



Physical Properties Test Report

Link Test Report: 230368-02
Test Description: SAE J661-2012
Purpose of Test: To Evaluate the Characteristics of Brake Materials
Material Identification: RZZW ZWB
Test Date: 07/14/2023 - 07/16/2023

Requested By

Rizhao Zhongwei Automobile Part Co., Ltd.
Han Songhua

Tested By

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Test Number				
Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
230368-02-A	230368-02-B	230368-02-C	230368-02-D	230368-02-E

Manufacturer:
Rizhao Zhongwei
Automobile Part Co., Ltd.
Material:
RZZW ZWB

Initial Baseline					
Application	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
1	0.286	0.271	0.269	0.283	0.255
20	0.316	0.297	0.310	0.313	0.288

Normal **0.381** **F**

First Fade					
Temp (°F)	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
200.0	0.306	0.287	0.293	0.292	0.285
550.0	0.304	0.283	0.303	0.290	0.281

(or Temp @ 10min)

Hot **0.335** **E**

First Recovery							
Temp (°F)	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Average	Norm/Hot
500.0	0.301	0.287	0.311	0.287	0.292	0.296	
400.0	0.302	0.283	0.316	0.291	0.288	0.296	Hot
300.0	0.292	0.283	0.299	0.283	0.278	0.287	Hot
200.0	0.297	0.278	0.281	0.278	0.267	0.280	

Wear					
Application	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
1	0.303	0.294	0.302	0.291	0.288
100	0.390	0.380	0.385	0.380	0.384

Second Fade							Max Var.		
Temp (°F)	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Average	< Average	Norm/Hot	% Var
200.0	0.385	0.368	0.359	0.351	0.363	0.365	0.014	Normal	4%
250.0	0.406	0.377	0.387	0.381	0.373	0.385	0.012	Normal	3%
300.0	0.399	0.385	0.395	0.373	0.385	0.387	0.014	Normal	4%
350.0	0.405	0.392	0.387	0.394	0.382	0.392	0.010	-	3%
400.0	0.412	0.389	0.383	0.372	0.384	0.388	0.016	Normal	4%
450.0	0.389	0.370	0.379	0.355	0.373	0.373	0.018	Hot	5%
500.0	0.358	0.362	0.364	0.341	0.356	0.356	0.015	Hot	4%
550.0	0.350	0.344	0.351	0.348	0.343	0.347	0.004	Hot	1%
600.0	0.339	0.341	0.332	0.341	0.329	0.336	0.007	Hot	2%
650.0	0.313	0.321	0.324	0.310	0.318	0.317	0.007	Hot	2%

(or Temp @ 10min)

Second Recovery							Max Var.		
Temp (°F)	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Average	< Average	Norm/Hot	% Var
600.0	0.329	0.327	0.306	0.315	0.316	0.319	0.013	-	4%
500.0	0.337	0.342	0.324	0.326	0.331	0.332	0.008	Hot	2%
400.0	0.348	0.358	0.343	0.347	0.334	0.346	0.012	Hot	3%
300.0	0.368	0.360	0.360	0.360	0.340	0.358	0.018	Hot	5%
200.0	0.366	0.383	0.373	0.361	0.362	0.369	0.008	-	2%

Final Baseline					
Application	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
1	0.383	0.392	0.398	0.363	0.370
20	0.408	0.422	0.420	0.409	0.399

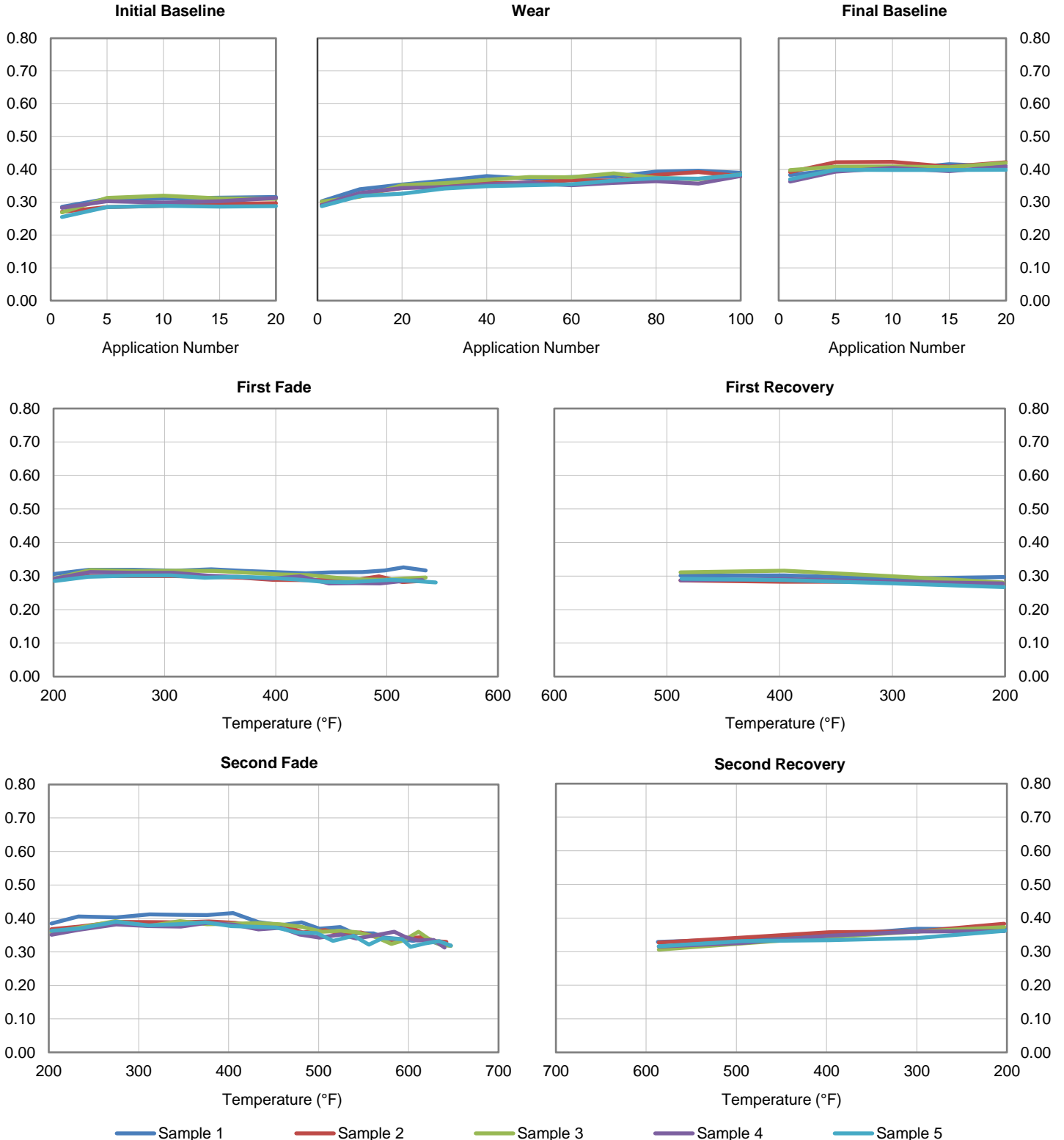


Manufacturer: Rizhao Zhongwei Automobile Part Co., Ltd.
Material: RZZW ZWB
Test Pressure: 150.0 psi

Test Dates: 07/14/2023 - 07/16/2023

Summary of 5 Samples

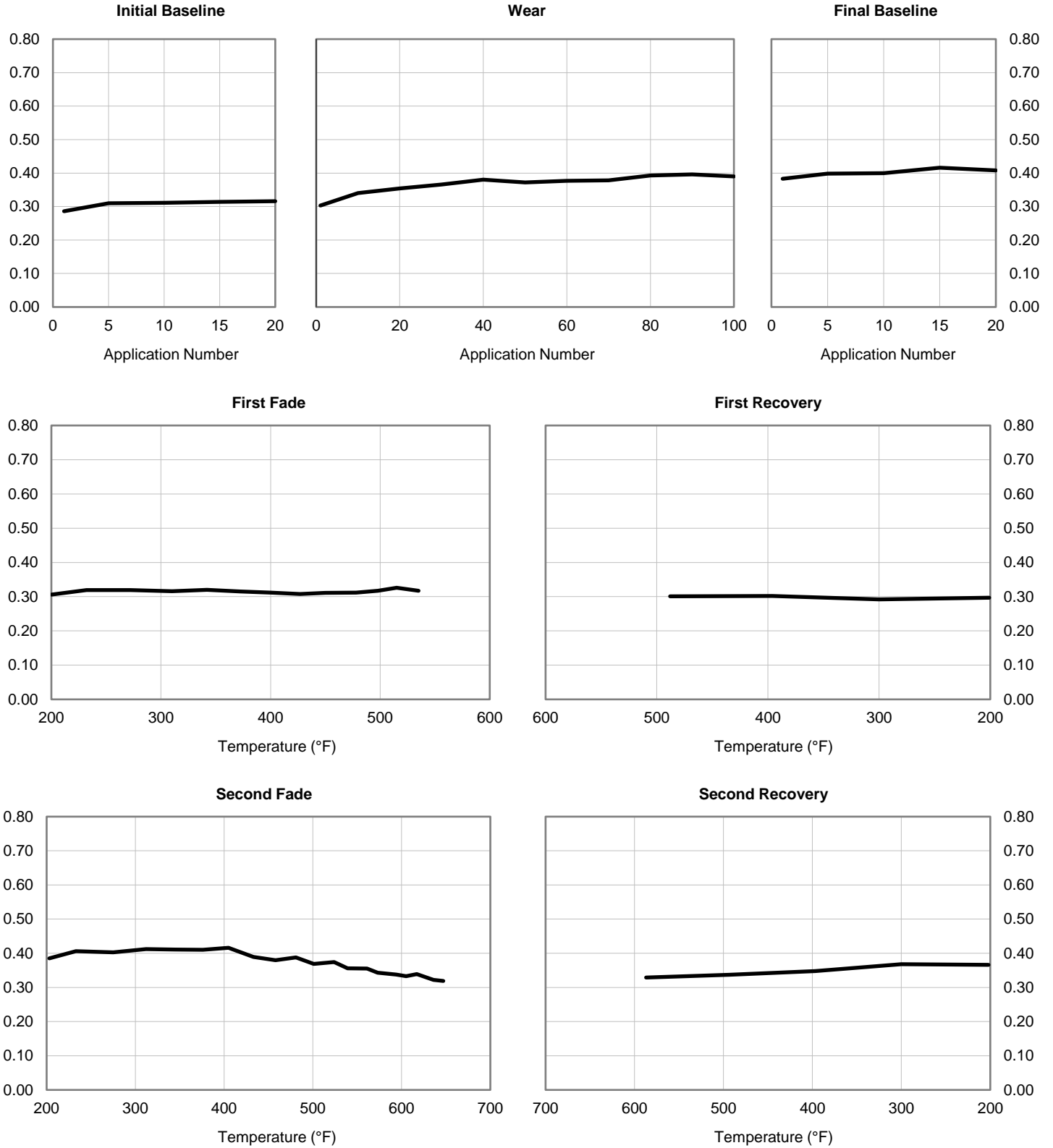
Coefficient of Friction





7/14/2023
230368-02-A
Sample 1 of 5

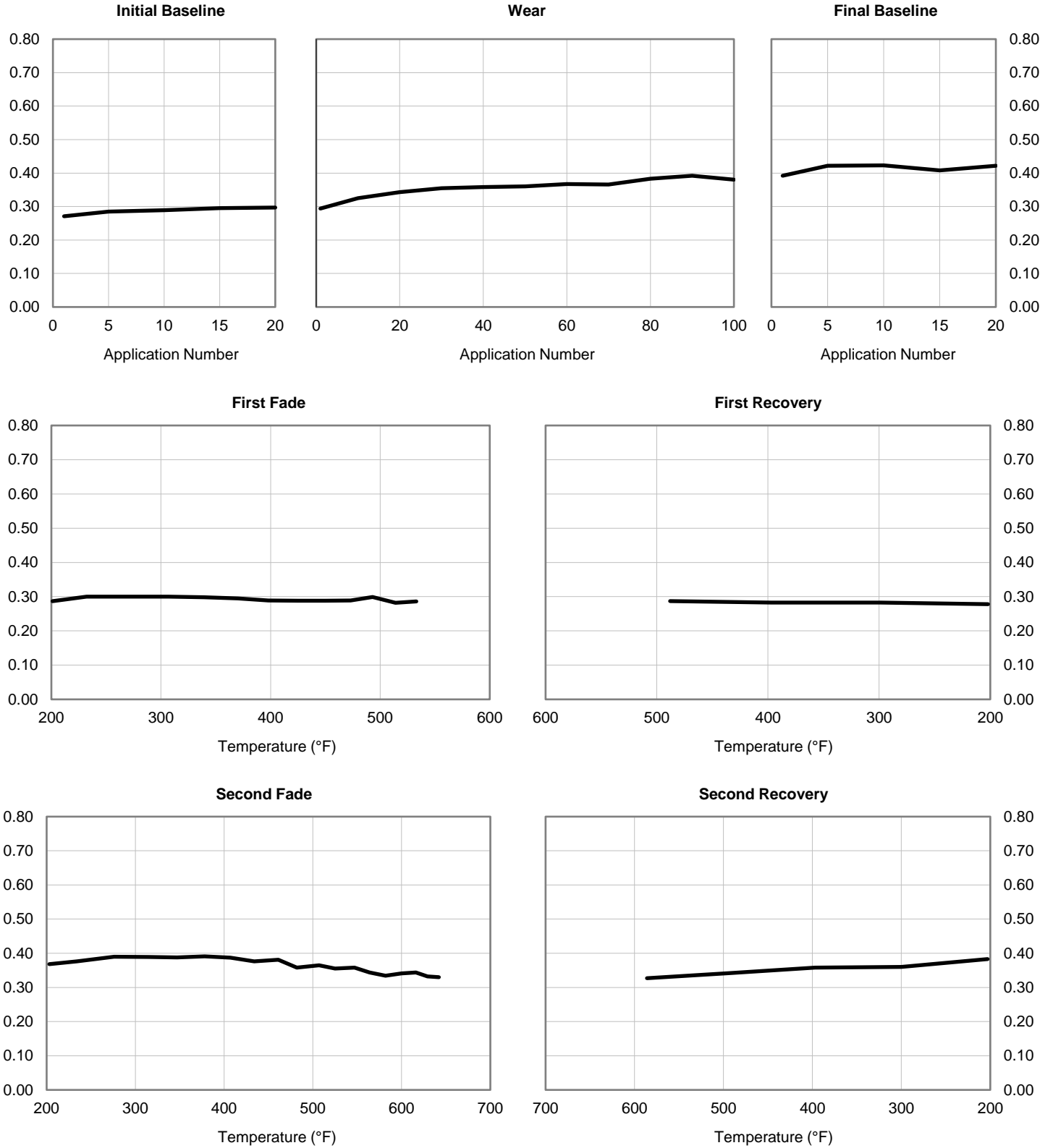
Coefficient of Friction





7/15/2023
230368-02-B
Sample 2 of 5

Coefficient of Friction





Normal **0.381** **F**
 Hot **0.339** **E**

7/15/2023
 230368-02-C
Sample 3 of 5

Wear

	Initial	Final	Loss	Loss / %
Weight (gr)	9.360	9.240	0.120	1.28
Thickness (inch)	0.239	0.236	0.003	1.26

Baseline

Event	Initial		Final	
	Force (lb)	μ	Force (lb)	μ
1	40.6	0.269	59.0	0.398
5	47.1	0.313	61.1	0.408
10	48.6	0.320	61.9	0.409
15	47.5	0.312	61.7	0.407
20	47.5	0.310	63.2	0.420

Wear

Event	Force (lb)	μ
1	45.8	0.302
10	47.6	0.317
20	53.0	0.352
30	53.7	0.358
40	55.4	0.368
50	56.7	0.377
60	56.6	0.376
70	58.6	0.388
80	57.3	0.375
90	56.4	0.370
100	57.7	0.385

First Fade

Time (sec)	Force (lb)	μ	Temp (°F)
0.0	45.2	0.293	201
30.0	47.9	0.318	233
60.0	47.4	0.315	274
90.0	47.4	0.316	311
120.0	47.2	0.315	345
150.0	46.8	0.310	376
180.0	46.3	0.305	404
210.0	45.3	0.303	430
240.0	44.1	0.295	454
270.0	43.3	0.290	476
300.0	43.2	0.289	498
330.0	43.7	0.293	517
360.0	44.7	0.296	535

Second Fade

Time (sec)	Force (lb)	μ	Temp (°F)
0.0	54.2	0.359	203
30.0	56.0	0.372	233
60.0	58.3	0.392	274
90.0	57.3	0.377	311
120.0	59.0	0.392	346
150.0	57.6	0.383	376
180.0	57.7	0.384	404
210.0	57.4	0.386	432
240.0	57.0	0.383	457
270.0	56.9	0.375	481
300.0	53.1	0.360	504
330.0	55.2	0.363	524
360.0	52.4	0.359	542
390.0	51.7	0.346	562
420.0	49.9	0.324	581
450.0	49.3	0.335	595
480.0	51.9	0.360	611
510.0	49.9	0.341	621
540.0	49.3	0.322	635
570.0	47.0	0.318	647

First Recovery

Event	Force (lb)	μ	Temp (°F)
1	46.7	0.311	488
2	48.2	0.316	396
3	44.3	0.299	299
4	41.8	0.281	202

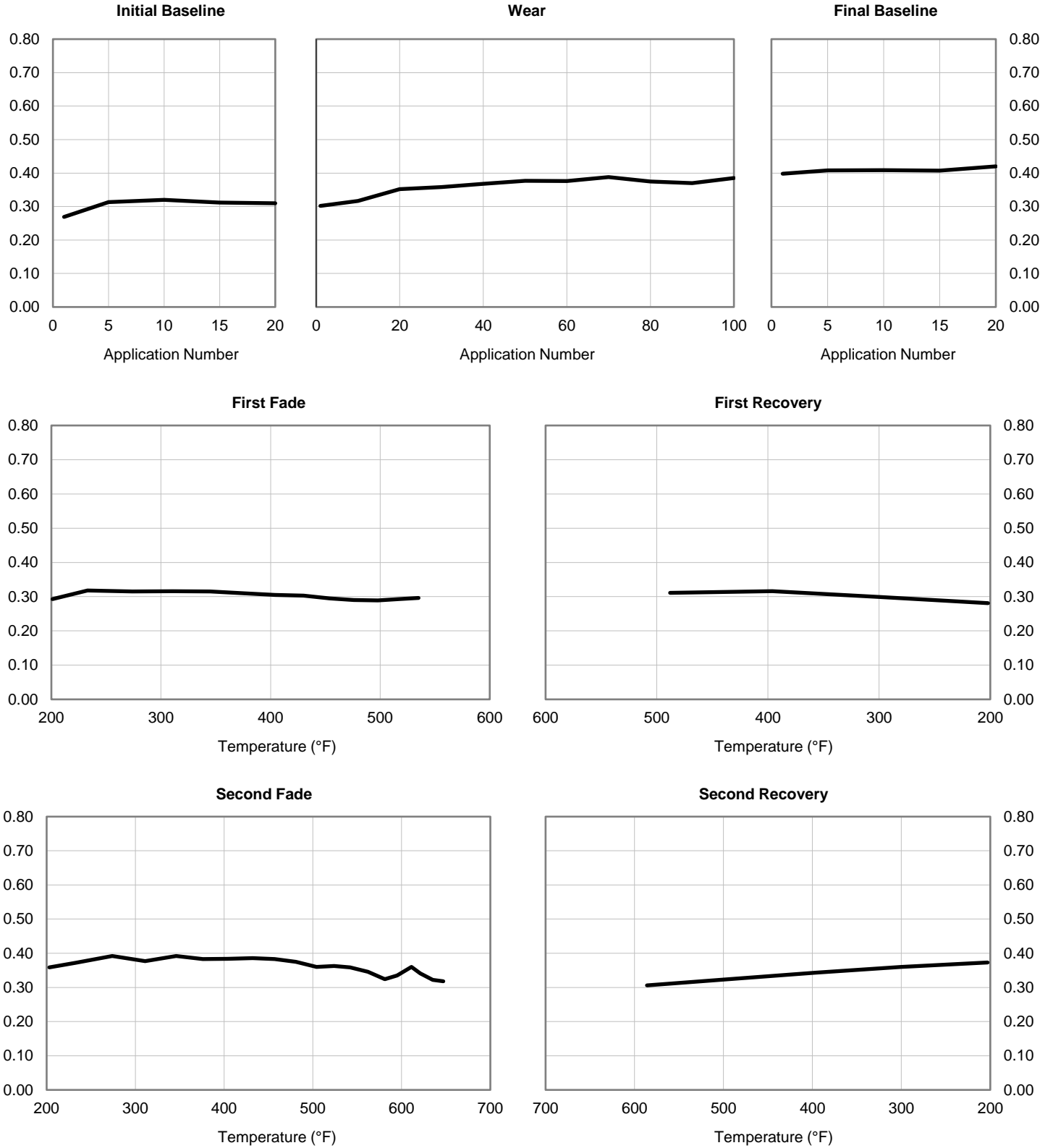
Second Recovery

Event	Force (lb)	μ	Temp (°F)
1	45.4	0.306	586
2	48.7	0.324	494
3	51.0	0.343	397
4	54.4	0.360	300
5	55.6	0.373	203



7/15/2023
230368-02-C
Sample 3 of 5

Coefficient of Friction





Normal **0.369**

F

7/15/2023
230368-02-D

Hot **0.330**

E

Sample 4 of 5

Wear

	Initial	Final	Loss	Loss / %
Weight (gr)	9.830	9.710	0.120	1.22
Thickness (inch)	0.236	0.234	0.002	0.85

Baseline

Event	Initial		Final	
	Force (lb)	μ	Force (lb)	μ
1	42.5	0.283	54.9	0.363
5	45.2	0.303	59.9	0.393
10	45.4	0.299	61.3	0.405
15	45.9	0.303	60.1	0.395
20	47.5	0.313	61.5	0.409

Wear

Event	Force (lb)	μ
1	44.3	0.291
10	50.0	0.328
20	52.0	0.343
30	52.2	0.346
40	53.6	0.355
50	54.2	0.359
60	52.6	0.352
70	54.4	0.359
80	54.5	0.364
90	53.2	0.357
100	57.0	0.380

First Fade

Time (sec)	Force (lb)	μ	Temp (°F)
0.0	44.6	0.292	201
30.0	47.0	0.312	233
60.0	46.6	0.310	272
90.0	46.4	0.310	308
120.0	45.1	0.301	339
150.0	44.4	0.297	369
180.0	43.8	0.292	396
210.0	44.5	0.299	422
240.0	41.8	0.278	448
270.0	41.9	0.279	472
300.0	42.1	0.278	494
330.0	42.8	0.285	514
360.0	42.9	0.288	532

Second Fade

Time (sec)	Force (lb)	μ	Temp (°F)
0.0	53.5	0.351	203
30.0	55.2	0.366	233
60.0	57.5	0.382	275
90.0	56.6	0.377	313
120.0	56.4	0.376	347
150.0	57.3	0.387	377
180.0	57.9	0.381	406
210.0	55.4	0.367	433
240.0	54.8	0.372	458
270.0	53.2	0.352	479
300.0	53.5	0.343	501
330.0	53.4	0.352	525
360.0	51.3	0.340	542
390.0	52.3	0.351	566
420.0	52.7	0.360	584
450.0	52.6	0.345	596
480.0	51.1	0.334	610
510.0	49.1	0.336	628
540.0	47.8	0.313	640

First Recovery

Event	Force (lb)	μ	Temp (°F)
1	43.7	0.287	488
2	44.5	0.291	397
3	41.9	0.283	300
4	41.9	0.278	202

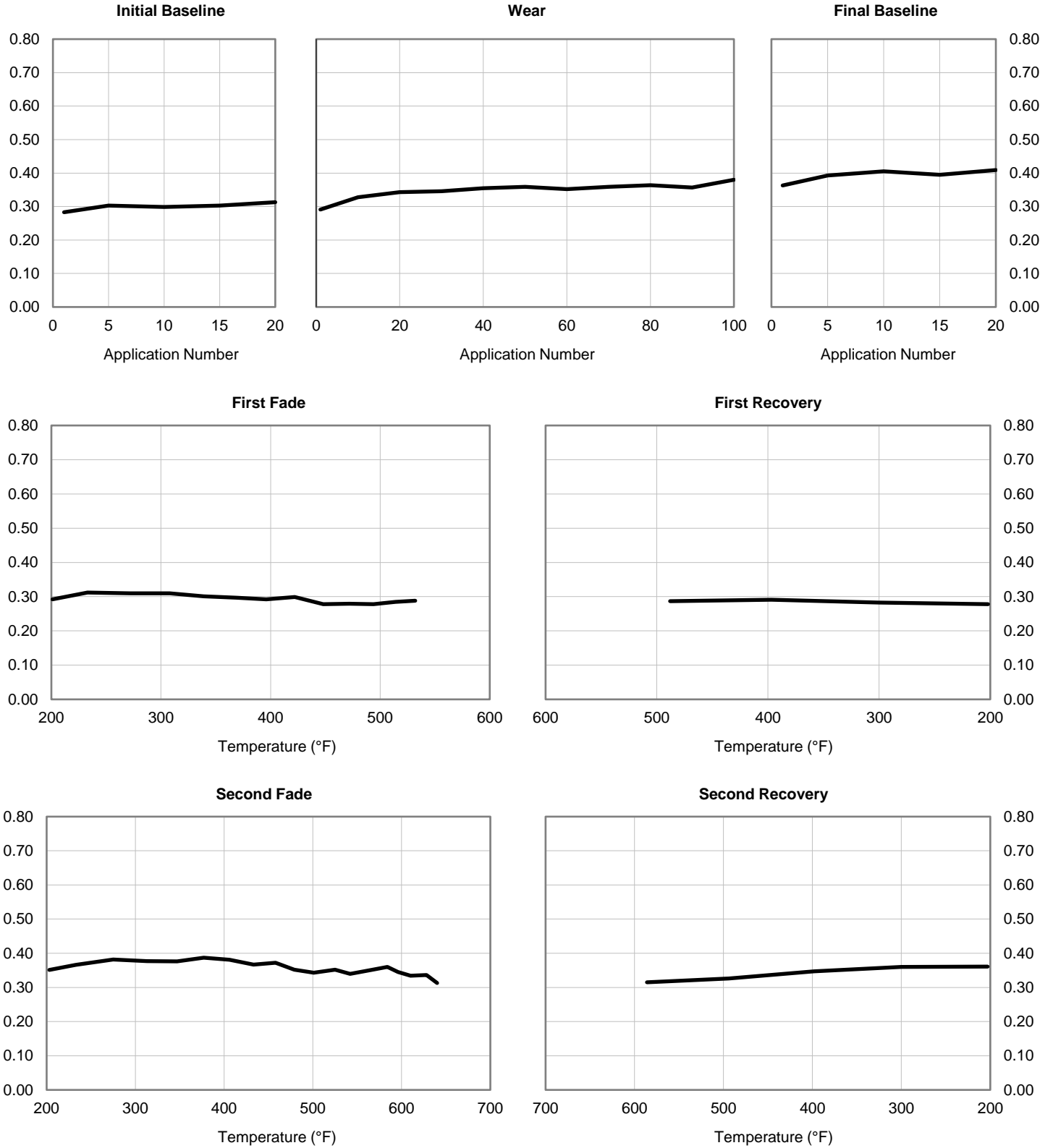
Second Recovery

Event	Force (lb)	μ	Temp (°F)
1	46.6	0.315	586
2	49.0	0.326	494
3	52.3	0.347	398
4	54.6	0.360	300
5	54.2	0.361	203



7/15/2023
230368-02-D
Sample 4 of 5

Coefficient of Friction





Normal **0.376**

F

Hot **0.329**

E

7/16/2023
230368-02-E
Sample 5 of 5

Wear

	Initial	Final	Loss	Loss / %
Weight (gr)	9.810	9.660	0.150	1.53
Thickness (inch)	0.237	0.235	0.002	0.84

Baseline

Event	Initial		Final	
	Force (lb)	μ	Force (lb)	μ
1	38.6	0.255	55.9	0.370
5	43.4	0.285	60.7	0.399
10	44.1	0.289	59.7	0.398
15	43.7	0.287	60.2	0.398
20	44.0	0.288	60.0	0.399

Wear

Event	Force (lb)	μ
1	43.8	0.288
10	48.1	0.319
20	49.6	0.326
30	51.5	0.342
40	52.5	0.349
50	53.0	0.352
60	53.7	0.355
70	55.8	0.366
80	56.2	0.373
90	55.6	0.372
100	57.3	0.384

First Fade

Time (sec)	Force (lb)	μ	Temp (°F)
0.0	42.9	0.285	201
30.0	44.8	0.298	231
60.0	44.9	0.301	270
90.0	44.9	0.302	305
120.0	44.5	0.295	336
150.0	44.7	0.298	365
180.0	44.0	0.295	393
210.0	43.2	0.290	418
240.0	42.8	0.283	442
270.0	42.4	0.282	465
300.0	42.4	0.285	485
330.0	42.6	0.289	504
360.0	43.2	0.285	526
390.0	42.9	0.281	544

Second Fade

Time (sec)	Force (lb)	μ	Temp (°F)
0.0	55.6	0.363	203
30.0	55.9	0.370	234
60.0	58.5	0.390	275
90.0	56.8	0.379	311
120.0	57.4	0.383	343
150.0	58.5	0.388	374
180.0	56.9	0.377	403
210.0	56.1	0.375	430
240.0	55.6	0.373	453
270.0	53.3	0.358	476
300.0	53.3	0.356	498
330.0	50.8	0.333	516
360.0	52.5	0.348	539
390.0	48.2	0.322	556
420.0	50.3	0.341	571
450.0	51.1	0.338	593
480.0	47.5	0.315	602
510.0	48.7	0.325	618
540.0	49.1	0.332	634
570.0	49.1	0.319	647

First Recovery

Event	Force (lb)	μ	Temp (°F)
1	43.8	0.292	487
2	43.3	0.288	396
3	42.3	0.278	299
4	40.8	0.267	201

Second Recovery

Event	Force (lb)	μ	Temp (°F)
1	46.7	0.316	586
2	50.0	0.331	494
3	50.7	0.334	397
4	50.8	0.340	300
5	55.1	0.362	202



7/16/2023
230368-02-E
Sample 5 of 5

Coefficient of Friction

