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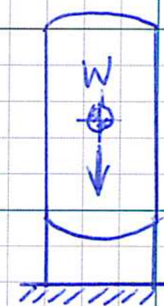
The City of Oswego

PROJECT: OSWEGO CASTINGS #738033
SHEET: 1 OF 7 SUBJECT: CONC. SLAB ANALYSIS
CALCULATED BY: JH DATE: 1/29/2020
CHECKED BY: ______ DATE: ______

DETERMINE THE LOADING FROM A FULL TANK.

$V_{TANK} = 10\,000$ GAL $= 1337$ FT^3



SPECIFIC GRAVITY OF LIQUID @ 60°F = 1.01

DENSITY OF WATER @ 60°F = 62.366 LB/FT^3

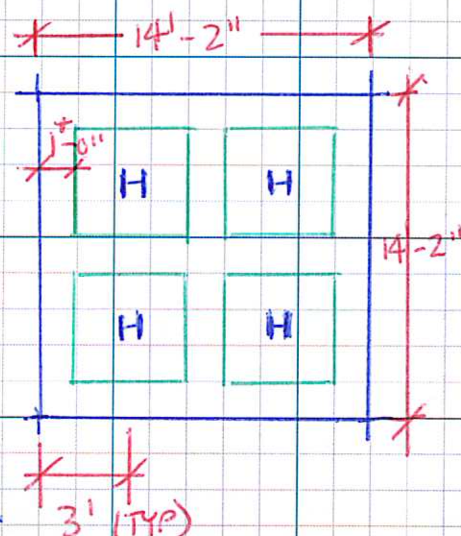
$W = (1.01)(62.366\ LB/FT^3)(1337\ FT^3)$

$W = 84\,217$ LB

∴ EACH POST WILL RECEIVE 21 054 LB.

ANALYSIS OF THE SLAB

$A_{SLAB} \approx 200$ SF



FOR ANALYSIS PURPOSES, SHEAR WILL BE CHECKED FOR A SINGLE POST.

THE ANALYSIS WILL INCLUDE BOTH ONE-WAY AND PUNCHING SHEAR, IN ACCORDANCE WITH ACI 318.

DUE TO THE LARGE PLATES, THE LIKELYHOOD OF A SHEAR FAILURE IS MINIMAL.

FOR ARGUMENTS SAKE, IT WILL BE ASSUMED AN AREA 16" x 16" WILL INFLUENCE THE SHEAR ZONE. THIS MATCHES THE SHIM MATERIAL DIMENSIONS.

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PROJECT:
SHEET: 2 OF 7 SUBJECT:
CALCULATED BY: JH DATE: 1/29/2020
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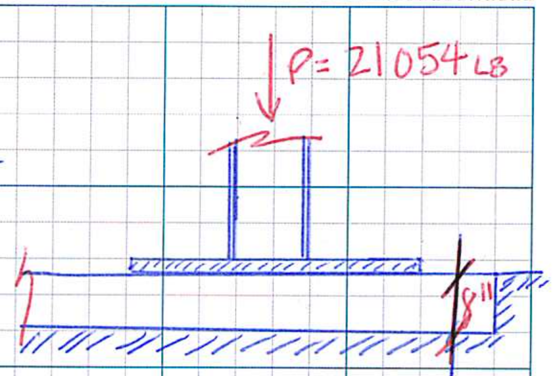
ANALYSIS OF A SINGLE POST



BASED ON RECORDS OF THE BACKFILL USED UNDER THE CAP, THE IN-PLACE DENSITY RESULTS SHOW A DENSITY OF APPROX 125 LB/FT^3.

THIS TYPICAL OF A WELL GRADED GRAVEL WITH GOOD COMPACTION.

NO SPECIFICATIONS WERE PROVIDED.

$\therefore$ AN ASSUMED BEARING PRESSURE IS 5000 PSF FOR A WELL GRADED GRAVEL.

$q_{EFF} = (5000 \text{ PSF} - 100 \text{ PSF}_{CONC}) = 4900 \text{ PSF}$ SAY 4500 PSF

$A_{REQ} = \dfrac{21054 \text{ LB}}{4500 \text{ LB/SF}} = 4.68 \text{ SQ FT.}$

EACH POST HAS A MINIMUM OF A 48" x 48" x 1/2" PLATE OF STEEL.

FOR ANALYSIS PURPOSES, ASSUME A CONCRETE AREA OF 16 SQ FT.

$\therefore P_u = \dfrac{1.6(21054 \text{ LB})}{16 \text{ FT}^2} = 2105 \text{ PSF}$

DEPTH TO REINFORCEMENT, $d = 8" - 3" \text{ COVER} = 5"$

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PROJECT: ______

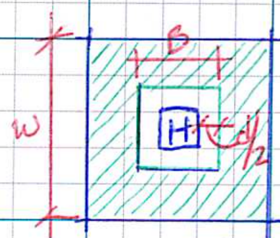
SHEET: 3 OF ____ SUBJECT: ______

CALCULATED BY: JH DATE: 1/29/2020

CHECKED BY: ______ DATE: ______

CHECK PUNCHING SHEAR

B = COLUMN + d = 16" + 5" = 21"



$V = P_u\,(W^2 - B^2) = 2105\ \text{PSF}\,(4\ \text{FT}^2 - 1.75\ \text{FT}^2)$

V = 27 233 LB SHEAR FORCE

CONCRETE SHEAR CAPACITY

a) $\phi V_c = (0.85)\left(2 + \frac{4}{\beta_c}\right)\sqrt{f'_c}\, b_o d = (0.85)\left(2 + \frac{4}{1}\right)\sqrt{4000\ \text{PSI}}\,(84")(5")$

= 135 472 LB.

b) $\phi V_c = (0.85)\left(\frac{\alpha_s d}{b_o} + 2\right)\sqrt{f'_c}\, b_o d = (0.85)\left(\frac{(20)(5")}{84"} + 2\right)\sqrt{4000\ \text{PSI}}\,(84")(5")$

ϕV_c = 72 037 LB

c) $\phi V_c = (0.85)\,4\sqrt{f'_c}\, b_o d = (0.85)(4)\sqrt{4000\ \text{PSI}}\,(84")(5")$

ϕV_c = 90 315 LB

USING THE SMALLEST VALUE FOR ϕV_c

72 037 LB > 27 233 LB

✓ OK

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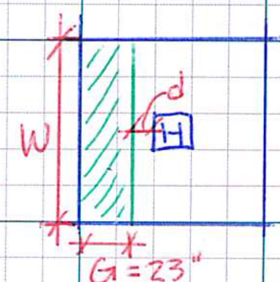
PROJECT:
SHEET: 4 OF 7 SUBJECT:
CALCULATED BY: JH DATE: 1/30/2020
CHECKED BY: DATE:

CHECK ONE-WAY SHEAR

$V_u = p_u W G = (2105_{PSF})(4_{FT})(1.92_{FT})$

$V_u = 16\,166$ LB



$\phi V_c = (0.85)(2)\sqrt{f'c}\; b_w d$

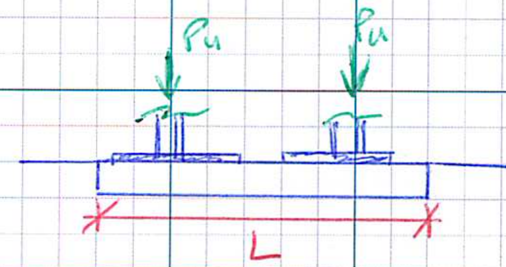
$= (0.85)(2)\sqrt{4000\,psi}\;(48'')(5'')$

$= 25\,804$ LB

25804 LB > 16 166 LB ✓ OK

CHECK BENDING MOMENT

DUE TO THE SLAB ACTING AS A MAT FOUNDATION, A MOMENT ANALYSIS WILL BE DONE LOOKING AT 2 POSTS ACTING ON HALF OF THE SLAB.



L = 14.11666 FT

W = 14/2 = 7.0833 FT

$A_{REQ} = \dfrac{42\,108 \text{ LB}}{4500 \text{ PSF}} = 9.36$ SQ FT.

$A_{PROV} = W \times L = 100.35$ SQ FT.

$p_u = \dfrac{1.6\,(42\,108 \text{ LB})}{100.35 \text{ SQFT}} = 671$ PSF ON THE FOOTER.

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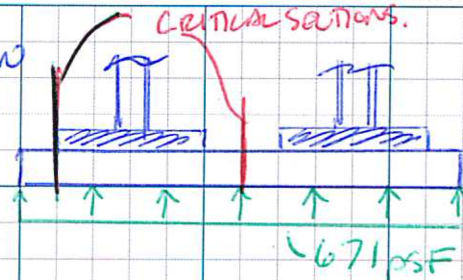
PROJECT:
SHEET: 5 OF 8 SUBJECT:
CALCULATED BY: JH DATE: 1/30/2020
CHECKED BY: DATE:

USING THE ATTACHED CALCULATION



M_{u_1} = 21 389 FT-LB NEAR POST

M_{u_2} = 18 236 FT-LB MID SPAN

CHECK THE DESIGN STEEL

$A_{S\,PROV} = 6 \times 6 \times 10/10$ WWF $= (0.028\ in^2/FT)(7.0833) = \underline{0.198\ in^2}$

$A_{S\,REQ}\ M_{u_2}$

$$\text{req}\ \bar{K} = \frac{M_u}{\phi b d^2} = \frac{(18{,}236\ \text{FT-LB})(12\ \text{IN/FT})}{(0.9)(7.0833)(12)(5\ \text{in})^2} = 0.1144\ \text{ksi}$$

$\rho = 0.0020$

$\therefore A_{S\,REQ} = \rho b d = (0.0020)(7.0833)(12)(5) = 0.85 > in^2$

NOT ENOUGH STEEL IS PROVIDED. THIS IS EVIDENCED BY A MOMENT CRACK DISCOVERED IN THE SLAB (PIC A)

∴ TO PREVENT FURTHER DAMAGE, THE AMOUNT OF LIQUID SHOULD BE LIMITED.

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PROJECT:

 SUBJECT:

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CHECKED BY: DATE:

ONLY 23.3 % OF THE REQUIRED STEEL IS PROVIDED.

$$\rho = \frac{A_s}{bd} = 0.0005$$

NOMINAL CAPACITY OF SLAB

$$\phi M_n = \frac{\phi b d^2}{12} \bar{K}$$

$$\bar{K} = f'_c\, \omega (1 - 0.59\,\omega)$$

$$\omega = \rho \frac{F_Y}{F'_c} = (0.0005) \frac{60\,000 \text{ PSI}}{4000 \text{ PSI}} = 0.0075.$$

$$\bar{K} = (4 \text{ ksi})(0.0075)(1 - 0.59(0.0075)) = 0.0299 \text{ ksi}$$

$$\phi M_n = \frac{(0.9)(85 \text{ in})(5 \text{ in})^2}{12} (0.0299 \text{ ksi}) = 4.765 \text{ FT-KIP}$$

4765 FT-LB.

APPROX 1225 LB/FT IS THE NOMINAL LOADING. THIS EQUATES TO A UNIFORM SOIL LOAD OF 173 PSF.

$$P_{Nom} = \frac{A_{PROV} \cdot P_u}{1.6} = \frac{(100.35 \text{ SQ FT})(173 \text{ PSF})}{1.6}$$

P_{Nom} = 10 850 LB PER LEG.

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PROJECT:
SHEET: 7 OF 7 SUBJECT:
CALCULATED BY: JH DATE: 1/30/2020
CHECKED BY: DATE:

WITH 10 850 LB PER POST, A TOTAL LOAD IS

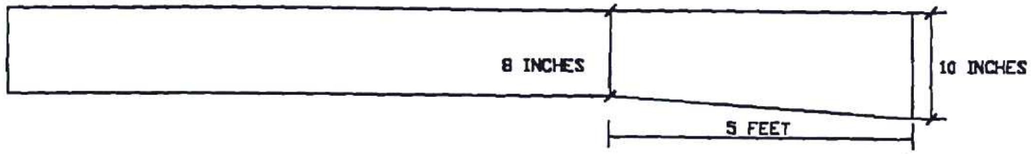
W_{NOM} = 43 400 LB.

THIS IS APPROX 51.5 % OF THE TANK CAPACITY.

∴ THE TANK SHOULD ONLY BE FILLED W/ 5000 gal TO PREVENT CRACK PROPIGATION.

STATE OF NEW YORK
JEFFREY MARK HINDERLITER
093650
LICENSED PROFESSIONAL ENGINEER

Jeffrey Hinderliter 1/30/2020

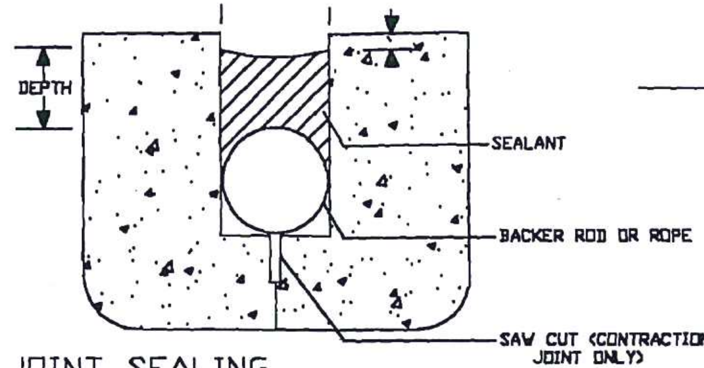


CONCRETE PAD - EDGE THICKENING

NTS

NOTES:

1. SLAB TO BE THICKENED AT ALL EXTERNAL EDGES WHICH ARE LOADED, INCLUDING DOORWAYS
2. SLAB TO BE THICKENED TO 10", AND TAPERED BACK TO 8" OVER A 5' DISTANCE.

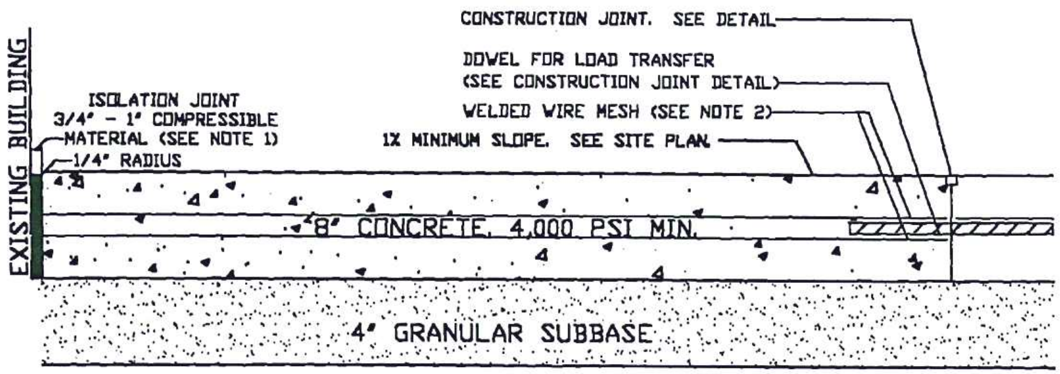


JOINT SEALING

NTS

NOTES:

1. SEALANT TO BE SIKAFLEX -2C, SL OR APPROVED EQUAL
2. MINIMUM DEPTH 1/4". MAXIMUM DEPTH 1/2"
3. $\frac{\text{DEPTH}}{\text{WIDTH}}$ = SHAPE FACTOR = 0.5

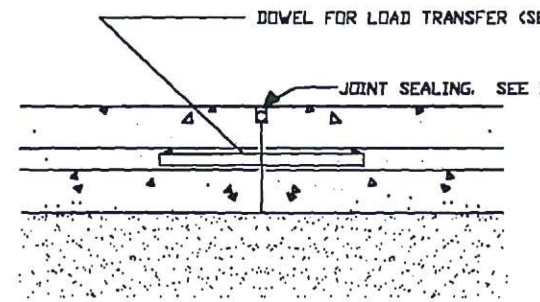


CONCRETE PAD - CROSS SECTION

NTS

NOTES:

1. INSTALL 1" NONEXTRUDABLE, PREFORMED COMPRESSIBLE MATERIAL BETWEEN SLAB AND ANY EXISTING BUILDINGS.
2. REINFORCING MESH: 2 LAYERS OF 10 GAUGE WIRE AT 6" CENTERS. WIRE TO BE 60,000 PSI YIELD STRENGTH WELDED WIRE MESH. INSTALL MESH AT 3" FROM TOP AND 3" FROM BOTTOM OF CONCRETE. MESH SHALL NOT EXTEND THROUGH THE CONTRACTION JOINT.



CONSTRUCTION JOINT

NTS

NOTES:

1. INTERNAL JOINTS (CONSTRUCTION OR CONTRACTION) TO BE SPACED NO GI THAN 15' O.C.
2. PROVIDE DOWELS AT ALL INTERNAL JOINTS. INSTALL DOWEL AT MID-DE DOWELS TO BE STEEL WITH A 50 KSI MINIMUM YIELD STRENGTH DOWEL DIMENTIONS: DIAMETER: 1". TOTAL LENGTH 18". SPACIN
3. DOWELS SHALL MEET THE REQUIREMENTS OF AASHTO M254 FOR LOAD DEI PULLOUT, CORROSION, AND ABRASION.
4. END DOWELS SHALL BE 6" FROM THE EDGE OF PAVEMENT. INTERVENING SHALL BE SPACED 12" +1/2" APART. DOWEL CENTERLINES SHALL BE AT MID-DEPTH OF CONCRETE +1/4". DOWELS SHALL BE PARALLEL TO THE C CENTERLINE TO WITHIN 1/8" PER FOOT. THE DOWELS SHALL BE CENTER THE JOINT.
5. REINFORCEMENT DOES NOT EXTEND THROUGH CONSTRUCTION JOINT


A


B


C
ASPHALT EMULSION
CRS - 2
TOTAL STORAGE: 10,000 GAL
WORKING CAP: 9,000 GAL


D

TABLE A-10 Coefficient of Resistance ($\bar{k}$) Versus Reinforcement Ratio (ρ) ($f_c' = 4000$ psi; $f_y = 60{,}000$ psi; Units of $\bar{k}$ Are ksi)

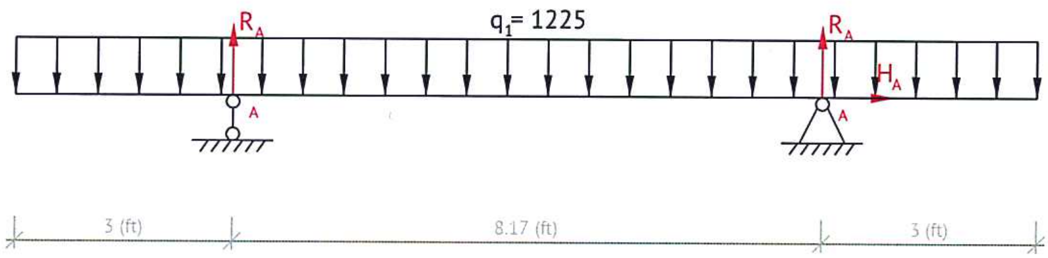
ρ	$\bar{k}$	ρ	$\bar{k}$	ρ	$\bar{k}$	ρ	$\bar{k}$
0.0010	0.0595	0.0036	0.2091	0.0062	0.3516	0.0088	0.4870
0.0011	0.0654	0.0037	0.2148	0.0063	0.3570	0.0089	0.4921
0.0012	0.0712	0.0038	0.2204	0.0064	0.3623	0.0090	0.4971
0.0013	0.0771	0.0039	0.2259	0.0065	0.3676	0.0091	0.5022
0.0014	0.0830	0.0040	0.2315	0.0066	0.3729	0.0092	0.5072
0.0015	0.0889	0.0041	0.2371	0.0067	0.3782	0.0093	0.5122
0.0016	0.0946	0.0042	0.2427	0.0068	0.3835	0.0094	0.5172
0.0017	0.1005	0.0043	0.2482	0.0069	0.3888	0.0095	0.5222
0.0018	0.1063	0.0044	0.2538	0.0070	0.3941	0.0096	0.5272
0.0019	0.1121	0.0045	0.2593	0.0071	0.3993	0.0097	0.5322
0.0020	0.1179	0.0046	0.2648	0.0072	0.4046	0.0098	0.5372
0.0021	0.1237	0.0047	0.2703	0.0073	0.4098	0.0099	0.5421
0.0022	0.1294	0.0048	0.2758	0.0074	0.4150	0.0100	0.5471
0.0023	0.1352	0.0049	0.2813	0.0075	0.4202	0.0101	0.5520
0.0024	0.1410	0.0050	0.2868	0.0076	0.4254	0.0102	0.5569
0.0025	0.1467	0.0051	0.2922	0.0077	0.4306	0.0103	0.5618
0.0026	0.1524	0.0052	0.2977	0.0078	0.4358	0.0104	0.5667
0.0027	0.1581	0.0053	0.3031	0.0079	0.4410	0.0105	0.5716
0.0028	0.1638	0.0054	0.3086	0.0080	0.4461	0.0106	0.5765
0.0029	0.1695	0.0055	0.3140	0.0081	0.4513	0.0107	0.5814
0.0030	0.1752	0.0056	0.3194	0.0082	0.4564	0.0108	0.5862
0.0031	0.1809	0.0057	0.3248	0.0083	0.4615	0.0109	0.5911
0.0032	0.1866	0.0058	0.3302	0.0084	0.4666	0.0110	0.5959
0.0033	0.1922	0.0059	0.3356	0.0085	0.4718	0.0111	0.6008
0.0034	0.1979	0.0060	0.3409	0.0086	0.4768	0.0112	0.6056
0.0035	0.2035	0.0061	0.3463	0.0087	0.4819	0.0113	0.6104

TABLE A-10 (CONT.) Coefficient of Resistance ($\bar{k}$) Versus Reinforcement Ratio (ρ)
($f_c' = 4000$ psi; $f_y = 60{,}000$ psi; Units of $\bar{k}$ Are ksi)

ρ	$\bar{k}$	ρ	$\bar{k}$	ρ	$\bar{k}$	ρ	$\bar{k}$
0.0114	0.6152	0.0140	0.7362	0.0165	0.8459	0.0190	0.9489
0.0115	0.6200	0.0141	0.7407	0.0166	0.8501	0.0191	0.9529
0.0116	0.6248	0.0142	0.7452	0.0167	0.8544	0.0192	0.9568
0.0117	0.6295	0.0143	0.7497	0.0168	0.8586	0.0193	0.9608
0.0118	0.6343	0.0144	0.7542	0.0169	0.8628	0.0194	0.9648
0.0119	0.6390	0.0145	0.7587	0.0170	0.8670	0.0195	0.9687
0.0120	0.6438	0.0146	0.7632	0.0171	0.8712	0.0196	0.9726
0.0121	0.6485	0.0147	0.7675	0.0172	0.8754	0.0197	0.9765
0.0122	0.6532	0.0148	0.7720	0.0173	0.8796	0.0198	0.9804
0.0123	0.6579	0.0149	0.7765	0.0174	0.8837	0.0199	0.9843
0.0124	0.6626	0.0150	0.7809	0.0175	0.8879	0.0200	0.9882
0.0125	0.6673	0.0151	0.7853	0.0176	0.8920	0.0201	0.9921
0.0126	0.6720	0.0152	0.7897	0.0177	0.8961	0.0202	0.9960
0.0127	0.6766	0.0153	0.7941	0.0178	0.9003	0.0203	0.9998
0.0128	0.6813	0.0154	0.7984	0.0179	0.9044	0.0204	1.0037
0.0129	0.6859	0.0155	0.8028	0.0180	0.9085	0.0205	1.0075
0.0130	0.6905	0.0156	0.8072	0.0181	0.9116	0.0206	1.0113
0.0131	0.6951	0.0157	0.8115	0.0182	0.9166	0.0207	1.0152
0.0132	0.6998	0.0158	0.8158	0.0183	0.9207	0.0208	1.0190
0.0133	0.7044	0.0159	0.8202	0.0184	0.9248	0.0209	1.0227
0.0134	0.7089	0.0160	0.8245	0.0185	0.9288	0.0210	1.0265
0.0135	0.7135	0.0161	0.8288	0.0186	0.9328	0.0211	1.0303
0.0136	0.7181	0.0162	0.8331	0.0187	0.9369	0.0212	1.0341
0.0137	0.7226	0.0163	0.8373	0.0188	0.9409	0.0213	1.0378
0.0138	0.7272	0.0164	0.8416	0.0189	0.9449	0.0214	1.0416
0.0139	0.7317						

Leave feedback

Clear beam | Save link on this calculation



Select units

Units of measurement: Foot (ft)

Units of force: Pound-force (lbf)

Setting the length of beam

Length of beam **L,(ft)**: **14.1666**

Setting the support of beam

at the point B

at the point A

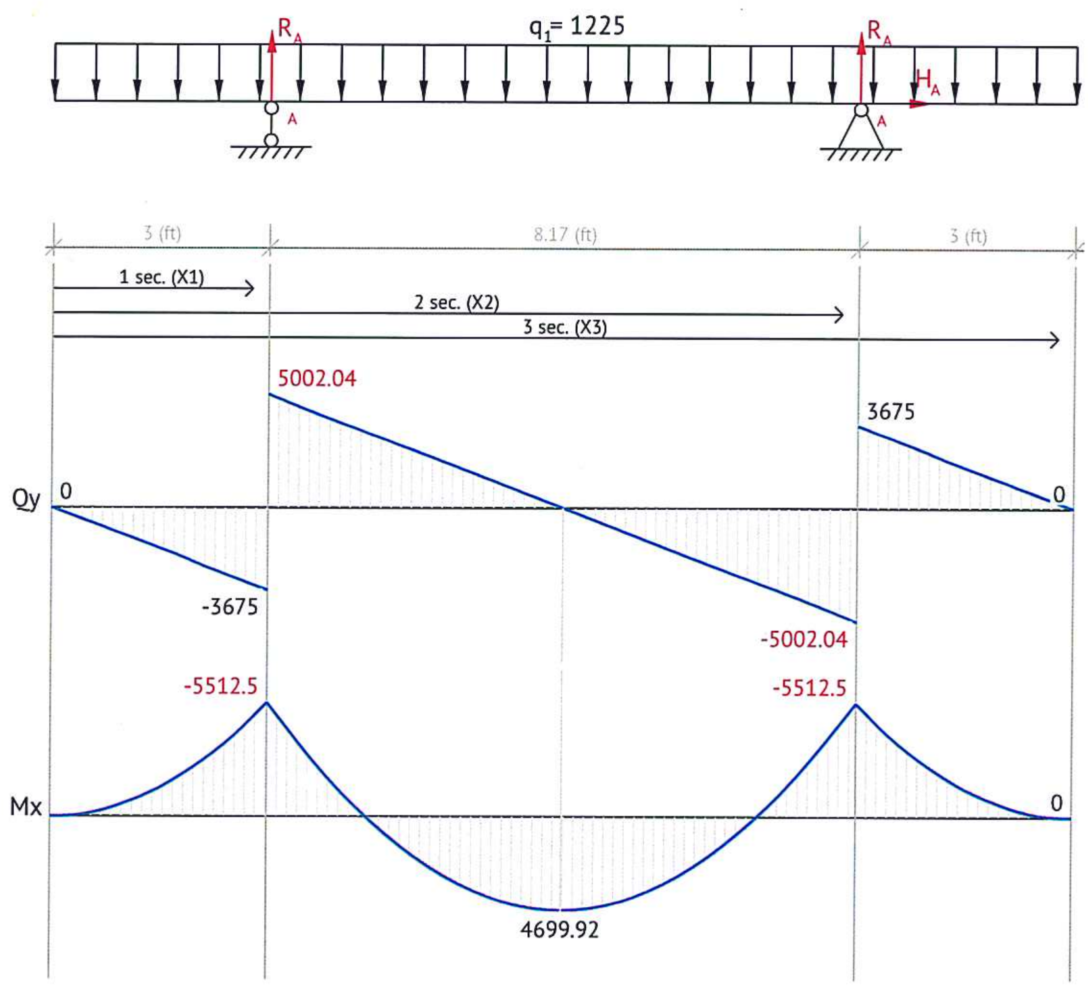
Setting the loads of beam

q_1 = -1225 (lbf/ft)

Setting the bending diagrams of beam

- [x] Calculate the reactions at the supports of a beam
- [x] Bending moment diagram (BMD) [x] Shear force diagram (SFD) [ ] Axial force diagram
- [x] Invert Diagram of Moment (BMD) - Moment is positive, when tension at the bottom of the beam

SOLVE



Calculate the reactions at the supports of a beam

1. A beam is in equilibrium when it is stationary relative to an inertial reference frame. The following conditions are satisfied when a beam, acted upon by a system of forces and moments, is in equilibrium.

$\Sigma F_x = 0$: $H_B = 0$

$\Sigma M_A = 0$: The sum of the moments about the roller support at the point A:

$- q_1*14.1666*(-3 + 14.1666/2) + R_B*8.1666 = 0$

$\Sigma M_B = 0$: The sum of the moments about the pin support at the point B:

$q_1*14.1666*(11.1666 - 14.1666/2) - R_A*8.1666 = 0$

2. Calculate reaction of pin support at the point B:

R_B = **(** $q_1*14.1666*(-3 + 14.1666/2)$**) / 8.1666** = **(** $1225*14.1666*(-3 + 14.1666/2)$**) / 8.1666** = 8677.04 (lbf)

3. Calculate reaction of roller support at the point A:

R_A = **(** $q_1*14.1666*(11.1666 - 14.1666/2)$**) / 8.1666** = **(** $1225*14.1666*(11.1666 - 14.1666/2)$**) / 8.1666** = 8677.04 (lbf)

4. Solve this system of equations:

$H_B = 0$ (lbf)

5. The sum of the forces about the Oy axis is zero:

$\Sigma F_y = 0$: $- q_1*14.1666 + R_A + R_B = - 1225*14.1666 + 8677.04*1 + 8677.04*1 = 0$

Draw diagrams for the beam

Consider first span of the beam $0 \le x_1 < 3$

Determine the equations for the shear force (Q):

$Q(x_1) = - q_1*(x_1 - 0)$

The values of Q at the edges of the span:

$Q_1(0) = - 1225*(0 - 0) = 0$ (lbf)

$Q_1(3) = - 1225*(3 - 0) = -3675$ (lbf)

Determine the equations for the bending moment (M):

$M(x_1) = - q_1*(x_1)^2/2$

The values of M at the edges of the span:

$M_1(0) = - 1225*(0 - 0)^2/2 = 0$ (lbf*ft)

$M_1(3) = - 1225*(3 - 0)^2/2 = -5512.50$ (lbf*ft)

Consider second span of the beam $3 \le x_2 < 11.1666$

Determine the equations for the shear force (Q):

$Q(x_2) = -q_1*(x_2 - 0) + R_A$

The values of Q at the edges of the span:

$Q_2(3) = -1225*(3 - 0) + 8677.04 = 5002.04$ (lbf)

$Q_2(11.17) = -1225*(11.1666 - 0) + 8677.04 = -5002.04$ (lbf)

The value of Q on this span that crosses the horizontal axis. Intersection point:

x = 4.08

Determine the equations for the bending moment (M):

$M(x_2) = -q_1*(x_2)^2/2 + R_A*(x_2 - 3)$

The values of M at the edges of the span:

$M_2(3) = -1225*(3 - 0)^2/2 + 8677.04*(3 - 3) = -5512.50$ (lbf*ft)

$M_2(11.17) = -1225*(11.17 - 0)^2/2 + 8677.04*(11.17 - 3) = -5512.50$ (lbf*ft)

Local extremum at the point x = 4.08:

$M_2(7.08) = -1225*(7.08 - 0)^2/2 + 8677.04*(7.08 - 3) = 4699.92$ (lbf*ft)

Consider third span of the beam $11.1666 \le x_3 < 14.1666$

Determine the equations for the shear force (Q):

$Q(x_3) = -q_1*(x_3 - 0) + R_A + R_B$

The values of Q at the edges of the span:

$Q_3(11.17) = -1225*(11.1666 - 0) + 8677.04 + 8677.04 = 3675$ (lbf)

$Q_3(14.17) = -1225*(14.1666 - 0) + 8677.04 + 8677.04 = 0$ (lbf)

Determine the equations for the bending moment (M):

$M(x_3) = -q_1*(x_3)^2/2 + R_A*(x_3 - 3) + R_B*(x_3 - 11.1666)$

The values of M at the edges of the span:

$M_3(11.17) = -1225*(11.17 - 0)^2/2 + 8677.04*(11.17 - 3) + 8677.04*(11.17 - 11.1666) = -5512.50$ (lbf*ft)

$M_3(14.17) = -1225*(14.17 - 0)^2/2 + 8677.04*(14.17 - 3) + 8677.04*(14.17 - 11.1666) = 0$ (lbf*ft)

Solved by BEAMGURU.COM

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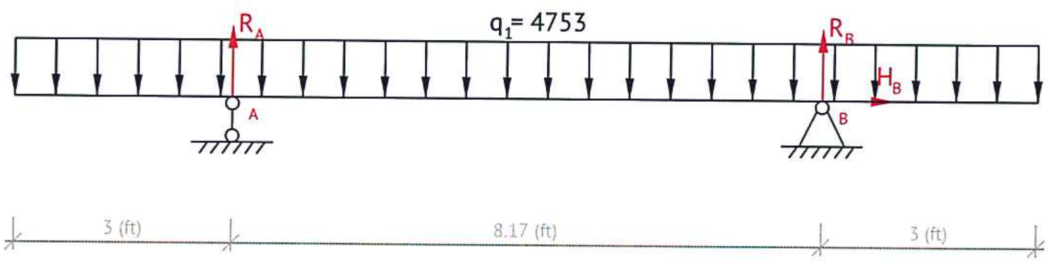


Select units

Units of measurement: Foot (ft)

Units of force: Pound-force (lbf)

Setting the length of beam

Length of beam **L,(ft)**: **14.1666**

Setting the support of beam

at the point B

at the point A

Setting the loads of beam

q_1 = -4753 (lbf/ft)

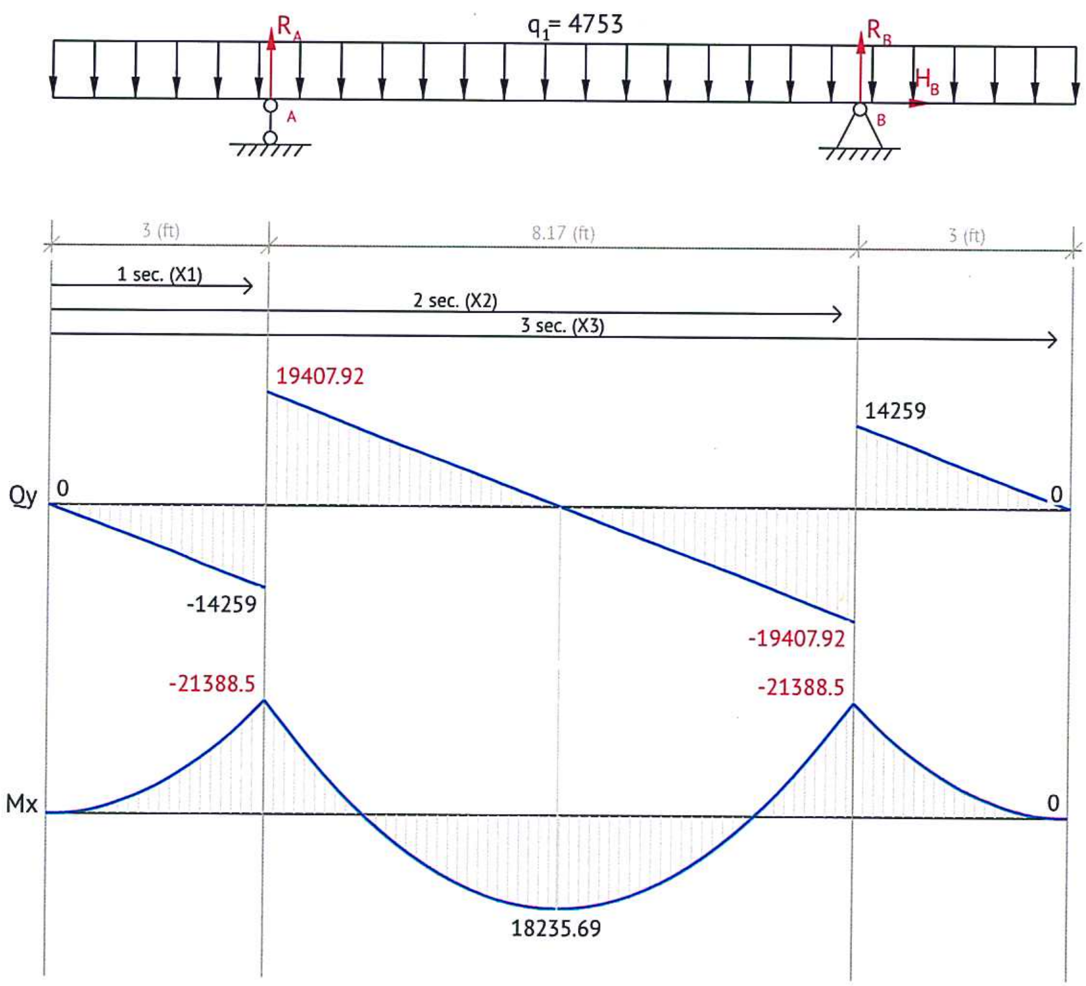
Setting the bending diagrams of beam

☑ Calculate the reactions at the supports of a beam

☑ Bending moment diagram (BMD) ☑ Shear force diagram (SFD) ☐ Axial force diagram

☑ Invert Diagram of Moment (BMD) - Moment is positive, when tension at the bottom of the beam

SOLVE



Calculate the reactions at the supports of a beam

1. A beam is in equilibrium when it is stationary relative to an inertial reference frame. The following conditions are satisfied when a beam, acted upon by a system of forces and moments, is in equilibrium.

$\Sigma F_x = 0$: $H_B = 0$

$\Sigma M_A = 0$: The sum of the moments about the roller support at the point A:

$- q_1*14.1666*(-3 + 14.1666/2) + R_B*8.1666 = 0$

$\Sigma M_B = 0$: The sum of the moments about the pin support at the point B:

$q_1*14.1666*(11.1666 - 14.1666/2) - R_A*8.1666 = 0$

2. Calculate reaction of pin support at the point B:

$R_B =$ **(** $q_1*14.1666*(-3 + 14.1666/2)$**) / 8.1666** = **(** 4753*14.1666*(-3 + 14.1666/2)**) / 8.1666** = 33666.92 (lbf)

3. Calculate reaction of roller support at the point A:

$R_A =$ **(** $q_1*14.1666*(11.1666 - 14.1666/2)$**) / 8.1666** = **(** 4753*14.1666*(11.1666 - 14.1666/2)**) / 8.1666** = 33666.92 (lbf)

4. Solve this system of equations:

$H_B = 0$ (lbf)

5. The sum of the forces about the Oy axis is zero:

$\Sigma F_y = 0$: $- q_1*14.1666 + R_A + R_B = - 4753*14.1666 + 33666.92*1 + 33666.92*1 = 0$

Draw diagrams for the beam

Consider first span of the beam $0 \le x_1 < 3$

Determine the equations for the shear force (Q):

$Q(x_1) = - q_1*(x_1 - 0)$

The values of Q at the edges of the span:

$Q_1(0) = - 4753*(0 - 0) = 0$ (lbf)

$Q_1(3) = - 4753*(3 - 0) = -14259$ (lbf)

Determine the equations for the bending moment (M):

$M(x_1) = - q_1*(x_1)^2/2$

The values of M at the edges of the span:

$M_1(0) = - 4753*(0 - 0)^2/2 = 0$ (lbf*ft)

$M_1(3) = - 4753*(3 - 0)^2/2 = -21388.50$ (lbf*ft)

Consider second span of the beam $3 \le x_2 < 11.1666$

Determine the equations for the shear force (Q):

$Q(x_2) = -q_1*(x_2 - 0) + R_A$

The values of Q at the edges of the span:

$Q_2(3) = -4753*(3 - 0) + 33666.92 = 19407.92$ (lbf)

$Q_2(11.17) = -4753*(11.1666 - 0) + 33666.92 = -19407.92$ (lbf)

The value of Q on this span that crosses the horizontal axis. Intersection point:

x = 4.08

Determine the equations for the bending moment (M):

$M(x_2) = -q_1*(x_2)^2/2 + R_A*(x_2 - 3)$

The values of M at the edges of the span:

$M_2(3) = -4753*(3 - 0)^2/2 + 33666.92*(3 - 3) = -21388.50$ (lbf*ft)

$M_2(11.17) = -4753*(11.17 - 0)^2/2 + 33666.92*(11.17 - 3) = -21388.50$ (lbf*ft)

Local extremum at the point x = 4.08:

$M_2(7.08) = -4753*(7.08 - 0)^2/2 + 33666.92*(7.08 - 3) = 18235.69$ (lbf*ft)

Consider third span of the beam $11.1666 \le x_3 < 14.1666$

Determine the equations for the shear force (Q):

$Q(x_3) = -q_1*(x_3 - 0) + R_A + R_B$

The values of Q at the edges of the span:

$Q_3(11.17) = -4753*(11.1666 - 0) + 33666.92 + 33666.92 = 14259$ (lbf)

$Q_3(14.17) = -4753*(14.1666 - 0) + 33666.92 + 33666.92 = 0$ (lbf)

Determine the equations for the bending moment (M):

$M(x_3) = -q_1*(x_3)^2/2 + R_A*(x_3 - 3) + R_B*(x_3 - 11.1666)$

The values of M at the edges of the span:

$M_3(11.17) = -4753*(11.17 - 0)^2/2 + 33666.92*(11.17 - 3) + 33666.92*(11.17 - 11.1666) = -21388.50$ (lbf*ft)

$M_3(14.17) = -4753*(14.17 - 0)^2/2 + 33666.92*(14.17 - 3) + 33666.92*(14.17 - 11.1666) = 0$ (lbf*ft)

Solved by BEAMGURU.COM