

Portal Frame Header Fastener Moments

Fastener Strength
 Z = 74.00 lbs/nail per NDS Table 11Q
 Cd = 1.60 (wind)
 Z' = 118.40 adj. strength

CR	x (in.)	y (in.)
	9.750	3.875

Nail Group	Width (in.)	Height (in.)
	19.5	7.75

Nail Lines	Columns	Rows
	8	4

Nail Spacing	Col. Spacing (in.)	Row Spacing (in.)
	2.786	2.583

Fastener #	x (in.)	y (in.)	dx (in.)	dy (in.)	r (in.)	dx ² +dy ² (in. ²)	F _{nail} (lbs)	M _{nail} (in-lbs)
1	0.000	7.750	-9.750	3.875	10.492	110.08	118.40	1242.23
2	2.786	7.750	-6.964	3.875	7.970	63.52	89.94	716.79
3	5.571	7.750	-4.179	3.875	5.699	32.48	64.31	366.49
4	8.357	7.750	-1.393	3.875	4.118	16.96	46.47	191.34
5	11.143	7.750	1.393	3.875	4.118	16.96	46.47	191.34
6	13.929	7.750	4.179	3.875	5.699	32.48	64.31	366.49
7	16.714	7.750	6.964	3.875	7.970	63.52	89.94	716.79
8	19.500	7.750	9.750	3.875	10.492	110.08	118.40	1242.23
9	0.000	5.167	-9.750	1.292	9.835	96.73	110.99	1091.61
10	2.786	5.167	-6.964	1.292	7.083	50.17	79.93	566.16
11	5.571	5.167	-4.179	1.292	4.374	19.13	49.36	215.87
12	8.357	5.167	-1.393	1.292	1.900	3.61	21.44	40.72
13	11.143	5.167	1.393	1.292	1.900	3.61	21.44	40.72
14	13.929	5.167	4.179	1.292	4.374	19.13	49.36	215.87
15	16.714	5.167	6.964	1.292	7.083	50.17	79.93	566.16
16	19.500	5.167	9.750	1.292	9.835	96.73	110.99	1091.61
17	0.000	2.583	-9.750	-1.292	9.835	96.73	110.99	1091.61
18	2.786	2.583	-6.964	-1.292	7.083	50.17	79.93	566.16
19	5.571	2.583	-4.179	-1.292	4.374	19.13	49.36	215.87
20	8.357	2.583	-1.393	-1.292	1.900	3.61	21.44	40.72
21	11.143	2.583	1.393	-1.292	1.900	3.61	21.44	40.72
22	13.929	2.583	4.179	-1.292	4.374	19.13	49.36	215.87
23	16.714	2.583	6.964	-1.292	7.083	50.17	79.93	566.16
24	19.500	2.583	9.750	-1.292	9.835	96.73	110.99	1091.61
25	0.000	0.000	-9.750	-3.875	10.492	110.08	118.40	1242.23
26	2.786	0.000	-6.964	-3.875	7.970	63.52	89.94	716.79
27	5.571	0.000	-4.179	-3.875	5.699	32.48	64.31	366.49
28	8.357	0.000	-1.393	-3.875	4.118	16.96	46.47	191.34
29	11.143	0.000	1.393	-3.875	4.118	16.96	46.47	191.34
30	13.929	0.000	4.179	-3.875	5.699	32.48	64.31	366.49
31	16.714	0.000	6.964	-3.875	7.970	63.52	89.94	716.79
32	19.500	0.000	9.750	-3.875	10.492	110.08	118.40	1242.23
Totals						1570.66	2323.33	17724.87

Longest Moment Arm (r _{max}) =	10.492 in.	
Average Moment Arm (r _{avg}) =	6.434 in.	
Critical Fastener Moment =	1242.2 in-lbs	103.5 ft-lbs
Average Fastener Moment =	553.9 in-lbs	46.2 ft-lbs
Total Moment of Fasteners =	17724.9 in-lbs	1477.1 ft-lbs

Assumptions:

The force in each nail is proportional to its distance from the center of rotation of the nail group.

Nail reactions are perpendicular to their radial line from the CR of the nail group.