

Table 3. Velocities and Stiffness Constants for Shales with Hexagonal Symmetry^a

P	V _p (0°)	V _p (90°) _{avg}	V _p (45°)	V _{SH} (90°)	V _{SVavg}	C ₁₁	C ₁₂	C ₃₃	C ₄₄	C ₁₃
<i>MRX101 (Antrim, Alpena, MI), Density = 2212 kg/m³</i>										
20	2.810	3.784	3.269	2.359	1.766	31.67	7.05	17.47	6.90	7.21
40	2.918	3.854	3.350	2.387	1.801	32.86	7.64	18.83	7.18	7.90
60	3.008	3.918	3.408	2.415	1.829	33.96	8.15	20.01	7.40	8.11
80	3.078	3.973	3.463	2.437	1.850	34.92	8.64	20.96	7.57	8.53
100	3.142	4.019	3.505	2.454	1.867	35.73	9.09	21.84	7.71	8.74
150	3.239	4.099	3.589	2.482	1.894	37.17	9.91	23.21	7.93	9.59
200	3.291	4.136	3.641	2.502	1.906	37.84	10.15	23.96	8.03	10.42
<i>MRX102 (New Albany, Scottsburg, IN), Density = 2268 kg/m³</i>										
20	3.045	4.008	3.449	2.514	1.957	36.42	7.77	21.03	8.69	5.95
40	3.161	4.068	3.557	2.537	1.993	37.53	8.33	22.66	9.01	7.69
60	3.253	4.122	3.632	2.559	2.026	38.53	8.83	24.00	9.31	8.52
80	3.321	4.170	3.692	2.580	2.056	39.43	9.24	25.01	9.59	9.09
100	3.369	4.215	3.737	2.595	2.078	40.29	9.75	25.74	9.79	9.41
150	3.400	4.286	3.792	2.638	2.135	41.66	10.08	26.22	10.34	9.14
200	3.425	4.321	3.817	2.668	2.170	42.34	10.04	26.60	10.68	8.72
<i>MRX103 (Chattanooga, Thorn Hill, TN), Density = 2341 kg/m³</i>										
20	2.976	4.473	3.662	2.777	1.754	46.83	10.73	20.73	7.21	10.25
40	3.105	4.549	3.766	2.812	1.801	48.44	11.41	22.57	7.59	11.81
60	3.181	4.593	3.828	2.833	1.828	49.39	11.82	23.69	7.83	12.72
80	3.235	4.625	3.871	2.847	1.848	50.07	12.11	24.50	7.99	13.36
100	3.286	4.666	3.912	2.864	1.865	50.97	12.56	25.28	8.14	13.76
150	3.352	4.693	3.966	2.879	1.890	51.57	12.76	26.31	8.37	14.76
200	3.406	4.725	4.010	2.894	1.910	52.26	13.06	27.16	8.54	15.39
<i>MRX104 (New Albany, Scottsburg, IN), Density = 2356 kg/m³</i>										
20	3.033	4.101	3.520	2.624	2.033	39.62	7.18	21.67	9.73	5.88
40	3.159	4.177	3.622	2.658	2.070	41.10	7.80	23.51	10.09	7.22
60	3.261	4.245	3.708	2.686	2.102	42.45	8.45	25.06	10.41	8.30
80	3.339	4.305	3.778	2.708	2.129	43.66	9.11	26.27	10.68	9.12
100	3.394	4.343	3.811	2.723	2.152	44.44	9.50	27.14	10.91	9.04
150	3.445	4.408	3.881	2.737	2.181	45.78	10.47	27.96	11.21	9.88
200	3.470	4.451	3.919	2.744	2.192	46.68	11.20	28.37	11.32	10.35
<i>MRX105 (New Albany, Scottsburg, IN), Density = 2370 kg/m³</i>										
20	3.184	4.182	3.645	2.640	2.115	41.45	8.41	24.02	10.60	6.98
40	3.313	4.264	3.739	2.684	2.156	43.09	8.94	26.02	11.02	7.82
60	3.391	4.330	3.817	2.717	2.191	44.44	9.44	27.26	11.38	8.68
80	3.448	4.387	3.879	2.741	2.220	45.62	9.99	28.18	11.68	9.31
100	3.507	4.424	3.935	2.754	2.245	46.39	10.44	29.15	11.94	10.13
150	3.575	4.483	4.035	2.785	2.279	47.64	10.86	30.29	12.31	12.10
200	3.634	4.518	4.135	2.799	2.289	48.38	11.24	31.31	12.41	15.08

Table 2. (Continued)

P	$V_p(0^\circ)$	$V_p(90^\circ)_{\text{avg}}$	$V_p(45^\circ)$	$V_{SH}(90^\circ)$	$V_{SV\text{avg}}$	C_{11}	C_{12}	C_{33}	C_{44}	C_{13}
<i>MRX106 (New Albany, Scottsburg, IN), Density = 2386 kg/m³</i>										
20	3.287	4.235	3.712	2.659	2.129	42.80	9.06	25.79	10.82	8.00
40	3.412	4.325	3.802	2.697	2.171	44.64	9.93	27.78	11.24	8.58
60	3.487	4.399	3.876	2.729	2.207	46.18	10.64	29.01	11.62	9.17
80	3.541	4.457	3.934	2.755	2.237	47.41	11.18	29.92	11.94	9.62
100	3.598	4.489	3.982	2.774	2.263	48.08	11.36	30.89	12.21	10.16
150	3.662	4.523	4.088	2.814	2.292	48.81	11.02	32.00	12.53	12.93
200	3.719	4.544	4.167	2.839	2.303	49.27	10.80	33.01	12.65	15.26
<i>MRX107 (Chattanooga, Thorn Hill, TN), Density = 2398 kg/m³</i>										
20	3.186	4.817	3.892	2.922	1.885	55.65	14.70	24.34	8.52	9.84
40	3.265	4.879	3.952	2.957	1.912	57.07	15.14	25.56	8.77	10.40
60	3.333	4.914	3.987	2.978	1.930	57.92	15.40	26.64	8.93	10.60
80	3.390	4.940	4.008	2.992	1.945	58.52	15.58	27.56	9.07	10.47
100	3.431	4.965	4.056	3.004	1.956	59.11	15.83	28.23	9.17	11.82
150	3.490	4.996	4.019	3.024	1.970	59.85	15.99	29.21	9.30	8.70
200	3.515	5.021	4.024	3.039	1.978	60.46	16.18	29.63	9.38	8.00

^aP is pressure in MPa; velocities are in km/s, and stiffness constants in GPa. $V_p(0^\circ)$ and $V_p(90^\circ)_{\text{avg}}$ are compressional wave velocities parallel and perpendicular to the symmetry axis. $V_p(45^\circ)$ is a quasicompressional wave velocity for propagation at 45° degrees to the symmetry axis. $V_{SH}(90^\circ)$ is a shear wave velocity with propagation and vibration directions normal to the symmetry axis. $V_{SV\text{avg}}$ is an average shear wave velocity for (1) propagation parallel to the symmetry axis and (2) propagation normal and vibration parallel to the symmetry axis.