Appendix: Tables

Table 21: Comparison of Survey One and Survey Two Results

Factors and Attributes	Multi-variate Hotellings p-value among survey results
Overall material performance ratings	0.80
Overall factor importance ratings	0.93
Cost factor importance ratings	0.98
Low initial cost attribute ratings for materials	1.00
Low maintenance cost attribute ratings for materials	0.73
Low life-cycle cost attribute ratings for materials	0.89
Durbility factor importance ratings	0.42
Fatigue resistance attribute ratings for materials	0.38
Mechanical wear/abrasion resistance attribute ratings for materials	0.16
Design factor importance ratings	0.16
Design standards available attribute ratings for materials	0.74
Materials available attribute ratings for materials	0.74
Ease of construction attribute ratings for materials	0.65
Environmental factor importance ratings	0.13
Chemically safe attribute ratings for materials	0.06
Aesthetically pleasing attribute ratings for materials	0.80
Maintenance factor importance ratings	0.64
Standards structure designs available in maintenance attribute ratings for materials	0.18
Field modification easy attribute ratings for materials	0.08
Ease of repair attribute ratings for materials	0.02
Innovation factor importance ratings	0.32
Innovative in performance attribute ratings for materials	0.43
Innovative in design attribute ratings for materials	0.69
Innovative in maintenance attribute ratings for materials	0.63

Table 22: Non-response bias and early versus late respondents comparisons.

	Overall material performance ratings	Overall factor importance ratings
Multivariate Hotellings test p-value among respondents and non-respondents	0.31	0.67
Multivariate Hotellings test p-value among early respondents and late respondents	0.81	0.85

Table 23: US infrastructure respondents' type of work by total count and percent.

Work-type	Highway Group n = 536	Waterway Group n = 99	Railroad Group n = 166	Utility Group n = 152	Combined Groups n = 959
Design	259 (48.3%)	60 (60.6%)	13 (7.8%)	54 (35.5%)	386 (40.3%)
Construction	82 (15.3%)	14 (14.1%)	9 (5.4%)	39 (25.7%)	144 (15.0%)
Maintenance	97 (18.1%)	16 (16.2%)	121 (72.9%)	26 (17.1%)	260 (27.1%)
Other (1)	98 (18.3%)	9 (9.1%)	23 (13.9%)	33 (21.7%)	163 (17.0%)

(1)Other could be administrative, materials research, or a combination of the above work-types

Table 24: US infrastructure respondents' education level by total count and percent.

Education	Highway Group n = 514	Waterway Group n = 98	Railroad Group n = 148	Utility Group n = 138	Combined Groups n = 959
BA	27 (5.3%)	1 (1.0%)	26 (17.6%)	10 (7.2%)	64 (6.7%)
MA	16 (3.1%)	2 (2.0%)	6 (4.1%)	9 (6.5%)	33 (3.4%)
PhD	9 (1.8%)	3 (3.1%)	1 (0.7%)	0 (0.0%)	13 (1.4%)
BS	311 (60.5%)	48 (49.0%)	67 (45.3%)	82 (59.4%)	508 (53.0%)
MS	128 (24.9%)	41 (41.8%)	17 (11.5%)	13 (9.4%)	199 (20.8%)
Other (1)	23 (4.5%)	3 (3.1%)	31 (20.9%)	24 (17.4%)	81 (8.4%)

(1)Other can be on the job training, vocational training, high school, or an unfinished college degree.

Table 25: US infrastructure respondents having coursework discussing structural design with wood by total count and percent.

	Highway Group n = 536	Waterway Group n = 100	Railroad Group n = 167	Utility Group n = 156	Combined Groups n = 959
Have course-work	227 (43.2%)	52 (53.1%)	58 (35.8%)	60 (39.5%)	397 (41.4%)
Do not have course-work	299 (56.8%)	46 (46.9%)	104 (64.2%)	92 (60.5%)	541 (56.4%)
Mandatory course-work	80 (34.2%)	17 (31.5%)	19 (30.2%)	21 (32.3%)	137 (14.3%)
Non-mandatory course-work	154 (65.8%)	37 (68.5%)	44 (69.8%)	44 (67.7%)	279 (29.1%)

Table 26: US infrastructure respondents' age groups by total count and percent.

Age Groups	Highway Group n = 529	Waterway Group n = 99	Railroad Group n = 164	Utility Group n = 155	Combined Groups n = 959
20 to 29 years	6 (1.1%)	0 (0.0%)	5 (3.0%)	2 (1.3%)	13 (1.4%)
30 to 39 years	63 (11.9%)	10 (10.1%)	23 (14.0%)	35 (22.6%)	131 (13.7%)
40 to 49 years	182 (34.4%)	40 (40.4%)	64 (39.0%)	55 (35.5%)	341 (35.6%)
50 to 59 years	192 (36.3%)	38 (38.4%)	60 (36.6%)	54 (34.8%)	344 (35.9%)
60 to 69 years	73 (13.8%)	9 (9.1%)	11 (6.7%)	8 (5.2%)	101 (10.5%)
70 years +	13 (2.5%)	2 (2.0%)	1 (0.6%)	1 (0.6%)	17 (1.8%)

Table 27: US infrastructure respondents' years of work experience groups by total count and percent.

Experience Groups	Highway Group n = 531	Waterway Group n = 99	Railroad Group n = 164	Utility Group n = 154	Combined Groups n = 959
5 years or less	16 (3.0%)	3 (3.0%)	17 (10.4%)	10 (6.5%)	46 (4.8%)
6 to 10 years	38 (7.2%)	8 (8.1%)	13 (7.9%)	12 (7.8%)	71 (7.4%)
11 to 15 years	55 (10.4%)	13 (13.1%)	18 (11.0%)	20 (13.0%)	106 (11.1%)
16 to 20 years	70 (13.2%)	16 (16.2%)	25 (15.2%)	24 (15.6%)	135 (14.1%)
21 to 25 years	96 (18.1%)	21 (21.2%)	36 (22.0%)	41 (26.6%)	194 (20.2%)
25 years or more	256 (48.2%)	38 (38.4%)	55 (33.5%)	47 (30.5%)	396 (41.3%)

Table 28: US infrastructure respondents that have guidelines for the use of wood products by total count and percent.

	Highway Group n = 511	Waterway Group n = 88	Railroad Group n = 154	Utility Group n = 156	Combined Groups n = 959
Have guidelines for wood use	342 (66.9%)	49 (55.7%)	65 (42.2%)	63 (45.3%)	519 (54.1%)
Have no guidelines for wood use	169 (33.1%)	39 (44.3%)	89 (57.8%)	79 (54.7%)	373 (38.9%)

Table 29: Structures designed, constructed or maintained by US infrastructure respondents by total count and percent.

Structure-Type	Highway Group n = 536	Waterway Group n = 100	Railroad Group n = 167	Utility Group n = 156	Combined Groups n = 959
Noise barrier	207 (38.6%)	8 (8.0%)	10 (6.0%)	4 (2.6%)	229 (23.9%)
Highway guardrail	414 (77.2%)	22 (22.0%)	13 (7.8%)	2 (1.3%)	451 (47.0%)
Signs and sign posts	289 (53.9%)	32 (32.0%)	75 (44.9%)	5 (3.2%)	501 (52.2%)
Salt storage buildings	148 (27.6%)	6 (6.0%)	3 (1.8%)	0 (0.0%)	157 (16.4%)
Formwork and falsework	185 (34.5%)	29 (29.0%)	26 (15.6%)	8 (5.1%)	248 (25.9%)
Wharves	29 (5.4%)	59 (59.0%)	11 (6.6%)	0 (0.0%)	109 (11.4%)
Bulkheads	84 (15.7%)	80 (80.0%)	26 (15.6%)	0 (0.0%)	190 (19.8%)
Marine pilings	73 (13.6%)	75 (75.0%)	19 (11.4%)	1 (0.6%)	168 (17.5%)
Boat docks	70 (13.1%)	58 (58.0%)	3 (1.8%)	2 (1.3%)	133 (13.9%)
Piers	115 (21.5%)	72 (72.0%)	21 (12.6%)	7 (4.5%)	215 (22.4%)
Railroad cross-ties	44 (8.2%)	12 (12.0%)	152 (91.0%)	3 (1.9%)	211 (22.0%)
Railroad bridges	120 (22.4%)	15 (15.0%)	132 (79.0%)	3 (1.9%)	270 (28.2%)
Distribution poles	21 (3.9%)	9 (9.0%)	18 (10.8%)	136 (87.2%)	184 (19.2%)
Cross-arms	14 (2.6%)	3 (3.0%)	35 (21.0%)	120 (76.9%)	172 (17.9%)
Pedestrian bridges	245 (45.7%)	30 (30.0%)	16 (9.6%)	1 (0.6%)	292 (30.4%)

Table 30: Materials used by US infrastructure respondents' in design, construction or maintenance of structures by total count and percent.

Material	Highway Group n = 536	Waterway Group n = 100	Railroad Group n = 167	Utility Group n = 156	Combined Groups n = 959
Reinforced concrete	472 (88.1%)	95 (95.0%)	94 (56.3%)	53 (34.0%)	714 (74.5%)
Prestressed concrete	398 (74.3%)	71 (71.0%)	57 (34.1%)	49 (31.4%)	575 (60.0%)
Steel	449 (83.9%)	91 (91.0%)	125 (74.9%)	109 (69.9%)	774 (80.7%)
Aluminum	250 (46.6%)	64 (64.0%)	24 (14.4%)	63 (40.4%)	401 (41.8%)
Wood	371 (69.2%)	75 (75.0%)	163 (97.6%)	150 (96.2%)	759 (79.1%)
Plastic	142 (26.5%)	34 (34.0%)	11 (6.6%)	14 (9.0%)	201 (21.0%)

Table 31: US infrastructure respondents' which have used and plan to use wood products in transportation structures by total count and percent.

	Highway Group n = 536	Waterway Group n = 100	Railroad Group n = 167	Utility Group n = 156	Combined Groups n = 959
Have used wood in the past 3 years	365 (69.0%)	67 (69.1%)	160 (98.2%)	146 (95.4%)	738 (77.0%)
Have not used wood in the past 3 years	164 (31.0%)	30 (30.9%)	3 (1.8%)	7 (4.6%)	204 (21.3%)
Have used engineered wood products in the past 3 years	255 (48.9%)	45 (46.4%)	71 (44.1%)	79 (52.0%)	450 (46.9%)
Have not used engineered wood products in the past 3 years	267 (51.1%)	52 (53.6%)	90 (55.9%)	73 (48.0%)	482 (50.3%)
Plan to use wood in the next 3 years	296 (57.4%)	57 (58.8%)	157 (96.3%)	141 (92.2%)	278 (29.0%)
Do not plan to use wood in the next 3 years	220 (42.6%)	40 (41.2%)	6 (3.7%)	12 (7.8%)	278 (29.0%)

Table 32: Engineered wood products used by infrastructure respondents' in design, construction or maintenance of structures by total count and percent.

Engineered Wood Product	Highway Group n = 536	Waterway Group n = 100	Railroad Group n = 167	Utility Group n = 156	Combined Groups n = 959
Plywood panel	111 (20.7%)	25 (25.0%)	24 (14.4%)	15 (9.6%)	175 (18.2%)
Glue-laminated timber	181 (33.8%)	27 (27.0%)	26 (15.6%)	53 (34.0%)	287 (29.9%)
Parallel strand lumber (PSL)	34 (6.3%)	4 (4.0%)	11 (6.6%)	7 (4.5%)	56 (5.8%)
Plate connected trusses	63 (11.8%)	17 (17.0%)	18 (10.8%)	10 (6.4%)	108 (11.3%)
Oriented strand board panels (OSB)	19 (3.5%)	7 (7.0%)	7 (4.2%)	1 (0.6%)	34 (3.5%)
Laminated veneer lumber (LVL)	39 (7.3%)	5 (5.0%)	6 (3.6%)	12 (7.7%)	62 (6.5%)
Engineered wood I-joists	54 (10.1%)	16 (16.0%)	7 (4.2%)	5 (3.2%)	82 (8.6%)

Table 33: US infrastructure respondents' mean perception of wood's overall performance versus their education level (1).

	Mean rating for Wood
BA n = 59	4.64
MA n = 31	4.90
BS n = 456	4.25
MS n = 177	4.07
other (2) n = 78	4.73
P-value among groups	<0.01

(1) 1 = does not possess the attribute; 7 = above average possession of the attribute.

(2) other could be high school, on the job training, or partial college degrees

Table 34: US infrastructure respondents' mean perception of wood's overall performance influenced by having or not having wood design coursework (1).

	Mean rating for wood
Have coursework n = 370	4.34
Do not have coursework n = 481	4.32
P-value between groups	0.80

(1) 1 = does not possess the attribute; 7 = above average possession of the attribute.

Table 35: US infrastructure respondents' mean perception of wood's overall performance influenced by having or not having guidelines for wood in highway structures (1).

	Mean rating for wood
Have guidelines n = 481	4.31
Do not have guidelines n = 335	4.36
P-value between groups	0.53

(1) 1 = does not possess the attribute; 7 = above average possession of the attribute.

Table 36: US infrastructure respondents' mean perception of wood's overall performance influenced by respondent age (1).

Age groups	Mean rating for wood
30 to 39 n = 123	4.46
40 to 49 n = 309	4.30
50 to 59 n = 305	4.32
60 to 69 n = 93	4.24
P-Value among groups	0.55

(1) 1 = does not possess the attribute; 7 = above average possession of the attribute.

Table 37: US infrastructure respondents' mean perception of wood's overall performance influenced by years of experience (1).

Years of Experience	Mean rating for wood
5 years of less n = 41	4.51
6 to 10 years n = 69	4.64
11 to 15 years n = 95	4.09
16 to 20 years n = 118	4.44
21 to 25 years n = 173	4.38
25 years or more n = 359	4.29
P - value between groups	0.06

(1) 1 = does not possess the attribute; 7 = above average possession of the attribute.

Table 38: US infrastructure respondents' mean overall factor importance ratings (1).

Factor	Highway Group n = 536	Waterway Group n = 100	Railroad Group n = 167	Utility Group n = 156	Combined Groups n = 959	P-Value Among Groups
Cost	5.88	5.97	5.89	5.91	5.90	0.82
Durability	6.31	6.26	6.27	6.19	6.28	0.50
Maintenance	5.98	4.89	6.12	5.88	5.99	0.11
Ease of Design	4.21	3.80	4.44	4.68	4.28	<0.01
Environmental Impact	4.79	5.02	4.74	4.79	4.81	0.31
Innovativeness of Material	3.37	3.24	3.56	3.49	3.41	0.47
P-Value Within Groups	< 0.01	<0.01	<0.01	<0.01	<0.01	
Multivariate Hotellings Test	P-Value <0.01					

(1) 1 = not important; 7 = very important.

Table 39: US infrastructure respondents' mean overall performance ratings for materials (1).

Material	Highway Group n = 536	Waterway Group n = 100	Railroad Group n = 167	Utility Group n = 156	Combined Groups n = 959	P-Value Among Groups
Prestressed Concrete	5.69	5.56	5.21	5.36	5.61	<0.01
Reinforced Concrete	5.51	5.52	5.15	5.07	5.42	<0.01
Steel	5.20	5.16	5.61	5.80	5.34	<0.01
Aluminum	4.60	4.20	4.01	4.84	4.53	<0.01
Wood	4.02	3.84	5.01	4.92	4.35	<0.01
Plastic	3.83	3.58	3.06	3.43	3.64	<0.01
P-Value Within Groups	< 0.01	<0.01	<0.01	<0.01	<0.01	
Multivariate Hotellings Test	P-Value <0.01					

(1) 1 = does not possess the attribute; 7 = above average possession of the attribute.

Table 40: Regional comparisons of US infrastructure respondents

Factors and Attributes	Region 1 Northeast n=197	Region 2 Southeast n=275	Region 3 Midwest n=244	Region 4 West PNW	Region 5 Southwest n=103	US Regions Combined n = 959	Univariate P-value among regions	Multi-variate Hotellings P-value among regions
Overall material performance ratings								0.58
Prestressed Concrete	5.42	5.68	5.64	5.56	5.75	5.61	0.16	
Reinforced Concrete	5.22	5.50	5.49	5.38	5.49	5.42	0.10	
Steel	5.35	5.29	5.35	5.44	5.35	5.34	0.94	
Aluminum	4.60	4.53	4.56	4.45	4.36	4.53	0.78	
Wood	4.28	4.23	4.38	4.58	4.36	4.35	0.72	
Plastic	3.80	3.54	3.68	3.52	3.61	3.64	0.71	
P-Value within regions	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
Overall factor importance ratings								0.33
Cost	5.85	5.92	5.85	5.95	5.96	5.90	0.64	
Durability	6.28	6.31	6.29	6.23	6.23	6.28	0.88	
Maintenance	6.00	6.07	5.96	5.91	5.94	5.99	0.48	
Design	4.03	4.40	4.25	4.37	4.41	4.28	0.03	
Environmental impact	4.94	4.87	4.71	4.69	4.79	4.81	0.42	
Innovativeness material	3.38	3.42	3.47	3.25	3.46	3.41	0.78	
P-value within regions	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		

Region 1 = Northeast, including: Connecticut, Delaware, Massachussetts, Maryland, District of Columbia, Maine, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, West Virginia.

Region 2 = Southeast, including: Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas and Virginia.

Region 3 = Midwest, including: Iowa, Illinois, Indiana, Michigan, Minnesota, Missouri, Ohio, Wisconsin, North Dakota, South Dakota, Nebraska and Kansas.

Region 4 = West and Pacific Northwest, including: Montana, Wyoming, Idaho, Washington, Oregon and Alaska.

Region 5 = Southwest and Pacific, including: California, Nevada, Arizona, New Mexico, Utah, Colorado and Hawaii.