APPLICATION FOR HCAI SPECIAL SEISMIC CERTIFICATION PREAPPROVAL (OSP)

OFFICE USE ONLY

APPLICATION #: OSP-0289

HCAI Special Seismic Certification Preapproval (OSP)

Type: ☐ New ☒ Renewal

Manufacturer Information

Manufacturer: Tower Tech, Inc.

Manufacturer's Technical Representative: Barry Woods

Mailing Address: PO Box 891810, Oklahoma City, OK 73189

Telephone: (405) 979-2176 Email: bwoods@towertechusa.com

Product Information

Product Name: Cooling Towers

Product Type: NA

Product Model Number: Multiple, see attachment

General Description: Wet cooling tower providing heat transfer (removal) by evaporative cooling. Counterflow mechanical-draft cooling tower constructed of pultruded Fiber Reinforced Polymer (FRP) structural components.

Mounting Description: Rigid, Floor Mounted

Tested Seismic Enhancements: Seismic enhancements made to the test units and/or modifications required to address anomalies during the tests shall be incorporated into the production units.

Applicant Information

Applicant Company Name: W.E. Gundy & Associates, Inc.

Contact Person: Travis Soppe

Mailing Address: 1199 Shoreline Drive, Suite 310, Boise, ID 83702

Telephone: (208) 342-5989 Email: tsoppe@wegai.com

Title: President

California Licensed Structural Engineer Responsible for the Engineering and Test Report(s)

Company Name: W.E. GUNDY & ASOCIATES INC.

Name: Travis Soppe California License Number: S6115

Mailing Address: P.O. Box 9121, Boise, ID 83707

Telephone: (208) 342-5989 Email: tsoppe@wegai.com

Certification Method

☐ GR-63-Core ☒ ICC-ES AC156 ☐ IEEE 344 ☐ IEEE 693 ☐ NEBS 3

☐ Other (Please Specify):

Testing Laboratory

Company Name: Pacific Earthquake Engineering Research Center (PEER)

Contact Person: Amarnath Kasalanati

Mailing Address: 1301 South 46th St., Bldg. 420, Richmond CA 94720-1729

Telephone: (510) 642-3437 Email: Amarnath1@berkeley.edu

Seismic Parameters

Design Basis of Equipment or Components (F_p/W_p) = 1.88 @ z/h=1 and 1.00 @ z/h=0 (Tall legs: 1ft to 8ft); 2.03 @ z/h=1 and 1.15 @ z/h=0 (Short legs: 1ft or less)

S_{DS} (Design spectral response acceleration at short period, g) = 1.25 @ z/h=1 and 2.00 @ z/h=0 (Tall legs: 1ft to 8 ft); 1.35 @ z/h=1 and 2.30 @ z/h=0 (Short legs: 1ft or less)

a_p (Amplification factor) = 2.5

R_p (Response modification factor) = 3.0

Ω_0 (System overstrength factor) = 2.0

I_p (Importance factor) = 1.5

z/h (Height ratio factor) = 1 and 0

Natural frequencies (Hz) = See Attachment

Overall dimensions and weight = See Attachment

HCAI Approval (For Office Use Only) - Approval Expires on 06/20/2029

Date: 6/20/2023

Name: Mohammad Karim Title: Supervisor, Health Facilities

Special Seismic Certification Valid Up to: S_{DS} (g) = See Above z/h = See Above

Condition of Approval (if applicable):

Table 1	TOWER TECH COOLING TOWERS CERTIFIED PRODUCT LINE MATRIX	WEGAI W.E. GUNDY & ASSOCIATES, INC. STRUCTURAL & EARTHQUAKE ENGINEERING

Tower Configurations with Short Support Legs ≤ 1ft - S_{DS} = 2.3 at z / h = 0 and 1.35 at z / h = 1.0

Model Number	Fan Information			General Dimensions (in)			Max Operating Weight (lbs)	Representative UUT
	# Fans	HP	kW	Width	Length	Height		
TTXR-i21930	2	6.0	4.4	84	162	144	7,950	
TTXL-i21930	2	6.0	4.4	84	162	144	8,090	
TTXR-i21950	2	10.0	7.4	84	162	144	7,950	
TTXL-i21950	2	10.0	7.4	84	162	144	8,090	
TTXL-i21975	*2*	*15.0*	*11.2*	*84*	*168*	*144*	*7,910*	*UUT-1B*
TTXR-i21975	2	15.0	11.2	84	162	144	7,950	
TTXR-i31930	3	9.0	6.6	84	231	144	11,180	
TTXL-i31930	3	9.0	6.6	84	231	144	11,310	
TTXR-i31950	3	15.0	11.1	84	231	144	11,180	
TTXL-i31950	3	15.0	11.1	84	231	144	11,310	
TTXR-i31975	3	22.5	16.8	84	231	144	11,180	
TTXL-i31975	3	22.5	16.8	84	231	144	11,310	
TTXR-i41930	4	12.0	8.8	84	300	144	14,500	
TTXL-i41930	4	12.0	8.8	84	300	144	14,630	
TTXR-i41950	4	20.0	14.8	84	300	144	14,500	
TTXL-i41950	4	20.0	14.8	84	300	144	14,630	
TTXR-i41975	4	30.0	22.4	84	300	144	14,500	
TTXL-i41975	4	30.0	22.4	84	300	144	14,630	
TTXR-41930	4	12.0	8.8	144	162	144	12,510	
TTXL-41930	4	12.0	8.8	144	162	144	11,910	
TTXR-41950	4	20.0	14.8	144	162	144	12,510	
TTXL-41950	4	20.0	14.8	144	162	144	11,910	
TTXR-41975	4	30.0	22.4	144	162	144	12,510	
TTXL-41975	4	30.0	22.4	144	162	144	11,910	
TTXR-i51930	5	15.0	11.0	84	369	144	17,830	
TTXL-i51930	5	15.0	11.0	84	369	144	17,960	
TTXR-i51950	5	25.0	18.5	84	369	144	17,830	
TTXL-i51950	5	25.0	18.5	84	369	144	17,960	
TTXR-i51975	5	37.5	28.0	84	369	144	17,830	

Notes:

[1)] Model numbers begining with ' i ' represent inline construction of the fans with all other units constructed with two rows of fans. The first digit in the model number identifies the number of fans in the tower (2, 3, 4, 5, 6, and 8). The last four digits in the model number identifies the fan type (1930, 1950, and 1975). Note that UUT-2 and UUT-3 are 8 fan models and contained all three fan types, 2 - 1930's, 2 - 1950's, 4 - 1975's.

[2)] Cooling towers are constructed of pultruded FRP material.

Table 1	TOWER TECH COOLING TOWERS CERTIFIED PRODUCT LINE MATRIX	WEGAI W.E. GUNDY & ASSOCIATES, INC. STRUCTURAL & EARTHQUAKE ENGINEERING

Tower Configurations with Short Support Legs ≤ 1ft - S_{DS} = 2.3 at z / h = 0 and 1.35 at z / h = 1.0

Model Number	Fan Information			General Dimensions (in)			Max Operating Weight (lbs)	Representative UUT
	# Fans	HP	kW	Width	Length	Height		
TTXL-i51975	5	37.5	28.0	84	369	144	17,960	
TTXR-61930	6	18.0	13.2	144	231	144	17,420	
TTXL-61930	6	18.0	13.2	144	231	144	17,550	
TTXR-61950	6	30.0	22.2	144	231	144	17,320	
TTXL-61950	6	30.0	22.2	144	231	144	17,450	
TTXR-61975	6	45.0	33.6	144	231	144	17,320	
TTXL-61975	6	45.0	33.6	144	231	144	17,450	
TTXR-81930	8	24.0	17.6	144	300	144	21,520	
TTXL-81930	8	24.0	17.6	144	300	144	22,200	
TTXR-81950	8	40.0	29.6	144	300	144	21,520	
TTXL-81950	8	40.0	29.6	144	300	144	22,200	
TTXR-81975	8	60.0	44.8	144	300	144	21,520	
TTXL-81975	*8*	*46.0*	*44.8*	*144*	*306*	*144*	*22,200*	*UUT-2B*

Notes:

[1)] Model numbers begining with ' i ' represent inline construction of the fans with all other units constructed with two rows of fans. The first digit in the model number identifies the number of fans in the tower (2, 3, 4, 5, 6, and 8). The last four digits in the model number identifies the fan type (1930, 1950, and 1975). Note that UUT-2 and UUT-3 are 8 fan models and contained all three fan types, 2 - 1930's, 2 - 1950's, and 4 - 1975's.

[2)] Cooling towers are constructed of pultruded FRP material.

Table 2	TOWER TECH COOLING TOWERS CERTIFIED PRODUCT LINE MATRIX	WEGAI W.E. GUNDY & ASSOCIATES, INC. STRUCTURAL & EARTHQUAKE ENGINEERING

Tower Configurations with Tall Support Legs: 1ft to 8ft - S_{DS} = 2.0 at z / h = 0 and 1.25 at z / h = 1.0

Model Number	Fan Information			General Dimensions (in)			Max Operating Weight (lbs)	Representative UUT
	# Fans	HP	kW	Width	Length	Height		
TTXR-i21930	2	6.0	4.4	84	162	180, 204, 228	8,950	
TTXL-i21930	2	6.0	4.4	84	162	180, 204, 228	9,090	
TTXR-i21950	2	10.0	7.4	84	162	180, 204, 228	8,950	
TTXL-i21950	2	10.0	7.4	84	162	180, 204, 228	9,090	
TTXR-i21975	2	15.0	11.2	84	162	180, 204, 228	8,950	
TTXL-i21975	*2*	*15.0*	*11.2*	*84*	*168*	*228*	*8,910*	*UUT-1A*
TTXR-i31930	3	9.0	6.6	84	231	180, 204, 228	12,280	
TTXL-i31930	3	9.0	6.6	84	231	180, 204, 228	12,410	
TTXR-i31950	3	15.0	11.1	84	231	180, 204, 228	12,280	
TTXL-i31950	3	15.0	11.1	84	231	180, 204, 228	12,410	
TTXR-i31975	3	22.5	16.8	84	231	180, 204, 228	12,280	
TTXL-i31975	3	22.5	16.8	84	231	180, 204, 228	12,410	
TTXR-i41930	4	12.0	8.8	84	300	180, 204, 228	15,600	
TTXL-i41930	4	12.0	8.8	84	300	180, 204, 228	15,730	
TTXR-i41950	4	20.0	14.8	84	300	180, 204, 228	15,600	
TTXL-i41950	4	20.0	14.8	84	300	180, 204, 228	15,730	
TTXR-i41975	4	30.0	22.4	84	300	180, 204, 228	15,600	
TTXL-i41975	4	30.0	22.4	84	300	180, 204, 228	15,730	
TTXR-41930	4	12.0	8.8	144	162	180, 204, 228	13,610	
TTXL-41930	4	12.0	8.8	144	162	180, 204, 228	13,010	
TTXR-41950	4	20.0	14.8	144	162	180, 204, 228	13,610	
TTXL-41950	4	20.0	14.8	144	162	180, 204, 228	13,010	
TTXR-41975	4	30.0	22.4	144	162	180, 204, 228	13,610	
TTXL-41975	4	30.0	22.4	144	162	180, 204, 228	13,010	
TTXR-i51930	5	15.0	11.0	84	369	180, 204, 228	18,930	
TTXL-i51930	5	15.0	11.0	84	369	180, 204, 228	19,060	
TTXR-i51950	5	25.0	18.5	84	369	180, 204, 228	18,930	
TTXL-i51950	5	25.0	18.5	84	369	180, 204, 228	19,060	
TTXR-i51975	5	37.5	28.0	84	369	180, 204, 228	18,930	

Notes:

[1] Model numbers begining with ' i ' represent inline construction of the fans with all other units constructed with two rows of fans. The first digit in the model number identifies the number of fans in the tower (2, 3, 4, 5, 6, and 8). The last four digits in the model number identifies the fan type (1930, 1950, and 1975). Note that UUT-2 and UUT-3 are 8 fan models and contained all three fan types, 2 - 1930's, 2 - 1950's, and 4 - 1975's.

[2] Cooling towers are constructed of pultruded FRP material.

Table 2	TOWER TECH COOLING TOWERS CERTIFIED PRODUCT LINE MATRIX	WEGAI W.E. GUNDY & ASSOCIATES, INC. STRUCTURAL & EARTHQUAKE ENGINEERING

Tower Configurations with Tall Support Legs: 1ft to 8ft - S_{DS} = 2.0 at z / h = 0 and 1.25 at z / h = 1.0

Model Number	Fan Information			General Dimensions (in)			Max Operating Weight (lbs)	Representative UUT
	# Fans	HP	kW	Width	Length	Height		
TTXL-i51975	5	37.5	28.0	84	369	180, 204, 228	19,060	
TTXR-61930	6	18.0	13.2	144	231	180, 204, 228	18,520	
TTXL-61930	6	18.0	13.2	144	231	180, 204, 228	18,650	
TTXR-61950	6	30.0	22.2	144	231	180, 204, 228	18,520	
TTXL-61950	6	30.0	22.2	144	231	180, 204, 228	18,650	
TTXR-61975	6	45.0	33.6	144	231	180, 204, 228	18,520	
TTXL-61975	6	45.0	33.6	144	231	180, 204, 228	18,650	
TTXR-81930	8	24.0	17.6	144	300	180, 204, 228	23,400	
TTXL-81930	8	24.0	17.6	144	300	180, 204, 228	24,290	
TTXR-81950	8	40.0	29.6	144	300	180, 204, 228	23,400	
TTXL-81950	8	40.0	29.6	144	300	180, 204, 228	24,290	
TTXR-81975	8	60.0	44.8	144	300	180, 204, 228	23,400	
TTXL-81975	*8*	*46.0*	*44.8*	*144*	*306*	*228*	*23,400*	*UUT-3A*

Notes:

[1)] Model numbers begining with ' i ' represent inline construction of the fans with all other units constructed with two rows of fans. The first digit in the model number identifies the number of fans in the tower (2, 3, 4, 5, 6, and 8). The last four digits in the model number identifies the fan type (1930, 1950, and 1975). Note that UUT-2 and UUT-3 are 8 fan models and contained all three fan types, 2 - 1930's, 2 - 1950's, and 4 - 1975's.

[2)] Cooling towers are constructed of pultruded FRP material.

Table 3	TOWER TECH TTXL SERIES COOLING TOWERS CERTIFIED SUBCOMPONENT MATRIX					WEGAI W.E. GUNDY & ASSOCIATES, INC. STRUCTURAL & EARTHQUAKE ENGINEERING
60 Hz Fan Models						
Model	**Multiwing Fan Part Number**	**Baldor Motor Part Number**	**HP**	**VOLTS**	**Weight (lbs)**	**Representative UUT**
TTXL-xx1930 TTXR-xx1930	57.5/3-6/30º/PPG/7WR	77H119W100	3Hp	230/460	267	UUT-2B, UUT-3A
TTXL-xx1950 TTXR-xx1950	57.5/6-6/29º/PPG/7WR	77H112W104H2	5Hp	230/460	294	UUT-2B, UUT-3A
TTXL-xx1975 TTXR-xx1975	57.5/8-8/29º/PPG/7WR	77H112W094	7.5Hp	230/460	303	UUT-1A, UUT-1B, UUT-2B, UUT-3A
CONTROL PANEL						
Model	**Description / Material / Manufacturer**	**Enclosure Width**	**Enclosure Length**	**Enclosure Height**	**Weight (lbs)**	**Representative UUT**
T9900	10" PLC / NEMA1 Enclosure / DK Controls	8"	30"	36"	na	UUT-2B, UUT-3A
DRIFT ELIMINATOR & FILL MEDIA						
Model	**Description / Material / Manufacturer**	**Width**	**Length**	**Height**	**Weight (lbs)**	**Representative UUT**
CF1900	Fill Media / Plastic PVC / Brentwood	12"	72"	12"	10.8	UUT-1A, UUT-1B, UUT-2B, UUT-3A
DE-080	Drift Eliminator / Plastic PVC / Brentwood	12"	36"	5.5"	3.7	UUT1-A, UUT-1B, UUT-2B, UUT-3A
COLLECTORS						
Model	**Description / Material / Manufacturer**	**Width**	**Length**	**Height**	**Weight (lbs)**	**Representative UUT**
Collector	Water Collector / Plastic ABS / Tower Tech	72" - 132"	144" - 348"	14"	na	UUT-1A, UUT-1B, UUT-2B, UUT-3A
PVC PIPING						
Model	**Description / Material / Manufacturer**	**Diameter**	**SCH**	**Length**	**Weight (lbs)**	**Representative UUT**
4" SCH40 Pipe	Top tower water pipe / PVC / Generic	4"	40	Varies	Varies	Extrapolated
6" SCH40 Pipe	Top tower water pipe / PVC / Generic	6"	40	Varies	Varies	UUT-1A, UUT-1B, UUT-2B, UUT-3A
8" SCH40 Pipe	Top tower water pipe / PVC / Generic	8"	40	Varies	Varies	Interpolated
10" SCH40 Pipe	Top tower water pipe / PVC / Generic	10"	40	Varies	Varies	UUT-2B, UUT-3A
12" SCH40 Pipe	Top tower water pipe / PVC / Generic	12"	40	Varies	Varies	UUT-2B, UUT-3A

Table 3	TOWER TECH TTXL SERIES COOLING TOWERS CERTIFIED SUBCOMPONENT MATRIX					

ROTARY DISCONECT

Model	Description / Material / Manufacturer	Width	Length	Height	Weight (lbs)	Representative UUT
Rotary Disconnect	Electrical disconnect / PVC / Salzer USA	3"	4"	6"	na	UUT-1A, UUT-1B

SUMP BOX

Model	Description / Material / Manufacturer	Width	Length	Height	Weight (lbs)	Representative UUT
Sump Box	Sump Box / Plastic ABS / Tower Tech	28.25"	4"	36.5"	na	UUT-1A, UUT-1B

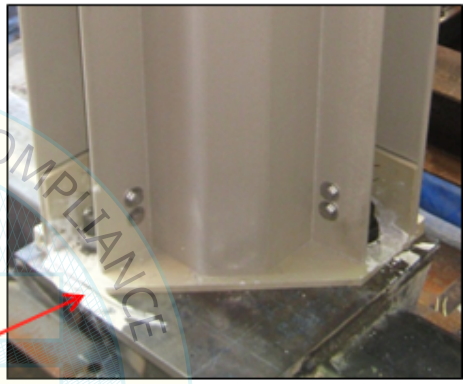
STRUCTURAL TOWER FRAME

Model	Description / Material / Manufacturer	Height x Width x Thick	Length	Weight (lbs)	Representative UUT
Basin	Side wall basin / Creative Pultrusions, Inc.	Pultruded 47" x 11.25" x 0.25"	64" - 340"	na	UUT-1A, UUT-1B, UUT-2B, UUT-3A
Cross Basin	Middle basin / Creative Pultrusions, Inc.	Pultruded 33.25" x 9.25" x 0.25"	64" or 124"	na	UUT-1A, UUT-1B, UUT-2B, UUT-3A
Top Wall	Side walls / Creative Pultrusions, Inc.	Pultruded 43.25" x 0.25"	64" - 340"	na	UUT-1A, UUT-1B, UUT-2B, UUT-3A
Mid Wall	Side walls / Creative Pultrusions, Inc.	Pultruded 47.25" x 0.25"	64" - 340"	na	UUT-1A, UUT-1B, UUT-2B, UUT-3A
Leg	Leg columns / Creative Pultrusions, Inc.	Pultruded 15" x 15" x 0.375"	15" - 100"	na	UUT-1A, UUT-1B, UUT-2B, UUT-3A
Brace	Square tube brace / Creative Pultrusions, Inc.	Pultruded 3.5" x 3.5" x 0.375"	55.5" - 83.5"	na	UUT-1A, UUT-1B, UUT-2B, UUT-3A

Notes:
Structural frames are pultruded Fiber Reinforced Polymer (FRP) with a minimum Lengthwise (LW) tensile strength of 35ksi @ 77^{o}F and a minimum Croswise (CW) tensile strength of 15ksi @ 77^{o}F.

UUT-1A	UNIT UNDER TEST (UUT) SUMMARY SHEET	WEGAI W.E. Gundy & Associates, Inc. Structural & Earthquake Engineering

Mounting Details: Cooling tower supported on 8ft legs and anchored to the foundation with 2 - 1" diameter anchor bolts on each leg.



Manufacturer: Tower Tech, Inc.	**Test Report:** 1259-01-R1	**Test Date:** May 2012

Product Line: TTXL & TTXR SERIES COOLING TOWERS

Identification Number: TTXL-i21975, SN 2012019-01

UUT Function: Wet cooling tower - Heat transfer (removal) by evaporative cooling

UUT Description: 2 Fan Inline Tower mounted on 8ft legs. Water mass was represented using sand bags placed on top of the collector system.

UUT Component Description: Tower constructed of pultruded FRP components, 2 - TTXL-xx1975 7.5Hp fans, CF1900 fill media, DE-080 drift eliminator, collector media, 6" SCH40 PVC piping, and rotary disconnects.

UUT PROPERTIES

Weight (lb)	Dimensions (inches)			Natural Fequency (Hz)		
	Width	Depth	Height	Short	Long	V
8,910	84	168	228	4.4	6.7	13.4

SEISMIC TEST PARAMETERS (Tested 05-19-2012)

Building Code / Test Criteria	S_{DS}	z / h	I_P	A_{FLX-H}	A_{RIG-H}	A_{FLX-V}	A_{RIG-V}
CBC 2022 / ICC-ES AC156	2.40	0.0	1.5	-	-	1.60	0.64
	1.50	1.0	1.5	2.40	1.80	-	-

Note: The unit was full of contents, including simulated water weight, during testing and remained fuctional before and after the ICC-ES AC156 test. The unit maintained structural integrity during and after the ICC-ES AC156 Test.

UUT-1B	UNIT UNDER TEST (UUT) SUMMARY SHEET	WEGAI W.E. Gundy & Associates, Inc. Structural & Earthquake Engineering

Mounting Details: Cooling tower supported on 1ft legs and anchored to the foundation with 2 - 1" diameter anchor bolts on each leg.

Manufacturer: Tower Tech, Inc.	**Test Report:** 1259-01-R1	**Test Date:** May 2012

Product Line: TTXL & TTXR SERIES COOLING TOWERS

Identification Number: TTXL-i21975, SN 2012019-01

UUT Function: Wet cooling tower - Heat transfer (removal) by evaporative cooling

UUT Description: 2 Fan Inline Tower mounted on 1ft legs. Water mass was represented using sand bags placed on top of the collector system.

UUT Component Description: Tower constructed of pultruded FRP components, 2 - TTXL-xx1975 7.5Hp fans, CF1900 fill media, DE-080 drift eliminator, collector media, 6" SCH40 PVC piping, and rotary disconnects.

UUT PROPERTIES

Weight (lb)	Dimensions (inches)			Natural Fequency (Hz)		
	Width	Depth	Height	Short	Long	V
7,910	84	168	144	7.7	8.1	13.4

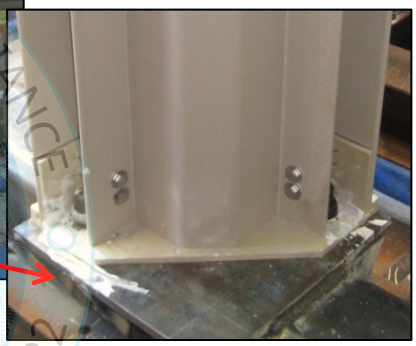
SEISMIC TEST PARAMETERS (Tested 05-19-2012)

Building Code / Test Criteria	S_{DS}	z / h	I_P	A_{FLX-H}	A_{RIG-H}	A_{FLX-V}	A_{RIG-V}
CBC 2022 / ICC-ES AC156	2.50	1.0	1.5	4.00	3.00	1.67	0.67

Note: The unit was full of contents, including simulated water weight, during testing and remained fuctional before and after the ICC-ES AC156 test. The unit maintained structural integrity during and after the ICC-ES AC156 Test.

UUT-2B	UNIT UNDER TEST (UUT) SUMMARY SHEET	WEGAI W.E. Gundy & Associates, Inc. Structural & Earthquake Engineering

Mounting Details: Cooling tower supported on 1ft legs and anchored to the foundation with 2 - 1" diameter anchor bolts on each leg.



Manufacturer: Tower Tech, Inc.	**Test Report:** 1259-01-R1	**Test Date:** May 2012

Product Line: TTXL & TTXR SERIES COOLING TOWERS

Identification Number: TTXL-081975, SN 2012018-01

UUT Function: Wet cooling tower - Heat transfer (removal) by evaporative cooling

UUT Description: 8 Fan Tower mounted on 1ft legs. Water mass was represented using sand bags placed on top of the collector system.

UUT Component Description: Tower constructed of pultruded FRP components, 2 - TTXL-xx1930 3Hp fans, 2 - TTXL-xx1950 5Hp fans, 4 - TTXL-xx1975 7.5Hp fans, T9900 control panel, CF1900 fill media, DE-080 drift eliminator, collector media, and 6"-10"-12" SCH40 PVC piping.

UUT PROPERTIES

Weight (lb)	Dimensions (inches)			Natural Fequency (Hz)		
	Width	Depth	Height	Short	Long	V
22,200	144	306	144	3.9	5.4	10.7

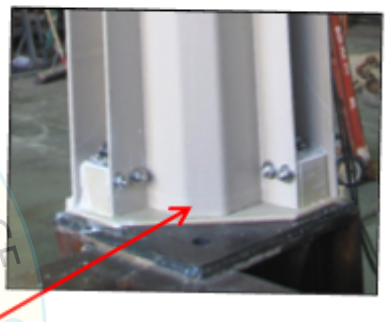
SEISMIC TEST PARAMETERS (Tested 05-22-2012)

Building Code / Test Criteria	S_{DS}	z / h	I_P	A_{FLX-H}	A_{RIG-H}	A_{FLX-V}	A_{RIG-V}
CBC 2022 / ICC-ES AC156	2.30	0.0	1.5	-	-	1.53	0.62
	1.35	1.0	1.5	2.16	1.62	-	-

Note: The unit was full of contents, including simulated water weight, during testing and remained fuctional before and after the ICC-ES AC156 test. The unit maintained structural integrity during and after the ICC-ES AC156 Test.

UUT-3A	UNIT UNDER TEST (UUT) SUMMARY SHEET	WEGAI W.E. Gundy & Associates, Inc. Structural & Earthquake Engineering

Mounting Details: Cooling tower supported on 8ft legs and anchored to the foundation with 2 - 1" diameter anchor bolts on each leg.



Manufacturer: Tower Tech, Inc.	**Test Report:** 1259-01-R1	**Test Date:** January 2013

Product Line: TTXL & TTXR SERIES COOLING TOWERS

Identification Number: TTXL-081975, SN 2012053-01

UUT Function: Wet cooling tower - Heat transfer (removal) by evaporative cooling

UUT Description: 8 Fan Tower mounted on 8ft legs. Water mass was represented using rock salt placed in the water basins.

UUT Component Description: Tower constructed of pultruded FRP components, 2 - TTXL-xx1930 3Hp fans, 2 - TTXL-xx1950 5Hp fans, 4 - TTXL-xx1975 7.5Hp fans, T9900 control panel, CF1900 fill media, DE-080 drift eliminator, collector media, and 6"-10"-12" SCH40 PVC piping.

UUT PROPERTIES

Weight (lb)	Dimensions (inches)			Natural Fequency (Hz)		
	Width	Depth	Height	Short	Long	V
23,400	144	306	228	3.3	3.7	21.7

SEISMIC TEST PARAMETERS (Tested 01-29-2013)

Building Code / Test Criteria	S_{DS}	z / h	I_P	A_{FLX-H}	A_{RIG-H}	A_{FLX-V}	A_{RIG-V}
CBC 2022 / ICC-ES AC156	2.00	0.0	1.5	-	-	1.34	0.54
	1.25	1.0	1.5	2.00	1.50	-	-

Note: The unit was full of contents, including simulated water weight, during testing and remained fuctional before and after the ICC-ES AC156 test. The unit maintained structural integrity during and after the ICC-ES AC156 Test.