Foundation Services

FOUNDATION & SINKHOLE REPAIR
GENERAL CONTRACTING
LANDSCAPE SOLUTIONS

4625 Northwest 44th Ave, Ocala Fl 34482
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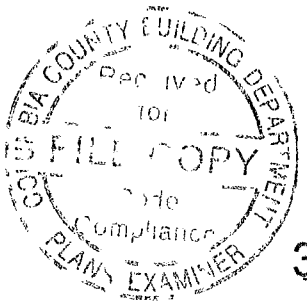
Fax: 352- 732-5459 www.FoundationServicesCF.com
STATE CERTIFIED CONTRACTOR CB-CA59697

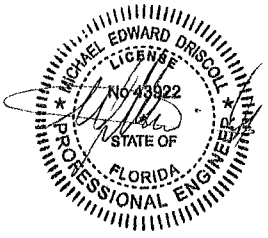


HELICALTORQUE ANCHORS

OWNER/ LOCATION

PEARCE
347 NW HARRIS LAKE DRIVE
LAKE CITY, FL

DS13-300



Digitally signed by Michael E. Driscoll, P.E.
DN: cn=Michael E. Driscoll, P.E., o=Driscoll Engineering Inc., ou, email=med@driscollengineering.com, c=US
Date: 2013.09.06 15:15:55 -04'00'

INDEX

DRISCOLL ENGINEERING,INC.
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DATE: 9-6-13

Michael E. Driscoll P.E.
Fl Reg #43922

DRISCOLL ENGINEERING,INC.
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HELICAL PILE ANALYSIS AND DESIGN

September 6, 2013

TO: Mr. Robert Stephenson
Foundation Services
4625 NW 44TH Ave
Ocala, Fl 34482

RE: Pearce
347 NW Harris Lake Dr
Lake City, Florida

Project. No. DS13-300

Dear Mr. Stephenson:

Per our conversation, we understand that the above referenced project is a single story wood frame w/ brick veneer wall building with slab on grade construction on a continuous masonry stemwall and reinforced concrete footing. The assumed footing size is 20"W x 10"D with 3 each #5 bars continuous at bottom.

Based on the information provided to us this project involves exterior piers which underpin the exterior wall areas location provided by Foundation Services Inc. As determined by these parameters the project will require helical piers designed for a working load of 20.0 kips with a safety factor of 2 being applied. The uniform wall load to be resisted by the piles is 1.3 klf.

No soils information has been provided for review at this site but the upper soil stratum at this site is assumed to be firm in accordance with the Florida Building Code (FBC) (N-value > 4). No lateral loading from the existing wall or foundation were provided. This design assumes homogeneous soil conditions & proper alignment of the drive motor to the shaft. This design does not assume obstruction-laden soils which may cause impact loading. If differing soil conditions are encountered, contact engineer immediately for evaluation before proceeding.

The underpinning piles for this project are defined as laterally unbraced per the FBC. Per section 1808.2.9.2 of the FBC, "Piers standing unbraced, in air, water or fluid soils shall be designed as columns in accordance with the provisions of this code. Such piles driven into firm soils can be considered fixed and laterally supported at 5 feet below the ground surface and in soft material at 10 feet below the ground surface unless otherwise prescribed by the building official after a foundation investigation by an approved agency". Based on the information provided, the piles

were analyzed for an unbraced length of five (5'-0) feet and the ultimate capacity of the selected Model TAB 288L-UB bracket is 40.0 kips. The tables have been attached for your review.

There are two different methods for calculating the capacities for helical piles based on soil strength, Torque Correlation Method and the Individual Bearing Method. The Torque Correlation Method is an empirical method that distinguishes the relationship between helical pile capacity and installation torque and has been widely used since the 1960's.The process of a helical plate shearing through the soil in a circular motion is equivalent to a plate penetrometer test. The International Code Council Evaluation Service (ICC-ES) adopted the Torque Correlation Method in their Acceptance Criteria for Helical Foundation Systems (AC358) as well as the 2009 International Building Code (IBC). The equation for the Torque Correlation Method is shown below (Equation 1.0). The K_t factor is a function of the diameter or geometry of the central anchor shaft and can range from 3 to 20.

$$P_u = K_t \times T \qquad \textbf{Equation 1.0}$$

where P_u = ultimate helical tension capacity
K_t = emperical torque factor
T = effective installation torque

The Individual Bearing Method uses Terzaghi's bearing equation with Meyerhof's deep foundation bearing factors. This method uses the sum of the area of the helical plates multiplied by the soil strength. Soil information is required in order to use the individual bearing method. Since there isn't any soils information available for review, the torque correlation method was used.

CONCLUSION

A 2 $^7/_8$" diameter helical pile with a twin 8"-10" helix plate configuration will be required. The pile should be attached to the structure with Earth Concept Products Model TAB-288L-UB bracket. A short section of the footing should be removed to the vertical face of the wall to allow the seat of the bracket to bear beneath the wall. If a section of the footing cannot be removed to the vertical face of the wall, the punching shear strength of the footing must be checked as it may control the capacity of the pile to support the existing wall.

The manufactures Kt factor for a 2 $^7/_8$" diameter pile is 8.5 Therefore, the pile must be installed with a minimum helical installation torque of 4,718 ft-lbs in order to provide an ultimate capacity of 40.0 kips and a working load capacity of 20.0 kips with a minimum safety factor of 2 being applied.

Based on the calculated wall loads of 1.3 klf, the piles shall be placed a maximum of 7 feet on center and require W4 x 13 x 3'-0" long spreader bars as shown on the attached pile location plan. The pile depth shall be a minimum of 20 feet below ground level regardless of the developed torque.

As previously noted, no lateral loading criteria was provided to be resisted by the pilings. Therefore, it is assumed that the lateral loading is being provided by other structural members. If the pilings are required to resist any lateral loads, please notify this office immediately with the

magnitude of the lateral loads to be resisted by the pilings as the pilings will need to be redesigned.

This design is not intended for sinkhole remediation at this project location.
The design and construction of this type of helical pier foundation is not a guarantee of resistance to foundation movement. The unwanted foundation movement or cracking may still occur. Any shallow foundation system which has clay soils beneath it, even if undercutting is performed, has some risk for differential movement. This design is not intended for sinkhole remediation at this project location.

To the best of my knowledge and belief, this design has been performed in accord with acceptable standards of engineering principles and practice. Should conditions differ during the course of the project, the engineer should be notified immediately to properly assess the differing conditions and their impact on the design.

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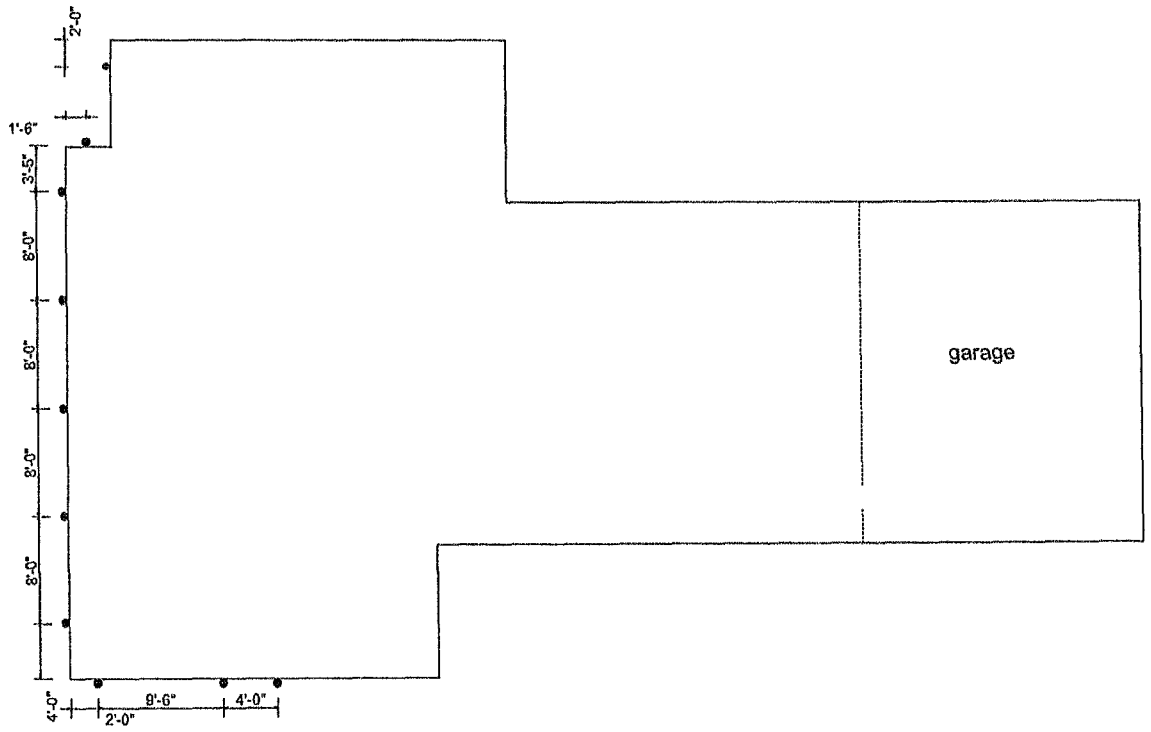
STATE CERTIFIED CONTRACTOR CB-CA59697

Customer Name: Pearce
Site Address. 347 NW Harris Lake Dr
City/State Lake City, Fl DS13-300

Building structure type: One Story wood frame & brick veneer, w/ slab on grade 9-6-13

PLAN VIEW & PIER LOCATIONS



W4 x 13 x 3' 0" LONG SPREADER BAR

FOUNDATION PIER LOCATION

DRISCOLL ENGINEERING, INC.
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STATE CERTIFIED CONTRACTOR CB-CA59697

Customer Name: Pearce
Site Address: 347 NW Harris Lake Dr
City/State: Lake City, Fl DS13-300
Building structure type One Story wood frame & brick veneer, w/ slab on grade 9-6-13

PIER LOADS

FOUNDATION PIER NUMBER	TOTAL LOAD
P-1 - P-10	10.1 KIPS

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Michael E. Driscoll P.E.
Fl Reg #43922

Pearce

DS13-300
Single Story
wood frame &
brick veneer

347 NW Harris Lake Drive
Lake City, Fl

Performance criteria based upon: Earth Contact Products Foundation Repair ECP Helical Torque Anchors ™

TAB-288L-UB Utility Bracket System w/ 2-7/8" X 0.203" wall tubular shaft

Lead configuration shall be TAF-288L-60 (8-10) or TAF-288L-84 (8-10)

Gravity Loads (lbs/ft):

Footing	250 plf
Stem Wall	83 plf
Slab	150 plf
1st Floor	0 plf
1st Floor Exterior Wall	390 plf
2nd Floor DL	0 plf
2nd Floor Exterior Wall	0 plf
2nd Floor Live Load	0 plf
Roof & Ceiling (DL)	100 plf
2nd Floor Deck (DL)	0 plf
2nd Floor Deck (LL)	0 plf
Roof Live Load (LL)	160 plf
Perm. Soil Load	124 plf
Working Load (Pw)	1,257 plf - - - (Subtotal)
Temporary Soil Load:	0
Lifting Load (PL):	1,257 plf - - - (TOTAL)

where:

P u = Ultimate Capacity of Torque Anchor	40,000 lbs
P L = Estimated Lifting Load	1,257 plf
X = Torque Anchor Spacing	8.0 ft

Torque Anchor Spacing based upon foundation strength

from Figure 6 on page 65

Footing Height:	10
P L =	1,257 plf
Torque Anchor Spacing:	8 ft

Allowable load per Torque Anchor
based upon foundation strength:
P L x tabular Torque Anchor Spacing
= 10,056 lbs

Helical Installation Torque (T):
T = P u / K where:

T = Pile Installation Torque (ft-lbs) 4,706 ft-lbs
(averaged over the final 3 to 5 ft)
P u = Ultimate Capacity of Torque
Anchor (lbs) 40,000 lbs
K = Empirical Torque Factor (1/ft) 8.5 (1/ft)

To select proper torque and pressure see Table 14 on page 39 (attached)
For PENGO Motor Model # LWS6K5
SELECT: 4,718 ft-lbs
which corresponds to a differential
pressure of: 1,800 psi

All Helical Torque Anchor installation shall be in strict accordance with manufacturer's requirements

Contact Engineer Immediately if project soil condiftions or equipment specifications differ from that shown above

Target Depth: from 20 ft to 25 ft

DRISCOLL ENGINEERING, INC.
CONSULTING ENGINEERS
P.O. Box 357577 EB 8690
GAINESVILLE, FL. 32635-7577 Ph#(352) 331-1513

Torque Anchors™ are usually installed with a hydraulic motor and reduction gear combination. Some motors offer a two speed gear box where the installer can rapidly advance the Torque Anchor™ through the upper portion of the soil. Once approximately 75% of the design installation torque is achieved, the rotational speed is then reduced to between 5 and 10 rpm until the final torque is achieved for the required embedment distance

When determining the installation torque from hydraulic pressures, it is imperative that the motor outlet pressure be subtracted from the motor inlet pressure prior to referring to any tables or charts that convert differential motor pressure to output shaft torque.

Table 13. Motor Differential Pressure to Shaft Output Torque

DIFFERENTIAL PRESSURE* $P_{IN} - P_{OUT}$ (psi)	Pengo Motor Model Number					Eskridge Model Number		
	LWS-6K5 6,500 ft-lb	MD8K-S 8,500 ft-lb	MDS-12K 12,000 ft-lb	MDT-20K 20,000 ft-lb 2 Speed		B26-16:1 4,500 ft-lb	D5016-21F54 5,000 ft-lb	77BA 12,000 ft-lb
	Single Speed			High Speed	Low Speed	Single Speed		
1,000	2,621	3,401	5,130	3,724	7,448	1,500	1,600	4,500
1,100	2,883	3,741	5,643	4,096	8,192	1,650	1,875	5,300
1,200	3,228	4,081	6,156	4,469	8,937	1,800	2,050	5,750
1,300	3,407	4,421	6,669	4,841	9,682	1,950	2,220	6,300
1,400	3,669	4,761	7,182	5,214	10,427	2,100	2,395	7,100
1,500	3,931	5,101	7,695	5,586	11,171	2,250	2,550	7,500
1,600	4,193	5,441	8,208	5,958	11,916	2,400	2,735	8,200
1,700	4,455	5,781	8,721	6,331	12,661	2,550	2,900	8,700
1,800	4,718	6,121	9,234	6,703	13,406	2,700	3,075	9,500
1,900	4,980	6,461	9,747	7,075	14,151	2,850	3,250	9,800
2,000	5,242	6,802	10 260	7,448	14 896	3,000	3,425	10,900
2,100	5,504	7,142	10,773	7,820	15,641	3,150	3,590	11,000
2,200	5,766	7,482	11,286	8,192	16,386	3,300	3,760	11,400
2,300	6,028	7,822	11,799	8,565	17,130	3,450	3,930	12,200
2,400	6,290	8,162	12,312	8,937	17 875	3,600	4,100	12,700
2,500	6,552	8,502		9,310	18,619	3,750	4,275	
2,600				9 682	19,364	3,900	4,450	
2,700				10,054	20,109	4,050	4,620	
2,800						4,200	4,790	
2,900						4,350	4,960	
3,000						4,500		

* IMPORTANT:

IT IS IMPERATIVE THAT THE MOTOR OUTLET PRESSURE BE SUBTRACTED FROM THE INLET PRESSURE PRIOR TO REFERRING TO THIS TABLE. Failure to subtract the "back pressure" will result in over estimating the output torque and could lead to insufficient installed capacity of the Torque Anchor™.

2-7/8" Dia. x 0.262 Wall Tubular Shaft Torque Anchors™

ECP Torque Anchor™ Leads

Plate Configuration	Part Number		
	60"	84"	120"
10' Dia	TAH-288-60 (10)	TAH-288-84 (10)	TAH-288-120 (10)
	HTAH-288-60 (10)	HTAH-288-84 (10)	HTAH-288-120 (10)
12" Dia	TAH-288-60 (12)	TAH-288-84 (12)	TAH-288-120 (12)
	HTAH-288-60 (12)	HTAH-288-84 (12)	HTAH-288-120 (12)
14" Dia	TAH-288-60 (14)	TAH-288-84 (14)	TAH-288-120 (14)
	HTAH-288-60 (14)	HTAH-288-84 (14)	HTAH-288-120 (14)
6" & 8" Dia	TAF-288-60 (6, 8)	TAF-288-60 (6, 8)	TAF-288-120 (6, 8)
	HTAF-288-60 (6 8)	HTAF-288-60 (6, 8)	HTAF-288-120 (6, 8)
8" & 10 Dia	**TAF-288-60 (8, 10)**	TAF-288-60 (8, 10)	TAF-288-120 (8, 10)
	HTAF-288-60 (8, 10)	HTAF-288-60 (8, 10)	HTAF-288-120 (8, 10)
8" & 12" Dia	TAF-288-60 (8, 12)	TAF-288-60 (8, 12)	TAF-288-120 (8, 12)
	HTAF-288-60 (8, 12)	HTAF-288-60 (8, 12)	HTAF-288-120 (8, 12)
10 & 12" Dia	**TAF-288-60 (10, 12)**	TAF-288-84 (10, 12)	TAF-288-120 (10, 12)
	HTAF-288-60 (10, 12)	HTAF-288-84 (10, 12)	HTAF-288-120 (10, 12)
12" & 14" Dia	**TAF-288-60 (12, 14)**	TAF-288-84 (12, 14)	TAF-288-120 (12, 14)
	HTAF-288-60 (12, 14)	HTAF-288-84 (12, 14)	HTAF-288-120 (12, 14)
8", 10', & 12" Dia	Not Available	**TAF-288-84 (8, 10, 12)**	TAF-288-120 (8, 10, 12)
		HTAF-288-84 (8, 10, 12)	HTAF-288-120 (8, 10, 12)
10", 12 , & 14" Dia	Not Available	**TAF-288-84 (10, 12, 14)**	TAF-288-120 (10, 12, 14)
		HTAF-288-84 (10, 12, 14)	HTAF-288-120 (10, 12, 14)
14", 14", & 14" Dia	Not Available	Not Available	TAF-288-120 (14, 14, 14)
			HTAF-288-120 (14, 14, 14)
14", 16, & 16" Dia	Not Available	Not Available	Not Available
			HTAF-288-120 (14, 16, 16)

ECP Torque Anchor™ Extensions

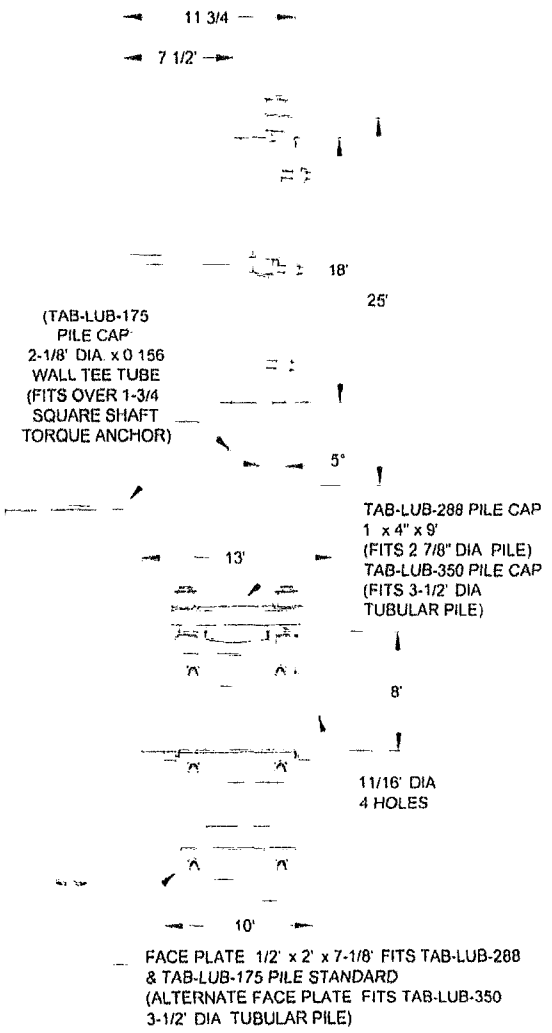
Part Number			
36	60	84	120
TAE-288-36	**TAE-288-60**	**TAE-288-84**	**TAE-288-120**

Note: Products Listed In **BOLD TYPE** Are Standard Items And Are Usually Available From Stock
Shaded Areas Indicate Product Available As Special Order – Allow Extra Time For Processing
Double Point Lead and Spiral Cut Helical Plates Are Special Orders – Indicate Which Plate(s) Require Spiral Cuts
All Helical Plates Spaced At Three Times The Diameter Of The Preceding Plate
Effective Length Of Extension Is 6" Less Than Overall Dimension Due to Coupling Overlap
All Product Hot Dip Galvanized Per ASTM A123 Grade 100

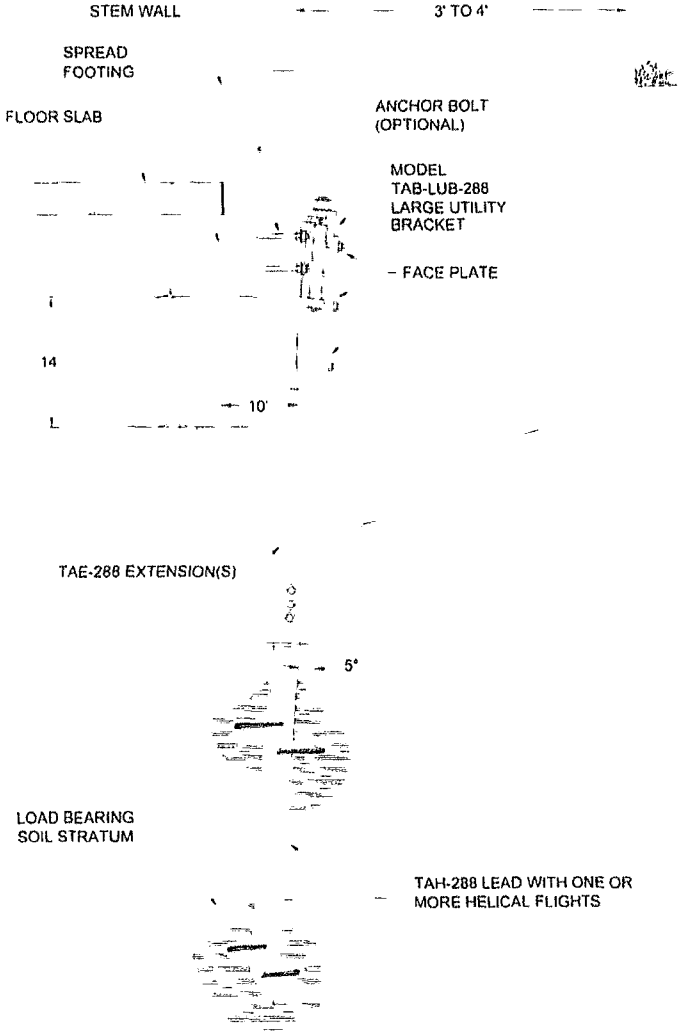
TAB-LUB Large Utility Bracket

Model TAB-LUB-288 -- Fits 2-7/8" Diameter x 0.262 Tubular – 98,000 lb. Ultimate Capacity
Model TAB-LUB-350 -- Fits 3-1/2" Diameter x 0.300 Tubular – 98,000 lb. Ultimate Capacity
Model TAB-LUB-175 -- Fits 1-3/4" Solid Square Bar – 60,000 lb. Ultimate Capacity

- **Unlimited Lift Range – 5-1/2" Standard**
- **Up to 98,000 lb. Ultimate Capacity**
- **75 Square Inches Bearing Surface**
- **Installs With Little or No Vibration**
- **Installs Below Unstable and Sinking Soil To Firm Bearing**
- **Easily Adjusted if Load or Soil Conditions Change**



Model TAB-LUB Large Utility Bracket Details



Model TAB-LUB-288 Large Utility Bracket Application Drawing

The capacity of the TAB-LUB foundation support system is a function of the capacity of torque anchor™ shaft, helical plate(s), bearing stratum, foundation bracket, foundation strength and strength of the bracket to foundation connection. Actual capacities could be lower than the bracket capacity.

PROFESSIONAL SERVICES BY
DRISCOLL ENGINEERING,INC.
PO BOX 357577,
GAINESVILLE, FL 32609
PH (352)-331-1513
CA 8690

PLANS AND SPECIFICATIONS

The plans and specifications presented herein are applicable only for the anticipated construction at the locations shown. If construction plans change, the Design Professional should be notified so the plans and specifications can be re-evaluated. The Design Professional should be given the opportunity to review final plans and specifications to see if the intent of the plans and specifications has been followed and/or if supplemental details and recommendations are needed The Design Professional warrants that the plans and specifications contained herein, have been prepared in accordance with generally accepted professional engineering practice. No other warranties are implied or expressed.

CORPORATE PROTECTION

It is understood and agreed that the Design Professional's Basic Services under this Agreement do not include project observation or review of the Contractor's performance or any other construction phase services, and that such services will be provided by the Client The Client assumes all responsibility for interpretation of the contractor Documents and for construction observation and supervision and waives any claims against the Design Professional that may be in any way connected thereto.

In addition, the Client agrees, to the fullest extent permitted by law, to indemnify and hold the Design Professional harmless from any loss, claim or cost, including reasonable attorney's fees and costs of defense, arising or resulting from the performance of such services by other person or entities and from any and all claims arising from modifications, clarifications, interpretations, adjustments or changes made to Contract Documents to reflect changed field or other conditions, except for claims arising from the sole negligence or willful misconduct to the Design Professional.

OWNERSHIP OF INSTRUMENTS OF SERVICE

All reports, plans, specifications, computer files, field data, notes and other documents and instruments prepared by the Design Professional as instruments of service shall remain the property of the Design Professional The Design Professional shall retain all common law, statutory and other reserved rights, including the copyright thereto

DEFECTS IN SERVICE

The Client shall promptly report to the Design Professional any defects or suspected defects in the Design Professional's work or services of which the Client becomes aware, so that the Design Professional may take measures to minimize the consequences of such a defect The Client warrants that he or she will impose a similar notification requirement on all contractors in his or her Client/Contractor contract and shall require all subcontractors at any level to contain a like requirement. Failure by the Client, and the Client's contractors or subcontractors to notify the Design Professional, shall relieve the Design Professional of the costs of remedying the defects above the sum such remedy would have cost had prompt notification been given

VERIFICATION OF EXISTING CONDITIONS

Inasmuch as the remodeling and/or rehabilitation of an existing building requires that certain assumptions be made regarding existing conditions, and because some of these assumptions may not be verifiable without expending additional sums of money or destroying otherwise adequate or serviceable portions of the building, the Client agrees, to the fullest extent permitted by law, to indemnify and hold the Design Professional harmless from any claim, liability or cost (including reasonable attorney's fees and costs of defense) for injury or economic loss arising or allegedly arising out of the professional services provided under this Agreement, excepting only those damages, liabilities, or costs attributable to the sole negligence or willful misconduct of the Design Professional.