

## APPENDIX A – DYNAMIC MODULUS MASTER CURVE DATA

DELDOT Uniaxial Compression Lab Measured E\* (Gyratory Lab Compacted Samples)

Temp. °F	Frequency Hz	HMA Lot #1 - UC/LC		HMA Lot #2 - UC/LC		SMA Lot #1 - UC/LC		SMA Lot #2 UC/LC		SMA Lot #3 UC/LC		SMA Lot #4 UC/LC		SMA Lot #5 UC/LC	
		Reduced Freq.	E*	Reduced Freq.	E*	Reduced Freq.	E*	Reduced Freq.	E*	Reduced Freq.	E*	Reduced Freq.	E*	Reduced Freq.	E*
39	25	3,970.72	1,960,571.28	4,800.35	2,400,470.63	8,537.17	2,353,720.14	4,189.50	2,681,795.42	3,570.66	2,748,851.18	3,928.09	2,554,307.28	6,584.32	2,612,757.47
39	10	1,588.29	1,786,284.31	1,920.14	2,197,369.50	3,414.87	2,149,797.14	1,675.80	2,461,048.04	1,428.26	2,523,172.52	1,571.24	2,329,160.42	2,633.73	2,405,691.98
39	5	794.14	1,646,419.62	960.07	2,039,616.83	1,707.43	1,988,128.45	837.90	2,293,771.23	714.13	2,343,374.12	785.62	2,156,517.22	1,316.86	2,239,527.13
39	1	158.83	1,322,840.52	192.01	1,672,284.68	341.49	1,610,305.24	167.58	1,906,858.99	142.83	1,925,907.27	157.12	1,748,284.44	263.37	1,843,477.51
39	0.5	79.41	1,178,963.12	96.01	1,511,002.76	170.74	1,441,578.05	83.79	1,729,236.15	71.41	1,744,948.57	78.56	1,567,567.46	131.69	1,672,719.79
39	0.1	15.88	858,623.18	19.20	1,145,411.06	34.15	1,043,256.18	16.76	1,327,916.84	14.28	1,338,601.28	15.71	1,161,171.83	26.34	1,284,647.25
68	25	25.00	1,027,833.83	25.00	1,336,522.41	25.00	1,240,652.49	25.00	1,463,285.36	25.00	1,463,043.63	25.00	1,418,130.28	25.00	1,453,422.79
68	10	10.00	855,045.59	10.00	1,131,052.33	10.00	1,046,205.28	10.00	1,238,960.38	10.00	1,244,568.50	10.00	1,190,324.40	10.00	1,227,744.13
68	5	5.00	734,470.91	5.00	985,821.25	5.00	899,813.89	5.00	1,076,808.23	5.00	1,082,609.74	5.00	1,027,978.87	5.00	1,063,658.15
68	1	1.00	493,224.87	1.00	687,430.35	1.00	597,410.29	1.00	739,740.62	1.00	747,330.92	1.00	695,552.46	1.00	725,478.58
68	0.5	0.50	407,797.67	0.50	583,293.28	0.50	491,871.19	0.50	615,491.65	0.50	628,254.97	0.50	578,555.39	0.50	601,132.92
68	0.1	0.10	247,434.32	0.10	372,360.12	0.10	290,220.44	0.10	366,268.54	0.10	387,589.08	0.10	351,426.35	0.10	361,288.91
95	25	0.64	426,217.45	0.56	579,135.54	0.37	412,922.33	0.62	639,761.29	0.69	691,684.79	0.65	599,972.62	0.45	553,512.21
95	10	0.26	318,116.02	0.22	445,459.12	0.15	295,538.49	0.25	486,794.87	0.28	531,369.79	0.26	450,293.71	0.18	409,828.19
95	5	0.13	250,915.22	0.11	358,919.96	0.07	220,167.23	0.12	383,237.95	0.14	420,174.22	0.13	351,087.93	0.09	317,729.25
95	1	0.03	139,023.47	0.02	209,627.82	0.01	114,164.01	0.02	217,073.09	0.03	239,602.28	0.03	193,673.68	0.02	176,854.14
95	0.5	0.01	107,429.42	0.01	166,261.55	0.01	87,742.97	0.01	170,177.57	0.01	188,645.70	0.01	150,239.72	0.01	137,548.92
95	0.1	0.00	55,206.18	0.00	90,996.65	0.00	48,109.01	0.00	94,342.19	0.00	106,003.22	0.00	80,341.22	0.00	75,579.15
95	0.01	0.00	20,629.20	0.00	35,824.31	0.00	25,048.01	0.00	44,357.36	0.00	49,728.59	0.00	33,943.66	0.00	35,500.39

DELDOT IDT Lab Measured E\* Results (Gyratory Lab Compacted Samples)



Temp. °F	Frequency Hz	HMA Lot #1 - LC/IDT		HMA Lot #2 - LC/IDT		SMA Lot #1 - LC/IDT		SMA Lot #2 LC/IDT		SMA Lot #3 LC/IDT		SMA Lot #4 LC/IDT		SMA Lot #5 LC/IDT	
		Reduced Freq.	E*	Reduced Freq.	E*	Reduced Freq.	E*	Reduced Freq.	E*	Reduced Freq.	E*	Reduced Freq.	E*	Reduced Freq.	E*
39	25	2,124.87	1,378,680.03	1,326.06	1,090,441.77	2,885.66	1,279,425.90	NO SAMPLES		12,646.57	2,557,498.11	45,969.71	2,381,664.07	3,037.21	2,317,460.72
39	10	849.95	1,201,057.19	530.43	987,126.59	1,154.26	1,152,566.26		5,058.63	2,375,814.22	18,387.88	2,279,170.76	1,214.88	2,117,743.80	
39	5	424.97	1,070,910.03	265.21	913,350.74	577.13	1,080,530.87		2,529.31	2,246,682.32	9,193.94	2,167,830.16	607.44	1,924,988.70	
39	1	84.99	786,152.68	53.04	724,656.70	115.43	885,551.85		505.86	1,922,474.71	1,838.79	1,828,345.25	121.49	1,441,723.08	
39	0.5	42.50	682,305.69	26.52	665,626.35	57.71	816,320.52		252.93	1,885,345.06	919.39	1,794,164.69	60.74	1,291,077.26	
39	0.1	8.50	453,339.50	5.30	491,967.88	11.54	616,796.99		50.59	1,474,211.53	183.88	1,411,023.44	12.15	872,546.80	
68	25	25.00	737,951.82	25.00	955,605.06	25.00	921,182.78		25.00	1,846,378.27	25.00	1,336,909.17	25.00	1,158,077.69	
68	10	10.00	559,458.75	10.00	775,033.12	10.00	760,867.77		10.00	1,571,338.44	10.00	1,128,054.88	10.00	937,233.62	
68	5	5.00	454,161.38	5.00	651,799.42	5.00	663,112.36		5.00	1,364,224.61	5.00	1,001,533.66	5.00	799,447.80	
68	1	1.00	289,156.83	1.00	434,484.60	1.00	446,281.00		1.00	970,737.33	1.00	697,534.65	1.00	517,494.51	
68	0.5	0.50	308,930.30	0.50	366,703.65	0.50	381,062.38		0.50	899,862.24	0.50	650,155.66	0.50	442,413.33	
68	0.1	0.10	253,187.48	0.10	216,396.25	0.10	232,592.12		0.10	707,929.01	0.10	468,181.70	0.10	282,823.52	
95	25	1.01	349,395.82	1.42	336,439.12	0.81	339,146.49		0.28	784,992.38	0.11	449,036.72	0.78	465,667.71	
95	10	0.40	276,635.24	0.57	254,057.70	0.32	252,317.25		0.11	612,929.32	0.04	351,281.31	0.31	368,105.68	
95	5	0.20	212,770.31	0.28	201,409.02	0.16	196,139.32		0.06	535,914.30	0.02	278,182.31	0.16	294,523.22	
95	1	0.04	110,663.77	0.06	106,022.56	0.03	109,068.35		0.01	324,014.22	0.00	154,610.19	0.03	167,276.81	
95	0.5	0.02	104,475.49	0.03	86,829.24	0.02	86,877.58		0.01	278,714.11	0.00	128,793.48	0.02	133,434.68	
95	0.1	0.00	76,241.48	0.01	52,310.26	0.00	50,038.01		0.00	173,706.82	0.00	82,091.34	0.00	80,254.19	

DELDOT IDT Lab Measured E\* Results (Field Compacted Samples)



Temp. °F	Frequency Hz	HMA Lot #1 - FC/IDT		HMA Lot #2 - FC/IDT		SMA Lot #2 FC/IDT		SMA Lot #1 - FC/IDT		SMA Lot #3 FC/IDT		SMA Lot #4 FC/IDT		SMA Lot #5 FC/IDT	
		Reduced Freq.	E*	Reduced Freq.	E*	Reduced Freq.	E*	Reduced Freq.	E*	Reduced Freq.	E*	Reduced Freq.	E*	Reduced Freq.	E*
39	25	2,245.30	1,020,533.60	3,836.37	1,841,156.91	4,640.93	1,786,429.35	NO SAMPLES	4,419.10	2,084,578.52	2,911.95	1,540,300.37	2,341.13	1,467,684.83	
39	10	898.12	887,050.57	1,534.55	1,575,012.73	1,856.37	1,609,193.28		1,767.64	1,793,052.74	1,164.78	1,401,837.72	936.45	1,276,670.18	
39	5	449.06	774,791.39	767.27	1,454,196.33	928.19	1,404,545.09		883.82	1,613,351.03	582.39	1,283,922.07	468.23	1,151,744.38	
39	1	89.81	566,565.60	153.45	1,174,273.57	185.64	982,050.27		176.76	1,169,584.01	116.48	977,409.06	93.65	846,149.94	
39	0.5	44.91	491,194.34	76.73	1,018,938.19	92.82	853,885.29		88.38	1,024,691.35	58.24	854,368.74	46.82	731,038.35	
39	0.1	8.98	318,599.48	15.35	669,348.99	18.56	554,092.36		17.68	664,030.94	11.65	546,260.32	9.36	454,934.92	
68	25	25.00	334,311.90	25.00	749,893.25	25.00	690,234.41		25.00	974,314.92	25.00	691,491.41	25.00	602,631.64	
68	10	10.00	267,787.94	10.00	568,402.75	10.00	558,443.49		10.00	739,257.16	10.00	534,705.65	10.00	471,324.18	
68	5	5.00	221,424.22	5.00	469,051.92	5.00	455,128.30		5.00	605,725.78	5.00	435,258.14	5.00	376,324.49	
68	1	1.00	137,834.16	1.00	290,800.59	1.00	263,630.19		1.00	333,828.44	1.00	250,480.11	1.00	215,671.06	
68	0.5	0.50	113,467.83	0.50	223,019.64	0.50	198,459.92		0.50	259,424.10	0.50	196,816.16	0.50	140,928.30	
68	0.1	0.10	65,121.93	0.10	112,645.95	0.10	107,714.67		0.10	134,401.60	0.10	104,040.38	0.10	71,165.16	
95	25	0.97	161,185.23	0.66	245,355.44	0.57	183,617.73		0.60	231,915.28	0.80	251,495.37	0.94	184,294.57	
95	10	0.39	124,635.73	0.26	175,012.16	0.23	135,706.94		0.24	170,612.68	0.32	158,961.32	0.38	134,643.33	
95	5	0.19	96,160.00	0.13	133,144.61	0.11	104,088.72		0.12	124,442.35	0.16	120,091.22	0.19	99,785.94	
95	1	0.04	53,083.80	0.03	67,200.80	0.02	56,419.67		0.02	61,109.22	0.03	62,849.67	0.04	51,778.46	
95	0.5	0.02	43,027.85	0.01	50,811.54	0.01	45,396.80		0.01	49,699.59	0.02	50,086.35	0.02	39,595.29	
95	0.1	0.00	27,412.13	0.00	26,735.28	0.00	26,010.09		0.00	28,475.74	0.00	27,508.82	0.00	23,012.65	

		DelDOT Lab Compacted Uniaxial Compression VTS-Shift E* (PSI)						
Temperature (F)	Frequency (Hz)	C/160 Lot #1	C/160 Lot #2	SMA Lot #1	SMA Lot #2	SMA Lot #3	SMA Lot #4	SMA Lot #5
10.0	25.0	2,031,657	2,362,744	2,464,840	2,581,218	2,635,951	2,510,454	2,577,931
	10.0	1,901,980	2,247,756	2,345,895	2,474,643	2,517,853	2,389,828	2,475,111
	5.0	1,795,781	2,150,882	2,244,466	2,380,786	2,414,878	2,286,072	2,385,278
	1.0	1,525,642	1,893,328	1,970,576	2,115,450	2,128,289	2,002,746	2,133,575
	0.5	1,401,420	1,769,350	1,837,084	1,980,644	1,984,967	1,863,417	2,006,368
	0.1	1,104,884	1,458,211	1,499,358	1,626,567	1,614,954	1,508,897	1,672,139
40.0	25.0	1,906,802	2,247,687	2,331,749	2,477,583	2,524,968	2,394,700	2,468,298
	10.0	1,765,424	2,117,790	2,193,601	2,351,478	2,387,424	2,255,915	2,346,061
	5.0	1,651,121	2,009,622	2,077,478	2,241,880	2,269,080	2,138,091	2,240,631
	1.0	1,366,701	1,727,871	1,771,864	1,939,590	1,947,698	1,823,884	1,952,155
	0.5	1,239,136	1,595,382	1,627,255	1,790,382	1,791,502	1,673,558	1,810,344
	0.1	943,601	1,272,437	1,274,796	1,413,092	1,402,863	1,304,236	1,450,997
70.0	25.0	1,006,963	1,304,293	1,179,519	1,484,447	1,515,796	1,388,355	1,412,416
	10.0	843,333	1,118,138	981,170	1,262,207	1,289,854	1,175,235	1,198,565
	5.0	725,721	980,007	838,364	1,095,405	1,120,926	1,017,225	1,039,322
	1.0	483,650	682,727	546,790	737,044	758,961	681,493	699,490
	0.5	395,878	569,937	442,977	603,755	624,276	557,270	573,390
	0.1	234,430	353,700	257,133	358,194	374,997	328,013	340,383
100.0	25.0	391,779	542,121	361,021	590,030	633,116	552,860	502,966
	10.0	293,333	415,050	262,944	441,363	478,418	412,690	372,788
	5.0	231,600	333,451	204,181	348,828	381,120	324,979	292,718
	1.0	126,960	190,854	110,335	195,204	216,970	178,124	161,341
	0.5	96,131	147,483	84,235	151,138	169,003	135,686	124,005
	0.1	48,882	79,108	45,564	84,747	95,583	71,738	68,072
130.0	25.0	135,328	194,256	98,216	204,821	235,359	190,204	152,875
	10.0	93,790	138,027	68,811	146,069	169,230	132,827	107,977
	5.0	70,339	105,714	52,809	113,426	131,949	100,866	83,284
	1.0	35,331	56,262	29,503	65,087	75,837	53,755	47,044
	0.5	26,196	42,957	23,417	52,333	60,817	41,507	37,545
	0.1	13,255	23,516	14,504	33,593	38,568	23,923	23,634

		DelDOT Lab Compacted IDT VTS-Shift E* (PSI)						
Temperature (F)	Frequency (Hz)	C/160 Lot #1	C/160 Lot #2	SMA Lot #1	SMA Lot #2	SMA Lot #3	SMA Lot #4	SMA Lot #5
10.0	25.0	1,416,878	1,555,284	1,797,645	NO SAMPLES	2,546,987	2,467,952	2,281,768
	10.0	1,284,399	1,401,026	1,644,100		2,472,755	2,383,755	2,138,129
	5.0	1,182,647	1,281,330	1,522,724		2,409,406	2,313,704	2,016,996
	1.0	947,571	1,002,380	1,231,261		2,236,235	2,129,081	1,698,365
	0.5	849,543	885,812	1,105,381		2,149,804	2,040,031	1,548,522
	0.1	637,385	635,575	825,156		1,921,219	1,812,198	1,188,687
40.0	25.0	1,305,067	1,439,218	1,659,258		2,457,861	2,344,574	2,151,310
	10.0	1,170,643	1,281,447	1,498,690		2,370,610	2,246,521	1,990,556
	5.0	1,068,757	1,160,767	1,373,712		2,296,738	2,165,688	1,857,244
	1.0	838,223	885,923	1,081,094		2,097,616	1,955,968	1,516,788
	0.5	744,239	773,957	958,211		1,999,805	1,856,577	1,361,998
	0.1	545,650	540,116	693,039		1,746,341	1,607,717	1,005,079
70.0	25.0	663,960	752,009	800,097		1,602,822	1,249,801	1,141,228
	10.0	553,821	615,663	656,728		1,437,637	1,095,320	942,946
	5.0	477,896	521,839	557,966		1,309,615	980,458	802,111
	1.0	328,562	339,650	365,821		1,012,458	728,620	521,076
	0.5	276,072	277,157	299,739		889,081	629,631	423,541
	0.1	179,937	166,793	182,612		626,806	429,083	252,593
100.0	25.0	309,526	352,072	319,079		731,445	393,315	446,645
	10.0	244,789	269,179	242,679		590,966	305,160	335,400
	5.0	203,529	217,230	195,481		495,543	248,567	267,574
	1.0	130,317	128,169	115,830		314,050	148,268	156,301
	0.5	107,064	101,219	92,022		253,284	116,875	124,253
	0.1	67,775	58,127	54,120		148,540	65,460	74,927
130.0	25.0	151,655	168,678	130,246	266,196	93,828	174,217	
	10.0	117,146	124,239	96,155	197,975	67,231	128,454	
	5.0	96,184	98,071	76,380	156,769	51,968	102,603	
	1.0	60,973	56,317	45,184	89,370	28,361	63,101	
	0.5	50,306	44,462	36,352	69,903	21,869	52,232	
	0.1	32,776	26,198	22,637	39,814	12,134	35,605	

 2 LVDTs (red/black)  
 3 LVDTs (red/black/green)

DelDOT Field Core IDT VTS-Shift E* (PSI)								
Temperature (F)	Frequency (Hz)	C/160 Lot #1	C/160 Lot #2	SMA Lot #1	SMA Lot #2	SMA Lot #3	SMA Lot #4	SMA Lot #5
10.0	25.0	1,178,551	1,971,805	NO SAMPLES	1,871,877	2,183,655	1,814,372	1,740,293
	10.0	1,021,023	1,807,062		1,715,486	2,017,507	1,635,110	1,545,489
	5.0	904,638	1,672,890		1,587,490	1,879,615	1,493,417	1,392,230
	1.0	653,884	1,338,698		1,267,205	1,526,563	1,156,044	1,033,297
	0.5	557,835	1,190,231		1,124,652	1,365,471	1,012,886	885,031
	0.1	369,680	854,990		803,453	992,481	704,065	577,945
40.0	25.0	1,043,531	1,814,300		1,716,447	2,020,171	1,652,500	1,572,616
	10.0	889,617	1,635,960		1,545,782	1,836,095	1,465,074	1,370,219
	5.0	778,267	1,493,576		1,409,160	1,686,394	1,319,843	1,214,736
	1.0	545,839	1,150,769		1,079,971	1,316,444	985,205	864,586
	0.5	459,781	1,004,256		939,625	1,154,380	848,357	726,190
	0.1	296,646	687,914		638,642	796,869	564,982	452,808
70.0	25.0	384,785	759,317		671,733	847,503	675,450	594,666
	10.0	297,974	595,156		521,035	662,532	526,431	448,862
	5.0	243,139	485,260		421,850	538,246	428,121	355,907
	1.0	147,984	283,600		244,225	310,319	250,281	196,543
	0.5	118,750	219,627		189,268	238,483	194,365	149,459
	0.1	71,219	116,406		102,128	123,963	104,184	77,605
100.0	25.0	135,266	218,979		178,494	227,733	209,852	173,630
	10.0	101,023	153,408		125,752	157,450	148,432	120,198
	5.0	81,036	116,036		96,128	117,976	113,119	90,553
	1.0	49,205	59,821		51,967	59,815	59,220	47,151
	0.5	40,086	45,062		40,343	44,887	44,813	35,976
	0.1	25,756	24,013		23,489	23,951	23,952	20,099
130.0	25.0	57,406	64,521	53,316	62,331	68,213	57,171	
	10.0	43,551	44,346	38,186	42,660	47,145	39,747	
	5.0	35,646	33,622	30,064	32,352	35,790	30,523	
	1.0	23,213	18,401	18,248	17,921	19,434	17,409	
	0.5	19,641	14,519	15,119	14,278	15,212	14,035	
	0.1	13,925	8,917	10,418	9,040	9,089	9,100	

 2 LVDTs (red/black)  
 3 LVDTs (red/black/green)

MEDOT E\* Test Results

LC-IDT		E* (PSI)				
Temperature (F)	Frequency (Hz)	7/29/11	8/27/11	9/1/11	9/2/11	9/17/11
		19mm	19mm	12.5mm	12.5mm	9.5mm
39.0	25.0		1,523,524	1,310,367	2,066,352	1,503,993
	10.0		1,326,466	1,144,928	1,869,536	1,256,703
	5.0		1,200,719	1,023,724	1,665,275	1,107,798
	1.0		878,348	724,318	1,197,480	807,086
	0.5		756,033	634,733	1,048,091	700,435
	0.1		494,772	404,123	663,596	451,261
68.0	25.0		717,453	675,634	701,886	626,950
	10.0		530,209	521,120	543,069	495,739
	5.0		435,887	416,983	436,418	399,869
	1.0		260,149	243,277	245,597	237,620
	0.5		219,345	190,676	195,076	187,775
	0.1		131,888	105,974	112,114	105,056
95.0	25.0		457,207	264,742	312,846	274,750
	10.0		371,538	212,867	277,457	223,165
	5.0		272,719	171,386	219,345	191,546
	1.0		134,015	100,028	139,430	116,707
	0.5		114,628	90,213	134,692	102,107
	0.1		100,269	56,806	105,297	63,285
Air Voids (%) -->			5.6	5.6	4.9	4.6
Vbeff (%) -->			11.6	11.51	12.67	14.28

MEDOT VTS-Shift E\* Results

LC-IDT		E* (PSI)				
Temperature (F)	Frequency (Hz)	7/29/11	8/27/11	9/1/11	9/2/11	9/17/11
		19mm	19mm	12.5mm	12.5mm	9.5mm
10.0	25.0		2,546,825	2,391,073	3,068,389	2,544,809
	10.0		2,391,126	2,244,568	3,007,686	2,407,404
	5.0		2,256,819	2,121,780	2,947,633	2,289,101
	1.0		1,893,983	1,800,868	2,745,228	1,967,984
	0.5		1,720,192	1,650,438	2,624,236	1,812,206
	0.1		1,300,348	1,288,500	2,250,076	1,426,030
40.0	25.0		1,622,465	1,423,235	2,204,510	1,538,674
	10.0		1,382,454	1,216,670	1,928,252	1,314,866
	5.0		1,202,801	1,064,156	1,700,358	1,148,102
	1.0		819,775	740,149	1,161,241	792,246
	0.5		678,697	619,380	949,555	660,112
	0.1		420,688	392,202	561,177	414,713
70.0	25.0		796,468	634,609	812,509	657,791
	10.0		617,332	493,465	599,660	507,699
	5.0		502,895	403,109	473,613	413,094
	1.0		305,778	245,231	280,822	251,702
	0.5		246,747	196,839	230,219	203,490
	0.1		153,964	118,948	158,300	127,338
100.0	25.0		368,695	262,251	260,679	262,045
	10.0		277,155	196,184	203,466	197,838
	5.0		224,096	157,556	173,243	160,924
	1.0		141,298	96,345	130,271	103,353
	0.5		118,233	78,991	119,199	87,191
	0.1		82,882	52,035	103,058	62,094
130.0	25.0		194,295	123,352	139,488	126,320
	10.0		149,751	93,738	122,510	99,268
	5.0		124,764	76,958	113,405	84,013
	1.0		86,485	50,892	100,061	60,299
	0.5		75,812	43,516	96,499	53,546
	0.1		59,172	31,869	91,168	42,790



MEDOT E\* Test Results

FC-IDT		E* (PSI)				
Temperature (F)	Frequency (Hz)	7/29/11	8/27/11	9/1/11	9/2/11	9/17/11
		19mm	19mm	12.5mm	12.5mm	9.5mm
39.0	25.0		849,921	846,182		1,243,747
	10.0		848,906	658,342		1,043,305
	5.0		769,280	558,492		892,369
	1.0		553,464	371,683		599,392
	0.5		420,174	298,455		492,161
	0.1		220,457	148,970		265,612
68.0	25.0		466,441	324,820		577,298
	10.0		289,205	233,865		442,848
	5.0		235,976	189,387		348,816
	1.0		128,213	101,140		179,895
	0.5		89,198	77,225		139,816
	0.1		42,351	41,255		67,684
95.0	25.0		118,496	73,228		128,939
	10.0		82,962	56,339		94,855
	5.0		58,015	42,351		71,649
	1.0		28,137	24,882		37,178
	0.5		21,901	21,852		29,733
	0.1		13,634	17,147		18,613
Air Voids (%) -->			6.1	8.1		3.5
Vbeff (%) -->			11.54	12.81		14.14

MEDOT VTS-Shift E\* Results

FC-IDT		E* (PSI)				
Temperature (F)	Frequency (Hz)	7/29/11	8/27/11	9/1/11	9/2/11	9/17/11
		19mm	19mm	12.5mm	12.5mm	9.5mm
10.0	25.0		2,159,110	1,974,036		2,387,634
	10.0		2,006,624	1,819,197		2,249,803
	5.0		1,882,518	1,694,129		2,135,729
	1.0		1,570,548	1,384,664		1,840,745
	0.5		1,429,157	1,247,225		1,702,748
	0.1		1,097,979	933,813		1,367,071
40.0	25.0		1,098,674	889,550		1,303,261
	10.0		916,597	726,607		1,110,943
	5.0		786,103	613,661		969,677
	1.0		519,040	393,582		669,441
	0.5		422,928	318,341		556,772
	0.1		247,695	186,947		342,483
70.0	25.0		378,558	267,704		470,248
	10.0		279,055	196,996		354,121
	5.0		217,829	154,852		281,014
	1.0		116,666	87,196		156,392
	0.5		87,652	68,044		119,414
	0.1		44,104	38,890		62,262
100.0	25.0		110,702	79,012		138,567
	10.0		75,592	57,044		96,387
	5.0		56,245	44,828		72,742
	1.0		28,102	26,425		37,563
	0.5		20,914	21,417		28,351
	0.1		10,821	13,810		15,141
130.0	25.0		35,733	30,391		44,454
	10.0		24,106	22,855		30,581
	5.0		17,990	18,680		23,173
	1.0		9,412	12,304		12,569
	0.5		7,254	10,515		9,839
	0.1		4,183	7,686		5,876

MEDOT E\* Test Results

LC-UC		E* (PSI)				
Temperature (F)	Frequency (Hz)	7/29/11	8/27/11	9/1/11	9/2/11	9/17/11
		19mm	19mm	12.5mm	12.5mm	9.5mm
39.0	25.0	2,365,613	2,006,161	1,972,416	1,841,495	1,824,042
	10.0	2,120,596	1,812,294	1,764,384	1,626,791	1,614,318
	5.0	1,932,241	1,652,028	1,609,097	1,465,219	1,456,662
	1.0	1,508,779	1,272,948	1,259,072	1,105,429	1,108,330
	0.5	1,319,795	1,116,984	1,112,536	952,898	961,213
	0.1	897,348	772,761	782,527	628,980	645,853
68.0	25.0	1,204,828	1,052,345	1,033,249	922,101	886,422
	10.0	990,704	857,511	847,842	743,802	714,552
	5.0	843,394	721,611	719,049	621,390	595,573
	1.0	548,436	455,322	467,070	385,414	372,022
	0.5	451,261	371,587	386,816	310,767	302,114
	0.1	261,310	209,386	221,569	171,290	171,048
95.0	25.0	476,594	443,284	384,302	314,297	324,836
	10.0	348,816	321,017	278,472	218,669	231,432
	5.0	266,676	230,755	214,317	161,427	174,529
	1.0	140,015	121,513	114,749	79,273	88,120
	0.5	105,380	89,087	87,487	58,034	65,383
	0.1	53,504	44,266	44,270	27,383	31,913
95.0	0.01	20,711	14,813	16,418	9,539	12,173
Air Voids (%) -->		3.5	4.7	4.4	5.0	4.1
Vbeff (%) -->		11.27	11.71	12.67	12.66	14.35

MEDOT VTS-Shift E\* Results

LC-UC		E* (PSI)				
Temperature (F)	Frequency (Hz)	7/29/11	8/27/11	9/1/11	9/2/11	9/17/11
			19mm	12.5mm	12.5mm	9.5mm
10.0	25.0		2,806,704	2,788,104	2,708,916	2,682,630
	10.0		2,721,601	2,709,973	2,623,404	2,594,218
	5.0		2,648,545	2,643,533	2,550,785	2,519,146
	1.0		2,447,201	2,462,583	2,353,660	2,315,590
	0.5		2,345,984	2,372,447	2,255,918	2,214,854
	0.1		2,076,657	2,133,919	1,999,106	1,951,100
40.0	25.0		2,000,476	1,960,830	1,839,631	1,814,356
	10.0		1,821,080	1,794,550	1,665,755	1,638,949
	5.0		1,677,844	1,662,510	1,528,813	1,501,182
	1.0		1,330,015	1,342,891	1,202,321	1,174,430
	0.5		1,178,742	1,203,593	1,062,659	1,035,547
	0.1		842,275	890,507	756,160	733,087
70.0	25.0		1,030,915	973,904	856,133	851,505
	10.0		842,992	803,660	691,114	687,740
	5.0		710,496	683,664	576,998	574,775
	1.0		446,928	443,317	355,542	356,218
	0.5		355,383	358,567	280,403	282,215
	0.1		195,115	206,554	151,227	154,894
100.0	25.0		392,128	348,902	280,027	290,305
	10.0		284,631	256,771	199,203	208,823
	5.0		218,921	200,127	150,993	159,981
	1.0		112,024	106,502	74,842	82,026
	0.5		82,118	79,627	54,148	60,487
	0.1		38,604	39,305	24,693	29,161
130.0	25.0		129,465	107,922	78,255	88,104
	10.0		86,303	73,373	51,006	58,956
	5.0		62,723	54,256	36,485	43,155
	1.0		29,175	26,401	16,400	20,679
	0.5		20,918	19,314	11,594	15,091
	0.1		13,474	9,817	9,469	7,435

MEDOT E\* Test Results

LC-UC		E* (PSI)				
Temperature (F)	Frequency (Hz)	7/29/11	8/27/11	9/1/11	9/2/11	9/17/11
		19mm	19mm	12.5mm	12.5mm	9.5mm
39.0	25.0		1,707,601	1,597,663	1,437,831	1,579,896
	10.0		1,482,575	1,389,606	1,238,404	1,377,568
	5.0		1,335,072	1,236,882	1,094,745	1,226,656
	1.0		922,512	908,299	790,238	900,974
	0.5		823,161	767,394	669,784	764,131
	0.1		536,132	487,979	417,128	480,002
68.0	25.0		858,261	729,177	718,299	746,074
	10.0		685,521	572,174	561,731	587,330
	5.0		568,620	471,082	461,147	484,571
	1.0		350,774	284,927	274,484	293,556
	0.5		283,984	230,320	219,877	235,976
	0.1		157,438	128,888	120,599	130,034
95.0	25.0		339,026	279,343	253,671	252,148
	10.0		235,251	197,251	174,988	176,366
	5.0		172,812	148,395	129,526	132,006
	1.0		84,673	74,491	63,628	65,303
	0.5		62,236	54,244	46,688	48,319
	0.1		30,132	26,622	22,938	23,453
95.0	0.01		11,233	9,580	8,166	9,210
Air Voids (%) -->			6.7	7.2	6.7	6.7
Vbeff (%) -->			11.76	12.3	12.43	13.96

MEDOT VTS-Shift E\* Results

LC-UC		E* (PSI)				
Temperature (F)	Frequency (Hz)	7/29/11	8/27/11	9/1/11	9/2/11	9/17/11
		19mm	19mm	12.5mm	12.5mm	9.5mm
10.0	25.0		2,543,046	2,436,822	2,348,425	2,458,522
	10.0		2,441,176	2,332,369	2,235,767	2,361,817
	5.0		2,355,149	2,244,753	2,142,515	2,280,428
	1.0		2,124,401	2,012,180	1,899,832	2,063,042
	0.5		2,011,732	1,899,818	1,784,847	1,957,240
	0.1		1,722,200	1,614,393	1,498,561	1,685,839
40.0	25.0		1,690,329	1,563,581	1,456,460	1,577,781
	10.0		1,510,013	1,387,805	1,284,794	1,405,756
	5.0		1,369,733	1,252,529	1,154,302	1,272,911
	1.0		1,042,733	942,190	859,809	966,289
	0.5		906,653	815,128	741,038	839,826
	0.1		617,961	549,757	496,016	573,377
70.0	25.0		812,232	713,907	652,398	696,413
	10.0		650,054	566,629	516,163	552,622
	5.0		538,933	467,066	424,609	455,551
	1.0		326,550	280,033	253,590	273,448
	0.5		255,778	218,719	197,730	213,792
	0.1		136,247	116,349	104,579	114,153
100.0	25.0		299,301	250,632	228,952	228,124
	10.0		214,196	178,516	162,798	161,844
	5.0		163,208	135,769	123,574	122,820
	1.0		82,174	68,524	61,820	61,881
	0.5		59,981	50,227	45,013	45,397
	0.1		28,101	23,933	20,922	21,763
130.0	25.0		100,311	81,685	74,602	68,857
	10.0		66,605	54,424	49,345	45,803
	5.0		48,334	39,694	35,701	33,428
	1.0		22,501	18,841	16,455	15,992
	0.5		16,162	13,687	11,742	11,687
	0.1		7,631	6,667	5,416	5,802

RIDOT E\* Test Results

LC-UC		E* (PSI)	
Temperature (F)	Frequency (Hz)	10/5/11	10/6/11
		12.5mm	12.5mm
39.0	25.0	1,865,765	2,152,553
	10.0	1,660,585	1,908,358
	5.0	1,502,446	1,723,773
	1.0	1,145,701	1,312,543
	0.5	989,254	1,137,821
	0.1	649,721	759,998
68.0	25.0	879,605	1,074,246
	10.0	702,273	866,455
	5.0	580,441	723,013
	1.0	347,559	449,569
	0.5	274,750	361,772
	0.1	142,296	198,847
95.0	25.0	276,248	383,625
	10.0	186,422	269,577
	5.0	134,706	199,378
	1.0	60,669	98,645
	0.5	42,191	72,611
	0.1	18,415	35,322
95.0	0.01	6,179	13,817
Air Voids (%) -->		7.8	4.5
Vbeff (%) -->		12.71	13.17

RIDOT VTS-Shift E\* Results

LC-UC		E* (PSI)	
Temperature (F)	Frequency (Hz)	10/5/11	10/6/11
		12.5mm	12.5mm
10.0	25.0		2,886,681
	10.0		2,816,022
	5.0		2,754,191
	1.0		2,578,708
	0.5		2,487,904
	0.1		2,238,601
40.0	25.0		2,096,039
	10.0		1,915,588
	5.0		1,769,392
	1.0		1,407,729
	0.5		1,248,008
	0.1		889,107
70.0	25.0		1,028,240
	10.0		831,289
	5.0		693,522
	1.0		424,302
	0.5		333,102
	0.1		178,001
100.0	25.0		343,111
	10.0		243,293
	5.0		184,149
	1.0		91,872
	0.5		67,136
	0.1		32,134
130.0	25.0		99,321
	10.0		65,662
	5.0		47,796
	1.0		23,009
	0.5		16,980
	0.1		8,792

## APPENDIX B – QRSS AND SPT INPUT FILES

**SURFACE RUTTING**  
**DeIDOT C/160 HMA+ RAP**

Project	Lot	Target E* (ksi)	In-Situ E* (ksi)	Design Distress (in)	As Built Distress (in)	Design Service Life (Yrs)	Predicted Service Life (Yrs)	PLD	Pay Factor	Predicted Design Mix Rutting	Avg Predicted As-Built Rutting (in)
QRSS - standard A&VTS	1	379.429	274.775	0.078	0.113	9.777	10.77	0.99	100	0.078	0.103
	2	379.429	326.447	0.078	0.093	9.777	10.229	0.45	100		
QRSS - exp A&VTS	1	562.164	407.311	0.05	0.072	9.8	10.767	0.97	100	0.050	0.066
	2	562.164	483.913	0.05	0.059	9.8	10.24	0.44	100		
SPT-LC UC E*	1	629.48	456.34	0.04	0.05	10.00	10.11	0.10	100.00	0.039	0.051
	2	629.48	506.46	0.04	0.05	10.00	10.07	0.07	100.00		
SPT-LC IDT E*	1	471.23	456.34	0.05	0.05	10.01	10.01	0.01	100.00	0.053	0.051
	2	471.23	506.46	0.05	0.05	10.01	9.98	-0.03	100.00		

**SURFACE RUTTING**  
**DeIDOT SMA+RAP**

Project	Lot	Target E* (ksi)	In-Situ E* (ksi)	Design Distress (in)	As Built Distress (in)	Design Service Life (Yrs)	Predicted Service Life (Yrs)	PLD	Pay Factor	Predicted Design Mix Rutting	Avg Predicted As-Built Rutting (in)
QRSS - standard A&VTS	2	429.655	451.547	0.068	0.064	9.821	9.67	-0.15	100	0.068	0.066
	3	429.655	457.9	0.068	0.063	9.821	9.635	-0.19	100		
	4	429.655	427.37	0.068	0.068	9.821	9.828	0.01	100		
	5	429.655	428.895	0.068	0.067	9.821	9.817	0.00	100		
QRSS - exp A&VTS	2	316.295	332.881	0.096	0.09	9.793	9.636	-0.16	100	0.096	0.093
	3	316.295	337.627	0.096	0.089	9.793	9.599	-0.19	100		
	4	316.295	315.218	0.096	0.096	9.793	9.794	0.00	100		
	5	316.295	316.177	0.096	0.096	9.793	9.785	-0.01	100		
SPT-LC UC E*	2	711.39	664.11	0.03	0.04	10.00	10.02	0.02	100.00	0.034	0.040
	3	711.39	673.86	0.03	0.04	10.00	10.02	0.02	100.00		
	4	711.39	654.94	0.03	0.04	10.00	10.03	0.03	100.00		
	5	711.39	672.35	0.03	0.04	10.00	10.02	0.02	100.00		
SPT-LC IDT E*	2	610.58	664.11	0.04	0.04	10.00	9.97	-0.03	100.00	0.039	0.036
	3	610.58	673.86	0.04	0.04	10.00	9.97	-0.03	100.00		
	4	610.58	654.94	0.04	0.04	10.00	9.98	-0.02	100.00		
	5	610.58	672.35	0.04	0.04	10.00	9.97	-0.03	100.00		

**SURFACE RUTTING**

**FHWA DE0883**

Project	Lot	Target E* (ksi)	In-Situ E* (ksi)	Design Distress (in)	As Built Distress (in)	Design Service Life (Yrs)	Predicted Service Life (Yrs)	PLD	Pay Factor	Predicted Design Mix Rutting	Avg Predicted As-Built Rutting (in)
QRSS - Standard A & VTS	1	349.918	387.111	0.17	0.153	18.882	18.925	0.04	100	0.170	0.154
	2	349.918	385.663	0.17	0.154	18.882	18.923	0.04	100		
	3	349.918	383.823	0.17	0.154	18.882	18.921	0.04	100		
QRSS - Experimental A & VTS	1	295.511	327.204	0.201	0.181	19.077	19.118	0.04	100	0.201	0.181
	2	295.511	325.884	0.201	0.181	19.077	19.116	0.04	100		
	3	295.511	324.484	0.201	0.182	19.077	19.114	0.04	100		
SPT	1	572.25	573.60	0.08	0.08	20.00	20.00	0.01	100.00	0.084	0.084
	2	572.25	573.60	0.08	0.08	20.00	20.00	0.01	100.00		
	3	572.25	573.60	0.08	0.08	20.00	20.00	0.01	100.00		

**SURFACE RUTTING**

**MEDOT Township D**

Project	Lot	Target E* (ksi)	In-Situ E* (ksi)	Design Distress (in)	As Built Distress (in)	Design Service Life (Yrs)	Predicted Service Life (Yrs)	PLD	Pay Factor	Predicted Design Mix Rutting	Avg Predicted As-Built Rutting (in)
QRSS - Standard A & VTS	1	505.617	540.725	0.001	0.001	20.367	21.929	1.562	100	0.001	0.001
QRSS - Experimental A & VTS	1	265.487	283.992	0.001	0.001	20.372	21.941	1.569	100	0.001	0.001
SPT - PC-UC E*	1	297.456	726.226	0.015	0.006	20.013	17.406	-2.607	95.951	0.015	0.006
SPT - LC-UC E*	1	634.842	726.226	0.006	0.005	20.006	19.593	-0.413	100.000	0.006	0.005
SPT - LC-IDT E*	1	517.390	726.226	0.007	0.005	20.009	18.939	-1.070	100.000	0.007	0.005

**SURFACE RUTTING**

**FHWA ME0359**

Project	Lot	Target E* (ksi)	In-Situ E* (ksi)	Design Distress (in)	As Built Distress (in)	Design Service Life (Yrs)	Predicted Service Life (Yrs)	PLD	Pay Factor	Predicted Design Mix Rutting	Avg Predicted As-Built Rutting (in)
QRSS - Standard A & VTS	1	548.463	605.648	0.033	0.029	19.706	18.703	-1.00	100	0.033	0.031
	2	548.463	600.055	0.033	0.029	19.706	18.792	-0.91	100		
	3	548.463	562.302	0.033	0.032	19.706	19.43	-0.28	100		
	4	548.463	569.053	0.033	0.031	19.706	19.312	-0.39	100		
	5	548.463	546.725	0.033	0.033	19.706	19.712	0.01	100		
	6	548.463	573.903	0.033	0.031	19.706	19.228	-0.48	100		
QRSS - Experimental A & VTS	1	420.583	464.035	0.046	0.041	19.691	18.697	-0.99	100	0.046	0.044
	2	420.583	459.861	0.046	0.041	19.691	18.784	-0.91	100		
	3	420.583	431.069	0.046	0.045	19.691	19.419	-0.27	100		
	4	420.583	436.09	0.046	0.044	19.691	19.304	-0.39	100		
	5	420.583	419.125	0.046	0.046	19.691	19.701	0.01	100		
	6	420.583	439.844	0.046	0.044	19.691	19.219	-0.47	100		
SPT	1	517.83	389.30	0.03	0.04	20.00	20.19	0.19	100.00	0.031	0.041
	2	517.83	389.30	0.03	0.04	20.00	20.19	0.19	100.00		
	3	517.83	389.30	0.03	0.04	20.00	20.19	0.19	100.00		
	4	517.83	389.30	0.03	0.04	20.00	20.19	0.19	100.00		
	5	517.83	389.30	0.03	0.04	20.00	20.19	0.19	100.00		
	6	517.83	389.30	0.03	0.04	20.00	20.19	0.19	100.00		

**SURFACE RUTTING**

**RIDOT Dunn's Corner**

Project	Lot	Target E* (ksi)	In-Situ E* (ksi)	Design Distress (in)	As Built Distress (in)	Design Service Life (Yrs)	Predicted Service Life (Yrs)	PLD	Pay Factor	Predicted Design Mix Rutting	Avg Predicted As-Built Rutting (in)
QRSS - Standard A & VTS	10/5/2011	536.524	429.636	0.036	0.045	15.084	14.729	-0.36	100	0.036	0.040
	10/6/2011	536.524	568.304	0.036	0.034	15.084	15.19	0.11	100		
QRSS - Experimental A & VTS	10/5/2011	336.987	270.142	0.057	0.07	14.658	14.47	-0.19	100	0.057	0.062
	10/6/2011	336.987	358.426	0.057	0.053	14.658	14.723	0.07	100		
SPT - LC-UC E*	10/5/2011	101.22	88.24	0.18	0.21	19.97	19.33	-0.64	100.00	0.181	0.176
	10/6/2011	101.22	130.09	0.18	0.15	19.97	21.22	1.25	100.00		



**Binder Rutting**  
**DeIDOT C/160 HMA+RAP**

Project	Lot	Target E* (ksi)	In-Situ E* (ksi)	Design Distress (in)	As Built Distress (in)	Design Service Life (Yrs)	Predicted Service Life (Yrs)	PLD	Pay Factor	redicted Design Mix Rutting	Predicted As-Built Rutting (
QRSS - standard A&VTS	1	553.177	624.206	0.214	0.2	12.063	13.353	1.29	100	0.21	0.20
	2	553.177	567.598	0.214	0.213	12.063	12.312	0.25	100		
	3	553.177	565.133	0.214	0.212	12.063	12.278	0.22	100		
	4	553.177	636.667	0.214	0.198	12.063	13.57	1.51	100		
	5	553.177	680.119	0.214	0.19	12.063	14.347	2.28	100.35		
QRSS - exp A&VTS	1	541.866	611.419	0.217	0.202	12.101	13.395	1.29	100	0.22	0.20
	2	541.866	555.977	0.217	0.215	12.101	12.351	0.25	100		
	3	541.866	553.581	0.217	0.215	12.101	12.317	0.22	100		
	4	541.866	623.652	0.217	0.2	12.101	13.612	1.51	100		
	5	541.866	666.234	0.217	0.192	12.101	14.392	2.29	100.36		
SPT-LC UC E*	1	562.07	840.76	0.17	0.14	9.96	13.62	3.66	102.07	0.17	0.14
	2	562.07	728.06	0.17	0.15	9.96	12.20	2.24	100.30		
	3	562.07	678.13	0.17	0.16	9.96	11.56	1.59	100.00		
	4	562.07	970.42	0.17	0.12	9.96	15.19	5.22	104.03		
	5	562.07	942.79	0.17	0.13	9.96	14.86	4.89	103.62		
SPT-LC IDT E*	1	561.26	840.76	0.17	0.14	9.96	13.64	3.67	102.09	0.17	0.14
	2	561.26	728.06	0.17	0.15	9.96	12.22	2.25	100.32		
	3	561.26	678.13	0.17	0.16	9.96	11.57	1.60	100.00		
	4	561.26	970.42	0.17	0.12	9.96	15.20	5.24	104.05		
	5	561.26	942.79	0.17	0.13	9.96	14.87	4.91	103.64		

**Binder Rutting**  
**DeIDOT SMA+RAP**

Project	Lot	Target E* (ksi)	In-Situ E* (ksi)	Design Distress (in)	As Built Distress (in)	Design Service Life (Yrs)	Predicted Service Life (Yrs)	PLD	Pay Factor	redicted Design Mix Rutting	Predicted As-Built Rutting (
QRSS - standard A&VTS	1	549.361	619.891	0.215	0.2	12.076	13.368	1.29	100	0.22	0.20
	2	549.361	563.676	0.215	0.213	12.076	12.325	0.25	100		
	3	549.361	561.235	0.215	0.213	12.076	12.292	0.22	100		
	4	549.361	632.275	0.215	0.199	12.076	13.585	1.51	100		
	5	549.361	675.434	0.215	0.191	12.076	14.362	2.29	100.36		
QRSS - exp A&VTS	1	558.08	629.749	0.213	0.199	12.046	13.336	1.29	100	0.21	0.20
	2	558.08	572.635	0.213	0.211	12.046	12.295	0.25	100		
	3	558.08	570.14	0.213	0.211	12.046	12.262	0.22	100		
	4	558.08	642.308	0.213	0.197	12.046	13.551	1.51	100		
	5	558.08	686.138	0.213	0.189	12.046	14.327	2.28	100.35		
SPT-LC UC E*	1	561.79	795.47	0.17	0.14	9.96	13.06	3.10	101.37	0.17	0.14
	2	561.79	728.06	0.17	0.15	9.96	12.21	2.24	100.31		
	3	561.79	678.13	0.17	0.16	9.96	11.56	1.60	100.00		
	4	561.79	848.81	0.17	0.14	9.96	13.73	3.76	102.20		
	5	561.79	849.76	0.17	0.14	9.96	13.74	3.77	102.22		
SPT-LC IDT E*	1	562.02	795.47	0.17	0.14	9.96	13.06	3.09	101.37	0.17	0.14
	2	562.02	728.06	0.17	0.15	9.96	12.20	2.24	100.30		
	3	562.02	678.13	0.17	0.16	9.96	11.56	1.59	100.00		
	4	562.02	848.81	0.17	0.14	9.96	13.72	3.76	102.20		
	5	562.02	849.76	0.17	0.14	9.96	13.73	3.77	102.21		

**Binder Rutting  
FHWA DE0883**

Project	Lot	Target E* (ksi)	In-Situ E* (ksi)	Design Distress (in)	As Built Distress (in)	Design Service Life (Yrs)	Predicted Service Life (Yrs)	PLD	Pay Factor	redicted Design Mix Rutting	Predicted As-Built Rutting
QRSS - Standard A & VTS	1	508.222	659.825	0.22	0.175	27.015	28.238	1.22	100	0.22	0.18
	2	508.222	599.969	0.22	0.193	27.015	27.754	0.74	100		
	3	508.222	597.31	0.22	0.192	27.015	27.757	0.74	100		
	4	508.222	672.918	0.22	0.173	27.015	28.318	1.30	100		
	5	508.222	718.794	0.22	0.163	27.015	28.644	1.63	100		
QRSS - Experimental A & VTS	1	511.885	664.59	0.219	0.174	26.98	28.202	1.22	100	0.22	0.18
	2	511.885	604.299	0.219	0.192	26.98	27.719	0.74	100		
	3	511.885	601.613	0.219	0.191	26.98	27.721	0.74	100		
	4	511.885	677.766	0.219	0.172	26.98	28.282	1.30	100		
	5	511.885	723.967	0.219	0.161	26.98	28.608	1.63	100		
SPT	1	648.53	840.76	0.14	0.11	19.94	21.50	1.56	100.00	0.14	0.12
	2	648.53	728.06	0.14	0.13	19.94	20.66	0.72	100.00		
	3	648.53	678.13	0.14	0.14	19.94	20.25	0.31	100.00		
	4	648.53	970.42	0.14	0.10	19.94	22.36	2.42	100.52		
	5	648.53	942.79	0.14	0.10	19.94	22.18	2.24	100.30		

**Binder Rutting  
MEDOT Township D**

Project	Lot	Target E* (ksi)	In-Situ E* (ksi)	Design Distress (in)	As Built Distress (in)	Design Service Life (Yrs)	Predicted Service Life (Yrs)	PLD	Pay Factor	redicted Design Mix Rutting	Predicted As-Built Rutting
QRSS - Standard A & VTS	1	806.147	891.531	0.147	0.139	17.725	19.461	1.736	100	0.147	0.147
	2	806.147	733.927	0.147	0.155	17.725	16.256	-1.469	100		
QRSS - Experimental A	1	417.171	460.96	0.213	0.201	17.318	18.914	1.596	100	0.213	0.213
	2	417.171	379.381	0.213	0.225	17.318	15.936	-1.382	100		
SPT - PC-UC E*	1	172.993	797.286	0.081	0.020	19.987	27.260	7.273	110.00	0.081	0.020
	2	172.993	850.861	0.081	0.019	19.987	27.621	7.634	110.00		
SPT - LC-UC E*	1	358.324	797.286	0.036	0.017	19.995	23.395	3.400	103.50	0.036	0.017
	2	358.324	850.861	0.036	0.016	19.995	23.696	3.701	104.25		
SPT - LC-IDT E*	1	288.813	797.286	0.043	0.017	19.993	24.404	4.411	106.03	0.043	0.017
	2	288.813	850.861	0.043	0.016	19.993	24.717	4.724	106.81		

**Binder Rutting  
FHWA ME0359**

Project	Lot	Target E* (ksi)	In-Situ E* (ksi)	Design Distress (in)	As Built Distress (in)	Design Service Life (Yrs)	Predicted Service Life (Yrs)	PLD	Pay Factor	redicted Design Mix Rutting	Predicted As-Built Rutting (
QRSS - Standard A & VTS	1	703.148	913.452	0.12	0.102	23.867	28.977	5.11	107.78	0.12	0.10
	2	703.148	830.424	0.12	0.109	23.867	26.958	3.09	102.73		
	3	703.148	826.315	0.12	0.109	23.867	26.898	3.03	102.58		
	4	703.148	930.921	0.12	0.101	23.867	29.359	5.49	108.73		
	5	703.148	993.993	0.12	0.097	23.867	30.817	6.95	110		
QRSS - Experimental A & VTS	1	712.157	925.178	0.119	0.101	23.817	28.919	5.10	107.76	0.12	0.10
	2	712.157	841.077	0.119	0.108	23.817	26.902	3.09	102.71		
	3	712.157	836.898	0.119	0.108	23.817	26.842	3.03	102.56		
	4	712.157	942.845	0.119	0.1	23.817	29.299	5.48	108.71		
	5	712.157	1,006.71	0.119	0.096	23.817	30.755	6.94	110		
SPT	1	828.65	840.76	0.09	0.08	19.95	20.21	0.26	100.00	0.12	0.10
	2	828.65	728.06	0.09	0.09	19.95	18.19	-1.76	100.00		
	3	828.65	678.13	0.09	0.10	19.95	17.26	-2.69	95.39		
	4	828.65	970.42	0.09	0.08	19.95	22.43	2.48	101.19		
	5	828.65	942.79	0.09	0.08	19.95	21.97	2.01	100.04		

**BINDER RUTTING**

**RIDOT Dunn's Corner HMA**

Project	Lot	Target E* (ksi)	In-Situ E* (ksi)	Design Distress (in)	As Built Distress (in)	Design Service Life (Yrs)	Predicted Service Life (Yrs)	PLD	Pay Factor	redicted Design Mix Rutting	Predicted As-Built Rutting (
QRSS - (standard Binder values)	1	779.274	1,012.54	0.031	0.027	24.7	30.447	5.747	109.37	0.03	0.03
	2	779.274	920.435	0.031	0.029	24.7	28.176	3.476	103.69		
	3	779.274	915.737	0.031	0.029	24.7	28.094	3.394	103.49		
	4	779.274	1,031.67	0.031	0.027	24.7	30.883	6.183	110		
	5	779.274	1,101.43	0.031	0.026	24.7	32.54	7.84	110		
QRSS - (experimental Binder A&VTS)	1	798.974	1,038.19	0.031	0.026	24.58	30.303	5.723	109.31	0.03	0.03
	2	798.974	943.734	0.031	0.028	24.58	28.042	3.462	103.65		
	3	798.974	938.879	0.031	0.028	24.58	27.959	3.379	103.45		
	4	798.974	1,057.74	0.031	0.026	24.58	30.735	6.155	110		
	5	798.974	1,129.24	0.031	0.025	24.58	32.384	7.804	110		
SPT - LC-UC E*	1	191.43	840.76	0.07	0.03	19.88	61.95	42.07	110.00	0.07	0.03
	2	191.43	728.06	0.07	0.03	19.88	55.81	35.93	110.00		
	3	191.43	678.13	0.07	0.03	19.88	52.97	33.09	110.00		
	4	191.43	970.42	0.07	0.03	19.88	68.63	48.75	110.00		
	5	191.43	942.79	0.07	0.03	19.88	67.24	47.36	110.00		

**BASE RUTTING**

**MEDOT Township D**

Project	Lot	Target E* (ksi)	In-Situ E* (ksi)	Design Distress (in)	As Built Distress (in)	Design Service Life (Yrs)	Predicted Service Life (Yrs)	PLD	Pay Factor	Avg Design Rutting (in)	Avg As-Built Rutting (in)
SPT - PC-UC E*	1	715.43	315.61	0.04	0.07	19.99	9.57	-10.43	95.95	0.043	0.068
SPT - LC-UC E*	1	1442.14	315.61	0.02	0.05	20.00	5.08	-14.92	100.00	0.022	0.052
SPT - LC-IDT E*	1	1057.26	315.61	0.03	0.05	19.99	6.73	-13.27	100.00	0.026	0.052

**Fatigue Cracking**

**DeIDOT C/160 HMA+RAP**

Project	Lot	Target E* (ksi)	In-Situ E* (ksi)	Design Distress (%)	As Built Distress (%)	Design Service Life (Yrs)	Predicted Service Life (Yrs)	PLD	Pay Factor	Design Fatigue Cracking (%)	As-Built Fatigue Cracking (%)
QRSS - standard A&VTS	1	1,247.95	1,410.30	2.474	2.238	13.511	10.058	-3.45	82.07	2.47	6.60
	2	1,247.95	1,282.77	2.474	16.917	13.511	2.154	-11.36	0		
	3	1,247.95	1,276.08	2.474	11.306	13.511	2.518	-10.99	0		
	4	1,247.95	1,438.05	2.474	0.912	13.511	21.188	7.68	105		
	5	1,247.95	1,532.36	2.474	1.604	13.511	13.232	-0.28	100		
QRSS - exp A&VTS	1	1,248.01	1,410.35	2.53	2.286	10.448	7.696	-2.75	90.71	2.53	6.72
	2	1,248.01	1,282.83	2.53	17.199	10.448	1.634	-8.81	0		
	3	1,248.01	1,276.13	2.53	11.526	10.448	1.911	-8.54	0		
	4	1,248.01	1,438.11	2.53	0.931	10.448	16.406	5.96	104.95		
	5	1,248.01	1,532.42	2.53	1.638	10.448	10.16	-0.29	100		
SPT-LC UC E*	1	1207.54	1475.67	2.57	5.70	11.63	5.06	-6.46	63.00	2.57	13.16
	2	1207.54	1300.91	2.57	29.18	11.63	1.00	-10.46	0.00		
	3	1207.54	1258.00	2.57	23.92	11.63	1.30	-10.17	0.00		
	4	1207.54	1678.65	2.57	2.47	11.63	10.36	-1.23	100.00		
	5	1207.54	1689.79	2.57	4.51	11.63	6.27	-5.27	63.00		
SPT-LC IDT E*	1	1222.65	1475.67	2.49	5.59	14.27	6.23	-7.92	0.00	2.49	12.96
	2	1222.65	1300.91	2.49	28.79	14.27	1.24	-12.83	0.00		
	3	1222.65	1258.00	2.49	23.57	14.27	1.60	-12.48	0.00		
	4	1222.65	1678.65	2.49	2.43	14.27	12.66	-1.56	100.00		
	5	1222.65	1689.79	2.49	4.42	14.27	7.70	-6.47	63.00		

**Fatigue Cracking**

**DeIDOT SMA+RAP**

Project	Lot	Target E* (ksi)	In-Situ E* (ksi)	Design Distress (%)	As Built Distress (%)	Design Service Life (Yrs)	Predicted Service Life (Yrs)	PLD	Pay Factor	Design Fatigue Cracking (%)	As-Built Fatigue Cracking (%)
QRSS - standard A&VTS	1	1,248.13	1,410.50	2.468	2.233	13.843	10.316	-3.53	81.17	2.47	6.58
	2	1,248.13	1,282.95	2.468	16.888	13.843	2.211	-11.63	0		
	3	1,248.13	1,276.26	2.468	11.284	13.843	2.585	-11.26	0		
	4	1,248.13	1,438.26	2.468	0.91	13.843	21.706	7.86	105		
	5	1,248.13	1,532.58	2.468	1.6	13.843	13.567	-0.28	100		
QRSS - exp A&VTS	1	1,248.09	1,410.45	2.433	2.204	16.094	12.083	-4.01	75.2	2.43	6.51
	2	1,248.09	1,282.91	2.433	16.716	16.094	2.605	-13.49	0		
	3	1,248.09	1,276.22	2.433	11.15	16.094	3.047	-13.05	0		
	4	1,248.09	1,438.21	2.433	0.898	16.094	25.205	9.11	105		
	5	1,248.09	1,532.53	2.433	1.58	16.094	15.849	-0.25	100		
SPT-LC UC E*	1	1198.49	1426.24	2.61	5.02	10.41	5.08	-5.22	63.00	2.61	11.50
	2	1198.49	1300.91	2.61	25.62	10.41	1.05	-9.19	0.00		
	3	1198.49	1258.00	2.61	20.84	10.41	1.35	-8.90	0.00		
	4	1198.49	1555.97	2.61	2.17	10.41	10.39	0.01	100.00		
	5	1198.49	1551.08	2.61	3.84	10.41	6.46	-3.86	77.02		
SPT-LC IDT E*	1	1205.83	1426.24	2.57	4.98	11.49	5.62	-5.77	63.00	2.57	11.41
	2	1205.83	1300.91	2.57	25.45	11.49	1.16	-10.15	0.00		
	3	1205.83	1258.00	2.57	20.69	11.49	1.50	-9.82	0.00		
	4	1205.83	1555.97	2.57	2.15	11.49	11.44	-0.02	100.00		
	5	1205.83	1551.08	2.57	3.80	11.49	7.13	-4.27	71.96		

**Fatigue Cracking**

**FHWA DE0883**

Project	Lot	Target E* (ksi)	In-Situ E* (ksi)	Design Distress (%)	As Built Distress (%)	Design Service Life (Yrs)	Predicted Service Life (Yrs)	PLD	Pay Factor	Design Fatigue Cracking (%)	As-Built Fatigue Cracking (%)
QRSS - Standard A & VTS	1	1,005.99	1,309.17	2.563	0.427	15.539	34.17	18.63	105	2.56	1.32
	2	1,005.99	1,190.80	2.563	3.49	15.539	10.681	-4.86	64.75		
	3	1,005.99	1,184.76	2.563	2.186	15.539	12.516	-3.02	87.38		
	4	1,005.99	1,335.14	2.563	0.176	15.539	51.396	35.86	105		
	5	1,005.99	1,422.84	2.563	0.305	15.539	40.304	24.77	105		
QRSS - Experimental A & VTS	1	1,005.98	1,309.15	2.549	0.425	22.252	45.026	22.77	105	2.55	1.31
	2	1,005.98	1,190.78	2.549	3.473	22.252	16.084	-6.17	63		
	3	1,005.98	1,184.74	2.549	2.174	22.252	18.747	-3.51	81.44		
	4	1,005.98	1,335.12	2.549	0.176	22.252	63.742	41.49	105		
	5	1,005.98	1,422.81	2.549	0.303	22.252	51.823	29.57	105		
SPT	1	1104.82	1475.67	2.39	0.52	17.04	38.48	21.51	105.00	2.39	1.44
	2	1104.82	1300.91	2.39	3.36	17.04	13.14	-3.89	76.69		
	3	1104.82	1258.00	2.39	2.76	17.04	15.23	-1.80	100.00		
	4	1104.82	1678.65	2.39	0.19	17.04	57.99	41.18	105.00		
	5	1104.82	1689.79	2.39	0.35	17.04	45.66	28.74	105.00		

**FATIGUE CRACKING**

**MEDOT Township D**

Project	Lot	Target E* (ksi)	In-Situ E* (ksi)	Design Distress (%)	As Built Distress (%)	Design Service Life (Yrs)	Predicted Service Life (Yrs)	PLD	Pay Factor	Design Fatigue Cracking (%)	As-Built Fatigue Cracking (%)
QRSS - Standard A &	1	1,777.04	1,962.11	0.004	0.001	28.673	48.076	19.403	110	0.004	0.0025
	2	1,777.04	1,613.50	0.004	0.004	28.673	15.83	-12.843	0		
QRSS - Experimental A	1	975.942	1,076.26	0.003	0.001	30.76	47.628	16.868	110	0.003	0.002
	2	975.942	884.822	0.003	0.003	30.76	16.133	-14.627	0.00		
SPT - PC-UC E*	1	1,128.56	558.00	0.587921682	0.526944791	4.543942319	4.369804942	-0.16144	100	0.588	0.527
SPT - LC-UC E*	1	2,087.73	558.00	0.598990798	0.479694017	3.806278111	4.091943883	0.284201	100.00	0.599	0.480
SPT - LC-IDT E*	1	1,580.11	558.00	0.813401354	0.517914334	1.906342009	2.532736074	0.614128	100	0.813	0.518

**FATIGUE CRACKING**

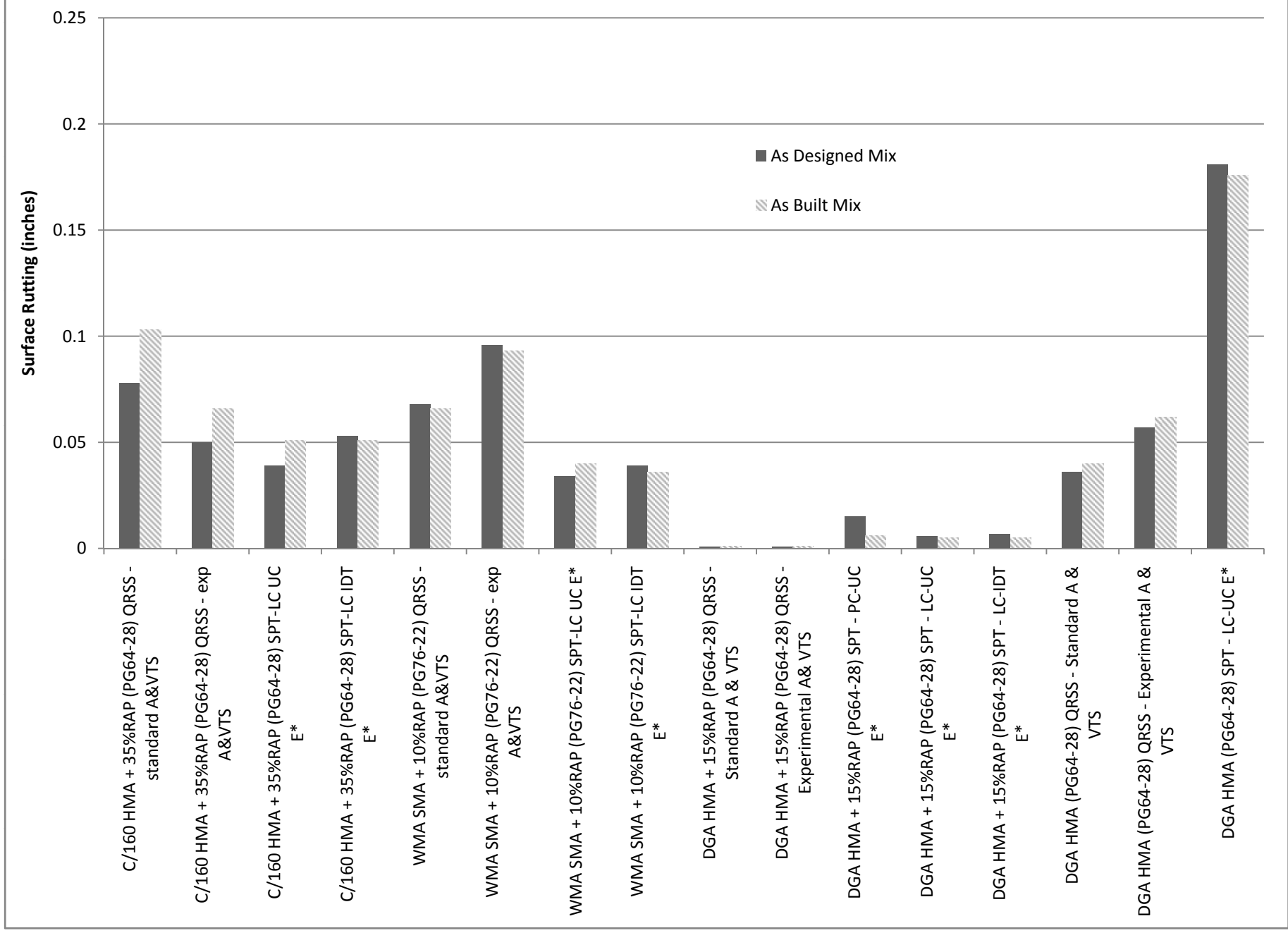
**FHWA ME0359**

Project	Lot	Target E* (ksi)	In-Situ E* (ksi)	Design Distress (%)	As Built Distress (%)	Design Service Life (Yrs)	Predicted Service Life (Yrs)	PLD	Pay Factor	Design Fatigue Cracking (%)	As-Built Fatigue Cracking (%)
QRSS - Standard A & VTS	1	1,596.78	2,079.57	2.462	0.489	23.644	57.922	34.28	110	2.46	1.67
	2	1,596.78	1,891.26	2.462	4.61	23.644	14.767	-8.88	0.00		
	3	1,596.78	1,880.02	2.462	2.692	23.644	17.298	-6.35	80		
	4	1,596.78	2,118.68	2.462	0.197	23.644	100.501	76.86	110		
	5	1,596.78	2,256.59	2.462	0.349	23.644	71.688	48.04	110		
QRSS - Experimental A & VTS	1	1,596.75	2,079.54	2.423	0.482	26.711	64.466	37.76	110	2.42	1.64
	2	1,596.75	1,891.23	2.423	4.549	26.711	16.823	-9.89	0.00		
	3	1,596.75	1,879.99	2.423	2.654	26.711	19.707	-7.00	0.00		
	4	1,596.75	2,118.65	2.423	0.195	26.711	109.786	83.08	110		
	5	1,596.75	2,256.56	2.423	0.344	26.711	79.257	52.55	110		
SPT	1	1614.88	1475.67	2.39	0.64	26.33	58.77	32.80	110.00	2.39	1.94
	2	1614.88	1300.91	2.39	4.66	26.33	14.72	-11.58	0.00		
	3	1614.88	1258.00	2.39	3.74	26.33	17.79	-8.52	80.00		
	4	1614.88	1678.65	2.39	0.23	26.33	104.63	78.29	110.00		
	5	1614.88	1689.79	2.39	0.44	26.33	73.80	48.11	110.00		

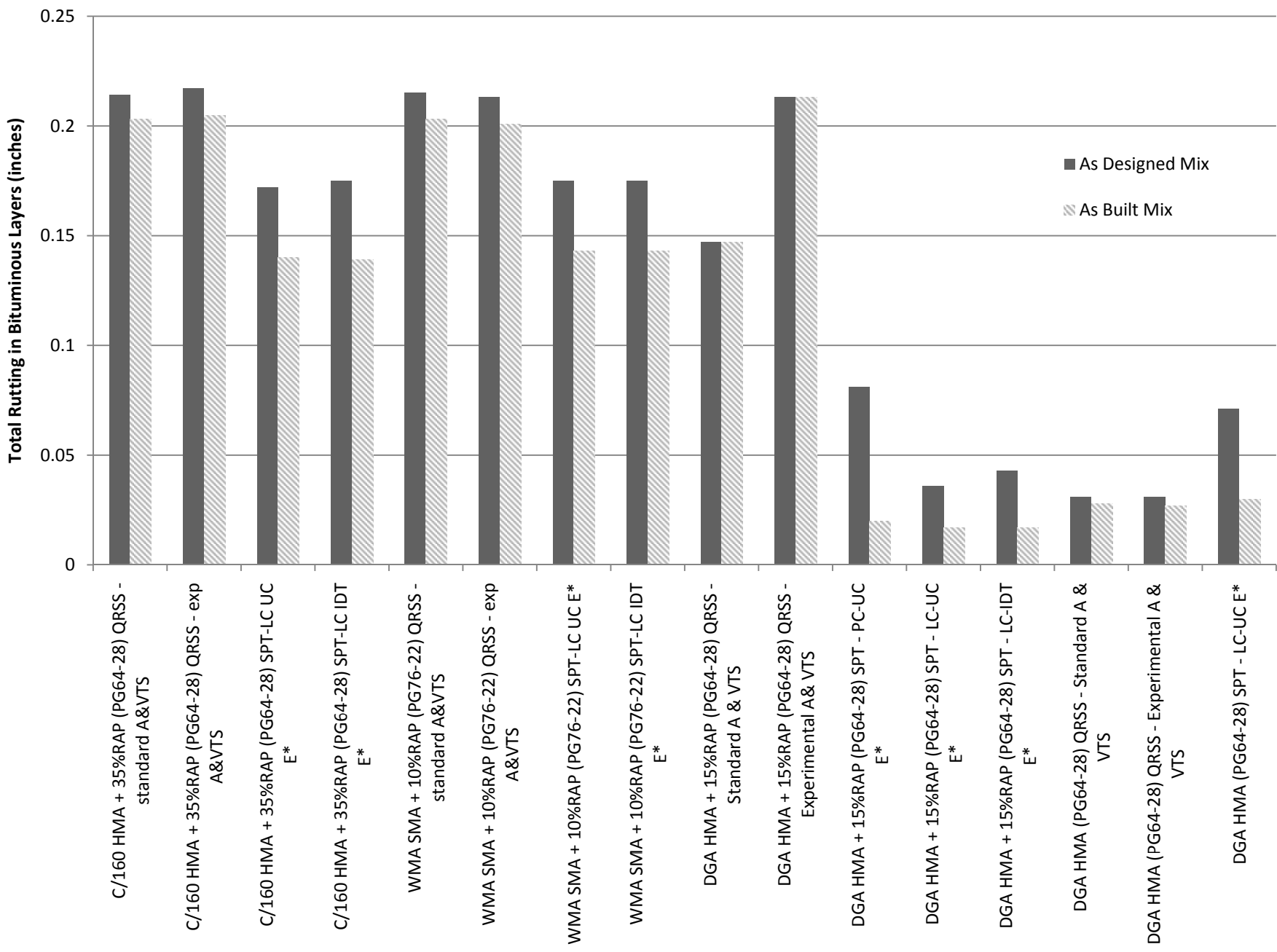
**FATIGUE CRACKING**

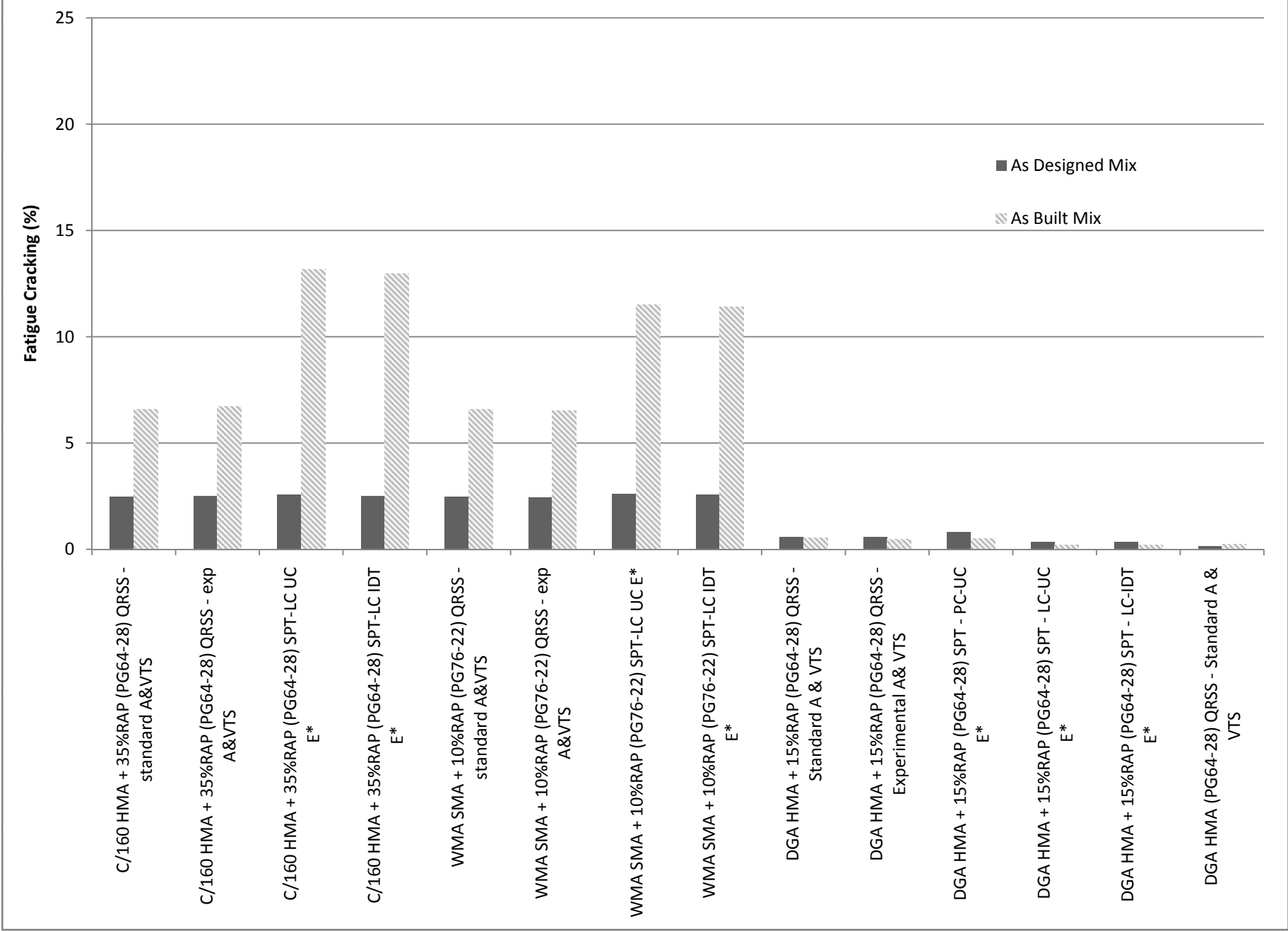
**RIDOT Dunn's Corner HMA**

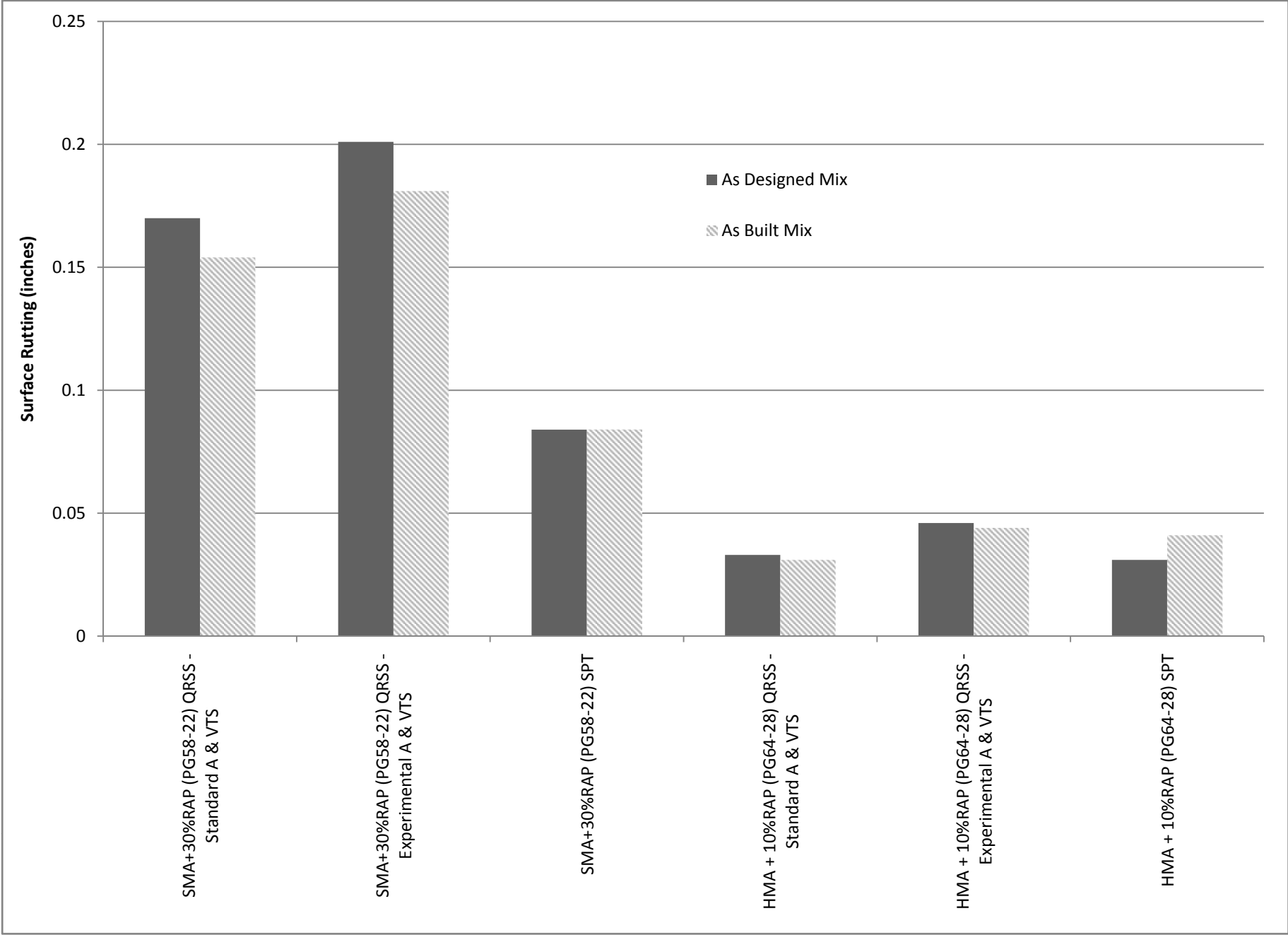
Project	Lot	Target E* (ksi)	In-Situ E* (ksi)	Design Distress (%)	As Built Distress (%)	Design Service Life (Yrs)	Predicted Service Life (Yrs)	PLD	Pay Factor	Design Fatigue Cracking (%)	As-Built Fatigue Cracking (%)
QRSS - (standard Binder values)	1	1,135.77	1,478.15	0.348	0.063	26.103	68.664	42.56	110	0.35	0.21
	2	1,135.77	1,344.33	0.348	0.592	26.103	15.522	-10.58	0.00		
	3	1,135.77	1,337.25	0.348	0.344	26.103	18.195	-7.91	0.00		
	4	1,135.77	1,507.00	0.348	0.026	26.103	131.582	105.48	110		
	5	1,135.77	1,605.85	0.348	0.045	26.103	88.201	62.10	110		
QRSS - (experimental Binder A&VTS)	1	1,135.72	1,478.08	0.34	0.062	33.702	86.882	53.18	110	0.34	0.21
	2	1,135.72	1,344.26	0.34	0.581	33.702	20.318	-13.38	0.00		
	3	1,135.72	1,337.18	0.34	0.337	33.702	23.821	-9.88	0.00		
	4	1,135.72	1,506.93	0.34	0.025	33.702	160.862	127.16	110		
	5	1,135.72	1,605.77	0.34	0.044	33.702	110.314	76.61	110		
SPT - LC-UC E*	1	537.49	1475.67	0.15	0.08	20.32	31.12	10.83	110.00	0.15	0.25
	2	537.49	1300.91	0.15	0.60	20.32	5.87	-14.28	0.00		
	3	537.49	1258.00	0.15	0.48	20.32	7.23	-12.95	0.00		
	4	537.49	1678.65	0.15	0.03	20.32	68.27	47.95	110.00		
	5	537.49	1689.79	0.15	0.06	20.32	41.44	21.28	110.00		

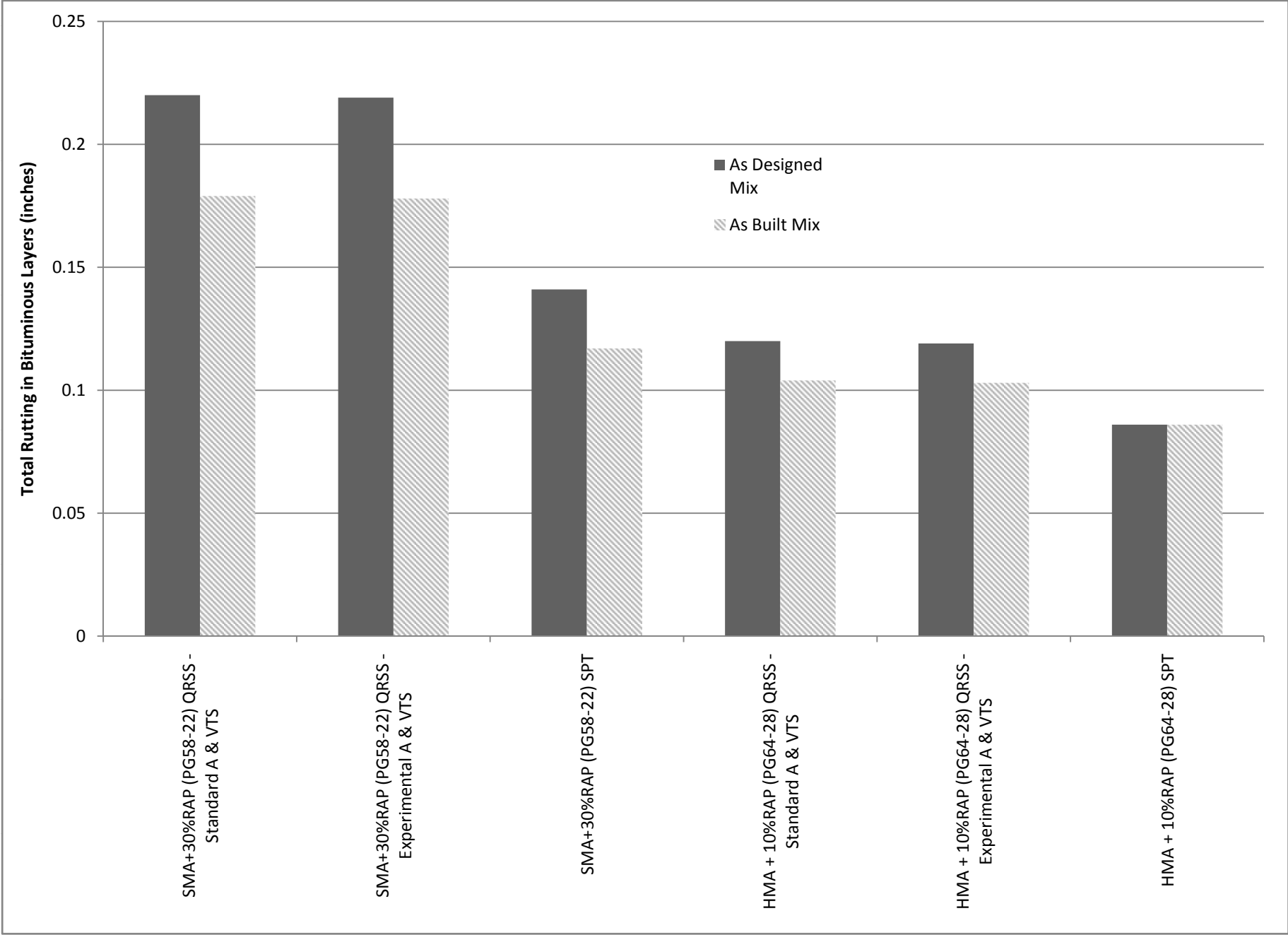


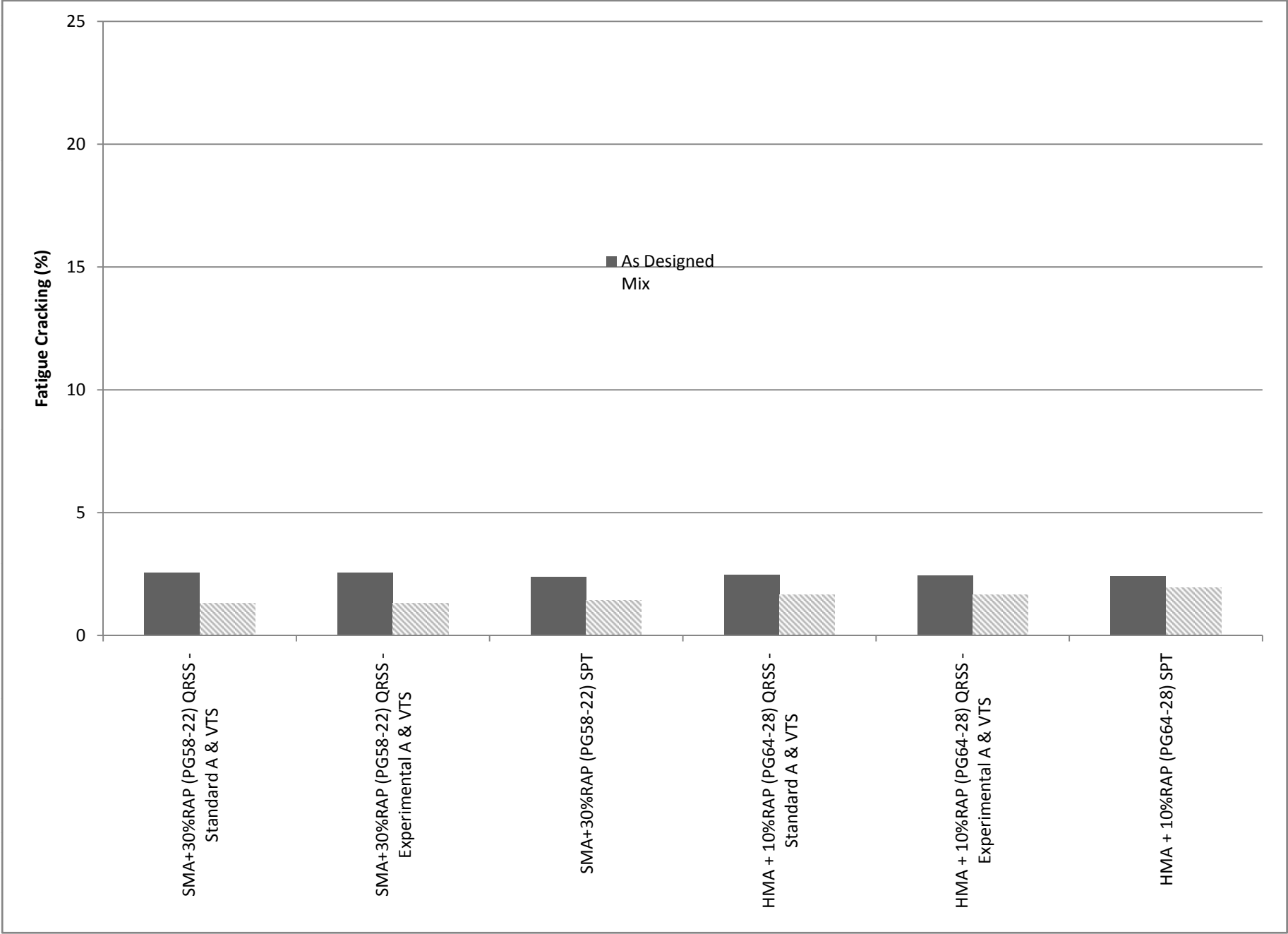


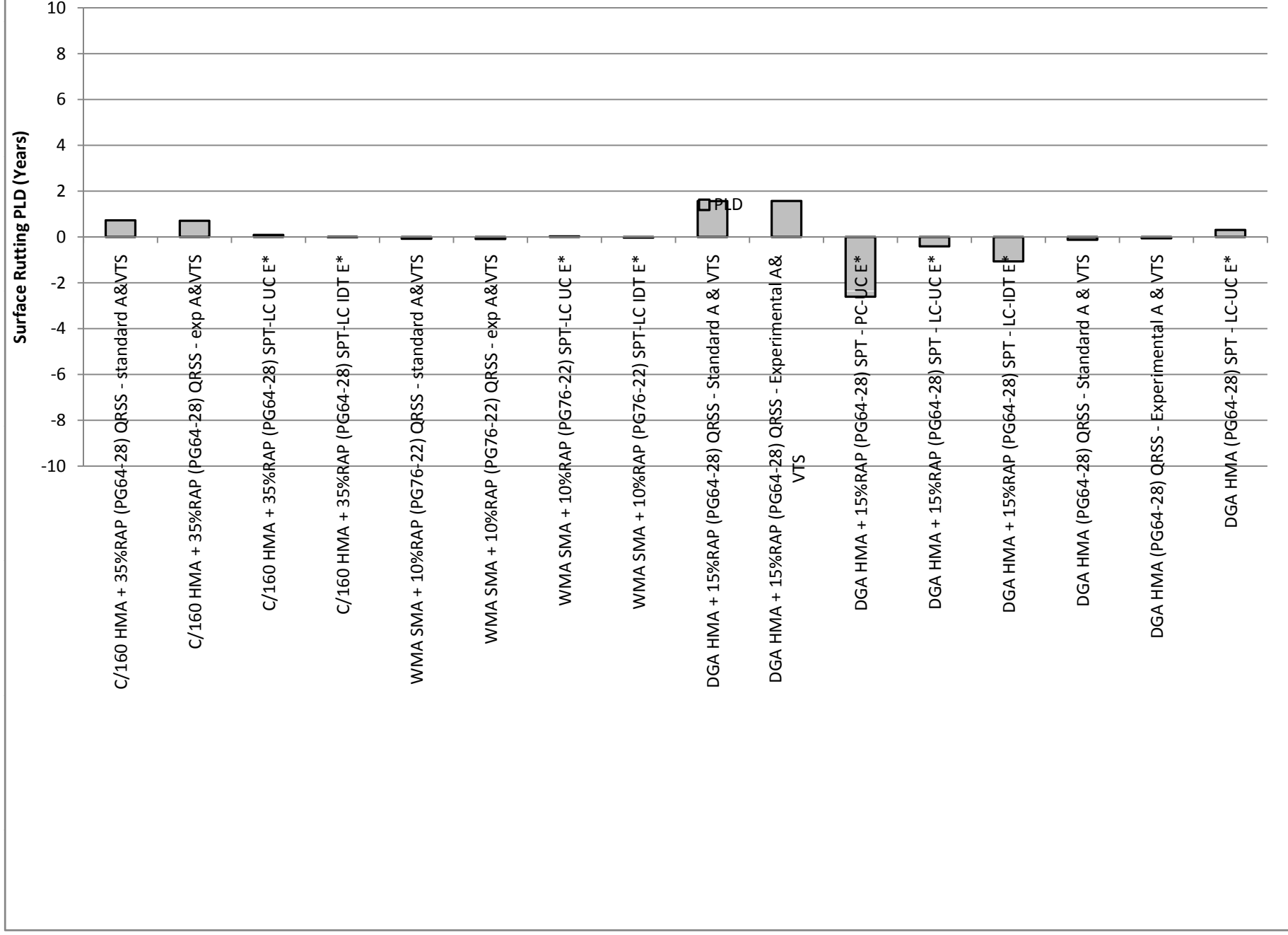


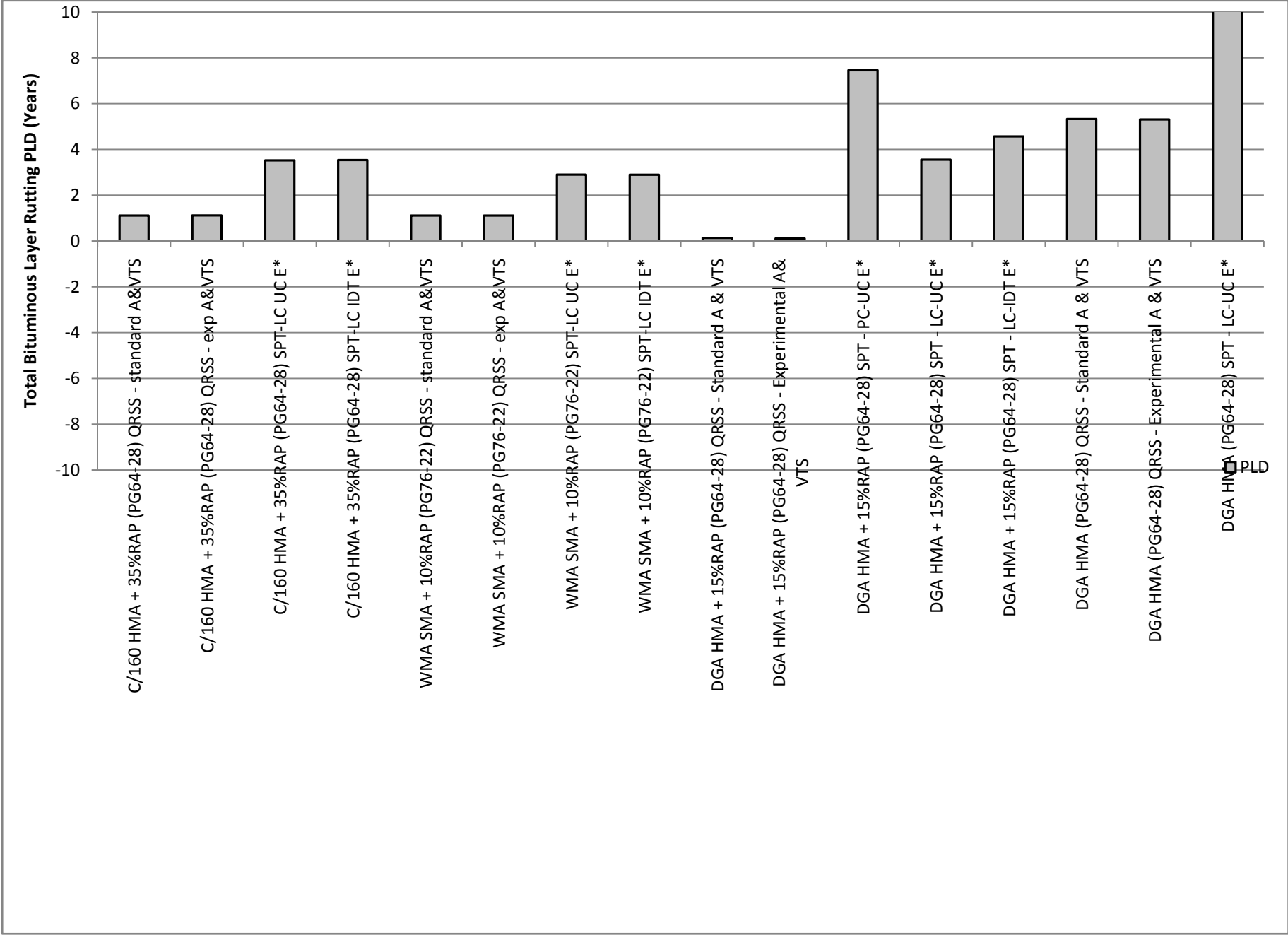


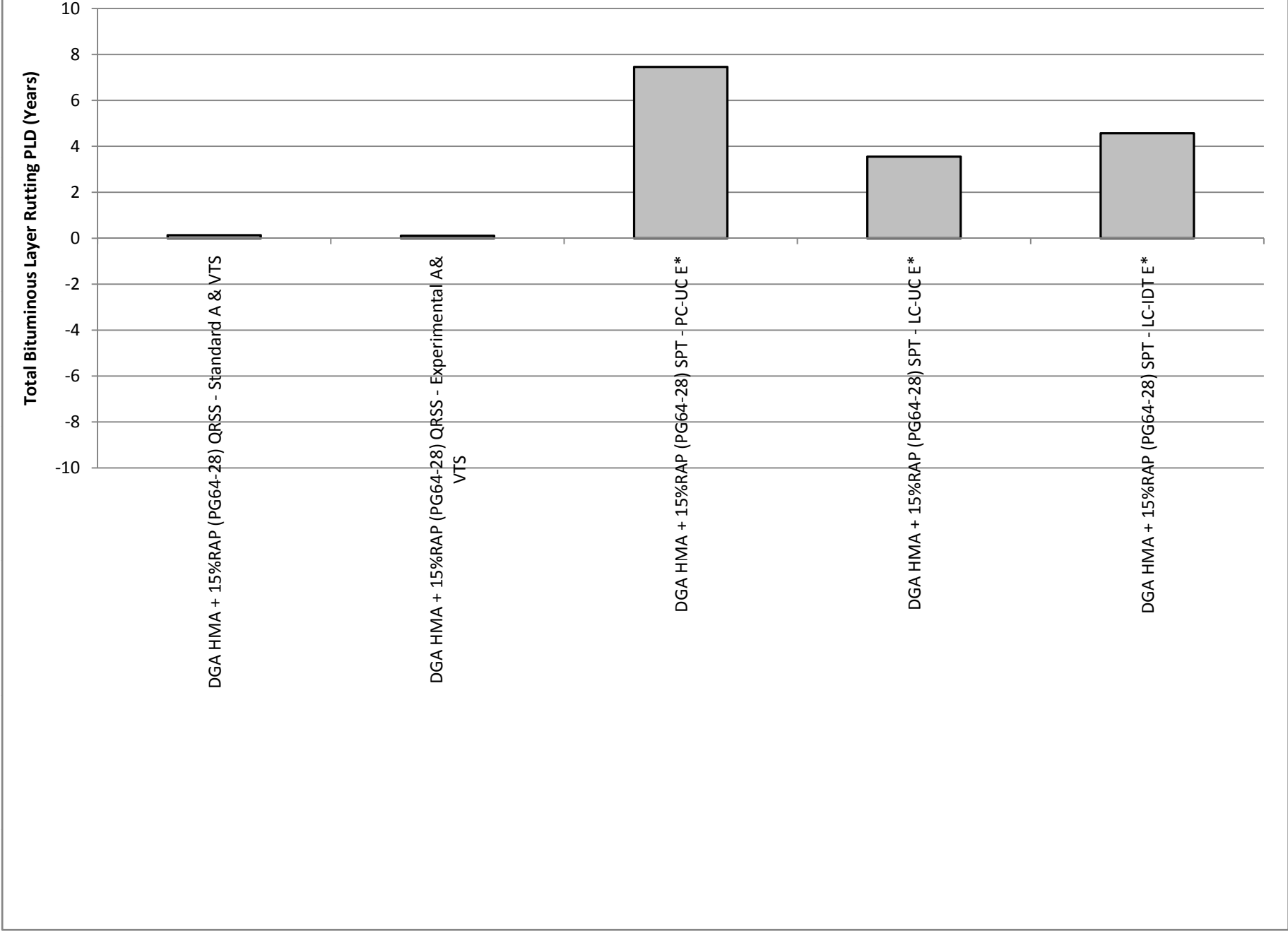




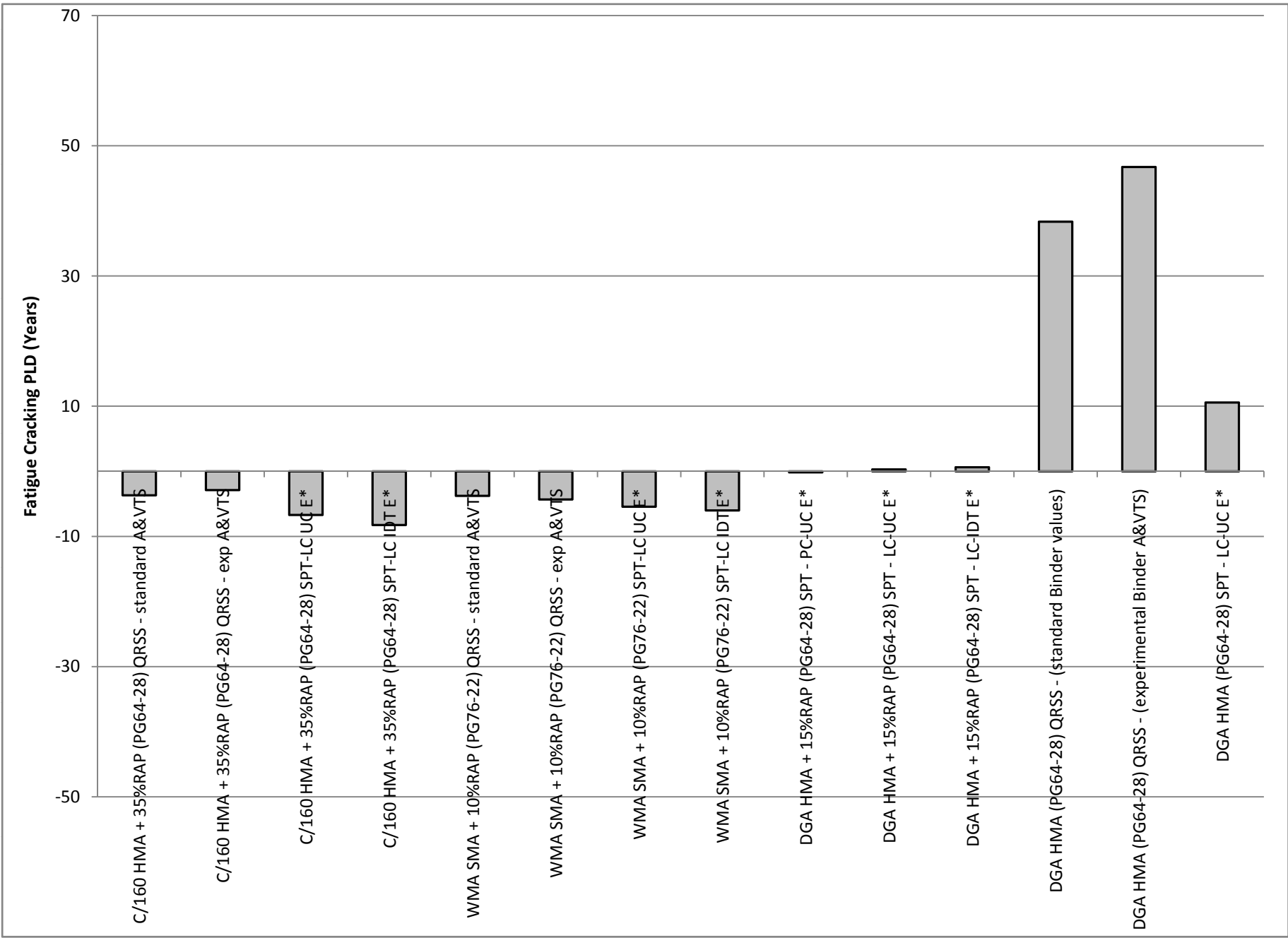


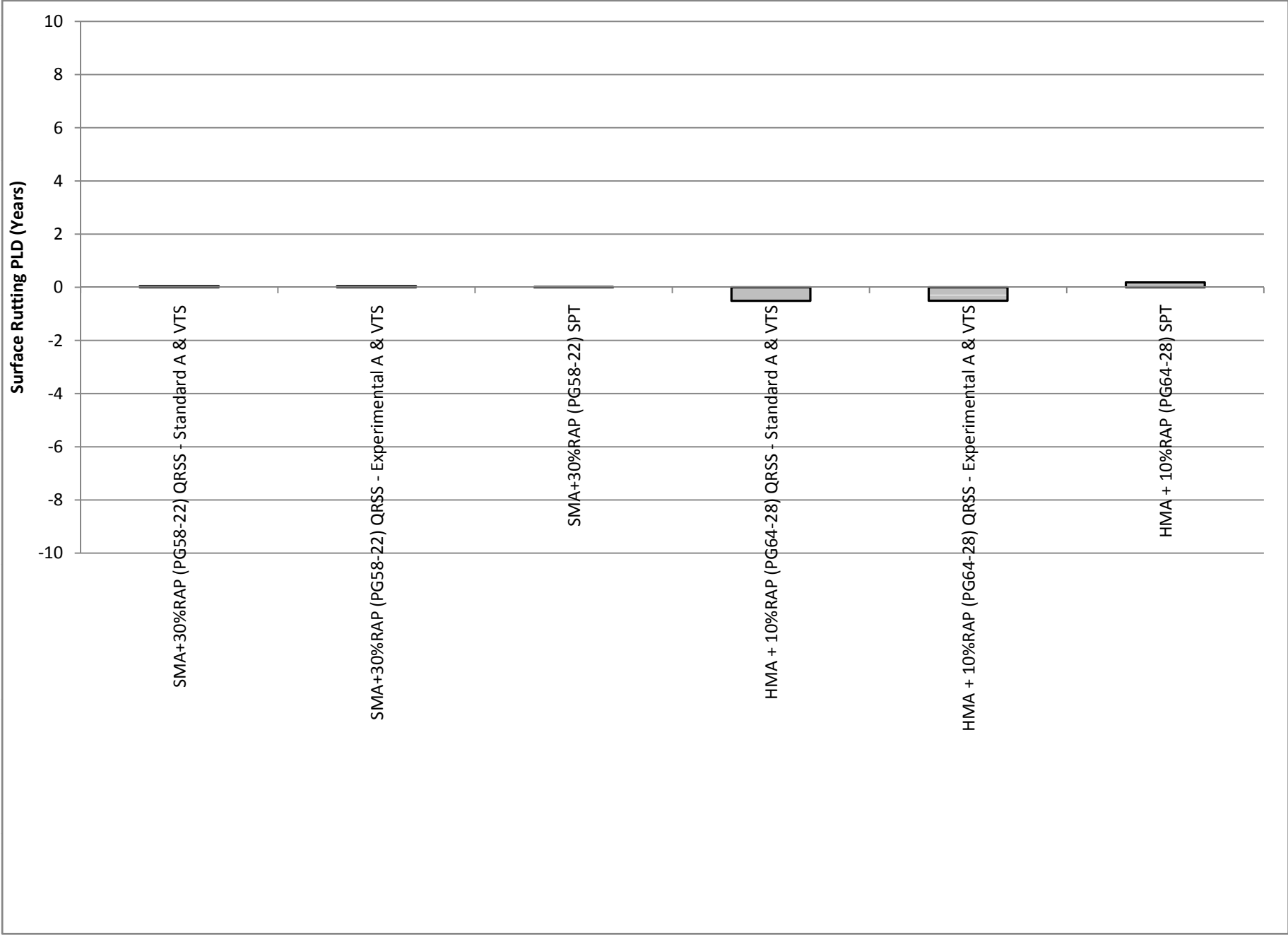


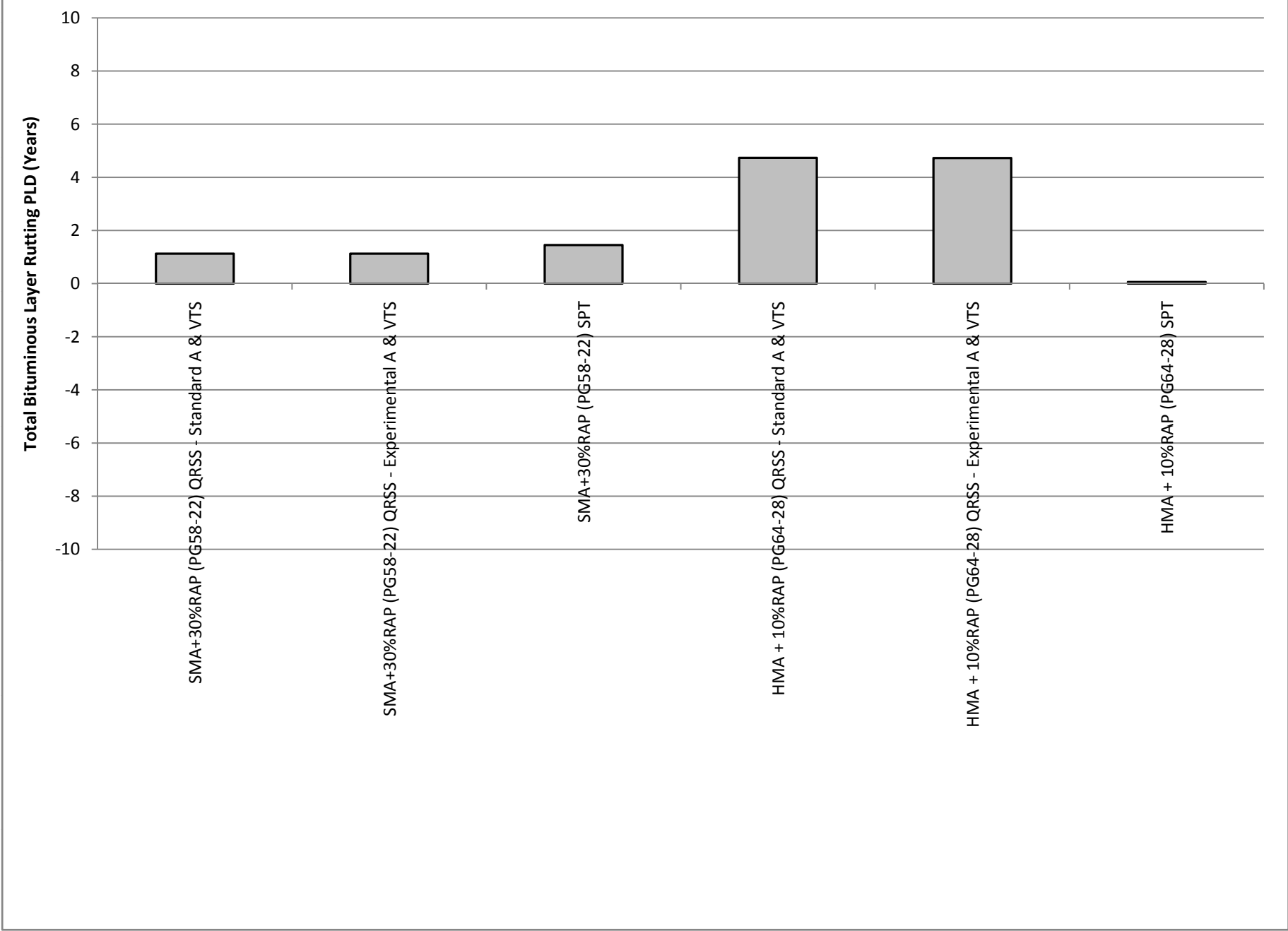


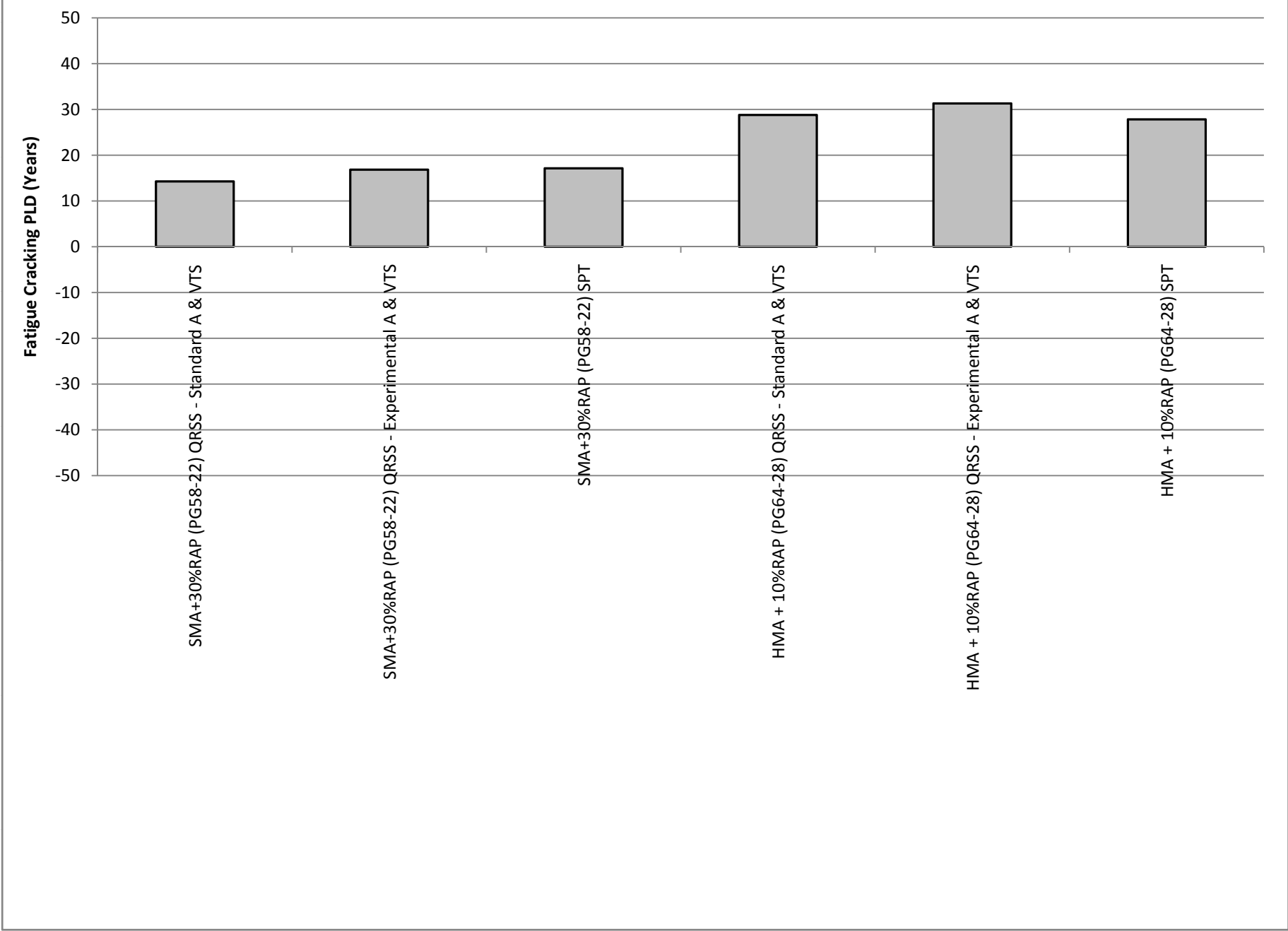


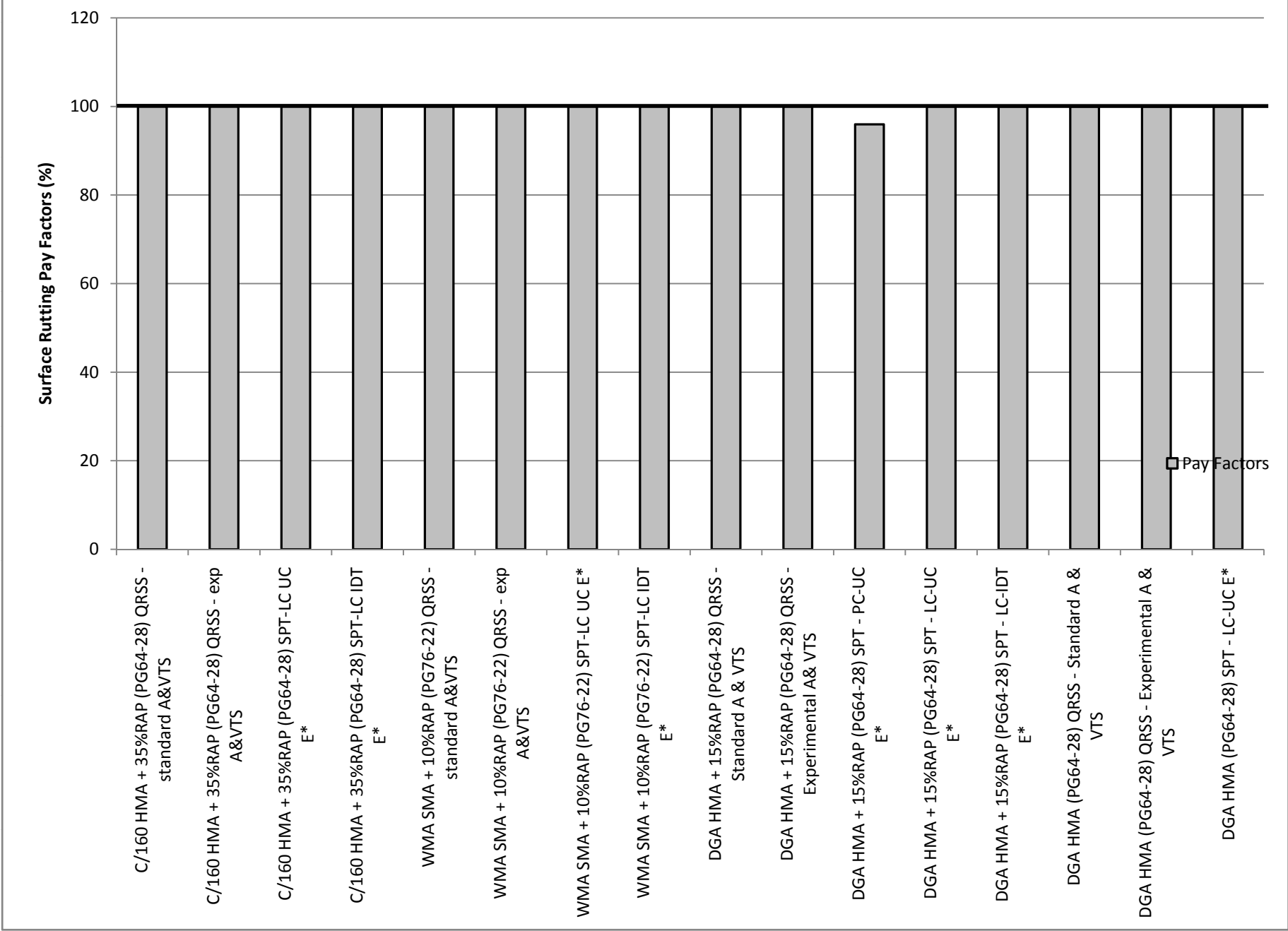


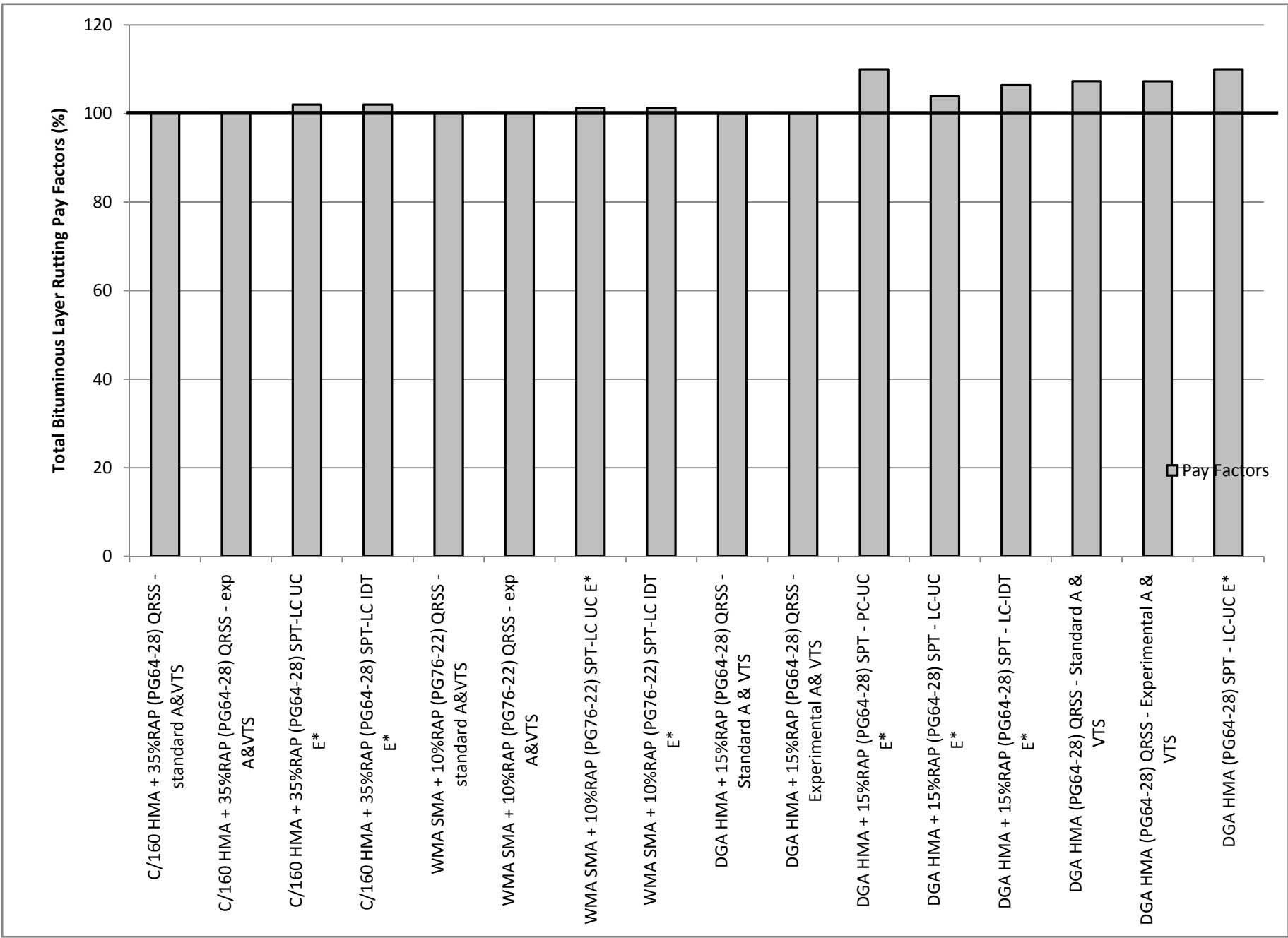


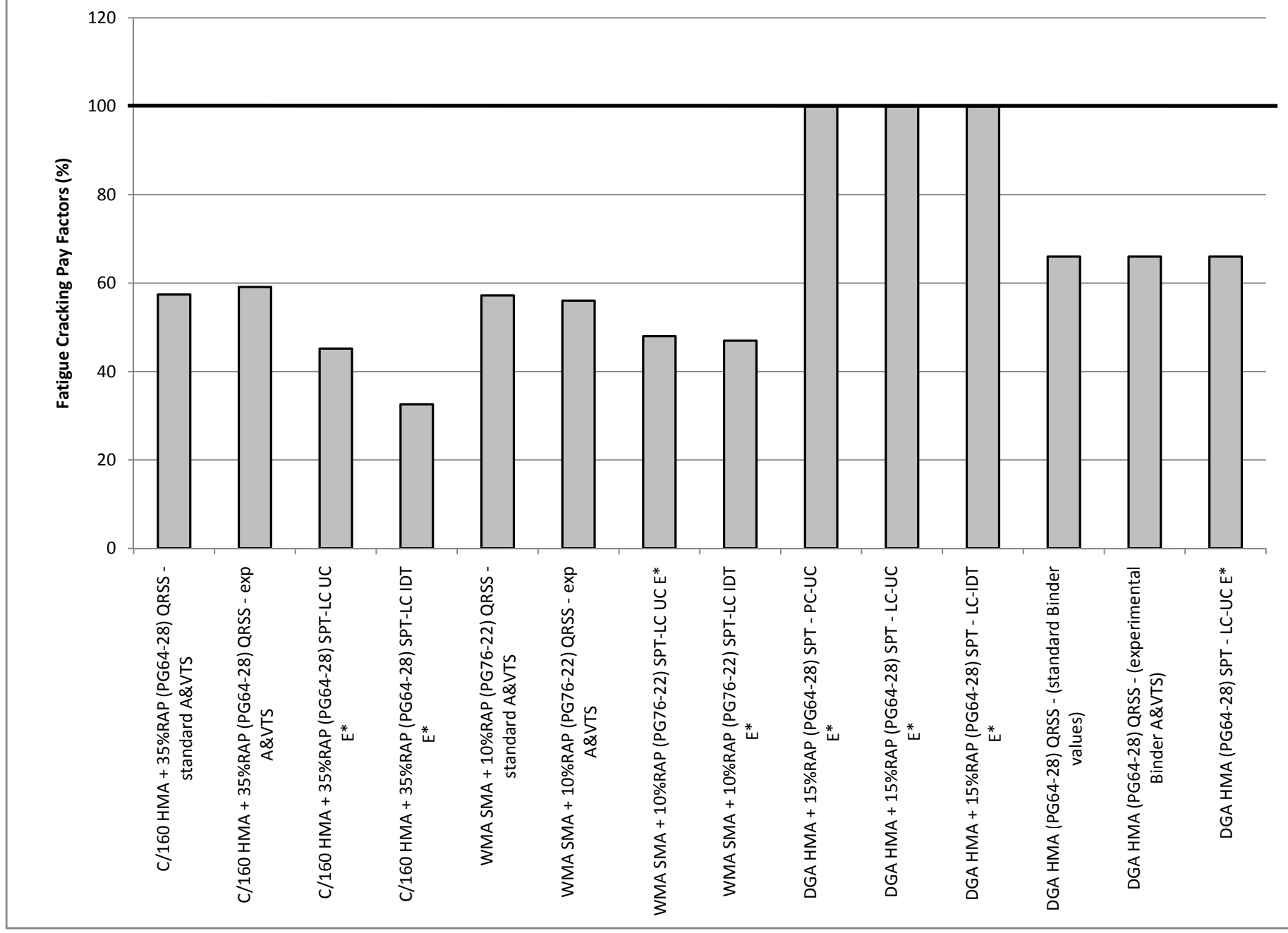


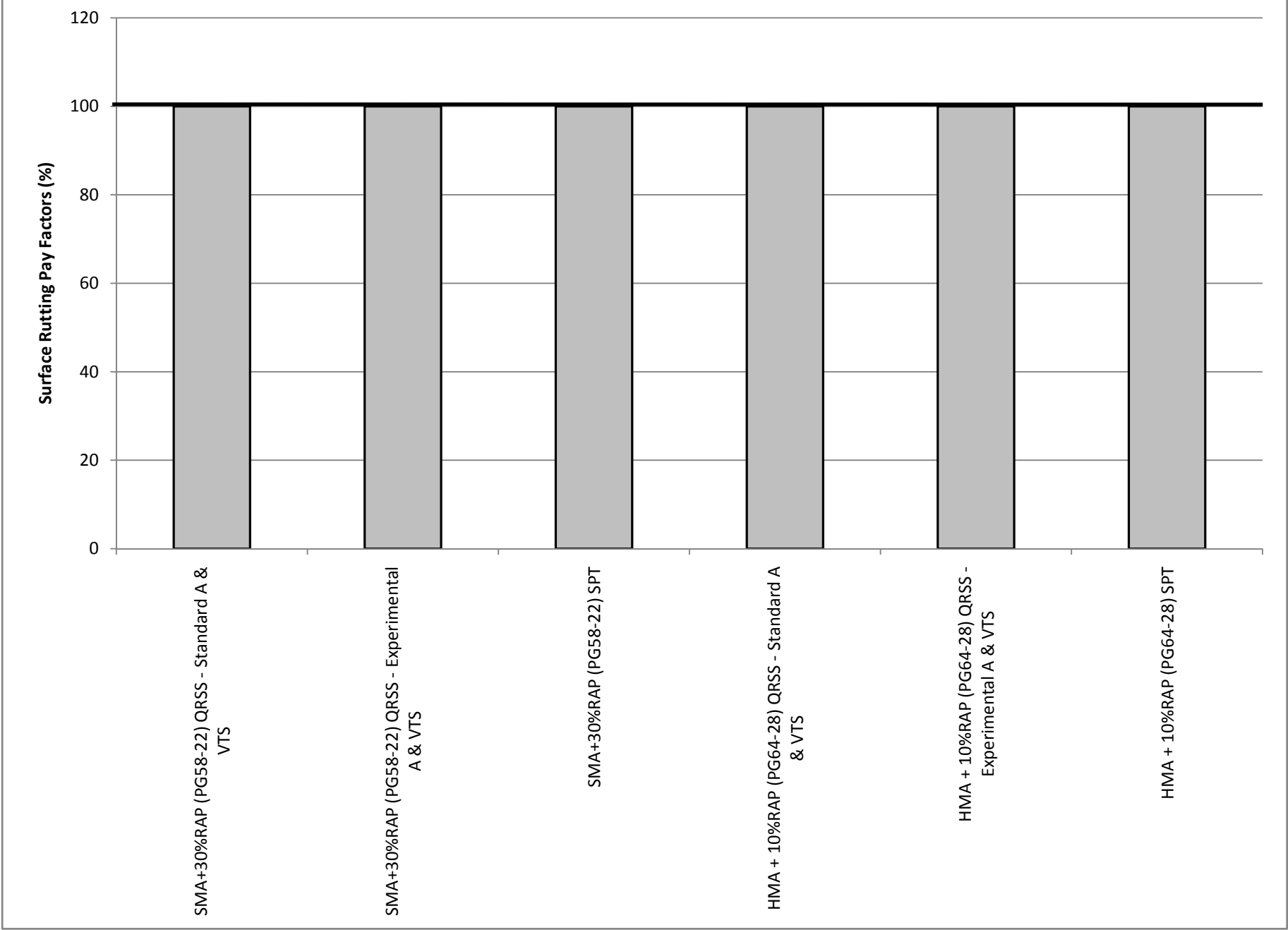




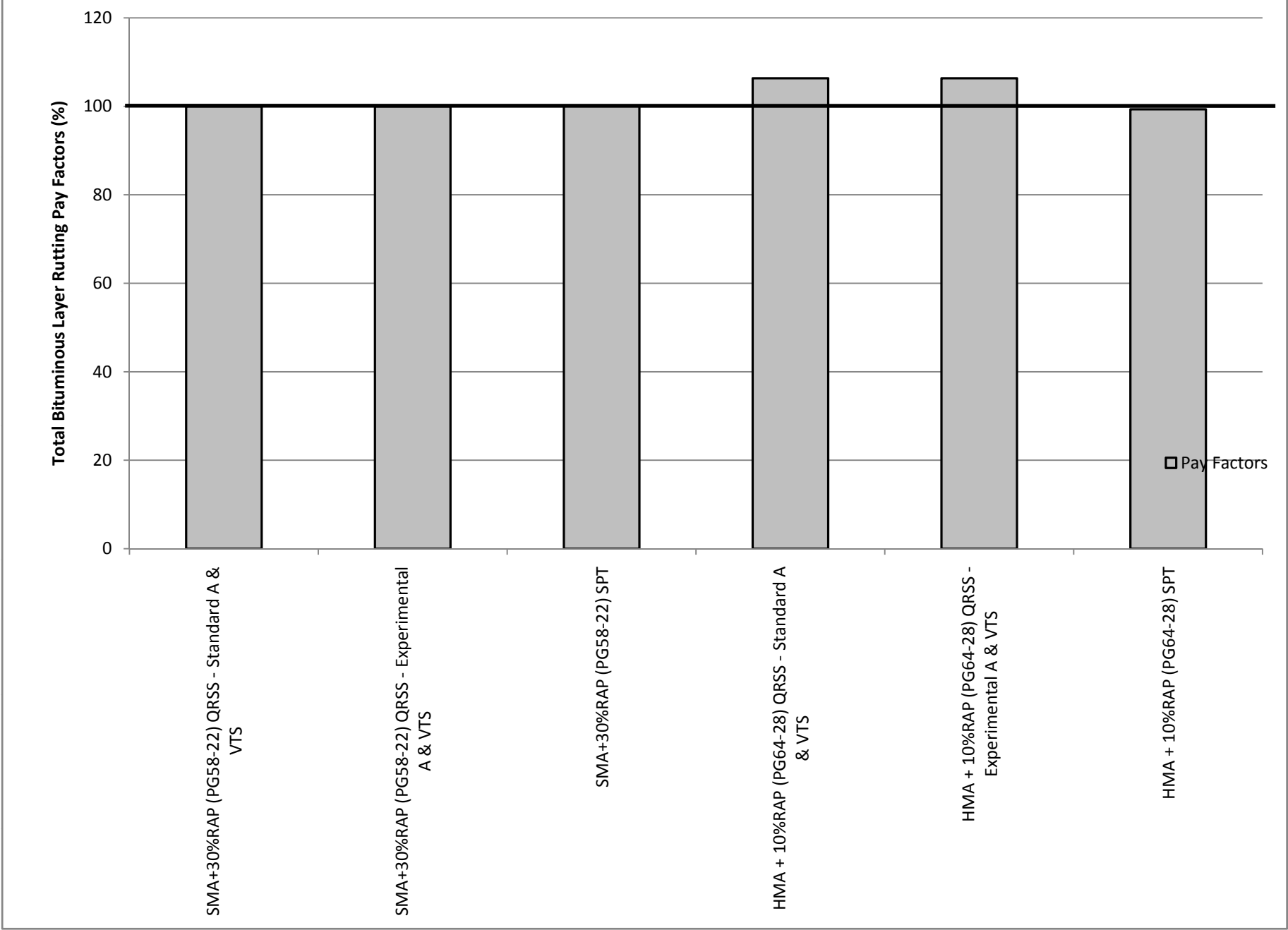


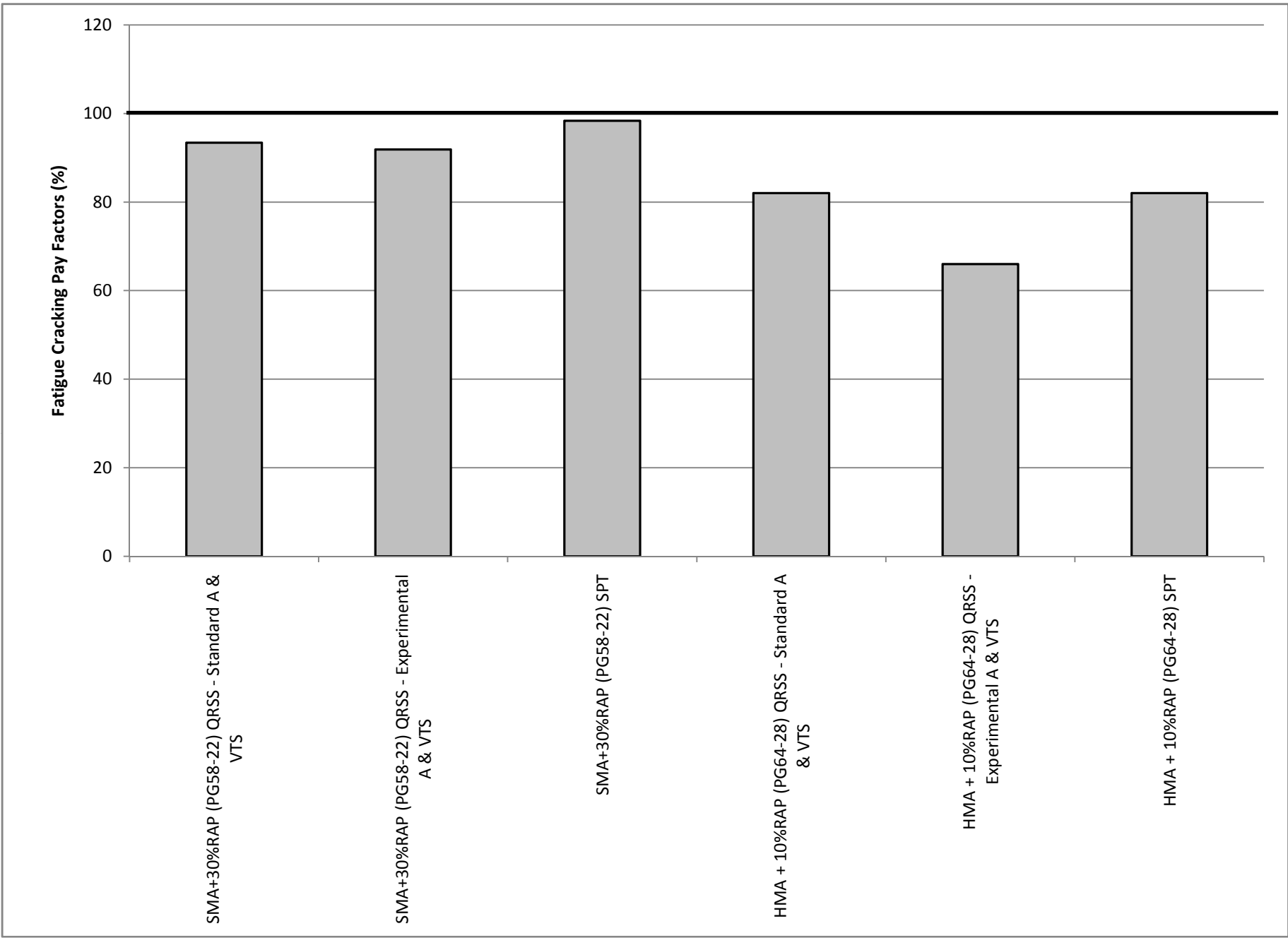






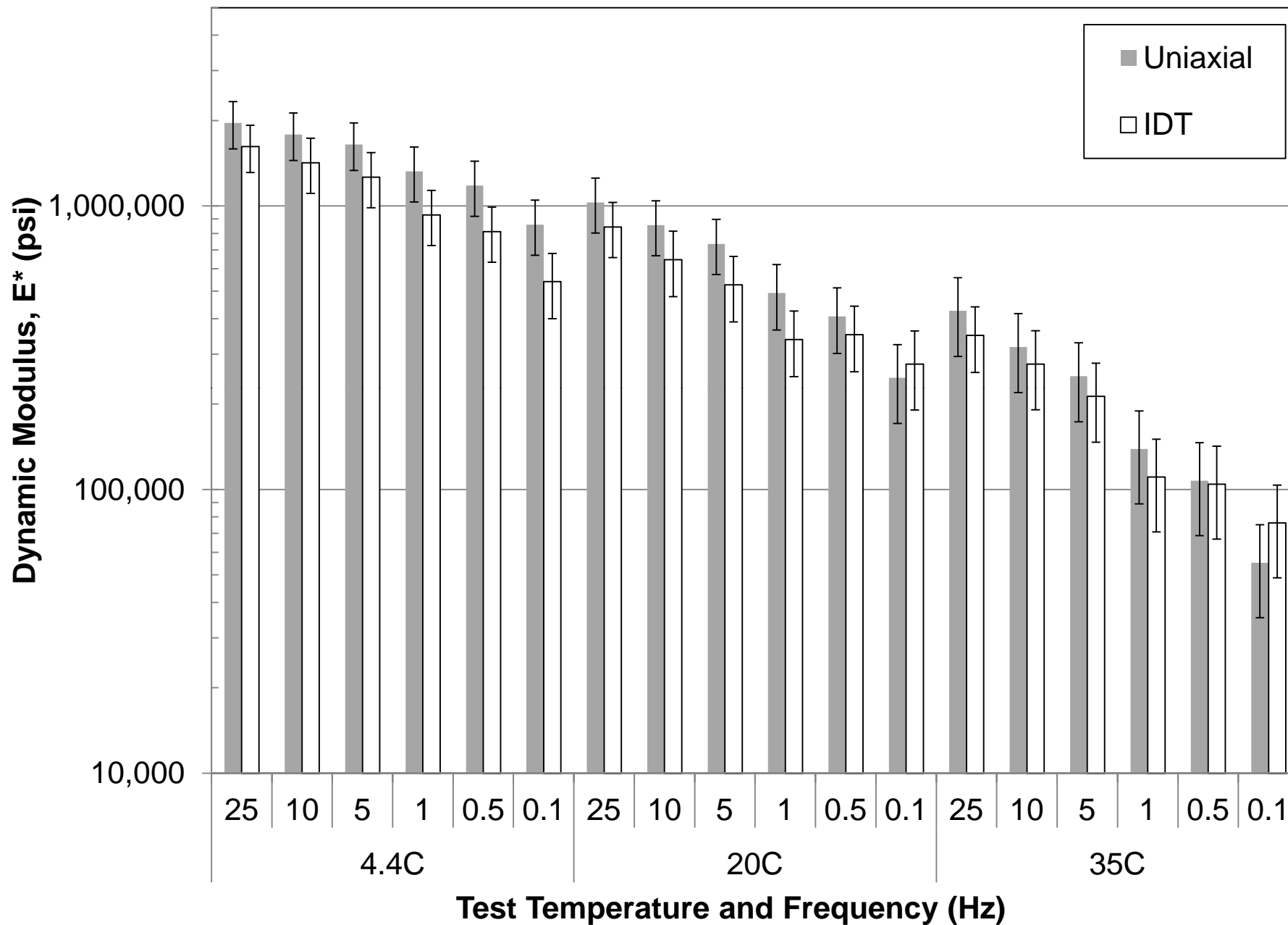




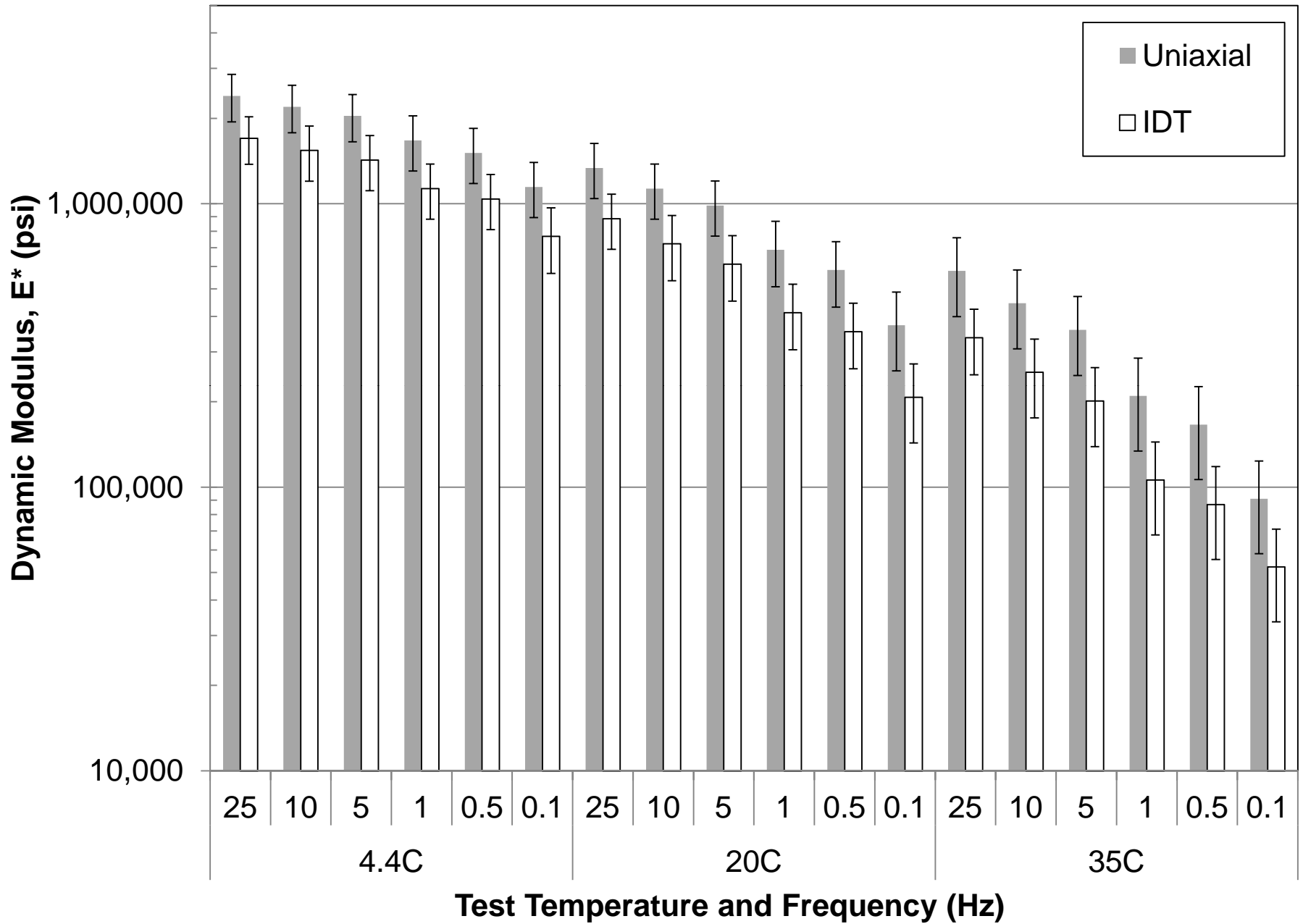


## APPENDIX D – CONFIDENCE INTERVAL ANALYSIS

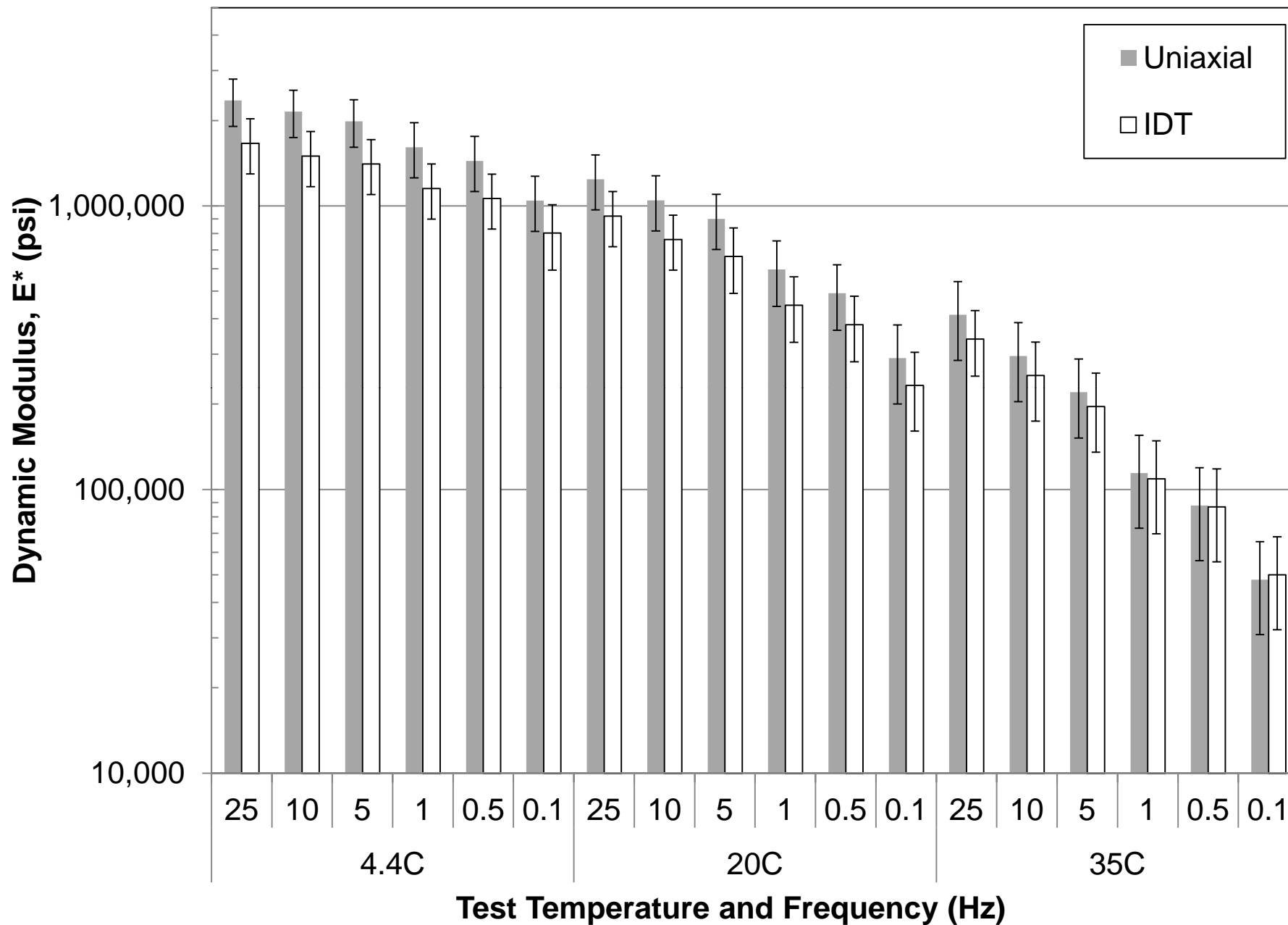
### HMA+35% RAP Lot #1 (DELDOT)



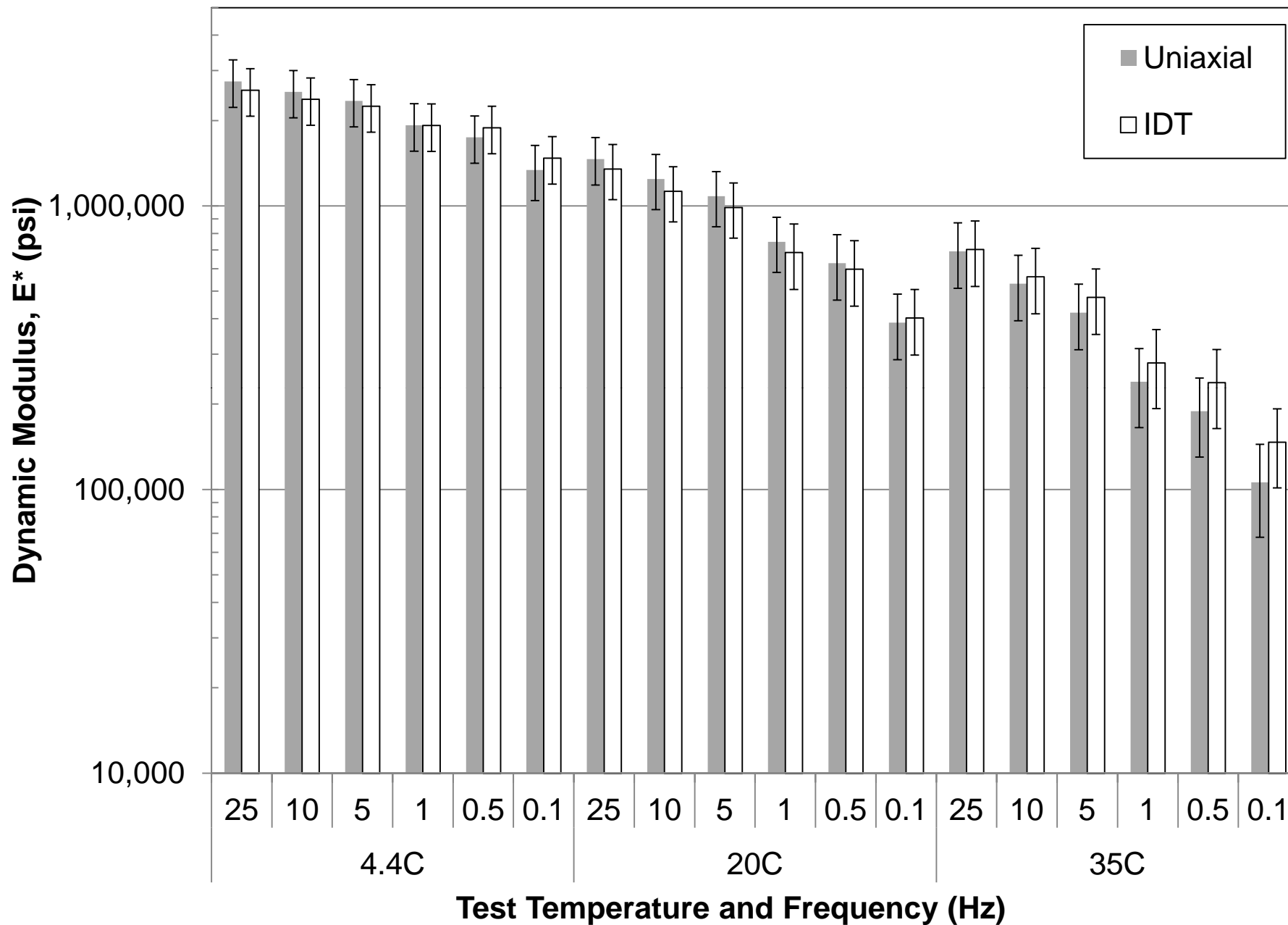
### HMA+35% RAP Lot #2 (DELDOT)



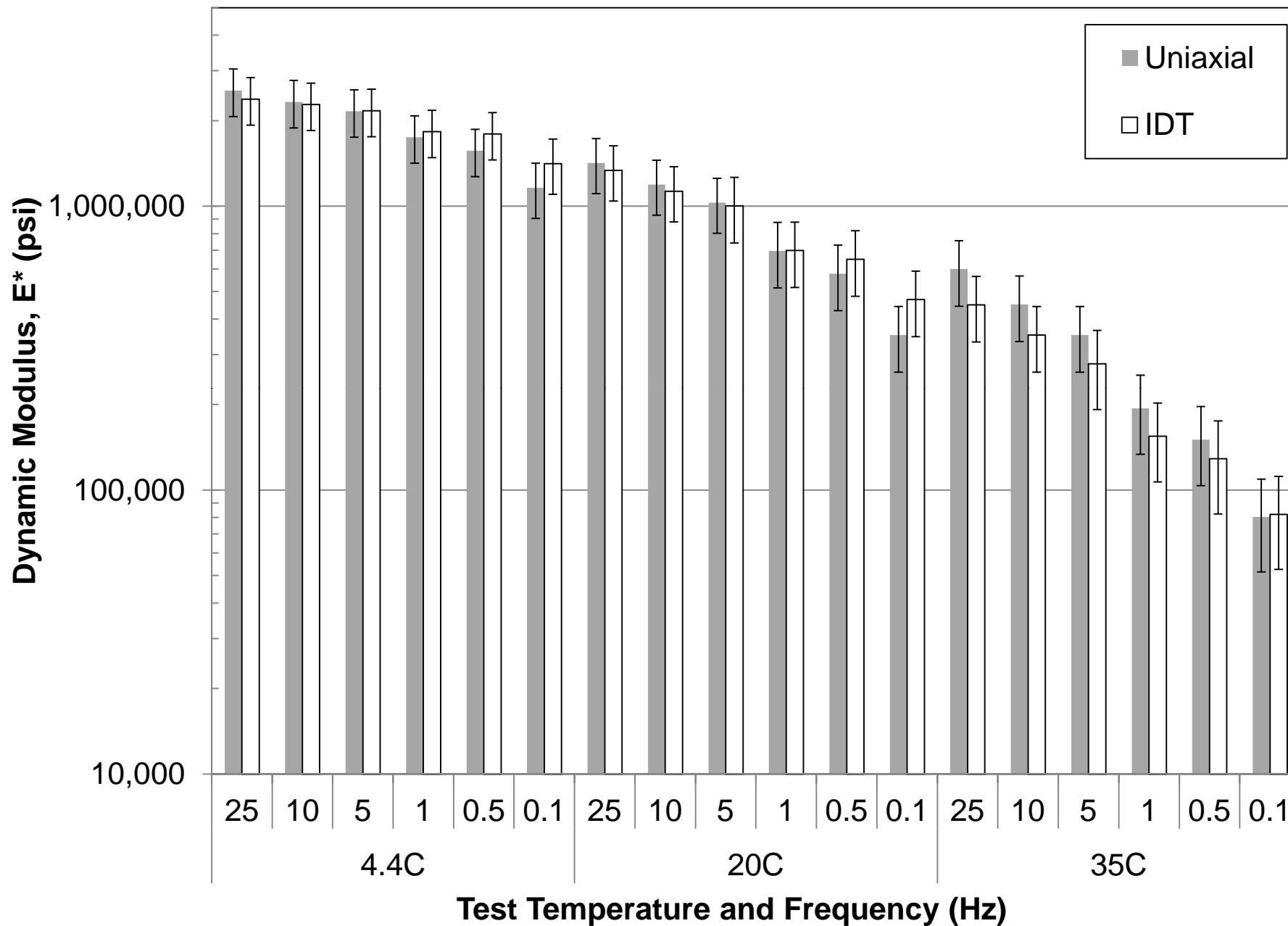
### WMA SMA+10% RAP Lot #1 (DELDOT)



### WMA SMA+10% RAP Lot #3 (DELDOT)



### WMA SMA+10% RAP Lot #4 (DELDOT)





### WMA SMA+10% RAP Lot #5 (DELDOT)

