

TABLE 2. Earthquake Shaking Force (EqSF)

CahX	CahY	CaV	t	EQF	Station	Distance	Note	Depth
<i>cm/sec/sec</i>	<i>cm/sec/sec</i>	<i>cm/sec/sec</i>	<i>sec</i>			<i>km</i>		<i>km</i>
El Centro, CA, May 18, 1940 M 6.9								6.0
Average 5 EQF = 7.6*0.8 = 6.1 (single station)								
341.70	185.00	144.00	24.70	7.4	El Centro ARRAY Station 9	8.2		
San Fernando, CA, February 9, 1971 M 6.6								8.4
Average 5 EQF = 6.9								
1148.00	1055.00	434.00	11.50	9.5	Pacoima Dam	8.5		
366.20	282.10	161.10	8.00	5.1	Elizabeth Lake - Lake Hughes	23.10		
327.60	280.90	173.70	14.80	6.3	Costaic-Old Ridge Route	27.60		
268.10	221.20	139.10	9.00	4.7	Glendale Municipal Serv Bldg	32.10		
341.40	258.00	165.00	31.50	8.5	Maricopa Array Sta 4	119.50		
Te Aroha, New Zealand, January 5, 1973 M 6.6								
153.00	143.00	68.00	10.50	4.1	Atene - C Valley	75.00		
Gazli, Uzbekistan, May 17, 1976 M7.0								
703.10	518.00	1331.70	11.00	8.1	Karakyr, Uzbekistan	unknown		
Imperial Valley, CA, October 15, 1979 M 6.5								12.0
Average 5 EQF = 7.3								
351.40	229.90	889.40	14.80	7.2	Agrarias	1.8		
763.20	582.50	434.90	13.00	8.3	Bonds Corner, Hwys 115 & 98	9.0		
476.80	346.40	596.00	7.20	5.6	El Centro, Differential Array	28.7		
607.10	469.30	403.90	6.50	5.7	El Centro, Array Sta 8	29.6		
478.60	361.20	240.70	6.50	5.2	El Centro, Array Sta 4	29.7		
444.30	147.00	1703.60	12.00	8.0	El Centro, Sta 6, 551 Hudston Rd	29.8		
521.30	373.40	511.10	10.50	6.6	El Centro, Array Sta 5	30.4		
Valparaiso, Chile, March 3, 1985 M 7.8								33.0
Average 5 EQF = 12.8								
656.00	437.00	849.00	53.80	14.0	Llolleo	n/a		
698.00	437.00	463.00	53.80	13.8	Llolleo	n/a		
425.00	303.00	189.00	46.80	10.8	San Felipe	n/a		
465.30	345.50	222.80	47.00	11.3	Llayllay	n/a		
673.00	518.00	250.00	45.00	12.9	Melipilla	n/a		
333.00	285.00	119.00	27.00	8.0	San Fernando	n/a		
707.00	696.00	393.00	54.30	14.8	San Isidro	n/a		

Loma Prieta, CA, October 17, 1989 M 7.1					Average 5 EQF = 6.5			18.0
617.70	469.40	431.10	11.60	7.3	Corralitos	6.9		
617.70	469.40	431.10	11.60	7.3	Corralitos	7.9	pick interval=1.3 sec	
617.70	327.00	431.10	11.60	7.0	Corralitos	7.9		
449.00	390.80	500.10	16.40	7.7	Capitola	11.7		
433.10	340.70	324.60	11.70	6.4	Santa Cruz Lick Observatory	18.6		
433.60	401.60	131.00	5.00	4.6	Lexington Dam	19.0		
494.50	316.20	353.40	7.00	5.3	Saratoga	27.4		
434.00	427.00	206.00	6.00	5.0	Gilroy Station 1	28.4		
531.70	362.00	360.10	6.00	5.2	Gilroy Station 3	31.1		
378.20	341.50	193.00	5.50	4.5	Palo Alto, VA Hospital	46.3		
325.80	230.80	63.30	7.00	4.5	SF Airport	79.4		
238.30	187.30	141.30	4.00	3.3	Oakland	91.9	no seismograms available	
281.40	265.50	65.10	4.00	3.6	Oakland, 14th str. Wharf	94.5	no seismograms available	
120.20	104.20	47.40	2.50	2.1	SF, Transamerica Basement	96.3		
155.80	97.90	15.90	3.00	2.4	Treasure Island	97.6		
194.90	97.90	56.20	2.50	2.3	SF Presidio	98.0		
238.70	124.20	57.50	4.00	3.1	Golden Gate Bridge	100.1		
Cape Mendocino/Petrolia, April 25, 1992 M 7.0					Average 5 EQF = 8.4			15.0
1468.30	1019.40	738.90	19.00	12.3	Cape Mendocino/Petrolia	3.8		
649.40	578.00	159.70	18.90	9.2	Petrolia, General Store	5.4		
471.00	317.60	122.80	16.00	7.2	Centerville Beach	22.0		
538.50	378.30	191.50	16.00	7.7	Rio Dell	23.7		
373.60	263.00	73.70	11.10	5.7	Eel River, Ferndale Fire Sta	24.0		
Landers, CA, June 28, 1992 M 7.3					Average 5 EQF = 8.9			1.1
256.00	268.00	156.00	30.90	8.0	Joshua Tree	13.7		
216.10	161.40	169.60	20.00	6.0	Morongo Valley	21.0		
213.00	204.00	103.00	24.50	6.6	Fun Valley, Reservoir 361	31.0		
798.00	716.80	383.00	24.00	11.0	Lucerne Valley	42.0		
301.70	126.00	81.90	31.30	7.6	Indio, Jackson Road	54.0		
240.00	148.60	133.20	15.00	5.4	Yermo, Fire Station	85.8		
Northridge, CA, January 17, 1994 M 6.7					Average 5 EQF = 9.4			19.0
467.90	357.00	785.00	14.30	7.5	White Oak Covenant Church	2.2		

1744.50	912.00	1027.50	21.50	13.5	Tarzana, Cedar Hill Nursery	5.5			
922.70	535.30	325.00	11.60	8.2	Sepulveda, VA Hospital	7.3			
266.00	302.00	361.00	10.00	5.4	Arleta	9.9			
825.50	471.00	830.00	12.00	8.2	LA Reservoir	9.9			
739.50	593.00	584.00	15.20	8.8	Sylmar, Converter, Valve Group 7	12.3			
814.80	377.00	396.00	9.00	6.9	Sylmar, Converter Station East	12.7			
782.40	375.50	324.30	9.00	6.8	Sylmar, County Hospital	15.8			
578.20	571.60	537.30	8.00	6.4	New Hall	20.2			
866.00	362.60	227.70	10.50	7.5	Santa Monica, City Hall	22.5			
Arthurs Pass, New Zealand, June 18, 1994, M 6.8								Average 5 EQF = 5.0	
428.40	329.30	367.30	19.00	7.7	Arthurs Pass	11.0			
140.00	116.00	53.00	5.60	3.0	Flock Hill	28.0			
Kobe, Japan, January 17, 1995, M 6.9								Average 5 EQF = 8.7	16.0
843.70	510.10	506.22	15.00	8.9	JMA Kobe	3.4	Assumed Vertical acceleration and duration		
323.70	255.00	194.22	15.00	6.2	Ceorka University, Kobe	3.8			
657.30	529.70	394.38	15.00	8.3	Ceorka, Kobe	6.2	Same as above		
421.80	137.30	253.08	15.00	6.5	Port Island, Kobe	6.6	Same as above		
680.81	679.83	424.77	15.00	8.8	Takarazuka	1.2	Same as above		
818.00	617.00	332.00	13.50	8.6	Marine Observation, Kobe	17.0	From seismogram		
Vertical acceleration assumed = 0.6*CahX									
Izmit/Kocaeli, Turkey, August 17, 1999, M 7.4								Average 5 EQF = 7.7	17.0
287.00	226.00	236.20	32.70	8.2	Yarimca	11.0			
224.90	123.00	146.40	33.00	7.1	Izmit	13.0			
264.80	141.50	198.50	5.50	3.7	Gebze	36.0			
207.00	131.50	81.50	3.80	2.9	Arcelik	41.0			
399.50		243.00	11.00	5.5	Sakarya	43.0	CahY is N/A		
207.00	131.00	82.00	5.00	3.3	Darica	44.5			
173.70	129.40	56.50	3.50	2.7	Cekmece	99.7			
373.70	314.80	479.90	9.50	5.8	Duzce	109.0			
Athens, Greece, September 7, 1999 M 5.9								Average 5 EQF = 4.8	10.0
243.30	221.70	91.20	4.00	3.3	Sepolia	15.0	t=4 sec assumed		
215.82	182.50	154.00	4.00	3.2	Keratsini	15.0	t=4 sec assumed		

297.20	259.00	154.00	4.00	3.6	Piraeus Str.	16.0	t=4 sec assumed	
523.85	218.75	218.75	4.00	4.2	Monastiraki	17.0	t=4 sec assumed	
Jiji, Taiwan, September 20, 1999 M 7.6								
						Average EQF = 12.3		8.0
440.00	302.70	171.00	28.63	8.9	Taichung TCU 078	7.1		
580.30	278.00	384.20	35.40	10.6	Taichung TCU 079	9.9		
990.10	423.30	265.00	31.00	12.2	Taichung TCU 084	10.5		
865.00	611.30	335.30	35.00	12.7	Taichung TCU 129	11.9		
983.90	389.00	150.00	35.00	12.7	Taichung TCU 129	11.9		
639.60	518.40	416.00	29.70	10.8	Taichung TCU 071	13.9		
775.10	438.00	125.00	36.00	11.9	Taichung TCU 065	24.6		
842.50	793.20	716.70	32.00	12.9	Chiayi CHY 080	31.7		
750.00	624.00	336.00	15.80	9.0	Chiayi CHY 028	32.1		
508.00	362.00	519.00	15.50	7.6	Taichung TCU 068	46.3		
128.00	106.00	43.00	6.00	3.0	Taipei	151.0		
Hector Mine, October 16, 1999 M 7.1								
						Average 5 EQF = 3.8		6.0
178.40	146.80	130.00	9.30	4.1	Amboy	48.4		
186.00	143.00	118.00	9.00	4.1	Joshua Tree	51.5		
169.70	153.10	43.80	5.00	3.2	Big Bear Lake	67.5		
128.00	89.20	66.30	3.00	2.2	Baker, Fire Station	77.6		
123.60	104.00	54.50	3.50	2.4	Fort Irwin	83.8		
133.30	123.60	33.40	9.00	3.6	Palm Spring, Hospital,	87.9		
Yountville (Napa), September 3, 2000 M 5.2								
						Average 5 EQF = 3.5		9.4
498.10	401.30	502.80	4.00	4.5	Napa, Fire Station	10.0		
180.70	120.80	55.60	4.00	2.8	Sonoma, Fire Station	10.0		
330.20	178.50	94.10	2.50	2.9	Napa College	16.9		
15.70	10.30	6.40	2.50	0.9	Petaluma Fire Station 2	25.0		
28.50	15.80	7.70	2.50	1.1	Vallejo, Fire Station	33.0		
16.30	14.80	6.80	2.50	0.9	Novato, Fire Station 4	36.0		
Western Tottori, Japan, October 6, 2000 M 7.1								
						Average 5 EQF = 9.8		12.0
927.20	753.00	775.80	50.00	15.6	Hino, Station TTRH02	8.0		
927.20	753.00	775.80	50.00	15.6	Hino, Station TTRH02	8.0		
720.40	607.10	459.00	32.70	11.9	Hakuta, Station SMNH01	12.5		
283.80	181.80	251.60	20.00	6.6	Yubara, Station OKYH09	29.0	First event	

Arequipa, Peru, June 26, 2001 Mw 8.4								33.0
294.30	166.77	137.34	32.60	7.9	Moquegua	100.0		
304.11	264.87	176.58	30.00	8.2	Arica Casa	148.0		
255.06	245.25	147.15	30.00	7.7	Poconcile	168.0		
323.73	264.87	78.48	30.00	8.2	Arica Costanera	148.0		
Gilroy, CA, May 14, 2002 M 5.2								7.6
75.30	35.20	31.70	0.50	0.8	Morgan Hill, El Toro Fire St	20.1	str. duration=0 sec.	
93.88		35.00	0.50	0.9	San Isidro		str. duration=0 sec.	
Nenana Mountain, AK, October 23, 2002 M 6.7								
29.70	29.00	20.20	0.50	0.6	Fairbanks, AK	149.0	str. duration=0 sec.	
Japan, November 3, 2002 M6.2								
214.10	145.20	101.30	1.00	1.7	Touwa Japan, stn MYGH11	78.3		
Denali, AK, November 3, 2002 M7.9								5.0
84.50	69.30	47.20	0.50	0.9	Fairbanks, AK	152.0	str. duration=0 sec.	
East Coast of Honshu, Japan, May 26, 2003 M7.0								60.0
					Average 5EQF=11.8			
809.10	650.80	459.80	28.60	11.7	Karakuwa, MYGH03	19.0		
888.10	556.10	636.50	32.90	12.5	Rikuzentakata, IWTH27	34.1		
570.60	501.70	338.00	30.00	10.5	Fujisawa, IWTH05	39.2		
664.70	502.60	376.00	21.50	9.6	Touwa, MYGH04	40.9		
729.60	679.20	1279.90	22.90	11.2	Sumita, IWTH04	54.7		
521.30	454.70	511.30	22.90	9.2	Ichinoseki-E, IWTH26	71.3		
586.20	549.90	711.10	22.90	9.9	Yamada, IWTH21	75.5		
615.00	579.00	168.00	20.00	9.3	Onoda, MYGH05	91.6		
795.60	409.00	379.00	44.00	13.1	Tamayama, IWTH02	119.0		
CahX	CahY	CaV	t	EQF Scale	Station	Distance	Note	Depth
<i>cm/sec/sec</i>	<i>cm/sec/sec</i>	<i>cm/sec/sec</i>	<i>sec</i>			<i>km</i>		<i>km</i>
Hokkaido, Japan, September 25, 2003 M8.0						Average 5EQF=12.37		27.0

972.60	618.00	316.00	65.00	16.8	Hiroo, HKD120	97.7		
366.10	290.00	201.60	32.50	8.9	Taiki, HKD098	116.0		
559.50	345.30	168.50	51.50	12.2	Seika, HKD097	120.0		
470.00	416.10	395.40	38.00	10.8	Taiki, TKCH08	123.0		
403.90	366.70	116.70	41.00	10.4	Toyokoro, TKCH07	135.0		
404.60	373.10	118.80	34.00	9.6	Akan-S, KSRH02	157.0		
500.20	339.60	442.20	31.00	9.9	Tsurui-S, KSRH07	160.0		
406.10	357.20	199.80	27.00	8.8	Honbetsu, TKCH05	165.0		
580.40	534.60	216.30	28.50	10.4	Tsuruui-S, KSRH10	184.0		
299.50	806.20	588.00	32.80	11.6	Shibecha-N, KSRH03	190.0		
437.80	428.30	147.00	17.00	7.6	Bekkai-E, NMRH04	203.0		
514.10	442.00	391.90	24.00	9.2	Shibecha-S, NMRH02	228.0		
Hokkaido, Japan, September 25, 2003 M7.0 (Aftershock)								
						Average 5EQF=6.2		
425.90	271.40	112.10	32.50	9.2	Hiroo, HKD100	76.2		
591.80	397.00	80.60	13.60	7.4	Urakawa, HKD109	99.5		
169.30	130.80	43.00	19.00	5.2	Taiki, TKCH08	102.0		
175.00	120.40	60.50	6.50	3.4	Monbetsu, HDKH03	155.0		
258.40	164.00	85.90	17.00	5.8	Minamidohri, AOM007	207.0		
211.10	217.20	53.90	14.00	5.3	Toi, HKD159	232.0		
CahX	CahY	CaV	t	EQF Scale	Station	Distance	Note	Depth
<i>cm/sec/sec</i>	<i>cm/sec/sec</i>	<i>cm/sec/sec</i>	<i>sec</i>			<i>km</i>		<i>km</i>
San Simeon, CA, December 22, 2003 M6.5								4.7
459.00	122.10	86.60	8.60	5.2	Templeton, CA	38.4		
175.00	122.10	86.60	9.00	3.9	Cambria, Hwy 1, Bridge	14.8		
201.50	159.60	48.30	8.50	4.1	Parkfield, Hwy 46, Cholame Creek Br.	73.8		
Bam, Iran, December 26, 2003 M6.6								10.0
						Average 5EQF=5.76		
623.44	567.00	979.95	16.50	9.1	Bam, Iran	0.0		
166.69	109.47	83.81	12.00	4.3	Abaraq, Iran	49.0	assumed duration	
115.94	66.79	69.17	12.00	3.7	Mohamad Abad	49.0	assumed duration	
40.17	27.56	30.32	10.00	2.3	Jiroft	76.0	assumed duration	
33.59	31.82	14.07	8.00	2.0	Andoohjerd	139.0	assumed duration	

Parkfield, CA, September 28, 2004 M6.0					Average 5EQF=6.4			7.9
802.96	580.69	118.00	7.00	6.5	Parkfiels, Fault Zone 1	8.8		
1108.53	559.17	706.32	6.50	7.0	Parkfield, Fault Zone 11	9.2	Preliminary	
535.81	486.80	246.49	6.30	5.5	Parkfiels, Fault Zone 8	12.0		
592.86	362.23	182.19	4.00	4.5	Chalome 2W	12.0		
244.68	227.97	78.00	2.10	2.6	Cholame 5W	13.8		
1285.11	578.79	588.60	6.80	7.4	Parkfiels, Fault Zone 14	14.0	Preliminary	
609.00	487.00	301.00	6.10	5.6	Joaquin Canyon	16.8		
Chuetsu, Japan, October 23, 2004 M6.6					Average 5EQF=9.99			15.8
1307.91	852.80	820.17	22.80	12.6	Ojiya, NIG019	0.7		
587.85	454.43	325.16	10.00	6.7	Kawanishi, NIGH11	15.2		
871.04	706.45	435.51	10.00	7.9	Nagaoka-Shisho, NIG028	15.8		
521.43	407.40	312.14	10.00	6.4	Koide, NIG020	16.5		
1715.50	849.55	564.40	9.50	9.6	Tonkamachi, NIG021	19.9		
Niigata-ken Chuetsu, Japan, October 23, 2004 Aftershock M6.3								
526.62	524.43	329.31	24.50	9.6	Koide, NIG020	9.7		
815.50	811.34	320.35	8.00	7.3	Tohkamachi, NIG021	23.5		
Niigata-ken Chuetsu, Japan, October 23, 2004 Aftershock M6.0								
523.10	387.58	530.32	5.80	5.2	Koide, NIG020	8.4		
Hokkaido, Japan, November 28, 2004 M7.0								
550.20	493.44	319.30	8.30	6.2	Nosappu, HKD074	82.8		
Honshu (East Cost), Japan, August 16, 2005 M7.2								
449.51	313.00	121.00	19.50	7.7	Oshika, MYGo11	81.2		
501.28	300.86	161.00	29.00	9.3	Utatsu, MYG002	104.0		
513.99	381.57	111.02	22.00	8.6	Tsukidate, MYG004	138.0		
Island of Hawaii, October 15, 2006 M6.7					Average 5EQF=8.9			29.0
268.00	259.00	233.00	10.70	5.3	Kailua-Kona, Fire Station	46.9		
1030.00	579.00	723.00	22.50	11.3	Waimea, Fire Station	50.9		
508.00	362.00	283.00	11.10	6.5	KeaLakekua, Hospital	55.4		
640.00	639.00	350.00	10.90	7.5	Honokaa, Police Station	66.7		

Island of Hawaii, October 15, 2006 M6.0								29.0
166.00	128.00	129.00	3.50	2.7	Waimea, Fire Station	40.3		
West Coast Honshu, Japan, March 25, 2007 M6.7					Average 5EQF= 7.6			5.0
849.15	717.47	462.18	14.30	9.1	Togi	16.3		
781.67	473.46	555.75	14.35	8.5	Anamizu	27.7		
396.04	518.99	141.46	11.00	6.6	Wajima	30.1		
359.34	274.27	203.95	7.00	4.8	Yanagida	40.4		
588.81	622.19	146.88	18.00	8.9	Noto	48.6		
Chile, February 27, 2010 M8.8					Average 5EQF= 13.5			35.0
529.74	343.35	618.03	45.00	11.9	Constitution	69.7		
393.38	360.03	280.57	50.00	11.2	Conception	82.4		
639.61	598.41	568.98	53.50	14.2	Conception San Pedro	109.1		
461.07	215.82	412.02	68.00	12.7	Talca	113.1		
461.07	196.20	402.21	56.00	11.7	Hospital Curico	164.0		
686.70	922.14	284.49	61.00	16.4	Angol	209.3		
323.73	657.27	549.36	38.00	11.6	Lyllelton Port Company	274.3		
480.69	549.36	235.44	45.00	12.1	Santiago Maipu	320.7		
462.44	452.34	235.44	53.00	12.3	Municipal San Jose de Maipu	332.0		
Calexico, Mexico, April 4, 2010, M7.2					Average 5EQF= 6.9			32.3
568.98	431.64	235.44	14.00	7.5	El Centro Array 11, McCabe Sch	61.8		
375.72	267.81	361.99	12.00	6.1	El Centro - Imperial & Ross	63.5		
374.74	196.20	356.10	12.00	7.5	El Centro - Array 10, Reg. Hospital	63.7		
500.31	539.55	304.11	14.00	7.6	El Centro Differential Array	77.3		
320.79	253.10	396.32	10.70	5.6	El Centro-Array 12 Meloland Cattle	78.3		
Canterbury, New Zealand, September 3, 2010 M7.0					Average 5EQF= 7.1			5.0
737.70	663.50	932.00	14.00	8.9	Greendale	8.0		
479.80	449.70	307.00	10.00	6.4	Darfield High School	9.0		
452.50	423.80	622.20	11.00	6.7	Hororata School	18.0		
428.90	402.50	752.60	11.00	6.7	Lincoln Crop & Food Research	25.0		

544.80	606.60	275.00	10.00	6.9	Heathcote Valley Primary School	43.0		
Christchurch, New Zealand, February 21, 2011 M6.3 Average 5EQF= 7.2								
1426.70	1163.60	1438.10	8.00	9.0	Heathcote Valley Primary School	2.1		5.0
767.30	862.20	404.70	5.00	6.0	Lyllelton Port Company	1.2		
651.80	577.90	1598.00	8.30	7.4	Page Roads Pumping Station	8.3		
473.90	359.70	678.30	8.50	6.0	Christchurch Cathedral College	8.5		
699.90	358.60	518.40	6.00	5.7	Christchurch Resthaven	10.4		
519.10	422.30	265.30	13.50	7.2	Christchurch Botanic Gardens	10.6		
Tohoku, Japan, March 11, 2011 M9.0 Average 5EQF= 18.5								
921.00	688.20	253.85	52.00	15.4	Oshika - MYG011	75.7		32.0
758.43	1969.18	500.76	31.00	15.9	Shiogama - MYG012	118.1		
2699.89	1268.49	1879.93	55.00	23.4	Tsukidate - MYG004	125.9		
1517.16	982.27	290.15	17.00	11.8	Sendai - MYG013	126.1		
1597.64	1185.91	1165.74	48.00	18.8	Hitachi	245.2		
1354.64	1070.26	811.18	58.00	19.0	Hokota	292.3		
Iquique, Chile, April 1, 2014 M8.2 Average 5EQF (only two stations recording)								
231.60	355.60	161.00	6.00	4.4	Chusmiza	170.2		25.0
13.80	15.60	8.20	6.00	1.3	Limon Verde	383.9		
South Napa, CA, August 24, 2014, M6.0 Average 5EQF= 5.1								
304.11	598.41	235.44	6.00	5.2	Main Street Napa	9.1		11.3
461.07	215.82	88.29	6.00	4.7	Vallejo, Broadway w/ Sereno	11.7		
421.83	402.21	313.92	6.00	5.0	Napa Fire Station	12.3		
174.62	415.94	169.71	6.00	4.5	Carquinez Br. Array 2	19.5		
510.12	961.38	313.92	6.00	6.3	Carquinez Br. Array 1	19.6		
The following row is for calibrating, acceleration equal to 1.0 g, strong duration equal to 20 sec.								
981.00	0.00	0.00	20.00	9.8	PGA=1g with t=20 sec.			
Last updated on Jan 18, 2015 - over 500 earthquakes reviewed with over 6600 station recordings								
48 earthquakes with more than 200 station recording are included on the table above.								