Twist, Plumb and Tension

Software by GTs



In Association With



**Introduces** 

**TPT Contractor**©



Twist, Plumb and Tension

Software by GTs

### **Software**

for Contractors with



## **TENSIONMETERS**



Twist, Plumb and Tension

Software by GTs

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(Click on • to go to each section.)

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## **Capabilities**



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## **Capabilities**

### TPT Contractor<sup>©</sup> will handle:

- 12 levels of guys, with or without torque arms
- 3 rings of guy foundations at different elevations and distances from the tower
- 22 different cable sizes and types
- Twist and Plumb Measurements by either Angular or % of Leg Measurement Methods
- Twist and Plumb Report in accordance with TIA-222
- Recommended dial reading for Tension Measurements based on tower geometry and temperature at time of measurement

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## **Capabilities**

### **TPT Contractor**<sup>©</sup> provides:

- Field Calibration Verification Check and Test Certificate
- Screen Shots with all tension data for each cable on the tower
- Tension Report in accordance with TIA-222
- Plan View at each guy level with cable tensions, twist & plumb measurements to assist field crew to better understand how to adjust the tower to correct out-of-tolerance measurements
- Preliminary Measurements Mode, Final Measurements Mode, and Inspector Mode
- Form for tension measurements without tower data



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## **Setup and Use**



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### **Setup and Use**

The goal of **TPT Contractor**<sup>©</sup> is to increase the accuracy of the **Twist, Plumb** and **Tension** work being performed by Tower **Contractor**s working on Guyed Towers. Each copy of the software contains the calibration data specific to the **Penn-Tech Tensionmeter** being used.

The following slides are designed to assist contractors in the initial setup of the software and to help them get the most out of the software with the minimum of effort.



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Software by

## **Setup and Use**

The software runs inside of Microsoft Excel. It is designed to run in versions 2007 and later. It will not operate properly in earlier versions of Excel.

The software will be provided on a USB Jump Drive. We suggest you make a copy onto any computers that might be used with the program. Each copy of the program is calibrated for one Penn-Tech Tensionmeter. The file name represents the Tensionmeter serial number and Calibration Date. For example, if the serial no. is TM 1000-012, calibrated on 1/05/2014, the file name will be TPT Contractor 1000-012 - 01052014.xlsm.

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## **Setup and Use**

We suggest you keep an original copy of the software on each computer using the software. Then make a copy of the software into a project file before starting work on a new tower. If multiple towers are in one project then either make a folder for each tower or multiple copies of the software, renaming each as the name or number for the tower. This will help keep your files organized and prevent you from having to clear the data from a previous project when starting a new project.



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## **Setup and Use**

Double-click on the file name to start the program. The first time the program starts there may be up to 2 different Security Warnings. You must enable each of these for the program to run correctly.

The program is now ready to use.

The program should start at the Dashboard.



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### The Dashboard



Twist, Plumb and Tension

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TPT CONTRACTOR® Twist, Plumb and Tension Software by GTS
DASHBOARD  Preliminary Measurements Selected
Tower Setup Form Field Calibration
MEASUREMENT OR INSPECTION SELECTION
Preliminary Measurements Inspector Mode
TWIST AND PLUMB METHOD
Twist & Plumb Angle Form Twist & Plumb % Leg Form
TENSION FORM SELECTION
Tension Data Form Measured Tensions Form
LEVEL PLANS SELECTIONS
Levels 1-4 Plan Views Levels 5-8 Plan Views Levels 9-12 Plan Views
REPORTS SELECTIONS
Reports Cover Page Twist & Plumb Report Tension Report
FIELD SHEETS SELECTIONS
P & T Field Sheet - Angle P & T Field Sheet - % Leg Tension Field Sheet
Version 2.0.0 - Registered to Penn-Tech International, Inc Penn-Tech TM 1000-63
License Days Remaining 170

### The Dashboard

The dashboard, shown to the left, has been designed to simplify navigation around the program. It is divided into 7 sections. These are Tower Setup; Preliminary or Final Measurement or Inspection; Twist & Plumb Method Forms; Tension Forms; Level Plans; Report Pages; and Field Sheets.



Twist, Plumb and Tension

Software by GTs

TPT CONTRACTOR® Twist, Plumb and Tension Software by GTS
DASHBOARD  Preliminary Measurements Selected
Tower Setup Form Field Calibration
MEASUREMENT OR INSPECTION SELECTION
Preliminary Measurements Inspector Mode
TWIST AND PLUMB METHOD
Twist & Plumb Angle Form Twist & Plumb % Leg Form
TENSION FORM SELECTION
Tension Data Form Measured Tensions Form
LEVEL PLANS SELECTIONS
Levels 1-4 Plan Views Levels 5-8 Plan Views Levels 9-12 Plan Views
REPORTS SELECTIONS
Reports Cover Page Twist & Plumb Report Tension Report
FIELD SHEETS SELECTIONS
P & T Field Sheet - Angle P & T Field Sheet - % Leg Tension Field Sheet
Version 2.0.0 - Registered to Penn-Tech International, Inc Penn-Tech TM 1000-63
License Days Remaining 170

### The Dashboard

Each of the 18 buttons on the Dashboard takes you to a specific form in the program. Every form also has one or more conveniently located buttons for returning to the Dashboard.

We will use the program with an example tower.



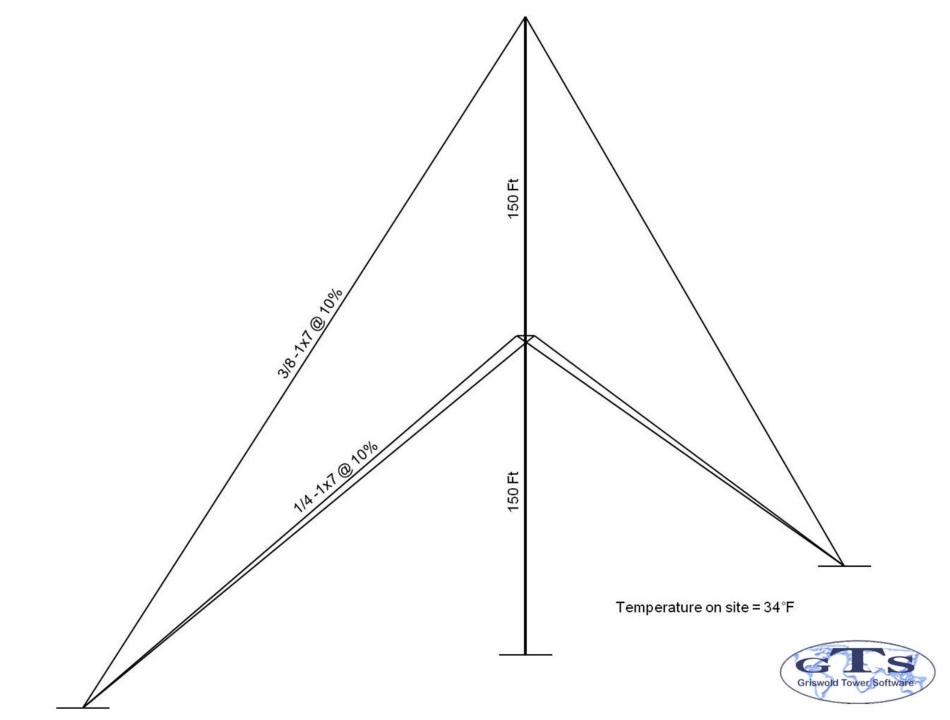
Twist, Plumb and Tension

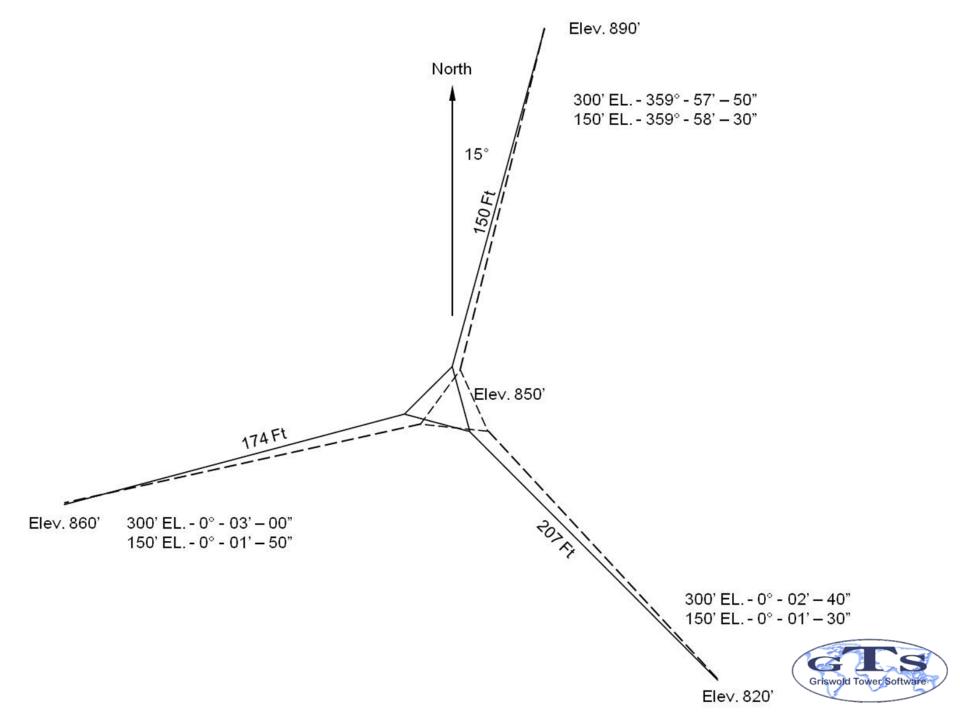
Software by GTs

## **Example Tower**

The sample tower at the right is 300 feet tall with 2 levels of guys. The next 2 slides provide better views of the elevation and plan of the tower. The face width is 30 inches with torque arms at 150 feet.

Temperature on site = 34°F





Twist, Plumb and Tension

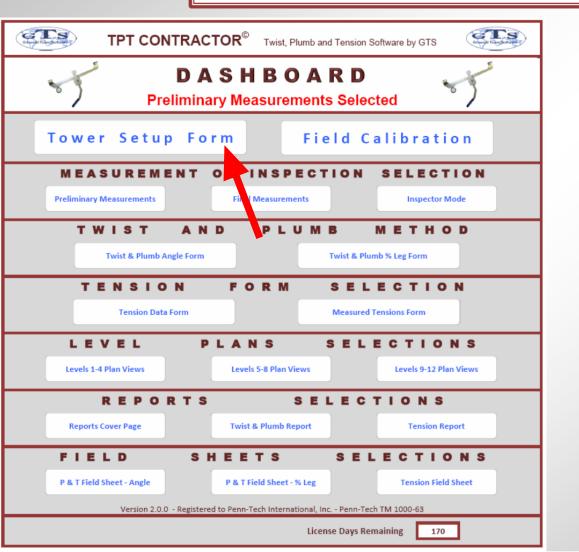
Software by GTs

## **Tower Setup Form**



Twist, Plumb and Tension

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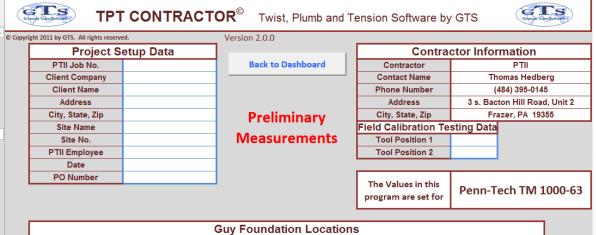
### The Dashboard

Press the "Tower Setup Form" button.



Twist, Plumb and Tension

Software by GTs



Guy Foundation Locations											
		Distan	stance to Anchor - Feet Elevation of Anch			chor	Structure Height (Feet)				
Leg	Azimuth	Ring 1	Ring 2	Ring 3	Ring 1	Ring 2	Ring 3	Base Elevation			
Α											
В											

	Tower Face Data and Cable Information									
	Level Number	Face Width (Inches)	Attachment Elev. (Ft)	Guy Ring 1, 2 or 3	Torque Arm Y or N	Cable Size	Specified % Tension	No. of Wires	Dia (Inches)	Area (In²)
	12					No Cable		0	0.0000	0.000
	11					No Cable		0	0.0000	0.000
w	10					No Cable		0	0.0000	0.000
Elevations	9					No Cable		0	0.0000	0.000
Ιĕ	8					No Cable		0	0.0000	0.000
S	7					No Cable		0	0.0000	0.000
l iii	6					No Cable		0	0.0000	0.000
	5					No Cable		0	0.0000	0.000
Guy	4					No Cable		0	0.0000	0.000
	3					No Cable		0	0.0000	0.000
	2					No Cable		0	0.0000	0.000
	1					No Cable		0	0.0000	0.000

## **Example Tower**

The screen to the left shows what you see when you go to the "Tower Setup Form".





1

### TPT CONTRACTOR®

Twist, Plumb and Tension Software by GTS



	Project Setup Data							
П	PTII Job No.							
	Client Company							
	Client Name							
	Address							
	City, State, Zip							
	Site Name							
	Site No.							
	PTII Employee							
	Date							
	PO Number							

Version 2.0.0

**Back to Dashboard** 

**Preliminary** Measurements

Contrac	ctor information
Contractor	PTII
Contact Name	Thomas Hedberg
Phone Number	(484) 395-0145
Address	3 s. Bacton Hill Road, Unit 2
City, State, Zip	Frazer, PA 19355
Field Calibration Te	sting Data

Contractor Information

The Values in this program are set for

**Tool Position 1 Tool Position 2** 

Penn-Tech TM 1000-63

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Area

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0.000

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				Guy Foundation Locations											
		Distance to Anchor - Feet			Elevation of Anchor			Structure Height (Feet)							
Leg	Azimuth	Ring 1	Ring 2	Ring 3	Ring 1	Ring 2	Ring 3	Base Elevation							
Α															
В															
С															

		Distance to Anchor - Leet			Lievation of Anchor			of Structure neight (Feet)		
Leg	Azimuth	Ring 1	Ring 2	Ring 3	Ring 1	Ring 2	Ring 3	Base Elevation		
Α										
В										
С										
	·		To	wer Face	Data an	d Cable	Informat	ion	·	

No Cable

				To	wer Face	Data and Cable Informati	ion	
	Level Number	Face Width (Inches)	Attachment Elev. (Ft)	Guy Ring 1, 2 or 3	Torque Arm Y or N	Cable Size	Specified % Tension	No. Wir
	12					No Cable		0
	11					No Cable		0
ဟ	10					No Cable		0
evations	9					No Cable		0
ı ţi	8					No Cable		0
No.	7					No Cable		0
E	6					No Cable		0
	5					No Cable		0
Guy	4					No Cable		0
	3					No Cable		0
	2					No Cable		0





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TPT CONTRACTOR® Twist, Plumb and Tension Software by GTS © Copyright 2011 by GTS. All rights reserved. Version 2.0.0 **Contractor Information Project Setup Data Back to Dashboard** 2017-70123 PTII Job No. PTII Contractor **Client Company** Joe's Towers Thomas Hedberg **Contact Name Client Name** Tim Smith Phone Number (484) 395-0145 3 s. Bacton Hill Road, Unit 2 Address 123 Rock Lane Address First input the Nowhere, NV 56567 Frazer, PA 19355 City, State, Zip City, State, Zip **Project Setup Data** Field Calibration Testing Data Site Name Midland Site No. 334-GT WICOSUI CITICITES **Tool Position 1 Daniel Boone Tool Position 2** PTII Employee Date 2/17/2017 **PO Number** JT-334-GT-2017 The Values in this Penn-Tech TM 1000-63 program are set for

Constitution I continue											
Guy Foundation Locations											
		Distance to Anchor - Feet			Elevation of Anchor			Structure Height (Feet)			
Leg	Azimuth	Ring 1	Ring 2	Ring 3	Ring 1	Ring 2	Ring 3	Base Elevation			
Α											
В											
С											

Azimuth	Ring 1	Ring 2	Ring 3	Ring 1	Ring 2	Ring 3	Base Elevation	

		Tower Face Data and Cable Information									
	Level Number	Face Width (Inches)	Attachment Elev. (Ft)	Guy Ring 1, 2 or 3	Torque Arm Y or N	Cable Size	Specified % Tension	No. of Wires	Dia (Inches)	Area (In²)	
	12					No Cable		0	0.0000	0.000	
	11					No Cable		0	0.0000	0.000	
ဋ	10					No Cable		0	0.0000	0.000	
Ü	9					No Cable		0	0.0000	0.000	
atic	8					No Cable		0	0.0000	0.000	
8	7					No Cable		0	0.0000	0.000	

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Project Setup Data								
PTII Job No.	2017-70123							
Client Company	Joe's Towers							
Client Name	Tim Smith							
Address	123 Rock Lane							
City, State, Zip	Nowhere, NV 56567							
Site Name	Midland							
Site No.	334-GT							
PTII Employee	Daniel Boone							
Date	2/17/2017							
PO Number	JT-334-GT-2017							

Version 2.0.0

**Back to Dashboard** 

### **Preliminary** Measurements

Contractor information						
Contractor	PTII					
Contact Name	Thomas Hedberg					
Phone Number	(484) 395-0145					
Address	3 s. Bacton Hill Road, Unit 2					
City, State, Zip	Frazer, PA 19355					
Field Calibration Testing Data						

Contractor Information

The Values in this program are set for

**Tool Position 1 Tool Position 2** 

			Distance to Ancho
Leg	Azimuth	Rii	Next input the
Α	15		Guy Foundati
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С	255		Don't use any
			such as the de
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Guy Foundation Locations									
		Dieta	nce to Ancho	r - Foot	Floyation of An	chor Structure Height (Fee			
Leg	Azimuth	Rii Ne	xt input the	e 3 Azimutl	hs of the Guys and	Ring 3	Base El	evation	
Α	15	Gu	v Foundatio	ons. Use o	nly numbers.				
В	135		•		•				
С	255		Don't use any letters or special characters						
	such as the degree symbol (°).								
			To	wer Face	Data and Cable	Informat	ion		
Level	Face Width	Attachment	, , ,		Cable Size		Specified	No. of	Dia (Inches)

	Guy Foundations. Use only numbers.  Don't use any letters or special characters such as the degree symbol (°).  Tower Face Data and Cable							nformatio	on			
	Level Number	Face Width (Inches)		hment v. (Ft)	Guy Ring 1, 2 or 3	Torque Arm Y or N	Cable Size		Specified % Tension	No. of Wires	Dia (Inches)	Area (In²)
	12						No Cable			0	0.0000	0.000
	11						No Cable			0	0.0000	0.000
G	10						No Cable			0	0.0000	0.000
ü	9						No Cable			0	0.0000	0.000
ıţi	8						No Cable			0	0.0000	0.000
Elevations	7						No Cable			0	0.0000	0.000
ile i	6						No Cable			0	0.0000	0.000
	5						No Cable			0	0.0000	0.000
Guy	4						No Cable			0	0.0000	0.000
)	3						No Cable			0	0.0000	0.000
	2						No Cable			0	0.0000	0.000
	1						No Cable			0	0.0000	0.000



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@ Copyright 2011 by GTS. All rights reserved. Version 2.0.0 Contractor Information **Project Setup Data Back to Dashboard** PTII Job No. 2017-70123 PTII Contractor Joe's Towers Contact Name Client Company Thomas Hedberg Tim Smith Phone Number (484) 395-0145 Client Name Address 123 Rock Lane Address 3 s. Bacton Hill Road, Unit 2 City, State, Zip Nowhere, NV 56567 **Preliminary** City, State, Zip Frazer, PA 19355 Field Calibration Testing Data Site Name Midland Measurements Site No. 334-GT **Tool Position 1 Daniel Boone Tool Position 2** PTII Employee Date 2/17/2017 PO Number JT-334-GT-2017 The Values in this Penn-Tech TM 1000-63 program are set for **Guy Foundation Locations** Distance to Anchor - Feet Structure Height (Feet) Ring 1 Input the Distances to Each of the Guy Lea Azimuth **Base Elevation** 15 150.0 Α Fan plates. Use only numbers. Don't 135 204.0 В use any letters or special characters C 174.0 255 such as feet (') or inches ("). Tower Face Data and Cable Information Level Face Width **Guy Ring** Area Torque Arm Specified No. of Dia Attachment Cable Size Elev. (Ft) 1, 2 or 3 Y or N (In<sup>2</sup>) Number (Inches) % Tension Wires (Inches) 12 No Cable 0 0.0000 0.000 No Cable 0 0.000 11 0.0000 No Cable 10 0 0.0000 0.000 Elevations 9 No Cable 0 0.0000 0.000 8 No Cable 0.000 0.0000 7 No Cable 0 0.0000 0.000

No Cable

No Cable

No Cable

No Cable

No Cable

No Cable

6

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4

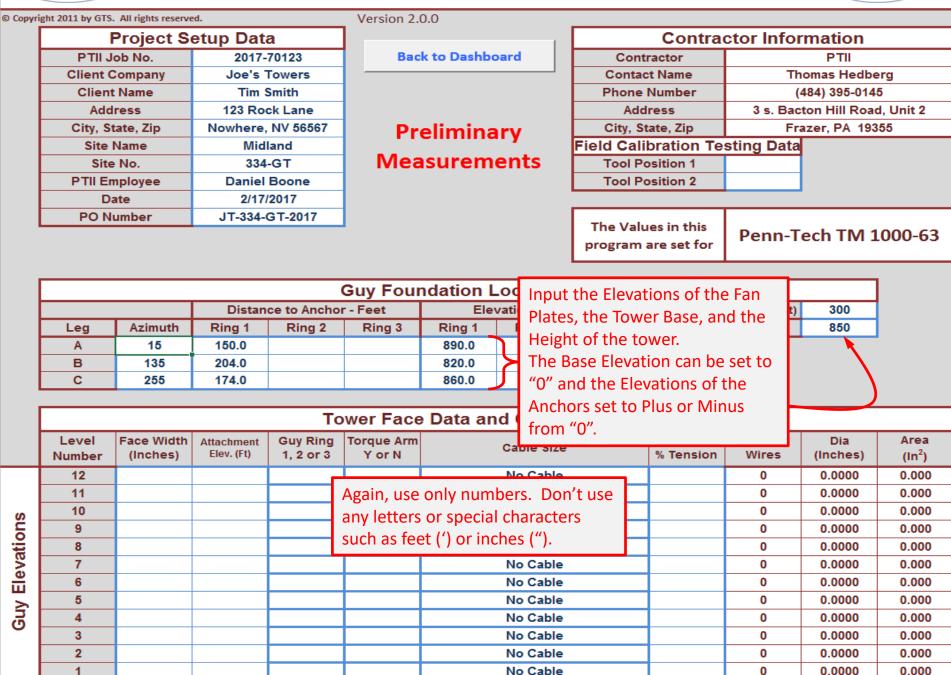
3

2



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30.0

30.0

300.00

150.00

### TPT CONTRACTOR<sup>©</sup>

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O Copyright 2011 by GTS. All rights reserved. **Project Setup Data** PTII Job No. 2017-70123 **Client Company** Joe's Towers **Client Name** Tim Smith Address 123 Rock Lane City, State, Zip Nowhere, NV 56567 Site Name Midland 334-GT Site No. **PTII Employee Daniel Boone** 2/17/2017 Date JT-334-GT-2017 PO Number

Version 2.0.0

Back to Dashboard

Preliminary Measurements

Contractor Information					
Contractor	PTII				
Contact Name	Thomas Hedberg				
Phone Number	(484) 395-0145				
Address	3 s. Bacton Hill Road, Unit 2				
City, State, Zip	Frazer, PA 19355				
Field Calibration Testing Data					

The Values in this program are set for

**Tool Position 1** 

**Tool Position 2** 

Penn-Tech TM 1000-63

from center to center of the

legs on one face.

Guy Foundation Locations									
		Distance to Anchor - Feet			Elevation of Anchor			Structure Height (Feet)	300
Leg	Azimuth	Ring 1	Ring 2	Ring 3	Ring 1	Ring 2	Ring 3	Base Elevation	850
Α	15	150.0			890.0				
В	135	204.0			820.0				
С	255	174.0			860.0				

				To	ower Face	Data and Cable Informa	ation				
	Level Number	Face Width (Inches)	Attachment Elev. (Ft)	Guy Ring 1, 2 or 3	Torque Arm Y or N	Cable Size	Specified % Tension		Dia (Inches)	Area (In²)	
	12			Г		No Coble		0	0.0000	0.000	Π
	11				Again, use	only numbers. Don't use		0	0.0000	0.000	
w	10				any letters	or special characters		0	0.0000	0.000	
Elevations	9				•	such as feet (') or inches (").		0	0.0000	0.000	
ij	8				Such as led	et ( ) of filenes ( ).		0	0.0000	0.000	
Š	7					No Cable		0	0.0000	0.000	
H	6					No Cable					1
_	5					No Cable			NOTE:		Γ
Guy	4					No Cable		The face w	idth is me	asured	
$\sim$	_										

Input the Face Width and Guy Attachment

Elevations (Height from the Base of the tower).



JT-334-GT-2017

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**PO Number** 

30.0

150.00

Project Setup Data							
PTII Job No.	2017-70123						
Client Company	Joe's Towers						
Client Name	Tim Smith						
Address	123 Rock Lane						
City, State, Zip	Nowhere, NV 56567						
Site Name	Midland						
Site No.	334-GT						
PTII Employee	Daniel Boone						
Date	2/17/2017						

Version 2.0.0

**Back to Dashboard** 

### **Preliminary** Measurements

Contractor information							
Contractor	PTII						
Contact Name	Thomas Hedberg						
Phone Number	(484) 395-0145						
Address	3 s. Bacton Hill Road, Unit 2						
City, State, Zip	Frazer, PA 19355						
Field Calibration Testing Data							

Contractor Information

The Values in this program are set for

**Tool Position 1 Tool Position 2** 

Penn-Tech TM 1000-63

0.0000

0.000

		Distance to Anchor - Feet		Elevation of Anchor			Structure Height (Feet)	300	
Leg	Azimuth	Ring 1	Ring 2	Ring 3	Ring 1	Ring 2	Ring 3	Base Elevation	850
Α	15	150.0			890.0				
В	135	204.0			820.0				
С	255	174.0			860.0				

		Distance to Anchor - Feet			Elevation of Anchor			Structure Height (Feet)	300
Leg	Azimuth	Ring 1	Ring 2	Ring 3	Ring 1	Ring 2	Ring 3	Base Elevation	850
Α	15	150.0			890.0				
В	135	204.0			820.0				
С	255	174.0			860.0				
Tower Face Data and Cable Information									

	Ü	200	1/4.0			860.0							
				To	wer F	ace Data an	nd Cable I	nformati	on				
	Level Number	Face Width (Inches)	Attachment Elev. (Ft)	Guy Ring 1, 2 or 3	Torque Y or		Cable Size		Specified % Tension	No. Wir	Dia (Inches)	Area (In²)	
	12						No Cable			0	0.0000	0.000	,
	11						No Cable			0	0.0000	0.000	
ဟ	10						No Cable			0	0.0000	0.000	,
Elevations	9						No Cable			0	0.0000	0.000	
Ĕ	8						No Cable			0	0.0000	0.000	,
N.	7						No Cable			0	0.0000	0.000	,
ᆵ	6						No Cable			0	0.0000	0.000	,
	5						No Cable			0	0.0000	0.000	,
Guy	4						No Cable			0	0.0000	0.000	,
~	3					Using the Dro	ndown But	ttons innu	it the Guy		0.0000	0.000	,
	2	30.0	300.00	1		Disas face a sale	•	•	•		0.0000	0.000	,

Ring for each of the Guy Attachment Elevations



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Project Setup Data								
PTII Job No.	2017-70123							
Client Company	Joe's Towers							
Client Name	Tim Smith							
Address	123 Rock Lane							
City, State, Zip	Nowhere, NV 56567							
Site Name	Midland							
Site No.	334-GT							
PTII Employee	Daniel Boone							
Date	2/17/2017							
PO Number	JT-334-GT-2017							

Version 2.0.0

**Back to Dashboard** 

### **Preliminary** Measurements

Contra	Contractor Information						
Contractor	PTII						
Contact Name	Thomas Hedberg						
Phone Number	(484) 395-0145						
Address	3 s. Bacton Hill Road, Unit 2						
City, State, Zip	Frazer, PA 19355						
Field Calibration Testing Data							

The Values in this program are set for

**Tool Position 1 Tool Position 2** 

Guy Foundation Locations										
		Distance to Anchor - Feet		Elevation of Anchor			Structure Height (Feet)	300		
Leg	Azimuth	Ring 1	Ring 2	Ring 3	Ring 1	Ring 2	Ring 3	Base Elevation	850	
Α	15	150.0			890.0					
В	135	204.0			820.0					
С	255	174.0			860.0					

		Distan	ce to Anchoi	r - Feet	Fle	vation of And	cnor	Structure Height (Feet)	300
Leg	Azimuth	Ring 1	Ring 2	Ring 3	Ring 1	Ring 2	Ring 3	Base Elevation	850
Α	15	150.0			890.0				
В	135	204.0			820.0				
С	255	174.0			860.0				
	Tower Face Data and Cable Information								
<b>——</b>									

											. ,		
	Leg	Azimuth	Ring 1	Ring 2	Ring 3	Ring	g 1	Ring 2	Ring 3	Base El	evation	850	
	Α	15	150.0			890	0.0						
	В	135	204.0			820	0.0						
	С	255	174.0			860	0.0						
				То	wer Face	Data	a an	d Cable I	nformati	ion			
	Level Number	Face Width (Inches)	Attachment Elev. (Ft)	Guy Ring 1, 2 or 3	Torque Arm Y or N			Cable Size		Specified % Tension	No. of Wires	Dia (Inches)	Area (In²)
	12					No Cable			0	0.0000	0.000		
	11					No Cable			0	0.0000	0.000		
w	10					No Cable			0	0.0000	0.000		
Ë	9					No Cable			0	0.0000	0.000		
ij	8							No Cable			0	0.0000	0.000
Š	7							No Cable			0	0.0000	0.000
Elevations	6							No Cable			0	0.0000	0.000
	5					No Cable			0	0.0000	0.000		
Guy	4					No Cable			0	0.0000	0.000		
0	3						Llcin	a tha Dran	down But	tons, selec	t lovels w	th 000	0.000
	2	30.0	300.00	1			•	•	uowii but	toris, selec	it levels w	000	0.000
	1	30.0	150.00	1	Yes		Iorqi	ue Arms				000	0.000



Twist, Plumb and Tension Software by GTS



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<del> </del>	
Project S	etup Data
PTII Job No.	2017-70123
Client Company	Joe's Towers
Client Name	Tim Smith
Address	123 Rock Lane
City, State, Zip	Nowhere, NV 56567
Site Name	Midland
Site No.	334-GT
PTII Employee	Daniel Boone
Date	2/17/2017
PO Number	JT-334-GT-2017

Version 2.0.0

**Preliminary** 

Measurements

**Back to Dashboard** 

Contractor Information							
Contractor	PTII						
Contact Name	Thomas Hedberg						
Phone Number	(484) 395-0145						
Address	3 s. Bacton Hill Road, Unit 2						
City State Zip	Frazer, PA 19355						

The Values in this

**Tool Position 1 Tool Position 2** 

Field Calibration Testing Data

								program	are set for			
					Guy Four	ndation L	ocations	3				
		Distance to Anchor - Feet		r - Feet	Elevation of Anchor			Structure H	eight (Feet)	300		
	Leg	Azimuth	Ring 1	Ring 2	Ring 3	Ring 1	Ring 2	Ring 3	Base El	evation	850	
	Α	15	150.0			890.0						
	В	135	204.0			820.0						
	С	255	174.0			860.0						
	Tower Face Data and Cable Information											
	Level	Face Width	Attachment	Guy Ring	Torque Arm		Cable Size		Specified	No. of	Dia	Area
	Number	(Inches)	Elev. (Ft)	1, 2 or 3	Y or N		Cable 3ize		% Tension	Wires	(Inches)	(In²)
	12					No Cable				0	0.0000	0.000
	11					No Cable				0	0.0000	0.000
S	10						No Cable			0	0.0000	0.000
Elevations	9						No Cable			0	0.0000	0.000
ati	8						No Cable			0	0.0000	0.000
Ne l	7						No Cable			0	0.0000	0.000
Ě	6						No Cable			0	0.0000	0.000
≥	5						No Cable			0	0.0000	0.000
Guy	4						No Cable			0	0.0000	0.000
	ng tha Dra	andown Pr	ittons inn	ut the cah	Jo		No Cable			0	0.0000	0.000
	_	opdown Bu	•			3/8" Dia	EHS 1x7 - (	Orange)		7	0.3750	0.080
size	s for the (	Guy Attach	ment Elev	ations		1/4" Dia	a EHS 1X7 - (	Yellow)		7	0.2500	0.028



JT-334-GT-2017

Twist, Plumb and Tension Software by GTS



Opyri Copyri	Copyright 2011 by GTS. All rights reserved.								
	Project S	etup Data							
	PTII Job No.	2017-70123							
	Client Company	Joe's Towers							
	Client Name	Tim Smith							
	Address	123 Rock Lane							
	City, State, Zip	Nowhere, NV 56567							
	Site Name	Midland							
	Site No.	334-GT							
	PTII Employee	Daniel Boone							
	Date	2/17/2017							

**PO Number** 

Version 2.0.0

Back to Dashboard

### Preliminary Measurements

Contractor Information					
Contractor PTII					
Contact Name Thomas Hedberg					
Phone Number (484) 395-0145					
Address	3 s. Bacton Hill Road, Unit 2				
City, State, Zip Frazer, PA 19355					
Field Calibration Testing Data					

The Values in this program are set for

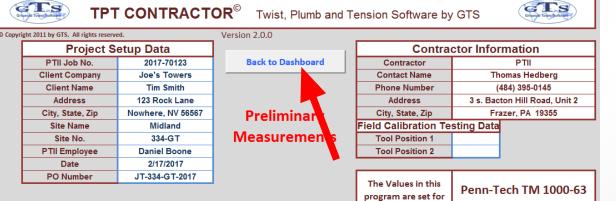
Tool Position 1
Tool Position 2

Guy Foundation Locations										
	Distance to Anchor - Feet						chor	Structure Height (Feet)	300	
Leg	Azimuth	Ring 1	Ring 2	Ring 3	Ring 1	Ring 2	Ring 3	Base Elevation	850	
Α	15	150.0			890.0					
В	135	204.0			820.0					
С	255	174.0			860.0					
								_		

		Tower Face Data and Cable Information									
	Level Number	Face Width (Inches)	Attachmen Elev. (Ft)	t Guy Ring 1, 2 or 3	Torque Arm Y or N	Cable Size		Specified % Tension	No. of Wires	Dia (Inches)	Area (In²)
	12					No Cablo	1		0	0.0000	0.000
	11				Use only n	umbers. Don't use any			0	0.0000	0.000
w	10				letters or special characters such as		Г		0	0.0000	0.000
Ë	9				the percent symbol (%).				0	0.0000	0.000
ij	8				the percer	it symbol (%).			0	0.0000	0.000
Elevations	7					No Cable			0	0.0000	0.000
ᆵ	6					No Cable			0	0.0000	0.000
	5					No Cable			0	0.0000	0.000
Guy	4					No Cable			0	0.0000	0.000
•	3			nnut the De	arcent of Ri	reaking Strength			0	0.0000	0.000
	2	30.0	-2(1)(1)(1)	•			J	10	7	0.3750	0.080
	1	30.0	150.0	Specified %	6 lension) f	or each of the Cables		10	7	0.2500	0.028

Twist, Plumb and Tension

Software by GTs



	Guy Foundation Locations								
		Distan	ce to Anchoi	r - Feet	Elev	ation of And	hor	Structure Height (Feet)	300
Leg	Azimuth	Ring 1	Ring 2	Ring 3	Ring 1	Ring 2	Ring 3	Base Elevation	850
Α	15	150.0			890.0				
В	135	204.0			820.0				
С	255	174.0			860.0				

	Tower Face Data and Cable Information									
	Level Number	Face Width (Inches)	Attachment Elev. (Ft)	Guy Ring 1, 2 or 3	Torque Arm Y or N	Cable Size	Specified % Tension	No. of Wires	Dia (Inches)	Area (In²)
	12					No Cable		0	0.0000	0.000
	11					No Cable		0	0.0000	0.000
<sub>s</sub>	10					No Cable		0	0.0000	0.000
Elevations	9					No Cable		0	0.0000	0.000
ĭ	8					No Cable		0	0.0000	0.000
2	7					No Cable		0	0.0000	0.000
<u> </u>	6					No Cable		0	0.0000	0.000
	5					No Cable		0	0.0000	0.000
Guy	4					No Cable		0	0.0000	0.000
	3					No Cable		0	0.0000	0.000
	2	30.0	300.00	1		3/8" Dia EHS 1x7 - (Orange)	10	7	0.3750	0.080
	1	30.0	150.00	1	Yes	1/4" Dia EHS 1X7 - (Yellow)	10	7	0.2500	0.028

## **Example Tower**

The screen to the left shows what the "Tower Setup Form" will look like after our example tower has been "Built" into the program.

Now click on the "Back to Dashboard" button



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### **Field Calibration Verification Section**



Twist, Plumb and Tension

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TPT CONTRACT	OR® Twist, Plumb and Tension S	Software by GTS						
8 1	SHBOARD y Measurements Selec	eted						
Tower Setup Form Field Calibration								
MEASUREMENT C	MEASUREMENT O INSPECTION SELECTION							
Preliminary Measurements	Fit \( \) Measurements	Inspector Mode						
TWIST ANI	PLUMB	METHOD						
Twist & Plumb Angle Form	Twist & Plur	nb % Leg Form						
TENSION  Tension Data Form		ECTION  Tensions Form						
LEVEL P	LANS SEL	ECTIONS						
Levels 1-4 Plan Views	Levels 5-8 Plan Views	Levels 9-12 Plan Views						
REPORTS	SELEC	TIONS						
Reports Cover Page	Twist & Plumb Report	Tension Report						
FIELD SH	EETS SEL	ECTIONS						
P & T Field Sheet - Angle	P & T Field Sheet - % Leg	Tension Field Sheet						
Version 2.0.0 - Registered	to Penn-Tech International, Inc Penn-Tec	h TM 1000-63						
	License Days Rer	naining 170						

### **Field Calibration**

First, perform the Field
Calibration Verification
Testing in accordance with
the Penn-Tech Tension
Meter User Manual.

Next, press the "Tower Setup Form" button.



Twist, Plumb and Tension

Software by GTS



#### TPT CONTRACTOR®

Twist, Plumb and Tension Software by GTS



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Project Setup Data						
PTII Job No.	2017-70123					
Client Company	Joe's Towers					
Client Name	Tim Smith					
Address	123 Rock Lane					
City, State, Zip	Nowhere, NV 56567					
Site Name	Midland					
Site No.	334-GT					
PTII Employee	Daniel Boone					
Date	2/17/2017					
PO Number	JT-334-GT-2017					

**Back to Dashboard** 

Version 2.0.0

**Preliminary** Measurements

Contractor Information					
Contractor PTII					
Contact Name	Th	Thomas Hedberg			
Phone Number	(484) 395-0145				
Address	3 s. Bacton Hill Road, Unit 2				
City, State, Zip	Fra	azer, PA 19355			
Field Calibration Te	sting Data				
Tool Position 1	76				
Tool Position 2	66				
Tool Position 2					

The Values in this program are set for

Penn-Tech TM 1000-63

#### **Guy Foundation Locations** Distance to Anchor - Feet **Elevation of Anchor** Structure Height (Feet) Leg Azimuth Ring 1 Ring 1 **Base Elevation** 15 150.0 890.0 В 135 204.0 820.0 255 174.0 860.0

	Tower Face Data and Cable Information									
	Level Number	Face Width (Inches)	Attachment Elev. (Ft)	Guy Ring 1, 2 or 3	Torque Arm Y or N	Cable Size	Specified % Tension	No. of Wires	Dia (Inches)	Area (In²)
	12					No Cable		0	0.0000	0.000
	11					No Cable		0	0.0000	0.000
<sub>so</sub>	10					No Cable		0	0.0000	0.000
۾	9					No Cable		0	0.0000	0.000
ij I	8					No Cable		0	0.0000	0.000
Š	7					No Cable		0	0.0000	0.000
Elevations	6					No Cable		0	0.0000	0.000
	5					No Cable		0	0.0000	0.000
Guy	4					No Cable		0	0.0000	0.000
~	3					No Cable		0	0.0000	0.000
	2	30.0	300.00	1		3/8" Dia EHS 1x7 - (Orange)	10	7	0.3750	0.080
	1	30.0	150.00	1	Yes	1/4" Dia EHS 1X7 - (Yellow)	10	7	0.2500	0.028

### **Field Calibration**

**Enter the Tension Meter Dial Readings for Tool** Positions 1 and 2 in the fields show.



Twist, Plumb and Tension

Software by GTs



#### TPT CONTRACTOR®

Twist, Plumb and Tension Software by GTS



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Project Setup Data						
PTII Job No.	2017-70123					
Client Company	Joe's Towers					
Client Name	Tim Smith					
Address	123 Rock Lane					
City, State, Zip	Nowhere, NV 56567					
Site Name	Midland					
Site No.	334-GT					
PTII Employee	Daniel Boone					
Date	2/17/2017					
PO Number	JT-334-GT-2017					



Version 2.0.0

Contractor Information					
Contractor	PTII				
Contact Name	Thomas Hedberg				
Phone Number	(484) 395-0145				
Address	3 s. Bacton Hill Road, Unit 2				
City, State, Zip	Frazer, PA 19355				
Field Calibration Te	sting Data				
Tool Position 1	76				
Tool Position 2	66				

tructure Height (Feet)
Base Elevation

The Values in this program are set for

Penn-Tech TM 1000-63

### Guy Foundation Locations Distance to Anchor - Feet Elevation of Anchor

		Distance to Anchor - Feet			Elevation of Anchor			
Leg	Azimuth	Ring 1	Ring 2	Ring 3	Ring 1	Ring 2	Ring 3	Γ
Α	15	150.0			890.0			Г
В	135	204.0			820.0			П
С	255	174.0			860.0			1

	Tower Face Data and Cable Information									
	Level Number	Face Width (Inches)	Attachment Elev. (Ft)	Guy Ring 1, 2 or 3	Torque Arm Y or N	Cable Size	Specified % Tension	No. of Wires	Dia (Inches)	Area (In²)
	12					No Cable		0	0.0000	0.000
	11					No Cable		0	0.0000	0.000
<sub>s</sub>	10					No Cable		0	0.0000	0.000
Elevations	9					No Cable		0	0.0000	0.000
ا≝	8					No Cable		0	0.0000	0.000
ا≋	7					No Cable		0	0.0000	0.000
-	6					No Cable		0	0.0000	0.000
	5					No Cable		0	0.0000	0.000
Guy	4					No Cable		0	0.0000	0.000
۲ I	3					No Cable		0	0.0000	0.000
	2	30.0	300.00	1		3/8" Dia EHS 1x7 - (Orange)	10	7	0.3750	0.080
	1	30.0	150.00	1	Yes	1/4" Dia EHS 1X7 - (Yellow)	10	7	0.2500	0.028

### **Field Calibration**

Return to the Dashboard using the "Back to Dashboard" button.



Twist, Plumb and Tension

Software by GTs

TPT CONTRACTOR® Twist, Plumb and Tension Software by GTS	Graphical Topics (Sathings)					
DASHBOARD Preliminary Measurements Selected						
Tower Setup Form Field Calibration						
MEASUREMENT OR INSTACTION SELECTION  Preliminary Measurements  Final Measurements  Inspector Mode	N					
TWIST AND PLUMB METHOD  Twist & Plumb Angle Form  Twist & Plumb % Leg Form						
TENSION FORM SELECTION  Tension Data Form  Measured Tensions Form						
LEVEL PLANS SELECTIONS  Levels 1-4 Plan Views Levels 9-12 Plan Views						
REPORTS SELECTIONS  Reports Cover Page Twist & Plumb Report Tension Report						
FIELD SHEETS SELECTION  P & T Field Sheet - Angle P & T Field Sheet - % Leg Tension Field Sheet  Version 2.0.0 - Registered to Penn-Tech International, Inc Penn-Tech TM 1000-63						
License Days Remaining 170						

### **Field Calibration**

Press the "Field Calibration" button to go to the "Field Calibration Test Certificate".



Twist, Plumb and Tension

Software by GTs



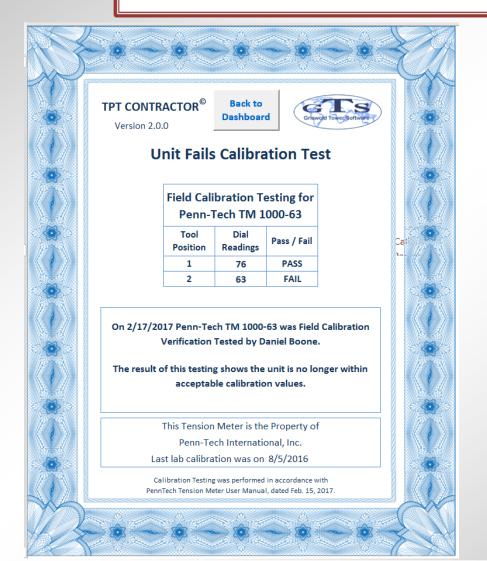
# Field Calibration Test Certificate

If the Dial Readings are within 2% of the Specified Maximum then the program generates a Field Test Certificate.



Twist, Plumb and Tension

Software by GTs



# Field Calibration Test Certificate

If the Dial Readings are outside of the Specified Maximum then the program generates a failing document.



Twist, Plumb and Tension

Software by GTs



February 17, 2017

3 s. Bacton Hill Road, Unit 2 Frazer, PA 19355 (484) 395-0145

Tim Smith Joe's Towers 123 Rock Lane Nowhere, NV 56567

Subject: Preliminary Measurements Report of Twist, Plumb and Tension

Site Name: Midland Site Number: 334-GT

Dear Tim Smith,

At your request and in accordance with your purchase order number JT-334-GT-2017, we at Penn-Tech International, Inc. are pleased to submit this Preliminary Measurements Report of the Twist, Plumb and Tension for the 300 foot tall tower at the subject site. The Twist and Plumb information was gathered using Angular Measurements from all 3 leg azimuths. The tension values were measured using our Penn-Tech TM 1000-63 Tension Meter. This meter was last calibrated in the PennTech lab on 8/5/2016. However, this meter failed the Field Calibration Test. The test requires the meter to be within 2% of the original calibration values. This meter is now within approximately 3.1% of the original calibration values and is scheduled for recalibration at the PennTech lab.

We at Penn-Tech International, Inc. appreciate the opportunity to provide our tower services for you and Joe's Towers. If you have any questions please give us a call at the number listed at the top of this name.

Sincerely.

Penn-Tech International, Inc.

Thomas Hedberg

Attachments

# Field Calibration Test Certificate

Also, if the test fails the cover page report will state the "meter failed the Field Calibration Test."



Twist, Plumb and Tension

Software by GTs



#### **Field Calibration**

Return to the Dashboard using the "Back to Dashboard" button.



Twist, Plumb and Tension

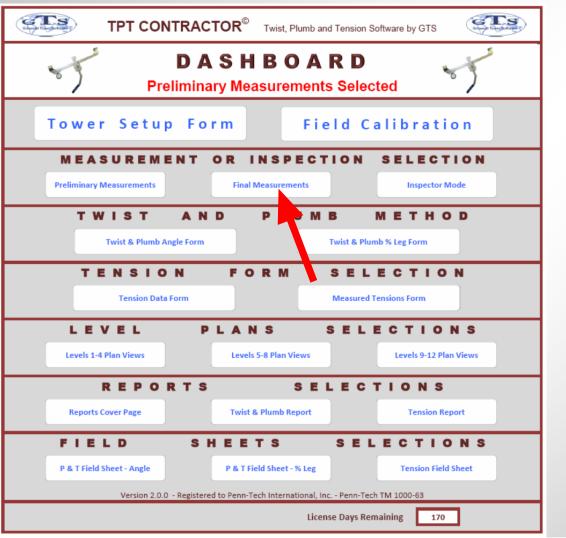
Software by GTs

#### **Measurement or Inspection Section**



Twist, Plumb and Tension

Software by GTs



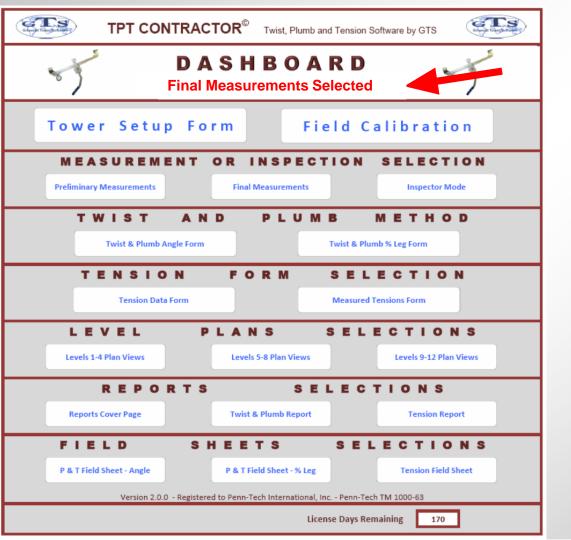
### Measurement or Inspection Section

This section allows for before and after measurements with reports when adjusting a tower, or inspection reports when no adjustments are to be made. For this example we will choose the "Final Measurements Mode".



Twist, Plumb and Tension

Software by GTs



### Measurement or Inspection Section

The change between "Preliminary Measurements", "Final Measurements", and "Inspector Mode" is reflected on the Dashboard and all other forms throughout the program.

Next we will cover Twist & Plumb.



Twist, Plumb and Tension

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#### **Twist and Plumb Section**



Twist, Plumb and Tension

Software by GTs

#### **Twist and Plumb**

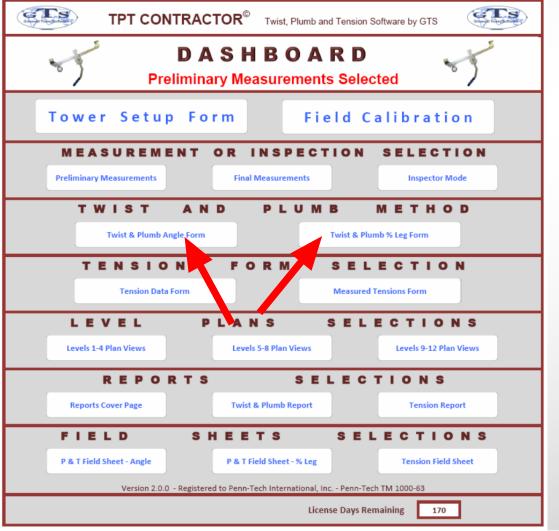
The software provides 2 different methods to measure the Twist and Plumb of the tower.

- 1. Angular Method
- 2. Percent of Leg Width Method



Twist, Plumb and Tension

Software by GTs



#### **Twist and Plumb Section**

The method that will be used to measure the Twist and Plumb of the tower is chosen on the Dashboard. We will first cover the Angular Measurement Method followed by the Percent of Leg Width Measurement Method.



Twist, Plumb and Tension

Software by GTs

### Twist and Plumb - Angular Method

- The Theodolite is set up next to an anchor fan plate. It is then centered on the leg at the base of the tower and the horizontal angle in the theodolite is set to Zero.
- The distance from the Theodolite to the leg is recorded
- The scope is then tilted up to the first guy elev.
- The Theodolite is rotated to the center of the leg and the angle recorded. This is then repeated for each guy elevation. Clockwise rotation of the Theodolite is recorded as positive.



Twist, Plumb and Tension

Software by GTs

### Twist and Plumb – Angular Method



Horizontal Angle Set to Zero



Angle of 0° 01′ 30″ Left





Angle of 0° 02′ 40″ Right





#### Twist, Plumb and Tension Software by GTS



**Final Measurements** 

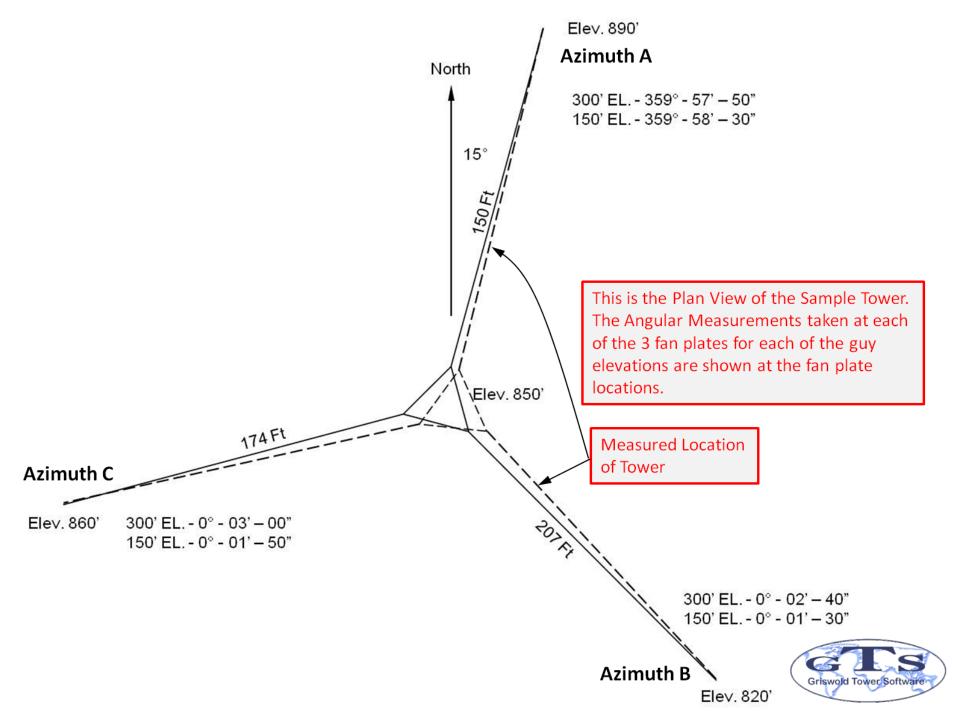
Back to Dashboard

	Twist and Plumb Data - Angular Measurements Method														
	Laval		D1 Re	1 Reading - Leg A - Azimuth = 15°				D2 Re	eading - Leg	B - Azimuth	= 135°	D3 Reading - Leg C - Azimuth = 255°			= 255°
	Level Number	Attachment Elev. (Ft)	Distance -	Instrume	nt to	Leg (Feet)		Distance -	Instrument to	Leg (Feet)		Distance - Instrument to Leg (Feet)			
	Nullibel	` '	Deg	Min		Sec	Equiv.	Deg	Min	Sec	Equiv.	Deg	Min	Sec	Equiv.
	12	-													
	11	-													
u	10	-													
ation	9	-													
ţi	8	-			Thi	s is how:	tha "Ang	ular Maa	ılar Measurements"						
e	7	-					_			11.5					
Eleva	6	-			torr	m will ap	pear afte	er "Buildi	ng" the						
	5	-			tow	er is cor	nplete.								
uy	4	-		_											
ര	3	-													
	2	300					0.0000				0.0000				0.0000
	1	150					0.0000				0.0000				0.0000

	1	150							
	Level Number	Attachment Elev. (Ft)	Deviation (in)						
	Number	(,	D1	D2	D3				
	12	-							
	11	-							
Ø	10	-							
ä	9	-							
ijΙ	8	-							
<b>Guy Elevations</b>	7	-							
<u> </u>	6	-							
	5	-							
Ď.	4	-							
0	3	-							
	2	300	0.0000	0.0000	0.0000				
	1	150	0.0000	0.0000	0.0000				
1/	Version 1.2.0 © Converget 2011 by CTS. All sights recovered								

	Twist Results	
Measured Twist Btwn Elevations (degrees)	Allowable Twist Btwn Elevations (degrees)	RESULT
0.00	5.00	OK
0.00	5.00	OK

			0.0000
			0.0000
F	Plumb Result	s	
Measured Defl Btwn Elevations (inches)	Allowable Defl Btwn Elevations (inches)	RESULT	
			Clear
			All
			Data
			Data
			on
			This
			Form
0.00	4.50	OK	
0.00	4.50	OK	





#### Twist, Plumb and Tension Software by GTS



**Final Measurements** 

**Back to Dashboard** 

	Twist and Plumb Data - Angular Measurements Method															
	Laurel	Attachment Elev. (Ft)	D1 R	D1 Reading - Leg A - Azimuth = 15					D2 Reading - Leg B - Azimuth = 135°					eading - Leg	C - Azimuth	= 255°
	Level Number		Distance -	Distance - Instrument to Leg (Feet 150.00			Dis	Distance - Instrument to Leg (Feet)				Distance	- Instrument to	nt to Leg (Feet)		
			Deg	Min	Sec	Equiv.	D	eg	Min	Sec	;	Equiv.	Deg	Min	Sec	Equiv.
	12	-														
	11	-														
Ø	10	-						For	For Leg A the Distance from the							
suc	9	-						Theodolite to the Leg is recorded								
atio	8	-						me	odonite	to the	LEE					
> 2	7	-														
Eleva	6	-								Use only numbers. Don't use any						
	5	-								letters or special characters such as				•		
Guy	4	-												Jucii as		
0	3	-								reet ( ) c	or in	iches (").				
	2	300				0.0000						0.0000				0.0000
	1	150				0.0000						0.0000				0.0000
																,

	1	150							
	Level Number	Attachment Elev. (Ft)	Deviation (in)						
	Nullibel	Liovi (i cj	D1	D2	D3				
	12	-							
	11	-							
w	10	-							
ä	9	-							
ţ	8	-							
e >	7	-							
<u>e</u>	6	-							
<b>Guy Elevations</b>	5	-							
ű	4	-							
0	3	-							
	2	300	0.0000	0.0000	0.0000				
	1	150	0.0000	0.0000	0.0000				
Marria	Version 1.2.0 @ Converight 2011 by CTS. All rights recoved								

	Twist Results			
Measured Twist Btwn Elevations (degrees)	Allowable Twist Btwn Elevations (degrees)	<u>RESULT</u>		
0.00	5.00	OK		
0.00	5.00	OK		

			0.0000
	Plumb Result	S	
Measured Defl Btwn Elevations (inches)	Allowable Defl Btwn Elevations (inches)	<u>RESULT</u>	
			Clear
			All
			Data
			Data
			on
			This
			Form
0.00	4.50	OK	
0.00	4.50	OK	



#### Twist, Plumb and Tension Software by GTS



Final Measurements

Back to Dashboard

Twist and Plumb Data - Angular Measurements Method													
Louis		D1 R	leading - Leg	A - Azimuth	= 15°	D2 Reading - Leg B - Azimuth = 135°				D3 Re	D3 Reading - Leg C - Azimuth = 255°		
		Distance -	Distance - Instrument to Leg (Feet) 150.00			Distance -	Instrument to	Leg (Feet)		Distance -	Distance - Instrument to Leg (Feet)		
Humber	` '	Deg	Min	Sec	Equiv.	Deg	Min	Sec	Equiv.	Deg	Min	Sec	Equiv.
12	-												
11													
10	Next	the Ang	ular Mea	suremen	ts for		Don't use any letters or special characters such as degrees (°),						
9		_											
8		· .				C							
7		_				n	minutes (') or seconds (").						
6	ther	efore the	angles a	re subtra	cted								
5	from	360° by	the Theo	dolite.									
4		,											
3	-												
2	300	359	57	50	359.9639				0.0000				0.0000
1	150	359	58	30	359.9750				0.0000				0.0000
	11 10 9 8 7 6 5 4	Number Elev. (Ft)  12 - 11 - 10 - 9 - 8 - Note 6 - 5 - 4 - 2 - 300	Level Number  Attachment Elev. (Ft)  Deg  12  11  10  Next the Ang each guy elev Note the leg therefore the from 360° by  4  3  2  300  359	Level Number  Attachment Elev. (Ft)  Deg Min  12  - 11  Next the Angular Mea each guy elevation are now therefore the angles a from 360° by the Theory and the second seco	Level Number  Attachment Elev. (Ft)  Deg Min Sec  12  11  Next the Angular Measuremen each guy elevation are recorde Note the leg has moved to the therefore the angles are subtrated from 360° by the Theodolite.	Level Number  Attachment Elev. (Ft)  Distance - Instrument to Leg (Feet)  Deg Min Sec Equiv.  12  10  Next the Angular Measurements for each guy elevation are recorded.  Note the leg has moved to the Left, therefore the angles are subtracted from 360° by the Theodolite.  4  3  -  -	Level Number  Attachment Elev. (Ft)  Distance - Instrument to Leg (Feet)  Deg Min Sec Equiv.  Deg  12  10  Next the Angular Measurements for each guy elevation are recorded.  Note the leg has moved to the Left, therefore the angles are subtracted from 360° by the Theodolite.  Attachment Distance - Instrument to Leg (Feet)  Deg Min Sec Equiv.  Deg  150.00  Distance - Instrument to Leg (Feet)  Deg  Min Sec Equiv.  Deg  10  Co  Co  Co  Therefore the angles are subtracted from 360° by the Theodolite.	Level Number    D1 Reading - Leg A - Azimuth = 15°   D2 Reading - Leg	Level Number    Deg   Min   Sec   Equiv.   Deg   Min   Sec   Equiv.	Level Number    D1 Reading - Leg A - Azimuth = 15°   D2 Reading - Leg B - Azimuth = 135°	Level Number    D1 Reading - Leg A - Azimuth = 15°   D2 Reading - Leg B - Azimuth = 135°   D3 Reading - Leg	Level Number    D1 Reading - Leg A - Azimuth = 15'   D2 Reading - Leg B - Azimuth = 135'   D3 Reading - Leg	Level Number    Data   Property   Attachment   Distance - Instrument to Leg (Feet)   Deg   Min   Sec   Equiv.   Deg   Min   Sec

	Level Number	Attachment Elev. (Ft)	Deviation (in)					
	Number	Liovi (i y	D1	D2	D3			
	12	-						
	11	-						
w	10	-						
<b>Guy Elevations</b>	9	-						
ij	8	-						
e >	7	-						
<u>e</u>	6	-						
<u></u>	5	-						
Ű.	4	-						
0	3	-						
	2	300	-1.1345	0.0000	0.0000			
	1	150	-0.7854	0.0000	0.0000			

Twist Results								
Measured Twist Btwn Elevations (degrees)	Allowable Twist Btwn Elevations (degrees)	<u>RESULT</u>						
-0.38	5.00	OK						
-0.87	5.00	OK						
	Measured Twist Btwn Elevations (degrees)	Measured Twist Btwn Elevations (degrees)  -0.38  Allowable Twist Btwn Elevations (degrees)  -0.38  5.00						

			0.0000
	,		
Measured Defl Btwn Elevations (inches)	Allowable Defl Btwn Elevations (inches)	<u>RESULT</u>	
			Clear
			All
			Data
			on
			This
			Form
0.23	4.50	OK	
0.52	4.50	OK	



Twist, Plumb and Tension Software by GTS



#### **Final Measurements**

Back to Dashboard

	Twist and Plumb Data - Angular Measurements Method														
	Lavel		D1 Re	eading - Leg	g A - Azimuth	= 15°	D2 Re	eading - Leg l	B - Azimuth	= 155	D3 Re	eading - Leg	C - Azimuth	= 255°	
	Level Number	Attachment Elev. (Ft)	Distance -	Instrument to	Leg (Feet)	150.00	Distance -	Instrument to	Leg (Feet)	207.00	Distance -	- Instrument to	Leg (Feet)	174.00	
	Number		Deg	Min	Sec	Equiv.	Deg	Min	Sec	Equiv	Deg	Min	Sec	Equiv	
	12	-													
	11	-													
σ	10	-													
suc	9	-						The process is repeated for Legs B and C until all of the distance and							
atio	8	-													
	7	-													
Ele	6	-						Angu	ılar ivlea	suremen	ts have r	been			
	5	-						ente	red.						
Guy	4	-													
0	3	-													
	2	300	359	57	50	359.9639	0	2	40	0.0444	0	3	0	0.0500	
	1	150	359	58	30	359.9750	0	1	30	0.0250	0	1	50	0.0306	
										1					

	Level	Attachment Elev. (Ft)	ı	Deviation (in	)					
	Number	Liev. (i t	D1	D2	D3					
	12	-								
	11	-								
w	10	-								
Guy Elevations	9	-								
	8	-								
<b>8</b>	7	-								
<u> </u>	6	-								
_ E	5	-								
ű	4	-								
0	3	-								
	2	300	-1.1345	1.9268	1.8221					
	1	150	-0.7854	1.0838	1.1135					
Versio	Version 1.2.0 © Copyright 2011 by GTS. All rights reserved.									

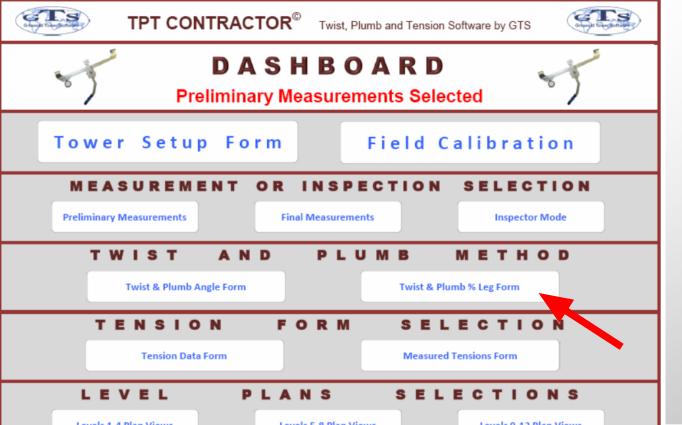
	s	Plumb Result			Twist Results	
<u>I</u>	RESULT	Allowable Defl Btwn Elevations (inches)	Measured Defl Btwn Elevations (inches)	RESULT	Allowable Twist Btwn Elevations (degrees)	Measured Twist Btwn Elevations (degrees)
Clea						
All						
Data						
on This	sults	lumb Re	ilts and P mmediate			
Form						
	ок	4.50	0.75	ОК	5.00	1.33
	ок	4.50	1.26	OK	5.00	1.56

Twist, Plumb and Tension

Software by GTs

### Twist and Plumb - Percent of Leg Width Method

When Percent of Leg Width method is used the "Twist and Plumb %









#### Twist, Plumb and Tension Software by GTS



**Final Measurements** 

Back to Dashboard

#### % of Leg Width Measurements Selected

	Twist and Plumb Data - Percent of Leg Width Measurements Method													
	Lavel		D1 R	eading - Leg	A - Azimuth	= 15°	D2 Re	ading - Leg	B - Azimuth :	= 135°	D3 Reading - Leg C - Azimuth = 255°			
	Level Number	Attachment Elev. (Ft)	Distance -	Instrument to	Leg (Feet)		Distance - Instrument to Leg (Feet)				Distance - Instrument to Leg (Feet)			
	rumbor	` '	Leg Width	% of Width	Left or Right	Equiv.	Leg Width	% of Width	Left or Right	Equiv.	Leg Width	% of Width	Left or Right	Equiv.
	12	-			Right				Right				Right	
	11	-			Right				Right				Right	
<b>"</b>	10	-			Right				Right				Right	
ations	9	-			Right				Right				Right	
	8	-			Right				Right				Right	
	7	-			Right	Thic ic t	This is the Percent of Leg						Right	
Ele	6	-			Right				Right				Right	
	5	-			Right	wiat	h Metho	a Form	Right				Right	
Guy	4	-			Right				Right				Right	
١	3	-			Right				Right				Right	
	2	300			Right				Right				Right	
	1	150			Right				Right				Right	

Twist and Dlumb Data - Dercent of Leg Width Measurements Method

	Level Number	Attachment Elev. (Ft)		Deviation (in	)
	Nullibel	,	D1	D2	D3
	12	-			
	11	-			
w	10	-			
ü	9	-			
ţ	8	-			
e A	7	-			
<u>e</u>	6	-			
<b>Guy Elevations</b>	5	-			
Ű.	4	-			
0	3	-			
	2	300			
	1	150			
Version	n 1 2 0	© Conveight 201:	1 by CTS All right	e received	

	Twist Results	
Measured Twist Btwn Elevations (degrees)	Allowable Twist Btwn Elevations (degrees)	<u>RESULT</u>
	5.00	
	5.00	

		Right	
ı	Plumb Result	s	
Measured Defl Btwn Elevations (inches)	Allowable Defl Btwn Elevations (inches)	<u>RESULT</u>	
			Clear
			All
			Data
			on This
			Form
	4.50	RE-PLUMB	
		RE-PLUMB	

Twist, Plumb and Tension

Software by GTs

### Twist and Plumb - Percent of Leg Width Method

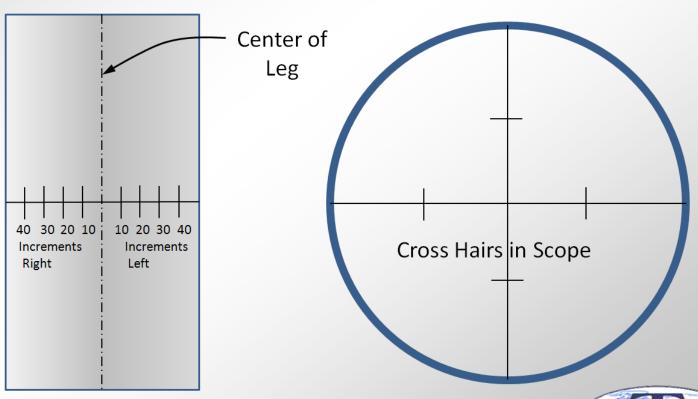
- Similar to the Angular Method, the instrument, usually a Transit, is setup at the fan plate and centered on the tower leg.
- Next the instrument is turned up to the guy elevation and the percent of leg width left or right is estimated as shown on the next 2 slides.





Twist, Plumb and Tension

Software by  $\mathbf{GTS}$ 



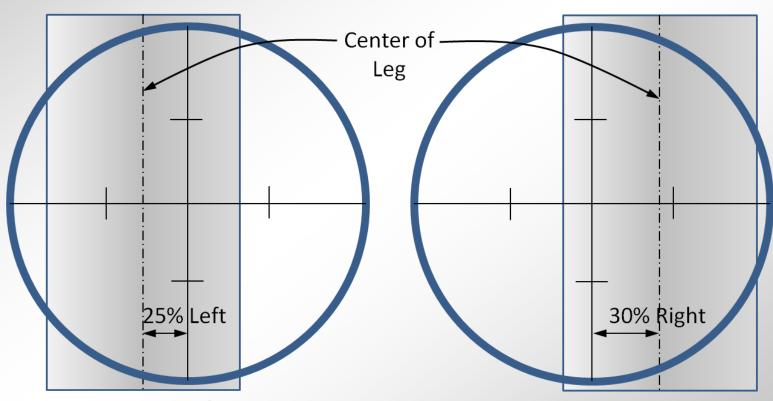
Leg broken into 10% increments



Twist, Plumb and Tension

Software by GTs

#### **Examples of % Left and Right**



Tower Leg Left of Cross Hairs 25%

Tower Leg Right of Cross Hairs 30%





Twist, Plumb and Tension Software by GTS



Final Measurements

Back to Dashboard

#### % of Leg Width Measurements Selected

	Twist and Plumb Data - Percent of Leg Width Measurements Method															
			D1 R		A - Azimuth					B - Azimuth =			D3 Reading - Leg C - Azimuth = 255°			
	Level Number	Attachment Elev. (Ft)	Distance -	Instrument to	Leg (Feet)	150.00	Dis	Distance - Instrument to Leg (Feet)			2	207.00 Distance - Instrument to		Instrument to	Leg (Feet)	174.00
	Number		Leg Width	% of Width	Left or Right	Equiv.	Leg	Width	% of Width	Left or Right	E	uiv.	Leg Width	% of Width	Left or Right	Equiv.
	12	-			Right					Right					Right	
	11	-			Right					Right					Right	
ations	10	-			Right										Right	
	9	-			Right										Right	
	8	-			Right			the distances from the instrument to each of the legs are recorded.						Right		
>	7	-			Right										Right	
Ele	6	-			Right			tile legs are recorded.							Right	
	5	-			Right					Right					Right	
Guy	4	-			Right					Right					Right	
	3	-			Dight					Dight					Right	
	2	300	3.5	Ne	xt the wid	dth of th	e leg	s at	the guy e	levations		.0000	3.5		Right	0.0000
	1	150	4	are	are entered.							.0000	4		Right	0.0000

			•		
	Level Number	Attachment Elev. (Ft)	-	Deviation (in	)
	Nullibel	2.01. (1. 4)	D1	D2	D3
	12	-			
	11	-			
w	10	-			
<b>Guy Elevations</b>	9	-			
Ę	8	-			
<b>8</b>	7	-			
<u>e</u>	6	-			
<u> </u>	5	-			
Ď.	4	-			
0	3	-			
	2	300	0.0000	0.0000	0.0000
	1	150	0.0000	0.0000	0.0000
		0.0			

	Twist Results	
Measured Twist Btwn Elevations (degrees)	Allowable Twist Btwn Elevations (degrees)	RESULT
0.00	5.00	OK
0.00	5.00	OK

0.0		rugiit	0.0000
4		Right	0.0000
ı	Plumb Result	s	
Measured Defl Btwn Elevations (inches)	Allowable Defl Btwn Elevations (inches)	<u>RESULT</u>	
			Clear
			All
			Data
			on This
			Form
0.00	4.50	ОК	
0.00	4.50	OK	



Twist, Plumb and Tension Software by GTS



**Final Measurements** 

**Back to Dashboard** 

% of Leg Width Measurements Selected

0.28

1.47

4.50

4.50

OK

OK

	Twist and Plumb Data - Percent of Leg Width Measurements Method													
	Level		D1 R	eading - Leg	A - Azimuth	= 15°	D2 Re	ading - Leg	B - Azimuth	= 135°	D3 Re	ading - Leg	C - Azimuth	= 255°
	Number	Attachment Elev. (Ft)	Distance -	Instrument to	Leg (Feet)	150.00	Distance -	Instrument to	Leg (Feet)	207.00	Distance -	Instrument to	Leg (Feet)	174.00
			Leg Width	% of Width	Left or Right	Equiv.	Leg Width	% of Width	Left or Right	Equiv.	Leg Width	% of Width	Left or Right	Equiv.
	12	-			Right				Right				Right	
	11	-			Right				Right				Right	
(n	10	-			Right				Right				Right	
Elevations	9	-			Right				Right				Right	
tic	8	-			Right				Right				Right	
e A	7	-			Right				Right				Right	
<u> </u>	6	-			Right				Right				Right	
	5	-			Right				Right				Right	
Guy	4	-			Right				Right				Right	
0	3	-			Right				Right				Right	
	2	300	3.5	25%	Left	359.9722	3.5	50%	Right	0.0404	3.5	50%	Right	0.0480
	1	150	4	25%	Left	359.9682	4	30%	Right	0.0277	4	30%	Right	0.0329
					-							<u> </u>		
						\		Twist Results				lumb Result	s	
	Level	Attachment		Deviation (in	1	Thomas	he percent of leg width is entered and using  Allowable Defl Btwn RESULT							
	Number	Elev. (Ft)		Soviation (iii)	,			_				Defl Btwn Elevations	<u>RESULT</u>	
			D1	D2	D3	the Dr	opdown	Buttons	the direc	tion (Left	or	(inches)		
	12	-				Right)	is input							Clear
	11	-												
Ø	10	-												All
Elevations	9	-												Data
ati	8	-							Again.	the Twi	st Results	and Plui	mb –	
) i	7	-									vided im			on This
Ĭ	6	-							Nesult	.s are pro	viucu IIII	mediate	y.	Form
_	5	-					l				l			

1.35

1.54

5.00

5.00

OK

OK

3 2

300

150

1.7500

1.2000

1.7500

1.2000

-0.8748

-0.9997



#### Twist, Plumb and Tension Software by GTS



**Final Measurements** 

**Back to Dashboard** 

% of Leg Width Measurements Selected

	Laval		D1 R	eading - Leg	A - Azimuth	= 15°	D2 Re	ading - Leg l	B - Azimuth	= 135°	D3 R	eading - Leg		= 255°
	Level Number	Attachment Elev. (Ft)	Distance -	Instrument to	Leg (Feet)	150.00	Distance -	Instrument to	Leg (Feet)	207.00	Distance -	Instrument to	Leg (Feet)	174.00
	Itallibei	` '	Leg Width	% of Width	Left or Right	Equiv.	Dun on Ale	a ((Daala)	La Da alala	// D		% of Width	Left or Right	Equiv.
	12	-			Right		Press th	е "васк	to Dashb	oard" Bu	tton		Right	
	11	-			Right				Right				Right	
<i>(</i> 0	10	-			Right				Right				Right	
ations	9	-			Right				Right				Right	
tic	8	-			Right				Right				Right	
۸a	7	-			Right				Right				Right	
Eleva	6	-			Right				Right				Right	
	5	-			Right				Right				Right	
Guy	4	-			Right				Right				Right	
0	3	-			Right				Right				Right	
	2	300	3.5	25%	Left	359.9722	3.5	50%	Right	0.0404	3.5	50%	Right	0.0480
	1	150	4	25%	Left	359.9682	4	30%	Right	0.0277	4	30%	Right	0.0329
								Tourist Describe				Diamela Daniela		1

Twist and Plumb Data Percent of Leg Width Measurements Method

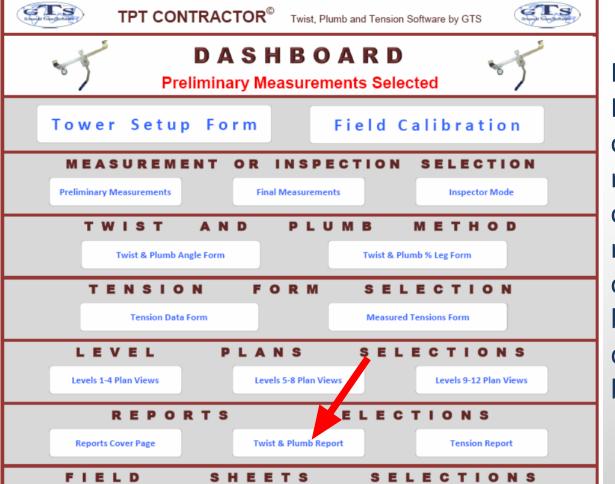
Level Number		Attachment Elev. (Ft)	Deviation (in)				
	Nullibel	(. 4	D1	D2	D3		
	12	-					
	11	-					
w	10	-					
<b>Guy Elevations</b>	9	-					
ţ	8	-					
e >	7	-					
<u>e</u>	6	-					
<u> </u>	5	-					
Ď.	4	-					
O	3	-					
	2	300	-0.8748	1.7500	1.7500		
	1	150	-0.9997	1.2000	1.2000		
Version	n 1.2.0	© Copyright 201:	1 by GTS. All right	s reserved.			

•	7	00 /0	rtigitt
		Twist Results	
	Measured Twist Btwn Elevations (degrees)	Allowable Twist Btwn Elevations (degrees)	<u>RESULT</u>
	1.35	5.00	OK
	1.54	5.00	OK

3.5	50%	Right	0.0480
4	30%	Right	0.0329
	Plumb Result	S	
Measured Defl Btwn Elevations (inches)	Allowable Defl Btwn Elevations (inches)	RESULT	
			Clear
			All
			Data
			on Thi
			Form
0.28	4.50	ОК	
1.47	4.50	ОК	

Twist, Plumb and Tension

Software by GTs



### Twist and Plumb Report

Now that the Twist and Plumb Measurements are complete we can get the report. The report will contain the data of the measurement method last chosen. In this example both are available as the data for both methods have been entered.

#### TPT CONTRACTOR® by GTS

#### IETS Engineering Services

129 Greenwich Road / Charlotte, NC 28211 Phone: (704) 522-1131 / Fax: (704) 522-1280



**Tower Twist & Plumb Report - Final Measure** 

ı	B	ac	k to	Das	hŀ	ona	rd
: 1		acı	K LU	Das	ш	va	u

IETS Job No.	2011-70123	IETS Employee	Daniel Boone
Client Name	Joe's Towers	Date	March 30, 2011
Site Name	Midland	PO Number	JT-334-GT-2011
Site No	334-GT		

Guy Azimuth (°)			Guy Ra			
			Α	В	С	Percent of Leg Width Method
Α	15	1	150	207	174	Used for Twist & Plumb
В	135	2				Determination
_	OFF	2				1

	Observed Mast Data									
Guy Elev (feet)	Tower Face Width A (inches)	15º leg D1 (inches)	135° leg D2 (inches)	255° leg D3 (inches)						
200.0	20	0.07	4.75	4.75						
300.0	30	-0.87	1.75	1.75						
150.0	30	-1.00	1.20	1.20						

from EIA/TIA 222-G
$d = \frac{(D1+D2+D3)}{3}$
$e = \frac{(d*\sqrt{3})}{A}$
$a = \arcsin(e)$
$x = \frac{(D2 - D3)}{\sqrt{3}}$
$y = \frac{(2*D1-D2-D3)}{3}$
$r = \sqrt{(x^2 + y^2)}$

	C	alculated Twi	st	Allowable with	Measured	Allowable Twist	
Guy Elev (feet)	d (inches)	е	α (degree)	respect to Base (degrees)	Twist Btwn Elevations (degrees)	Btwn Elevations (degrees)	<u>RESULT</u>
300.0	0.88	0.05	2.90	5.00	1.35	5.00	OK
150.0	0.47	0.03	1.54	5.00	1.54	5.00	OK

	Calcula	ted Plumb R	esultant	Total	Measured	Measured Allowable		
Mast Elev (feet)	x (inches)	y (inches)	Resultant Deflection r (inches)	Allowable Deflection (inches)	Defl Btwn Elevations (inches)	Defl Btwn Elevations (inches)	RESULT	
300.0	0.00	-1.75	1.75	9.00	0.28	4.50	OK	
150.0	0.00	-1.47	1.47	4.50	1.47	4.50	OK	
© Copyright	2011 by GTS. All rig	ghts reserved.						

Your Logo will appear on the reports.

The "Back to Dashboard" Button will not appear in the printed report.

### **Twist and Plumb Report**

The report shown on the left of this slide is automatically generated by the software.

This page can be printed to a pdf and sent to your client. This report is prepared in accordance with TIA-222 requirements.



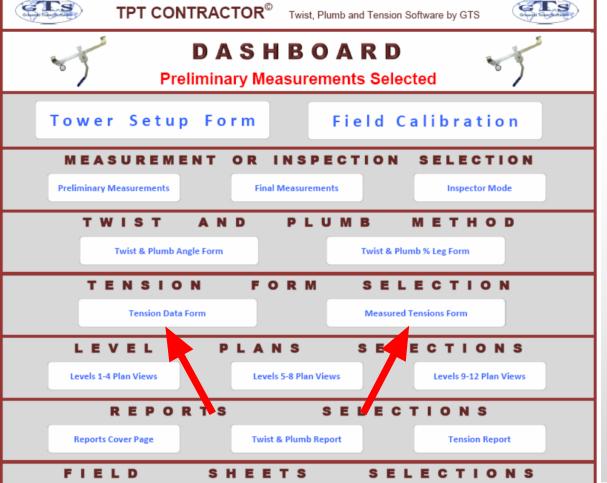
Twist, Plumb and Tension

Software by GTs

#### **Tension Section**



Twist, Plumb and Tension
Software by



#### **Tension Section**

The Tension Forms Section of the Dashboard contains buttons for access to the "Tension Data Form" and a "Measured Tensions Form" that is used for making tension measurements without first building a tower into the "Tower Setup Form".



Twist, Plumb and Tension

Software by GTs

#### **Tension Data Form**

- This form is used to record the measured tensions.
- The program contains the calibration data specific to the Penn-Tech Tensionmeter being used.
- When the current temperature is input the software provides a dial reading. This dial reading can be used to adjust the tension so that the cable tension will be correct when normalized to 60°.
- The next slide shows the Tension Data Form for the Cables along Azimuth A. Scroll down to access the portions of the Tension Data Form for Azimuths B & C.





Reg'd Dial /

Handle\*Block

23.6 / 3\*X

11.1 / 4\*X

11.1 / 4\*X



**Back to Dashboard** 

Percent

Difference

-108.4%

-119.9%

-119.9%

1,540

665

665

Tension Values for Cables along Azimuth A - The 15° Leg Penn-Tech TM 1000-90

3

**Average** 



23	1
	ā.
Griswold	Tow
Contrado.	

Specified

**Tensions** 

Version 1.2.0

Tension @

60 Deg. F.

Screen

Shots

Screen Shot Screen Shot

Screen Shot Screen Shot

Screen Shot

Screen Shot

Screen Shot Screen Shot

Screen Shot

Screen Shot

Screen Shot Screen Shot Screen Shot Screen Shot

Screen Shot

Screen Shot

Screen Shot

Screen Shot

Screen Shot

Screen Shot

Screen Shot

Screen Shot

Screen Shot

Screen Shot

0

0

0

-129

-132

-132

0.00

0.00

0.00

Measured

**Tensions** 

Griswold Tower Software	TPT CONTRACTOR <sup>©</sup>	Twist, Plumb and Tension Software by GTS
-------------------------	-----------------------------	--

Griswold Tower Software	IF I CONTRACTOR

Left, Right

or Center

-

-

Center

Left

Right

Cable

Temp.

Griswold Tower Software	IPI	CONTRACTOR	

TPT CONTRACTOR Twist, Plumb and Tension S	Software by GTS
---	-----------------

2

Griswold Tower Software	TPT CONTRACTOR*	Twist, Plumb and Tension Software by GTS

1

A	_	

Level

Number

12

11

10

0 ĬΩ

 $\overline{\phantom{a}}$ 

ı

⋖

Azimuth

for

Number

evel

4

3

2

300

150

150

**Final Measurements** 

Attachment

Elev. (Ft)



Level

Number

12

11

10

9

Leg

<u>ي</u>

ı

⋖

Azimuth

٠

Number

evel

Attachment

Elev. (Ft)

The temperature at the

measurement is made is

recorded here. Use only

300

150

150

Center

Left

Right

34

time the tension

numbers.

3

2

Left, Right

or Center

Cable

Temp.



Specified

**Tensions** 

Version 1.2.0

Tension @

60 Deg. F.

Screen

**Shots** 

Screen Shot Screen Shot

Screen Shot

Screen Shot

Screen Shot

Screen Shot

Screen Shot Screen Shot

Screen Shot

Screen Shot

Screen Shot Screen Shot

Screen Shot

Screen Shot

Screen Shot

Screen Shot

Screen Shot

Screen Shot

Screen Shot

Screen Shot

Screen Shot

Screen Shot

Screen Shot

Screen Shot

0

0

0

-56

-132

-132

1,540

665

665

-103.6%

-119.9%

-119.9%

0.00

0.00

0.00

Average

Measured

**Tensions** 

**Back to Dashboard** 

Percent

Difference

oftware	TPT CONTRACTOR <sup>©</sup>	Twist, Plumb and Tension Software by GTS

2

The software recommends

get the right tension. It also

the dial reading "22.7" to

gives the required handle

position and block size for

the cable being tested.

Tension Values for Cables along Azimuth A - The 15° Leg Penn-Tech TM 1000-90

Final Measurements		

Griswold Tower Software	IPT CONTRACTOR <sup>®</sup>	Twist, Plumb and Tension Software by GTS

1

Griswold Tower Software	IPT CONTRACTOR	Twist, Plumb and	Tension Software

Reg'd Dial /

Handle\*Block

22.7 / 3\*X

11.1 / 4\*X

11.1 / 4\*X

Griswold Tower Software	IPTCONTRACTOR	I WIST, Plumb and	Tension Soπware by GTS	
				ı



Level

Number

12

11

10

eg

5

ı

⋖

Azimuth

for

Number

evel

3

300

150

150

Attachment

Elev. (Ft)

Left, Right

or Center

-

-

Center

Left

Right

34

22.7 / 3\*X

11.1 / 4\*X

11.1 / 4\*X

Cable

Temp.

Reg'd Dial /

Handle\*Block



**Back to Dashboard** 

Percent

Difference

100	1	
	5	7
Griswold	Towe	198
		-

**Specified** 

Tensions

Version 1.2.0

Tension @

60 Deg. F.

The software provides the

percent difference.

1,566

-132

-132

1,622

0

0

measured tension, the measured

specified tension at 60°F, and the

1,540

665

665

1.7%

-119.9%

-119.9%

tension converted to 60°F, the

Measured

**Tensions** 

Screen

Shots

Screen Shot Screen Shot

Screen Shot

Screen Shot

Screen Shot

Screen Shot Screen Shot

Screen Shot

Screen Shot

Screen Shot

Screen Shot Screen Shot Screen Shot

Screen Shot

Screen Shot

Screen Shot

Screen Shot

Screen Shot

Screen Shot

Screen Shot

Screen Shot Screen Shot

Screen Shot

Screen Shot

Average

Griswold Tower Software	TPT CONTRACTOR <sup>©</sup>	Twist, Plumb and Tension Software by GTS

Griswold Tower software	IF I CONTINACTOR	Twist, Fluitib and Terision Software by G13
Final Measurements		

Tension Values for Cables along Azimuth A - The 15° Leg Penn-Tech TM 1000-90

2

Next the dial readings

23

23.5

23.00

0.00

0.00

are recorded from 3

measurements.

22.5



Level

Number

12

11

10

ĹΩ

the

ı

⋖

Azimuth

for

Number

evel

3

300

150

150

**Final Measurements** 

Attachment Elev. (Ft)

Cable

Temp.

Req'd Dial /

Handle\*Block

Screen

**Shots** 

Screen Shot Screen Shot

Screen Shot Screen Shot

Screen Shot

Screen Shot

Screen Shot

Screen Shot

Screen Shot

Screen Shot

Screen Shot Screen Shot Screen Shot

When the "Screen Shot" button is pressed the

Screen Shot

Screen Shot

Screen Shot

Screen Shot

1,622

0

0

1,566

-132

-132

1,540

665

665

software provides the

next screen.

23.00

0.00

0.00

Average

Measured

**Tensions** 



**Back to Dashboard** 

Percent

Difference

1.7%

-119.9%

-119.9%



**Specified** 

**Tensions** 

Version 1.2.0

Tension @

60 Deg. F.

TPT CONTRACTOR <sup>©</sup>	Twist, Plumb and Tension Software by
-----------------------------	--------------------------------------

Griswold Tower Software	TPT CONTRACTOR®	Twist, Plumb and Tension Software by GTS	Griswold Towers

Tension Values for Cables along Azimuth A - The 15° Leg Penn-Tech TM 1000-90

Griswold Tower Software	IF I CONTINACTOR	TWIST, FIGHTO AND TENSION SOFTWARE BY G13

Left, Right

or Center

-

-

Center

Left

Right

34

22.7 / 3\*X

11.1 / 4\*X

11.1 / 4\*X

22.5

23

23.5

#### **Azimuth A Cable Information**



Date and Time	3/30/2011 9:36 AM
Level No.	2
Cable Size	3/8" Dia EHS 1x7 - (Orange)
Attachment Elev.	300
Left, Right or Center	Center
Temperature	34
Req'd Dial / Handle & Block	22.7 / 3*X
Average Dial Reading	23.0
Measured Tension	1,622
Measured Converted to 60 <sup>0</sup> F.	1,566
Specified Tension at 60 <sup>0</sup> F.	1,540
Percent Difference	1.69%

**Return to Tension Data Form** 

Twist, Plumb and Tension

Software by GTs

#### **Azimuth A Cable Information**



Date and Time	3/30/2011 9:36 AM
Level No.	2
Cable Size	3/8" Dia EHS 1x7 - (Orange)
Attachment Elev.	300
Left, Right or Center	Center
Temperature	34
Req'd Dial / Handle & Block	22.7 / 3*X
Average Dial Reading	23.0
Measured Tension	1,622
Measured Converted to 60 <sup>0</sup> F.	1,566
Specified Tension at 60 <sup>0</sup> F.	1,540
Percent Difference	1.69%

**Return to Tension Data Form** 

With this on the screen the laptop computer can be held next to the Tensionmeter and both photographed for inclusion in the report to the client or tower owner.

The Button in the lower right is pressed to return.



Level

Number

12

11

10

5

ı

⋖

Azimuth

for

Number

evel

3

300

150

150

Center

Left

Right

34

34

34

Final Measurements

Attachment

Elev. (Ft)

Left, Right

or Center

Reg'd Dial /

Handle\*Block

22.7 / 3\*X

10.1 / 4\*X

10.1 / 4\*X

22.5

10

10.5

Screen

**Shots** 

Screen Shot Screen Shot

Screen Shot Screen Shot

Screen Shot

Screen Shot Screen Shot Screen Shot

Screen Shot

Screen Shot

Screen Shot

Screen Shot Screen Shot Screen Shot

Screen Shot

Screen Shot Screen Shot Screen Shot

Screen Shot

Screen Shot

Screen Shot Screen Shot

Screen Shot

Screen Shot

1,622

740

764

1,566

683

707

1,540

665

665

1.7%

2.7%

6.3%

Average

Measured

**Tensions** 



**Back to Dashboard** 

Percent

Difference

TPT CONTRACTOR <sup>©</sup>	
-----------------------------	--

Cable

Temp.

2

The remaining dial

23

10

11

23.5

11

10.5

23.00

10.33

10.67

readings will be filled in

for the remaining cables

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----------------------------	--

Tension Values for Cables along Azimuth A - The 15° Leg Penn-Tech TM 1000-90

Specified

**Tensions** 

Version 1.2.0

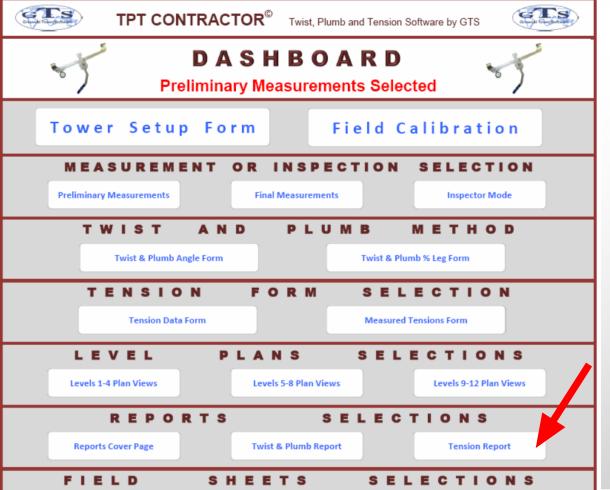
Tension @

60 Deg. F.

	Tension Values for Cables along Azimuth B - The 135° Leg													
	Level Attachment Left, Right Cable Req'd Dial / Penn-Tech TM 1000-90					)	Screen	Measured	Tension @	Specified	Percent			
	Number	Elev. (Ft)	or Center	Temp.	Handle*Block	1	2	3	Average	Shots	Tensions	60 Deg. F.	Tensions	Difference
	12	-	-		-				-	Screen Shot	-	-	-	-
	-	-	-		-				-	Screen Shot	-	-	-	-
g	11	-	-		-				-	Screen Shot	-	-	-	-
Leg	-	-	-		-				-	Screen Shot	-	-	-	-
5°	10	-	-		-				-	Screen Shot	-	-	-	-
3	-	-	-		-				-	Screen Shot	-	-	-	-
Level1	2	-	-		-				-	Screen Shot	-	-	-	-
ev	2	300	Center	34	23.4 / 3*X	24	25	24	24.33	Screen Shot	1,728	1,612	1,540	4.7%
7	-	-	-		-				-	Screen Shot	-	-	-	-
	1	150	Left	34	10.2 / 4*X	10	10.5	10	10.17	Screen Shot	728	660	665	-0.8%
	1	150	Right	34	10.2 / 4*X	10.5	11	10.5	10.67	Screen Shot	764	695	665	4.5%
	The values for Azimuth B are given above.  The values for Azimuth C are given below.  Clear All Data on This Form  Back to Dashboard  Back to Dashboard													
Fin	al Measu		ues for Az	zimuth (	C are given	below.			C	lear All Data	on This Forn	n	Back to Da	ashboard
Fin	al Measu		ues for Az		C are given			ılong A				n	Back to Da	ashboard
Fin	al Measu Level		Left, Right				Cables a	Ilong A:	zimuth (			Tension @	Back to Da	ashboard Percent
Fir		irements		Ten	sion Valu		Cables a		zimuth (	C - The 2	2 <b>55</b> ° Leg			
Fir	Level	Irements  Attachment	Left, Right	<b>Ten</b>	sion Valu	es for (	Cables a	TM 1000-90	zimuth (	C - The 2	255° Leg	Tension @	Specified	Percent
Fir	Level Number	Attachment Elev. (Ft)	Left, Right or Center	<b>Ten</b>	sion Valu Req'd Dial / Handle*Block	es for (	Cables a	TM 1000-90	zimuth (	C - The 2 Screen Shots	255° Leg Measured Tensions	Tension @ 60 Deg. F.	Specified Tensions	Percent Difference
	Level Number	Attachment Elev. (Ft)	Left, Right or Center	<b>Ten</b>	Req'd Dial / Handle*Block	es for (	Cables a	TM 1000-90	zimuth ( Average	C - The 2 Screen Shots	255° Leg Measured Tensions	Tension @ 60 Deg. F.	Specified Tensions	Percent Difference
Fir	Level Number 12	Attachment Elev. (Ft)	Left, Right or Center -	<b>Ten</b>	Req'd Dial / Handle*Block - -	es for (	Cables a	TM 1000-90	zimuth ( ) Average -	Screen Shots Screen Shot	255° Leg Measured Tensions -	Tension @ 60 Deg. F.	Specified Tensions - -	Percent Difference - -
eg	Level Number 12 - 11	Attachment Elev. (Ft)	Left, Right or Center - -	<b>Ten</b>	Req'd Dial / Handle*Block - -	es for (	Cables a	TM 1000-90	zimuth (  Average	Screen Shots Screen Shot Screen Shot	255° Leg  Measured Tensions	Tension @ 60 Deg. F. - -	Specified Tensions - -	Percent Difference - -
55° Leg	Level Number 12 - 11 - 10	Attachment Elev. (Ft)	Left, Right or Center - - -	<b>Ten</b>	Req'd Dial / Handle*Block - - -	es for (	Cables a	TM 1000-90	Average	Screen Shot	Measured Tensions	Tension @ 60 Deg. F	Specified Tensions	Percent Difference
55° Leg	Level Number 12 - 11 - 10 - 3	Attachment Elev. (Ft)	Left, Right or Center	<b>Ten</b>	Req'd Dial / Handle*Block	es for (	Cables a	TM 1000-90	Average	Screen Shot	Measured Tensions	Tension @ 60 Deg. F	Specified Tensions	Percent Difference
55° Leg	Level Number 12 - 11 - 10 - 3	Attachment Elev. (Ft)	Left, Right or Center	Ten Cable Temp.	Req'd Dial / Handle*Block	es for (	Penn-Tech	TM 1000-90	Average	Screen Shot	Measured Tensions	Tension @ 60 Deg. F	Specified Tensions	Percent Difference
55° Leg	Level Number 12 - 11 - 10 - 3 -	Attachment Elev. (Ft)  300	Left, Right or Center  Center	<b>Ten</b>	Req'd Dial / Handle*Block  23.0 / 3*X	es for (	Cables a	TM 1000-90	Average 24.50	Screen Shot	Measured Tensions  1,742	Tension @ 60 Deg. F.  1,656	Specified Tensions  1,540	Percent Difference  7.5%
5° Leg	Level Number 12 - 11 - 10 - 3 - 2	Attachment Elev. (Ft)  300	Left, Right or Center	Ten Cable Temp.	Req'd Dial / Handle*Block  23.0 / 3*X	es for (	Penn-Tech 2	TM 1000-90	Average	Screen Shot	Measured Tensions  1,742	Tension @ 60 Deg. F.  1,656	Specified Tensions  1,540	Percent Difference
55° Leg	Level Number 12 - 11 - 10 - 3 -	Attachment Elev. (Ft)  300	Left, Right or Center  Center	Ten Cable Temp.	Req'd Dial / Handle*Block  23.0 / 3*X	es for (	Penn-Tech	TM 1000-90	Average 24.50	Screen Shot	Measured Tensions  1,742	Tension @ 60 Deg. F.  1,656	Specified Tensions  1,540	Percent Difference  7.5%

Twist, Plumb and Tension

Software by GTs



### **Tension Report**

Press the "Tension Report" button to go to that report.



#### TPT CONTRACTOR® by GTS

#### **IETS Engineering Services**

129 Greenwich Road / Charlotte, NC 28211 Phone: (704) 522-1131 / Fax: (704) 522-1280



#### **GUY TENSION DATA - Final Measurements**

			<u> </u>									
	ETS Job No.	2011-70123					IETS En	nployee		Daniel Boone		
(	Client Name		,	Joe's Tower	s		Da	te	March 30, 2011			
	Site Name			Midland			PO Nu	mber			JT-334-GT-2	2011
	Site No.			334-GT			Temp	(F°)		In	put for each	cable
							Measureme	ent Device		Per	n-Tech TM	1000-90
				Tension	at Anchor	(Pounds)	Specified	% Differ	enc	e with S	Specified	
Cable Number	Wire Size	Anchor Number	Guy Elevation	15° Leg	135° Leg	255° Leg	Tensions (Pounds)	15° Leg	13	85° Leg	255° Leg	<u>RESULT</u>
12	No Cable					_	-	_	$\blacksquare$	-	-	
-	-	-		G	uy Tens	ion Rai	oort			-	-	
11	No Cable			O.	uy lelis	ion ite				-	-	
-	-	-	Thic	roport	ic auto	matical	lly gener	ated by	,	-	-	
10	No Cable		11115	report	is auto	matica	ily gellel	ateu by	′ [	-	-	
-	-	-	the	softwa	re.					-	-	
9	No Cable		CITC	3011114						-	-	
-	-	-								-	-	
8	No Cable									-	-	
-	-	-	Thic	nage	an he r	rinted	to a pdf	and		-	-	
7	No Cable		11113	page c	an be p	mitted	to a pai	ariu		-	-	
-	-	-	sen <sup>.</sup>	t to vou	ır client	:. This i	report is			-	-	
6	No Cable			•			•			-	-	
-	-	-	pre	pared II	n accor	dance v	with TIA-	222		-	-	
5	No Cable									-	-	
-	-		requ	uireme	1115.					-	-	
4	No Cable	_	-	-	-	-	-	-		-	-	
-	-	-	-	-	-	-	-	-		-	-	
3	No Cable		-	-	-	-	-	-		-	-	
-	-	-	-	-	-	-	-	-		-	-	
2	3/8" Dia EHS 1x7 -	1	300	1566	1612	1656	1540	1.7%	4	4.7%	7.5%	OK
-	-	-	-	-	-	-	-	-		-	-	
1	1/4" Dia EHS 1X7 -	1	150	683	660	666	665	2.7%	-/	-0.8%	0.1%	OK
1	1/4" Dia EHS 1X7 -	1	150	707	695	654	665	6.3%	1	4.5%	-1.7%	OK
	* Tension adjusted to equivalent 60°F temperature.											

Tension adjusted to equivalent 60°F temperature.

Twist, Plumb and Tension

Software by GTs

### **Level Plans Section**



Twist, Plumb and Tension

Software by GTs

# Measured Tensions, Twist, and Deflections for each Guy Level

The software provides additional information to assist in the field in the form of "Plan" views at each guy level. On each plan view the elevation, cable size, orientation of the guys relative to North, the "Measured Twist" and "Measured Deflections" of the tower are provided.

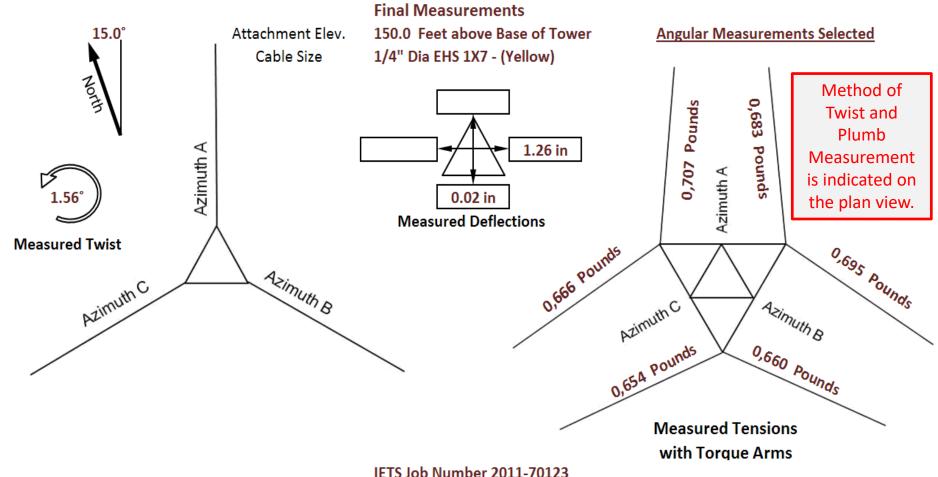
The tension of each of the cables at the Fan Plate, normalized to 60° F, are provided.





#### Guy Level 1 - Measured Tensions, Twist, and Deflections





Joe's Towers Site Name: Tim Smith Joe's Towers Site No.: 123 Rock Lane

3/30/2011

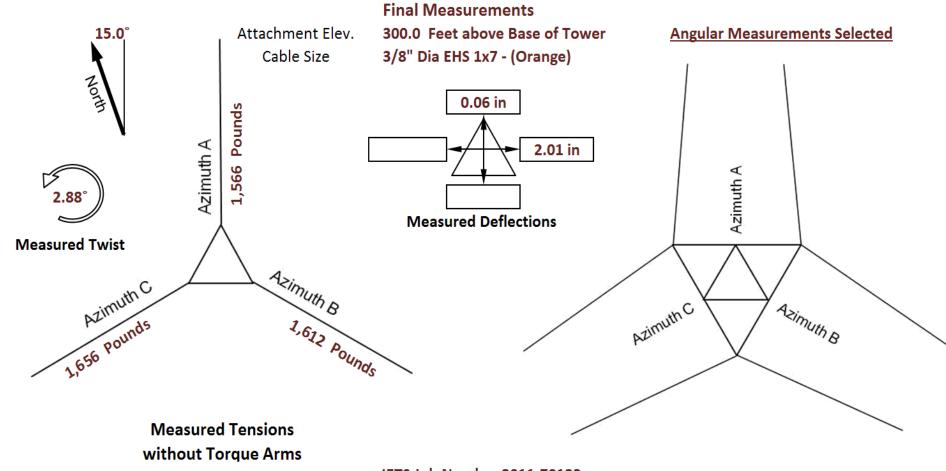
**Back to Dashboard** 

Note that the tension values for Guy Level 1 are shown on the plan with Torque Arms



#### Guy Level 2 - Measured Tensions, Twist, and Deflections





IETS Job Number 2011-70123
Joe's Towers Site Name: Tim Smith
Joe's Towers Site No.: 123 Rock Lane
3/30/2011

**Back to Dashboard** 

Note that the tension values for Guy Level 2 are shown on the plan without Torque Arms

Twist, Plumb and Tension

Software by GTs

# Measured Tensions, Twist, and Deflections for each Guy Level

The purpose of these individual plan views is to give information as to what the tower is doing if the twist and plumb are out of tolerance. Of course the same information is available even if the tower is within tolerance.

Levels 1 thru 4 are on a single form (tab).

Levels 5 thru 8 are on a single form (tab).

Levels 9 thru 12 are on a single form (tab).



Twist, Plumb and Tension

Software by GTs

### **Field Data Sheets**



Twist, Plumb and Tension

Software by GTs

### **Plumb and Twist Field Data Sheets**

Once the tower has been built on the "Tower Setup Form" the software provides 2 different field data sheets. One for Angular Measurement Method, and one for Percent of Leg Width Measurement Method. Either or both may be printed for use by the field crew.

### **Tension Field Data Sheets**

Once the tower has been built on the "Tower Setup Form" the software provides a Tension Field Data Sheet that can be printed for use by the field crew.



### **Plumb and Twist Field Data - Angular Method**



IETS Job No.	2011-70123
Client Name	Joe's Towers
Site Name	Midland
Site No.	334-GT

IETS Employee	Daniel Boone
Date	
Wind	
Temperature - F	

			D1 Readings			D2 Readings			D3 Readings		
	Level Number	Attachment Elev. (Ft)	Distance t	to Leg (Ft)		Distance	to Leg (Ft)		Distance	to Leg (Ft)	
			Deg	Min	Sec	Deg	Min	Sec	Deg	Min	Sec
	12										
	11	-									
	10										
တ္က	9										
ion	8	-									
vat	7	-									
Elevations	6										
Guy	5	-									
Q	4	-									
	3	-									
	2	300									
	1	150									

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### Plumb and Twist Field Data - % of Leg Width



IETS Job No.	2011-70123				
Client Name	Joe's Towers				
Site Name	Midland				
Site No.	334-GT				

IETS Employee	Daniel Boone
Date	
Wind	
Temperature - F	

			D1 Readings			D2 Readings			D3 Readings		
	Level Number	Attachment Elev. (Ft)	Distance t	to Leg (Ft)		Distance	to Leg (Ft)		Distance	to Leg (Ft)	
		(,	Leg Width	% of Width	Left or Right	Leg Width	% of Width	Left or Right	Leg Width	% of Width	Left or Right
	12										
	11	-									
	10	-									
<u>v</u>	9	-									
Elevations	8	-									
vat	7										
	6	-									
Guy	5										
٥	4	-									
	3	-									
	2	300									
	1	150									

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#### Tension Field Data using Penn-Tech TM 1000-90



IETS Job No.	2011-70123
Client Name	Joe's Towers
Site Name	Midland
Site No.	334-GT

IETS Employee	Daniel Boone
Date	
Wind	
Temperature - F°	

Penn-Tech TM 1000-90

Tension Equipment

	Level	Elev.	Left, Right	Cable Size	1	15° Penn-Teo	h TM 1000-9	0	1	35° Penn-Te	ch TM 1000-9	90	2	55° Penn-Te	ch TM 1000-	90
	Number	(Ft)	or Center	Cable Size	1	2	3	Temp	1	2	3	Temp	1	2	3	Temp
	12	-	-	No Cable												
ĺ	-	-	-	-												
	11	-	-	No Cable												
	-	-	-	-												
	10	-	-	No Cable												
	-	-	-	-												
	9	-	-	No Cable												
	-	-	-	-												
	8	-	-	No Cable												
	-	-	-	-												
Elevations	7	-	-	No Cable												
evat	-	-	-	-												
ij	6	-	-	No Cable												
Guy	-	-	-	-												
	5	-	-	No Cable												
	-	-	-	-												
	4	-	-	No Cable												
	-	-	-	-												
	3	-	-	No Cable												
	-	-	-	-												
	2	300	Center	3/8" Dia EHS 1x7 - (Orange)												
	-	-	-	-												
	1	150	Left	1/4" Dia EHS 1X7 - (Yellow)												
	1	150	Right	1/4" Dia EHS 1X7 - (Yellow)												

Twist, Plumb and Tension

Software by GTs

### **Tension Measurements without Tower Data**



Twist, Plumb and Tension

Software by GTs

### **Tension Measurements without Tower Data**

Sometimes you might need to take tension measurements on cables(s) but do not want to, or don't need to build the tower.

TPT Contractor provides a form specifically for this purpose. It is shown on the next slide.



Twist, Plumb and Tension

Software by GTs



#### TPT CONTRACTOR<sup>©</sup>

Twist, Plumb and Tension Software by GTS



Cable No.  Cable Size  Cable Size  Cable No.  Cable No.  Cable No.  Cable Size  Cable No.  Cable Size  Cable Size  Dial Readings Tension (Pounds)  Average  Tension (Pounds)  Tension (Pounds)  Notes  Notes												
	Cable Size			Dial Re	adings			of Drook	Notes			
140.		& Block	1	2	3	Average	(Founds)	Strength				
1	No Cable											
2	No Cable											
3	No Cable											
4	No Cable											
5	No Cable											
6	No Cable											
7	No Cable											
8	No Cable											
9	No Cable											
10	No Cable											
11	No Cable											
12	No Cable											
13	No Cable											
14	No Cable											
15	No Cable											



Twist, Plumb and Tension

Software by GTs

### **Tension Measurements without Tower Data**

This form works similar to the other forms in the software. When a cable size is selected the software displays the required handle position and block size. Once 3 dial readings have been recorded the software provides the average dial reading, the tension in the cable, and the percent of break strength. The form also provides a place for short notes for each cable. The software currently allows up to 15 individual cable tension tests on this one form.



Twist, Plumb and Tension

Software by GTs



TPT CONTRACTOR<sup>©</sup>

Twist, Plumb and Tension Software by GTS



				Measur	ed Tens	ions usin	g Penn-	Tech TN	/ 1000-90
Cable	Cable Size	Handle Position		Dial Re	eadings		Tension	Percent of Break	Notes
No.		& Block	1	2	3	Average	(Pounds)	Strength	
1	5/8" Dia EHS 1x19 - (Black)	3*L (	44	43	43	43.3	3,872	9.6%	This is an example of a measurement on a 5/8" 1x19 EHS Cable
2	No Cable								
3	No Cable								
4	No Cable								
5	No Cable								
6	No Cable								
7	No Cable				1		<b>'</b>		
8	No Cable			Inserte	d Intor	mation			
9	No Cable								
10	No Cable								
11	No Cable								
12	No Cable								
13	No Cable								
14	No Cable								
15	No Cable								



Twist, Plumb and Tension

Software by GTs



TPT CONTRACTOR<sup>©</sup>

Twist, Plumb and Tension Software by GTS



				Measur	ed Tensi	ions usin	ng Penn-	Tech TN	/I 1000-90
Cable	Cable Size	Handle Position		Dial Re	adings		Tension	Percent of Break	Notes
No.		& Block	1	2	3	Average	(Pounds)	Strength	110100
1	5/8" Dia EHS 1x19 - (Black)	3*L	44	43	43	43.3	3,872	9.6%	his is an example of a measurement on a 5/8" 1x19 EHS Cable
2	No Cable								
3	No Cable								
4	No Cable								
5	No Cable								
6	No Cable					Result			
7	No Cable								
8	No Cable								
9	No Cable								
10	No Cable								
11	No Cable								
12	No Cable								
13	No Cable								
14	No Cable								
15	No Cable								



Twist, Plumb and Tension

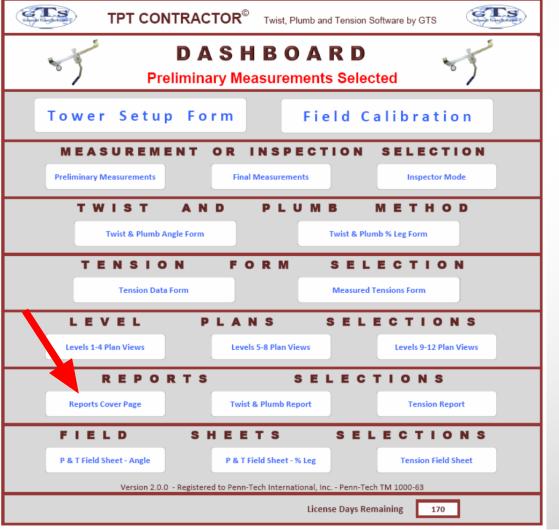
Software by GTs

### **Report Pages**



Twist, Plumb and Tension

Software by GTs



#### **Report Pages**

We previously covered the "Twist & Plumb Report" and the "Tension Report" automatically generated by TPT Contractor. The program also generates a "Reports Cover Page". Using the information provided in the Tower Setup form the report is addressed to your client, identifies the tower and work performed.





129 Greenwich Road Charlotte, NC 28211 (704) 522-1131

March 30, 2011

Tim Smith Joe's Towers

123 Rock Lane

Nowhere, NV 56567

Subject: Final Measurements Report of Twist, Plumb and Tension

Site Name: Site Number: 334-GT

Dear Tim Smith.

At your request and in accordance with your purchase order number JT-334-GT-2011, we at IETS Engineering Services are pleased to submit this Final Measurements Report of the Twist, Plumb and Tension for the 300 foot tall tower at the subject site. The Twist and Plumb information was gathered using Angular Measurements from all 3 leg azimuths. The tension values were measured using our Penn-Tech TM 1000-90 Tension Meter. This meter was last calibrated on 6/16/2011.

We at IETS Engineering Services appreciate the opportunity to provide our tower services for you and Joe's Towers. If you have any questions please give us a call at the number listed at the top of this page.

Sincerely,

**IETS Engineering Services** 

Bill Griswold

Attachments

Tension



### **Report Pages**

The Report Cover Page example shown on the left covers the Final Measurements on our 300 foot sample tower. Note the client's PO is referenced, what method was used to measure the twist and plumb, and the serial number of the Penn-Tech Tension Meter used. Your company logo is also placed on this and the other 2 reports.





March 30, 2011 IETS Engineering Se

Charlotte, NC 28211 (704) 522-1131

IETS Employee

DO Numba

ractor©

Tim Smith

Joe's Towers

123 Rock Lane

Nowhere, NV

IETS Job No.

Client Name

Cito Namo

TPT CONTRACTOR® by GTS

IETS Engineering Services

129 Greenwich Road / Charlotte, NC 28211 Phone: (704) 522-1131 / Fax: (704) 522-1280



Subject: Site Name: Tower Twist & Plumb Report - Final Measurements

 IET S Job No.
 2011-70123
 IET S Employee
 Daniel Boone

 Client Name
 Joe's Towers
 Date
 March 30, 2011

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Daniel Boone March 30, 2011

IT-33/LGT-2011

#### **GUY TENSION DATA - Final Measurements**

2011-70123

Joe's Towers

Midland

	Site Name			Midland			PO Nu	mber		JT-334-GT-2	2011	
	Site No.			334-GT			Temp	(F°)		put for each		
							Measureme	ent Device	Penn-Tech TM 1000-90			
				Tension	at Anchor (	Pounds)	Specified	% Differ	ence with S			
Cable Number	Wire Size	Anchor Number	Guy Elevation	15° Leg	135° Leg	255° Leg	Tensions (Pounds)	15° Leg	135° Leg	255° Leg	<u>RESULT</u>	
12	No Cable		-	-	-	-	-	-	-	-		
-	-	-	-	-	-	-	-	-	-	-		
11	No Cable		-	-	-	-	-	-	-	-		
-	-	-	-	-	-	-	-	-	-	-		
10	No Cable		-	-	-	-	-	-	-	-		
-	-	-	-	-	-	-	-	-	-	-		
9	No Cable		-	-	-	-	-	-	-	-		
-	-	-	-	-	-	-	-	-	-	-		
8	No Cable		-	-	-	-	-	-	-	-		
-	-	-	-	-	-	-	-	-	-	-		
7	No Cable		-	-	-	-	-	-	-	-		
-	-	-	-	-	-	-	-	-	-	-		
6	No Cable		-	-	-	-	-	-	-	-		
-	-	-	-	-	-	-	-	-	-	-		
5	No Cable		-	-	-	-	-	-	-	-		
-	-	-	-	-	-	-	-	-	-	-		
4	No Cable		-	-	-	-	-	-	-	-		
-	-	-	-	-	-	-	-	-	-	-		
3	No Cable		-	-	-	-	-	-	-	-		
-	-	-	-	-	-	-	-	-	-	-		
2	3/8" Dia EHS 1x7 -	1	300	1566	1612	1656	1540	1.7%	4.7%	7.5%	OK	
-	-	-	-	-	-	-	-	-	-	-		
1	1/4" Dia EHS 1X7 -	1	150	683	660	666	665	2.7%	-0.8%	0.1%	OK	
1	1/4" Dia EHS 1X7 -	1	150	707	695	654	665	6.3%	4.5%	-1.7%	OK	

#### \* Tension adjusted to equivalent 60°F temperature.

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Version 1.2.0

### **Report Pages**

With the "Report Cover Page", the "Twist and Plumb Report" and the "Tension Report", along with the "Screen Shots" taken at each guy cable, you have everything you need to provide your client with a complete and professional report of your services.





129 Greenwich Road

**IETS** Employee

PO Number

Charlotte, NC 28211 (704) 522-1131



Tim Smith

Joe's Towers

123 Rock Lane

Nowhere, NV

IETS Job No.

**Client Name** Site Name

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March 30, 2011

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Subject: Site Name: **Tower Twist & Plumb Report - Final Measurements** 

IETS Job No. Daniel Boone IET S Employee Joe's Towers March 30, 2011 Client Name

#### TPT CONTRACTOR® by GTS

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Daniel Boone

March 30, 2011

JT-334-GT-2011

#### **GUY TENSION DATA - Final Measurements**

2011-70123

Joe's Towers

Midland

	Site Mairie			Midialid			FONU	IIIDei		3 1-33 <del>4</del> -6 1-2	2011
	Site No.			334-GT			Temp	(F°)		put for each	
							Measureme	ent Device	Per	1000-90	
				Tension	at Anchor	(Pounds)	Specified	% Differ	rence with \$	Specified	
Cable Number	Wire Size	Anchor Number	Guy Elevation	15° Leg	135° Leg	255° Leg	Tensions (Pounds)	15° Leg	135° Leg	255° Leg	RESULT
12	No Cable		-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	-	
11	No Cable		-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	-	
10	No Cable		-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	-	
9	No Cable		-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	-	
8	No Cable		-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	-	
7	No Cable		-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	-	
6	No Cable		-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	-	
5	No Cable		-	-	-	-	-	-	-	-	
•	-	-	-		-	-	-	-	-	-	
4	No Cable		-	•	-	-	-	-	-	-	
-	-	-	-	•	-	-	-	-	-	-	
3	No Cable		-	-	-	-	-	-	-	-	
•	-	-	-	-	-	-	-	-	-	-	
2	3/8" Dia EHS 1x7 -	1	300	1566	1612	1656	1540	1.7%	4.7%	7.5%	OK
-	-	-	-	-	-	-	-	-	-	-	
1	1/4" Dia EHS 1X7 -	1	150	683	660	666	665	2.7%	-0.8%	0.1%	OK
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\* Tension adjusted to equivalent 60°F temperature.

Version 1.2.0

### **Report Pages**

Don't forget to save a copy of both the "Preliminary Reports" as well as the "Final Reports".



Twist, Plumb and Tension

Software by GTs

### **Background on Author and Questions**



Twist, Plumb and Tension

Software by GTs

### **Background**

TPT Contractor was developed by Bill Griswold, a professional structural engineer, registered in 40 states, with 43 years of experience. Mr. Griswold has been heavily involved in the tower industry for over 17 years, helping to develop many of the engineering standards in use today. Mr. Griswold is the President and Chief Engineer of Griswold Tower Software, PC an independent Structural Engineering Company that is available with assist contractors with their engineering needs. Mr. Griswold can be contacted at, <a href="mailto:BillGriswold@Live.com">BillGriswold@Live.com</a>



Twist, Plumb and Tension

Software by GTs

### Questions

- For questions regarding TPT Contractor please contact Tom Hedberg, President of Penn-Tech International, Inc.
- Email address <u>pti@ptii.net</u>
- Phone (484) 395-0145 Office
   (484) 431-2156 Mobile



Twist, Plumb and Tension

Software by GTs

### The End

