

Tie Down Specifications

Purpose:
To provide tie down criteria based on a buoyancy analysis of tank and anchor and cabling capacities. This specification is specific to buoyancy related resistance items. Wind, flood, impact and other force considerations, if applicable, are not included in this specification. The specification herein may be considered a minimum criteria, the use of equal or higher capacity products in substitution may resistance item is acceptable.

Applicable Codes:

- Florida Building Code, Building 5th Ed.
- Florida Building Code, Fuel Gas 5th Ed.
- ASCE 7-10
- NFPA 58
- FEMA 348, Buoyancy Calculations

Materials:

- All cables shall be 7X19 aircraft cable (may be galvanized or Type 304 SS), or equal that meets the following criteria:
 - 3/16" cables shall have a breaking strength of 3700 lbs min and a working capacity of 1280 lbs min.
 - 1/4" cables shall have a breaking strength of 6400 lbs min and a working capacity of 1280 lbs min.
 - 5/16" cables shall have a breaking strength of 9000 lbs min and a working capacity of 1800 lbs min.
- In all areas subject to salt water incursion or other corrosive soils, Type 304 SS stainless steel cables shall be used.
- All cabling components must meet or exceed the working capacity of the cable being used (i.e., clips, turnbuckles, etc.)
- All cables shall be installed, and shall be configured such that they restrict movement of the tank, provide suitable buoyancy resistance, and secure the tank from floating.
- All assumed tank dimensions are given and the actual tank being installed should be within +/- 10% of the table value
- If required by local authority, protect tank from cables with flexible rubber gasket or approved material.
- Concrete shall meet the minimum requirements of the FDOT Standard Specifications for Road and Bridge Construction, Section 247 - Portland Cement Concrete - Class NS with a minimum 28-day compressive strength of 2,500 psi.
- Rebar shall meet the minimum requirements of the FDOT Standard Specifications for Road and Bridge Construction, Section 415 - Reinforcing Steel. In all areas subject to salt water incursion or other corrosive conditions epoxy coated (green) rebar shall be used.

Limitations:

- Specifications are for use within the State of Florida only.
- Specifications are valid for permitting use one (1) year from the date of the Engineer's signature on these plans or subsequent code implementation date whichever is less.
- Specifications are intended for use by all Florida Propane Dealers.

GENERAL SPECIFICATIONS

- ALL STORAGE TANKS, FACILITIES AND APPURTANCES MUST BE CONSTRUCTED, INSTALLED, PROTECTED AND MAINTAINED IN ACCORDANCE WITH THE FOLLOWING:
 - NFPA 58
 - FLORIDA ADMINISTRATIVE CODE, CHAPTER 55-20
 - FLORIDA STATUTES, CHAPTER 327
 - AND ALL APPLICABLE REQUIREMENTS OF THE LOCAL JURISDICTIONAL AUTHORITY

- ALL TANKS ARE PRE-PURGED AND READY TO FILL RATED AT 250 psig FROM -20° F TO 125° F

BUOYANCY CALCULATION

BUOYANCY CALCULATIONS BASED ON FEMA 348

BUOYANCY = $0.134 \times V \times W \times FS$

Conversion from gallons to ft³
V = Tank Volume (gallons)
SW = Specific Weight of Salt Water (64.1 lbs/ft³)
FS = Safety Factor for Buoyancy (1.3)

NET BUOYANCY = $F_b - (W_t + W_{str})$

F_b = Buoyancy (lbs)
W_t = Tank Weight (lbs)
W_{str} = Safety Factor for Tank Weight (1.3)

REQUIRED STRAINS = F_{bnet} / W_C

F_{bnet} = Net Buoyancy (lbs)

W_C = Individual Strap Minimum Working Capacity (lbs)

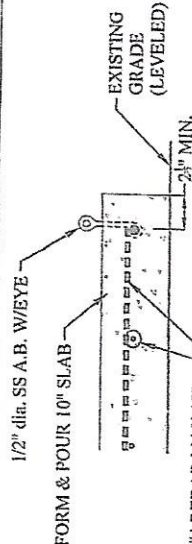
3/16" 1/4" 5/16" 7/8" 1280 1800

REQUIRED CONC. = $(F_{bnet} / W_C) \times 27$

F_{bnet} = Net Buoyancy (lbs)

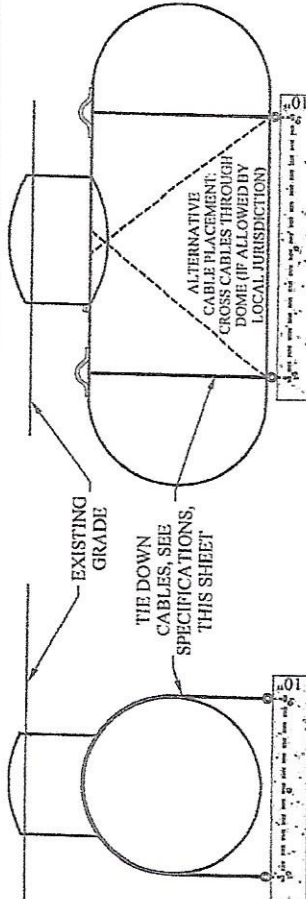
SWC = Specific Weight of Concrete (150 lbs/ft³)

27 = Conversion from cf to cy



O.C. EACH WAY (MIN)
TWO #4 BARS E.W.

SLAB DETAIL



NOTE: SEE SPECIFICATIONS FOR NUMBER OF TIE DOWNS REQUIRED

TANK DATA AND CALCULATIONS

* DIMENSIONS MAY VARY FOR DIFFERENT SLAB THICKNESSES

* SLABS MAY BE MULTI-SECTIONAL

HORIZONTAL TANK		TANK DATA AND CALCULATIONS					VERTICAL TANK		
Tank Volume (gallons)	Buoyancy (pounds)	Tank Weight (pounds)	Net Buoyancy (pounds)	Cable Diameter (inches)	Number of Cables	Minimum Concrete (cy)	Tank Capacity (gallons)	Buoyancy (pounds)	Tank Weight (pounds)
120	1340	260	1140	3/16	2	0.28	23.6	120	85
150	1675	380	1383	3/16	2	0.34	57	200	190
230	2792	480	2422	1/4	2	0.60	120	420	290
320	3573	620	2953	1/4	2	0.76			
500	5583	940	4860	5/16	3	1.20			
1000	11166	1880	9782	5/16	5	2.42			
VERTICAL TANK		TANK DATA AND CALCULATIONS					VERTICAL TANK		
Tank Capacity (gallons)	Buoyancy (pounds)	Tank Weight (pounds)	Net Buoyancy (pounds)	Cable Diameter (inches)	Number of Cables	Minimum Concrete (cy)	Tank Capacity (gallons)	Buoyancy (pounds)	Tank Weight (pounds)
23.6	120	85	198	3/16	2	0.05	23.6	120	85
57	200	190	490	3/16	2	0.12	57	200	190
120	420	290	1117	3/16	2	0.28	120	420	290

* On vertical tanks each cable is attached to the tank

NOTE: CONTRACTOR SHALL INSURE ADEQUATE SOIL BEARING FOR ABOVE GROUND TANK INSTALLATION

ABOVE GROUND TANK ANCHORING DETAIL

Brett R. Hedstrom
JAN 24 2017
P.E. NO. 53662

Propane Tank Buoyancy
Anchoring Specifications
For Use In Lee County

Prepared For
South Florida Gas Company
2483 Evans Avenue
Fort Myers, FL 33902

Revised

TANK
ANCHORING
WITH CONCRETE
BALLAST

SHEET
1 OF 1