DAMMON ENGINEERING, INC.
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CONSULTING DESIGN STUDIES EXPERT WITNESS
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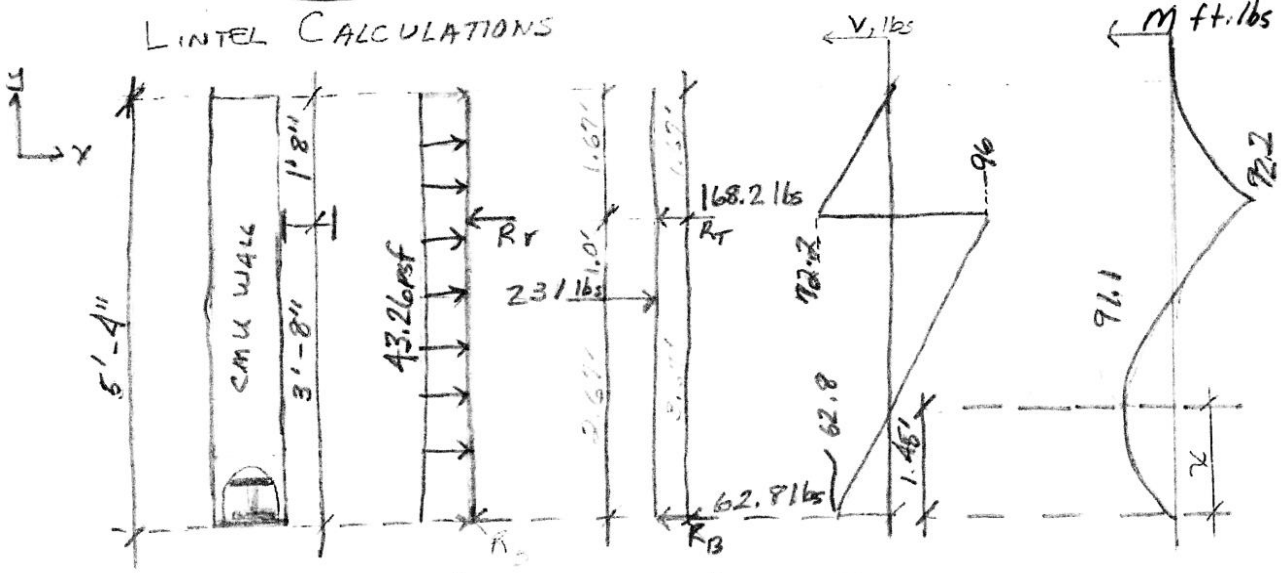
#1

BUILDING 2441 LINTEL & WIND BEAM CALCULATIONS

LINTEL CALCULATIONS



$\Sigma M_{R_T} = 0 \Rightarrow R_B = \frac{1}{3.67}[231\text{ lbs} \times 1.0] = 62.8\text{ lbs}$

$\Sigma F_y = 0 \Rightarrow R_T = 231 - 62.8\text{ lbs} = 168.2\text{ lbs}$

$x = \frac{62.8}{43.26} = 1.45'$

$M_{max} = \frac{1}{2}[1.45' \times 62.8\text{ lbs}] = 91.1\text{ ft-lbs}$

Use 8" CMU

$d = \frac{7.63"}{2} = 3.8"$

$A_s = \frac{M}{F_s j d}$

Assume $j = 0.9$ for initial estimate

Allow $\frac{1}{3}$ stress increase for wind load

$A_{s\,required} \quad \frac{91.1\text{ ft-lbs} \times 12\frac{in}{ft}}{24{,}000\text{ psi} \times 1.33 \times 0.9 \times 3.8"} = 0.100\text{ in}^2$

Use #4 @ 24 in o.c. ($A_s = 0.20\ \frac{12}{24} = 0.10\text{ in}^2$)

check strength

Use 2.0' wide strip ∴ Design moment = $91.1\text{ ft-lbs} \times 2 = 182.2\text{ ft-lbs}$

$p = \frac{A_s}{bd} = \frac{0.20\text{ in}^2}{24 \times 3.8\text{ in}} = 0.002$

$np = 0.0322$

$k = 0.220$

$k^2 + 0.064k - 0.064 = 0$

$j = \left(1 - \frac{k}{3}\right) = \left(1 - \frac{0.22}{3}\right) = 0.927$

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Bldg 2441 26ft Door Lintel Weight (cont.)

Allowable Tension Flexural capacity

$M_T = A_s j d F_s = 0.50\ in^2 \times 0.927 \times 3.8\ in \times 24{,}000\ psi \times \frac{1.33}{12\ in/ft}$

$\Rightarrow M_T = 1871\ ft\text{-}lbs > 182.2\ ft\text{-}lbs$ ∴ OK

Allowable Compression Flexural capacity

$F_b = \frac{1}{3} f'_m \times 1.33 = \frac{1}{3}(1500\ psi) \times 1.33 = 665\ psi$

$M_c = \frac{b d^2}{2} K_j F_b$

$M_c = \frac{24 \times (3.8\ in)^2}{2} \times 0.220 \times 0.927 \times \frac{665\ psi}{12\ in/ft}$

$M_c = 1958\ ft\text{-}lbs > 182.2\ Ft\text{-}lbs$ ∴ OK

USE #4 24" O.C.

Calculate beam to support weight

CMU, hollow core	= 55 pcf
Mortar, masonry	= 116 pcf
Concrete	= 150 pcf
Steel	= 489 pcf

lea. solid filled CMU w/2 bars	1806.7 lbs
6 courses hollow CMU	= 5,720.0 lbs
mortar	= 1,503.0 lbs
vertical #9@24 o.c.	= 43.6 lbs
Vertical concrete	= 2,520.0 lbs
Total weight	= 11,598.3 lbs
weight/lf	= 446.1 plf

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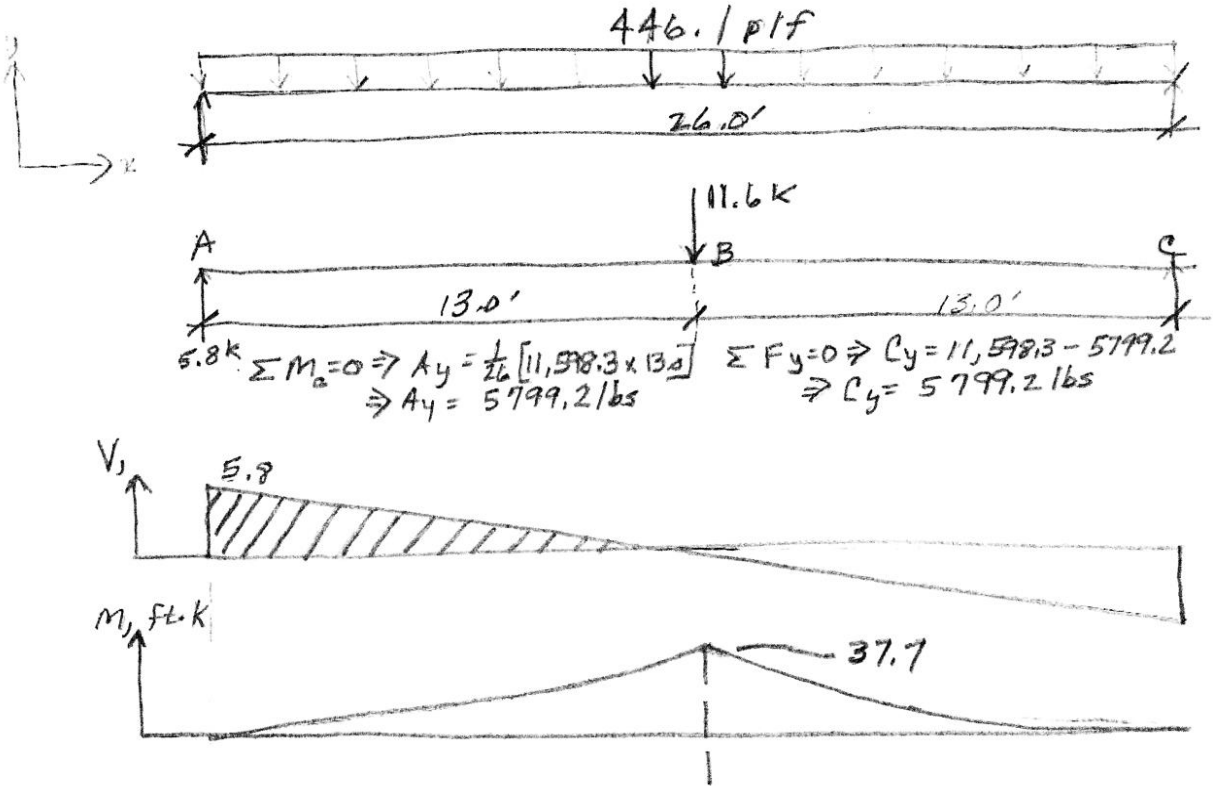
#3

BLDG 2441 26 ft Door Lintel Weight Calc (cont.)



Section modulus $S = \frac{M \times 12''/ft}{24{,}000 psi} = \frac{37.7k \times 12\ in/ft}{24\ k \cdot lb/in^2} = 18.8\ in^3$ x-x

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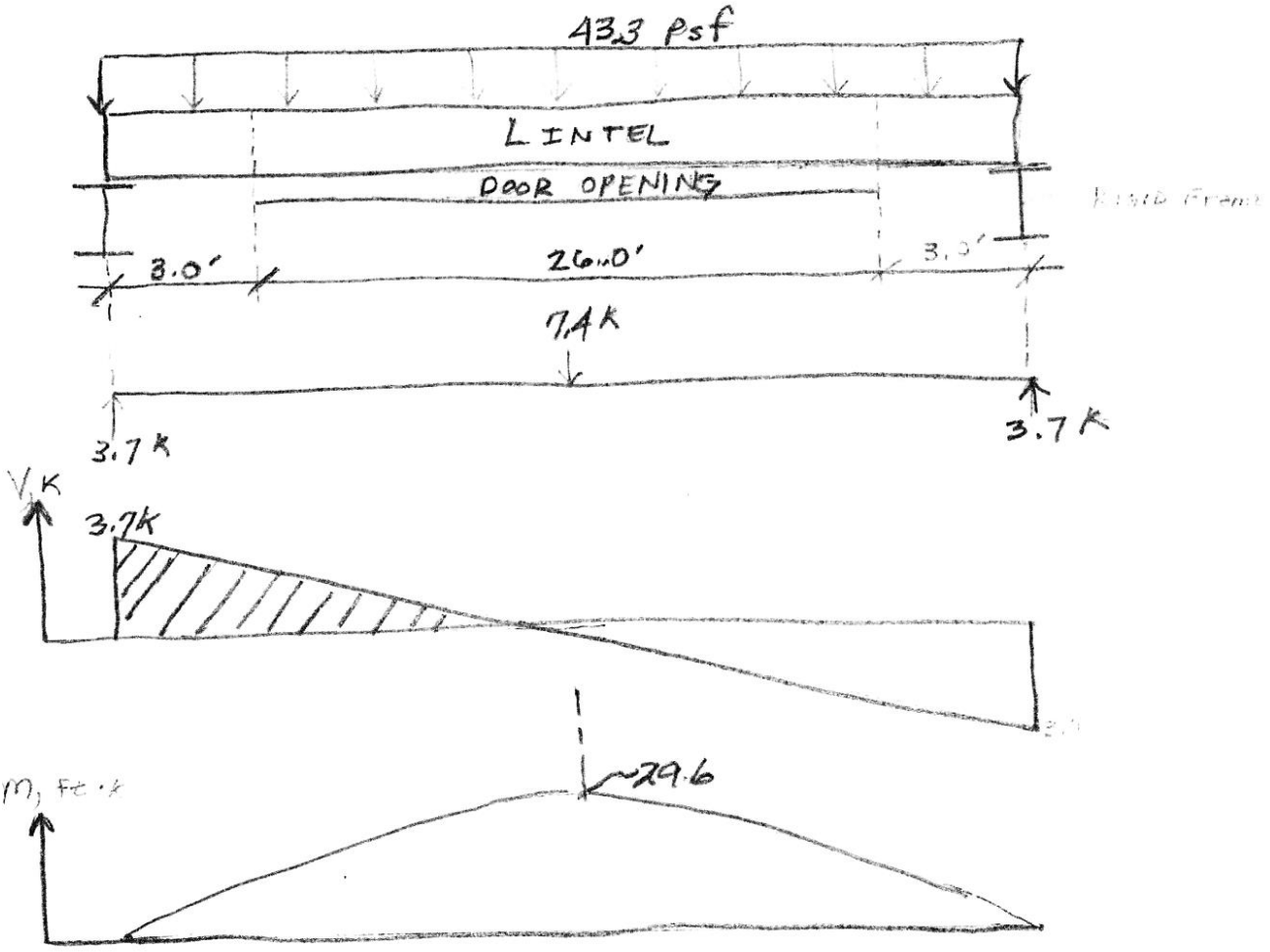
Bldg 2141 Wind Beam Calculations



Beam Selection

Section modulus $S_{yy} = \frac{M \times 12\ in/ft}{24{,}000\ psi} = \frac{27.6\ ft\cdot k \times 12\ in/ft}{24\ ksi} = 14.8\ in^3$

$S_{xx} = 18.9\ in^3$

		Depth	S, X-X	I, x-x	S, Y-Y
W 14 x 22		13.91"	29.0	199.0	2.8
MC	8 x 18.7	2.976"	1.97	4.20	13.1
	Total	16.89"	$30.97\ in^3$	203.20	15.9

Beam Deflection

W 12 x 19 + MC 8 x 21.4

$\Delta = \frac{5WL^3}{384EI} = \frac{5(11.6K + 0.6K + 0.5k)(312")^3}{384(29{,}000\ ksi)(\ in^4)}$

$\Rightarrow \Delta = 0.8522"$

ALLOWED $\Delta = \frac{1}{360} \times L = \frac{1}{360} \times 312" = 0.8667"$ ∴ OK