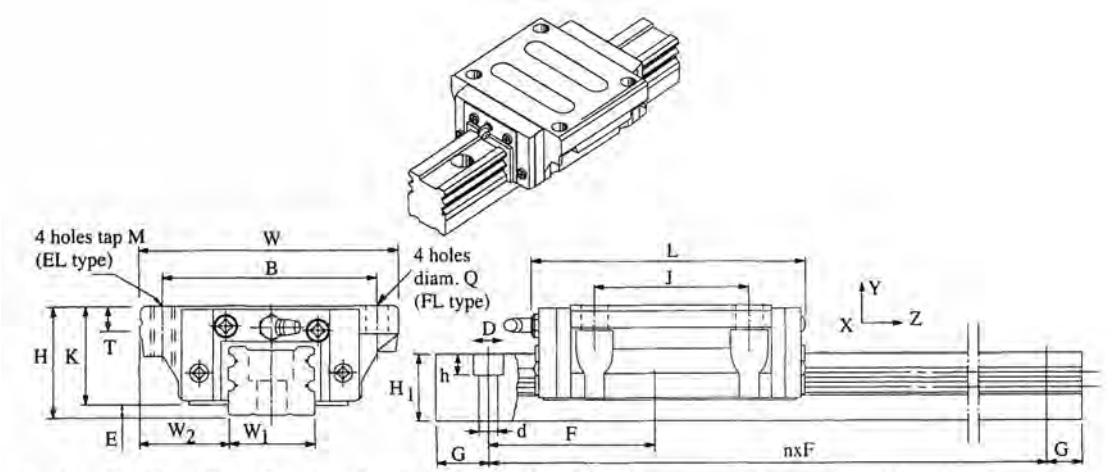

#*	H	E	W_2	W	B	L	J	K	T	Q	M	W_1	H_1	F	d,D,h	G	Std. rail lengths
15	24	4.5	16	47	38	55	30	19.5	8	4.5	M5	15	14	60	4.5,7.5,5.3	20	60,280,400,520
20	30	7	21.5	63	53	69.4	40	23	10	6	M6	20	19	60	6,9.5,8.5	20	280,400,520,700
25	36	5.5	23.5	70	57	80.8	45	30.5	11	7	M8	23	22.5	60	7,11,9	20	340,460,640,820,1000
30	42	7.5	31	90	72	95.2	52	34.5	11	9	M8	28	27.5	80	9,14,12	20	440,660,760,1000,1240
35	48	7.5	33	100	82	111	62	40.5	12	9	M10	34	31	80	9,14,12	20	600,760,1000,1240,1560
45	60	10	37.5	120	100	137	80	50	13	11	M12	45	37.5	105	14,20,17	22.5	780,990,1200,1410,1620
55	70	13	43.5	140	116	160	95	57	14	14	M14	53	45	120	16,23,20	30	1020,1260,1500,1980
65	90	14	53.5	170	142	186	110	76	23	16	M16	63	53	150	18,26,22	35	1270,1570,2170,2620

*Prefix by LY and suffix by EL or FL. Note that LY15&20 have a single row on each side.

Figure 8.5.36 Gothic arch groove linear guides. (Courtesy of NSK Corp.)

	Stiffness (K_Y, K_Z) (N/micron) Preload				Load capacity (kN) $F_Y = F_Z$		Moment capacity (N-m)		
Model	Heavy	Medium	Light	Very light	Dyn. C	Static C	Static M_X	Static M_X	Static M_X
LY15		167	137	98	6.05	7.45	70	50	50
LY20		196	167	127	9.8	11.3	140	90	90
LY25	461	392	284	167	17.4	26.5	310	210	210
LY30	578	480	323	196	25.7	38.4	540	360	360
LY35	657	578	363	245	35.9	52.2	900	590	590
LY45	862	735	500	314	52.6	78.8	1800	1180	1180
LY55	1019	882	598	372	80.9	115.0	3130	2060	2060
LY65	1558	1343	911	559	171.0	230.0	8530	5440	5440

Figure 8.5.37 Stiffness and load capacity of linear guides of Figure 8.5.36. (Courtesy of NSK Corp.)

$$F_{3Z,FZ} = F_{4Z,FZ} = \frac{F_Z}{2}\left(\frac{x_1 - x_{FZ}}{x_4 - x_1}\right) \tag{8.5.22}$$

A Z direction force with a Y axis offset causes Y direction forces in the bearing carriages with bearing carriages 1 and 4 acting as a couple with carriages 2 and 3:

$$F_{1Y,FZ} = F_{4Y,FZ} = \frac{F_z y_{FZ}}{2(z_1 - z_2)} \tag{8.5.23}$$

$$F_{2Y,FZ} = F_{3Y,FZ} = \frac{-F_z y_{FZ}}{2(z_1 - z_2)} \tag{8.5.24}$$

Various manufacturers' catalogs give specialized examples of this general case, but the general form is more amenable to inclusion in a spreadsheet program, where one can enter all types of forces and locations and then click the mouse and see their effect on the bearing reaction forces. With these reaction forces and bearing stiffnesses, estimates of the carriage error motions can easily be determined for inclusion in the machine's error budget.

Four bearing carriages at the corners of a structure work well to support boxy-type structures such as machine columns that support other axes; however, in some cases when supporting a boxy structure it may be desirable to distribute the load along the rails to decrease local deformations. In