Table 1. Physical-property test results for samples from Decker mine, Montana

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Rock description	Sample number	Density ρ (g/cm³)	Confining pressure σ_3 (kN/m²)[4]	Young's modulus E (10^9 N/m²)	Poisson's ratio ν	Peak compressive strength $(\sigma_1-\sigma_3)$ (kN/m²)	Residual compressive strength $(\sigma_1-\sigma_3)$ (kN/m²)	Braz. tens. strength T_B (kN/m²)	Remarks
SHALE - med. gray, calcareous, has many thin bituminous laminae along which cores tend to split. Samples 1A left unwrapped at 95% humidity for 2-3 days before testing.	1-1	2.38	0	0.54	—	7,810	0	3,172	
	1-2	2.33	345	0.447	—	9,540	3,750	3,813	
	1-3	2.30	690	0.236	—	6,270	—	917	
	1A-4	2.33	0	0.757	0.49	22,800	0	3,716	
	1-5	2.34	1,380	0.215	—	5,830	5,200	3,537	
	1A-6	2.34	2,070	0.351	—	8,230	7,880	1,048	
	1A-7	2.31	2,760	0.336	—	8,250	7,190	610	
	1-8	2.33	3,450	0.269	—	6,040	5,850	2,699	
	1-9	2.60	5,170	2.26	—	40,400	—	1,014	
	1-10	2.33	6,900	0.209	—	7,060	5,890	2,220	
	1-11	2.54	10,300	2.41	—	39,400	33,800	779[1]	
	1-12	2.39	0	0.244	—			2,331[1]	Cyclic loading.
			1,720	0.444	—				
			3,450	0.611	—				
			6,900	0.652	—				
			10,300	0.690	—	10,400			
	1-13	2.36	0	—	0.56[3]	—	—	662[1]	
	1-14A	—	—	—	—	—	—	1,786[1]	
	1-15A	—	—	—	—	—	—	501[1]	
SHALE - silty, dark gray, some calc. layers. Samples small and crumbly. No cores obtained.	2-1	—	—	—	—	—	—	869	
	2-2	—	—	—	—	—	—	463	
	2-3	—	—	—	—	—	—	166	
	2-4	—	—	—	—	—	—	132	
SHALE - med. gray, calcareous, few thin bituminous laminae. Stored unwrapped at 95% humidity.	3A-1	2.28	0	1.29	—	18,100	0	2,551	
	3A-2	2.27	690	1.28	—	19,100	9,100	3,227	
	3A-3	2.33	345	1.88	—	24,400	7,500	2,765	
	3A-4	2.29	1,720	1.29	—	20,600	11,300	3,427	
	3A-5	2.25	3,450	1.60	—	24,700	17,200	2,462	
	3A-6	2.38	1,380	1.28	—	15,300	10,200	2,339	
	3A-7	2.29	2,070	1.67	—	27,200	13,000	2,358	
	3A-8	2.25	2,760	1.50	—	25,600	15,000	2,813	
	3A-9	2.31	5,170	1.90	—	31,400	16,300	2,413	
	3A-10	2.34	6,900	2.12	—	38,100	23,100	2,606	
	3A-11	2.30	10,300	1.95	—	36,600	26,400	1,903	
	3A-12		0	1.29	—			1,531	Cyclic loading.
			1,720	1.84	—				
			3,450	2.24	—				
			5,170	2.53	—				
			10,300	2.94	—	40,200	28,300		
	3A-13	2.27			0.15			924	
	3A-14	2.33	0	1.81	—	19,100	0	1,572	
	3A-15	2.36	0	1.64	0.44	16,300	0	1,241	
	3A-16	—	—	—	—	—	—	855[2]	
	3A-17	—	—	—	—	—	—	1,262[2]	
	3A-18	—	—	—	—	—	—	779[2]	
	3A-19	—	—	—	—	—	—	883[2]	
	3A-20	—	—	—	—	—	—	958[2]	
	3A-21	—	—	—	—	—	—	841[2]	
SILTSTONE - sandy, white to tan, calcareous, crumbly, poorly cemented. Stored unwrapped at 95% humidity.	3B-1	2.15	—	—	0.57[3]	—	—		
	3B-2	2.08	0	0.884	—	7,750	0	372	
	3B-3	2.14	0	0.867	0.36	7,250	0	400	
	3B-4	2.13	345	0.879	—	8,310	3,150	359	
	3B-5	2.04	690	1.0	—	9,350	5,250	469	
	3B-6	2.17	1,380	0.775	—	11,000	6,350	607	
	3B-7	2.16	2,070	1.55	—	16,700	10,600	503	
	3B-8	2.11	2,760	1.71	—	17,500	13,100	600	
	3B-9	2.08	3,450	1.98	—	21,600	15,000	614	
	3B-10	2.11	5,170	2.16	—	25,000	18,400	476	
	3B-11	2.10	6,900	2.26	—	25,000	20,500	600	
	3B-12	2.11	10,300	2.27	—	27,500	26,300	476	
	3B-13	2.09	0	.965	—			421[1]	Cyclic loading.
			1,720	1.91	—				
			3,450	2.47	—				
			6,900	3.26	—				
			10,300	4.15	—	28,400	27,500		
	3B-14	2.09	0	0.799	0.40	4,000	0	393[1]	Cored ‖ to bd.
	3B-15	—	—	—	—	—	—	434[1]	
	3B-16	—	—	—	—	—	—	228[1]	
	3B-17	—	—	—	—	—	—	324[1]	
	3B-18	—	—	—	—	—	—	379[1]	
SHALE - calcareous, med. gray, grading to brown clayey limestone.	3C-1	2.36	—	—	0.30	—	—	2,165	
	3C-2	2.42	0	1.5	—	17,300	0	2,620	
	3C-3	2.36	0	1.28	—			1,993	Cyclic loading.
			1,720	1.55	—				
			3,450	1.90	—				
			6,900	2.50	—				
			10,300	3.26	—	38,000	34,000		
	3C-4	—	—	—	—	—	—	2,972	
	3C-5	—	—	—	—	—	—	1,517	
	3C-6	—	—	—	—	—	—	2,620	
	3C-7	—	—	—	—	—	—	1,944	
	3C-8	—	—	—	—	—	—	2,786	
	3C-9	—	—	—	—	—	—	1,758	
	3C-10	—	—	—	—	—	—	2,675	
	3C-11	—	—	—	—	—	—	5,000	
	3C-12	—	—	—	—	—	—	2,248	
	3C-13	—	—	—	—	—	—	13,390	
	3C-14	—	—	—	—	—	—	31,500	
	3C-15	—	—	—	—	—	—	12,390	
	3C-16	—	—	—	—	—	—	5,726	
SILTSTONE, sandy, calcareous, gray to brownish gray, vy. fine grained, dense, hard. Contains about 47% $CaCO_3$ cement.	3D-1	2.82	0	9.98	0.81[3]			16,160	Cyclic loading.
			1,720	12.2	—				
			3,450	14.1	—				
			5,170	12.5	—	97,000	48,100		
	3D-2	2.58	0	6.6	—	45,000	0	10,200	
	3D-3	—	—	—	0.47	—	—	8,130	
	3D-4	2.60	1,720	6.02	—	50,000	22,300	7,550	
	3D-5	2.73	3,450	14.1	—	103,000	35,200	12,400	
	3D-6	2.79	6,900	15.3	—	135,000	48,500	4,990	
	3D-7	—	—	—	—	—	—	13,340	
	3D-8	—	—	—	—	—	—	13,400	
	3D-9	—	—	—	—	—	—	11,600	
	3D-10	—	—	—	—	—	—	7,950	
	3D-11	—	—	—	—	—	—	10,900[1]	
	3D-12	—	—	—	—	—	—	14,300[1]	
	3D-13	—	—	—	—	—	—	[illegible][1]	
	3D-14	—	—	—	—	—	—	8,730[1]	
COAL - subbituminous, black, blocky. Contains two major cleat planes perpendicular to bd. and to each other, cleat-plane spacing about 5-7.5 cm, exhibits subconchoidal fracture.	4-1	1.31	—	—	0.36	—	—	2,280	
	4-2	1.32	—	—	0.37	—	—	1,730	
	4A-3	1.32	—	—	0.43	—	—	2,490	
	4-4	1.34	0	2.2	—	20,000	0	1,180	
	4-5	1.32	0	2.03	—	25,500	0	1,900	
	4A-6	1.33	0	1.51	—	19,000	0	2,090	
	4A-7	1.33	345	1.74	—	23,100	9,000	1,450	
	4A-8	1.33	690	1.97	—	28,800	10,000	1,090	
	4-9	1.33	1,380	1.68	—	24,400	14,100	2,300	
	4-10	1.31	2,070	1.63	—	28,800	18,400	1,875	
	4-11	1.31	2,760	1.93	—	31,400	20,000	669	
	4A-12	1.32	3,450	2.24	—	37,800	19,400	1,155	
	4-13	1.29	5,170	1.75	—	40,000	22,800	1,138	
	4-14	1.32	6,900	2.16	—	35,900	30,000	1,262	
	4A-15	1.32	10,300	2.02	—	33,100	29,700	1,860	
	4A-16	1.31	0	2.17	—			2,241[1]	Cyclic loading.
			1,720	2.15	—				
			3,450	2.25	—				
			5,170	2.05	—				
			6,900	2.05	—				
			10,300	2.05	—	39,100	37,200		
	4-17		—	—	—	—	—	2,475[1]	
	4-18		—	—	—	—	—	1,282[1]	

[1]Loaded at an oblique angle to bedding.

[2]Loaded parallel to bedding. All other Brazilian test specimens loaded perpendicular to bedding.

[3]Poisson's ratio value greater than 0.5 means that sample dilated during test.

[4]1 lb/in.² = 6.894 kN/m² or 6894 N/m²