



# COAST POST-TENSIONED SYSTEMS

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## TRANSMITTAL LETTER

Date: 1/19/2009

To: Dammon Engineering  
1095 Florida Ave.  
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Attn: Chuck Dammon  
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From: Jeremy DeVille  
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### We are sending you the following:

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### Description:

1	Post-tension calculations for Bldg 2440

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**CALCULATION COVERSHEET**

**Job#** 09-0020  
**Contractor/Builder:** Broadmoor Construction  
**Owner:** NAVFAC  
**Lot #, Subdivision:** SOF Riverine & Combatant Craft Operations Facility  
**Address:** Bldg. 2440  
**Parish:** Hancock  
**City, State** Stennis Space Center, Mississippi

Attached is an analysis of a post-tensioned slab (PT Slab). The slab is analyzed using GTK software titled "PTI Slab" which follows the Post-Tensioning Institute's "Design and Construction of Post-Tensioned Slabs-On-Ground." A sketch of the design rectangles may be attached for clarity.

For Simplicity of Calculations a Design Rectangle Composed of the Largest Dimensions of all Design Rectangles May be Chosen for Analysis.

The following page may contain a sketch of the design rectangle(s). Following the sketch is a printout of the analysis using PTI Slab software. PTI Slab checks the bearing pressure the slab exerts on the subgrade, the compressive prestress in the concrete slab, moments, shears and reflections.

NOTE: PTI slab checks bearing with benefit of the beams only. ACI (American Concrete Institute) common practice allows the use of "T-Beam" action of the slab. "T-Beam" action increases the bearing surface of the slab by approximately 500%. Therefore, if the bearing pressure is not exceeded by more than 500% as stated by the PTI Slab software, the bearing capacity of the slab/soil interface is satisfied.

# PTISlab 2.06

Geostructural Tool Kit, Inc.

Registered To : Coast Concrete Services

Serial Number : 100-200-459

Project Title : Broadmoor, Bldg 2440, SOF Riverine & Combatant Craft Operations @ Stennis Space Center  
Project Engineer : Dammon Engineering, Inc.

Project Number : CCS #09-0020

Project Date : 12/11/2008

Geotechnical Report : N/A

Report Date : N/A

Report Number : N/A

## DESIGN SUMMARY

Slab Dimensions : 58.00 FT x 148.00 FT x 5.00 Inches

Jacking Force : 33.05 KIPS

### Material Properties

Concrete Strength,  $f'_c$  : 4,000 PSI

Tendon Strength,  $F_{pu}$  : 270 KSI

Tendon Diameter : 1 / 2 Inch

### Material Quantities

Concrete Volume : 207.6 Cubic Yards

Prestressing Tendon : 6,030 Linear Feet

Number of End Anchorages : 138

### In the LONG direction ...

	<u>Type I Beam</u>	<u>Type II Beam</u>
Quantity of Beams :	4	0
Depth of Beams :	24.0 Inches	0.0 Inches
Width of Beams :	16.0 Inches	0.0 Inches
Tendons per Beam :	1	0
Cover below Beam Tendon :	3.0 Inches	0.0 Inches

Beam Spacing : 19.33 Feet O.C.

Number of Slab Tendons : 17

Slab Tendon Spacing : 3.50 Feet O.C.

Slab Tendon Cover : 2.25 Inches from top of slab

### In the SHORT direction ...

	<u>Type I Beam</u>	<u>Type II Beam</u>
Quantity of Beams :	7	0
Depth of Beams :	24.0 Inches	0.0 Inches
Width of Beams :	16.0 Inches	0.0 Inches
Tendons per Beam :	1	0
Cover below Beam Tendon :	3.0 Inches	0.0 Inches

Beam Spacing : 24.67 Feet O.C.

Number of Slab Tendons : 41

Slab Tendon Spacing : 3.65 Feet O.C.

Slab Tendon Cover : 2.25 Inches from top of slab

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Geostructural Tool Kit, Inc.

Registered To : Coastal Concrete Services

Serial Number : 100-200-439

Project Title : Broadmoor, Bldg 2440, SOF Riverine & Combatant Craft Operations @ Stennis Space Center  
Project Engineer : Dammon Engineering, Inc.

Project Number : CCS #09-0020

Project Date : 12/11/2008

Geotechnical Report : N/A

Report Date : N/A

Report Number : N/A

**DESIGN COMPLIANCE SUMMARY**

**These Values Exceed Allowable Limits by the Percentage Indicated:**

**SOIL BEARING :**

**SOIL BEARING: 1.3%**

**COMPRESSIBLE SOIL MODE :**

**ALL VALUES WITHIN ALLOWABLE LIMITS.**

**LINE LOAD ANALYSIS :**

**ALL VALUES WITHIN ALLOWABLE LIMITS.**

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Report Date : N/A  
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**RESULTS OF SLAB ANALYSIS**

**Soil Bearing Analysis**

Applied Pressure on Soil 2,026 PSF  
 Soil Pressure Safety Factor 0.99

**Prestress Summary**

Subgrade Friction calculated by method prescribed in PTI Manual

	<u>Short Direction</u>	<u>Long Direction</u>
Minimum Effective Prestress (PSI)	88	54
Mid-Slab Effective Prestress (PSI)	88	54
Beta Distance Effective Prestress	104	110
Eccentricity of Prestressing	-0.34	-0.37
Number of Slab Tendons	41	17
Number of Beam Tendons	7	4

**Moment Analysis - Compressible Soils Mode**

Maximum Moment, Short Direction 1.56 Ft-K/Ft  
 Maximum Moment, Long Direction 1.45 Ft-K/Ft

**Banding Stresses (KSI)**

	<u>Tension in Bottom Fiber Short Direction</u>	<u>Long Direction</u>		<u>Compression in Top Fiber Short Direction</u>	<u>Long Direction</u>
Allowable Stress	-0.379	-0.379	Allowable Stress	1.800	1.800
Actual Stress	-0.027	0.026	Actual Stress	0.144	0.139

**Differential Deflection Analysis - Compressible Soils Mode**

Based on an Allowable Deflection of L / 960

	<u>Short Direction</u>	<u>Long Direction</u>
Allowable Differential Deflections (Inches)	0.51	0.56
Actual Differential Deflections (Inches)	0.12	0.12

**Shear Stress Analysis - Compressible Soils Mode**

	<u>Short Direction</u>	<u>Long Direction</u>
Allowable Shear Stress (PSI)	125	118
Actual Shear Stress (PSI)	32	23

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 Report Number : N/A

**RECAP OF SELECTED VARIABLES**

	Short Direction	Long Direction
Cross Sectional Area of Foundation (Inches <sup>2</sup> )	11,008.00	4,696.00
Moment of Inertia (Inches <sup>4</sup> )	329,711.75	173,593.24
Section Modulus, Top (Inches <sup>3</sup> )	68,408.23	30,958.30
Section Modulus, Bottom (Inches <sup>3</sup> )	17,190.19	9,438.17
Center of Gravity of Concrete-from top (Inches)	4.82	5.61
Center of Gravity of Prestressing Tendons-from top (Inches)	5.16	5.98
Eccentricity of Prestress (Inches)	-0.34	-0.37
Beta Distances (Relative Stiffness Lengths) (Feet)	6.80	7.44
Effective Prestress Force at Beta (KIPS)	1,206.44	528.42
Effective Prestress at Beta (PSI)	109.60	112.53

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 Geotechnical Report : N/A      Report Date : N/A  
 Report Number : N/A

**SUMMARY OF INPUT DATA**

**Material Properties**

Material Label :	Concrete
Concrete Strength, $f'_c$ :	4,000.0 PSI
Concrete Creep Modulus, $E_c$ :	1,500,000.0 PSI
Concrete Unit Weight :	145.0 PCF
Tendon Strength, $F_{pu}$ :	270.0 KSI
Tendon Diameter :	1 / 2 Inch

**Slab Properties**

Rectangle Label :	R1									
Rectangle Geometry :	58.00 FT x 148.00 FT x 5.00 Inches									
	<table border="0"> <tr> <td></td> <td align="center"><u>Short Direction</u></td> <td align="center"><u>Long Direction</u></td> </tr> <tr> <td>Number of Slab Tendons :</td> <td align="center">41</td> <td align="center">17</td> </tr> <tr> <td>Slab Tendon Cover :</td> <td align="center">2.25 Inches</td> <td align="center">2.25 Inches</td> </tr> </table>		<u>Short Direction</u>	<u>Long Direction</u>	Number of Slab Tendons :	41	17	Slab Tendon Cover :	2.25 Inches	2.25 Inches
	<u>Short Direction</u>	<u>Long Direction</u>								
Number of Slab Tendons :	41	17								
Slab Tendon Cover :	2.25 Inches	2.25 Inches								

**Beam Properties**

	Short Direction		Long Direction		
	Type I	Type II	Type I	Type II	
Quantity :	7	0	4	0	
Depth :	24.0	0.0	24.0	0.0	Inches
Width :	16.0	0.0	16.0	0.0	Inches
Tendons :	1	0	1	0	
Cover :	3.0	0.0	3.0	0.0	Inches

Average beam spacing used in analysis

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Geostructural Tool Kit, Inc.

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Serial Number : 100-200-450

Project Title : Broadmoor, Bldg 2440, SOF Riverine & Combatant Craft Operations @ Stennis Space Center  
Project Engineer : Dammon Engineering, Inc.      Project Number : CCS #09-0020  
Project Date : 12/11/2008  
Geotechnical Report : N/A      Report Date : N/A  
Report Number : N/A

**SUMMARY OF INPUT DATA - Continued**

**Soil Properties**

Soil Label :	CL
Allowable Bearing Pressure :	2,000.0 PSF
Expected Settlement	1.000 Inches
Subgrade Friction Coefficient, $\mu$ :	0.75
Soil Modulus of Elasticity, $E_s$ :	1,000.0 PSI

**Load, Deflection and Subgrade Properties**

**Slab Loading**

Uniform Superimposed Load :	150.00 PSF
Total Perimeter Load (Live + Dead) :	1,200.00 PLF

**Allowable Deflection Limits**

Compressible Soils :	L /960
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**Prestress Calculation**

Subgrade Friction calculated by method prescribed in PTI Manual

Prestress Loss :	15.0 KSI
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Project Engineer : Dammon Engineering, Inc.

Project Number : CCS #09-0020

Project Date : 12/11/2008

Geotechnical Report : N/A

Report Date : N/A

Report Number : N/A

**Line Load Analysis**

**Summary of Input Data**

Line Load :	800.0 lb/ft
Direction Of Line Load :	Parallel to Long Direction
Prestress at Line Load :	Minimum Effective Prestress
Soil Modulus, $K_S$ :	40 PCI
Slab Thickness :	5.00 Inch
Concrete Creep Modulus, $E_C$ :	1,500,000.0 PSI

**Summary of Line Load Analysis**

Applied Moment : 0.88 Ft-K/Ft

**Bending Stresses (KSI)**

	<u>Tension in Extreme Fiber</u>	<u>Compression in Extreme Fiber</u>
Allowable Stress :	-0.379	1.800
Applied Stress :	-0.124	0.301
Prestress at Line Load :		88.4 PSI