

3.11.6.2 Point, Line and Strip Loads (ES)— Walls Restrained from Movement

The horizontal pressure, Δ_{ph} in ksf, on a wall resulting from a uniformly loaded strip parallel to the wall may be taken as:

$$\Delta_{ph} = \frac{2p}{\pi} [\delta - \sin \delta \cos (\delta + 2\alpha)] \quad (3.11.6.2-1)$$

where:

p = uniform load intensity on strip parallel to wall (ksf)

α = angle specified in Figure 1 (rad.)

δ = angle specified in Figure 1 (rad.)

C3.11.6.2

Eqs. 2, 3, 4, and 5 are based on the assumption that the wall does not move, i.e., walls which have a high degree of structural rigidity or restrained at the top combined with an inability to slide in response to applied loads. For flexible walls, this assumption can be very conservative. Additional guidance regarding the ability of walls to move is provided in Articles C3.11.1 and A11.1.1.3.

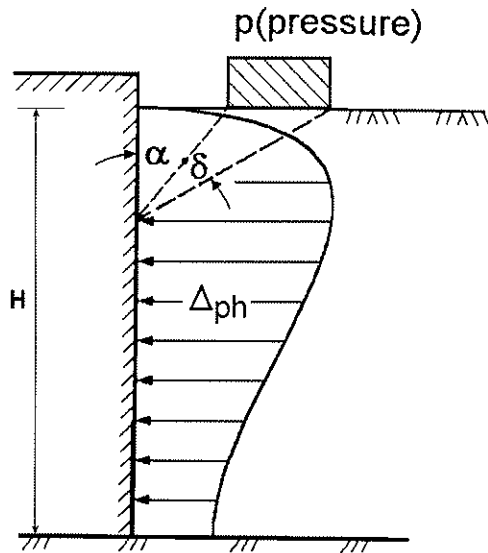


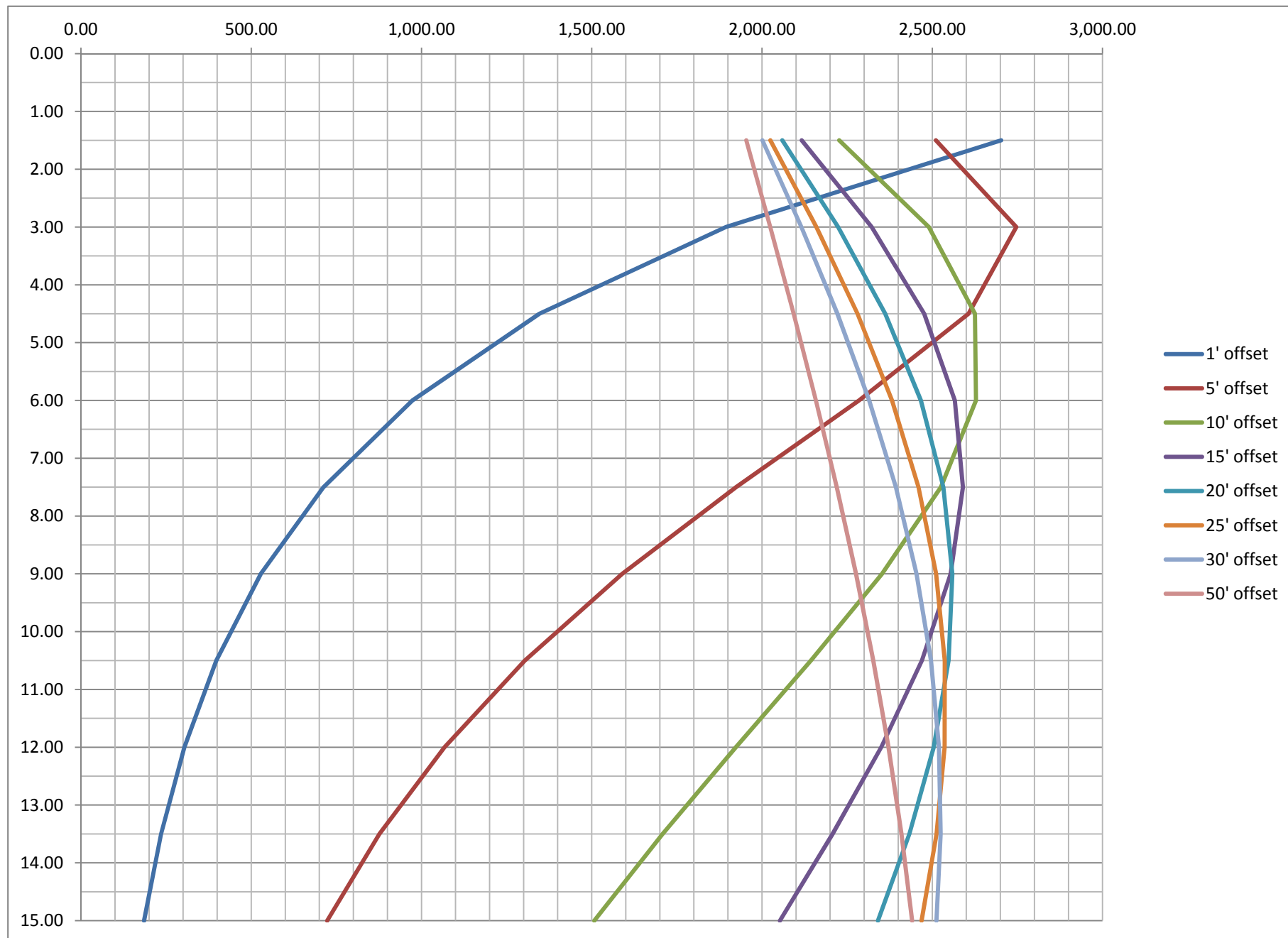
Figure 3.11.6.2-1 Horizontal Pressure on Wall Caused by a Uniformly Loaded Strip.

The horizontal pressure, Δ_{ph} in ksf, on a wall resulting from a point load may be taken as:

$$\Delta_{ph} = \frac{P}{\pi R^2} \left[\frac{3ZX^2}{R^3} - \frac{R(1-2\nu)}{R+Z} \right] \quad (3.11.6.2-2)$$

where:

P = point load (kip)



Cooper E80 Railroad Surcharge - Strip Load (AASHTO procedure) - 1' Offset

General Info	
Uniformly loaded strip pressure, p (psf)	1,882
Distance that edge of strip is offset from wall (ft)	1.00
Width of strip (ft)	8.50
Total depth to be considered (ft)	15.00

Point #	% of total depth	Z (ft)	X (ft)	α (rad)	δ (rad)	A_{ps} (psf)	Force / Unit Depth (lbs/ft)	Total Force (lbs/ft)
1	0.1	1.50	10.00	0.59	1.41	2,702.43	4,054	13,918
2	0.2	3.00	10.00	0.32	1.26	1,893.96	2,841	
3	0.3	4.50	10.00	0.22	1.13	1,346.53	2,020	
4	0.4	6.00	10.00	0.17	1.01	973.16	1,460	
5	0.5	7.50	10.00	0.13	0.90	712.35	1,069	
6	0.6	9.00	10.00	0.11	0.81	528.38	793	
7	0.7	10.50	10.00	0.09	0.74	397.59	596	
8	0.8	12.00	10.00	0.08	0.67	303.68	456	
9	0.9	13.50	10.00	0.07	0.61	235.43	353	
10	1	15.00	10.00	0.07	0.56	185.17	278	

Cooper E80 Railroad Surcharge - Strip Load (AASHTO procedure) - 5' Offset

General Info	
Uniformly loaded strip pressure, p (psf)	1,882
Distance that edge of strip is offset from wall (ft)	5.00
Width of strip (ft)	8.50
Total depth to be considered (ft)	15.00

Point #	% of total depth	Z (ft)	X (ft)	α (rad)	δ (rad)	A_{ps} (psf)	Force / Unit Depth (lbs/ft)	Total Force (lbs/ft)
1	0.1	1.50	10.00	1.28	1.46	2,510.67	3,766	26,450
2	0.2	3.00	10.00	1.03	1.35	2,746.81	4,120	
3	0.3	4.50	10.00	0.84	1.25	2,606.58	3,910	
4	0.4	6.00	10.00	0.69	1.15	2,284.82	3,427	
5	0.5	7.50	10.00	0.59	1.06	1,923.92	2,886	
6	0.6	9.00	10.00	0.51	0.98	1,589.62	2,384	
7	0.7	10.50	10.00	0.44	0.91	1,303.57	1,955	
8	0.8	12.00	10.00	0.39	0.84	1,067.72	1,602	
9	0.9	13.50	10.00	0.35	0.79	876.68	1,315	
10	1	15.00	10.00	0.32	0.73	723.10	1,085	

Cooper E80 Railroad Surcharge - Strip Load (AASHTO procedure) - 10' Offset

General Info	
Uniformly loaded strip pressure, p (psf)	1,882
Distance that edge of strip is offset from wall (ft)	10.00
Width of strip (ft)	8.50
Total depth to be considered (ft)	15.00

Point #	% of total depth	Z (ft)	X (ft)	α (rad)	δ (rad)	A_{ps} (psf)	Force / Unit Depth (lbs/ft)	Total Force (lbs/ft)
1	0.1	1.50	10.00	1.42	1.49	2,226.56	3,340	33,196
2	0.2	3.00	10.00	1.28	1.41	2,490.05	3,735	
3	0.3	4.50	10.00	1.15	1.33	2,625.22	3,938	
4	0.4	6.00	10.00	1.03	1.26	2,628.24	3,942	
5	0.5	7.50	10.00	0.93	1.19	2,525.17	3,788	
6	0.6	9.00	10.00	0.84	1.12	2,352.46	3,529	
7	0.7	10.50	10.00	0.76	1.05	2,143.54	3,215	
8	0.8	12.00	10.00	0.69	1.00	1,923.41	2,885	
9	0.9	13.50	10.00	0.64	0.94	1,708.32	2,562	
10	1	15.00	10.00	0.59	0.89	1,507.57	2,261	

Cooper E80 Railroad Surcharge - Strip Load (AASHTO procedure) - 15' Offset

General Info	
Uniformly loaded strip pressure, p (psf)	1,882
Distance that edge of strip is offset from wall (ft)	15.00
Width of strip (ft)	8.50
Total depth to be considered (ft)	15.00

Point #	% of total depth	Z (ft)	X (ft)	α (rad)	δ (rad)	A_{ps} (psf)	Force / Unit Depth (lbs/ft)	Total Force (lbs/ft)
1	0.1	1.50	10.00	1.47	1.51	2,116.57	3,175	35,557
2	0.2	3.00	10.00	1.37	1.44	2,322.21	3,483	
3	0.3	4.50	10.00	1.28	1.38	2,476.26	3,714	
4	0.4	6.00	10.00	1.19	1.32	2,566.17	3,849	
5	0.5	7.50	10.00	1.11	1.26	2,589.97	3,885	
6	0.6	9.00	10.00	1.03	1.21	2,554.04	3,831	
7	0.7	10.50	10.00	0.96	1.15	2,469.70	3,705	
8	0.8	12.00	10.00	0.90	1.10	2,350.00	3,525	
9	0.9	13.50	10.00	0.84	1.05	2,207.43	3,311	
10	1	15.00	10.00	0.79	1.00	2,052.62	3,079	

Cooper E80 Railroad Surcharge - Strip Load (AASHTO procedure) - 20' Offset

General Info	
Uniformly loaded strip pressure, p (psf)	1,882
Distance that edge of strip is offset from wall (ft)	20.00
Width of strip (ft)	8.50
Total depth to be considered (ft)	15.00

Point #	% of total depth	Z (ft)	X (ft)	α (rad)	δ (rad)	A_{ps} (psf)	Force / Unit Depth (lbs/ft)	Total Force (lbs/ft)
1	0.1	1.50	10.00	1.50	1.52	2,059.39	3,089	36,043
2	0.2	3.00	10.00	1.42	1.47	2,223.26	3,335	
3	0.3	4.50	10.00	1.35	1.41	2,361.85	3,543	
4	0.4	6.00	10.00	1.28	1.36	2,466.56	3,700	
5	0.5	7.50	10.00	1.21	1.31	2,532.64	3,799	
6	0.6	9.00	10.00	1.15	1.26	2,559.09	3,839	
7	0.7	10.50	10.00	1.09	1.22	2,548.11	3,822	
8	0.8	12.00	10.00	1.03	1.17	2,504.13	3,756	
9	0.9	13.50	10.00	0.98	1.13	2,432.87	3,649	
10	1	15.00	10.00	0.93	1.09	2,340.49	3,511	

Cooper E80 Railroad Surcharge - Strip Load (AASHTO procedure) - 25' Offset

General Info	
Uniformly loaded strip pressure, p (psf)	1,882
Distance that edge of strip is offset from wall (ft)	25.00
Width of strip (ft)	8.50
Total depth to be considered (ft)	15.00

Point #	% of total depth	Z (ft)	X (ft)	α (rad)	δ (rad)	A_{ps} (psf)	Force / Unit Depth (lbs/ft)	Total Force (lbs/ft)
1	0.1	1.50	10.00	1.51	1.53	2,024.51	3,037	35,806
2	0.2	3.00	10.00	1.45	1.48	2,159.62	3,239	
3	0.3	4.50	10.00	1.39	1.44	2,280.56	3,421	
4	0.4	6.00	10.00	1.34	1.39	2,381.80	3,573	
5	0.5	7.50	10.00	1.28	1.35	2,459.40	3,689	
6	0.6	9.00	10.00	1.23	1.31	2,511.13	3,767	
7	0.7	10.50	10.00	1.17	1.27	2,536.46	3,805	
8	0.8	12.00	10.00	1.12	1.23	2,536.30	3,804	
9	0.9	13.50	10.00	1.08	1.19	2,512.71	3,769	
10	1	15.00	10.00	1.03	1.15	2,468.50	3,703	

Cooper E80 Railroad Surcharge - Strip Load (AASHTO procedure) - 30' Offset

General Info	
Uniformly loaded strip pressure, p (psf)	1,882
Distance that edge of strip is offset from wall (ft)	30.00
Width of strip (ft)	8.50
Total depth to be considered (ft)	15.00

Point #	% of total depth	Z (ft)	X (ft)	α (rad)	δ (rad)	A_{ps} (psf)	Force / Unit Depth (lbs/ft)	Total Force (lbs/ft)
1	0.1	1.50	10.00	1.52	1.53	2,001.05	3,002	35,329
2	0.2	3.00	10.00	1.47	1.49	2,115.60	3,173	
3	0.3	4.50	10.00	1.42	1.45	2,221.45	3,332	
4	0.4	6.00	10.00	1.37	1.42	2,314.92	3,472	
5	0.5	7.50	10.00	1.33	1.38	2,393.10	3,590	
6	0.6	9.00	10.00	1.28	1.34	2,453.91	3,681	
7	0.7	10.50	10.00	1.23	1.30	2,496.18	3,744	
8	0.8	12.00	10.00	1.19	1.27	2,519.59	3,779	
9	0.9	13.50	10.00	1.15	1.23	2,524.58	3,787	
10	1	15.00	10.00	1.11	1.20	2,512.21	3,768	

Cooper E80 Railroad Surcharge - Strip Load (AASHTO procedure) - 50' Offset

General Info	
Uniformly loaded strip pressure, p (psf)	1,882
Distance that edge of strip is offset from wall (ft)	50.00
Width of strip (ft)	8.50
Total depth to be considered (ft)	15.00

Point #	% of total depth	Z (ft)	X (ft)	α (rad)	δ (rad)	A_{ps} (psf)	Force / Unit Depth (lbs/ft)	Total Force (lbs/ft)
1	0.1	1.50	10.00	1.54	1.55	1,953.70	2,931	33,410
2	0.2	3.00	10.00	1.51	1.52	2,024.33	3,036	
3	0.3	4.50	10.00	1.48	1.49	2,092.83	3,139	
4	0.4	6.00	10.00	1.45	1.47	2,158.21	3,237	
5	0.5	7.50	10.00	1.42	1.44	2,219.54	3,329	
6	0.6	9.00	10.00	1.39	1.42	2,275.99	3,414	
7	0.7	10.50	10.00	1.36	1.39	2,326.86	3,490	
8	0.8	12.00	10.00	1.34	1.37	2,371.56	3,557	
9	0.9	13.50	10.00	1.31	1.34	2,409.63	3,614	
10	1	15.00	10.00	1.28	1.32	2,440.75	3,661	