APPENDIX N
CALIBRATION OF THE COMPUTATIONAL MODEL TO FIELD DATA

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There are total of 131 sections used in our calibration evaluation. The regression coefficients ρ and β are calibrated to the observed values of field data which contained high severity, medium + high severity, and low + medium + high severity data. Most of the observed coefficients ρ and β were determined from the LTPP database are seen in Table N-1. Based on these observed values of ρ and β, we can use linear regression to calibrate the coefficients of the mechanistic crack growth model for different types of pavement structures and climate zones. The models for ρ and β can be expressed as:

$$\rho_{LMH} = \alpha_0 N_{B1} - \alpha_1 \frac{N_{B1}^2}{N_{T1}} - \alpha_2 \frac{N_{B1}^2}{N_{S1}} + \alpha_3 N_{T2} - \alpha_4 \frac{N_{T2}^2}{N_{S2}} \quad \text{(N-1)}$$

$$\rho_{MH} = \alpha_5 N_{B1} - \alpha_6 \frac{N_{B1}^2}{N_{T1}} - \alpha_7 \frac{N_{B1}^2}{N_{S1}} + \alpha_8 N_{T2} - \alpha_9 \frac{N_{T2}^2}{N_{S2}} \quad \text{(N-2)}$$

$$\rho_{H} = \alpha_{10} N_{B1} - \alpha_{11} \frac{N_{B1}^2}{N_{T1}} - \alpha_{12} \frac{N_{B1}^2}{N_{S1}} + \alpha_{13} N_{T2} - \alpha_{14} \frac{N_{T2}^2}{N_{S2}} \quad \text{(N-3)}$$

$$\beta_{LMH} = \beta_0 N_{B1} - \beta_1 \frac{N_{B1}^2}{N_{T1}} - \beta_2 \frac{N_{B1}^2}{N_{S1}} + \beta_3 N_{T2} - \beta_4 \frac{N_{T2}^2}{N_{S2}} \quad \text{(N-4)}$$

$$\beta_{MH} = \beta_5 N_{B1} - \beta_6 \frac{N_{B1}^2}{N_{T1}} - \beta_7 \frac{N_{B1}^2}{N_{S1}} + \beta_8 N_{T2} - \beta_9 \frac{N_{T2}^2}{N_{S2}} \quad \text{(N-5)}$$

$$\beta_{H} = \beta_{10} N_{B1} - \beta_{11} \frac{N_{B1}^2}{N_{T1}} - \beta_{12} \frac{N_{B1}^2}{N_{S1}} + \beta_{13} N_{T2} - \beta_{14} \frac{N_{T2}^2}{N_{S2}} \quad \text{(N-6)}$$

Table N-1 Observed coefficients ρ and β for each calibration section.

LTPP ID	State	County	Climate Zone	H+M+L		H+M		H	
				β	ρ	β	ρ	β	ρ
014129	Alabama	COOSA	WNF	2.400	1266.20				
010563	Alabama	HOUSTON	WNF	5.393	4290.66				
011001	Alabama	LEE	WNF	8.131	2681.98				
010503	Alabama	HOUSTON	WNF	2.753	4409.68				
010505	Alabama	HOUSTON	WNF	3.999	2696.95				
021004	Alaska	ANCHORAGE	WF	0.265	2493.43	0.517	4696.20	3.207	5191.29
021002	Alaska	KENAI PENINSULA	WF	0.965	259.11	1.391	317.99	1.333	671.05
041007	Arizona	MARICOPA	DNF	1.863	2592.64	5.976	3231.69		
040504	Arizona	PINAL	DNF	3.567	4876.01	9.530	5099.01		
040505	Arizona	PINAL	DNF	1.858	3901.33	3.200	4112.13	1.653	6478.76
040506	Arizona	PINAL	DNF	6.718	4260.71	8.279	4736.42	21.845	5086.69
040559	Arizona	PINAL	DNF	3.409	3593.92	2.852	4916.43		
040560	Arizona	PINAL	DNF	3.534	3663.92	3.978	4844.05		
040502	Arizona	PINAL	DNF	4.163	4271.87	2.950	5891.55		
040503	Arizona	PINAL	DNF	2.122	2940.47	3.106	4165.53		
052042	Arkansas	ASHLEY	WNF	2.250	2979.32	3.082	4649.33		
053058	Arkansas	CRAIGHEAD	WNF	0.881	1829.40	3.759	3519.13		
060563	California	SAN BERNARDINO	DNF	1.034	8677.29				
068149	California	SAN BERNARDINO	DNF	5.716	4490.91	9.271	4564.57		
060504	California	SAN BERNARDINO	DNF	3.878	3239.27	8.877	3920.00		
060507	California	SAN BERNARDINO	DNF	4.999	3618.72	7.189	4193.35		
060568	California	SAN BERNARDINO	DNF	2.334	4207.03				
080503	Colorado	LINCOLN	DF	7.565	2561.66	6.857	2810.08	5.751	3030.00
080501	Colorado	LINCOLN	DF	1.095	2191.48	4.346	3077.12	2.333	4108.79
080502	Colorado	LINCOLN	DF	0.908	2551.02	1.990	2931.90	11.140	3014.69
080504	Colorado	LINCOLN	DF	4.501	2061.10	21.241	2576.50	20.323	2910.96

LTPP ID	State	County	Climate Zone	H+M+L		H+M		H	
				β	ρ	β	ρ	β	ρ
080505	Colorado	LINCOLN	DF	2.325	1970.86	2.073	2814.74		
080559	Colorado	LINCOLN	DF	3.328	1406.19	6.678	2503.62	31.976	2906.12
080560	Colorado	LINCOLN	DF	5.368	2432.08	6.983	2721.08	5.680	3333.01
091803	Connecticut	NEW LONDON	WF	0.756	640.37	2.298	1255.32		
134420	Georgia	BRYAN	WNF	1.595	2584.91				
170603	Illinois	CHAMPAIGN	WF	0.424	751.68	1.249	4843.29	2.699	6386.50
170604	Illinois	CHAMPAIGN	WF	0.486	1038.80	1.255	6915.75		
175217	Illinois	MC LEAN	WF	1.171	1393.61	0.722	1686.47		
179327	Illinois	MC LEAN	WF	2.322	1088.89	1.207	2913.93	2.369	3599.00
18A902	Indiana	HANCOCK	WF	0.951	2858.82	2.286	2972.68		
183003	Indiana	MARSHALL	WF	1.777	1482.73	1.490	2126.02		
180901	Indiana	TIPPECANOE	WF	1.031	9483.01				
180905	Indiana	TIPPECANOE	WF	1.171	6537.4	1.216	8319.26		
180904	Indiana	TIPPECANOE	WF	1.898	4974.22	3.102	5061.18		
18A901	Indiana	HANCOCK	WF	4.765	1254.58	4.628	1317.18	6.982	2011.14
190601	Iowa	POLK	WF	1.562	3489.90	0.920	6126.68	1.100	6849.38
199126	Iowa	SCOTT	WF	1.554	717.10	1.761	3454.83		
199116	Iowa	WORTH	WF	0.606	7766.99				
190602	Iowa	POLK	WF	1.902	2911.81	1.472	3507.14		
204067	Kansas	HARVEY	WF	0.608	5512.32				
200106	Kansas	KIOWA	WF	3.941	1014.22				
201009	Kansas	STAFFORD	WF	3.348	2595.59				
230502	Maine	PENOBSCOT	WF	13.889	3511.78				
240504	Maryland	FREDERICK	WF	1.009	3041.47	1.607	4308.59		
240505	Maryland	FREDERICK	WF	0.523	679.28	1.157	1952.56	4.953	4261.28
240559	Maryland	FREDERICK	WF	0.835	768.99	3.290	3565.63		
240560	Maryland	FREDERICK	WF	1.018	2009.67	13.339	4654.15		
240561	Maryland	FREDERICK	WF	0.886	1542.61	5.523	3963.47		

LTPP ID	State	County	Climate Zone	H+M+L		H+M		H	
				β	ρ	β	ρ	β	ρ
240562	Maryland	FREDERICK	WF	1.076	2820.29	2.988	4998.90		
240563	Maryland	FREDERICK	WF	2.276	1461.25	5.618	3695.47		
270507	Minnesota	BELTRAMI	WF	0.247	4912.94	0.589	4796.83		
270561	Minnesota	BELTRAMI	WF	0.891	562.72	1.064	1038.24	1.651	3497.14
270902	Minnesota	SCOTT	WF	0.249	18902.46	0.326	23698.11		
275076	Minnesota	WASHINGTON	WF	1.009	4971.47	1.493	6915.26		
270559	Minnesota	BELTRAMI	WF	0.196	2493.43	0.445	3956.79	1.287	4984.75
270903	Minnesota	SCOTT	WF	0.281	15072.46	0.234	24557.28		
270909	Minnesota	SCOTT	WF	0.689	691.96	0.198	22998.11		
282807	Mississippi	LAFAYETTE	WNF	0.489	1027.64				
283091	Mississippi	LAUDERDALE	WNF	0.588	559.99	1.010	3500		
280504	Mississippi	YAZOO	WNF	2.710	2828.65				
280502	Mississippi	YAZOO	WNF	7.217	2512.12				
280503	Mississippi	YAZOO	WNF	3.266	1671.77				
295483	Missouri	CLAY	WF	0.806	1757.13	0.768	2210.07	1.380	5460.17
295403	Missouri	DUNKLIN	WF	1.083	2068.20	6.159	3861.86	2.841	5441.40
295413	Missouri	DUNKLIN	WF	3.624	3879.37	3.700	4463.56	2.160	7417.96
294069	Missouri	PLATTE	WF	2.590	2072.02	1.275	3173.28		
295393	Missouri	ST CHARLES	WF	5.567	2355.11	4.258	2780.28	2.990	3905.46
290507	Missouri	TANEY	WF	3.908	2700.58				
341033	New Jersey	HUNTERDON	WF	2.535	1614.23	2.560	1835.50		
340560	New Jersey	MONMOUTH	WF	2.009	5369.19				
341003	New Jersey	SUSSEX	WF	2.535	1614.23	2.560	1835.50		
340504	New Jersey	MONMOUTH	WF	1.470	4177.91	5.392	4701.23		
361008	New York	ONEIDA	WF	1.789	2282.40	1.083	3709.18		
361644	New York	ST LAWRENCE	WF	0.607	5552.37				
361643	New York	WASHINGTON	WF	0.736	4278.16	1.090	3923.40	2.664	3410.05

LTPP ID	State	County	Climate Zone	H+M+L		H+M		H	
				β	ρ	β	ρ	β	ρ
371801	North Carolina	BUNCOMBE	WF	4.714	2537.93	4.784	2683.37		
371814	North Carolina	MACON	WNF	1.875	1896.21				
393013	Ohio	BROWN	WF	0.603	183.25	3.377	2449.63		
421691	Pennsylvania	BEAVER	WF	0.367	2058.82	0.960	3436.64	7.502	4136.91
421614	Pennsylvania	CENTRE	WF	0.382	418.20				
421613	Pennsylvania	DELAWARE	WF	0.441	586.60				
421617	Pennsylvania	MONTGOMERY	WF	2.864	2523.45				
421605	Pennsylvania	NORTHUMBERLAND	WF	0.884	1197.66				
421618	Pennsylvania	SOMERSET	WF	4.561	3031.34	7.862	3958.55		
460601	South Dakota	BROWN	WF	1.883	3760.66				
460605	South Dakota	BROWN	WF	4.065	3707.32	2.393	4510.51	3.186	4572.37
473108	Tennessee	ANDERSON	WF	3.218	2751.85				
472008	Tennessee	GIBSON	WF	5.868	2955.60				
471029	Tennessee	MARION	WNF	4.137	1704.25				
473110	Tennessee	MC MINN	WNF	0.854	3017.57				
481119	Texas	CHEROKEE	WNF	3.267	3512.14				
486079	Texas	DEAF SMITH	DF	0.742	75.49	0.695	70.89	0.600	73.04
483855	Texas	FAYETTE	WNF	1.068	3011.34				
483865	Texas	MILLS	WNF	2.909	716.98				
483875	Texas	SHERMAN	DF	1.074	2299.40	1.383	4951.88		
501682	Vermont	CHITTENDEN	WF	0.535	23.75	0.599	2497.00		
501683	Vermont	CHITTENDEN	WF	2.096	7998.09				
501681	Vermont	CHITTENDEN	WF	1.120	6155.32				
512021	Virginia	CARROLL	WF	6.603	3770.20	2.931	4395.25		
512004	Virginia	PITTSYLVANIA	WNF	3.444	1922.09	9.443	2008.55		
511023	Virginia	PRINCE GEORGE	WNF	4.868	2361.23				

LTPP ID	State	County	Climate Zone	H+M+L		H+M		H	
				β	ρ	β	ρ	β	ρ
511464	Virginia	YORK	WNF	6.425	2289.81	6.425	2289.81		
531008	Washington	SPOKANE	DF	0.681	978.41	0.675	1298.94	3.553	3151.42
55B900	Wisconsin	ASHLAND	WF	1.061	968.90	1.072	1671.61	5.923	4598.87
550902	Wisconsin	MONROE	WF	0.778	2188.13	0.919	3563.78	1.613	5920.96
55A900	Wisconsin	WAUKESHA	WF	0.892	2055.53	0.719	4706.15		
550901	Wisconsin	MONROE	WF	0.308	2130.56	0.581	4583.75	1.510	7799.83
	Texas	Waco	WNF	0.36	906.71				
	Texas	Waco	WNF	0.8	1881.81				
	Texas	Waco	WNF	0.427	308.27				
	Texas	Waco	WNF	1.043	1427.13				
	Texas	Waco	WNF	0.606	1873.72				
	Texas	Waco	WNF	0.447	729.85				
	Texas	Waco	WNF	1.074	2379.75				
	Texas	Amarillo	DF	1.266	1664.9				
	Texas	Amarillo	DF	1.355	1758.09				
	Texas	Amarillo	DF	1.49	1819.89				
	Texas	Amarillo	DF	0.667	1619.74				
	Texas	Amarillo	DF	2.383	2036.85				
	Texas	Amarillo	DF	1.494	1766.2				
	Texas	Amarillo	DF	1.436	2015.39				
	Texas	Amarillo	DF	6.784	1762.73				
	Texas	Amarillo	DF	1.345	1633.91				
	Texas	Amarillo	DF	0.896	1929.89				
	Texas	Amarillo	DF	2.806	1997.73				
	New York	New York	WF	0.867	322.42	0.805	473.25		
	New York	New York	WF	0.991	2197.32	0.676	4753.42		

LTPP ID	State	County	Climate Zone	H+M+L		H+M		H	
				β	ρ	β	ρ	β	ρ
	New York	New York	WF	0.766	1123.27	0.985	2237.87		
	New York	New York	WF	0.731	1402.14	0.711	2799.96		
	New York	New York	WF	0.955	1403.55	1.171	2034.02		
	New York	New York	WF	0.539	2260.60	1.092	2660.89		
	New York	New York	WF	0.162	550.14	0.835	2618.90		
	New York	New York	WF	0.554	1622.74	0.923	3385.46		
	New York	New York	WF	0.715	484.53	2.158	1510.52		
	New York	New York	WF	1.728	1299.36	0.881	3037.79		
	New York	New York	WF	1.165	1458.92	1.659	2014.79		
	New York	New York	WF	1.367	1184.70	2.026	2308.27		
	New York	New York	WF	2.684	991.36	2.084	1611.83		
	New York	New York	WF	1.050	2578.42	1.212	5019.59		
	New York	New York	WF	2.485	1192.14	1.817	2358.40		
	New York	New York	WF	1.627	1607.16	0.819	4612.83		
	New York	New York	WF	2.625	1037.27	1.003	2258.14		
	New York	New York	WF	2.117	1194.36	1.160	3517.76		
	New York	New York	WF	2.872	906.24	2.487	1346.83		
	New York	New York	WF	23.709	856.86	2.781	1098.01		
	New York	New York	WF	1.761	1388.10	0.757	6103.60		
	New York	New York	WF	1.010	1622.78	0.773	3318.02		
	New York	New York	WF	1.686	558.64	2.783	996.77		
	New York	New York	WF	0.499	351.29	1.451	1029.74		

$$\beta_H = \beta_{10} N_{B1} - \beta_{11} \frac{N_{B1}^2}{N_{T1}} - \beta_{12} \frac{N_{B1}^2}{N_{S1}} + \beta_{13} N_{S2} - \beta_{14} \frac{N_{S2}^2}{N_{T2}} \quad \text{(N-6)}$$

Linear regression analysis was used to determine the calibration coefficients (α_i and β_i) for each model. Considering the difference of the temperature during the summer and winter, two separate sets of calibration models are developed: one is the calibration model for the overlay beginning service during the summer; the other one is for the overlay beginning service during the winter. The summary of the results for each model in the winter and summer are shown in Table N-2 and Table N-3. The models which are highlighted are the cases that used SID to generate the coefficients. Figures N-1 to Figure N-24 show the results of the linear regression method.

Table N-2. Summary of modeling coefficients for different pavement structures and climate zones beginning service during the winter.

			α_0	α_1	α_2	α_3	α_4	$R^2_{w/o\ outlier}$	$R^2_{w/\ outlier}$
ρ_{LMH}	WF	AC/AC	1.36E+02	-9.53E-01	5.85E+01	8.22E+01	-1.99E-01	0.488215	0.37662
		JRC/JPC	-6.35E+08	-6.35E+08	4.03E+03	-3.06E+01	5.90E+00	0.524717	0.45657
		FC/AC	1.72E+10	1.72E+10	5.38E+02	1.73E+01	-1.81E+02	0.760757	0.26949
		CRC/AC	-6.50E+08	-6.36E+08	-1.47E+07	-3.81E+02	-1.63E+04	0.775576	0.77558
		AC/Reinforcing/PCC	-1.72E+10	-8.59E+09	-8.59E+09	1.97E+01	-6.01E+00	0.35734	0.31101
	WNF	AC/AC	2.29E+03	1.78E+03	-9.49E+02	8.58E+00	-1.16E-01	0.784504	0.53332
		FC/AC	-1.30E+05	-1.28E+04	-1.18E+05	-8.58E+00	-8.80E+01	0.768855	0.4567
		AC/Reinforcing/PCC	-1.64E+03	1.44E+03	1.41E+03	2.10E+03	1.59E+02	0.583384	0.37016
	DF	AC/Reinforcing/AC	2.04E+03	-2.99E+04	3.01E+04	-9.92E-01	-5.75E+00	0.134864	0.13486
		AC/AC	8.35E+01	8.49E+00	-2.62E+00	5.08E+01	1.56E+01	0.71824	0.64161
	DNF	AC/AC	4.57E+02	1.09E+01	4.47E+01	3.41E+01	1.27E+01	0.885011	0.66384
			β_0	β_1	β_2	β_3	β_4	$R^2_{w/o\ outlier}$	$R^2_{w/\ outlier}$
β_{LMH}	WF	AC/AC	7.13E-01	1.12E-01	-6.35E-02	1.41E-02	-2.74E-03	0.681528	0.5702
		JRC/JPC	6.21E-01	-1.21E+00	-7.86E-01	-4.25E-02	-1.41E-02	0.502271	0.466
		FC/AC	3.26E+10	1.63E+10	1.63E+10	1.26E-02	1.22E-02	0.668079	0.31107
		CRC/AC	3.61E+03	-2.21E+00	3.61E+03	1.36E-01	4.01E+00	0.86974	0.86974
		AC/Reinforcing/PCC	1.12E+09	5.60E+08	5.60E+08	4.81E-02	-1.19E-02	0.443029	0.43709
	WNF	AC/AC	4.45E+00	5.06E+00	-2.85E+00	2.27E-02	1.86E-06	0.643317	0.59368
		FC/AC	-1.72E+10	-8.59E+09	-8.59E+09	-5.73E-03	-1.50E-01	0.813614	0.66452
		AC/Reinforcing/PCC	1.38E+00	-5.68E+00	4.30E+00	-4.99E-01	-3.65E-02	0.572104	0.35183
	DF	AC/Reinforcing/AC	1.03E+00	-3.12E+01	3.28E+01	3.66E-02	-1.20E-02	0.731422	0.58526
		AC/AC	-1.09E-01	-5.38E-02	4.60E-02	9.70E-02	2.65E-02	0.719001	0.54557
	DNF	AC/AC	2.06E-01	5.04E-03	2.13E-02	3.54E-02	1.68E-03	0.700608	0.58154

			α_0	α_1	α_2	α_3	α_4	$R^2_{w/o\ outlier}$	$R^2_{w/\ outlier}$
ρ_{MH}	WF	AC/AC	4.52E+03	8.49E+02	-2.52E+02	1.84E+01	1.40E+01	0.714736	0.2102
		JRC/JPC	1.82E+07	1.82E+07	1.40E+04	2.86E+01	6.02E+01	0.501718	0.49972
		FC/AC	1.63E+10	1.63E+10	-3.39E+02	3.61E+01	-1.90E+01	0.480755	0.41402
		CRC/AC	-1.54E+07	1.10E+07	-2.64E+07	4.19E+02	3.07E+04	0.999995	0.99999
		AC/Reinforcing/PCC	2.32E+03	-9.38E+02	-2.18E+03	-2.30E+01	-2.52E+01	0.452683	0.32298
	WNF	AC/AC	2.32E+03	9.38E+02	-2.18E+03	-2.30E+01	-1.19E+00	0.929697	0.9297
		FC/AC	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		AC/Reinforcing/PCC	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	DF	AC/Reinforcing/AC	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		AC/AC	9.98E+01	1.12E+01	-1.81E+01	6.33E+01	1.35E+01	0.767309	0.59148
	DNF	AC/AC	5.47E+02	-3.13E+00	8.56E+01	2.41E+01	-6.77E+00	0.482832	0.44129
			β_0	β_1	β_2	β_3	β_4	$R^2_{w/o\ outlier}$	$R^2_{w/\ outlier}$
β_{MH}	WF	AC/AC	6.62E+08	9.31E+07	5.69E+08	1.31E-01	4.56E-01	0.806066	0.40459
		JRC/JPC	9.51E+00	9.38E+00	-2.82E+00	-3.90E-02	-1.83E-02	0.564571	0.49286
		FC/AC	-4.12E+09	-2.06E+09	-2.06E+09	7.46E-02	1.34E-01	0.771652	0.77165
		CRC/AC	-2.42E+02	-1.51E+02	-9.25E+01	-9.59E-02	-1.17E+01	1	1
		AC/Reinforcing/PCC	1.08E+07	5.41E+06	5.41E+06	4.66E-02	-9.22E-03	0.364102	0.28908
	WNF	AC/AC	6.37E+00	7.66E+00	-4.94E+00	1.11E-01	1.27E-03	1	0.52431
		FC/AC	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		AC/Reinforcing/PCC	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	DF	AC/Reinforcing/AC	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		AC/AC	-4.50E-01	-1.44E-01	8.61E-02	4.15E-01	1.25E-01	0.944937	0.74096
	DNF	AC/AC	3.52E-01	-1.89E-02	8.46E-02	7.11E-02	1.13E-02	0.864728	0.47192

			α_0	α_1	α_2	α_3	α_4	$R^2_{w/o\ outlier}$	$R^2_{w/\ outlier}$
ρ_H	WF	AC/AC	9.32E+09	4.66E+09	4.66E+09	1.79E+02	5.07E+02	0.452578	0.45258
		JRC/JPC	-7.63E+09	-7.63E+09	-5.75E+03	5.11E+01	-5.37E+00	0.599614	0.59961
		FC/AC	-5.84E+05	-1.60E+05	-1.63E+05	-6.79E+04	-9.50E+04	0.5	0.5
		CRC/AC	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		AC/Reinforcing/PCC	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	WNF	AC/AC	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		FC/AC	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		AC/Reinforcing/PCC	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	DF	AC/Reinforcing/AC	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		AC/AC	2.18E+03	4.91E+02	2.55E+03	1.11E+02	2.00E+01	0.476257	0.40535
	DNF	AC/AC	7.23E+02	-1.51E+00	2.13E+02	3.68E+01	7.22E+02	1	1
			β_0	β_1	β_2	β_3	β_4	$R^2_{w/o\ outlier}$	$R^2_{w/\ outlier}$
β_H	WF	AC/AC	1.67E+00	1.08E-01	1.52E-01	6.66E-02	1.17E-01	0.549172	0.54917
		JRC/JPC	1.11E+09	1.11E+09	7.00E+00	6.99E-05	1.06E-02	0.809196	0.66975
		FC/AC	-8.62E+02	-3.01E+02	-4.22E+02	-1.10E+02	-1.30E+02	0.5	0.5
		CRC/AC	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		AC/Reinforcing/PCC	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	WNF	AC/AC	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		FC/AC	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		AC/Reinforcing/PCC	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	DF	AC/Reinforcing/AC	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		AC/AC	3.12E+01	7.19E+00	3.75E+01	7.57E-01	1.47E-01	0.960595	0.96059
	DNF	AC/AC	-5.32E-01	-4.91E-01	-3.99E-02	7.35E-01	-2.01E-01	1	1

Table N-3. Summary of modeling coefficients for different pavement structures and climate zones beginning service during the summer.

LMH	Summer		α_0	α_1	α_2	α_3	α_4	$R^2_{w/o\ outlier}$	$R^2_{w/\ outlier}$
ρ_{LMH}	W F	AC/AC	838.0983	62.95655	-3.16733	29.6539	0.082986	0.520547	0.470474
		JRC/JPC	-6.4E+08	-6.4E+08	887.4669	-115.336	16.69693	0.467325	0.239443
		FC/AC	1.72E+10	1.72E+10	-105.097	-18.2301	2.154086	0.64933	0.32468
		CRC/AC	-8.7E+08	-6.4E+08	-2.4E+08	-4742.36	-3717526	0.619324	0.619324
		AC/Reinforcing/PCC	-4002.98	4745.433	4745.893	1824.642	-230.237	0.300026	0.300026
	WNF	AC/AC	1354.996	2159.017	-3536.22	-10.1298	-0.25768	0.615653	0.52931
		FC/AC	-135267	-7449.76	-112978	447.9632	394.3746	0.836659	0.836659
		AC/Reinforcing/PCC	-2294.14	2088.171	2055.601	-32.1347	-49.5802	0.508553	0.308489
	DF	AC/Reinforcing/AC	2028.364	-29856.8	30067.11	0.803883	0.013498	0.476557	0.476557
		AC/AC	17.6837	2.731075	3.141373	43.32357	27.30668	0.679434	0.578449
	DNF	AC/AC	45.18122	-0.0286	16.3266	57.02824	57.83339	0.545349	0.254128
			β_0	β_1	β_2	β_3	β_4	$R^2_{w/o\ outlier}$	$R^2_{w/\ outlier}$
β_{LMH}	WF	AC/AC	0.27468	0.018715	0.000269	0.018185	-0.00028	0.517973	0.411374
		JRC/JPC	-1.9E+09	-1.9E+09	-0.30546	0.007577	-0.00062	0.319041	0.319041
		FC/AC	0.641803	-0.34841	-0.26685	-0.00907	-0.00071	0.660101	0.262304
		CRC/AC	3.44E+10	1.72E+10	1.72E+10	0.02547	6.449303	0.170764	0.170764
		AC/Reinforcing/PCC	1.12E+09	5.6E+08	5.6E+08	-2.86146	0.411664	0.442853	0.442853
	WNF	AC/AC	1.721257	2.742465	-4.47183	-0.00663	-0.00019	0.40011	0.213879
		FC/AC	251.3713	13.95986	205.6249	-0.77628	-0.69274	1	0.673008
		AC/Reinforcing/PCC	1.52643	-5.82637	4.153652	-0.01027	0.001755	0.676638	0.350734
	DF	AC/ Reinforcing /AC	2.113978	-32.2903	31.70648	0.000569	9.78E-06	0.823999	0.823999
		AC/AC	0.018413	-0.00715	0.038639	0.043159	0.031761	0.796943	0.483678
	DNF	AC/AC	0.046121	0.001137	0.006635	0.029903	-0.12809	0.462059	0.361453

			α_0	α_1	α_2	α_3	α_4	$R^2_{w/o\ outlier}$	$R^2_{w/\ outlier}$
ρ_{MH}	WF	AC/AC	3645.928	-921.94	1048.941	20.58654	70.56971	0.703248	0.549398
		JRC/JPC	-2.7E+10	-2.7E+10	6362.101	-1357.18	-22.8129	0.240817	0.240817
		FC/AC	1.63E+10	1.63E+10	-760.999	38.06925	74.69437	0.819347	0.565498
		CRC/AC	-1.5E+07	11040881	-2.6E+07	-1547.68	-2137878	1	1
		AC/Reinforcing/PCC	-7067.14	13522.23	13522.69	4508.422	-2597.54	0.474469	0.355796
	WNF	AC/AC	-131322	-195603	194373.2	133070.4	193824.2	1	0.448477
		FC/AC	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		AC/Reinforcing/PCC	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	DF	AC/Reinforcing/AC	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		AC/AC	28.12225	6.756599	-4.15854	10.1671	-4.36256	0.856617	0.445084
	DNF	AC/AC	55.82387	0.207237	17.42424	55.48212	46.18416	0.611015	0.611015
			β_0	β_1	β_2	β_3	β_4	$R^2_{w/o\ outlier}$	$R^2_{w/\ outlier}$
β_{MH}	WF	AC/AC	0.476846	-5.08537	4.549536	0.05749	0.178996	0.809379	0.348404
		JRC/JPC	6.91E+09	6.91E+09	-0.19777	0.296327	0.00551	0.347163	0.347163
		FC/AC	4.067401	-3.83042	3.309069	0.044951	0.094808	0.757912	0.757912
		CRC/AC	-241.207	-151.302	-92.8628	1.819691	1855.998	0.999962	0.999962
		AC/Reinforcing/PCC	4.76E+08	2.38E+08	2.38E+08	-4.21083	0.656146	0.298514	0.198862
	WNF	AC/AC	923.656	1339.96	-1332.63	-913.533	-1330.67	0.868934	0.868934
		FC/AC	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		AC/Reinforcing/PCC	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	DF	AC/Reinforcing/AC	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		AC/AC	-0.02031	-0.03136	0.100201	0.599859	0.487055	0.837378	0.725392
	DNF	AC/AC	0.077325	0.001998	0.014839	0.100506	0.034864	0.437068	0.358431

			α_0	α_1	α_2	α_3	α_4	$R^2_{w/o\ outlier}$	$R^2_{w/\ outlier}$
ρ_H	WF	AC/AC	4542.755	-58.7436	339.1663	-1.76399	-507.468	0.896074	0.896074
		JRC/JPC	-7.6E+09	-7.6E+09	-634.007	179.8428	64.40599	0.577601	0.482876
		FC/AC	-584751	-159196	-162275	-78653.2	-85016.7	0.5	0.5
		CRC/AC	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		AC/Reinforcing/PCC	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	WNF	AC/AC	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		FC/AC	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		AC/Reinforcing/PCC	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	DF	AC/Reinforcing/AC	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		AC/AC	58.05305	26.07528	-52.7576	42.41798	18.5372	0.870799	0.575435
	DNF	AC/AC	73.3422	-5.96998	218.0791	-9.73338	727.5026	1	1
			β_0	β_1	β_2	β_3	β_4	$R^2_{w/o\ outlier}$	$R^2_{w/\ outlier}$
β_H	WF	AC/AC	1.745876	0.034641	0.078267	0.023628	0.162319	0.624022	0.387199
		JRC/JPC	0.73761	-0.51118	-1.06981	0.047407	-0.08365	0.782101	0.782101
		FC/AC	-862.917	-300.547	-420.914	-117.282	-122.948	0.5	0.5
		CRC/AC	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		AC/Reinforcing/PCC	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	WNF	AC/AC	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		FC/AC	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		AC/Reinforcing/PCC	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	DF	AC/Reinforcing/AC	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		AC/AC	0.333755	0.175154	-0.39502	0.409374	0.338053	0.913809	0.580747
	DNF	AC/AC	0.26483	0.016508	-0.04056	0.776853	-0.20823	1	1

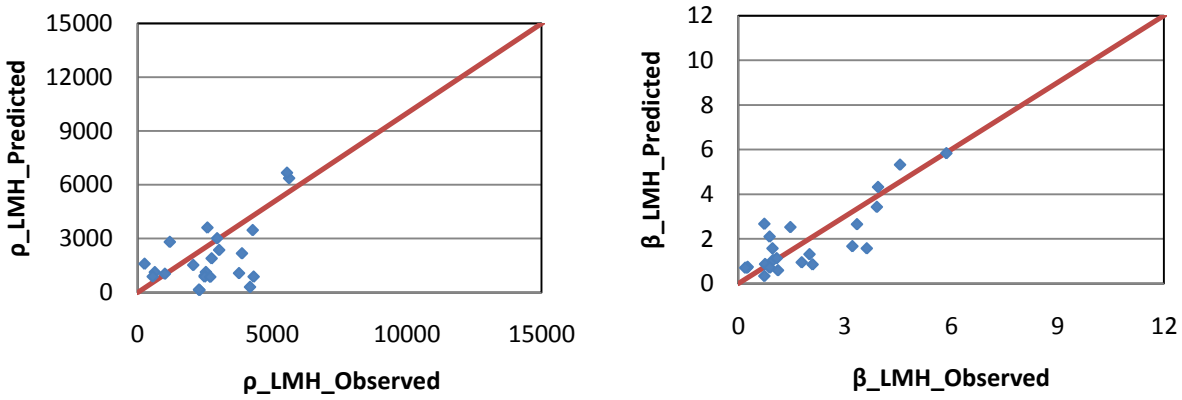

Figure N-1. LMH Regression results of ρ and β for AC over AC pavement and Wet-Freeze climate zone.

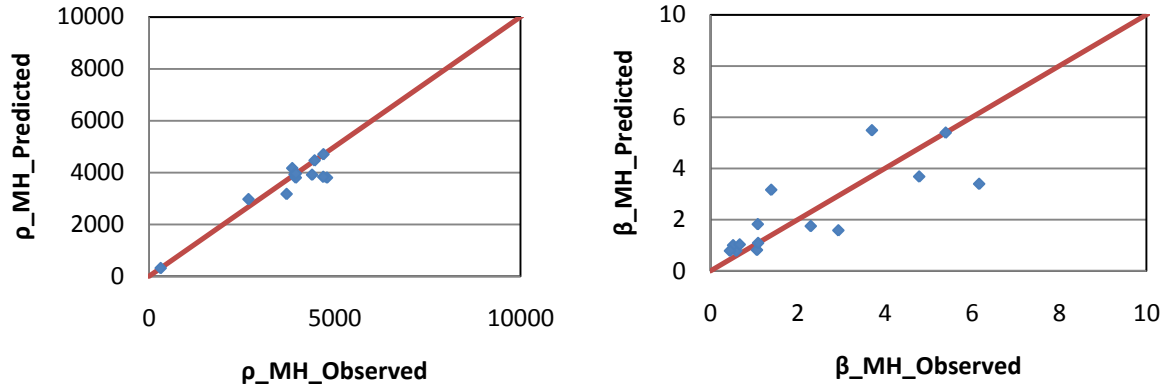

Figure N-2. MH Regression results of ρ and β for AC over AC pavement and Wet-Freeze climate zone.

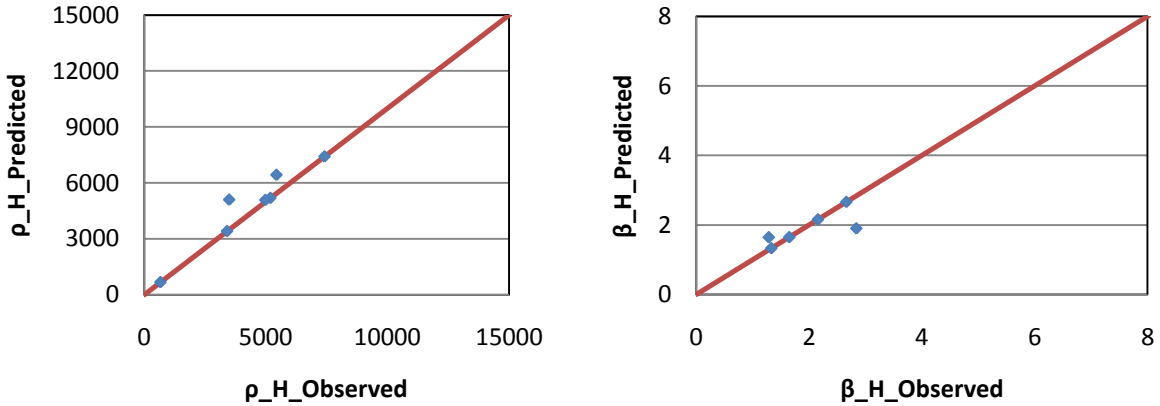

Figure N-3. H Regression results of ρ and β for AC over AC pavement and Wet-Freeze climate zone.

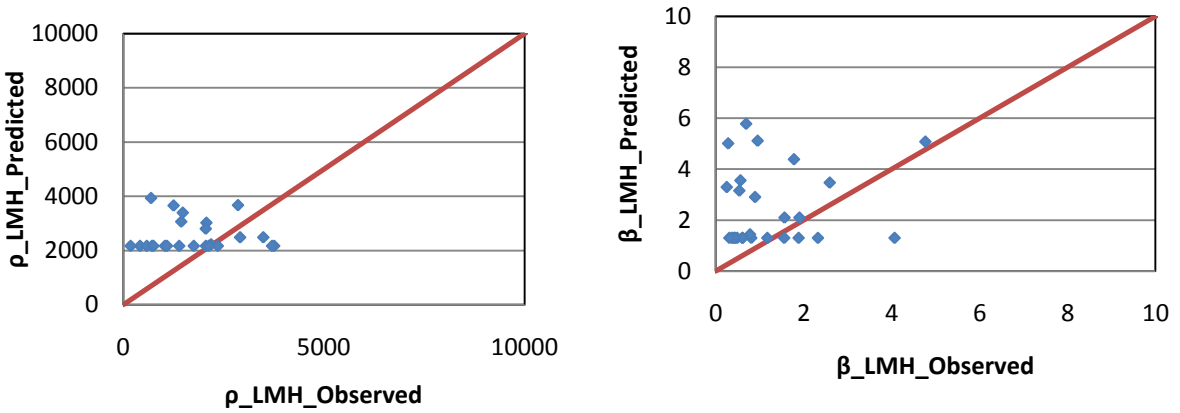

Figure N-4. LMH Regression results of ρ and β for AC over JPC/JRC pavement and Wet-Freeze climate zone.

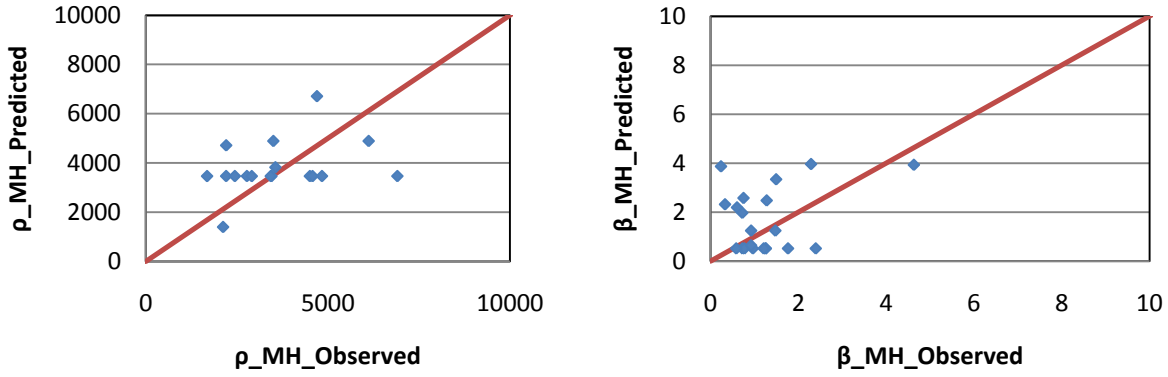

Figure N-5. MH Regression results of ρ and β for AC over JPC/JRC pavement and Wet-Freeze climate zone.

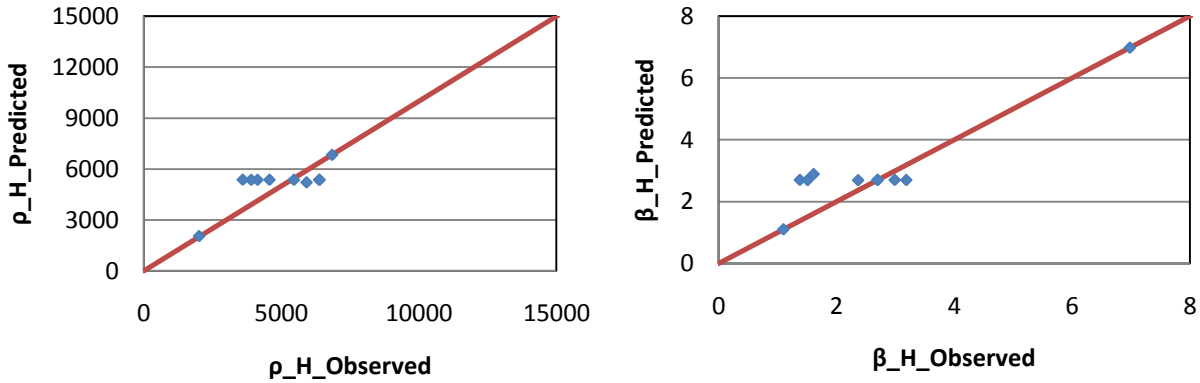

Figure N-6. H Regression results of ρ and β for AC over JPC/JRC pavement and Wet-Freeze climate zone.

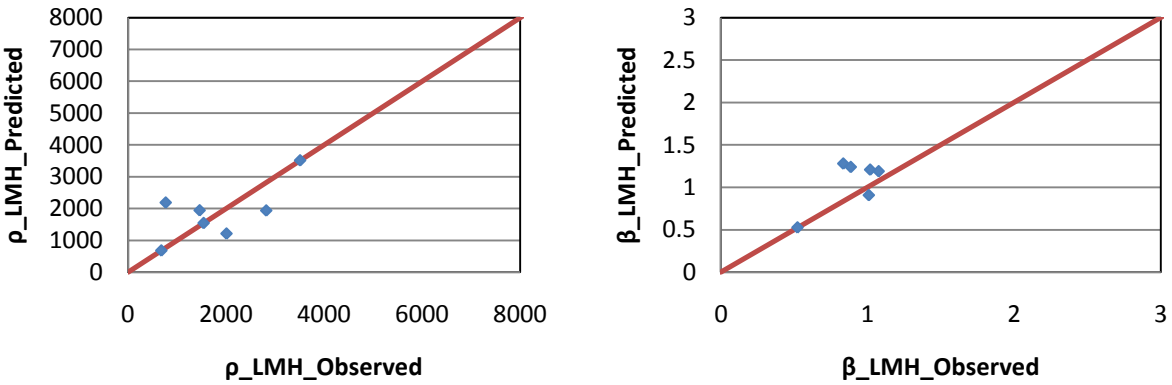

Figure N-7. LMH Regression results of ρ and β for AC over FC/SC pavement and Wet-Freeze climate zone.

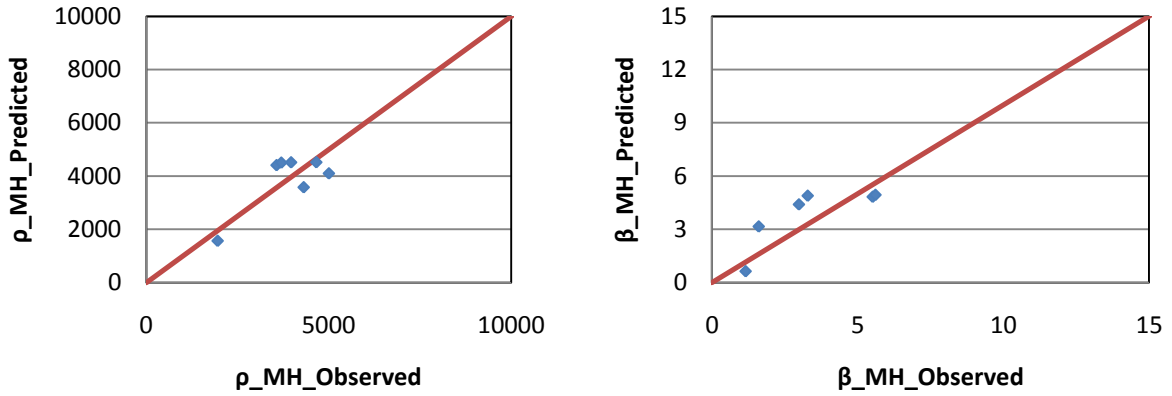

Figure N-8. MH Regression results of ρ and β for AC over FC/SC pavement and Wet-Freeze climate zone.

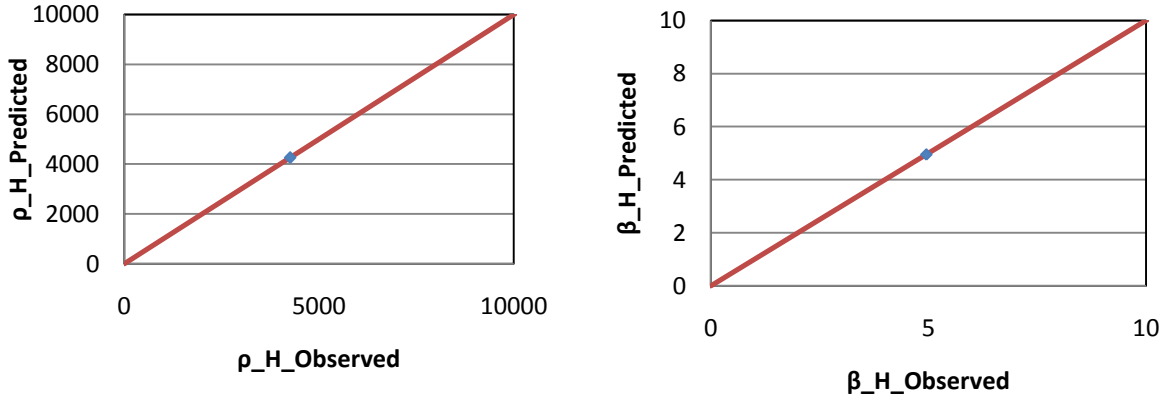

Figure N-9. H Regression results of ρ and β for AC over FC/SC pavement and Wet-Freeze climate zone.

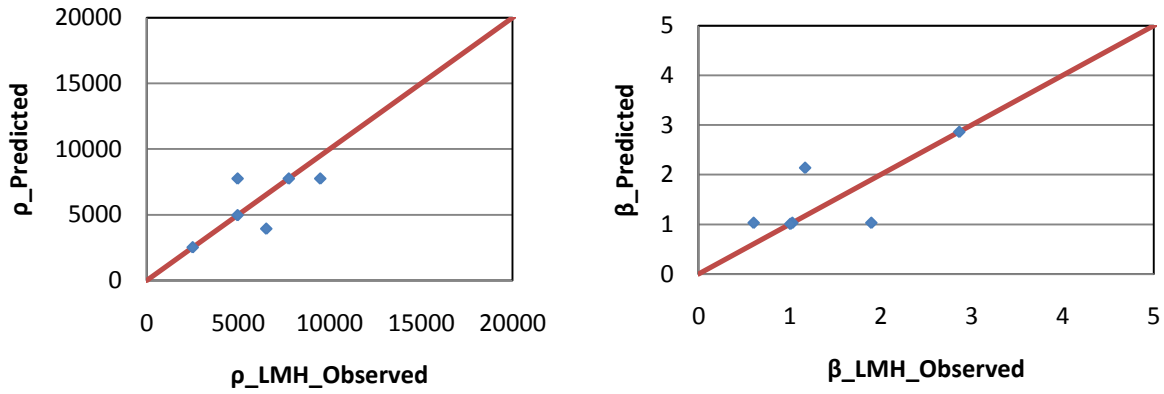

Figure N-10. LMH Regression results of ρ and β for AC over CRC pavement and Wet-Freeze climate zone.

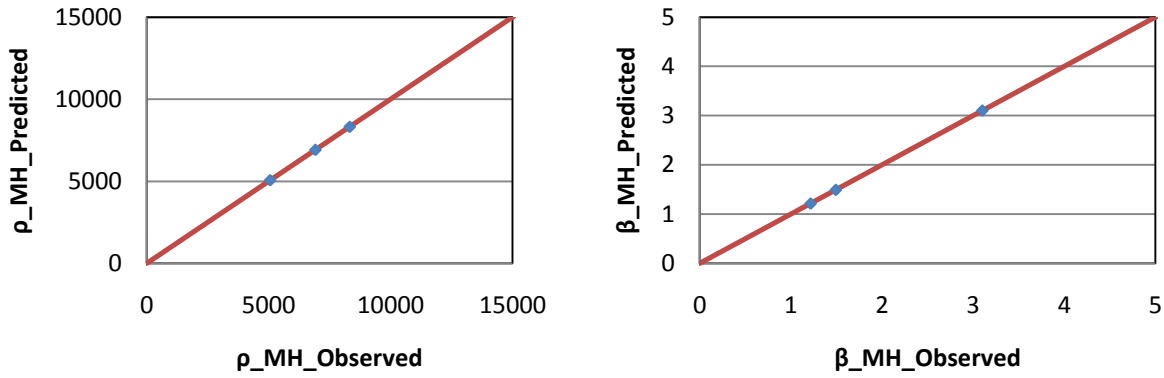

Figure N-11. MH Regression results of ρ and β for AC over CRC pavement and Wet-Freeze climate zone.

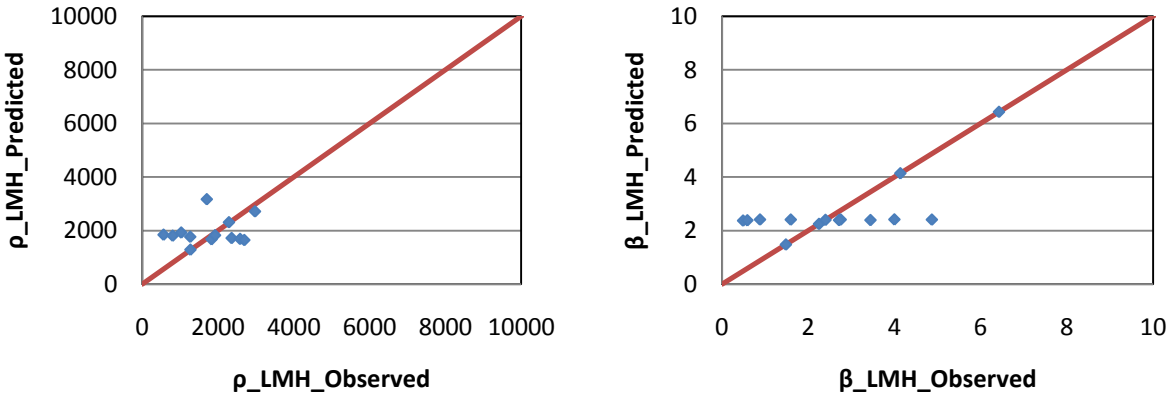

Figure N-12. LMH Regression results of ρ and β for AC over AC pavement and Wet-No Freeze climate zone.

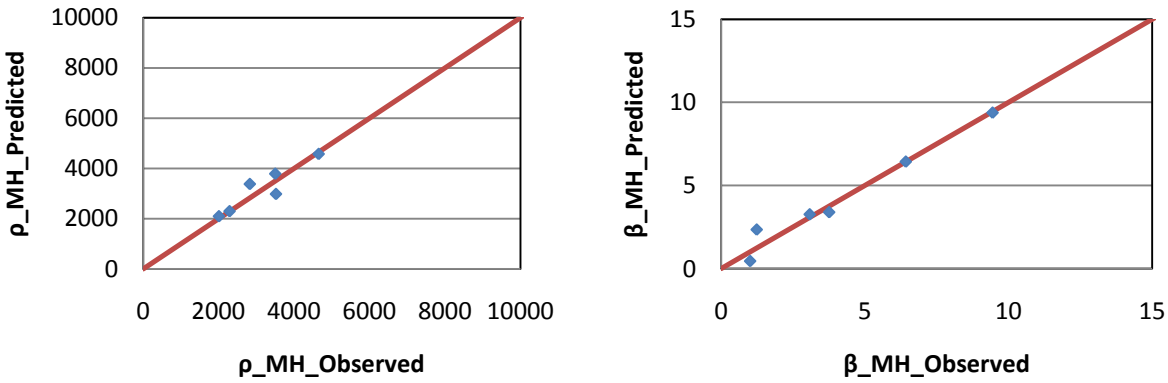

Figure N-13. MH Regression results of ρ and β for AC over AC pavement and Wet-No Freeze climate zone.

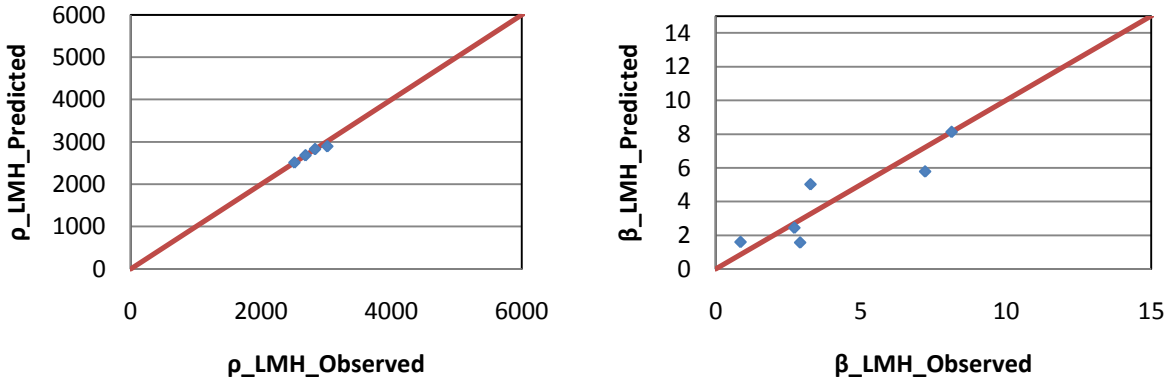

Figure N-14. LMH Regression results of ρ and β for AC over FC/SC pavement and Wet-No Freeze climate zone.

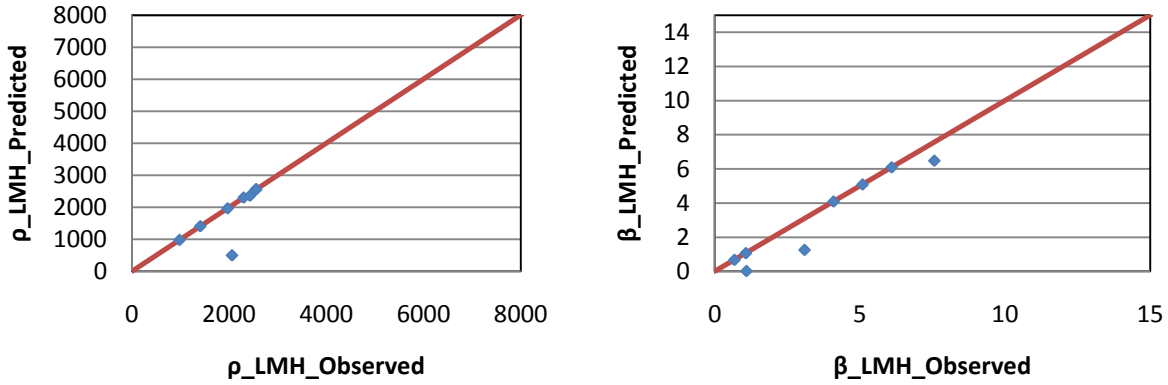

Figure N-15. LMH Regression results of ρ and β for AC over AC pavement and Dry-Freeze climate zone.

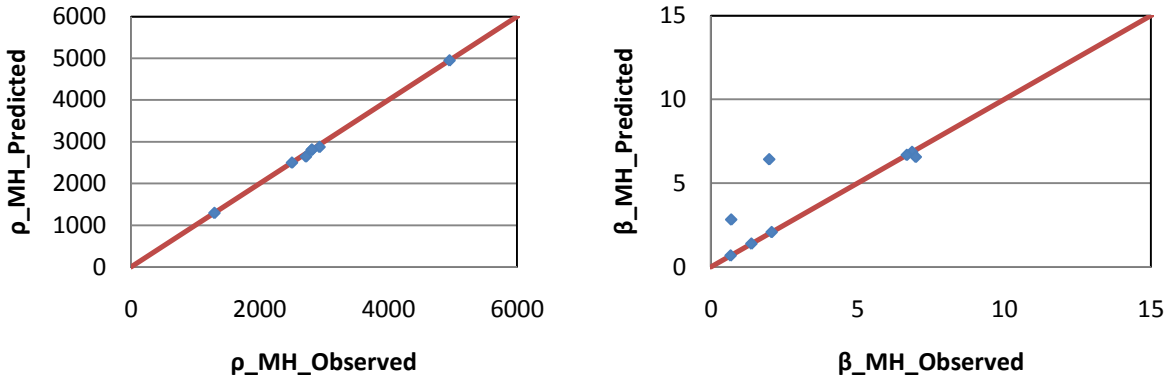

Figure N-16. MH Regression results of ρ and β for AC over AC pavement and Dry-Freeze climate zone.

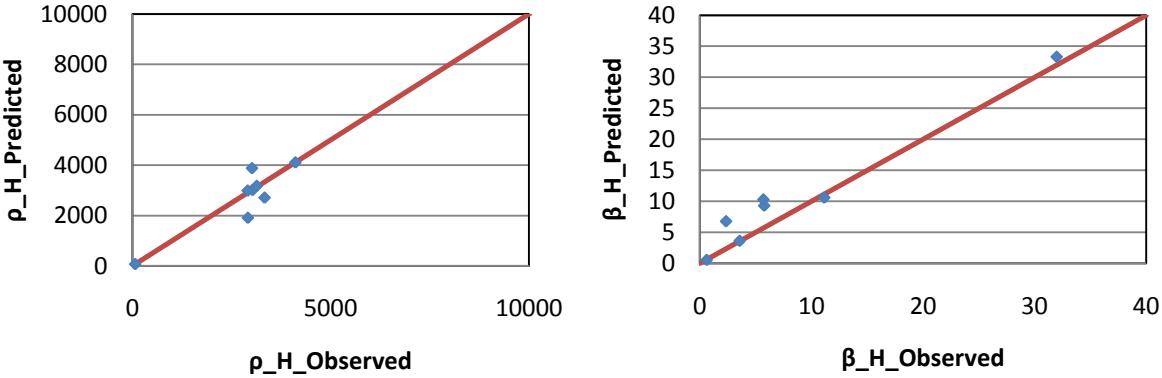

Figure N-17. H Regression results of ρ and β for AC over AC pavement and Dry-Freeze climate zone.

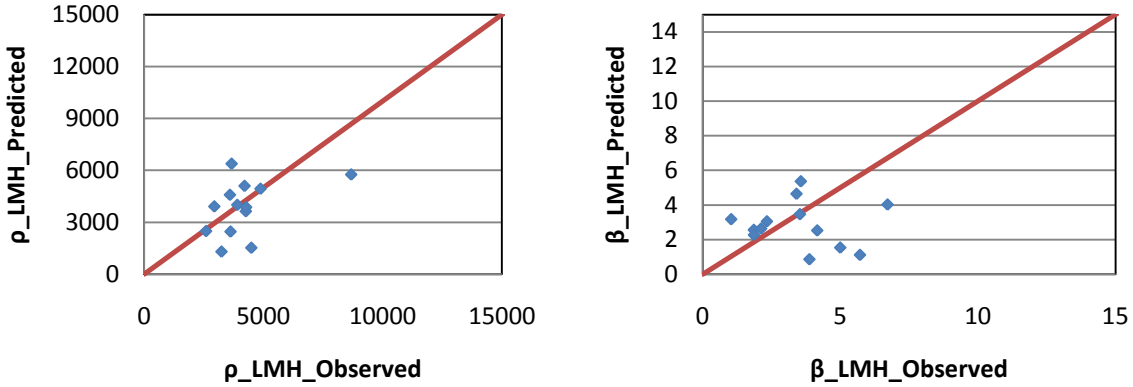

Figure N-18. LMH Regression results of ρ and β for AC over AC pavement and Dry-No Freeze climate zone.

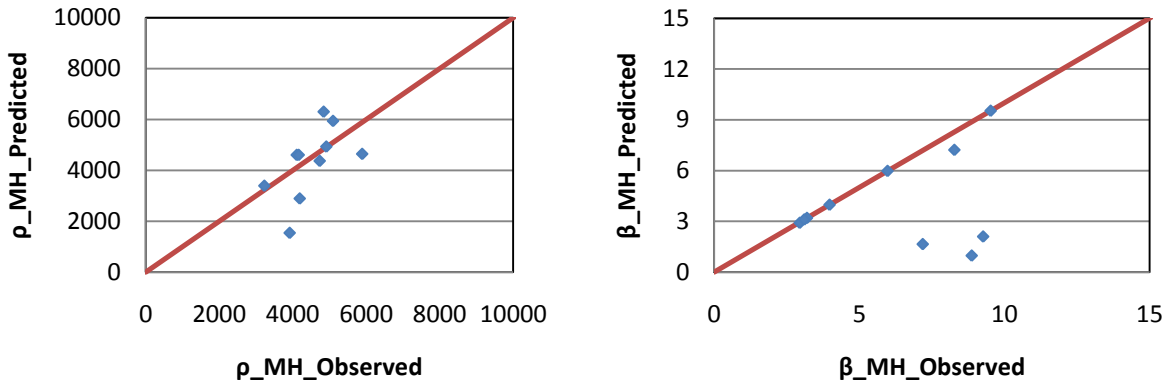

Figure N-19. MH Regression results of ρ and β for AC over AC pavement and Dry-No Freeze climate zone.

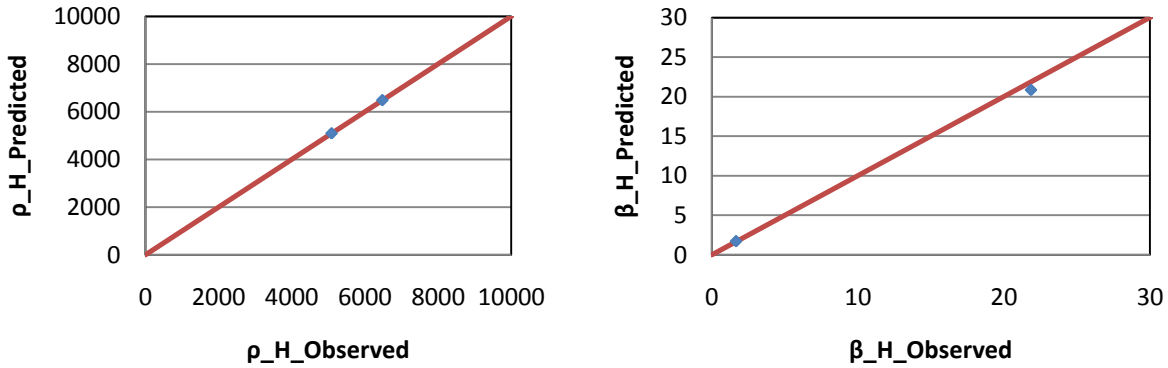

Figure N-20. H Regression results of ρ and β for AC over AC pavement and Dry-No Freeze climate zone.

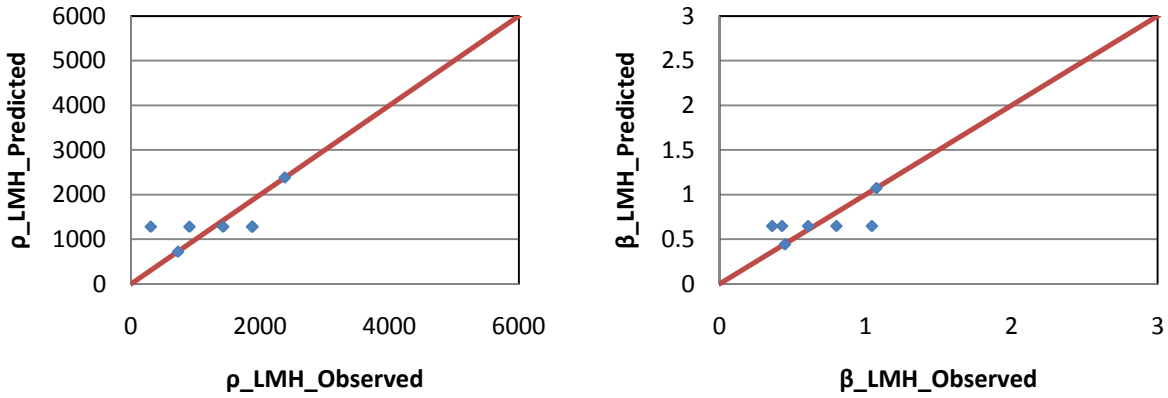

Figure N-21. LMH Regression results of ρ and β for AC with reinforcing over PCC pavement and Wet-No Freeze climate zone.

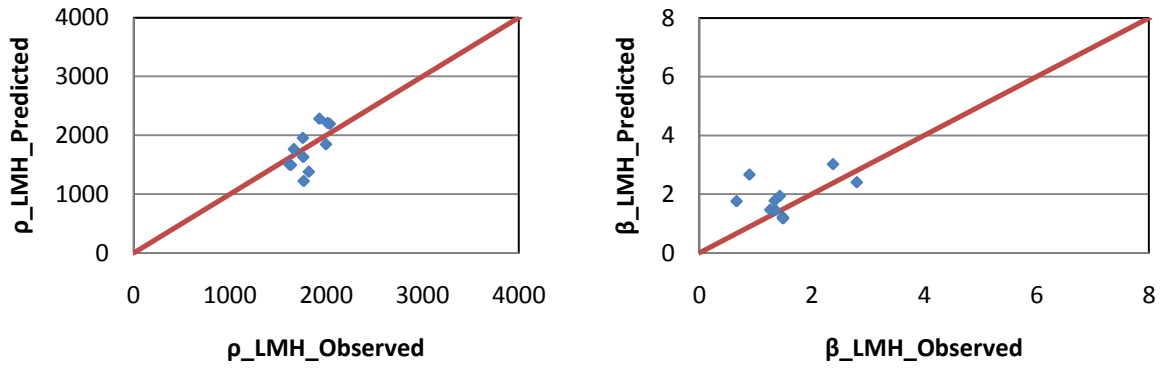

Figure N-22. LMH Regression results of ρ and β for AC with reinforcing over AC pavement and Dry-Freeze climate zone.

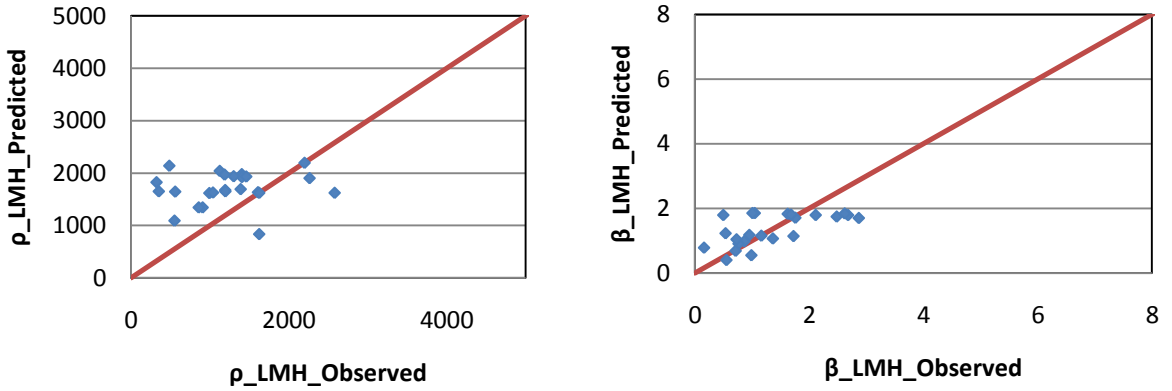

Figure N-23. LMH Regression results of ρ and β for AC with Reinforcing over PCC pavement and Wet- Freeze climate zone.

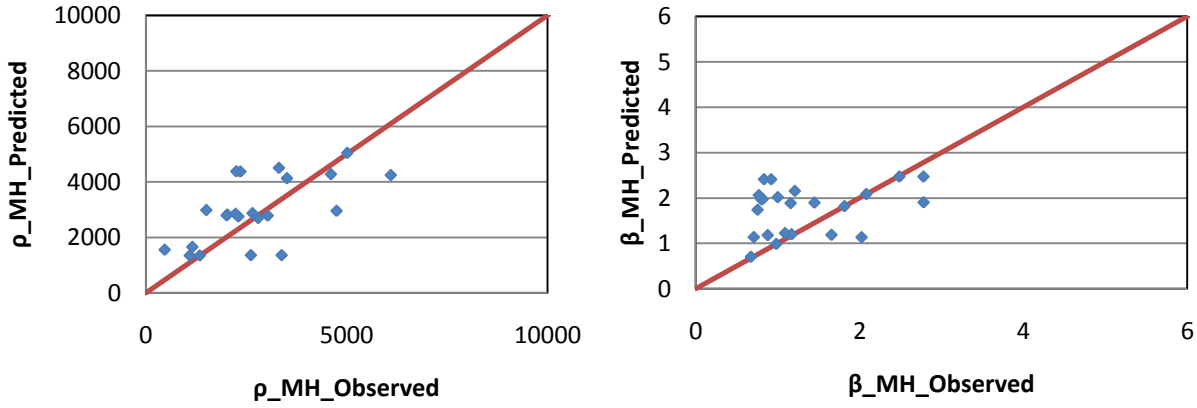

Figure N-24. MH Regression results of ρ and β for AC with Reinforcing over PCC pavement and Wet- Freeze climate zone.