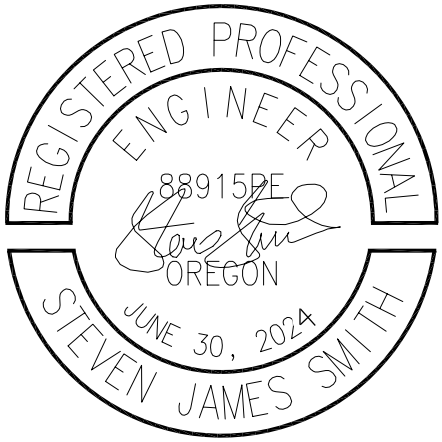
STRUCTURAL CALCULATIONS

PROJECT: BURGER KING - PORTLAND
CO2 TANK ATTACHMENT

HTK STRUCTURAL ENGINEERS, LLP

DESIGN ASSUMPTIONS

Concrete Strength at 28 days: $f'_c := 2500$ *psi*
Masonry (Grade N Concrete Block): $f'_m := 2000$ *psi*
Mortar (Type S): $f'_m := 2000$ *psi*
Grout: $f'_g := 2000$ *psi*



Reinforcing Steel: A-615
Grade 40 (#4 and less) $F_{y40} := 40000$ *psi*
Grade 60 (#5 and larger) $F_{y60} := 60000$ *psi*

Structural Steel: A-36 Yield Strength: $F_y := 50000$ *psi*

Lumber: Douglas Fir-Larch $E_s := 29 \cdot 10^6$ *psi*

4x Joists, Beams and Posts: #2 (UON)
$F_v4x := 95$ *psi*
$F_b4x := 900$ *psi*
$E4x := 1.6 \cdot 10^6$ *psi*

6x Joists, Beams and Posts: #1 (UON)
$F_v6x := 85$ *psi*
$F_b6x := 1350$ *psi*
$E6x := 1.6 \cdot 10^6$ *psi*

Studs: Stud Grade (UON)

Manufactured: PSL: $F_vPSL := 290$ *psi*
$F_bPSL := 2900$ *psi*
$EPSL := 2.0 \cdot 10^6$ *psi*

LSL: $F_vLSL := 310$ *psi*
$F_bLSL := 2325$ *psi*
$ELSL := 1.55 \cdot 10^6$ *psi*

DESIGN LOADS:

ROOF DEAD LOAD

	SLOPING	FLAT
Roofing:		4 psf
Plywood:		2 psf
Joists:		5 psf
Insul. & Clg:		1 psf
Sprink:		2 psf
Misc:		2 psf

$DL_{roofslope} := 16$ *psf*
$DL_{roofflat} := 16$ *psf*

FLOOR DEAD LOAD

	INTERIOR	EXTERIOR
Flooring:	2 psf	4 psf
Plywood:	2 psf	2 psf
Joists:	5 psf	5 psf
Insul. & Clg:	2 psf	2 psf
Sprink:	2 psf	2 psf
Misc:	1 psf	1 psf

$DL_{floorint} := 14$ *psf*
$DL_{floorext} := 16$ *psf*

WALL DEAD LOAD
$DL_{wallext} := 16$ *psf*
$DL_{wallint} := 10$ *psf*

ROOF LIVE LOAD
$LL_{roofslope} := 20$ *psf*
$LL_{roofflat} := 20$ *psf*

FLOOR LIVE LOAD
$LL_{floorext} := 60$ *psf*
$LL_{floorint} := 40$ *psf*
$LL_{floorexit} := 100$ *psf*

SOIL DESIGN VALUES
Report by: N/A (CBC MINIMUMS)
Report Date: -
Reporty No.: -
Bearing Pressure: $q_b := 1500$ *psf*

These calculations are limited only to the items included herein, selected by the client and do not imply approval of any other portion of the structure by this office. These calculations are not valid if altered in any way, or not accompanied by a wet stamp and signature of the Engineer of Record.

Job No.	Designed By	Date
20-372.00	RT	9/29/2022

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BURGER KING - POTLAND
Anchorage Analysis for CO2 tank

$Sds := 0.737$ $w_{tank} := 670\ lbf$ $h_{tank} := 169.55\ in$ $l_{tank} := 8\ in$
$a_p := 1$
$R_p := 2.5$
$I_p := 1.0$

$E_v := 0.6 - 0.7 \cdot 0.2 \cdot Sds = 0.5$

NDS 2018 (12M), Wpullout=2850(G^2)D) (per inch of penetration)

$screw_{pull} := 117\ \frac{lbf}{in} \cdot 2.5\ in = 292.5\ lbf$ (#8 Wood Screws for tank strap) 8-#8 x 2" scrwes

$screw_{shear} := 103\ lbf$ (Table 12M w/ steel plate)

CO2 TANK (670 lb max)

$$F_{ptank} := \frac{0.4 \cdot a_p \cdot Sds \cdot w_{tank}}{\frac{R_p}{I_p}} \cdot \left(1 + 2 \cdot \langle 1 \rangle\right)$$

$F_{ptank} = 237.02\ lbf$

$Mot_{tank} := F_{ptank} \cdot \left(\frac{h_{tank}}{2}\right) = 1674.442\ lbf \cdot ft$

$$Mres_{tank} := E_v\ \frac{2 \cdot \langle w_{tank} \rangle \cdot \langle l_{tank} \rangle}{2} = 221.913\ lbf \cdot ft$$

$$OT_{tank} := \frac{Mot_{tank} - Mres_{tank}}{l_{tank}} = 2178.79\ lbf$$

$screw_t := \frac{OT_{tank}}{screw_{pull}} = 7.45$

-Use strap per manuf or CS16 (H) min) w/ 4-#8 x 2.5" screw ea. side (8 total).

STRUCTURAL CALCULATIONS

Worst Case Stud Check

$l_{stud} := 12\ \mathbf{ft}$ $F_{ptank} = 237.02\ \mathbf{lbf}$

$Mot_{stud} := \frac{F_{ptank} \cdot \langle 12\ \mathbf{ft} \rangle}{\langle 4 \cdot 4 \rangle} = 177.76\ \mathbf{lbf \cdot ft}$ ea stud

$Sx_{req} := \frac{Mot_{stud} \cdot 12\ \frac{\mathbf{in}}{\mathbf{ft}}}{900\ \mathbf{psi} \cdot 1.6}$ $Sx_{req} = 1.48\ \mathbf{in}^3$ 2x6 stud is adequate