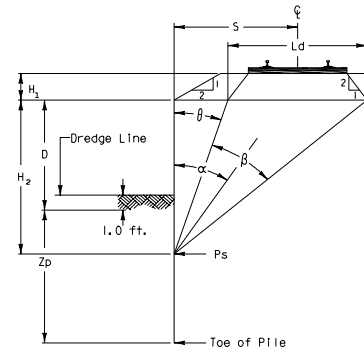


# CHART A

This chart identifies the active pressure and resulting forces due to E80 live load.  
See "SAMPLE PROBLEM" sheet for definitions of variables and equations.

1. Select distance S from track centerline to face of shoring.
2. Select depth H<sub>2</sub> below base of tie.
3. Read P<sub>s</sub>, M, R and  $\bar{z}$  from the table.
4. Use the procedure outlined in the sample problem to determine values at non-tabulated points.



$$P_s = \frac{2q}{\pi} [\beta - \sin \beta \cos(2\alpha)]$$

where q = 1778 psf

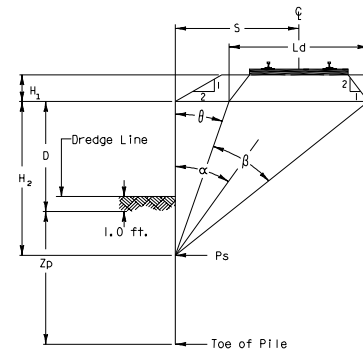
## Boussinesq surcharge pressure E80 live load for H<sub>1</sub>=0

Depth below top of shoring H <sub>2</sub> (ft)	Variables	Horizontal distance (S) from shoring to track CL measured at a right angle									
		12	14	16	18	20	22	24	26	28	30
2	<b>P<sub>s</sub></b> (psf)	<b>305</b>	<b>220</b>	<b>166</b>	<b>130</b>	<b>105</b>	<b>86</b>	<b>72</b>	<b>61</b>	<b>53</b>	<b>46</b>
	α (radians)	1.38	1.41	1.44	1.45	1.47	1.48	1.48	1.49	1.50	1.50
	β (radians)	0.14	0.10	0.07	0.06	0.05	0.04	0.03	0.03	0.02	0.02
	$\bar{z}$ (ft)	1.32	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33
	M (ft-lbs/ft)	215	152	114	89	71	58	49	41	36	31
R (lbs/ft)	317	226	170	132	106	87	73	62	53	46	
4	<b>P<sub>s</sub></b> (psf)	<b>496</b>	<b>381</b>	<b>299</b>	<b>240</b>	<b>197</b>	<b>164</b>	<b>138</b>	<b>118</b>	<b>102</b>	<b>89</b>
	α (radians)	1.21	1.27	1.31	1.34	1.36	1.38	1.40	1.41	1.43	1.44
	β (radians)	0.25	0.19	0.14	0.11	0.09	0.07	0.06	0.05	0.05	0.04
	$\bar{z}$ (ft)	2.59	2.61	2.63	2.64	2.64	2.65	2.65	2.65	2.65	2.66
	M (ft-lbs/ft)	1,609	1,165	882	692	557	459	384	327	281	244
R (lbs/ft)	1,141	840	643	508	411	339	285	242	209	182	
6	<b>P<sub>s</sub></b> (psf)	<b>558</b>	<b>461</b>	<b>381</b>	<b>317</b>	<b>266</b>	<b>225</b>	<b>193</b>	<b>167</b>	<b>146</b>	<b>128</b>
	α (radians)	1.06	1.13	1.19	1.23	1.27	1.29	1.32	1.34	1.35	1.37
	β (radians)	0.33	0.25	0.20	0.16	0.13	0.11	0.09	0.08	0.07	0.06
	$\bar{z}$ (ft)	3.77	3.83	3.88	3.90	3.92	3.94	3.95	3.96	3.96	3.97
	M (ft-lbs/ft)	4,944	3,674	2,830	2,244	1,822	1,508	1,269	1,082	933	813
R (lbs/ft)	2,214	1,696	1,332	1,070	877	731	618	529	458	400	
8	<b>P<sub>s</sub></b> (psf)	<b>535</b>	<b>476</b>	<b>414</b>	<b>358</b>	<b>309</b>	<b>268</b>	<b>234</b>	<b>205</b>	<b>181</b>	<b>160</b>
	α (radians)	0.94	1.02	1.08	1.13	1.17	1.21	1.24	1.26	1.29	1.30
	β (radians)	0.37	0.29	0.24	0.19	0.16	0.14	0.12	0.10	0.09	0.08
	$\bar{z}$ (ft)	4.84	4.97	5.06	5.11	5.16	5.19	5.21	5.23	5.24	5.26
	M (ft-lbs/ft)	10,481	8,006	6,286	5,051	4,141	3,452	2,920	2,501	2,165	1,892
R (lbs/ft)	3,316	2,641	2,134	1,751	1,456	1,228	1,047	903	786	689	
10	<b>P<sub>s</sub></b> (psf)	<b>474</b>	<b>449</b>	<b>411</b>	<b>370</b>	<b>329</b>	<b>293</b>	<b>260</b>	<b>232</b>	<b>207</b>	<b>186</b>
	α (radians)	0.83	0.92	0.99	1.04	1.09	1.13	1.17	1.19	1.22	1.24
	β (radians)	0.38	0.32	0.26	0.22	0.19	0.16	0.14	0.12	0.10	0.09
	$\bar{z}$ (ft)	5.81	6.02	6.16	6.26	6.34	6.39	6.44	6.47	6.50	6.52
	M (ft-lbs/ft)	18,145	14,227	11,385	9,280	7,689	6,463	5,502	4,736	4,117	3,610
R (lbs/ft)	4,328	3,571	2,964	2,482	2,099	1,792	1,544	1,341	1,175	1,037	
12	<b>P<sub>s</sub></b> (psf)	<b>404</b>	<b>403</b>	<b>386</b>	<b>360</b>	<b>331</b>	<b>302</b>	<b>274</b>	<b>248</b>	<b>225</b>	<b>204</b>
	α (radians)	0.75	0.83	0.90	0.96	1.01	1.06	1.10	1.13	1.16	1.18
	β (radians)	0.38	0.33	0.28	0.24	0.20	0.18	0.15	0.13	0.12	0.11
	$\bar{z}$ (ft)	6.68	6.97	7.18	7.34	7.46	7.55	7.61	7.67	7.71	7.75
	M (ft-lbs/ft)	27,703	22,237	18,121	14,980	12,550	10,641	9,121	7,895	6,894	6,068
R (lbs/ft)	5,207	4,424	3,763	3,214	2,762	2,389	2,080	1,823	1,608	1,427	
14	<b>P<sub>s</sub></b> (psf)	<b>338</b>	<b>351</b>	<b>349</b>	<b>337</b>	<b>319</b>	<b>298</b>	<b>276</b>	<b>255</b>	<b>234</b>	<b>215</b>
	α (radians)	0.68	0.76	0.83	0.89	0.94	0.99	1.03	1.07	1.10	1.13
	β (radians)	0.38	0.33	0.28	0.25	0.22	0.19	0.17	0.15	0.13	0.12
	$\bar{z}$ (ft)	7.46	7.85	8.13	8.35	8.51	8.64	8.74	8.82	8.89	8.94
	M (ft-lbs/ft)	38,880	31,856	26,395	22,116	18,729	16,021	13,831	12,043	10,568	9,339
R (lbs/ft)	5,948	5,178	4,499	3,913	3,414	2,990	2,631	2,327	2,068	1,847	
16	<b>P<sub>s</sub></b> (psf)	<b>280</b>	<b>301</b>	<b>310</b>	<b>308</b>	<b>300</b>	<b>286</b>	<b>271</b>	<b>254</b>	<b>237</b>	<b>220</b>
	α (radians)	0.62	0.70	0.77	0.83	0.88	0.93	0.97	1.01	1.04	1.07
	β (radians)	0.36	0.32	0.28	0.25	0.22	0.20	0.18	0.16	0.14	0.13
	$\bar{z}$ (ft)	8.17	8.64	9.01	9.29	9.51	9.68	9.82	9.93	10.03	10.10
	M (ft-lbs/ft)	51,411	42,880	36,066	30,598	26,183	22,590	19,644	17,207	15,175	13,468
R (lbs/ft)	6,563	5,829	5,158	4,560	4,034	3,576	3,179	2,837	2,540	2,284	

CHART A continued

This chart identifies the active pressure and resulting forces due to E80 live load. See "SAMPLE PROBLEM" sheet for definitions of variables and equations.

1. Select distance S from track centerline to face of shoring.
2. Select depth H<sub>2</sub> below base of tie.
3. Read Ps, M, R and Z̄ from the table.
4. Use the procedure outlined in the sample problem to determine values at non-tabulated points.



$$P_s = \frac{2q}{\pi} [\beta - \sin \beta \cos(2\alpha)]$$

where q = 1778 psf

**Boussinesq surcharge pressure E80 live load for H<sub>1</sub>=0**

Depth below top of shoring H <sub>2</sub> (ft)	Variables	Horizontal distance (S) from shoring to track CL measured at a right angle									
		12	14	16	18	20	22	24	26	28	30
18	<b>Ps</b> (psf)	<b>231</b>	<b>256</b>	<b>271</b>	<b>277</b>	<b>276</b>	<b>269</b>	<b>259</b>	<b>247</b>	<b>234</b>	<b>220</b>
	α (radians)	0.57	0.64	0.71	0.77	0.82	0.87	0.92	0.96	0.99	1.02
	β (radians)	0.35	0.31	0.28	0.25	0.23	0.20	0.18	0.16	0.15	0.13
	Z̄ (ft)	8.80	9.37	9.81	10.16	10.44	10.67	10.85	11.00	11.12	11.22
	M (ft-lbs/ft)	65,062	55,110	46,976	40,313	34,834	30,304	26,536	23,384	20,728	18,477
	R (lbs/ft)	7,072	6,386	5,739	5,145	4,609	4,132	3,710	3,338	3,012	2,725
20	<b>Ps</b> (psf)	<b>191</b>	<b>217</b>	<b>236</b>	<b>246</b>	<b>250</b>	<b>249</b>	<b>244</b>	<b>237</b>	<b>227</b>	<b>217</b>
	α (radians)	0.52	0.59	0.66	0.72	0.77	0.82	0.87	0.91	0.94	0.98
	β (radians)	0.33	0.30	0.28	0.25	0.23	0.21	0.19	0.17	0.15	0.14
	Z̄ (ft)	9.37	10.03	10.56	10.98	11.32	11.59	11.82	12.01	12.16	12.30
	M (ft-lbs/ft)	79,641	68,368	58,973	51,137	44,586	39,093	34,465	30,548	27,216	24,367
	R (lbs/ft)	7,493	6,859	6,245	5,668	5,135	4,651	4,214	3,822	3,474	3,163
22	<b>Ps</b> (psf)	<b>159</b>	<b>184</b>	<b>204</b>	<b>217</b>	<b>225</b>	<b>228</b>	<b>227</b>	<b>223</b>	<b>217</b>	<b>210</b>
	α (radians)	0.49	0.55	0.62	0.67	0.73	0.77	0.82	0.86	0.90	0.93
	β (radians)	0.31	0.29	0.27	0.25	0.23	0.21	0.19	0.17	0.16	0.14
	Z̄ (ft)	9.89	10.64	11.24	11.73	12.14	12.47	12.74	12.97	13.17	13.33
	M (ft-lbs/ft)	94,986	82,497	71,913	62,945	55,341	48,878	43,370	38,658	34,611	31,122
	R (lbs/ft)	7,842	7,260	6,684	6,131	5,611	5,128	4,685	4,283	3,918	3,590
24	<b>Ps</b> (psf)	<b>133</b>	<b>157</b>	<b>176</b>	<b>191</b>	<b>202</b>	<b>207</b>	<b>210</b>	<b>209</b>	<b>206</b>	<b>201</b>
	α (radians)	0.45	0.52	0.58	0.63	0.68	0.73	0.78	0.82	0.85	0.89
	β (radians)	0.30	0.28	0.26	0.24	0.22	0.20	0.19	0.17	0.16	0.15
	Z̄ (ft)	10.35	11.19	11.87	12.44	12.90	13.29	13.62	13.89	14.13	14.32
	M (ft-lbs/ft)	110,969	97,366	85,670	75,625	66,997	59,577	53,183	47,661	42,875	38,716
	R (lbs/ft)	8,132	7,600	7,064	6,540	6,037	5,564	5,122	4,715	4,342	4,001
26	<b>Ps</b> (psf)	<b>112</b>	<b>134</b>	<b>153</b>	<b>168</b>	<b>180</b>	<b>188</b>	<b>192</b>	<b>194</b>	<b>193</b>	<b>191</b>
	α (radians)	0.42	0.48	0.54	0.60	0.65	0.69	0.74	0.78	0.82	0.85
	β (radians)	0.28	0.27	0.25	0.23	0.22	0.20	0.19	0.17	0.16	0.15
	Z̄ (ft)	10.78	11.69	12.45	13.09	13.62	14.07	14.44	14.77	15.04	15.28
	M (ft-lbs/ft)	127,485	112,863	100,135	89,071	79,460	71,105	63,836	57,499	51,963	47,113
	R (lbs/ft)	8,376	7,890	7,393	6,899	6,418	5,959	5,524	5,118	4,741	4,393
28	<b>Ps</b> (psf)	<b>94</b>	<b>114</b>	<b>132</b>	<b>148</b>	<b>160</b>	<b>169</b>	<b>175</b>	<b>179</b>	<b>180</b>	<b>180</b>
	α (radians)	0.40	0.46	0.51	0.56	0.61	0.66	0.70	0.74	0.78	0.81
	β (radians)	0.27	0.26	0.24	0.23	0.21	0.20	0.19	0.17	0.16	0.15
	Z̄ (ft)	11.17	12.16	12.99	13.70	14.29	14.80	15.23	15.60	15.91	16.19
	M (ft-lbs/ft)	144,448	128,896	115,211	103,191	92,642	83,385	75,258	68,113	61,823	56,274
	R (lbs/ft)	8,581	8,137	7,677	7,214	6,758	6,315	5,892	5,491	5,115	4,764
30	<b>Ps</b> (psf)	<b>80</b>	<b>98</b>	<b>115</b>	<b>130</b>	<b>142</b>	<b>152</b>	<b>160</b>	<b>165</b>	<b>167</b>	<b>168</b>
	α (radians)	0.37	0.43	0.48	0.53	0.58	0.63	0.67	0.71	0.74	0.78
	β (radians)	0.26	0.25	0.23	0.22	0.21	0.20	0.18	0.17	0.16	0.15
	Z̄ (ft)	11.52	12.59	13.49	14.26	14.92	15.48	15.97	16.38	16.75	17.06
	M (ft-lbs/ft)	161,789	145,388	130,819	117,903	106,466	96,343	87,381	79,443	72,404	66,153
	R (lbs/ft)	8,755	8,349	7,925	7,492	7,060	6,636	6,227	5,834	5,462	5,112
32	<b>Ps</b> (psf)	<b>69</b>	<b>85</b>	<b>101</b>	<b>115</b>	<b>127</b>	<b>137</b>	<b>145</b>	<b>151</b>	<b>155</b>	<b>157</b>
	α (radians)	0.35	0.41	0.46	0.51	0.55	0.60	0.64	0.68	0.71	0.75
	β (radians)	0.25	0.24	0.22	0.21	0.20	0.19	0.18	0.17	0.16	0.15
	Z̄ (ft)	11.85	12.98	13.95	14.79	15.51	16.13	16.67	17.13	17.54	17.89
	M (ft-lbs/ft)	179,452	162,274	146,888	133,136	120,859	109,909	100,144	91,432	83,655	76,706
	R (lbs/ft)	8,904	8,532	8,140	7,736	7,329	6,925	6,531	6,150	5,785	5,438