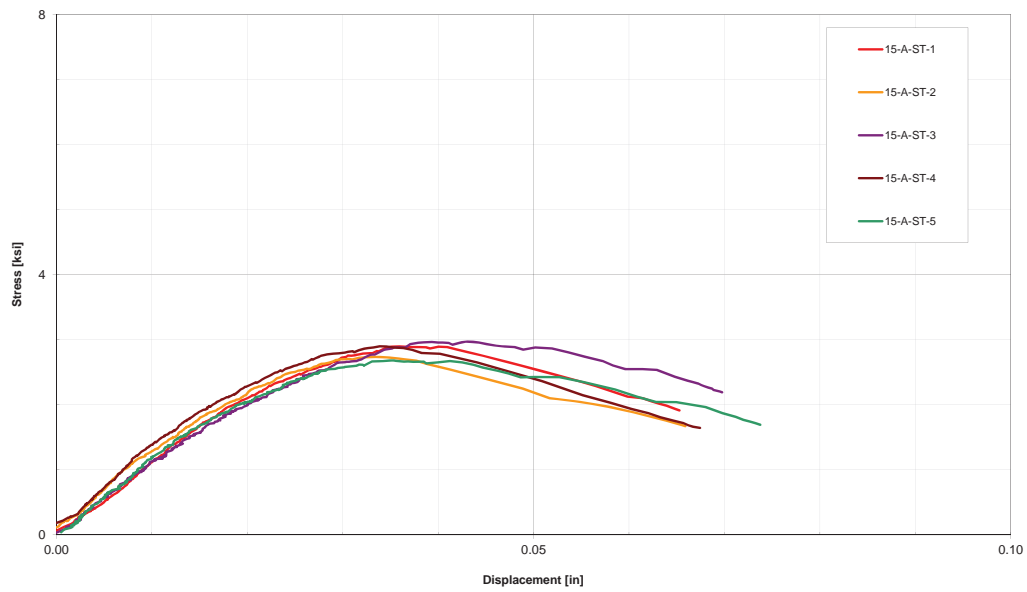
Test	14-C-ST-1	14-C-ST-2	14-C-ST-3	14-C-ST-4	14-C-ST-5	Mean	std. dev.	COV
Max Stress (ksi)	4.16	4.37	4.33	4.46	4.32	4.33	0.10	0.02
Displacement (in)	0.056	0.041	0.039	0.041	0.043	0.044	0.007	0.16

14-C-ST

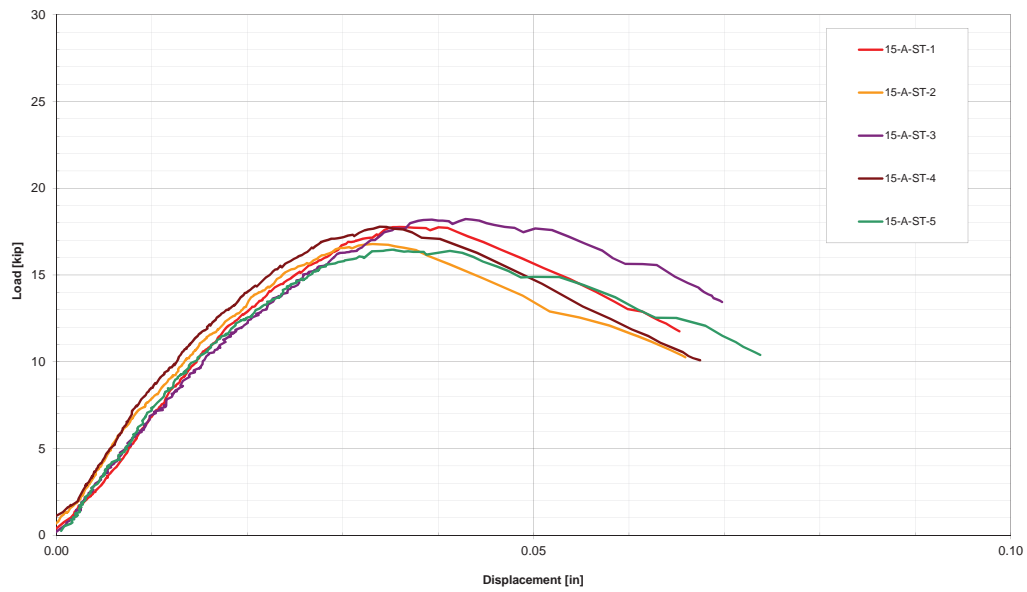


Test	14-C-ST-1	14-C-ST-2	14-C-ST-3	14-C-ST-4	14-C-ST-5	Mean	std. dev.	COV
Max Load (kips)	25.6	26.8	26.5	27.3	26.5	26.5	0.6	0.02
Displacement (in)	0.056	0.041	0.039	0.041	0.043	0.044	0.007	0.16

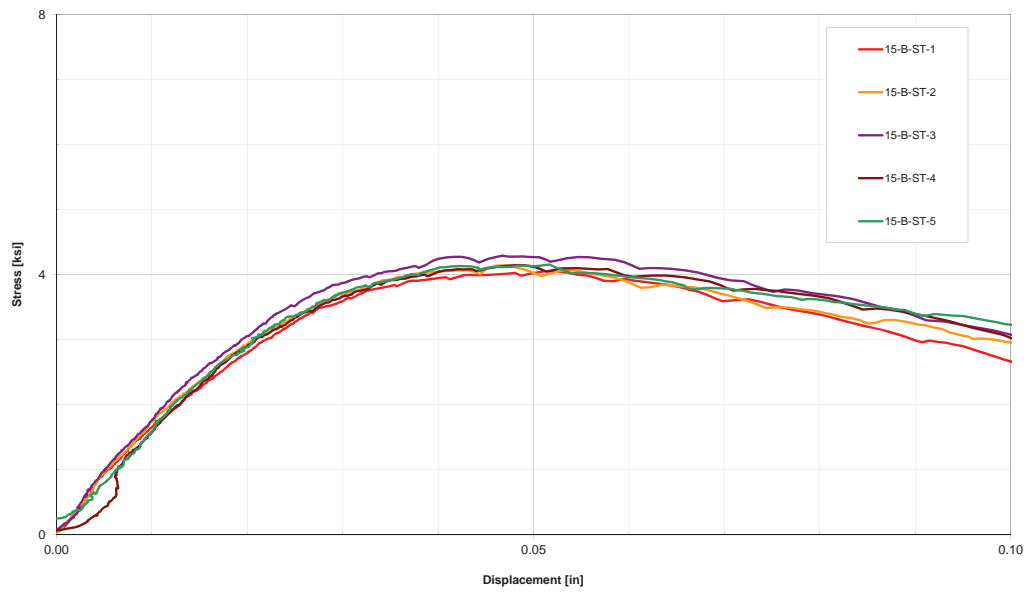
15-A-ST



15-A-ST

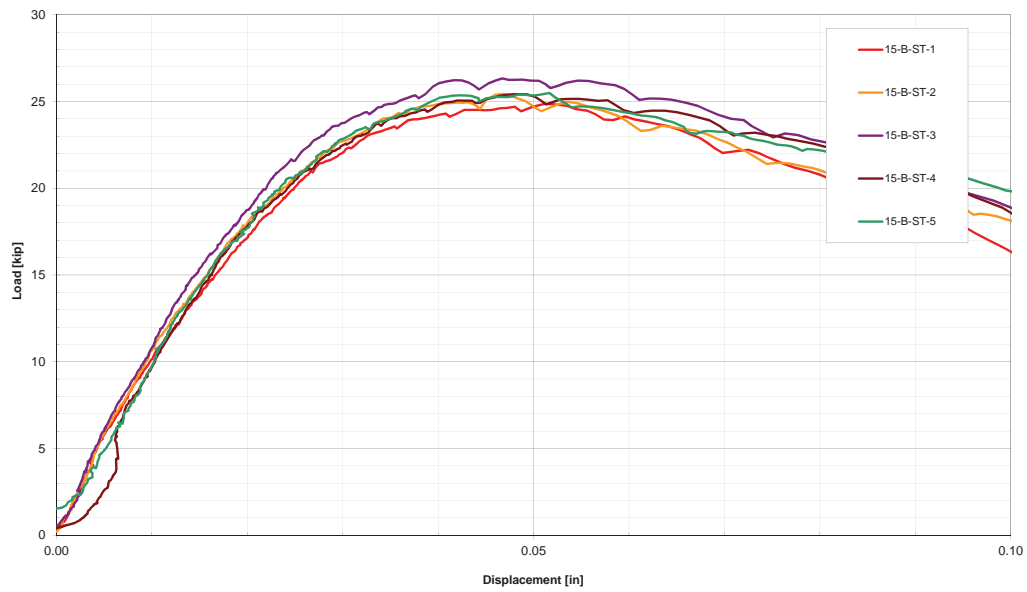


15-B-ST



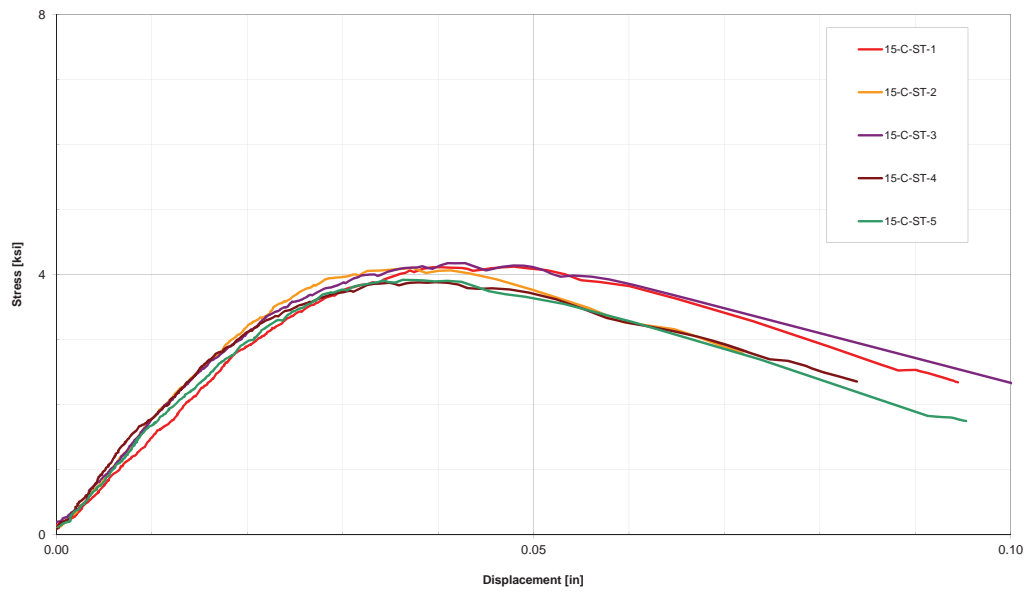
Test	15-B-ST-1	15-B-ST-2	15-B-ST-3	15-B-ST-4	15-B-ST-5	Mean	std. dev.	COV
Max Stress (ksi)	4.05	4.15	4.29	4.14	4.16	4.16	0.09	0.02
Displacement (in)	0.051	0.047	0.047	0.048	0.052	0.049	0.002	0.05

15-B-ST



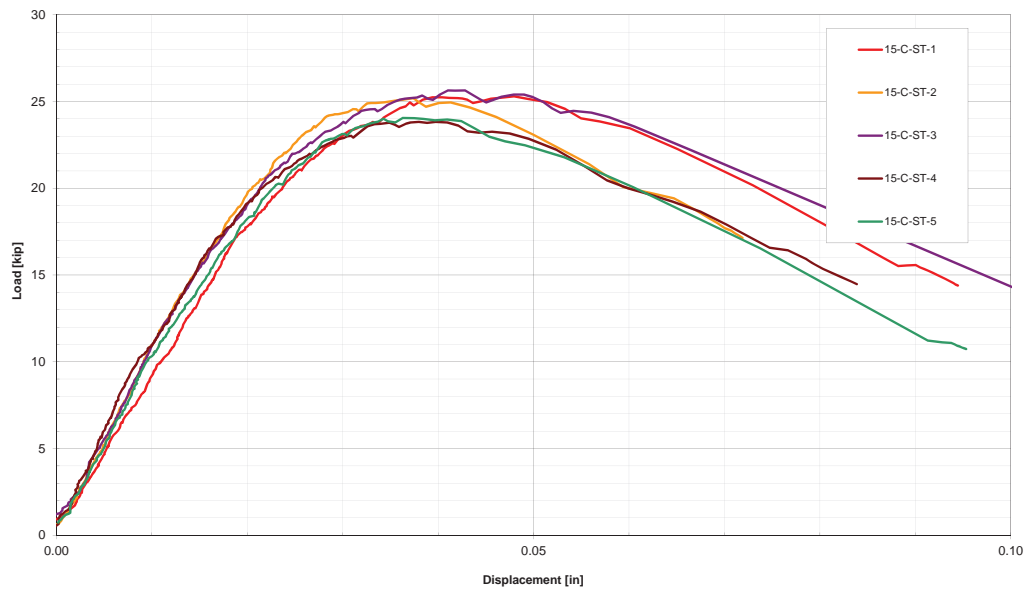
Test	15-B-ST-1	15-B-ST-2	15-B-ST-3	15-B-ST-4	15-B-ST-5	Mean	std. dev.	COV
Max Load (kips)	24.9	25.4	26.3	25.4	25.5	25.5	0.5	0.02
Displacement (in)	0.051	0.047	0.047	0.048	0.052	0.049	0.002	0.05

15-C-ST



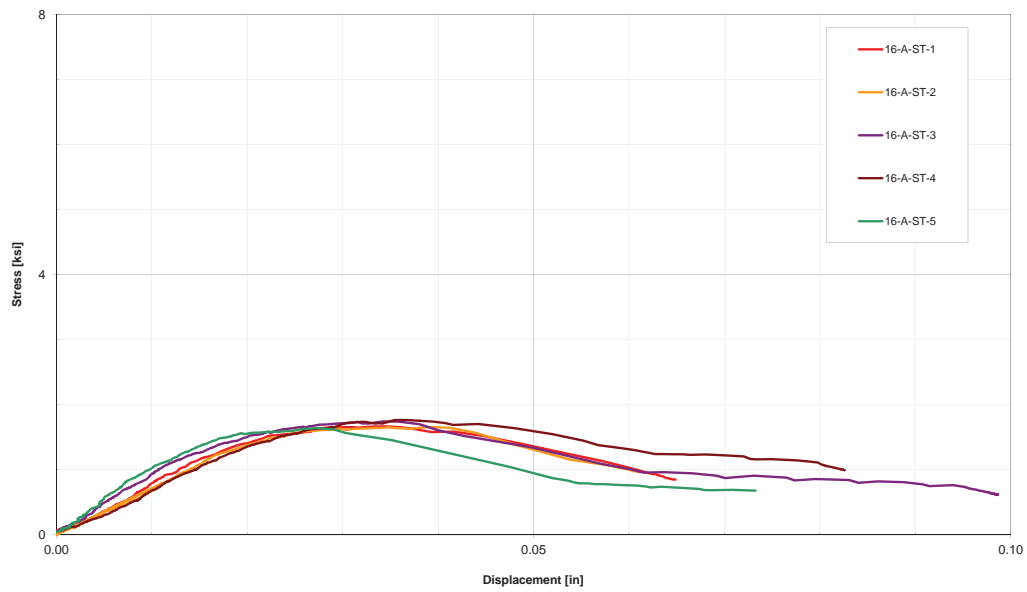
Test	15-C-ST-1	15-C-ST-2	15-C-ST-3	15-C-ST-4	15-C-ST-5	Mean	std. dev.	COV
Max Stress (ksi)	4.12	4.11	4.18	3.88	3.92	4.04	0.13	0.03
Displacement (in)	0.048	0.037	0.041	0.040	0.036	0.040	0.005	0.11

15-C-ST



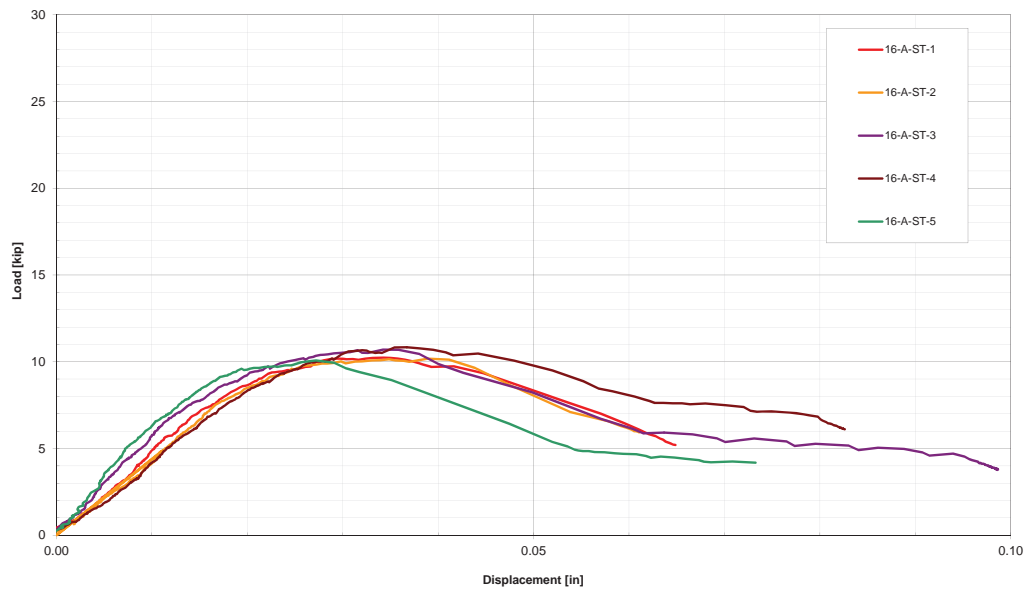
Test	15-C-ST-1	15-C-ST-2	15-C-ST-3	15-C-ST-4	15-C-ST-5	Mean	std. dev.	COV
Max Load (kips)	25.3	25.2	25.6	23.8	24.1	24.8	0.8	0.03
Displacement (in)	0.048	0.037	0.041	0.040	0.036	0.040	0.005	0.11

16-A-ST



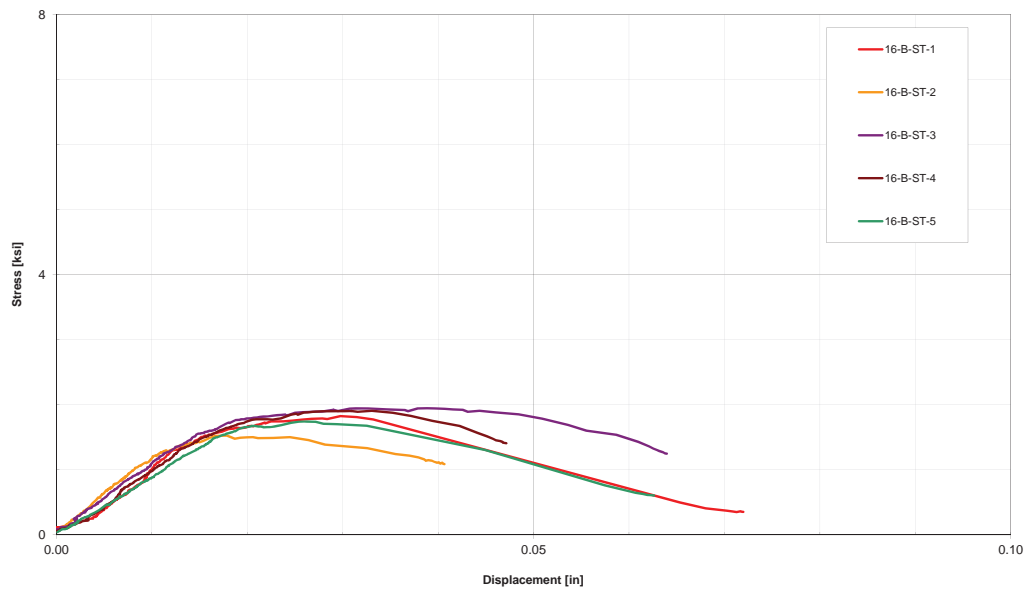
Test	16-A-ST-1	16-A-ST-2	16-A-ST-3	16-A-ST-4	16-A-ST-5	Mean	std. dev.	COV
Max Stress (ksi)	1.67	1.66	1.74	1.77	1.64	1.70	0.06	0.03
Displacement (in)	0.034	0.039	0.034	0.037	0.027	0.034	0.004	0.13

16-A-ST



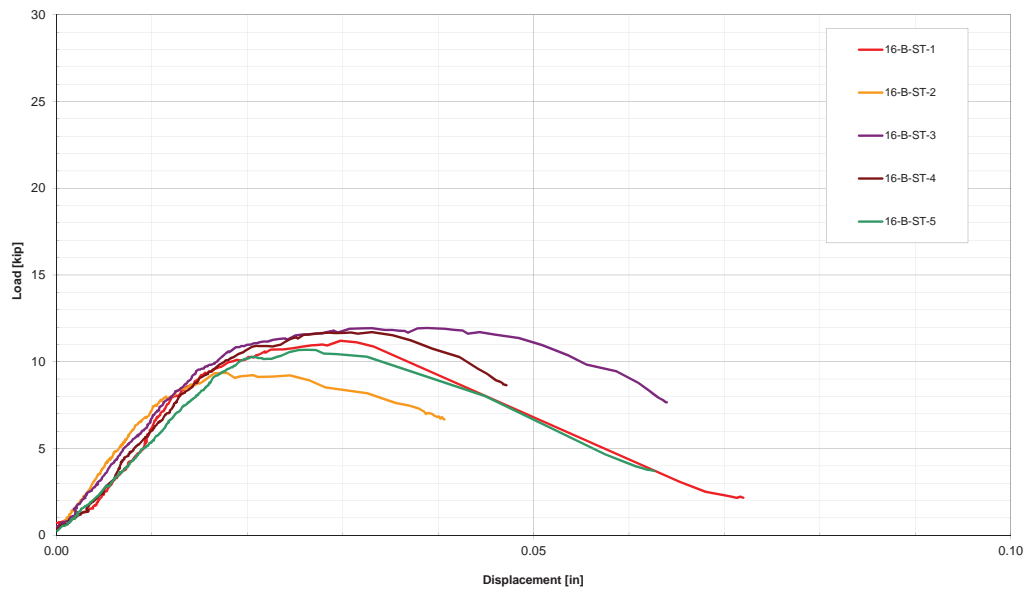
Test	16-A-ST-1	16-A-ST-2	16-A-ST-3	16-A-ST-4	16-A-ST-5	Mean	std. dev.	COV
Max Load (kips)	10.2	10.2	10.7	10.8	10.1	10.4	0.3	0.03
Displacement (in)	0.034	0.039	0.034	0.037	0.027	0.034	0.004	0.13

16-B-ST



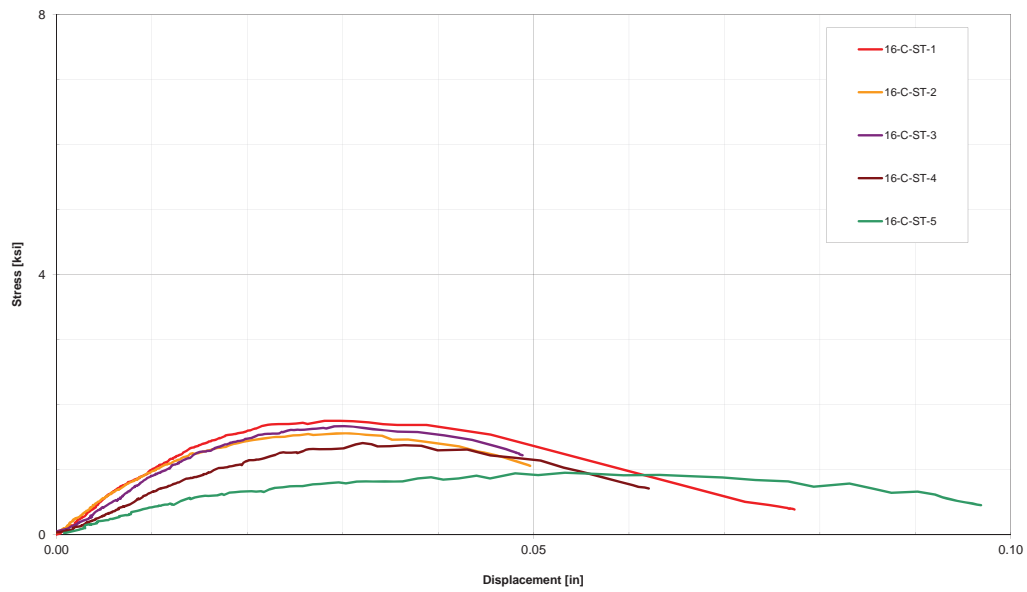
Test	16-B-ST-1	16-B-ST-2	16-B-ST-3	16-B-ST-4	16-B-ST-5	Mean	std. dev.	COV
Max Stress (ksi)	1.83	1.53	1.95	1.91	1.74	1.79	0.17	0.09
Displacement (in)	0.030	0.018	0.039	0.033	0.026	0.029	0.008	0.27

16-B-ST



Test	16-B-ST-1	16-B-ST-2	16-B-ST-3	16-B-ST-4	16-B-ST-5	Mean	std. dev.	COV
Max Load (kips)	11.2	9.4	12.0	11.7	10.7	11.0	1.0	0.09
Displacement (in)	0.030	0.018	0.039	0.033	0.026	0.029	0.008	0.27

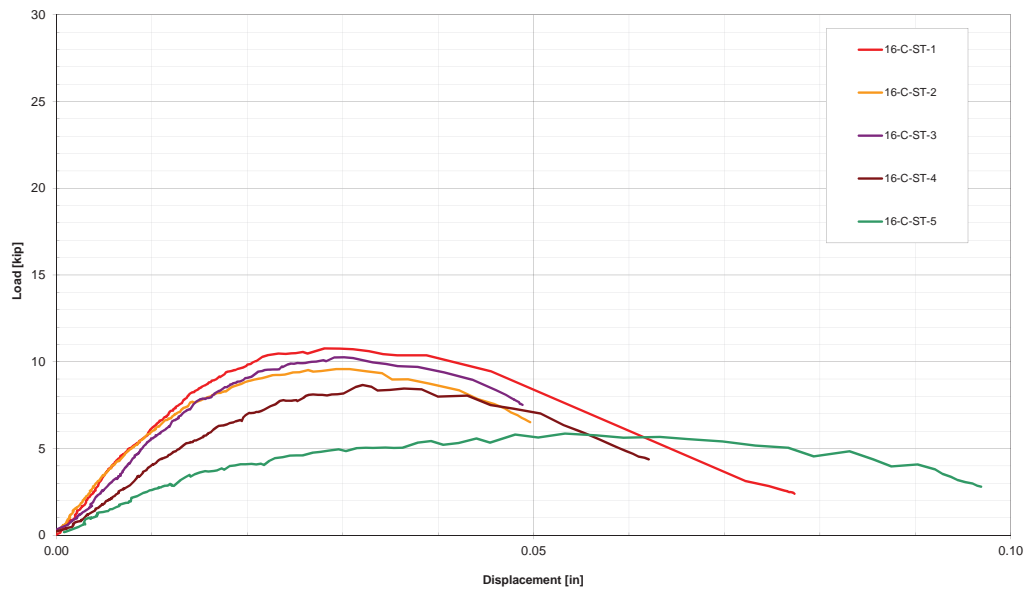
16-C-ST



Test	16-C-ST-1	16-C-ST-2	16-C-ST-3	16-C-ST-4	16-C-ST-5	Mean	std. dev.	COV
Max Stress (ksi)	1.76	1.56	1.67	1.41	0.96	1.60	0.15	0.09
Displacement (in)	0.028	0.029	0.030	0.032	0.053	0.030	0.002	0.06

* 16-C-ST-5 is considered an outlier

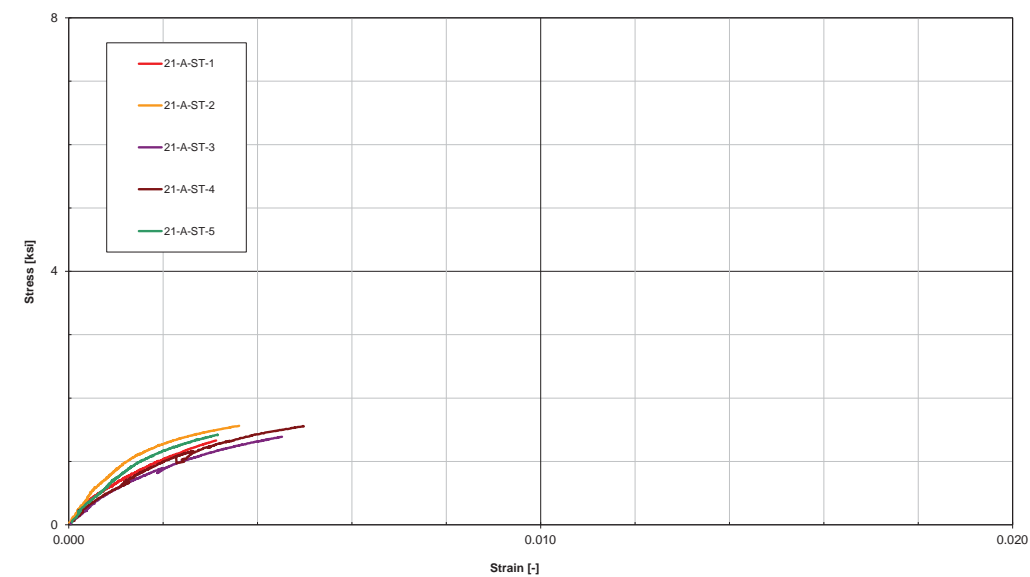
16-C-ST



Test	16-C-ST-1	16-C-ST-2	16-C-ST-3	16-C-ST-4	16-C-ST-5	Mean	std. dev.	COV
Max Load (kips)	10.8	9.6	10.3	8.7	5.9	9.8	0.9	0.09
Displacement (in)	0.028	0.029	0.030	0.032	0.053	0.030	0.002	0.06

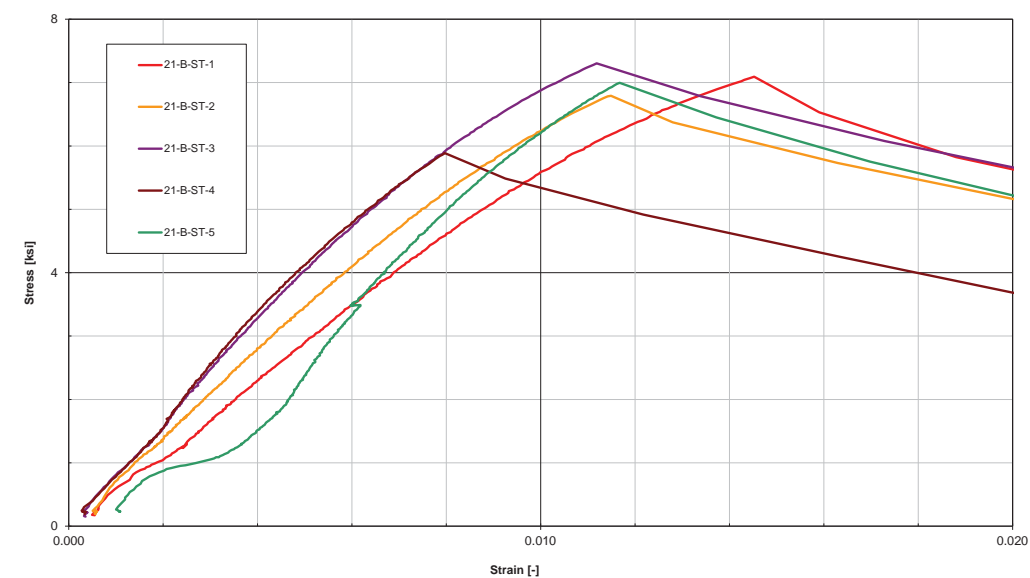
* 16-C-ST-5 is considered an outlier

21-A-ST



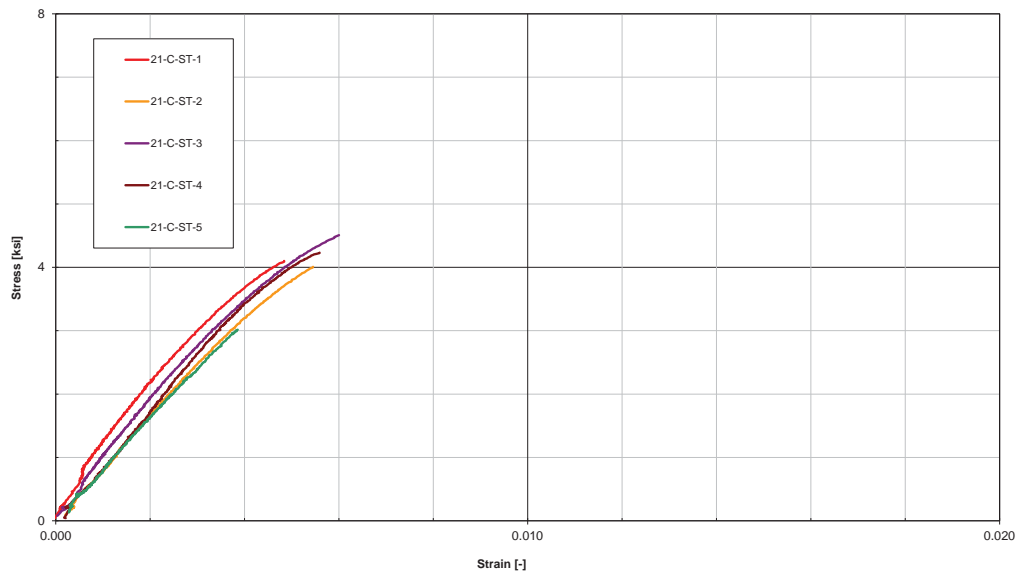
Test	21-A-ST-1	21-A-ST-2	21-A-ST-3	21-A-ST-4	21-A-ST-5	Mean	std. dev.	COV
Max. Stress (ksi)	1.33	1.56	1.39	1.56	1.42	1.45	0.10	0.07
Strain	0.003	0.004	0.005	0.005	0.003	0.004	0.001	0.21

21-B-ST



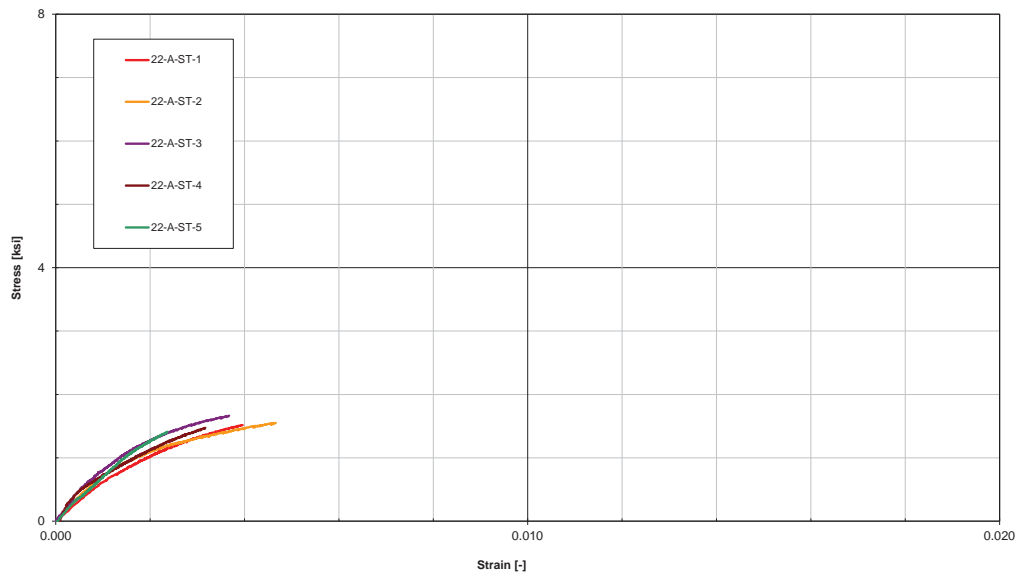
Test	21-B-ST-1	21-B-ST-2	21-B-ST-3	21-B-ST-4	21-B-ST-5	Mean	std. dev.	COV
Max. Stress (ksi)	7.09	6.79	7.30	5.89	7.00	6.81	0.5	0.08
Strain	0.015	0.011	0.011	0.008	0.012	0.011	0.002	0.20

21-C-ST



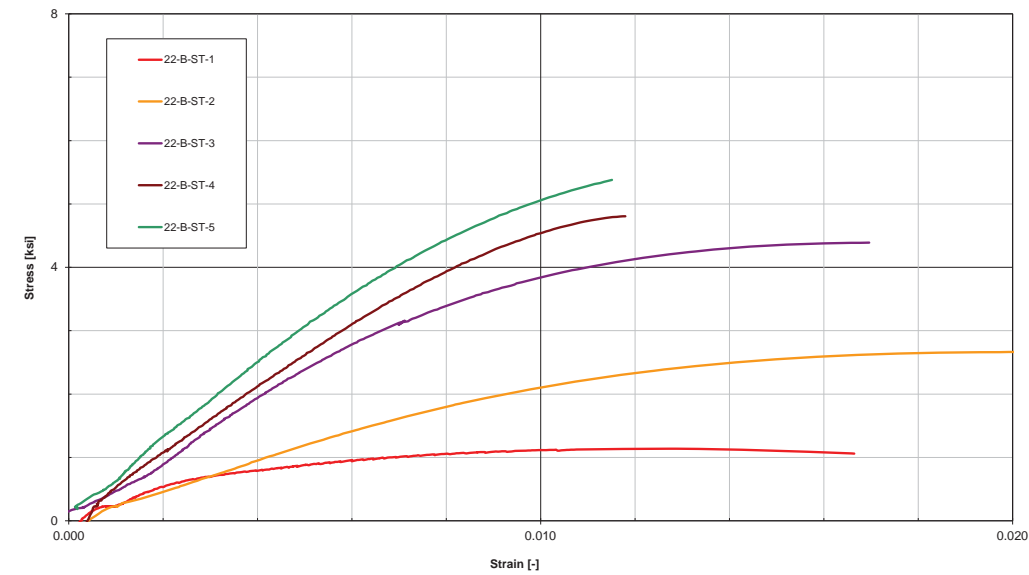
Test	21-C-ST-1	21-C-ST-2	21-C-ST-3	21-C-ST-4	21-C-ST-5	Mean	std. dev.	COV
Max. Stress (ksi)	4.10	4.01	4.51	4.23	3.01	3.97	0.57	0.14
Strain	0.005	0.005	0.006	0.006	0.004	0.005	0.001	0.16

22-A-ST



Test	22-A-ST-1	22-A-ST-2	22-A-ST-3	22-A-ST-4	22-A-ST-5	Mean	std. dev.	COV
Max. Stress (ksi)	1.52	1.55	1.66	1.47	1.41	1.52	0.10	0.06
Strain	0.004	0.005	0.004	0.003	0.002	0.004	0.001	0.24

22-B-ST



Test	22-B-ST-1	22-B-ST-2	22-B-ST-3	22-B-ST-4	22-B-ST-5	Mean	std. dev.	COV
Max. Stress (ksi)	1.14	2.67	4.39	4.81	5.38	3.68	1.74	0.47
Strain	0.013	0.021	0.017	0.012	0.012	0.015	0.004	0.27

Comparison of Time to Tertiary Creep and Time to Rupture

University of Florida Tests

Baseline Adhesive A					Baseline Adhesive B					Baseline Adhesive C				
Test	Tertiary Creep (hour)	Rupture (hour)	% Difference		Test	Tertiary Creep (hour)	Rupture (hour)	% Difference		Test	Tertiary Creep (hour)	Rupture (hour)	% Difference	
01-A-88-1	0.06	0.06	0%		01-B-81-1	0.11	0.11	4%		01-C-80-1	0.31	0.32	3%	
01-A-88-2	0.11	0.12	5%		01-B-81-2	0.02	0.02	3%		01-C-79-2	0.15	0.15	2%	
01-A-87-3	0.05	0.06	0%		01-B-75-3	0.04	0.04	1%		01-C-72-3	11.2	11.2	1%	
01-A-76-4	0.16	0.17	3%		01-B-73-4	0.64	0.67	5%		01-C-72-4	7.4	7.8	4%	
01-A-68-5	0.13	0.14	1%		01-B-72-5	0.29	0.32	10%		01-C-72-5	36.4	37.4	3%	
01-A-57-6	35.2	36.2	3%		01-B-70-6	2.79	3.29	15%		01-C-71-6	0.05	0.06	1%	
01-A-57-7	49.2	52.2	6%		01-B-70-7	3.47	3.64	5%		01-C-70-7	0.23	0.25	10%	
01-A-57-8	52.4	55.4	5%		01-B-68-8	0.02	0.02	2%		01-C-68-8	0.27	0.29	6%	
01-A-57-9	58.1	59.1	2%		01-B-67-9	33.1	35.1	6%		01-C-59-9	0.02	0.03	3%	
01-A-46-10	16173	16174	0%		01-B-56-10	22.0	24.0	8%		01-C-52-10	1341	1347	0%	
01-A-46-11	Test still running				01-B-55-11	Test terminated early				01-C-50-11	1572	1576	0%	
01-A-46-12	Test still running				01-B-53-12	859	862	0%		01-C-47-12	0.01	0.02	4%	
01-A-36-13	Test terminated early				01-B-45-13	Test terminated early				01-C-44-13	Test terminated early			
01-A-36-14	Test terminated early				01-B-45-14	Test terminated early				01-C-44-14	Test terminated early			
01-A-36-15	Test terminated early				01-B-44-15	Test terminated early				01-C-44-15	Test terminated early			

University of Stuttgart Tests

Baseline Adhesive A					Baseline Adhesive B					Baseline Adhesive C				
Test	Tertiary Creep (hour)	Rupture (hour)	% Difference		Test	Tertiary Creep (hour)	Rupture (hour)	% Difference		Test	Tertiary Creep (hour)	Rupture (hour)	% Difference	
02-A-65-1	0.17	0.33	50%		02-B-85-1	6.67	6.83	2%		02-C-85-1	no data	0.03		
02-A-65-2	0.17	0.33	50%		02-B-85-2	2.00	2.17	8%		02-C-85-2	no data	0.02		
02-A-65-3	26.3	26.5	1%		02-B-85-3	0.17	0.33	50%		02-C-85-3	no data	0.02		
02-A-55-4	36.8	37.0	0%		02-B-75-4	0	0.17	0%		02-C-75-4	no data	0.08		
02-A-55-5	56.2	56.3	0%		02-B-75-5	56.5	56.8	1%		02-C-75-5	no data	0.08		
02-A-55-6	511	511	0%		02-B-75-6	194	194	0%		02-C-75-6	no data	7.00		
02-A-45-7	Test still running				02-B-65-7	Test terminated early				02-C-65-7	Test terminated early			
02-A-45-8	674	674	0%		02-B-65-8	Test terminated early				02-C-65-8	370	371	0%	
02-A-45-9	Test still running				02-B-65-9	2096	2096	0%		02-C-65-9	4346	4346	0%	
02-A-35-10	Test still running				02-B-55-10	Test terminated early				02-C-55-10	Test terminated early			
02-A-35-11	Test still running				02-B-55-11	Test terminated early				02-C-55-11	581	581	0%	
02-A-35-12	Test still running				02-B-55-12	Test terminated early				02-C-55-12	Test terminated early			

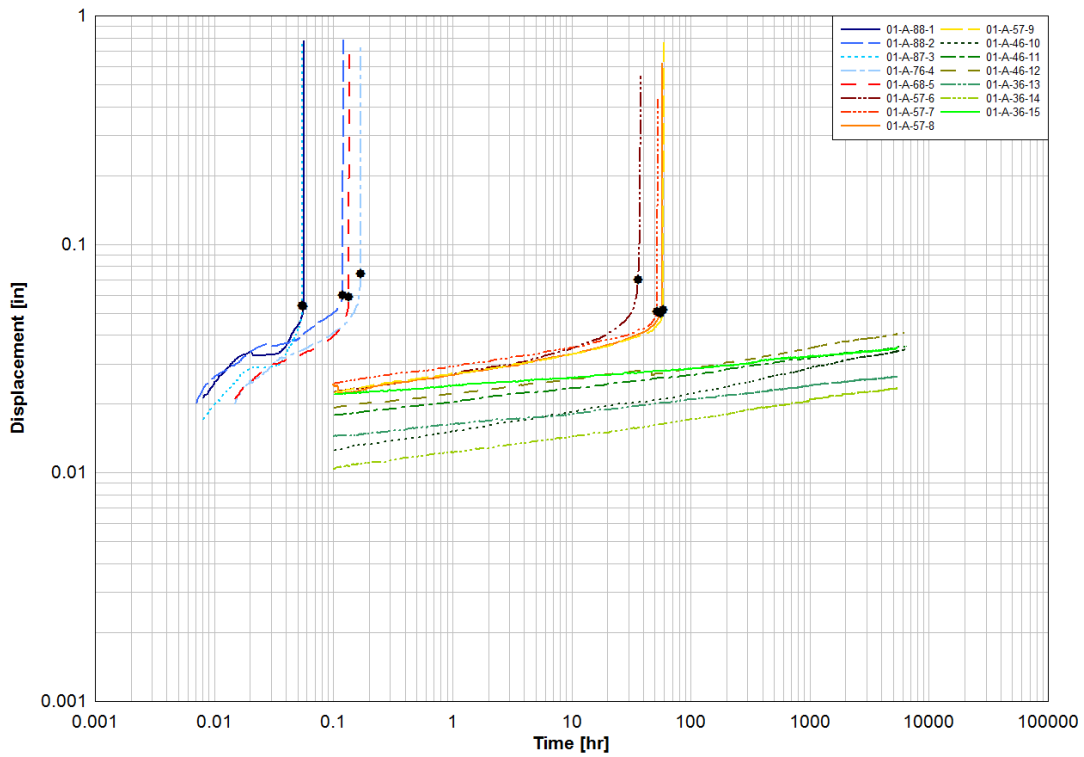


Figure 1: TS01A - UF Baseline Adhesive A Long-term Displacement vs. Time

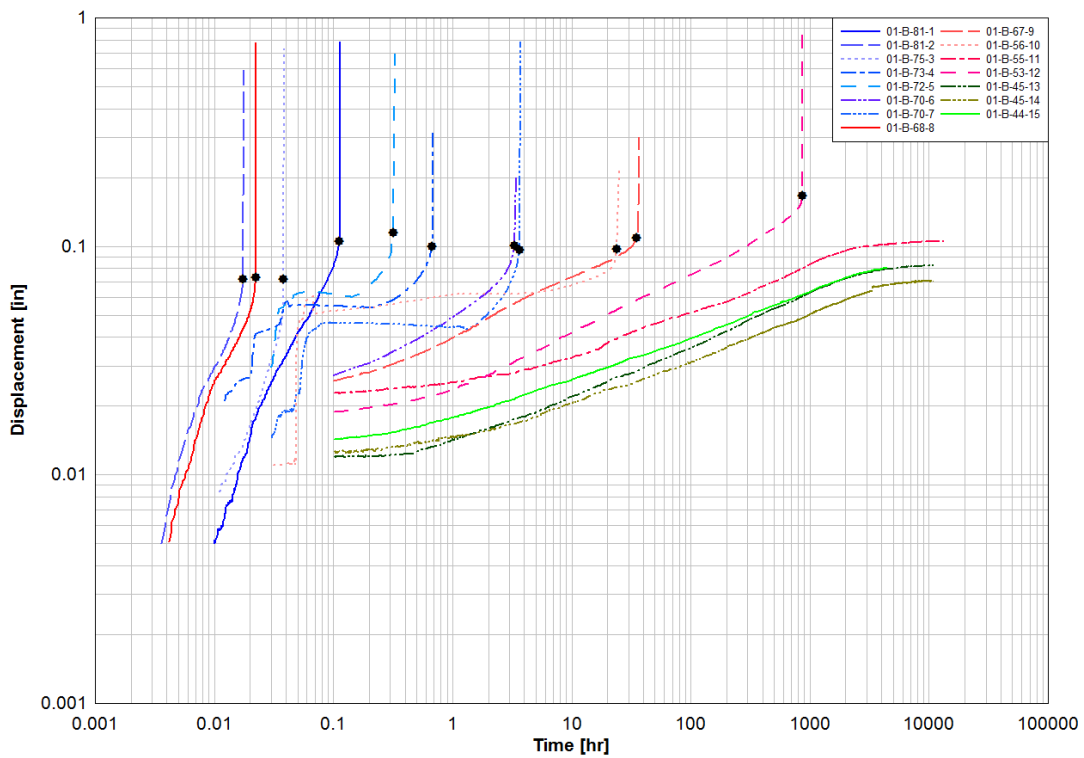


Figure 2: TS01B - UF Baseline Adhesive B Long-term Displacement vs. Time

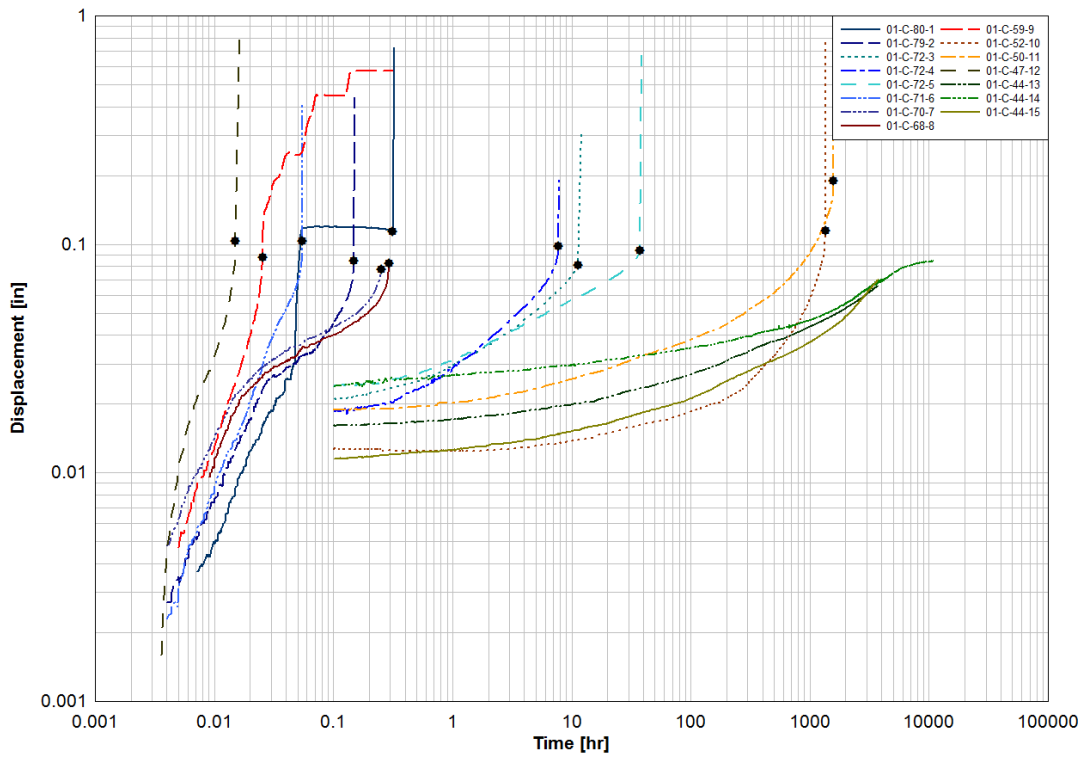


Figure 3: TS01C - UF Baseline Adhesive C Long-term Displacement vs. Time

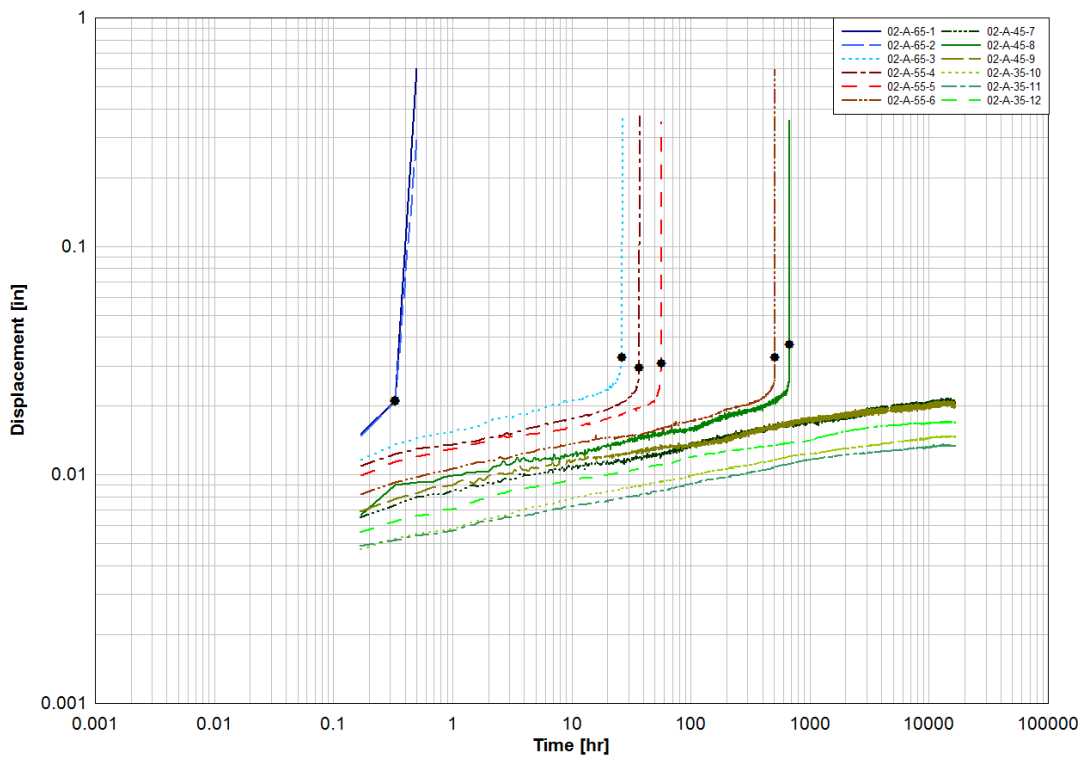


Figure 4: TS02A - US Baseline Adhesive A Long-term Displacement vs. Time

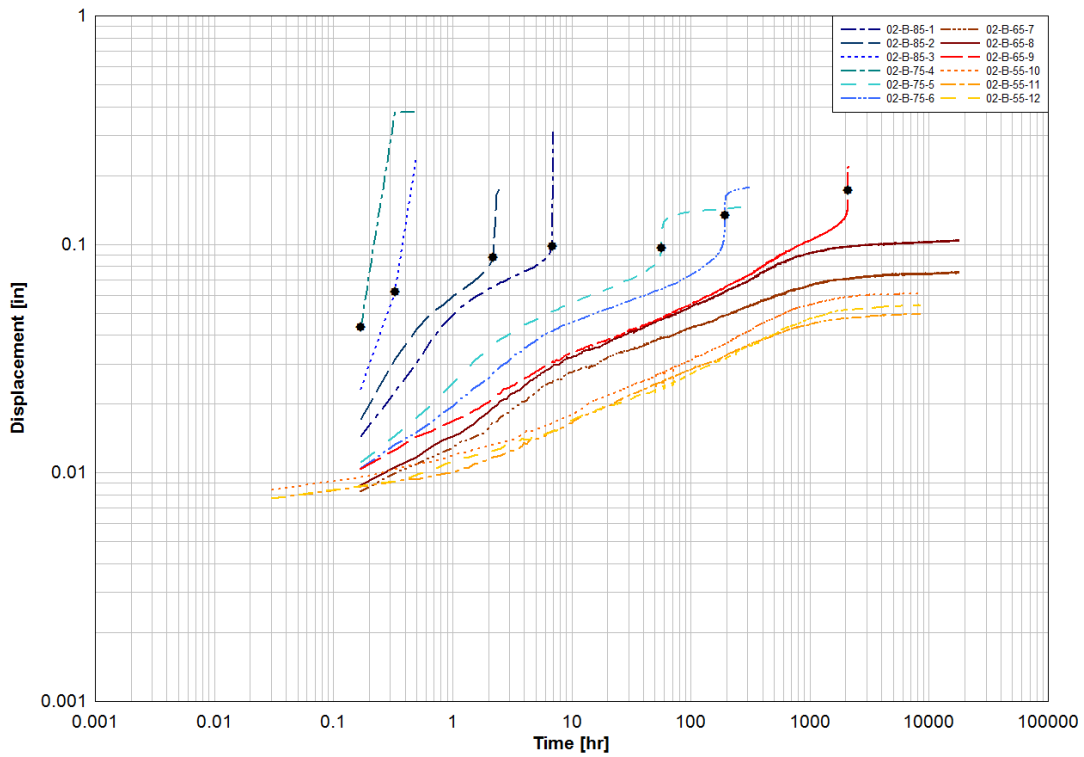


Figure 5: TS02B - US Baseline Adhesive B Long-term Displacement vs. Time

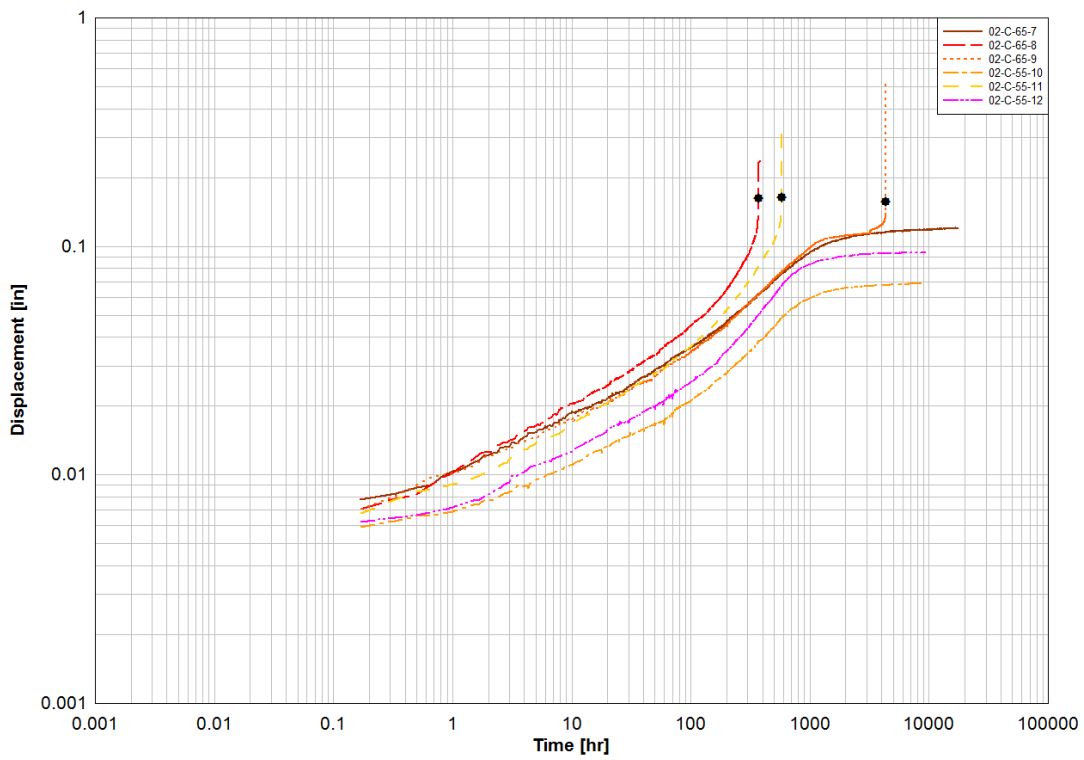


Figure 6: TS02C - US Baseline Adhesive C Long-term Displacement vs. Time

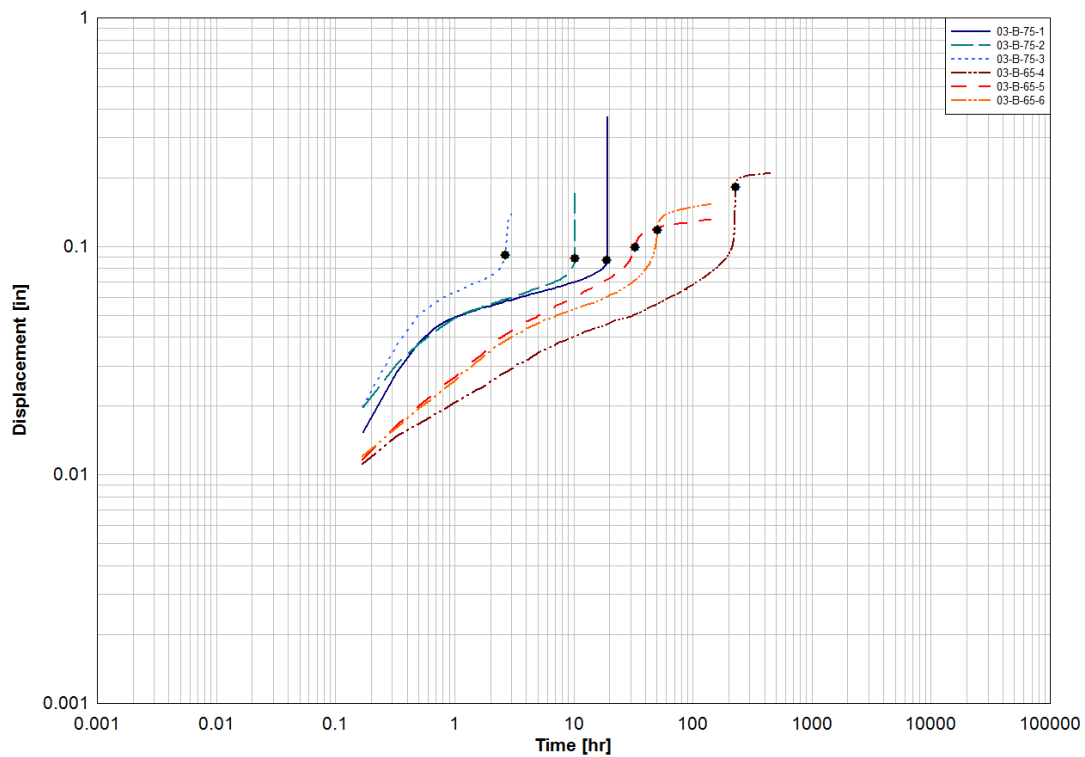


Figure 7: TS03B – 120°F Service Temperature Long-term Displacement vs. Time

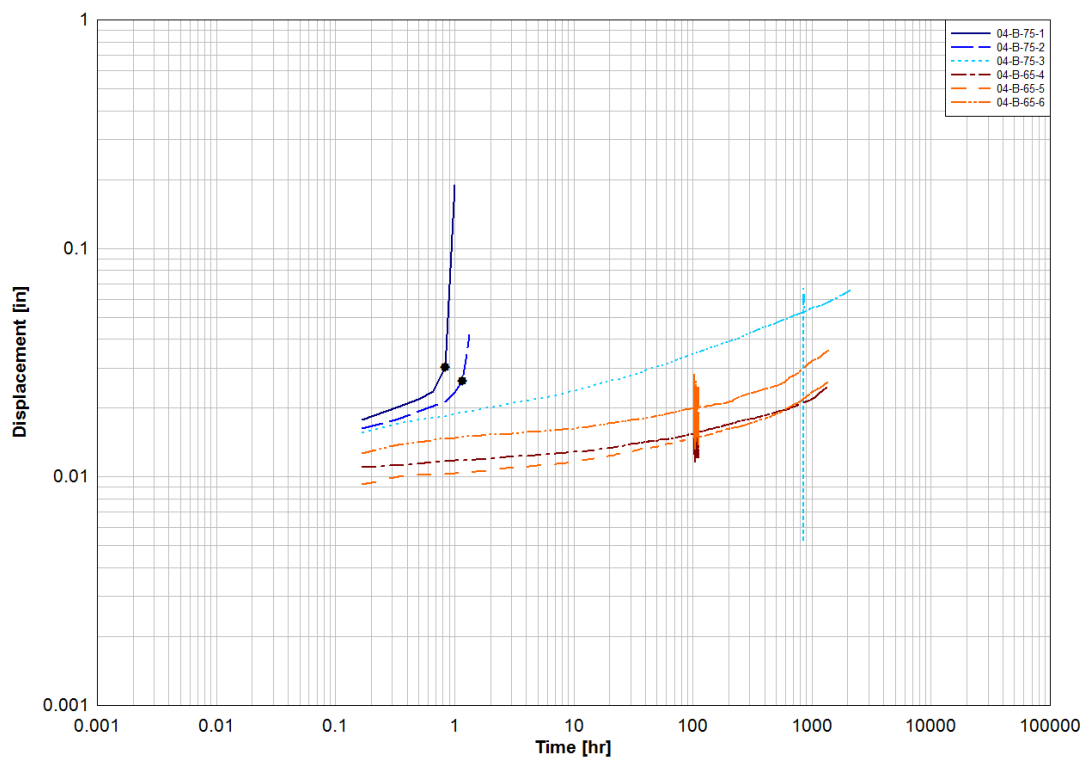


Figure 8: TS04B – 70°F Service Temperature Long-term Displacement vs. Time

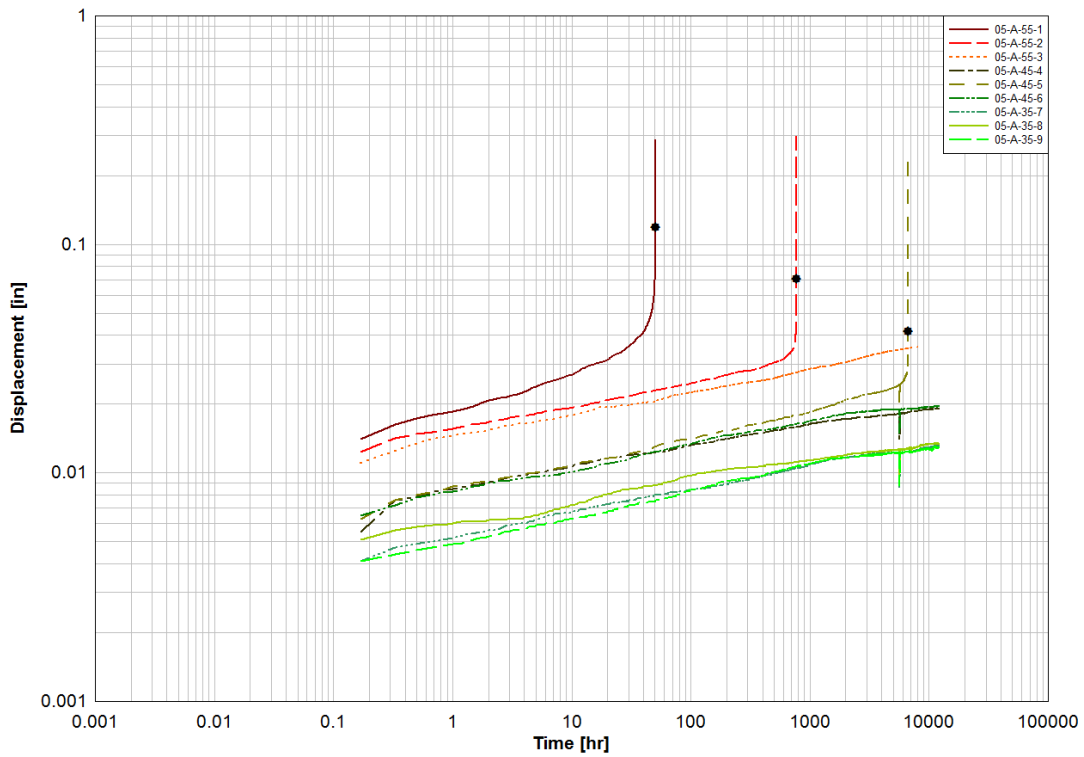


Figure 9: TS05A – Horizontal Installation Long-term Displacement vs. Time

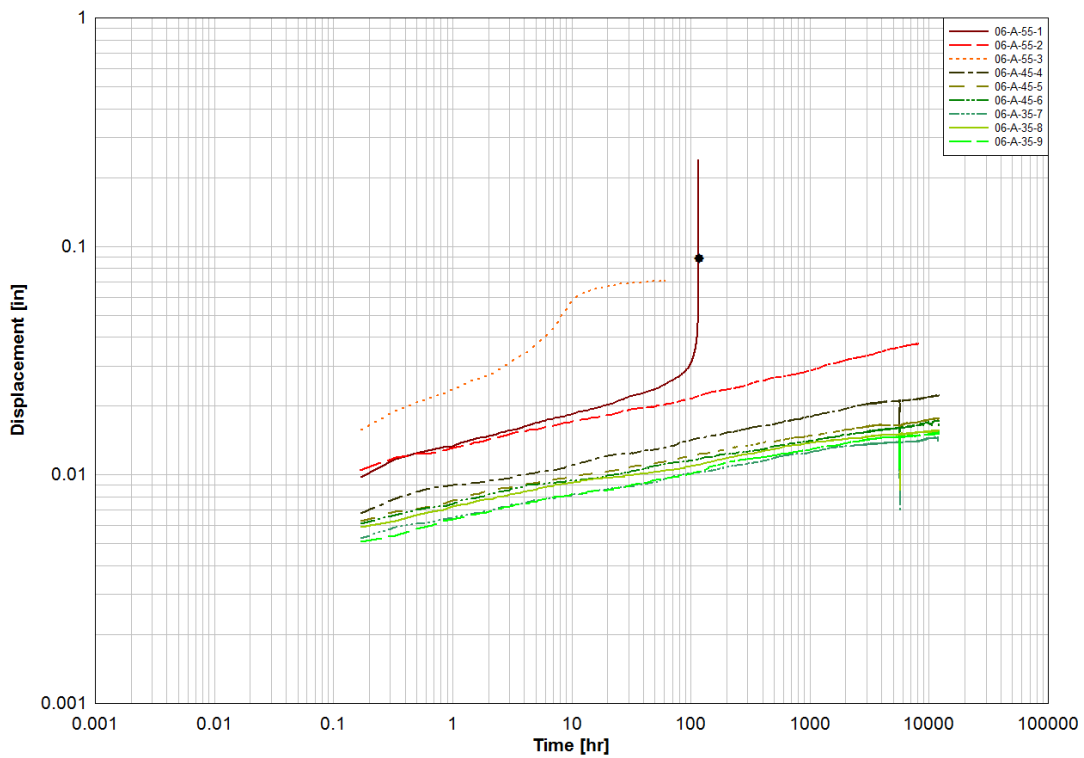


Figure 10: TS06A – Overhead Installation Long-term Displacement vs. Time

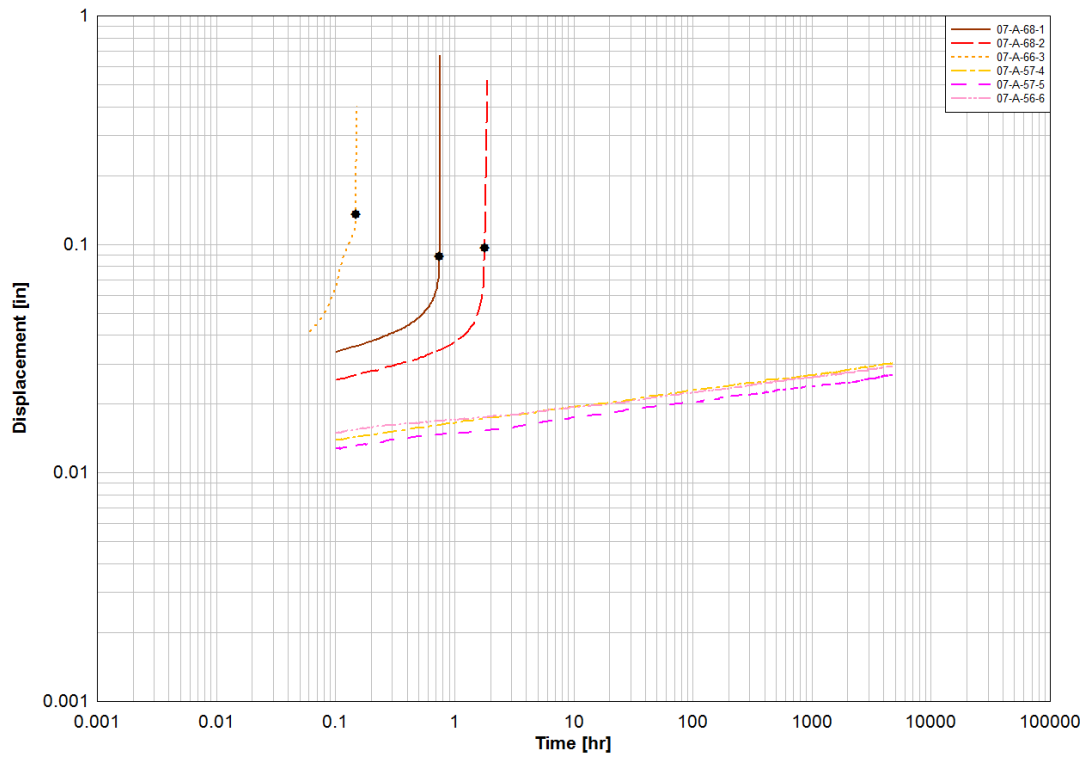


Figure 11: TS07A – Moisture at Installation Long-term Displacement vs. Time

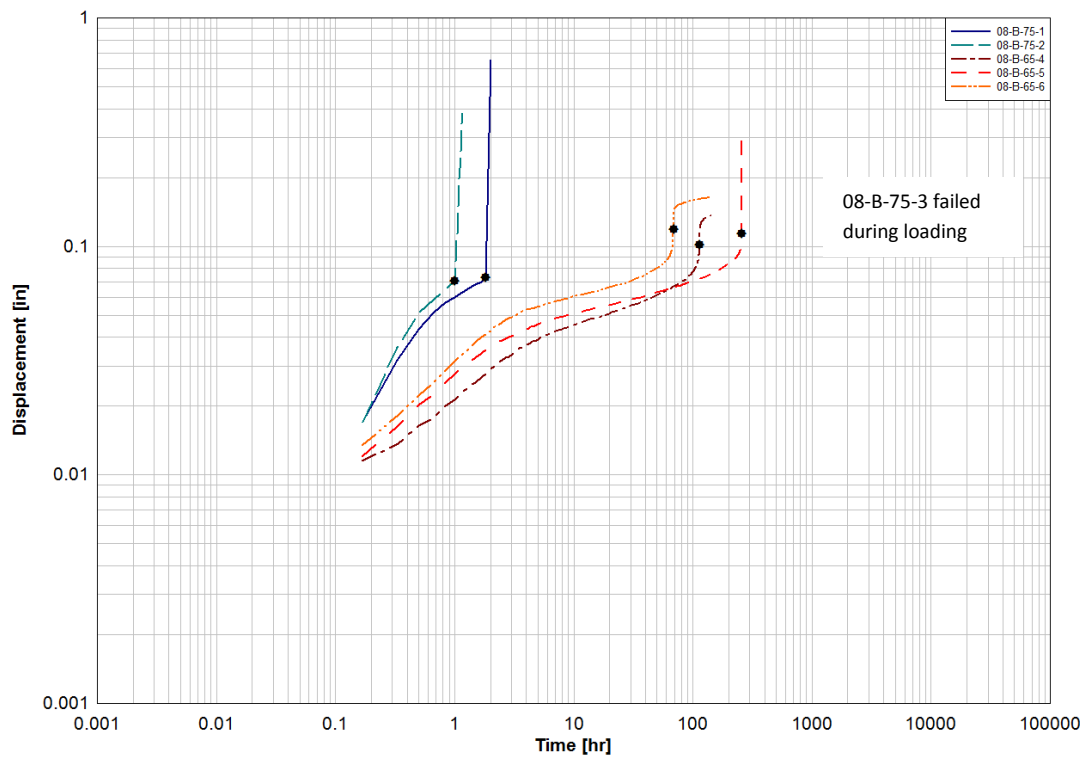


Figure 12: TS08B – Moisture during service Long-term Displacement vs. Time

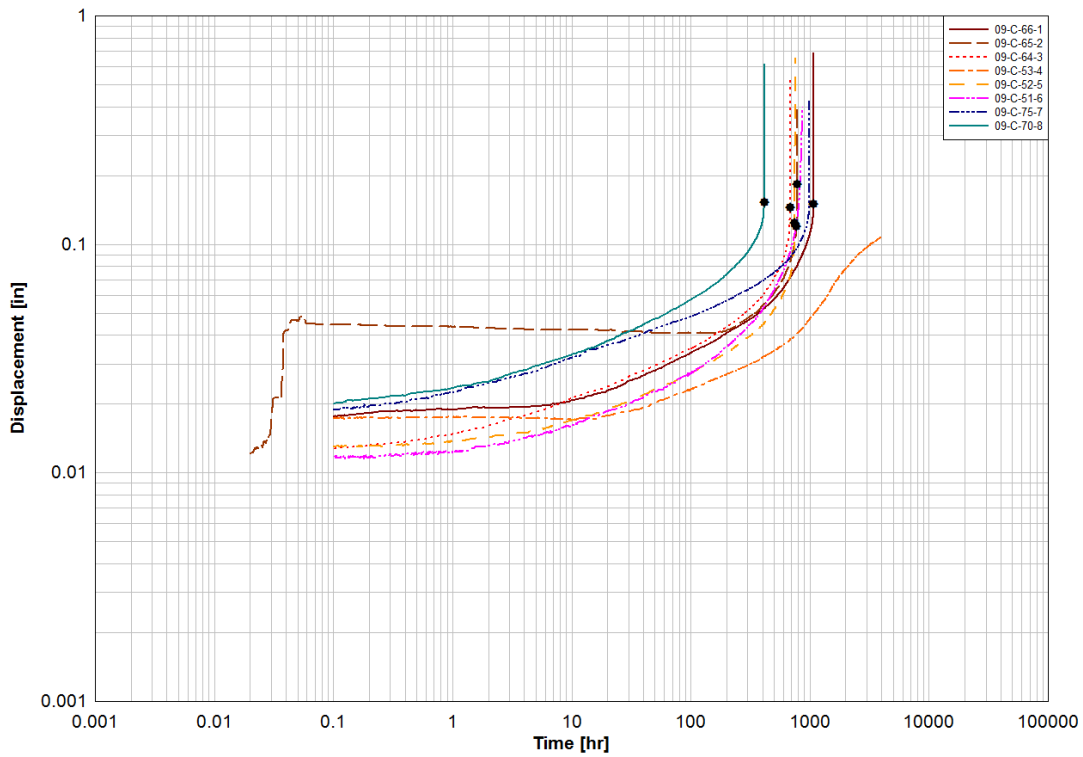


Figure 13: TS09C – Partially cleaned hole Long-term Displacement vs. Time

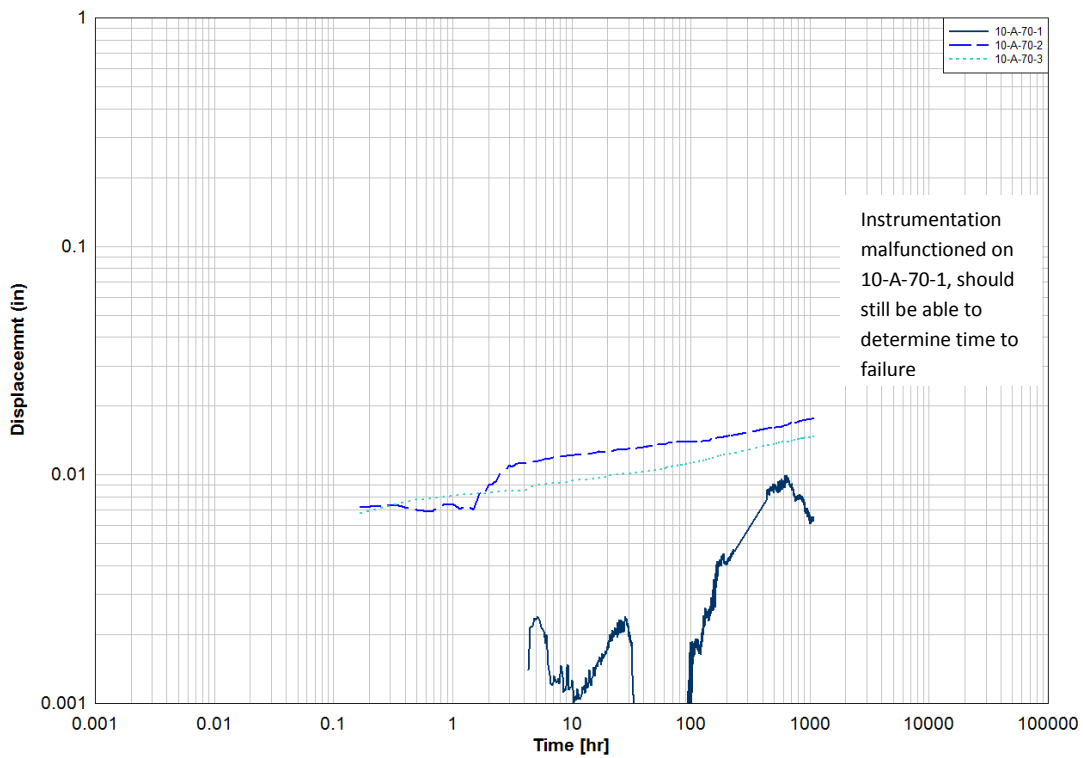


Figure 14: TS10A – MFR minimum installation temperature/ MFR minimum service temperature Long-term Displacement vs. Time

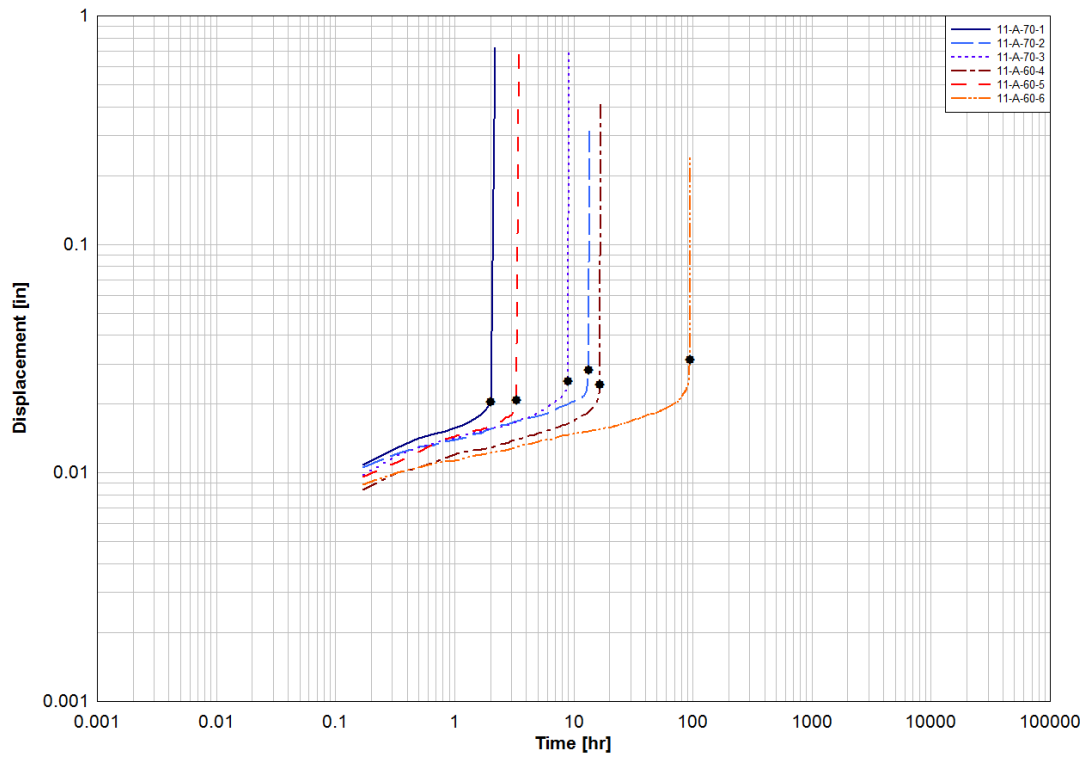


Figure 15: TS11A – MFR minimum installation temperature/110°F service temperature Long-term Displacement vs. Time

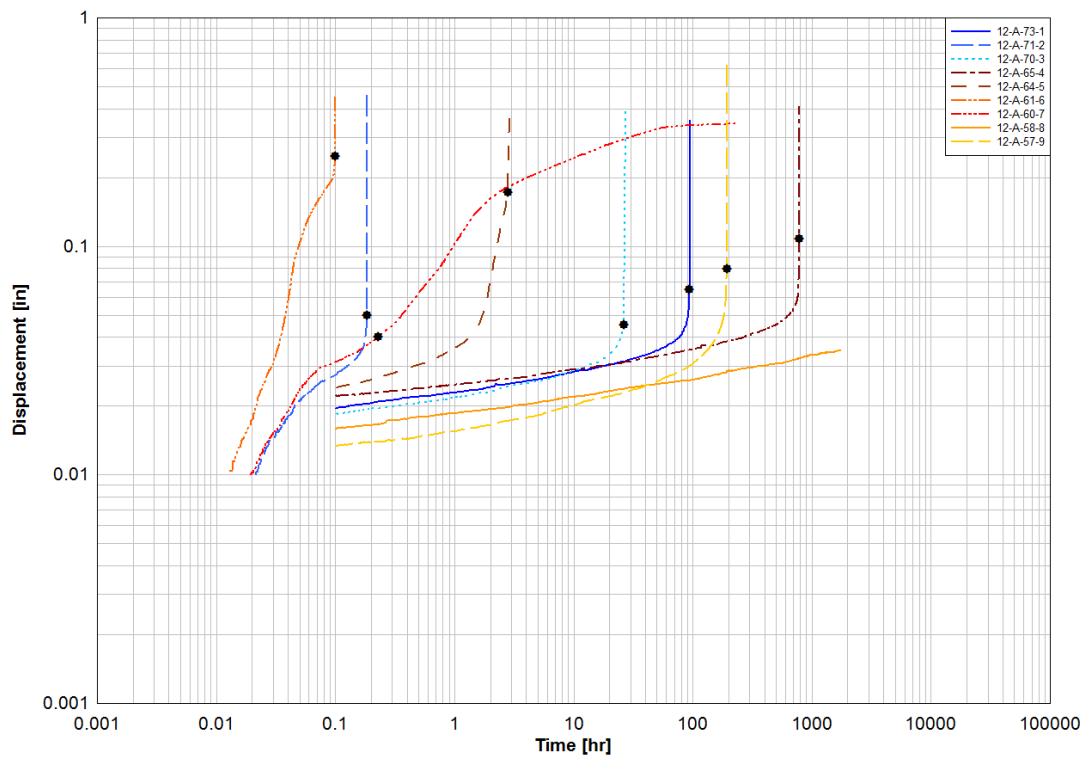


Figure 16: TS12A – DOT concrete mix Long-term Displacement vs. Time

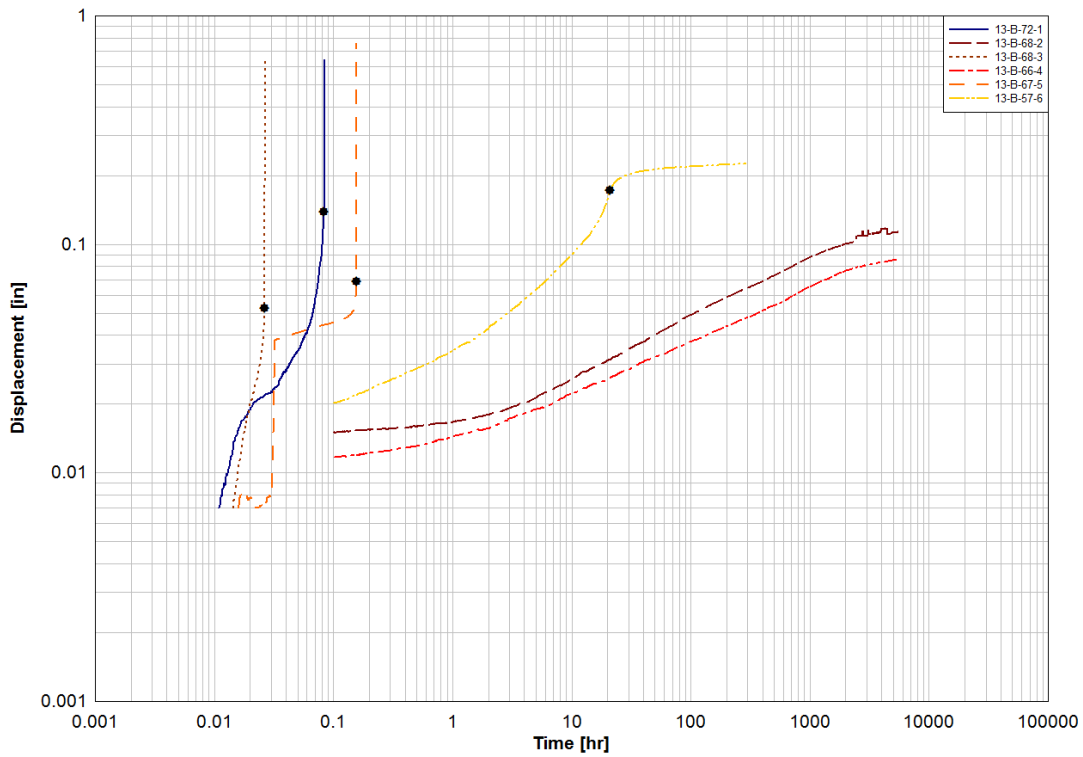


Figure 17: TS13B – Core drilled hole Long-term Displacement vs. Time

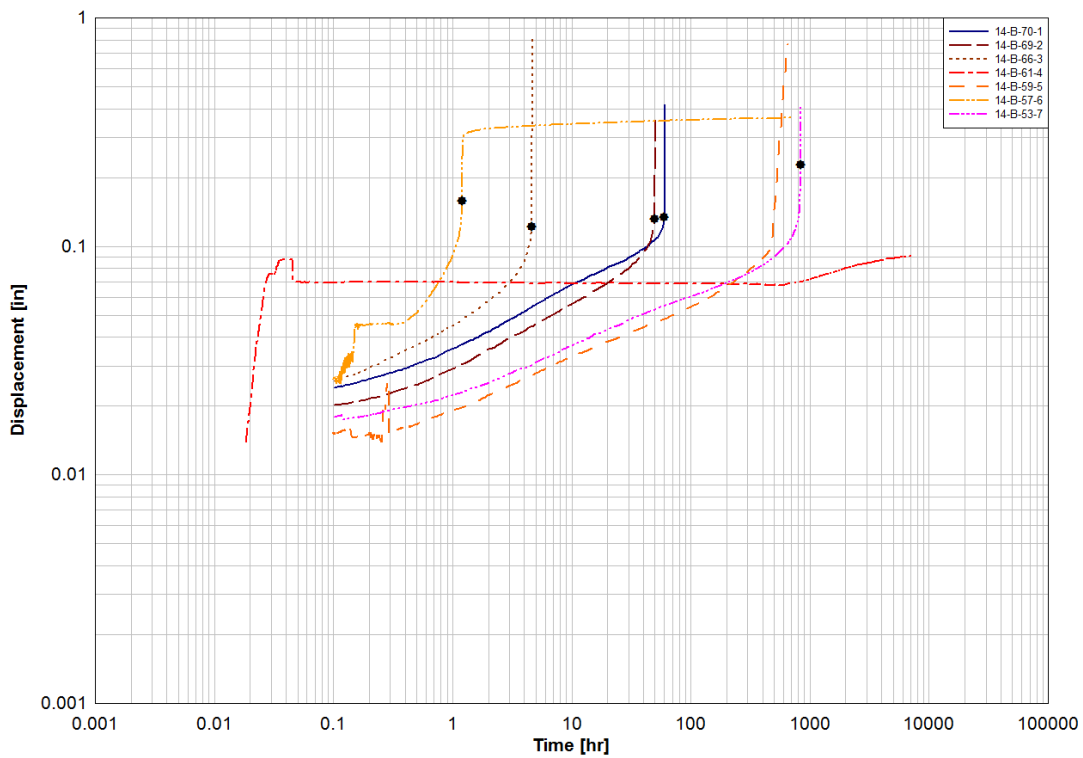


Figure 18: TS14B – Fly ash Long-term Displacement vs. Time

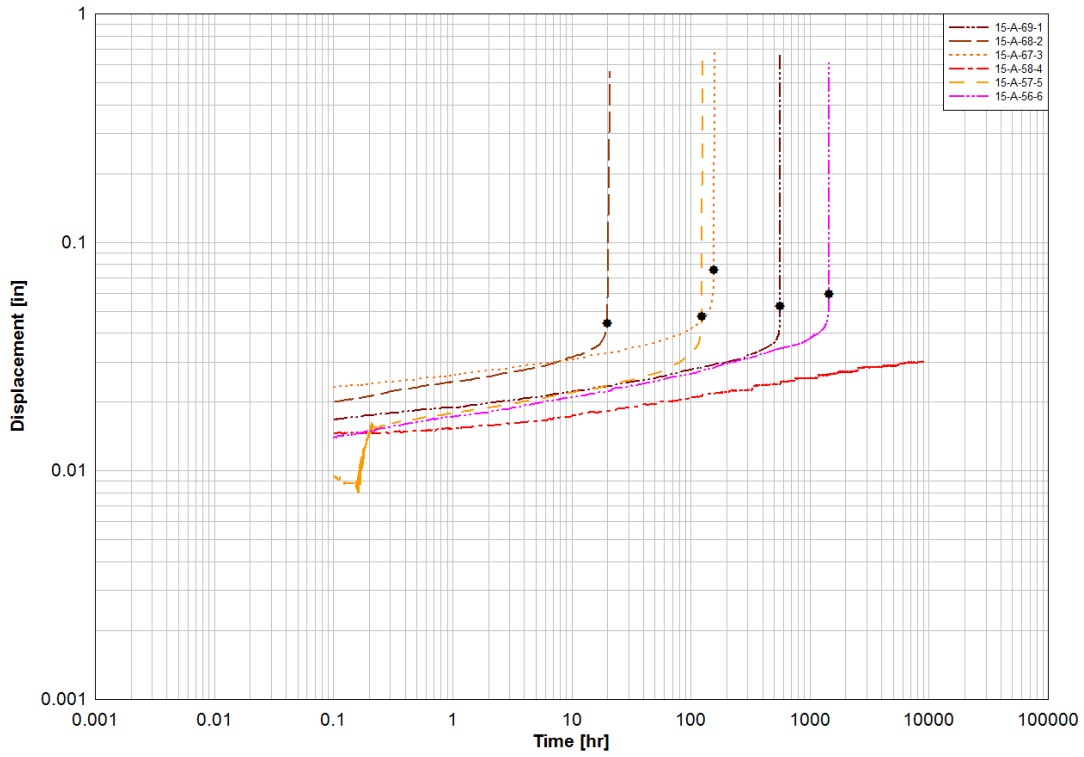


Figure 19: TS15A – Blast furnace slag Long-term Displacement vs. Time

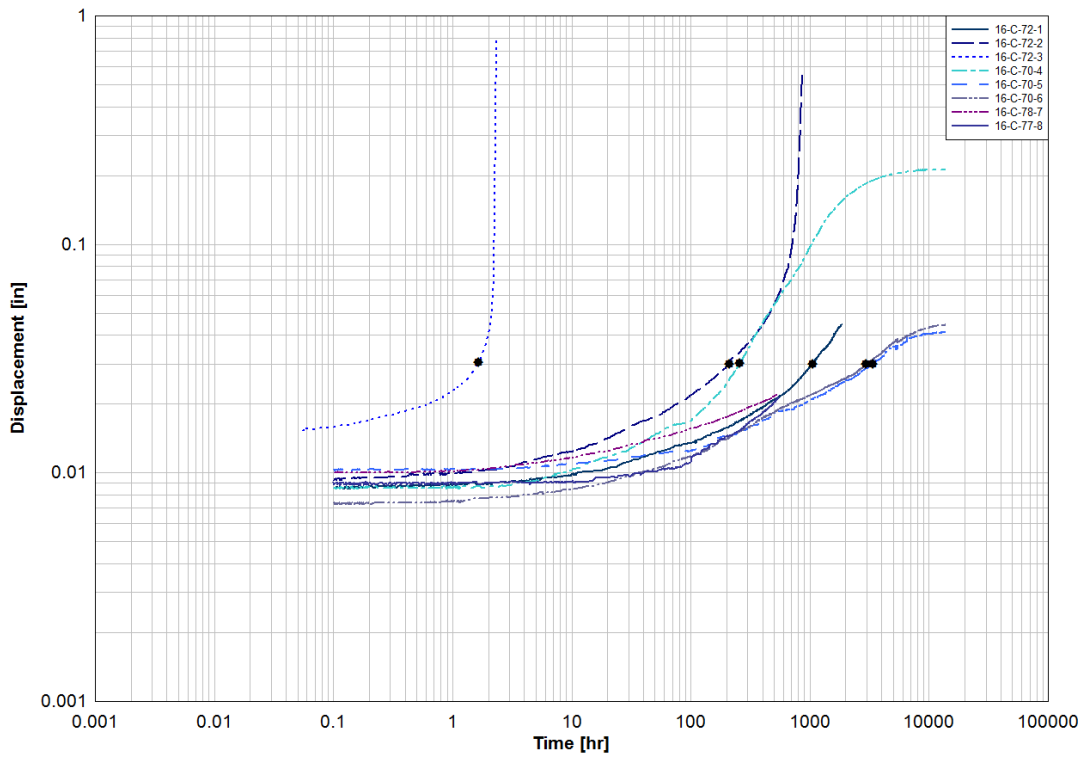


Figure 20: TS16C – Unconfined setup Long-term Displacement vs. Time

01-A Baseline Tests

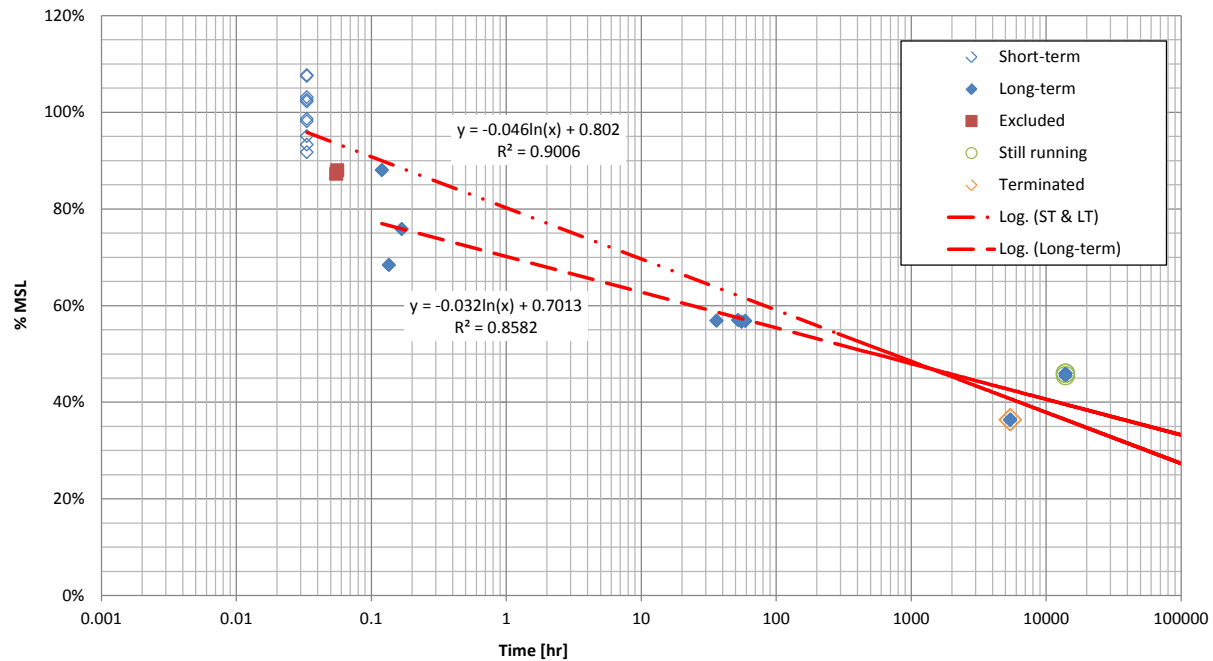
Series	01	
Adhesive	A	
MSL	19.8	kips
hef	3.125	in
d	0.625	in
A	6.136	in ²

Short-term (Reference) Test

Test	Load (kips)	Rupture Disp. (in)	Time (hour)	Bond Stress (psi)	% MSL	Notes
01-A-ST-1	21.3	0.047	0.03	3473	108%	
01-A-ST-2	20.3	0.048	0.03	3309	103%	
01-A-ST-3	20.2	0.044	0.03	3298	102%	
01-A-ST-4	19.4	0.044	0.03	3166	98%	
01-A-ST-5	20.4	0.048	0.03	3326	103%	
01-A-ST-6	18.8	0.040	0.03	3067	95%	
01-A-ST-7	18.2	0.043	0.03	2959	92%	
01-A-ST-8	21.3	0.044	0.03	3468	108%	
01-A-ST-9	18.5	0.037	0.03	3010	93%	
01-A-ST-10	19.5	0.038	0.03	3181	99%	

Long-term (Creep) Test

Test	Load (kips)	Rupture Disp. (in)	TTF (hour)	Bond Stress (psi)	% MSL	Notes
01-A-88-1	17.4	0.053	0.06	2838	88%	failed during loading
01-A-88-2	17.4	0.060	0.12	2839	88%	
01-A-87-3	17.3	0.054	0.06	2815	87%	failed during loading
01-A-76-4	15.0	0.074	0.17	2446	76%	
01-A-68-5	13.5	0.059	0.14	2206	68%	
01-A-57-6	11.3	0.070	36	1835	57%	
01-A-57-7	11.3	0.051	52	1839	57%	
01-A-57-8	11.2	0.050	55	1827	57%	
01-A-57-9	11.2	0.051	59	1832	57%	
01-A-46-10	9.1		13924	1483	46%	still running (3/27/2012)
01-A-46-11	9.1		13924	1483	46%	still running (3/27/2012)
01-A-46-12	9.0		13924	1467	45%	still running (3/27/2012)
01-A-36-13	7.2		5419	1173	36%	terminated (5/10/2011)
01-A-36-14	7.2		5419	1173	36%	terminated (5/10/2011)
01-A-36-15	7.2		5419	1173	36%	terminated (5/10/2011)



01-B Baseline Tests

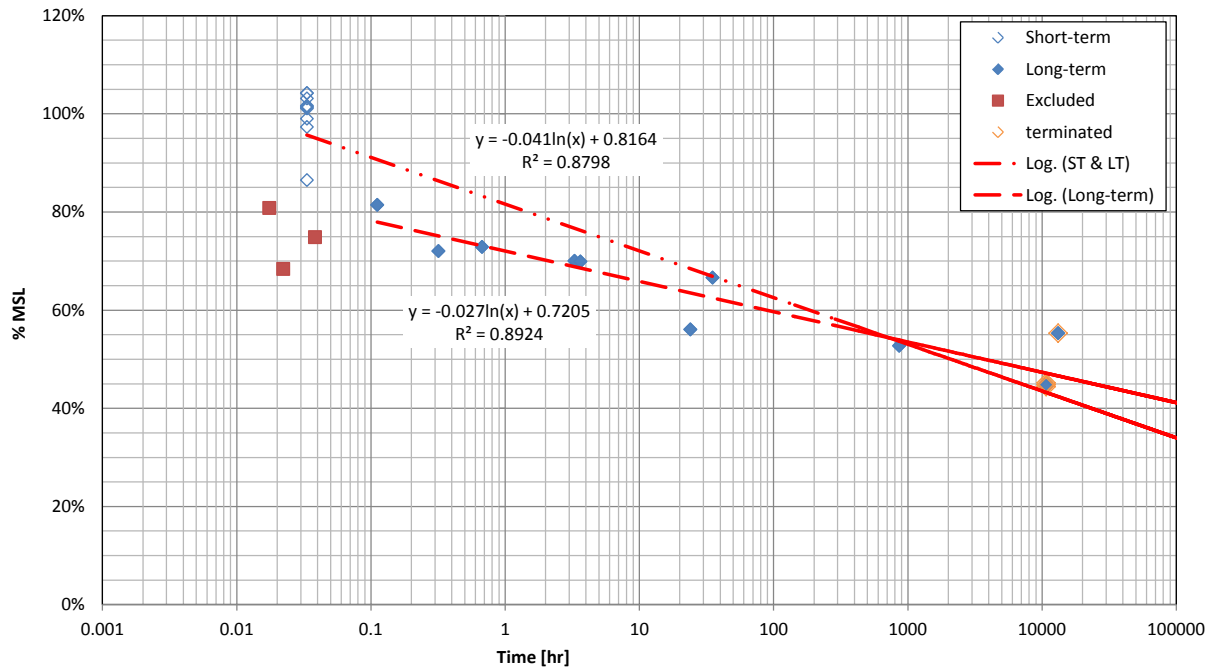
Series	01	
Adhesive	B	
MSL	25.7	kips
hef	3.125	in
d	0.625	in
A	6.136	in ²

Short-term (Reference) Test

Test	Load (kips)	Rupture Disp. (in)	Time (hour)	Bond Stress (psi)	% MSL	Notes
01-B-ST-1	26.7	0.057	0.03	4357	104%	
01-B-ST-2	26.0	0.047	0.03	4245	102%	
01-B-ST-3	26.7	0.045	0.03	4359	104%	
01-B-ST-4	26.1	0.050	0.03	4252	102%	
01-B-ST-5	26.5	0.051	0.03	4313	103%	
01-B-ST-6	26.0	0.051	0.03	4236	101%	
01-B-ST-7	25.4	0.050	0.03	4140	99%	
01-B-ST-8	25.9	0.047	0.03	4227	101%	
01-B-ST-9	25.0	0.053	0.03	4069	97%	
01-B-ST-10	22.2	0.057	0.03	3618	87%	

Long-term (Creep) Test

Test	Load (kips)	Rupture Disp. (in)	Time (hour)	Bond Stress (psi)	% MSL	Notes
01-B-81-1	20.9	0.105	0.11	3407	81%	
01-B-81-2	20.7	0.072	0.02	3379	81%	failed during loading
01-B-75-3	19.2	0.072	0.04	3131	75%	failed during loading
01-B-73-4	18.7	0.100	0.67	3048	73%	
01-B-72-5	18.5	0.115	0.32	3013	72%	
01-B-70-6	18.0	0.100	3.29	2930	70%	
01-B-70-7	17.9	0.096	3.6	2924	70%	
01-B-68-8	17.6	0.073	0.02	2860	68%	failed during loading
01-B-67-9	17.1	0.109	35	2786	67%	
01-B-56-10	14.4	0.097	24	2344	56%	
01-B-55-11	14.2		13198	2314	55%	terminated (2/7/2012)
01-B-53-12	13.5	0.166	862	2206	53%	
01-B-45-13	11.6		10751	1891	45%	terminated (2/7/2012)
01-B-45-14	11.5		10751	1874	45%	terminated (2/7/2012)
01-B-44-15	11.4		10751	1858	44%	terminated (2/7/2012)



01-C Baseline Tests

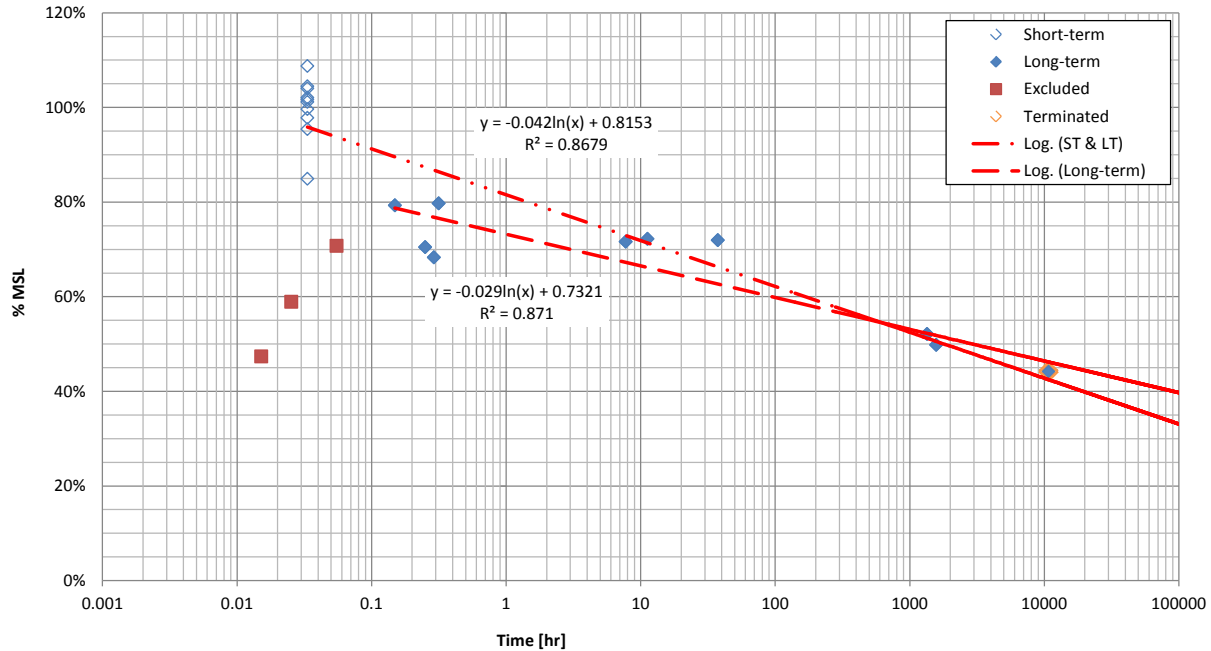
Series	01	
Adhesive	C	
MSL	26.3	kips
hef	3.125	in
d	0.625	in
A	6.136	in ²

Short-term (Reference) Test

Test	Load (kips)	Rupture Disp. (in)	Time (hour)	Bond Stress (psi)	% MSL	Notes
01-C-ST-1	26.3	0.052	0.03	4279	100%	
01-C-ST-2	28.6	0.047	0.03	4669	109%	
01-C-ST-3	22.4	0.051	0.03	3645	85%	
01-C-ST-4	26.6	0.043	0.03	4343	101%	
01-C-ST-5	26.9	0.051	0.03	4382	102%	
01-C-ST-6	27.5	0.041	0.03	4485	104%	
01-C-ST-7	26.8	0.040	0.03	4364	102%	
01-C-ST-8	25.1	0.051	0.03	4096	95%	
01-C-ST-9	27.4	0.047	0.03	4466	104%	
01-C-ST-10	25.8	0.039	0.03	4199	98%	

Long-term (Creep) Test

Test	Load (kips)	Rupture Disp. (in)	Time (hour)	Bond Stress (psi)	% MSL	Notes
01-C-80-1	21.0	0.113	0.32	3422	80%	
01-C-79-2	20.9	0.085	0.15	3406	79%	
01-C-72-3	19.0	0.081	11	3101	72%	
01-C-72-4	18.9	0.098	7.76	3074	72%	
01-C-72-5	19.0	0.094	37	3089	72%	
01-C-71-6	18.6	0.103	0.06	3038	71%	failed during loading
01-C-70-7	18.6	0.077	0.25	3026	70%	
01-C-68-8	18.0	0.083	0.29	2932	68%	
01-C-59-9	15.5	0.088	0.03	2530	59%	failed during loading
01-C-52-10	13.7	0.115	1347	2237	52%	
01-C-50-11	13.1	0.189	1576	2139	50%	
01-C-47-12	12.5	0.103	0.02	2033	47%	failed during loading
01-C-44-13	11.7		10752	1907	44%	terminated (2/7/2012)
01-C-44-14	11.6		10752	1891	44%	terminated (2/7/2012)
01-C-44-15	11.6		10752	1891	44%	terminated (2/7/2012)



02-A Baseline Tests

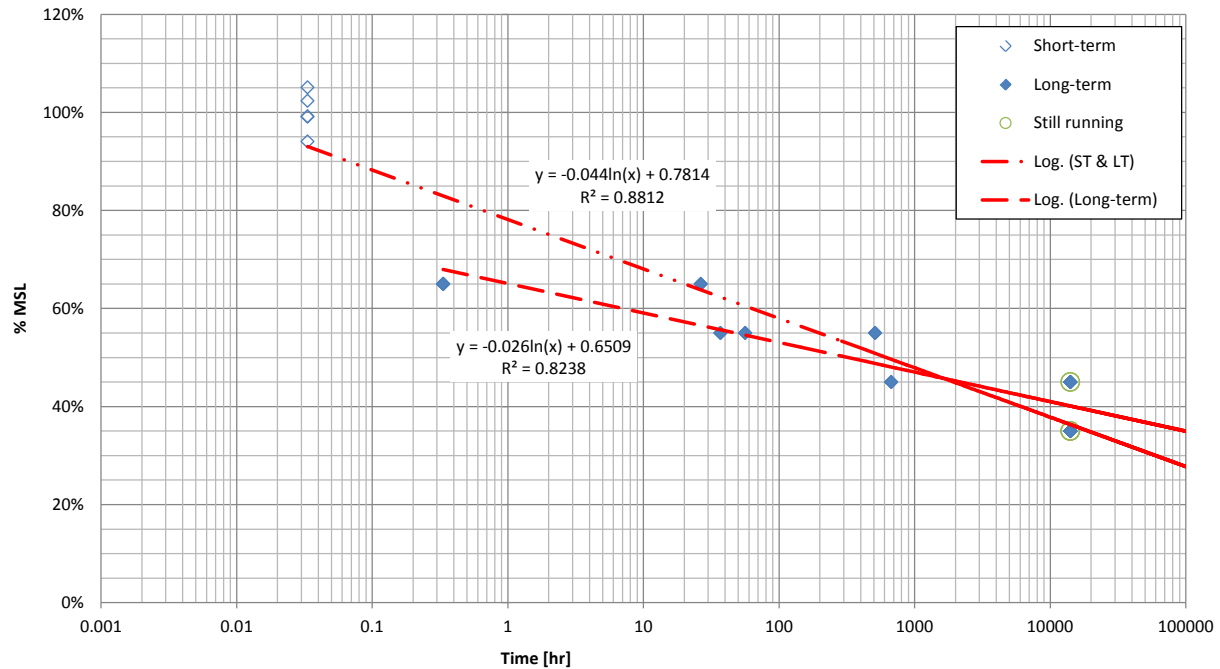
Series	02			
Adhesive	A			
MSL	65.6	kN	14.7	kips
hef	80	mm	3.15	in
d	12	mm	0.47	in
A	3016	mm ²	4.67	in ²

Short-term (Reference) Test

Test	Load (kips)	Rupture Disp. (in)	Time (hour)	Bond Stress (psi)	% MSL	Notes
02-A-ST-1	14.6	0.023	0.03	3129	99%	
02-A-ST-2	15.5	0.023	0.03	3316	105%	
02-A-ST-3	14.6	0.023	0.03	3127	99%	
02-A-ST-4	13.9	0.021	0.03	2968	94%	
02-A-ST-5	15.1	0.028	0.03	3229	102%	

Long-term (Creep) Test

Test	Load (kips)	Rupture Disp. (in)	Time (hour)	Bond Stress (psi)	% MSL	Notes
02-A-65-1	9.6	0.021	0.33	2051	65%	
02-A-65-2	9.6	0.021	0.33	2051	65%	
02-A-65-3	9.6	0.032	27	2051	65%	
02-A-55-4	8.1	0.030	37	1735	55%	
02-A-55-5	8.1	0.031	56	1735	55%	
02-A-55-6	8.1	0.032	511	1735	55%	
02-A-45-7	6.6		14092	1420	45%	still running (3/20/2012)
02-A-45-8	6.6	0.037	674	1420	45%	
02-A-45-9	6.6		14092	1420	45%	still running (3/20/2012)
02-A-35-10	5.2		14091	1104	35%	still running (3/20/2012)
02-A-35-11	5.2		14091	1104	35%	still running (3/20/2012)
02-A-35-12	5.2		14091	1104	35%	still running (3/20/2012)



02-B Baseline Tests

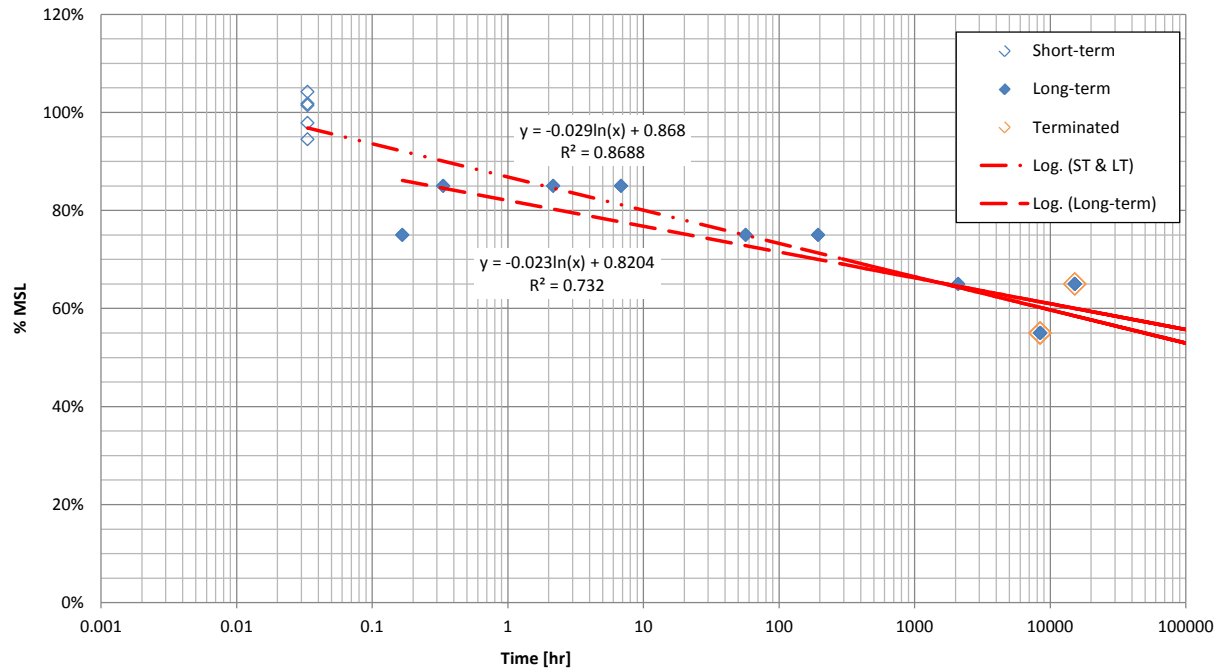
Series	02			
Adhesive	B			
MSL	85.8	kN	19.3	kips
hef	80	mm	3.15	in
d	12	mm	0.47	in
A	3016	mm ²	4.67	in ²

Short-term (Reference) Test

Test	Load (kips)	Rupture Disp. (in)	Time (hour)	Bond Stress (psi)	% MSL	Notes
02-B-ST-1	18.2	0.027	0.03	3899	95%	
02-B-ST-2	20.1	0.032	0.03	4299	104%	
02-B-ST-3	19.6	0.026	0.03	4187	101%	
02-B-ST-4	18.9	0.039	0.03	4038	98%	
02-B-ST-5	19.6	0.032	0.03	4200	102%	

Long-term (Creep) Test

Test	Load (kips)	Rupture Disp. (in)	Time (hour)	Bond Stress (psi)	% MSL	Notes
02-B-85-1	16.4	0.098	6.83	3507	85%	
02-B-85-2	16.4	0.088	2.17	3507	85%	
02-B-85-3	16.4	0.062	0.33	3507	85%	
02-B-75-4	14.5	0.043	0.17	3095	75%	
02-B-75-5	14.5	0.097	57	3095	75%	
02-B-75-6	14.5	0.133	194	3095	75%	
02-B-65-7	12.5		15218	2682	65%	to be terminated
02-B-65-8	12.5		15218	2682	65%	to be terminated
02-B-65-9	12.5	0.172	2096	2682	65%	
02-B-55-10	10.6		8429	2270	55%	terminated (7/10/2011)
02-B-55-11	10.6		8429	2270	55%	terminated (7/10/2011)
02-B-55-12	10.6		8429	2270	55%	terminated (7/10/2011)



02-C Baseline Tests

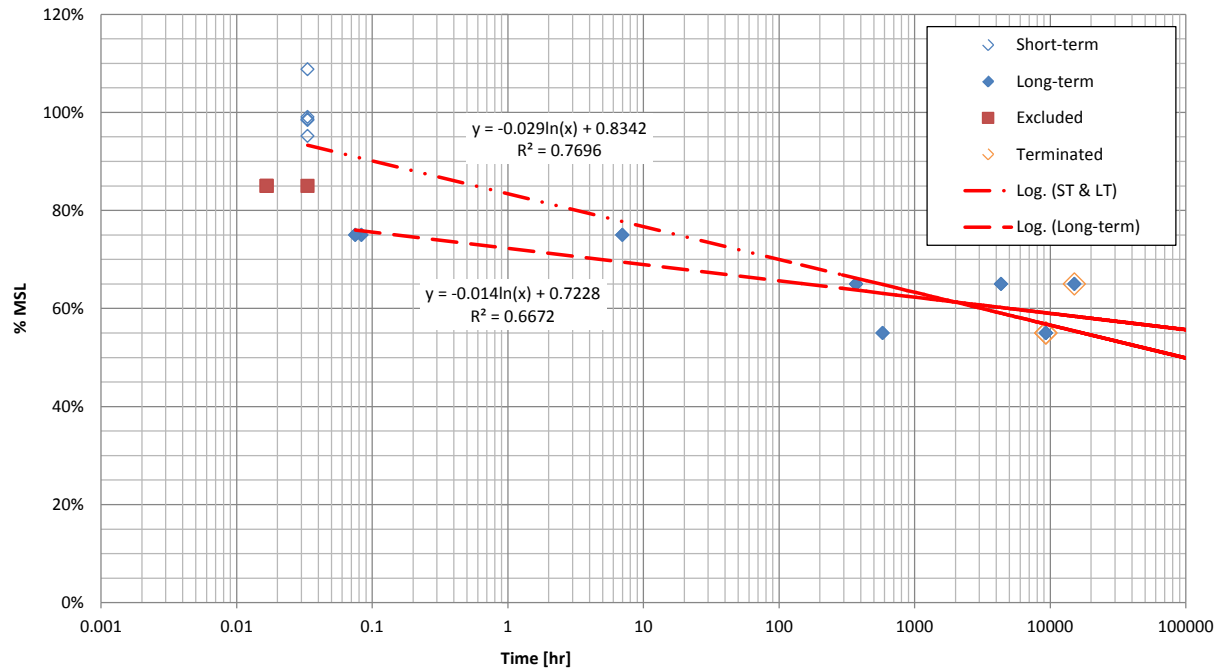
Series	02			
Adhesive	C			
MSL	82.1	kN	18.5	kips
hef	80	mm	3.15	in
d	12	mm	0.47	in
A	3016	mm ²	4.67	in ²

Short-term (Reference) Test

Test	Load (kips)	Rupture Disp. (in)	Time (hour)	Bond Stress (psi)	% MSL	Notes
02-C-ST-1	18.2	0.029	0.03	3893	99%	
02-C-ST-2	18.2	0.039	0.03	3887	98%	
02-C-ST-3	18.3	0.030	0.03	3911	99%	
02-C-ST-4	17.6	0.034	0.03	3757	95%	
02-C-ST-5	20.1	0.032	0.03	4296	109%	

Long-term (Creep) Test

Test	Load (kips)	Rupture Disp. (in)	Time (hour)	Bond Stress (psi)	% MSL	Notes
02-C-85-1	15.7	NA	0.03	3356	85%	failed during loading
02-C-85-2	15.7	NA	0.02	3356	85%	failed during loading
02-C-85-3	15.7	NA	0.02	3356	85%	failed during loading
02-C-75-4	13.8	NA	0.08	2961	75%	
02-C-75-5	13.8	NA	0.08	2961	75%	
02-C-75-6	13.8	NA	7	2961	75%	
02-C-65-7	12.0		15075	2566	65%	to be terminated
02-C-65-8	12.0	0.162	371	2566	65%	
02-C-65-9	12.0	0.157	4346	2566	65%	
02-C-55-10	10.2		9289	2172	55%	terminated (7/10/2011)
02-C-55-11	10.2	0.164	581	2172	55%	
02-C-55-12	10.2		9289	2172	55%	terminated (7/10/2011)



03-B Service Temperature (120°F)

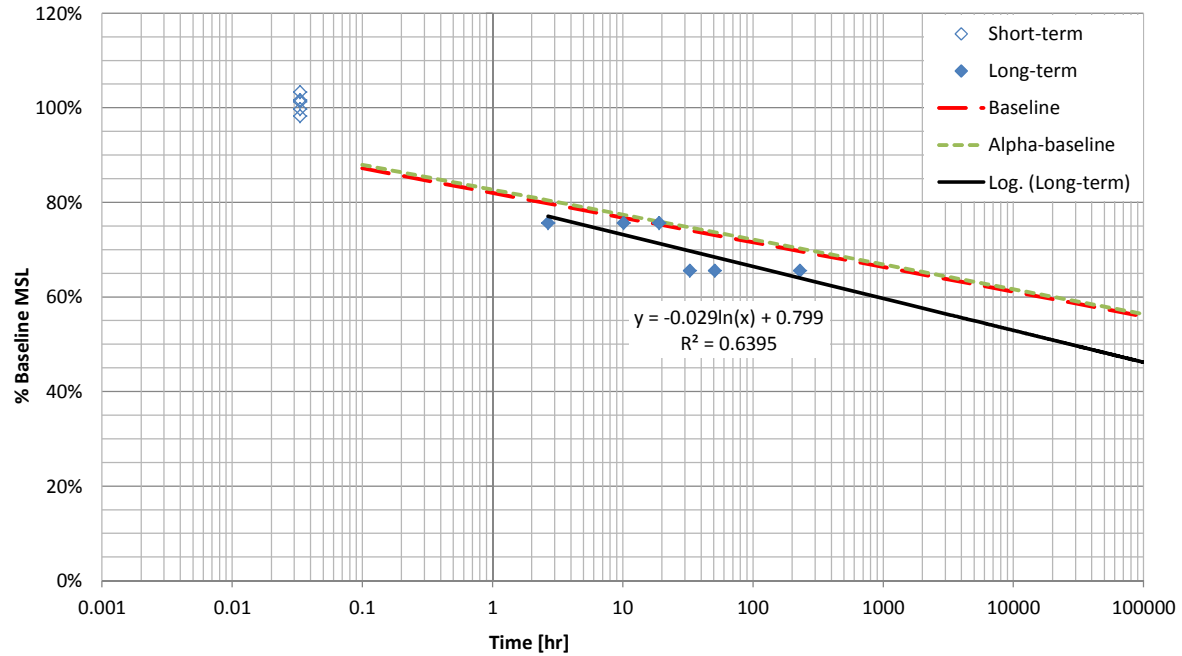
Series	03			
Adhesive	B			
Baseline MSL	101.7	kN	22.9	kips
MSL	102.6	kN	23.1	kips
hef	80	mm	3.15	in
d	12	mm	0.47	in
A	3016	mm ²	4.67	in ²

Short-term (Reference) Test

Test	Load (kips)	Rupture Disp. (in)	Time (hour)	Bond Stress (psi)	% MSL	% BL MSL	Notes
03-B-ST-1	23.6	0.042	0.03	5056	102%	103%	
03-B-ST-2	23.2	0.035	0.03	4955	100%	101%	
03-B-ST-3	23.2	0.037	0.03	4972	101%	102%	
03-B-ST-4	22.8	0.031	0.03	4880	99%	100%	
03-B-ST-5	22.5	0.029	0.03	4806	97%	98%	

Long-term (Creep) Test

Test	Load (kips)	Rupture Disp. (in)	Time (hour)	Bond Stress (psi)	% MSL	% BL MSL	Notes
03-B-75-1	17.3	0.087	19.0	3700	75%	76%	
03-B-75-2	17.3	0.088	10.2	3700	75%	76%	
03-B-75-3	17.3	0.092	2.7	3700	75%	76%	
03-B-65-4	15.0	0.182	229	3207	65%	66%	
03-B-65-5	15.0	0.098	33	3207	65%	66%	
03-B-65-6	15.0	0.117	51	3207	65%	66%	



04-B Service Temperature (70°F)

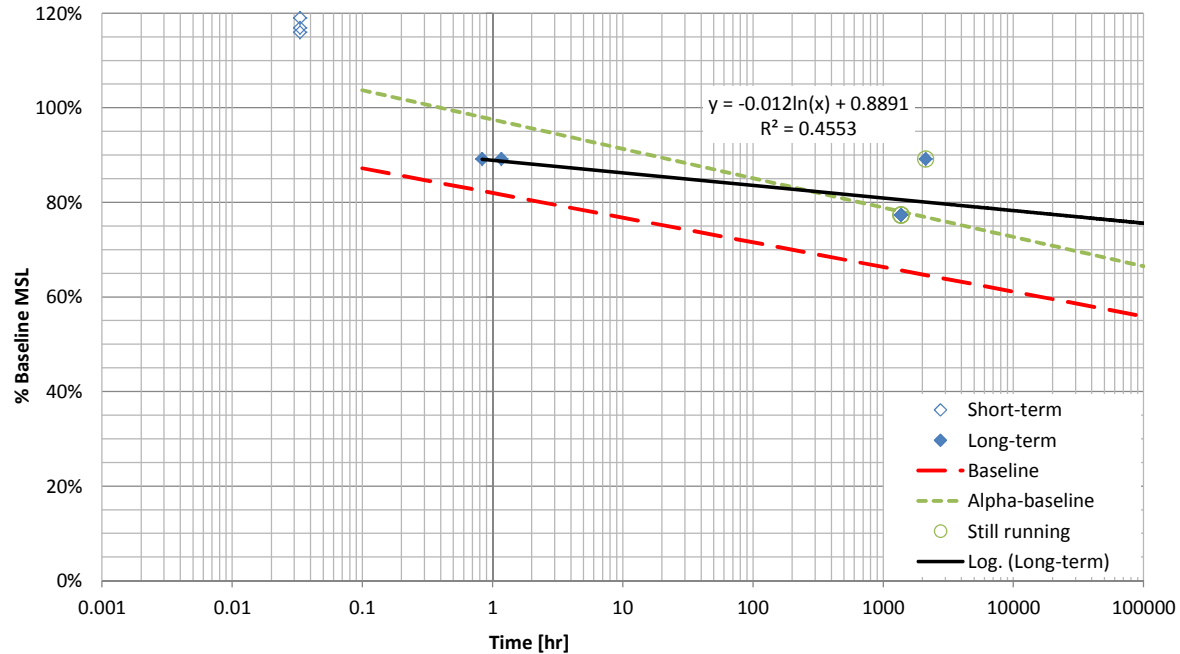
Series	04			
Adhesive	B			
Baseline MSL	101.7	kN	22.9	kips
MSL	121.0	kN	27.2	kips
hef	80	mm	3.15	in
d	12	mm	0.47	in
A	3016	mm2	4.67	in2

Short-term (Reference) Test

Test	Load (kips)	Rupture Disp. (in)	Time (hour)	Bond Stress (psi)	% MSL	% BL MSL	Notes
04-B-ST-1	26.5	0.044	0.03	5674	97%	116%	
04-B-ST-2	27.7	0.064	0.03	5929	102%	121%	
04-B-ST-3	27.8	0.067	0.03	5952	102%	122%	
04-B-ST-4	26.7	0.046	0.03	5722	98%	117%	
04-B-ST-5	27.2	0.052	0.03	5823	100%	119%	

Long-term (Creep) Test

Test	Load (kips)	Rupture Disp. (in)	Time (hour)	Bond Stress (psi)	% MSL	% BL MSL	Notes
04-B-75-1	20.4	0.030	0.8	4365	75%	89%	
04-B-75-2	20.4	0.026	1.2	4365	75%	89%	
04-B-75-3	20.4		2118	4365	75%	89%	still running (7/2/2012)
04-B-65-4	17.7		1371	3783	65%	77%	still running (7/2/2012)
04-B-65-5	17.7		1371	3783	65%	77%	still running (7/2/2012)
04-B-65-6	17.7		1371	3783	65%	77%	still running (7/2/2012)



05-A Installation Direction (Horizontal)

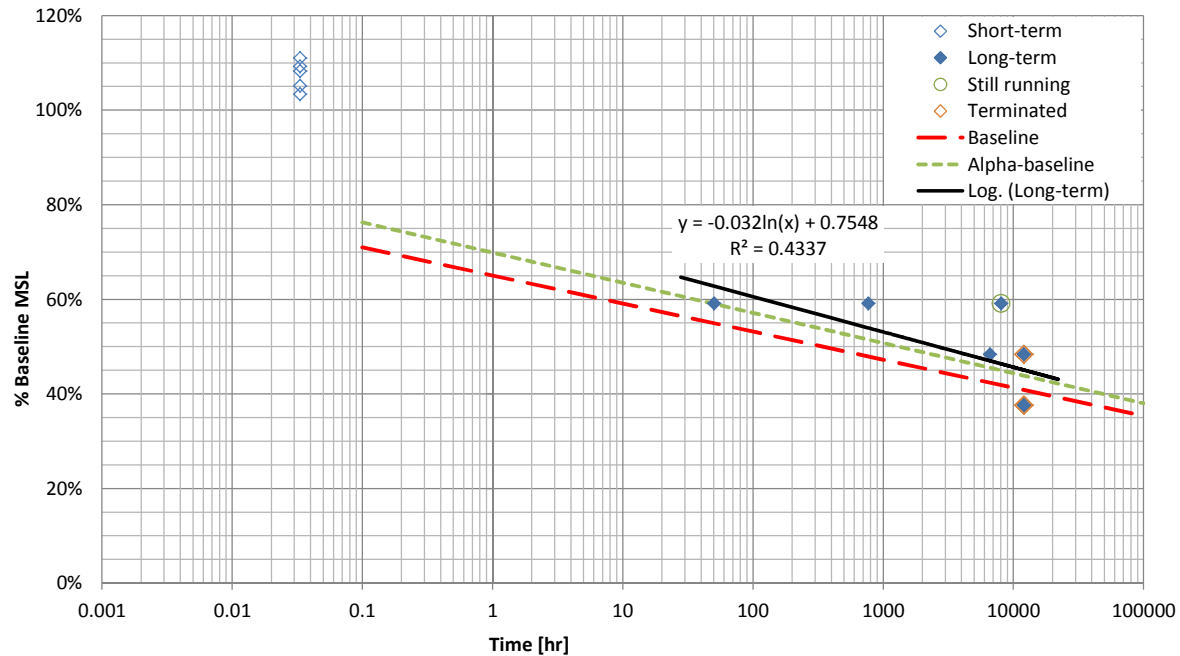
Series	05			
Adhesive	A			
Baseline MSL	65.6	kN	14.7	kips
MSL	70.5	kN	15.8	kips
hef	80	mm	3.15	in
d	12	mm	0.47	in
A	3016	mm ²	4.67	in ²

Short-term (Reference) Test

Test	Load (kips)	Rupture Disp. (in)	Time (hour)	Bond Stress (psi)	% MSL	% BL MSL	Notes
05-A-ST-1	15.2	0.022	0.03	3261	96%	103%	
05-A-ST-2	16.4	0.025	0.03	3502	103%	111%	
05-A-ST-3	16.1	0.024	0.03	3448	102%	109%	
05-A-ST-4	16.0	0.023	0.03	3414	101%	108%	
05-A-ST-5	15.5	0.021	0.03	3316	98%	105%	

Long-term (Creep) Test

Test	Load (kips)	Rupture Disp. (in)	Time (hour)	Bond Stress (psi)	% MSL	% BL MSL	Notes
05-A-55-1	8.7	0.119	50	1865	55%	59%	
05-A-55-2	8.7	0.071	772	1865	55%	59%	
05-A-55-3	8.7		8052	1865	55%	59%	still running (7/2/2012)
05-A-45-4	7.1		12068	1526	45%	48%	terminated (3/21/2012)
05-A-45-5	7.1	0.042	6633	1526	45%	48%	
05-A-45-6	7.1		12068	1526	45%	48%	terminated (3/21/2012)
05-A-35-7	5.5		12068	1187	35%	38%	terminated (3/21/2012)
05-A-35-8	5.5		12068	1187	35%	38%	terminated (3/21/2012)
05-A-35-9	5.5		12067	1187	35%	38%	terminated (3/21/2012)



06-A Installation Direction (Vertical)

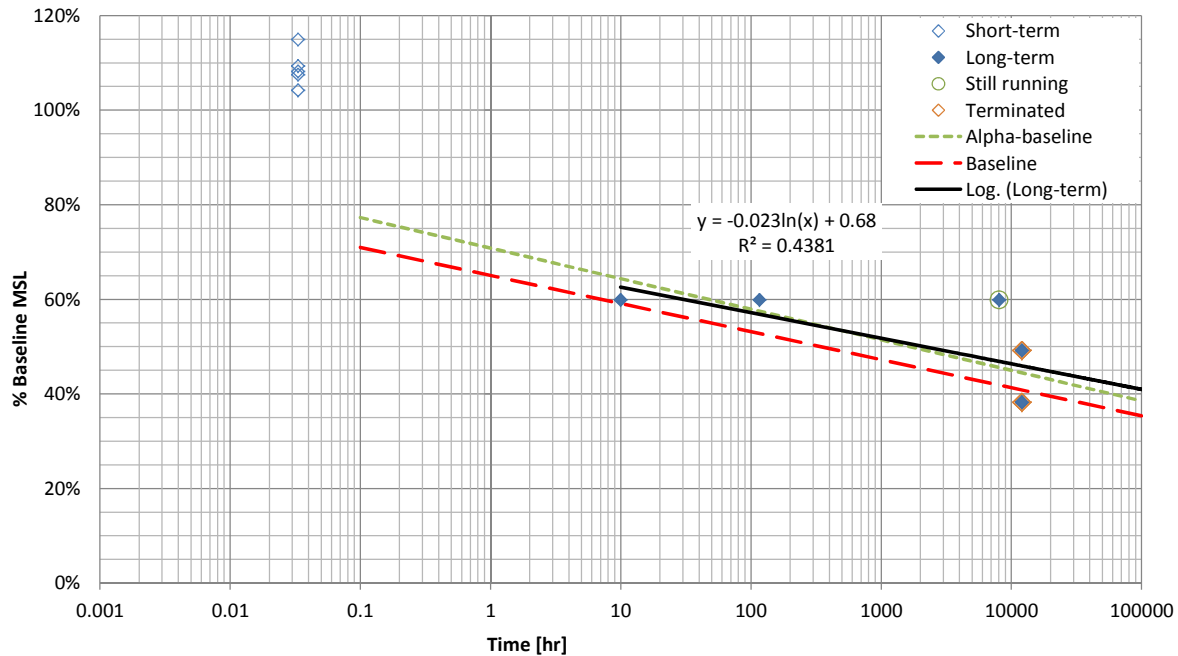
Series	06			
Adhesive	A			
Baseline MSL	65.6	kN	14.7	kips
MSL	71.4	kN	16.1	kips
hef	80	mm	3.15	in
d	12	mm	0.47	in
A	3016	mm ²	4.67	in ²

Short-term (Reference) Test

Test	Load (kips)	Rupture Disp. (in)	Time (hour)	Bond Stress (psi)	% MSL	% BL MSL	Notes
06-A-ST-1	16.0	0.025	0.03	3414	99%	108%	
06-A-ST-2	17.0	0.022	0.03	3628	106%	115%	
06-A-ST-3	16.1	0.023	0.03	3450	100%	109%	
06-A-ST-4	15.9	0.024	0.03	3391	99%	107%	
06-A-ST-5	15.4	0.021	0.03	3286	96%	104%	

Long-term (Creep) Test

Test	Load (kips)	Rupture Disp. (in)	Time (hour)	Bond Stress (psi)	% MSL	% BL MSL	Notes
06-A-55-1	8.8	0.088	117	1889	55%	60%	
06-A-55-2	8.8		8076	1889	55%	60%	still running (7/2/2012)
06-A-55-3	8.8		10	1889	55%	60%	
06-A-45-1	7.3		12068	1551	45%	49%	terminated (3/21/2012)
06-A-45-2	7.3		12068	1551	45%	49%	terminated (3/21/2012)
06-A-45-3	7.3		12068	1551	45%	49%	terminated (3/21/2012)
06-A-35-1	5.6		12066	1207	35%	38%	terminated (3/21/2012)
06-A-35-2	5.6		12066	1207	35%	38%	terminated (3/21/2012)
06-A-35-3	5.6		12066	1207	35%	38%	terminated (3/21/2012)



07-A Moisture during Installation

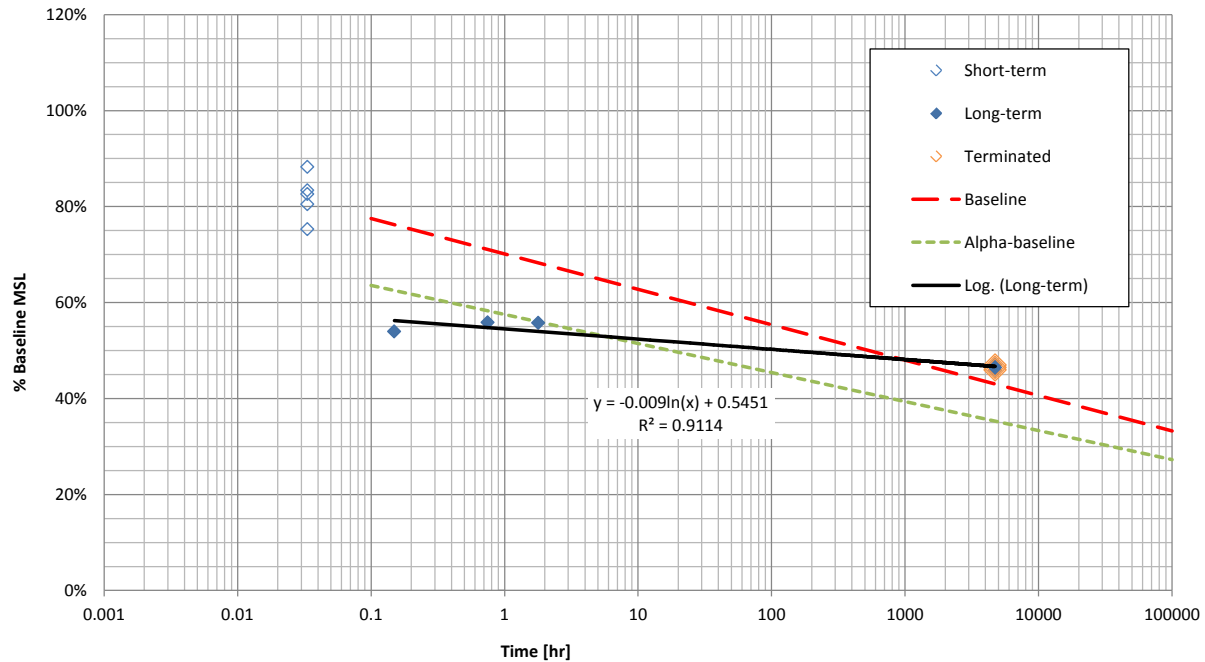
Series	07	
Adhesive	A	
Baseline MSL	19.8	kips
MSL	16.2	kips
hef	3.125	in
d	0.625	in
A	6.136	in2

Short-term (Reference) Test

Test	Load (kips)	Rupture Disp. (in)	Time (hour)	Bond Stress (psi)	% MSL	% BL MSL	Notes
07-A-ST-1	15.9	0.037	0.03	2596	98%	80%	
07-A-ST-2	17.5	0.038	0.03	2848	108%	88%	
07-A-ST-3	16.4	0.040	0.03	2665	101%	83%	
07-A-ST-4	14.9	0.037	0.03	2428	92%	75%	
07-A-ST-5	16.5	0.040	0.03	2690	102%	83%	

Long-term (Creep) Test

Test	Load (kips)	Rupture Disp. (in)	Time (hour)	Bond Stress (psi)	% MSL	% BL MSL	Notes
07-A-68-1	11.1	0.089	0.75	1802	68%	56%	
07-A-68-2	11.0	0.136	1.79	1800	68%	56%	
07-A-66-3	10.7	0.136	0.15	1741	66%	54%	
07-A-57-4	9.3		4722	1516	57%	47%	terminated (5/10/2011)
07-A-57-5	9.2		4722	1499	57%	46%	terminated (5/10/2011)
07-A-56-6	9.1		4722	1483	56%	46%	terminated (5/10/2011)



08-B Moisture in-service

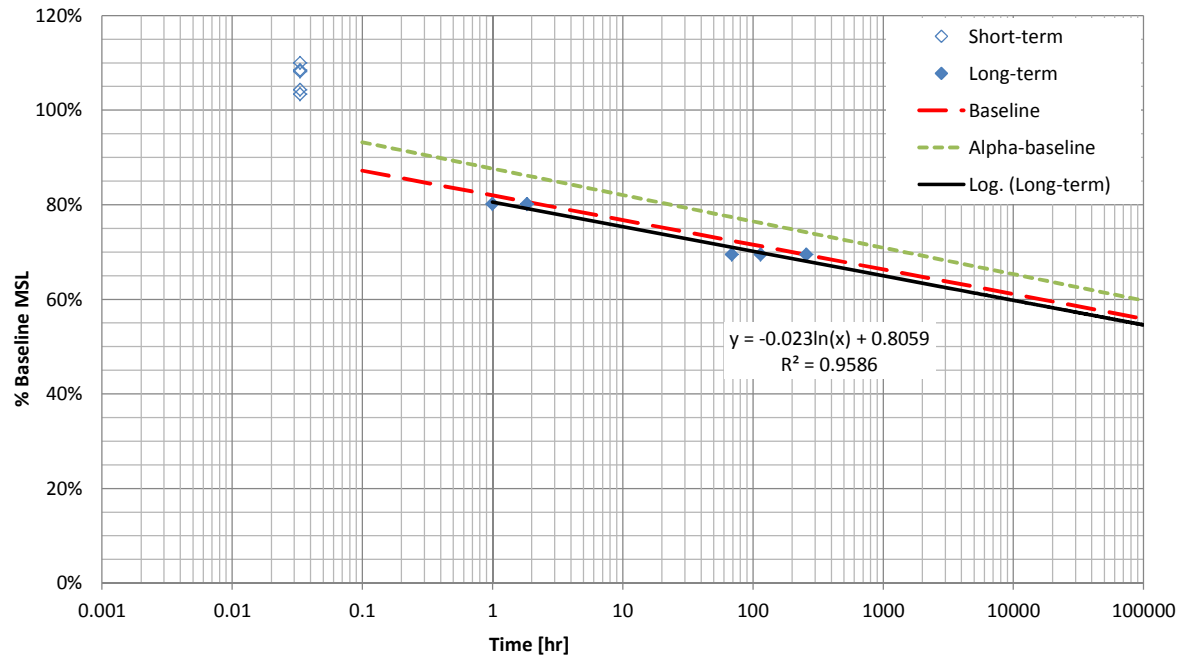
Series	08			
Adhesive	B			
Baseline MSL	101.7	kN	22.9	kips
MSL	108.8	kN	24.4	kips
hef	80	mm	3.15	in
d	12	mm	0.47	in
A	3016	mm2	4.67	in2

Short-term (Reference) Test

Test	Load (kips)	Rupture Disp. (in)	Time (hour)	Bond Stress (psi)	% MSL	% BL MSL	Notes
08-B-ST-1	23.6	0.029	0.03	5058	97%	103%	
08-B-ST-2	23.9	0.032	0.03	5106	98%	104%	
08-B-ST-3	24.8	0.035	0.03	5308	101%	108%	
08-B-ST-4	24.7	0.033	0.03	5293	101%	108%	
08-B-ST-5	25.2	0.036	0.03	5384	103%	110%	

Long-term (Creep) Test

Test	Load (kips)	Rupture Disp. (in)	Time (hour)	Bond Stress (psi)	% MSL	% BL MSL	Notes
08-B-75-1	18.3	0.073	1.8	3923	75%	80%	
08-B-75-2	18.3	0.070	1.0	3923	75%	80%	
08-B-75-3	18.3			3923	75%	80%	failed during loading
08-B-65-4	15.9	0.102	114	3400	65%	69%	
08-B-65-5	15.9	0.113	257	3400	65%	69%	
08-B-65-6	15.9	0.119	69	3400	65%	69%	



09-C Reduced Hole Cleaning

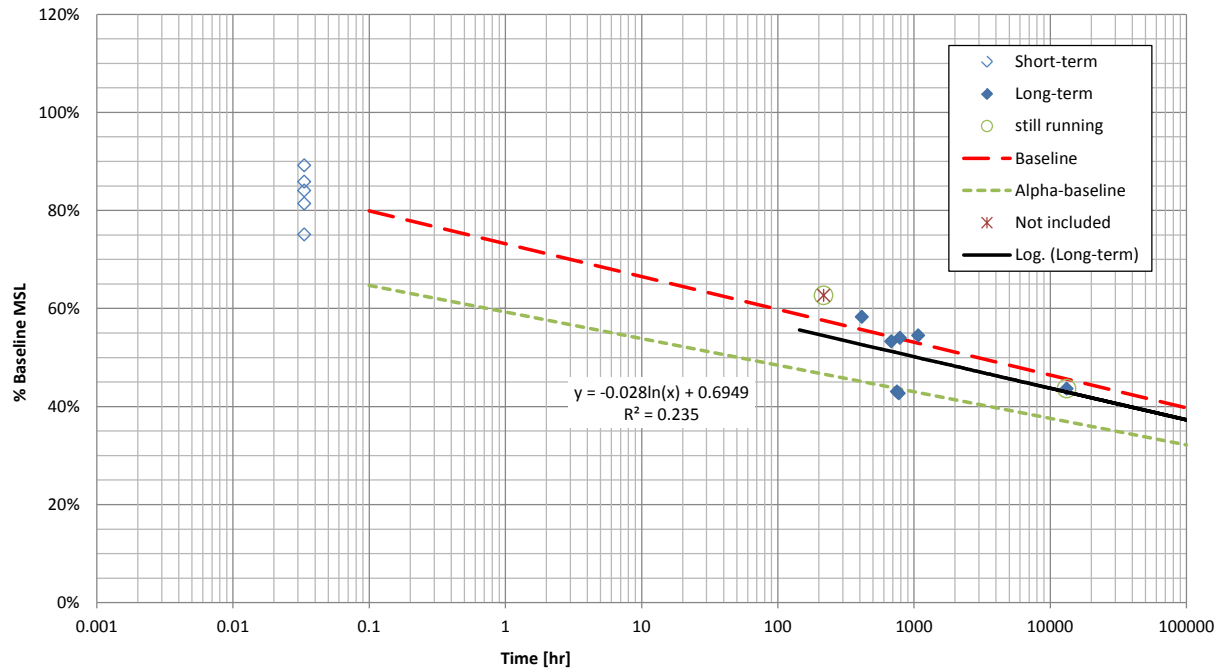
Series	09	
Adhesive	C	
Baseline MSL	25.7	kips
MSL	21.3	kips
hef	3.125	in
d	0.625	in
A	6.136	in ²

Short-term (Reference) Test

Test	Load (kips)	Rupture Disp. (in)	Time (hour)	Bond Stress (psi)	% MSL	% BL MSL	Notes
09-C-ST-1	22.9	0.043	0.03	3730	107%	89%	
09-C-ST-2	19.3	0.035	0.03	3141	90%	75%	
09-C-ST-3	22.0	0.040	0.03	3591	103%	86%	
09-C-ST-4	21.6	0.041	0.03	3515	101%	84%	
09-C-ST-5	20.9	0.044	0.03	3404	98%	81%	

Long-term (Creep) Test

Test	Load (kips)	Rupture Disp. (in)	Time (hour)	Bond Stress (psi)	% MSL	% BL MSL	Notes
09-C-66-1	14.0	0.150	1073	2279	66%	55%	
09-C-65-2	13.9	0.184	787	2259	65%	54%	
09-C-64-3	13.7	0.144	681	2229	64%	53%	
09-C-53-4	11.2		13226	1825	53%	44%	Still running (3/27/2012)
09-C-52-5	11.0	0.124	750	1800	52%	43%	
09-C-51-6	11.0	0.120	772	1785	51%	43%	
09-C-75-7	16.1		217	2619	75%	63%	Still running (4/4/2012)
09-C-70-8	15.0	0.152	415	2438	70%	58%	



10-A Installation Temperature (MFR minimum/MFR minimum)

Series	10			
Adhesive	A			
Baseline MSL	76.3	kN	17.2	kips
MSL	84.2	kN	18.9	kips
hef	80	mm	3.15	in
d	12	mm	0.47	in
A	3016	mm2	4.67	in2

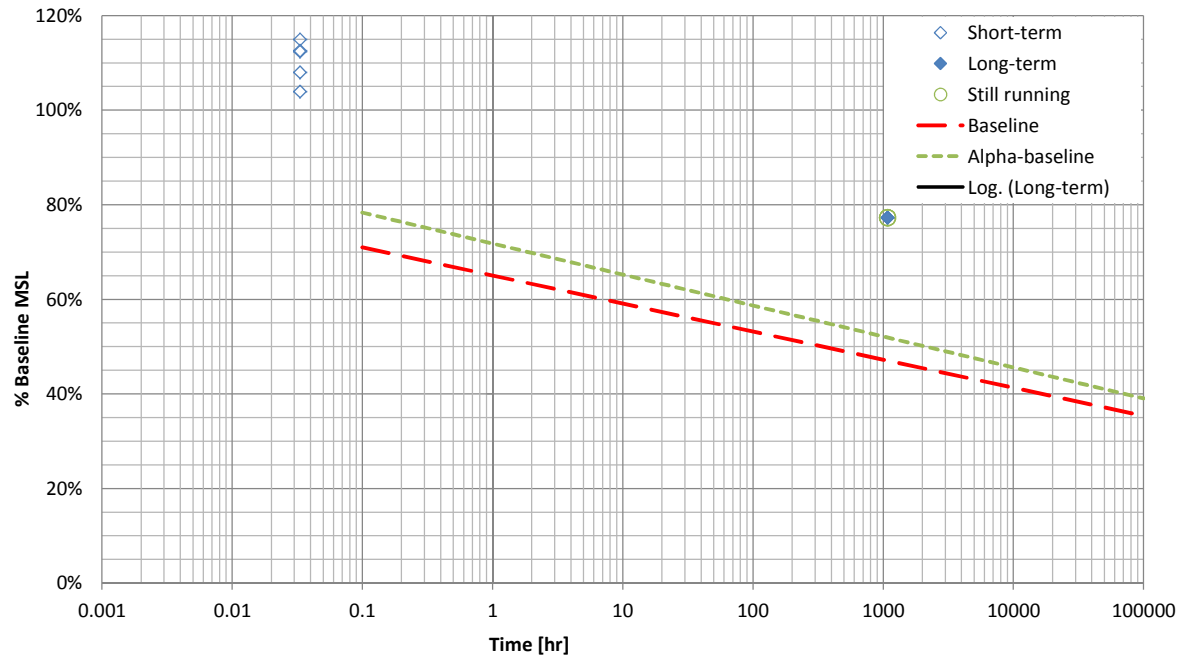
Short-term (Reference) Test

Test	Load (kips)	Rupture Disp. (in)	Time (hour)	Bond Stress (psi)	% MSL	% BL MSL	Notes
10-A-ST-1	19.3	0.015	0.03	4124	102%	112%	
10-A-ST-2	19.3	0.016	0.03	4131	102%	113%	
10-A-ST-3	17.8	0.015	0.03	3814	94%	104%	
10-A-ST-4	19.7	0.017	0.03	4219	104%	115%	
10-A-ST-5	18.5	0.015	0.03	3964	98%	108%	

Long-term (Creep) Test

Test	Load (kips)	Rupture Disp. (in)	Time (hour)	Bond Stress (psi)	% MSL	% BL MSL	Notes
10-A-70-1	13.3		1080	2835	70%	77%	still running (7/2/2012)
10-A-70-2	13.3		1080	2835	70%	77%	still running (7/2/2012)
10-A-70-3	13.3		1080	2835	70%	77%	still running (7/2/2012)
				0	0%	0%	
				0	0%	0%	
				0	0%	0%	

Not enough data to accurately generate experimental trendline



11-A Installation Temperature (MFR minimum/110°F)

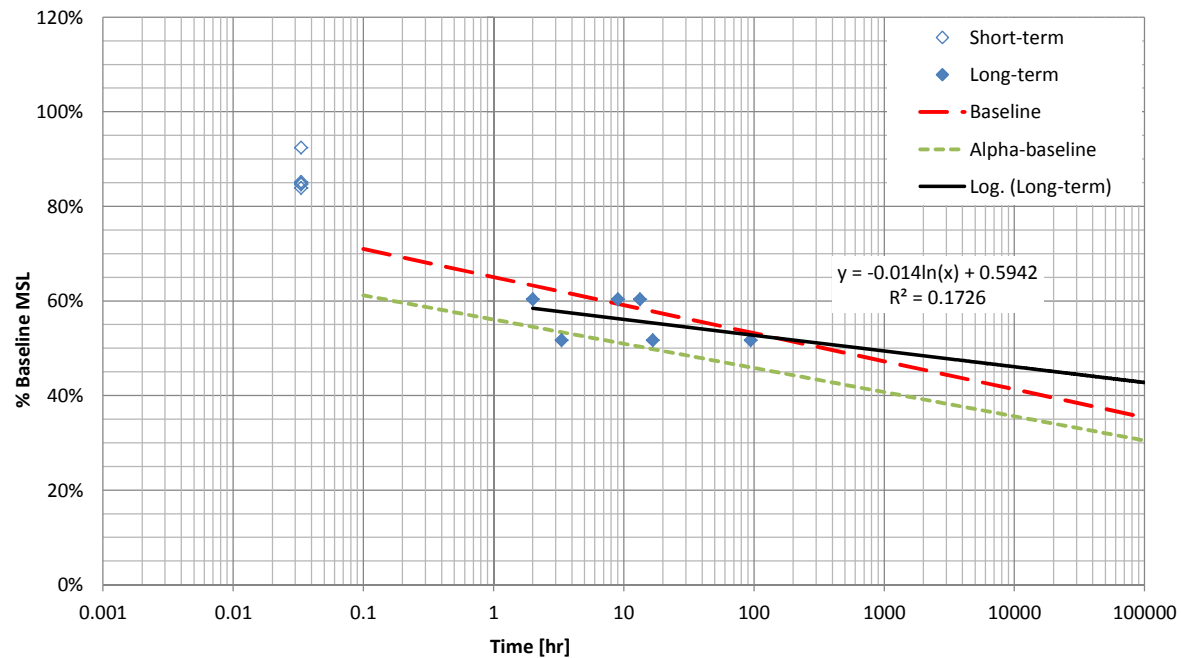
Series	11			
Adhesive	A			
Baseline MSL	76.3	kN	17.2	kips
MSL	65.8	kN	14.8	kips
hef	80	mm	3.15	in
d	12	mm	0.47	in
A	3016	mm2	4.67	in2

Short-term (Reference) Test

Test	Load (kips)	Rupture Disp. (in)	Time (hour)	Bond Stress (psi)	% MSL	% BL MSL	Notes
11-A-ST-1	14.5	0.015	0.03	3106	98%	85%	
11-A-ST-2	14.4	0.014	0.03	3079	97%	84%	
11-A-ST-3	14.6	0.015	0.03	3114	98%	85%	
11-A-ST-4	14.6	0.016	0.03	3125	99%	85%	
11-A-ST-5	15.9	0.015	0.03	3392	107%	92%	

Long-term (Creep) Test

Test	Load (kips)	Rupture Disp. (in)	Time (hour)	Bond Stress (psi)	% MSL	% BL MSL	Notes
11-A-70-1	10.4	0.020	2	2214	70%	60%	
11-A-70-2	10.4	0.028	13	2214	70%	60%	
11-A-70-3	10.4	0.025	9	2214	70%	60%	
11-A-60-4	8.9	0.024	17	1898	60%	52%	
11-A-60-5	8.9	0.021	3	1898	60%	52%	
11-A-60-6	8.9	0.031	94	1898	60%	52%	



12-A Standard DOT mix

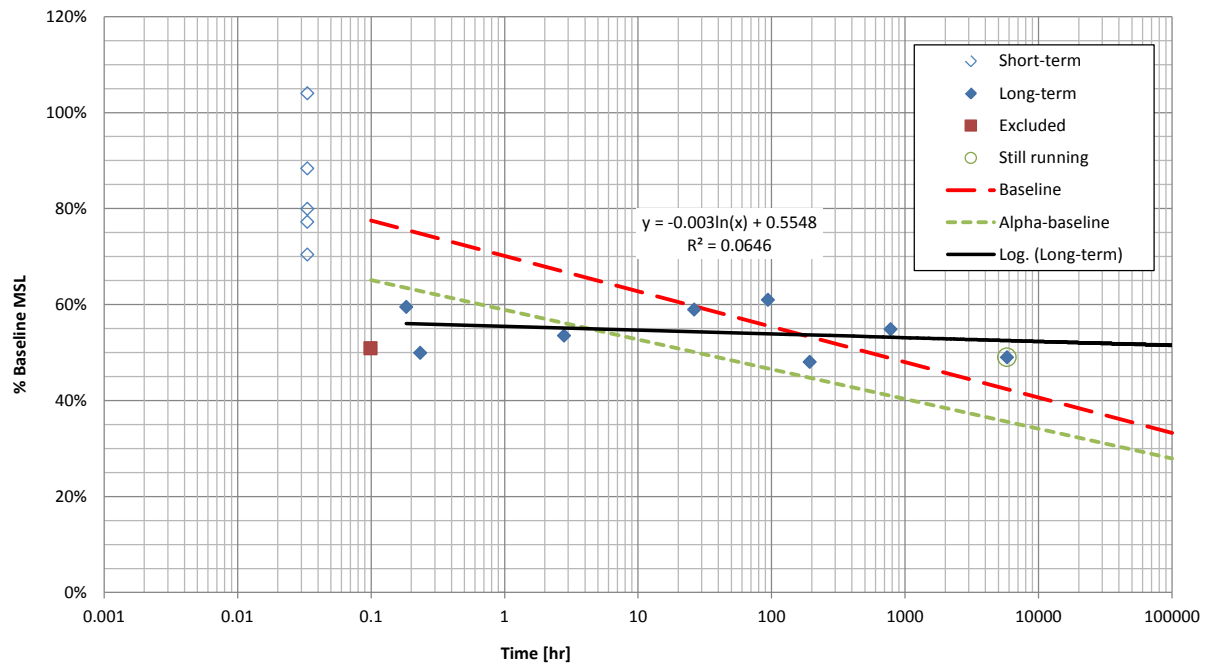
Series	12	
Adhesive	A	
Baseline MSL	19.8	kips
MSL	16.6	kips
hef	3.125	in
d	0.625	in
A	6.136	in2

Short-term (Reference) Test

Test	Load (kips)	Rupture Disp. (in)	Time (hour)	Bond Stress (psi)	% MSL	% BL MSL	Notes
12-A-ST-1	15.3	0.037	0.03	2491	92%	77%	
12-A-ST-2	20.6	0.040	0.03	3355	124%	104%	
12-A-ST-3	13.9	0.047	0.03	2272	84%	70%	
12-A-ST-4	17.5	0.038	0.03	2851	105%	88%	
12-A-ST-5	15.8	0.037	0.03	2578	95%	80%	

Long-term (Creep) Test

Test	Load (kips)	Rupture Disp. (in)	Time (hour)	Bond Stress (psi)	% MSL	% BL MSL	Notes
12-A-73-1	12.1	0.065	94	1967	73%	61%	
12-A-71-2	11.8	0.050	0.18	1919	71%	59%	failed under 10 minutes
12-A-70-3	11.7	0.045	26	1902	70%	59%	
12-A-65-4	10.9	0.108	779	1770	65%	55%	
12-A-64-5	10.6	0.173	2.79	1726	64%	54%	
12-A-61-6	10.1	0.249	0.10	1642	61%	51%	failed during loading
12-A-60-7	9.9	0.040	0.23	1610	60%	50%	
12-A-58-8	9.7		5813	1581	58%	49%	still running (3/27/2012)
12-A-57-9	9.5	0.080	193	1550	57%	48%	



13-B Core Drilling

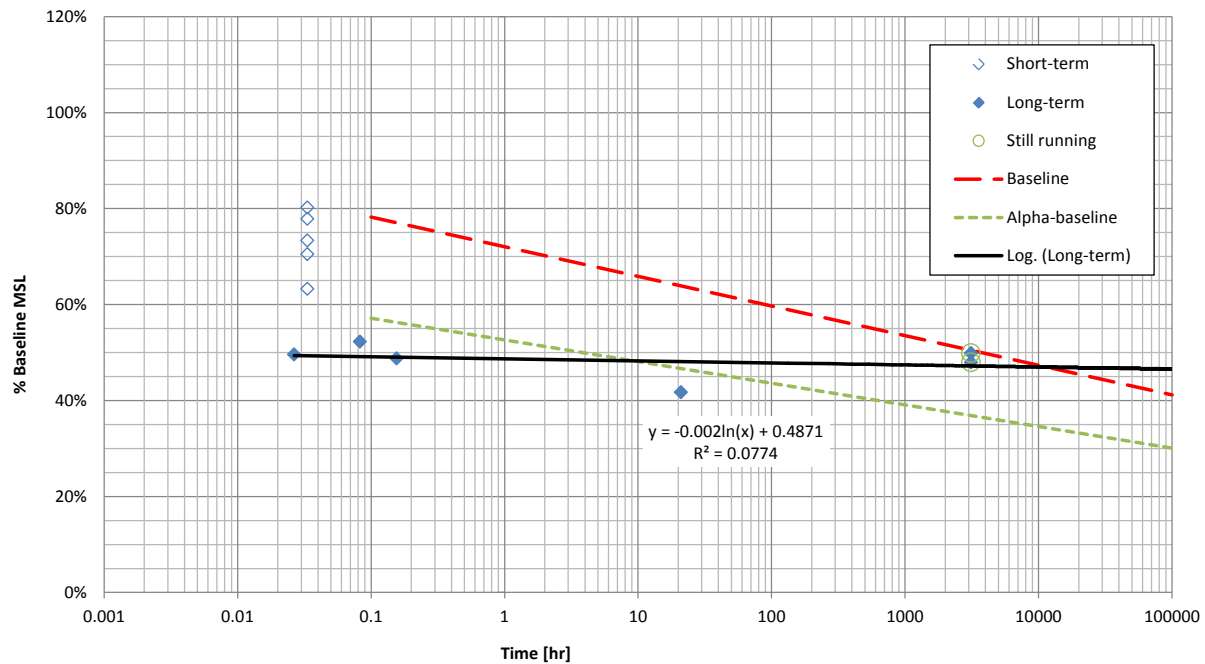
Series	13	
Adhesive	B	
Baseline MSL	25.7	kips
MSL	18.7	kips
hef	3.125	in
d	0.625	in
A	6.136	in ²

Short-term (Reference) Test

Test	Load (kips)	Rupture Disp. (in)	Time (hour)	Bond Stress (psi)	% MSL	% BL MSL	Notes
13-B-ST-1	20.6	0.030	0.03	3355	110%	80%	
13-B-ST-2	20.0	0.028	0.03	3257	107%	78%	
13-B-ST-3	18.8	0.029	0.03	3067	100%	73%	
13-B-ST-4	16.2	0.033	0.03	2646	87%	63%	
13-B-ST-5	18.1	0.030	0.03	2948	97%	70%	

Long-term (Creep) Test

Test	Load (kips)	Rupture Disp. (in)	Time (hour)	Bond Stress (psi)	% MSL	% BL MSL	Notes
13-B-72-1	13.4	0.139	0.08	2185	72%	52%	
13-B-68-2	12.8		3121	2086	68%	50%	still running (3/27/2012)
13-B-68-3	12.7	0.053	0.03	2074	68%	50%	
13-B-66-4	12.3		3121	2005	66%	48%	still running (3/27/2012)
13-B-67-5	12.5	0.069	0.16	2039	67%	49%	
13-B-57-6	10.7	0.171	20.98	1745	57%	42%	



14-B Fly Ash

Series	14	
Adhesive	B	
Baseline MSL	25.7	kips
MSL	23.4	kips
hef	3.125	in
d	0.625	in
A	6.136	in ²

Short-term (Reference) Test

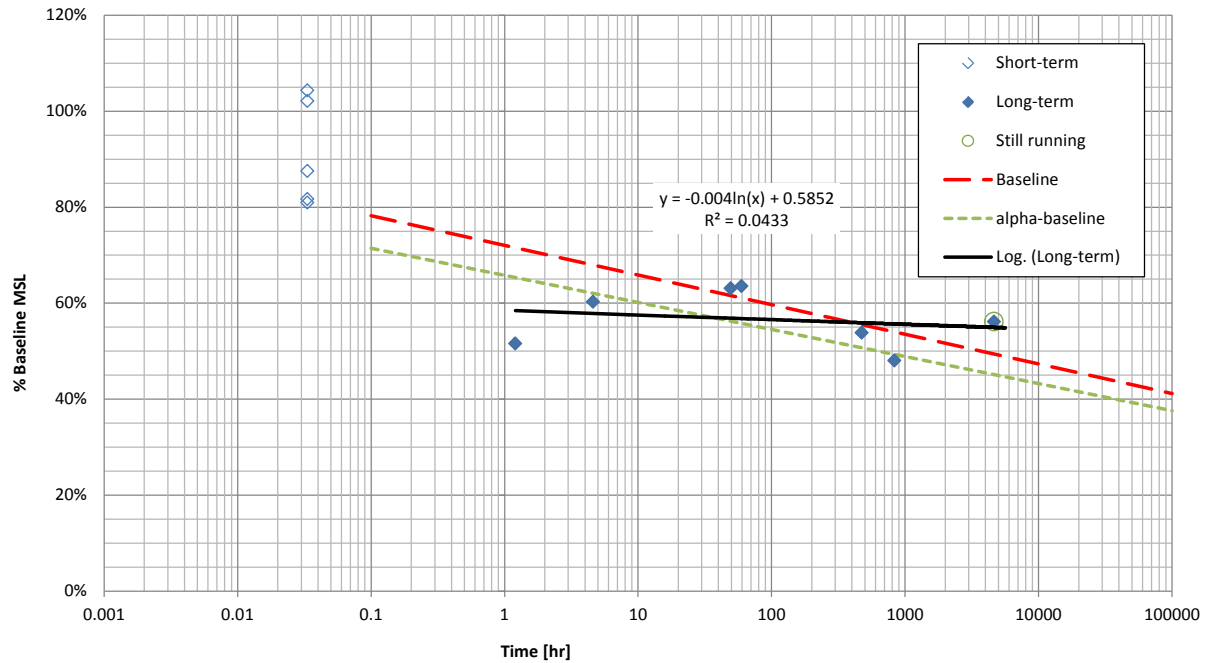
Test	Load (kips)	Rupture Disp. (in)	Time (hour)	Bond Stress (psi)	% MSL	% BL MSL	Notes
14-B-ST-1	26.2	0.047	0.03	4271	112%	102%	
14-B-ST-2	22.5	0.044	0.03	3661	96%	88%	
14-B-ST-3	20.8	0.045	0.03	3385	89%	81%	
14-B-ST-4	21.0	0.043	0.03	3416	89%	82%	
14-B-ST-5	26.8	0.051	0.03	4363	114%	104%	

Long-term (Creep) Test

Test	Load (kips)	Rupture Disp. (in)	Time (hour)	Bond Stress (psi)	% MSL	% BL MSL	Notes
14-B-70-1	16.3	0.134	60	2658	70%	64%	
14-B-69-2	16.2	0.132	49	2638	69%	63%	
14-B-66-3	15.5	0.122	5	2521	66%	60%	
14-B-61-4	14.4		4635	2347	61%	56%	still running (3/27/2012)
14-B-59-5	13.8		472	2252	59%	54%	conservative value ¹
14-B-57-6	13.2	0.157	1.2	2157	56%	52%	
14-B-53-7	12.3	0.227	833	2008	53%	48%	

Notes:

- Test 14-B-62-4 failed when test equipment was malfunctioning. The exact time of failure was not captured. The failure occurred between 473 and 646 hours.



15-A Blast Furnace Slag

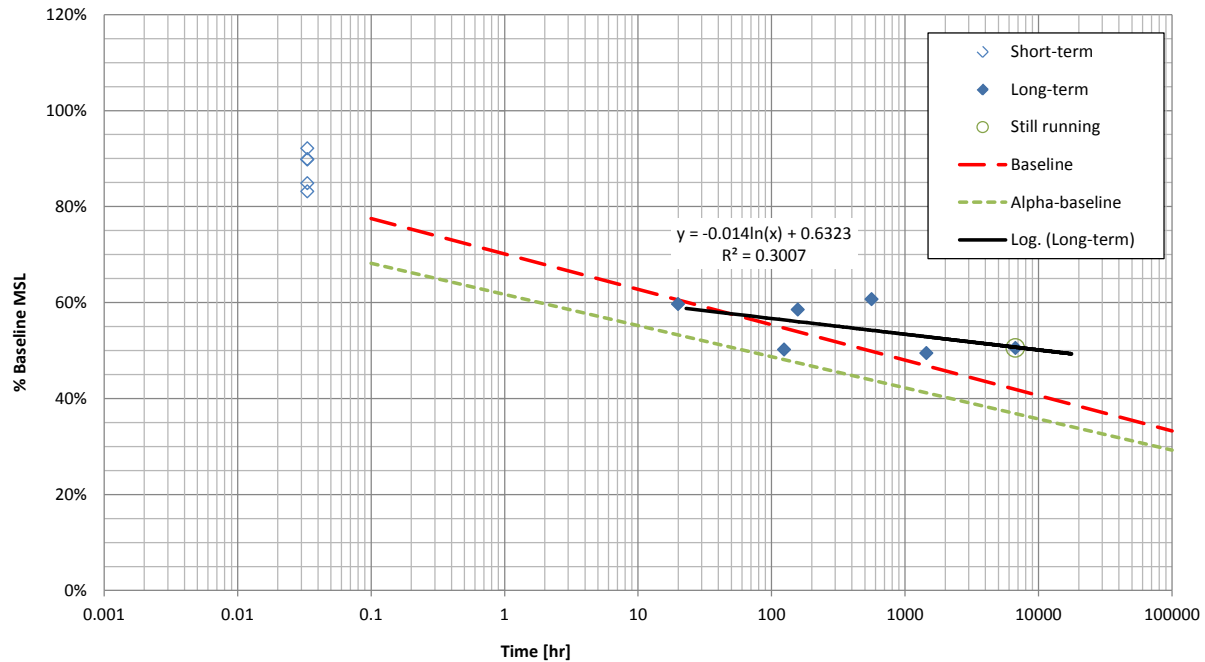
Series	15	
Adhesive	A	
Baseline MSL	19.8	kips
MSL	17.4	kips
hef	3.125	in
d	0.625	in
A	6.136	in ²

Short-term (Reference) Test

Test	Load (kips)	Rupture Disp. (in)	Time (hour)	Bond Stress (psi)	% MSL	% BL MSL	Notes
15-A-ST-1	17.8	0.036	0.03	2897	102%	90%	
15-A-ST-2	16.8	0.033	0.03	2737	96%	85%	
15-A-ST-3	18.2	0.043	0.03	2972	105%	92%	
15-A-ST-4	17.8	0.034	0.03	2899	102%	90%	
15-A-ST-5	16.5	0.035	0.03	2683	95%	83%	

Long-term (Creep) Test

Test	Load (kips)	Rupture Disp. (in)	Time (hour)	Bond Stress (psi)	% MSL	% BL MSL	Notes
15-A-69-1	12.0	0.053	562	1958	69%	61%	
15-A-68-2	11.8	0.044	20	1926	68%	60%	
15-A-67-3	11.6	0.076	157	1888	67%	59%	
15-A-58-4	10.0		6719	1630	57%	51%	still running (3/27/2012)
15-A-57-5	9.9	0.047	124	1620	57%	50%	
15-A-56-6	9.8	0.059	1446	1595	56%	49%	



16-C Unconfined Setup

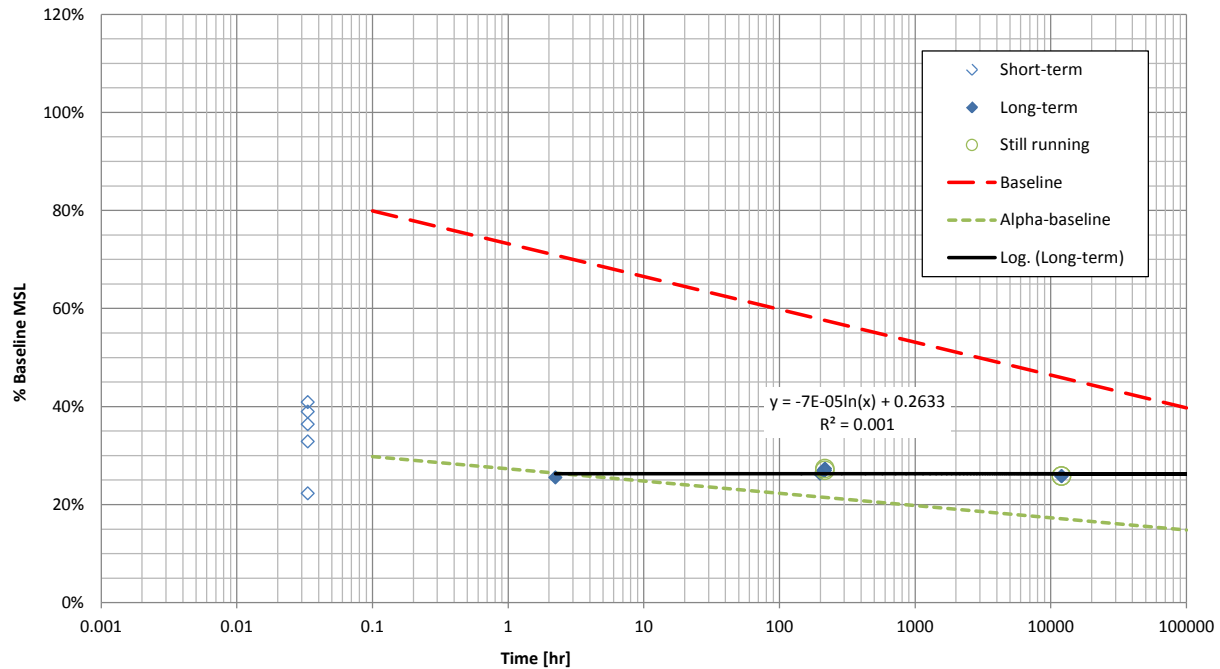
Series	16	
Adhesive	C	
Baseline MSL	26.3	kips
MSL	9.8	kips
hef	3.125	in
d	0.625	in
A	6.136	in ²

Short-term (Reference) Test

Test	Load (kips)	Displacement (in)	Time (hour)	Bond Stress (psi)	% MSL	% BL MSL	Notes
16-C-ST-1	10.8	0.028	0.03	1755	110%	41%	
16-C-ST-2	9.6	0.029	0.03	1563	98%	36%	
16-C-ST-3	10.3	0.030	0.03	1673	105%	39%	
16-C-ST-4	8.7	0.032	0.03	1412	88%	33%	
16-C-ST-5	5.9	0.053	0.03	957	60%	22%	

Long-term (Creep) Test

Test	Load (kips)	Displacement (in)	Time (hour)	Bond Stress (psi)	% MSL	% BL MSL	Notes
16-C-73-1	7.2		217	1173	73%	27%	still running (4/4/2012)
16-C-72-2	7.1		217	1157	72%	27%	still running (4/4/2012)
16-C-69-3	6.7	0.071	2.24	1096	68%	26%	
16-C-71-4	6.9	0.025	200	1129	71%	26%	
16-C-69-5	6.8		12024	1108	69%	26%	still running (3/27/2012)
16-C-69-6	6.8		12024	1108	69%	26%	still running (3/27/2012)



21-A

Baseline Tests

Series

21

Adhesive

A

Mean Peak Stress

1.45

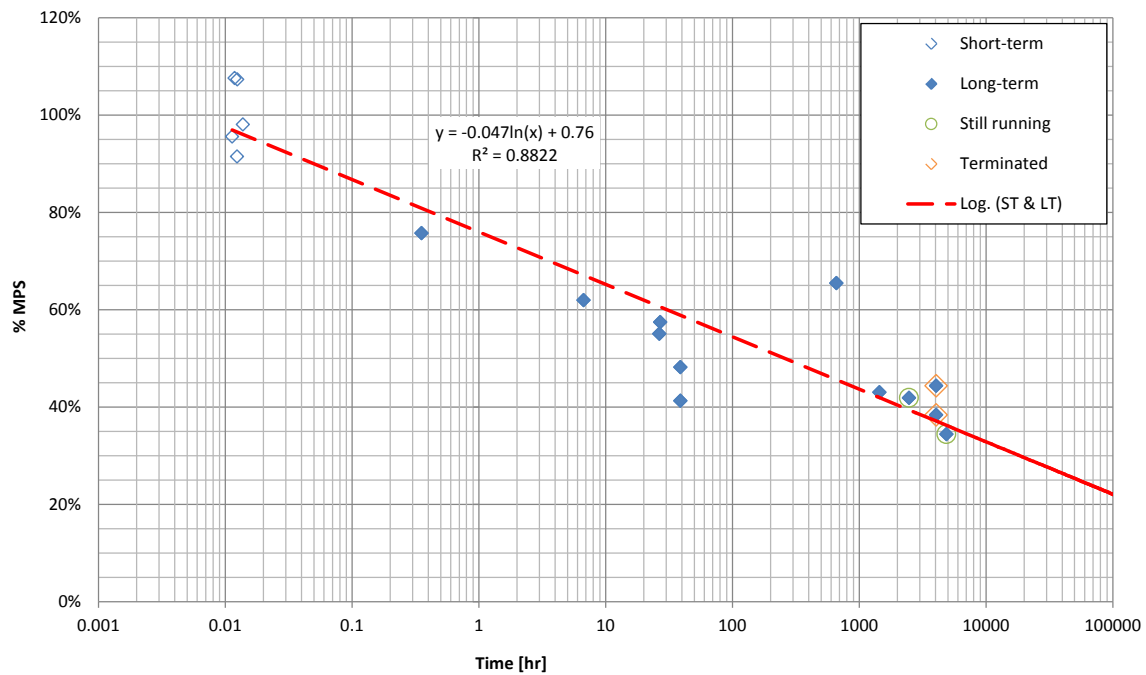
ksi

Short-term (Reference) Test

Test	Stress (ksi)	Rupture Strain (--)	Time (hour)	% MPS	Notes
21-A-ST-1	1.33	0.003	0.012	0.91	
21-A-ST-2	1.56	0.004	0.012	1.08	
21-A-ST-3	1.39	0.005	0.011	0.96	
21-A-ST-4	1.56	0.005	0.012	1.07	
21-A-ST-5	1.42	0.003	0.014	0.98	

Long-term (Creep) Test

Test	Stress (ksi)	Rupture Strain (--)	Time (hour)	% MPS	Notes
21-A-76-1	1.10	0.005	0.35	0.76	
21-A-65-2	0.95	0.005	661	0.65	
21-A-62-3	0.90	0.005	6.70	0.62	
21-A-57-4	0.83	0.002	27.0	0.57	
21-A-55-5	0.80	0.003	26.5	0.55	
21-A-48-6	0.70	0.004	38.9	0.48	
21-A-44-7	0.64	>0.003	4053	0.44	terminated (2/16/2012)
21-A-43-8	0.63	0.003	1448	0.43	
21-A-42-9	0.61	0.003	2476	0.42	still running(4/4/2012)
21-A-41-10	0.60	0.004	39.0	0.41	
21-A-38-11	0.56		4053	0.38	terminated (2/16/2012)
21-A-34-12	0.50		4893	0.34	still running(4/4/2012)



21-B

Baseline Tests

Series	21	
Adhesive	B	
Mean Peak Stress	6.81	ksi

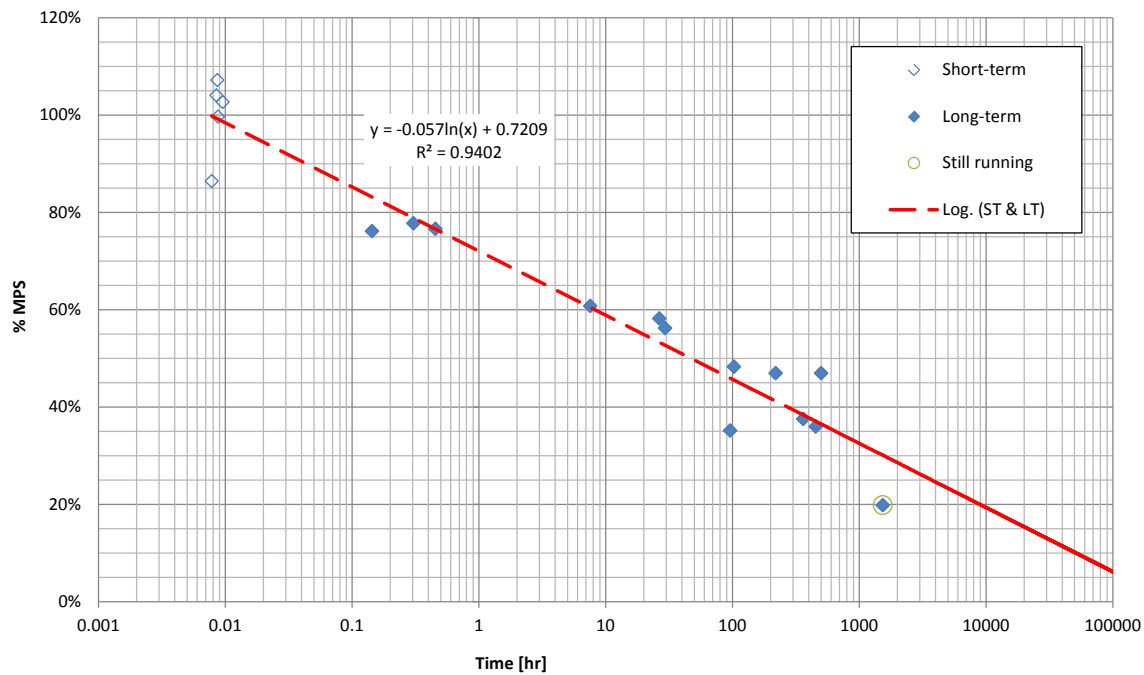
Short-term (Reference) Test

Test	Stress (ksi)	Rupture Strain (--)	Time (hour)	% MPS	Notes
21-B-ST-1	7.09	0.015	0.009	1.04	
21-B-ST-2	6.79	0.011	0.009	1.00	
21-B-ST-3	7.30	0.011	0.009	1.07	
21-B-ST-4	5.89	0.008	0.008	0.86	
21-B-ST-5	7.00	0.012	0.010	1.03	

Long-term (Creep) Test

Test	Stress (ksi)	Rupture Strain (--)	Time (hour)	% MPS	Notes
21-B-78-1	5.30	0.017	0.31	0.78	
21-B-77-2	5.22	0.025	0.45	0.77	
21-B-76-3	5.19	0.013	0.14	0.76	
21-B-61-4	4.14	0.047	7.57	0.61	
21-B-58-5	3.97	0.003	26.5	0.58	
21-B-56-6	3.83	0.035	29.5	0.56	
21-B-48-7	3.29	0.076	103	0.48	
21-B-47-8	3.20	0.819	220	0.47	1
21-B-47-9	3.20	0.089	501	0.47	
21-B-38-10	2.56	0.033	363	0.38	
21-B-36-11	2.45	0.006	455	0.36	
21-B-35-12	2.40	0.025	96.0	0.35	2
21-B-20-13	1.35		1536	0.20	still running (4/4/2012)

1. No strain vs. time data for the first 150 hours due to bad connection
2. Specimen broke due to shock from failure of neighbor sample



21-C

Baseline Tests

Series

21

Adhesive

C

Mean Max. Tensile Stress

3.97

ksi

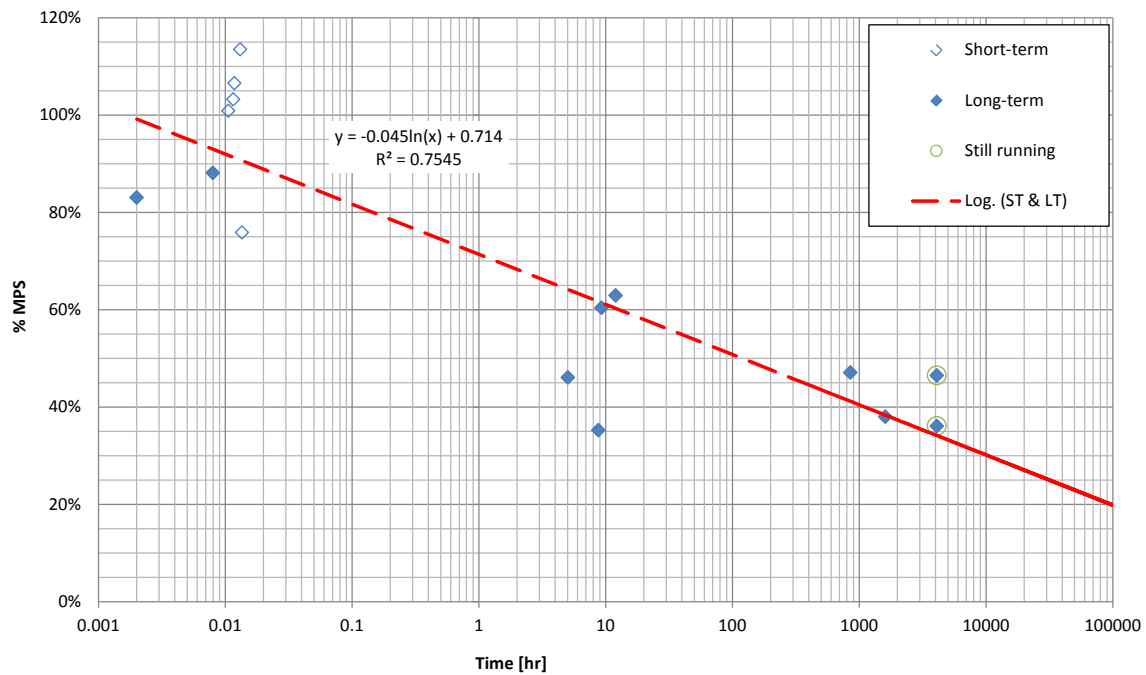
Short-term (Reference) Test

Test	Stress (ksi)	Rupture Strain (--)	Time (hour)	% MPS	Notes
21-C-ST-1	4.10	0.005	0.012	1.03	
21-C-ST-2	4.01	0.005	0.011	1.01	
21-C-ST-3	4.51	0.006	0.013	1.13	
21-C-ST-4	4.23	0.006	0.012	1.07	
21-C-ST-5	3.01	0.004	0.014	0.76	

Long-term (Creep) Test

Test	Stress (ksi)	Rupture Strain (--)	Time (hour)	% MPS	Notes
21-C-88-1	3.50	0.004	0.008	0.88	
21-C-83-2	3.30	0.027	0.002	0.83	
21-C-63-3	2.50	0.014	12.0	0.63	
21-C-60-4	2.40	0.007	9.3	0.60	
21-C-47-5	1.87	>0.02	850	0.47	1
21-C-46-6	1.85	>0.0267	4102	0.46	Still running (4/4/2012)
21-C-46-7	1.83	0.007	5.0	0.46	
21-C-38-8	1.51	0.019	1607	0.38	
21-C-36-9	1.43	>0.0145	4102	0.36	Still running (4/4/2012)
21-C-35-10	1.40	0.004	8.8	0.35	

1. Exact failure time is not known, failed within 850 and 940 hours, 850 was used as it is conservative.



22-A

Manufacturer Cure Time

Series

22

Adhesive

A

Baseline Mean Peak Stress

1.45

ksi

Mean Peak Stress

1.52

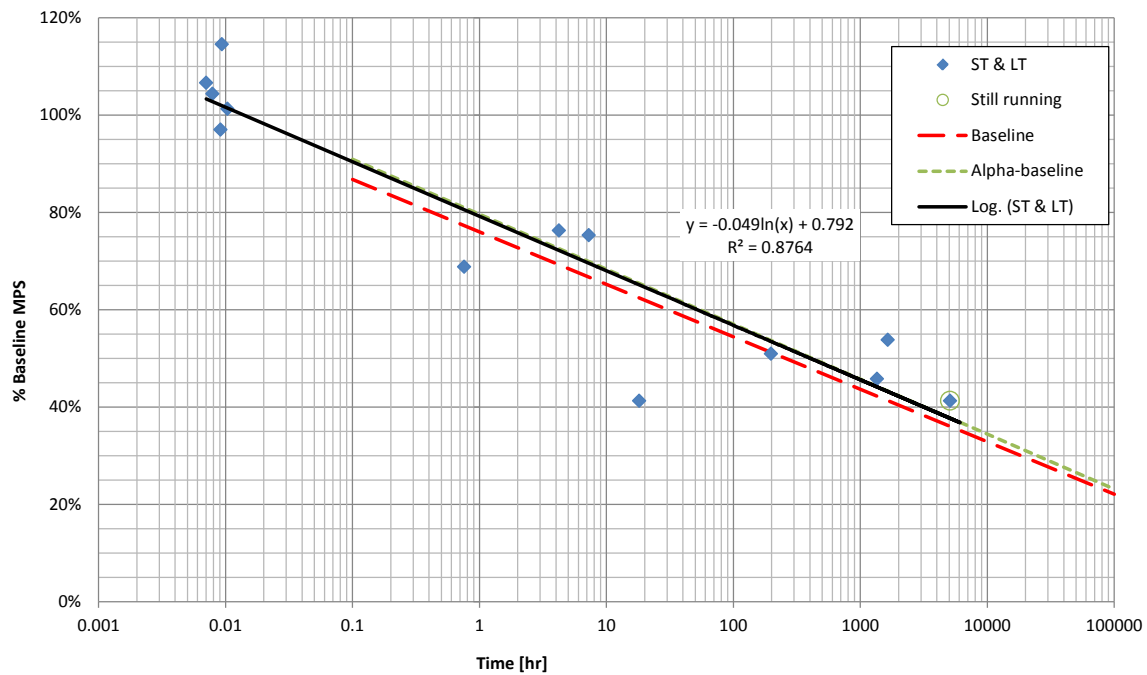
ksi

Short-term (Reference) Test

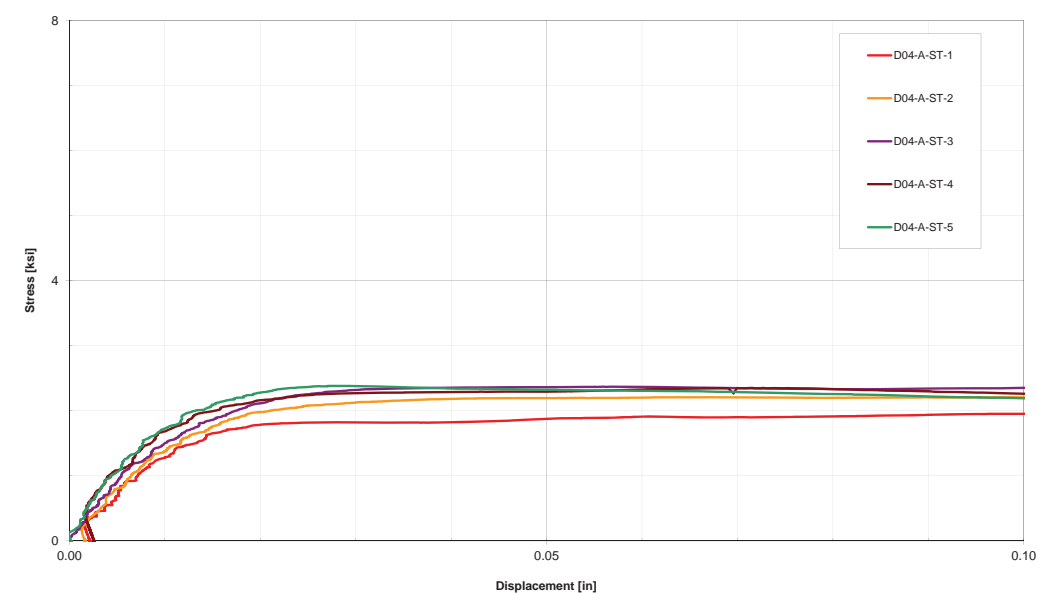
Test	Stress (ksi)	Rupture Strain (--)	Time (hour)	% MPS	% BL MPS	Notes
22-A-ST-1	1.52	0.004	0.008	1.00	1.04	
22-A-ST-2	1.55	0.005	0.007	1.02	1.07	
22-A-ST-3	1.66	0.004	0.009	1.09	1.15	
22-A-ST-4	1.47	0.003	0.010	0.97	1.01	
22-A-ST-5	1.41	0.002	0.009	0.93	0.97	

Long-term (Creep) Test

Test	Stress (ksi)	Rupture Strain (--)	Time (hour)	% MPS	% BL MPS	Notes
22-A-73-1	1.11	0.005	4.22	0.73	0.76	
22-A-72-2	1.09	0.005	7.24	0.72	0.75	
22-A-66-3	1.00	0.003	0.757	0.66	0.69	
22-A-51-4	0.78	0.006	1647	0.51	0.54	
22-A-49-5	0.74	0.004	198	0.49	0.51	
22-A-44-6	0.67	0.004	1351	0.44	0.46	
22-A-39-7	0.60	0.004	18.1	0.39	0.41	
22-A-39-8	0.60		5084	0.39	0.41	still running (4/4/2012)

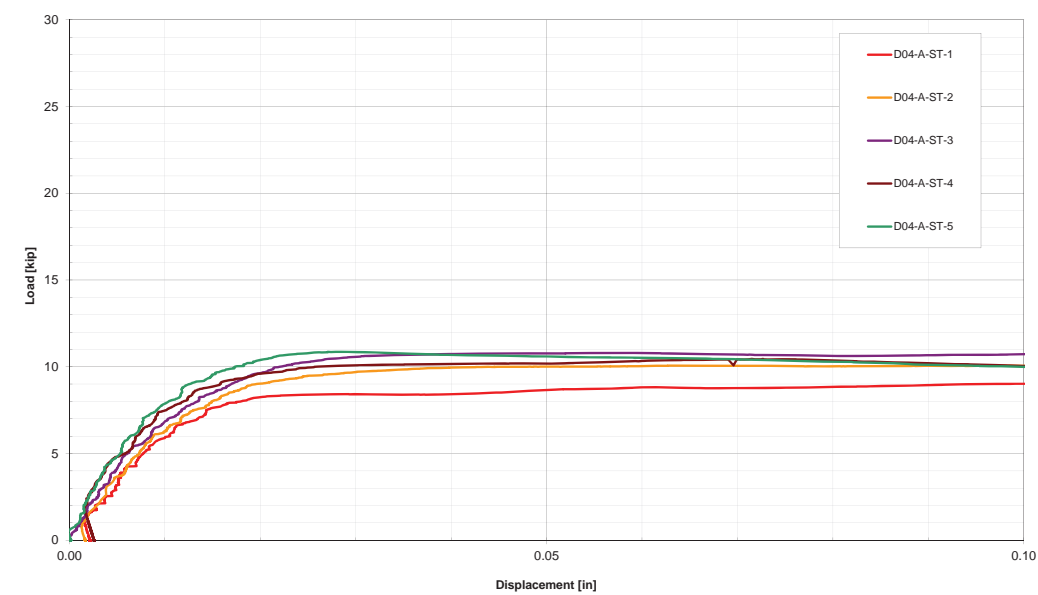


D04-A-ST



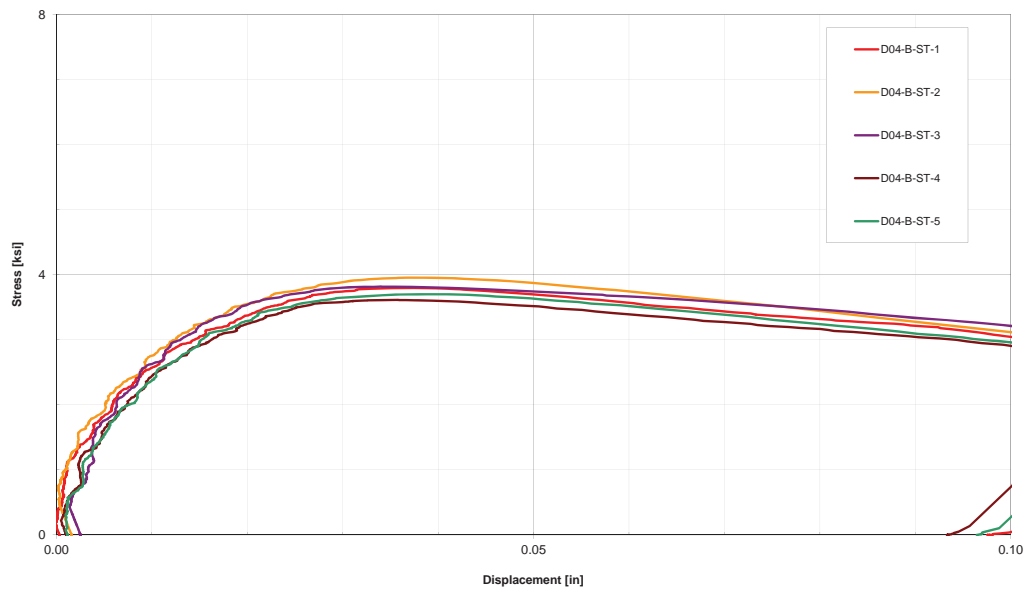
Note:
All tests are considered stiffness failures

D04-A-ST



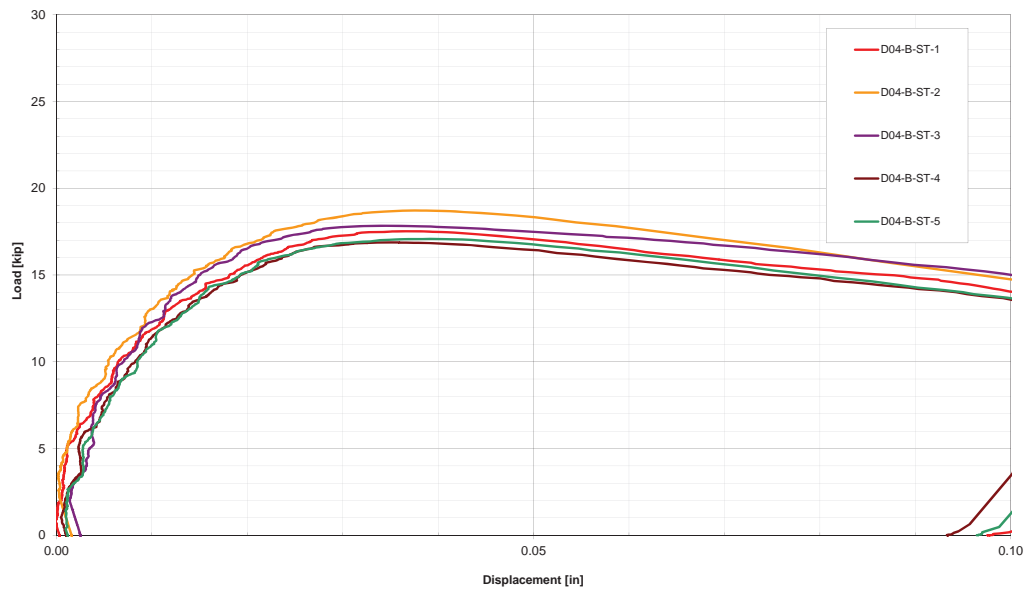
Note:
All tests are considered stiffness failures

D04-B-ST



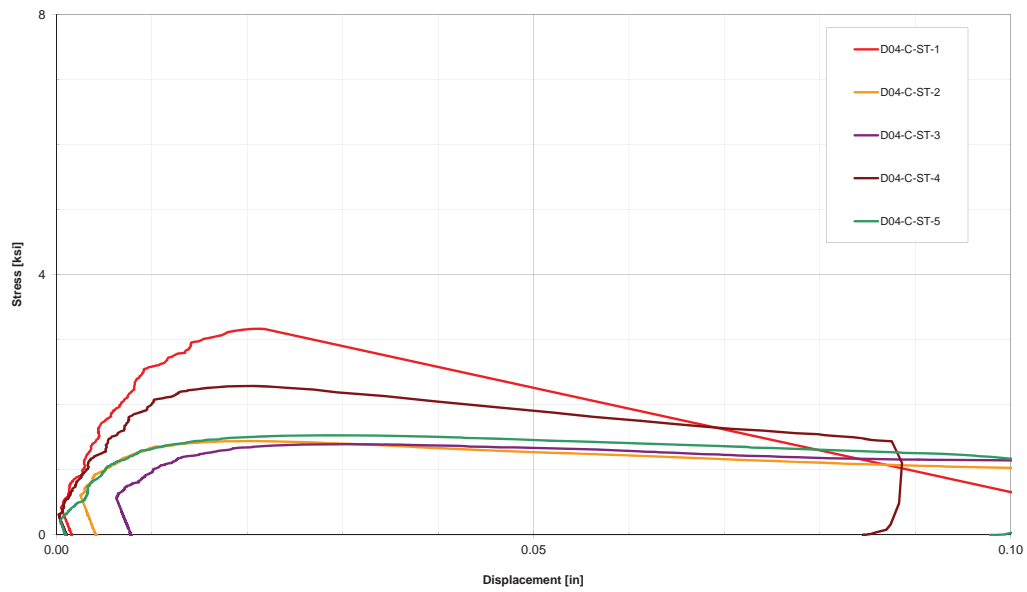
Test	D04-B-ST-1	D04-B-ST-2	D04-B-ST-3	D04-B-ST-4	D04-B-ST-5	Mean	std. dev.	COV
Max Stress (ksi)	3.80	3.96	3.82	3.61	3.70	3.78	0.13	0.03
Displacement (in)	0.036	0.038	0.034	0.036	0.039	0.037	0.002	0.06

D04-B-ST



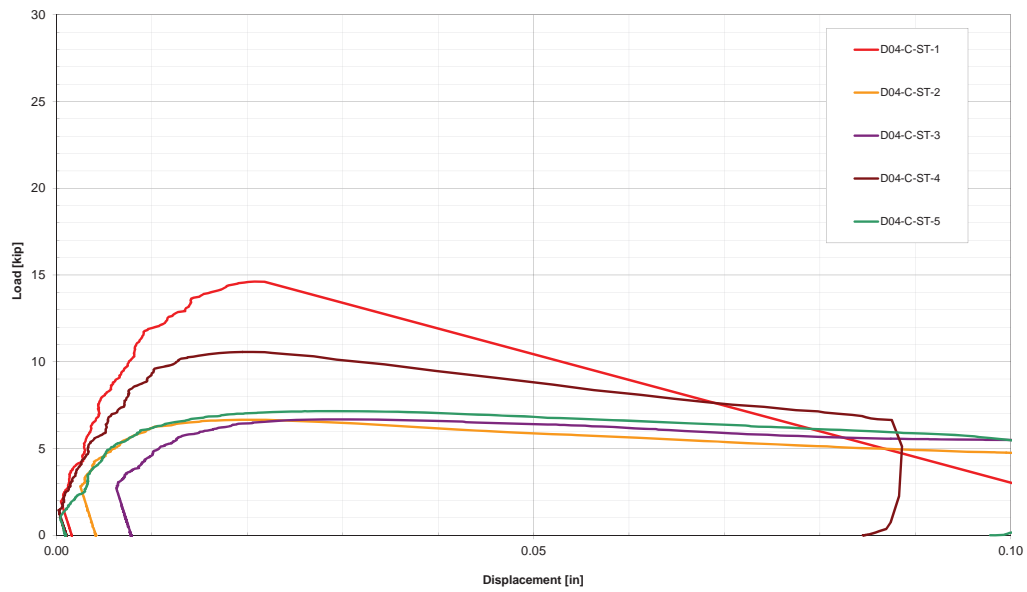
Test	D04-B-ST-1	D04-B-ST-2	D04-B-ST-3	D04-B-ST-4	D04-B-ST-5	Mean	std. dev.	COV
Max Load (kips)	17.5	18.7	17.8	16.9	17.1	17.6	0.7	0.04
Displacement (in)	0.036	0.038	0.034	0.036	0.039	0.037	0.002	0.06

D04-C-ST



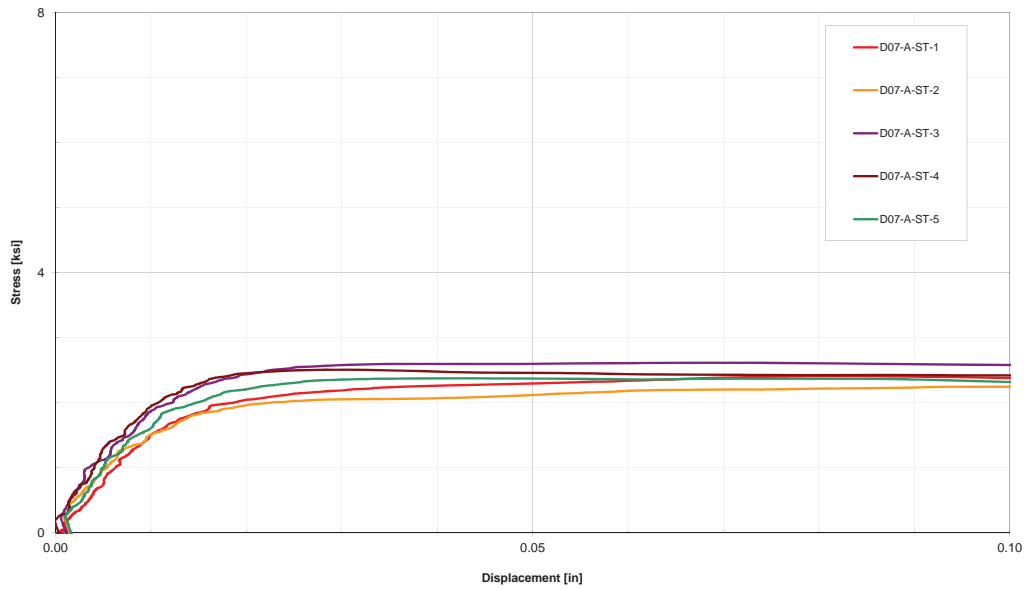
Test	D04-C-ST-1	D04-C-ST-2	D04-C-ST-3	D04-C-ST-4	D04-C-ST-5	Mean	std. dev.	COV
Max Stress (ksi)	3.17	1.44	1.40	2.29	1.53	1.97	0.76	0.39
Displacement (in)	0.021	0.020	0.029	0.019	0.028	0.024	0.005	0.20

D04-C-ST

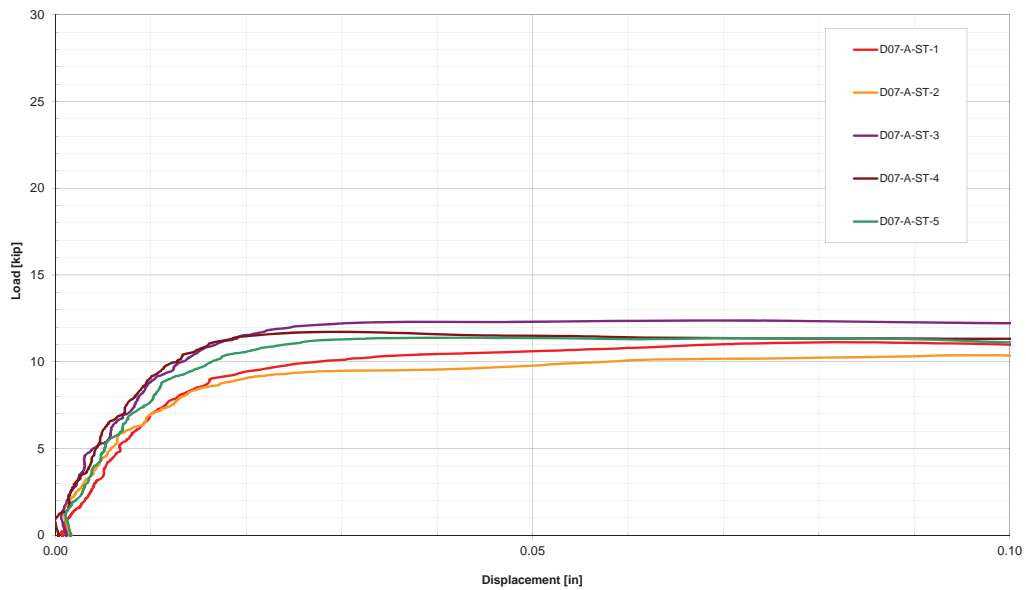


Test	D04-C-ST-1	D04-C-ST-2	D04-C-ST-3	D04-C-ST-4	D04-C-ST-5	Mean	std. dev.	COV
Max Load (kips)	14.6	6.7	6.7	10.6	7.2	9.1	3.5	0.38
Displacement (in)	0.021	0.020	0.029	0.019	0.028	0.024	0.005	0.20

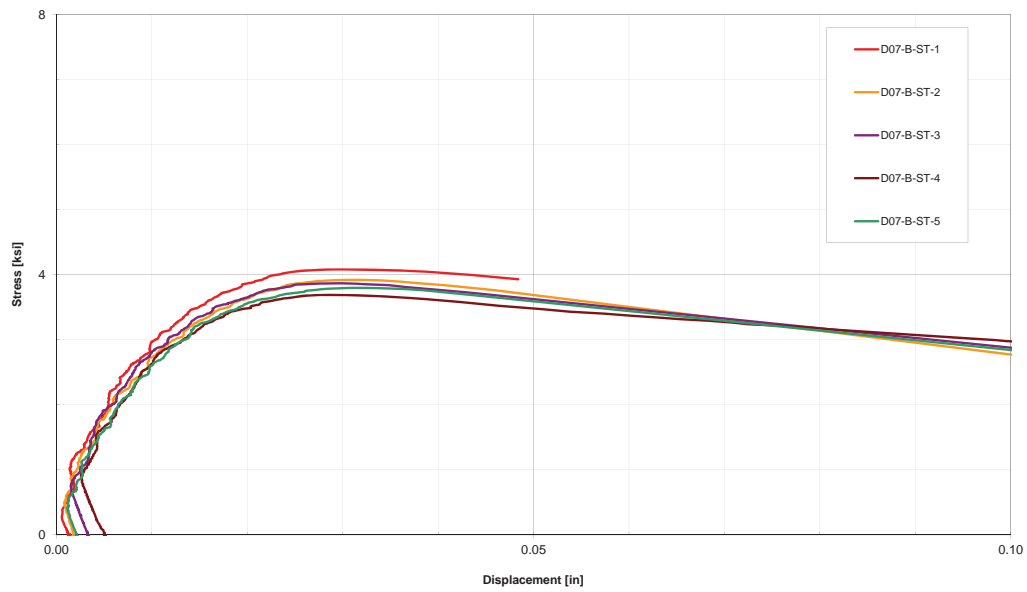
D07-A-ST



D07-A-ST

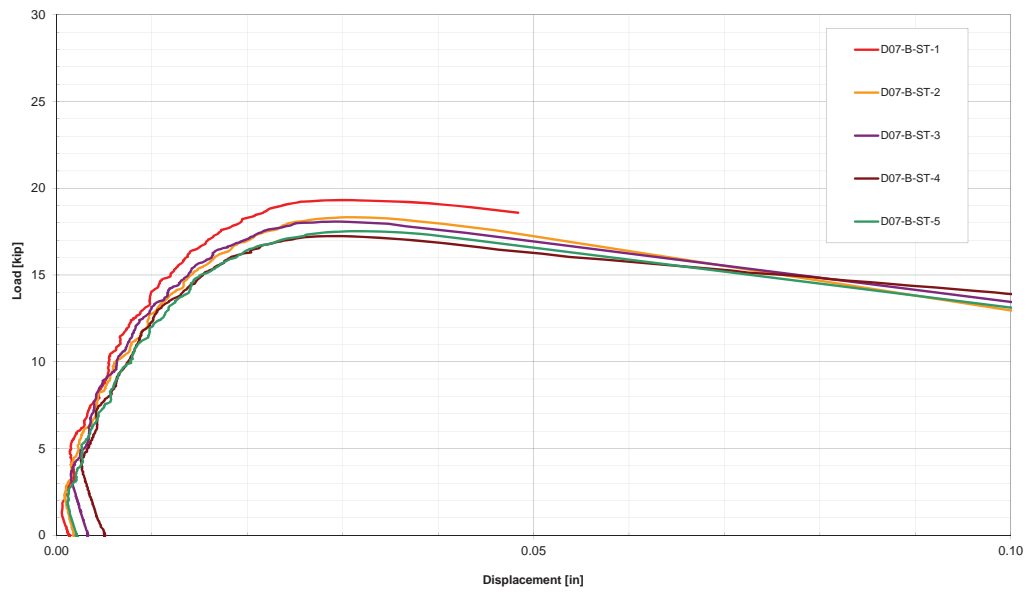


D07-B-ST



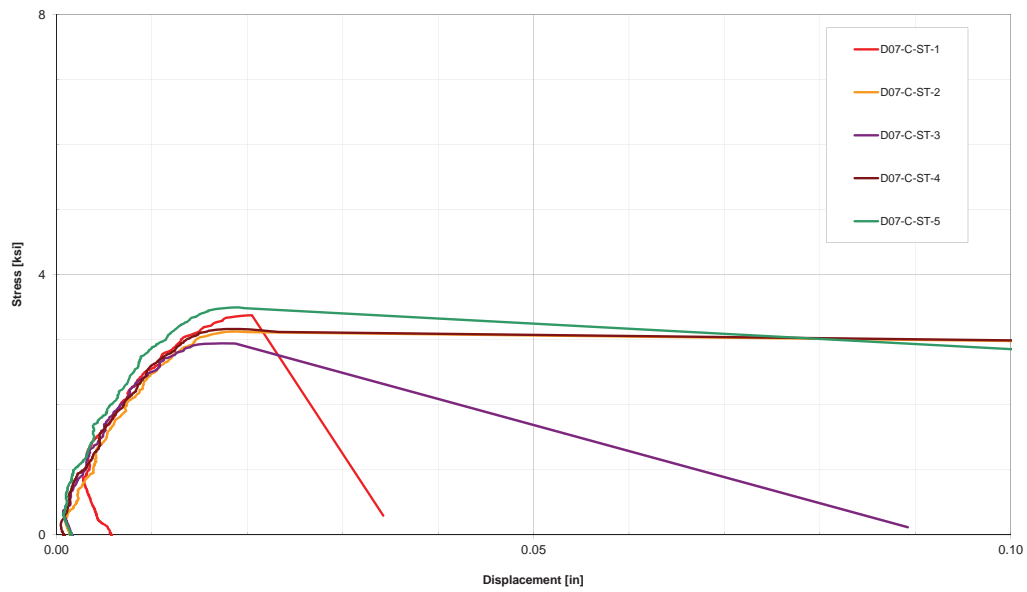
Test	D07-B-ST-1	D07-B-ST-2	D07-B-ST-3	D07-B-ST-4	D07-B-ST-5	Mean	std. dev.	COV
Max Stress (ksi)	4.08	3.92	3.87	3.69	3.80	3.87	0.15	0.04
Displacement (in)	0.029	0.030	0.029	0.029	0.032	0.030	0.001	0.04

D07-B-ST

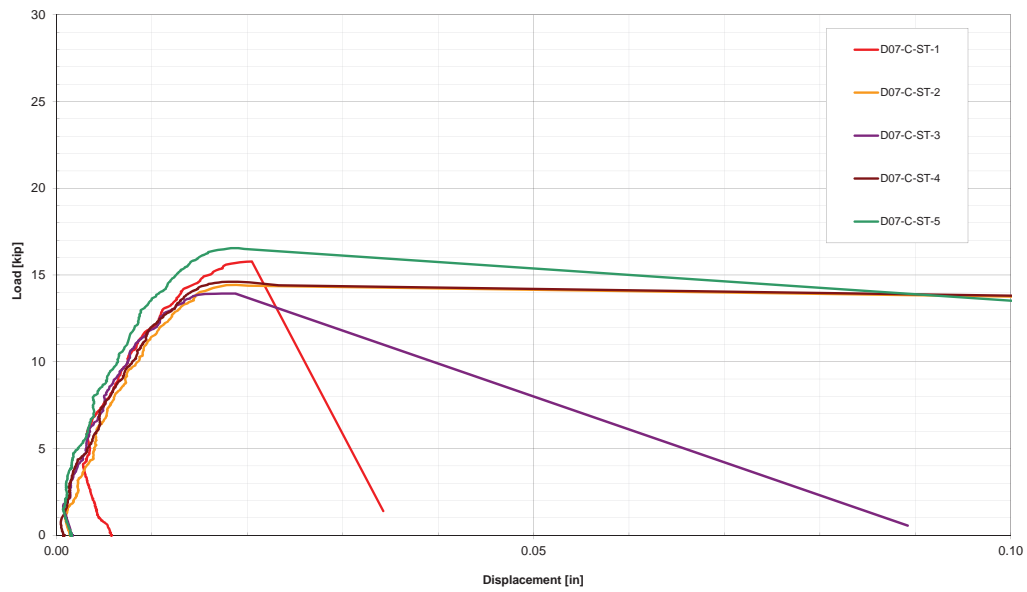


Test	D07-B-ST-1	D07-B-ST-2	D07-B-ST-3	D07-B-ST-4	D07-B-ST-5	Mean	std. dev.	COV
Max Load (kips)	18.3	18.3	18.1	17.2	17.5	18.1	0.8	0.04
Displacement (in)	0.029	0.030	0.029	0.029	0.032	0.030	0.001	0.04

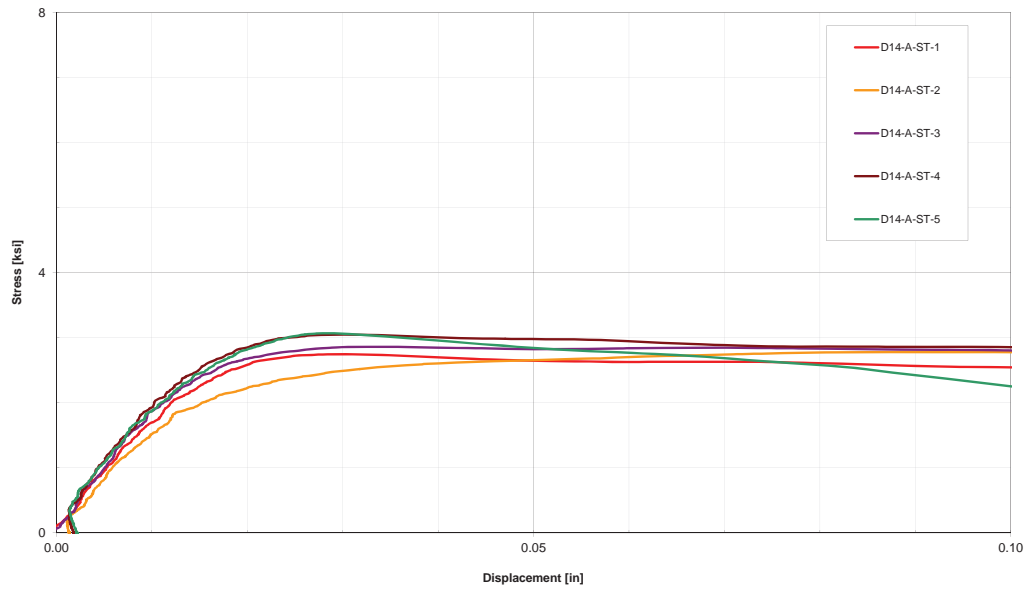
D07-C-ST



D07-C-ST

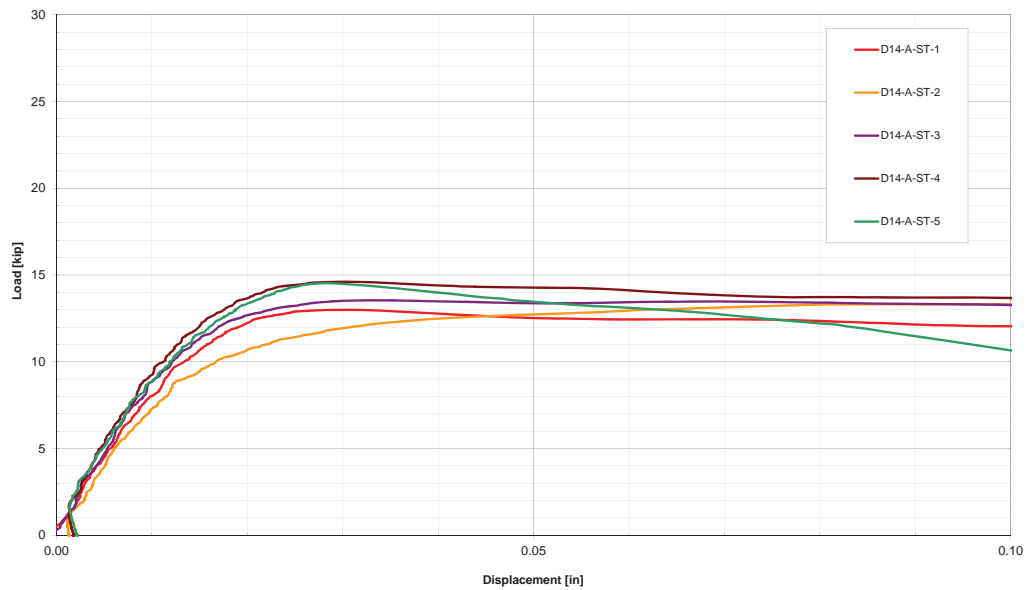


D14-A-ST



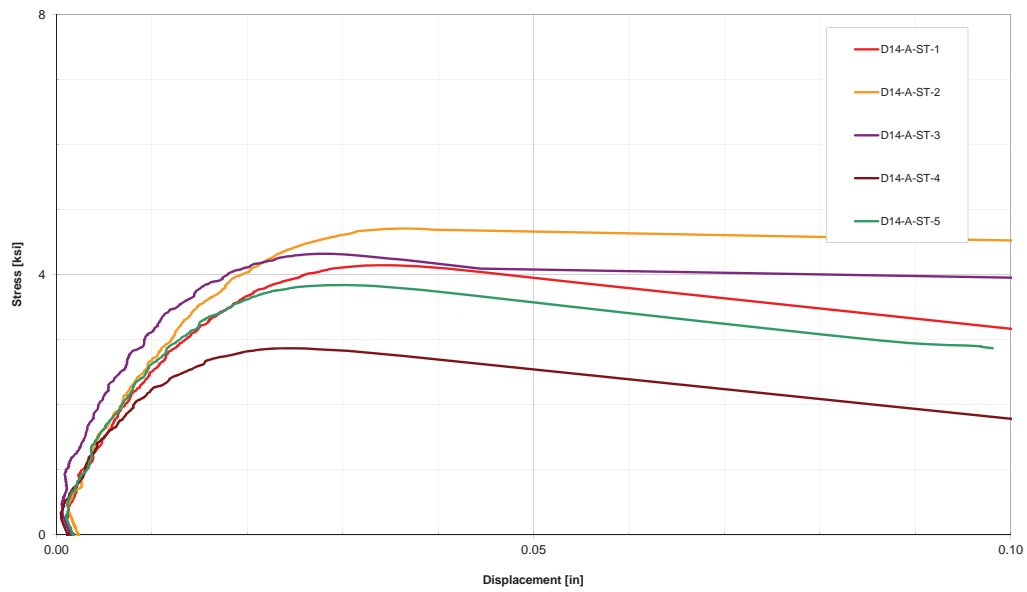
Note:
D14-A-ST-2 considered a stiffness failure

D14-A-ST



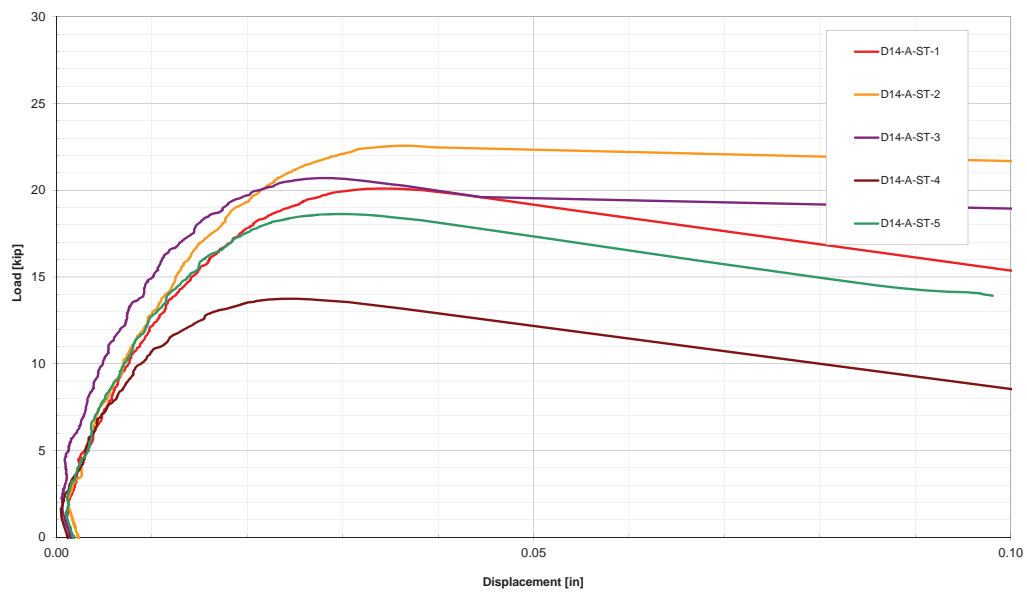
Note:
D14-A-ST-2 considered a stiffness failure

D14-B-ST



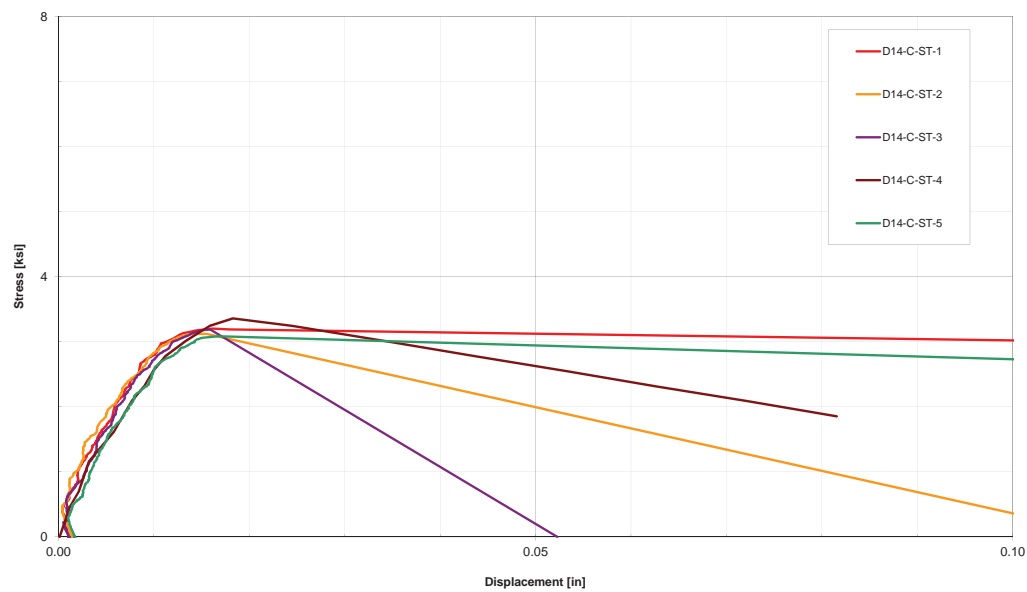
Test	D14-A-ST-1	D14-A-ST-2	D14-A-ST-3	D14-A-ST-4	D14-A-ST-5	Mean	std. dev.	COV
Max Stress (ksi)	4.15	4.71	4.32	2.87	3.84	3.98	0.69	0.17
Displacement (in)	0.034	0.036	0.028	0.024	0.030	0.031	0.005	0.15

D14-B-ST



Test	D14-A-ST-1	D14-A-ST-2	D14-A-ST-3	D14-A-ST-4	D14-A-ST-5	Mean	std. dev.	COV
Max Load (kips)	20.1	22.6	20.7	13.8	18.6	19.2	3.3	0.17
Displacement (in)	0.034	0.036	0.028	0.024	0.030	0.031	0.005	0.15

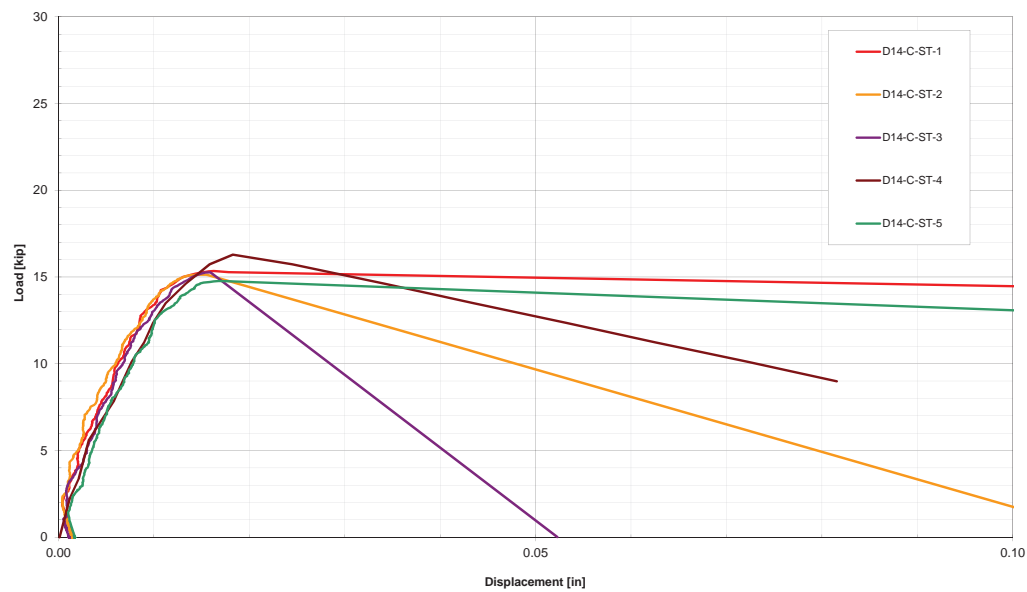
D14-C-ST



Test	D14-C-ST-1	D14-C-ST-2	D14-C-ST-3	D14-C-ST-4	D14-C-ST-5	Mean	std. dev.	COV
Max Stress (ksi)	3.20	3.12	3.19	3.36	3.08	3.19	0.11	0.03
Displacement (in)	0.016	0.015	0.016	0.018	0.017	0.016	0.001	0.08

Note:
Computer froze after testing D14-C-ST-4, no data was obtained, rather a screen shot was obtained and a curve was created graphically

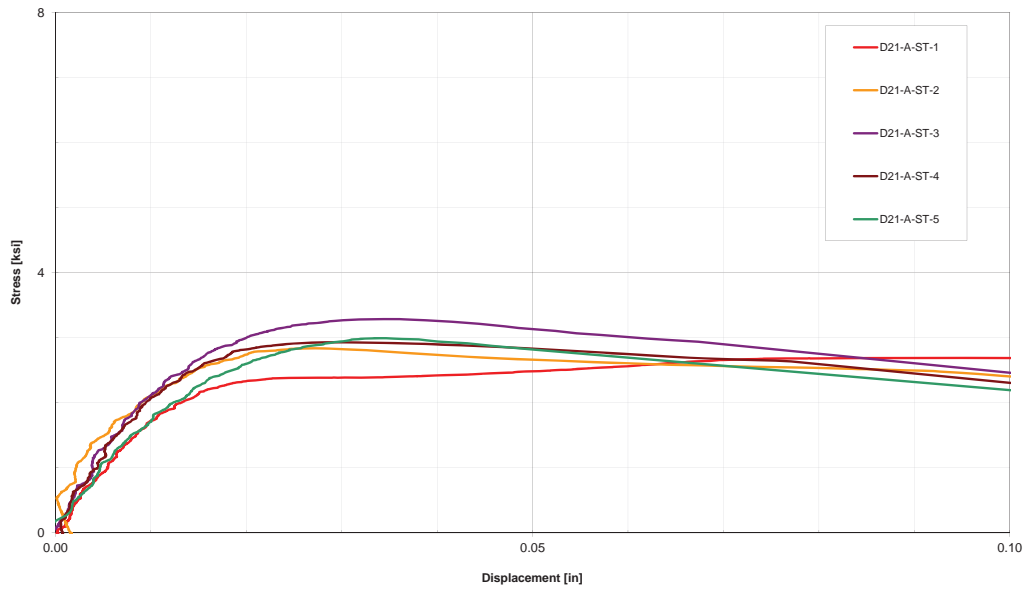
D14-C-ST



Test	D14-C-ST-1	D14-C-ST-2	D14-C-ST-3	D14-C-ST-4	D14-C-ST-5	Mean	std. dev.	COV
Max Load (kips)	15.3	15.1	15.3	16.3	14.8	15.4	0.6	0.04
Displacement (in)	0.016	0.015	0.016	0.018	0.017	0.016	0.001	0.08

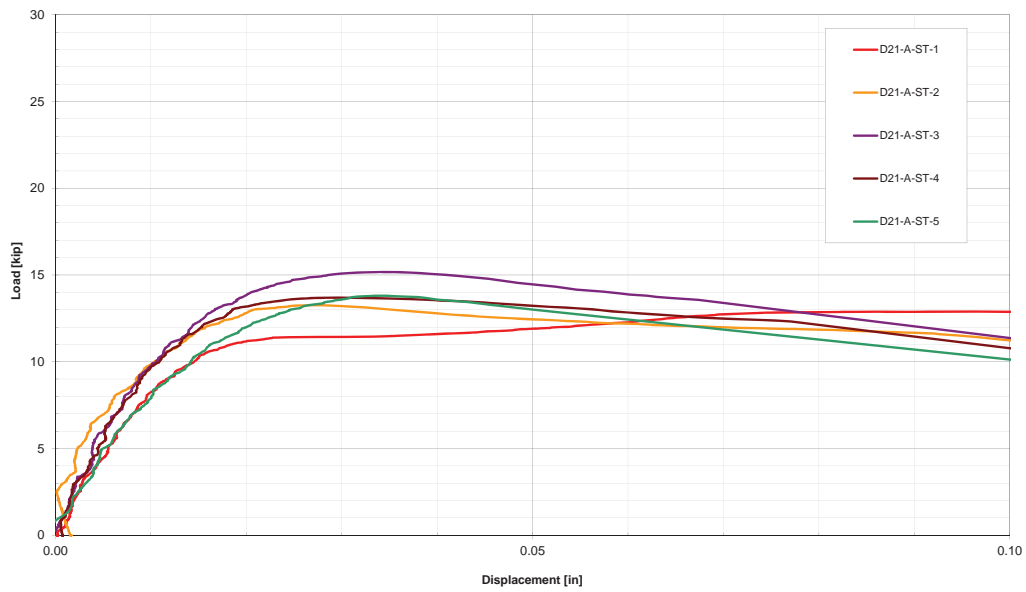
Note:
Computer froze after testing D14-C-ST-4, no data was obtained, rather a screen shot was obtained and a curve was created graphically

D21-A-ST



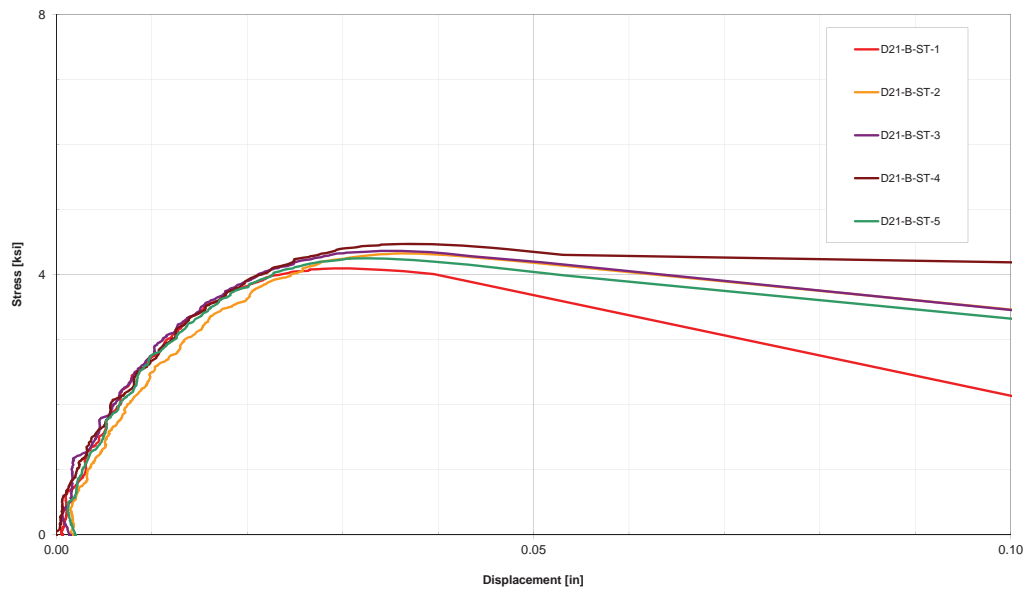
Note:
D21-A-ST-1 considered a stiffness failure

D21-A-ST

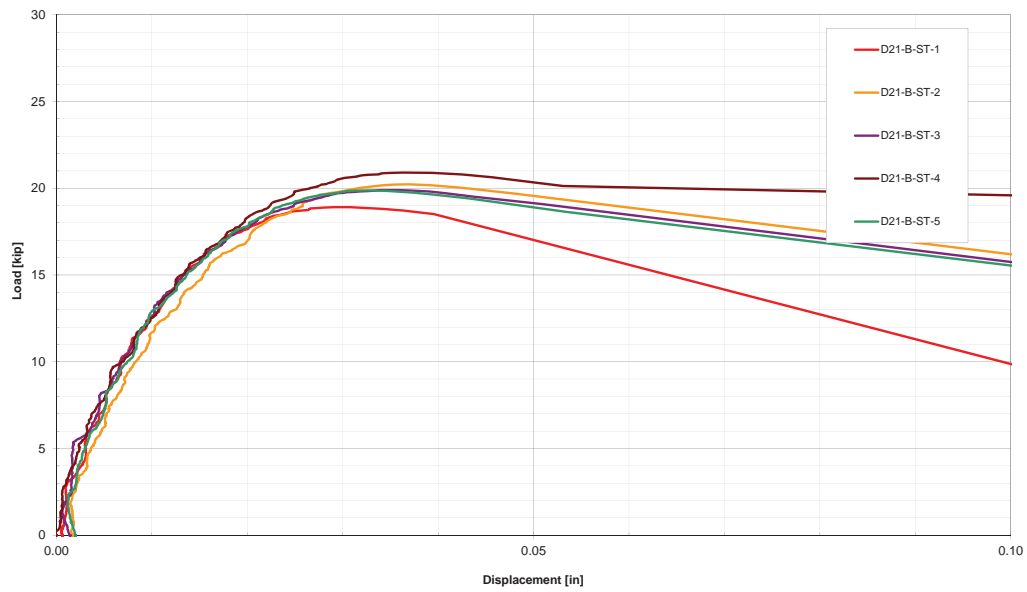


Note:
D21-A-ST-1 considered a stiffness failure

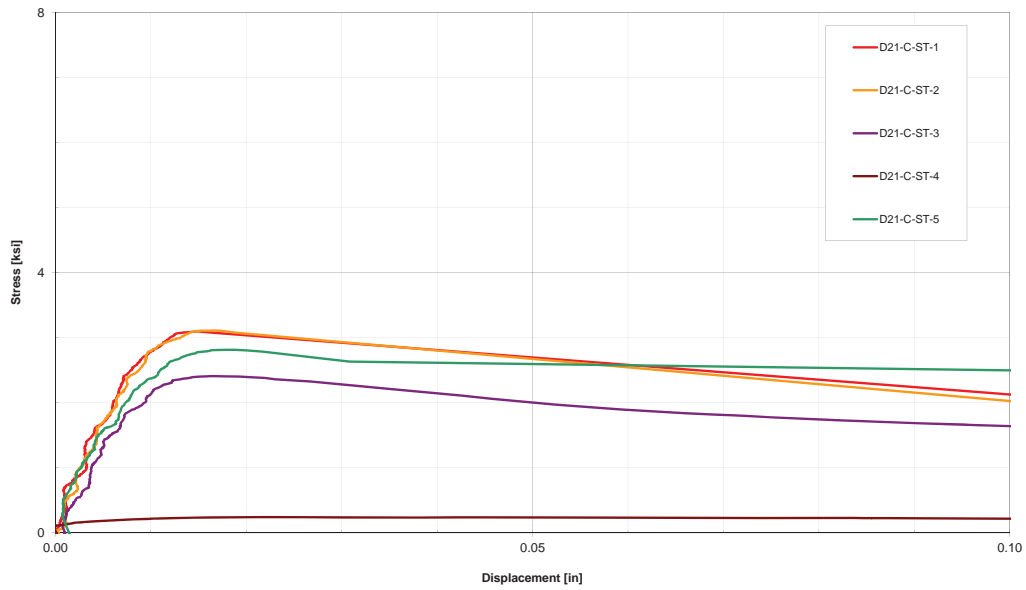
D21-B-ST



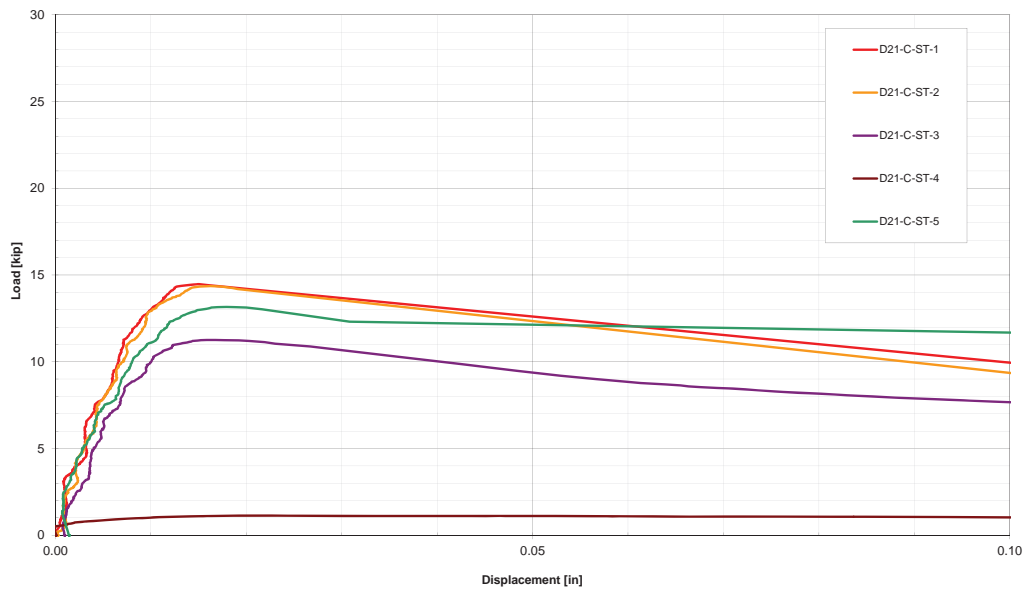
D21-B-ST



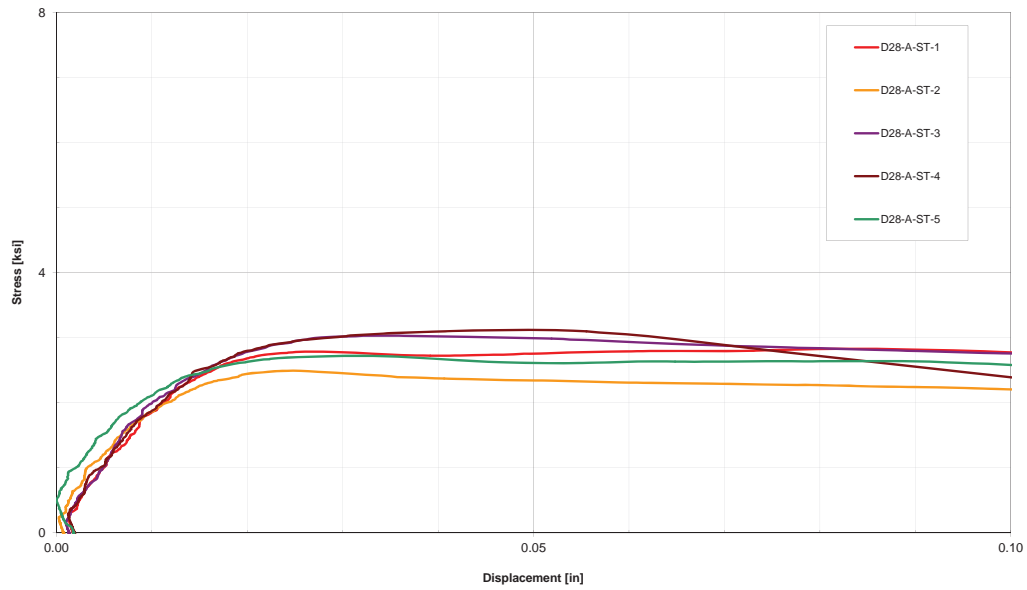
D21-C-ST



D21-C-ST

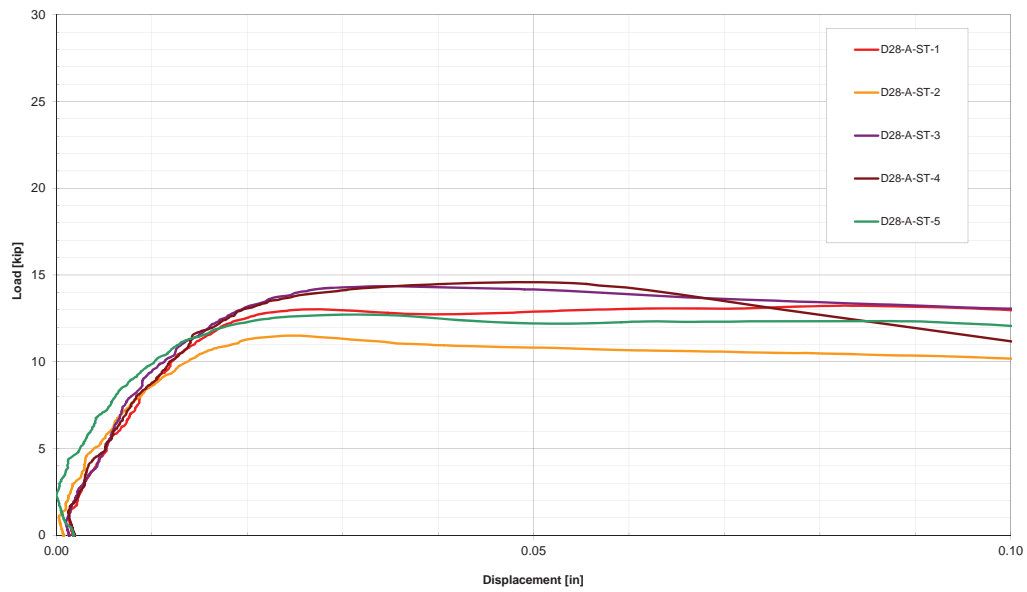


D28-A-ST



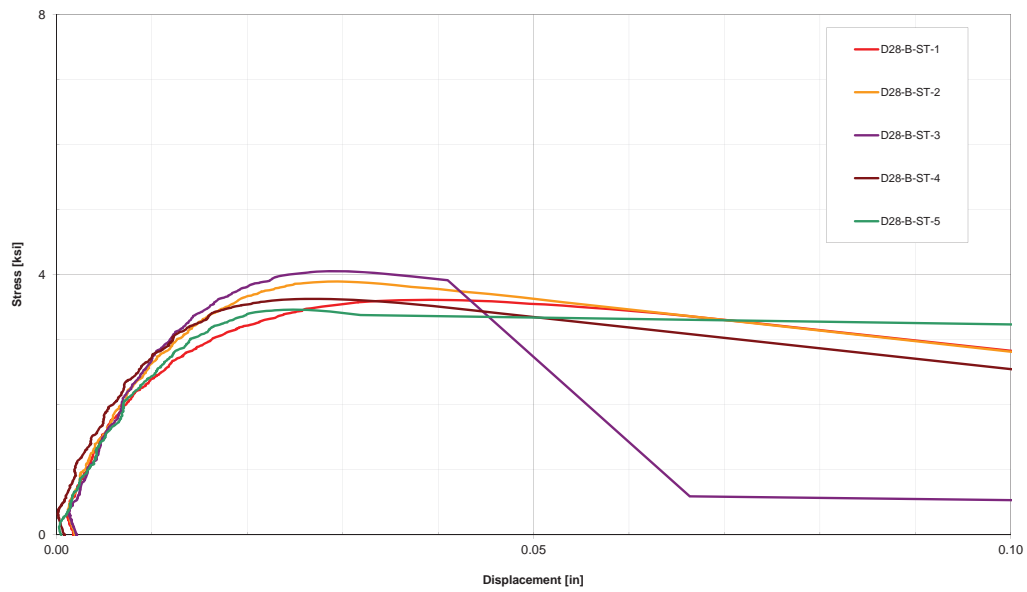
Note:
D28A-ST-3 & 4 considered stiffness failureS

D28-A-ST



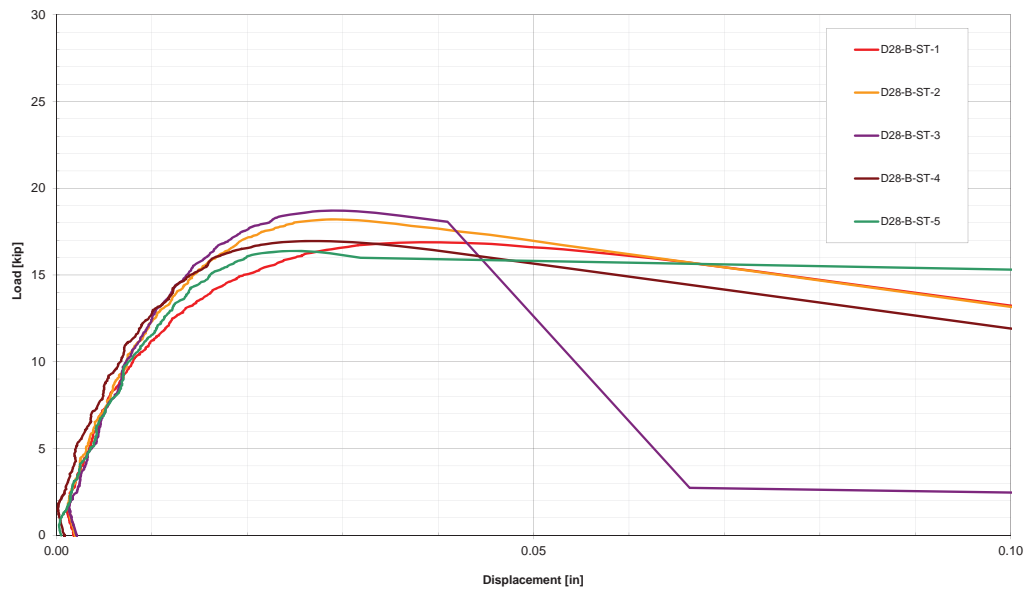
Note:
D28A-ST-3 & 4 considered stiffness failureS

D28-B-ST



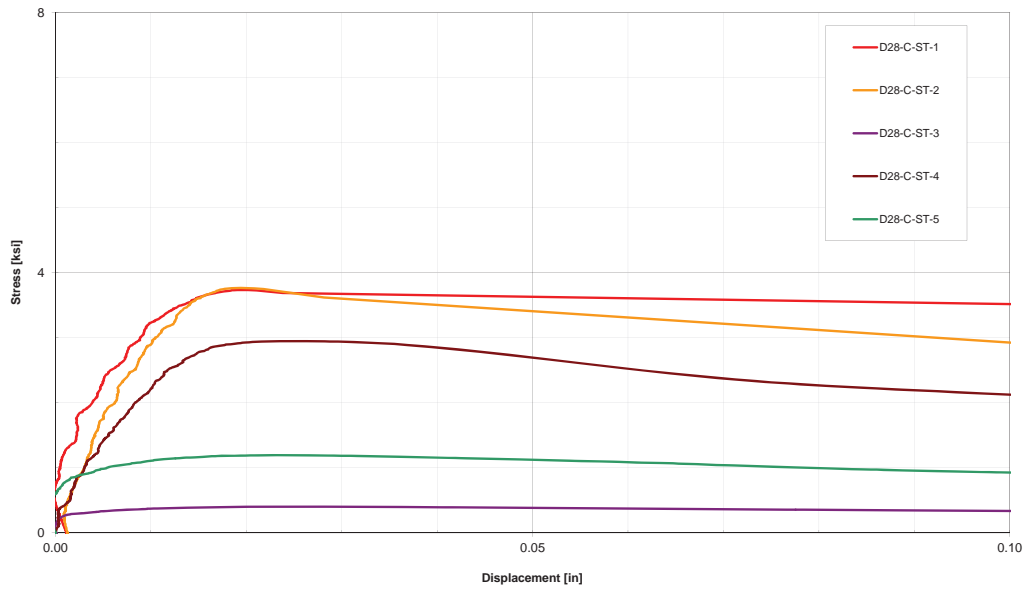
Test	D28-B-ST-1	D28-B-ST-2	D28-B-ST-3	D28-B-ST-4	D28-B-ST-5	Mean	std. dev.	COV
Max Stress (ksi)	3.61	3.89	4.06	3.63	3.46	3.73	0.24	0.06
Displacement (in)	0.038	0.029	0.029	0.027	0.024	0.029	0.005	0.18

D28-B-ST



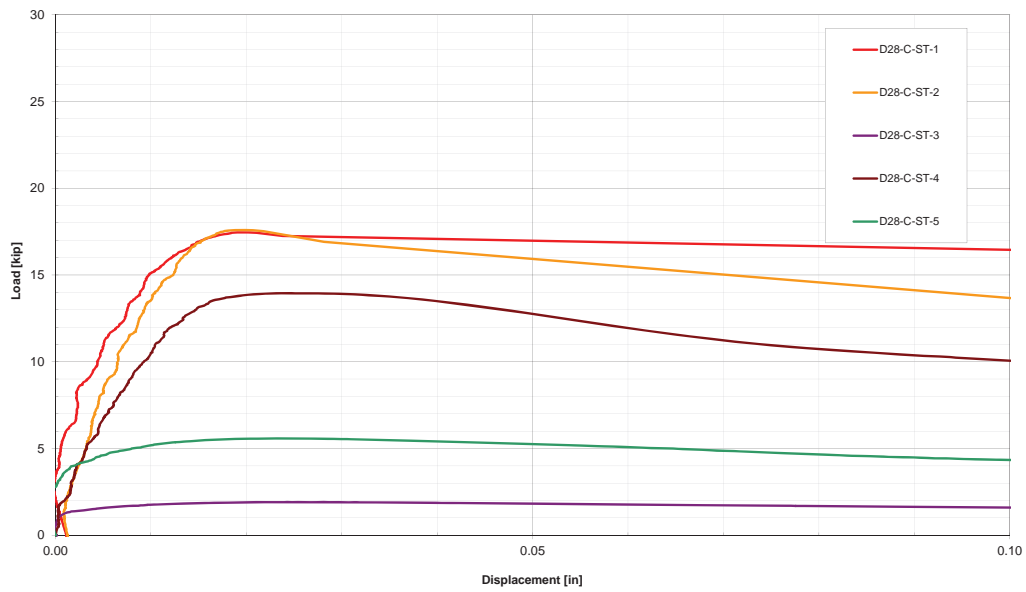
Test	D28-B-ST-1	D28-B-ST-2	D28-B-ST-3	D28-B-ST-4	D28-B-ST-5	Mean	std. dev.	COV
Max Load (kips)	16.9	18.2	18.7	17.0	16.4	17.4	1.0	0.06
Displacement (in)	0.038	0.029	0.029	0.027	0.024	0.029	0.005	0.18

D28-C-ST



Note:
D28-C-ST-3 & 5 are outliers and are removed from data

D28-C-ST



Note:
D28-C-ST-3 & 5 are outliers and are removed from data