



**OFFICE OF STATEWIDE HEALTH PLANNING AND DEVELOPMENT
FACILITIES DEVELOPMENT DIVISION**

**APPLICATION FOR OSHPD SPECIAL SEISMIC
CERTIFICATION PREAPPROVAL (OSP)**

OFFICE USE ONLY

APPLICATION #: **OSP – 0289 – 10**

OSHPD Special Seismic Certification Preapproval (OSP)

Type: New Renewal

Manufacturer Information

Manufacturer: Tower Tech, Inc.

Manufacturer's Technical Representative: Barry Woods, PE

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

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

Product Information

Product Name: TTXL and TTXR Series Cooling Towers

Product Type: Pultruded FRP Cooling Tower

Product Model Number: Multiple, see attachment

(List all unique product identification numbers and/or part numbers)

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. Seismic enhancements made to the test units and modifications required to address anomalies observed during the tests shall be incorporated into the production units.

Mounting Description: Rigid floor mounted

Applicant Information

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

Contact Person: Travis Soppe, SE

Mailing Address: 250 Bobwhite Ct, Suite 100, Boise, ID 83706

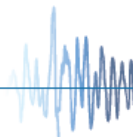
Telephone: (208) 342-5898 Ext. 115 Email: tsoppe@wegai.com

I hereby agree to reimburse the Office of Statewide Health Planning and Development review fees in accordance with the California Administrative Code, 2016.

Signature of Applicant:  Date: 09-14-2016

Title: Vice President Company Name: W.E. Gundy & Associates, Inc.

"Access to Safe, Quality Healthcare Environments that Meet California's Diverse and Dynamic Needs"





**OFFICE OF STATEWIDE HEALTH PLANNING AND DEVELOPMENT
FACILITIES DEVELOPMENT DIVISION**

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

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

Name: Travis Soppe, SE California License Number: S6115

Mailing Address: 205 Bobwhite Ct, Suite 100, Boise, ID 83706

Telephone: (208) 342-5898 Ext. 115 Email: tsoppe@wegai.com

Supports and Attachments Preapproval

- Supports and attachments are preapproved under OPM- _____
(Separate application for OSHPD Preapproval of Manufacturer's Certification (OPM) of Supports and attachments is required)
- Supports and attachments are not preapproved

Certification Method

- Testing in accordance with: ICC-ES AC156
- Other (Please Specify): _____

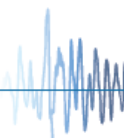
Testing Laboratory

Company Name: UC Berkeley-PEER

Contact Name: Clément Barthès

Mailing Address: 1301 S. 46th Street, Building 420, Richmond, CA 94804

Telephone: (510) 665-2136 Email: clementbarthes@berkeley.edu





**OFFICE OF STATEWIDE HEALTH PLANNING AND DEVELOPMENT
FACILITIES DEVELOPMENT DIVISION**

Seismic Parameters

Design in accordance with ASCE 7-10 Chapter 13: Yes No

Design Basis of Equipment or Components (F_p/W_p) = 1.88 @ z/h=1 and 1.00 @ z/h=0 (Tall legs > 1ft)
2.03 @ z/h=1 and 1.15 @ z/h=0 (Short legs ≤ 1ft)

S_{DS} (Design spectral response acceleration at short period, g) = 1.25 @ z/h=1 and 2.00 @ z/h=0 (Tall legs > 1ft)
1.35 @ z/h=1 and 2.30 @ z/h=0 (Short legs ≤ 1ft)

a_p (In-structure equipment or component amplification factor) = 2.5

R_p (Equipment or component response modification factor) = 3.0

Ω_0 (System overstrength factor) = 2.0

I_p (Importance factor) = 1.5

z/h (Height factor ratio) = Varies 1.0 and 0

Equipment or Component Natural Frequencies (Hz) = Varies – see attached matrix

Overall dimensions and weight (or range thereof) = Varies – see attached matrix

Equipment or Components @ grade designed in accordance with ASCE 7-10 Chapter 15: Yes No

Design Basis of Equipment or Components (V/W) = _____

S_{DS} (Design spectral response acceleration at short period, g) = _____

S_{D1} (Design spectral response acceleration at 1 second period, g) = _____

R (Response modification coefficient) = _____

Ω_0 (System overstrength factor) = _____

C_d (Deflection amplification factor) = _____

I_p (Importance factor) = 1.5

Height to Center of Gravity above base = _____

Equipment or Component Natural Frequencies (Hz) = _____

Overall dimensions and weight (or range thereof) = _____

Tank(s) designed in accordance with ASME BPVC, 2015: Yes No

List of Attachments Supporting Special Seismic Certification

Test Report(s) Drawings Calculations Manufacturer's Catalog

Other(s) (Please Specify): _____

OSHPD Approval (For Office Use Only) – Approval Expires on December 31, 2022

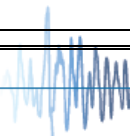
Signature:  Date: 11/29/2016

Print Name: M. R. Karim Title: SHFR

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

Condition of Approval (if applicable): _____

Access to Safe, Quality Healthcare Environments that Meet California's Diverse and Dynamic Needs



TOWER TECH COOLING TOWERS CERTIFIED PRODUCT LINE MATRIX



| Model Number | Fan Information | | | General Dimensions (ft) | | | Operating Weight (lbs) | Representative UUT |
|--------------|-----------------|------|------|-------------------------|--------|--------------------|------------------------|--------------------|
| | # Fans | HP | kW | Width | Length | Variable Height | | |
| TTXR-i21930 | 2 | 6.0 | 4.4 | 84 | 162 | 144, 180, 204, 228 | 8470-9470 | |
| TTXL-i21930 | 2 | 6.0 | 4.4 | 84 | 162 | 144, 180, 204, 228 | 8610-9610 | |
| TTXR-i21950 | 2 | 10.0 | 7.4 | 84 | 162 | 144, 180, 204, 228 | 8470-9470 | |
| TTXL-i21950 | 2 | 10.0 | 7.4 | 84 | 162 | 144, 180, 204, 228 | 8610-9610 | |
| TTXR-i21975 | 2 | 15.0 | 11.2 | 84 | 162 | 144, 180, 204, 228 | 8470-9470 | |
| TTXL-i21975 | 2 | 15.0 | 11.2 | 84 | 162 | 144, 180, 204, 228 | 8610-9610 | UUT-1A, UUT-1B |
| TTXR-i31930 | 3 | 9.0 | 6.6 | 84 | 231 | 144, 180, 204, 228 | 11790-12990 | |
| TTXL-i31930 | 3 | 9.0 | 6.6 | 84 | 231 | 144, 180, 204, 228 | 11930-13130 | |
| TTXR-i31950 | 3 | 15.0 | 11.1 | 84 | 231 | 144, 180, 204, 228 | 11790-12990 | |
| TTXL-i31950 | 3 | 15.0 | 11.1 | 84 | 231 | 144, 180, 204, 228 | 11930-13130 | |
| TTXR-i31975 | 3 | 22.5 | 16.8 | 84 | 231 | 144, 180, 204, 228 | 11790-12990 | |
| TTXL-i31975 | 3 | 22.5 | 16.8 | 84 | 231 | 144, 180, 204, 228 | 11930-13130 | |
| TTXR-i41930 | 4 | 12.0 | 8.8 | 84 | 300 | 144, 180, 204, 228 | 15200-16500 | |
| TTXL-i41930 | 4 | 12.0 | 8.8 | 84 | 300 | 144, 180, 204, 228 | 15340-16640 | |
| TTXR-i41950 | 4 | 20.0 | 14.8 | 84 | 300 | 144, 180, 204, 228 | 15200-16500 | |
| TTXL-i41950 | 4 | 20.0 | 14.8 | 84 | 300 | 144, 180, 204, 228 | 15340-16640 | |
| TTXR-i41975 | 4 | 30.0 | 22.4 | 84 | 300 | 144, 180, 204, 228 | 15200-16500 | |
| TTXL-i41975 | 4 | 30.0 | 22.4 | 84 | 300 | 144, 180, 204, 228 | 15340-16640 | |
| TTXR-41930 | 4 | 12.0 | 8.8 | 144 | 162 | 144, 180, 204, 228 | 13195-14395 | |
| TTXL-41930 | 4 | 12.0 | 8.8 | 144 | 162 | 144, 180, 204, 228 | 12560-13760 | |
| TTXR-41950 | 4 | 20.0 | 14.8 | 144 | 162 | 144, 180, 204, 228 | 13195-14395 | |
| TTXL-41950 | 4 | 20.0 | 14.8 | 144 | 162 | 144, 180, 204, 228 | 12560-13760 | |
| TTXR-41975 | 4 | 30.0 | 22.4 | 144 | 162 | 144, 180, 204, 228 | 13195-14395 | |
| TTXL-41975 | 4 | 30.0 | 22.4 | 144 | 162 | 144, 180, 204, 228 | 12560-13760 | |
| TTXR-i51930 | 5 | 15.0 | 11.0 | 84 | 369 | 144, 180, 204, 228 | 18725-20025 | |
| TTXL-i51930 | 5 | 15.0 | 11.0 | 84 | 369 | 144, 180, 204, 228 | 18860-20160 | |
| TTXR-i51950 | 5 | 25.0 | 18.5 | 84 | 369 | 144, 180, 204, 228 | 18725-20025 | |
| TTXL-i51950 | 5 | 25.0 | 18.5 | 84 | 369 | 144, 180, 204, 228 | 18860-20160 | |
| TTXR-i51975 | 5 | 37.5 | 28.0 | 84 | 369 | 144, 180, 204, 228 | 18725-20025 | |
| TTXL-i51975 | 5 | 37.5 | 28.0 | 84 | 369 | 144, 180, 204, 228 | 18860-20160 | |
| TTXR-61930 | 6 | 18.0 | 13.2 | 144 | 231 | 144, 180, 204, 228 | 18290-19590 | |
| TTXL-61930 | 6 | 18.0 | 13.2 | 144 | 231 | 144, 180, 204, 228 | 18430-19730 | |

Notes:

¹⁾ Model numbers beginning 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.

TOWER TECH COOLING TOWERS CERTIFIED PRODUCT LINE MATRIX



| Model Number | Fan Information | | | General Dimensions (ft) | | | Operating Weight (lbs) | Representative UUT |
|--------------|-----------------|------|------|-------------------------|--------|--------------------|------------------------|--------------------|
| | # Fans | HP | kW | Width | Length | Variable Height | | |
| TTXR-61950 | 6 | 30.0 | 22.2 | 144 | 231 | 144, 180, 204, 228 | 19590-19590 | |
| TTXL-61950 | 6 | 30.0 | 22.2 | 144 | 231 | 144, 180, 204, 228 | 18430-19730 | |
| TTXR-61975 | 6 | 45.0 | 33.6 | 144 | 231 | 144, 180, 204, 228 | 18290-19590 | |
| TTXL-61975 | 6 | 45.0 | 33.6 | 144 | 231 | 144, 180, 204, 228 | 18430-19730 | |
| TTXR-81930 | 8 | 24.0 | 17.6 | 144 | 300 | 144, 180, 204, 228 | 23480-24780 | |
| TTXL-81930 | 8 | 24.0 | 17.6 | 144 | 300 | 144, 180, 204, 228 | 24400-25700 | UUT-2B, UUT-3A |
| TTXR-81950 | 8 | 40.0 | 29.6 | 144 | 300 | 144, 180, 204, 228 | 23480-24780 | |
| TTXL-81950 | 8 | 40.0 | 29.6 | 144 | 300 | 144, 180, 204, 228 | 24400-25700 | UUT-2B, UUT-3A |
| TTXR-81975 | 8 | 60.0 | 44.8 | 144 | 300 | 144, 180, 204, 228 | 23480-24780 | |
| TTXL-81975 | 8 | 60.0 | 44.8 | 144 | 300 | 144, 180, 204, 228 | 24400-25700 | UUT-2B, UUT-3A |

Notes:

¹⁾ Model numbers beginning 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.

**TOWER TECH TTXL SERIES COOLING TOWERS
CERTIFIED SUBCOMPONENT MATRIX**



60 Hz Fan Models

| Model | Multiwing Fan Part Number | Baldor Motor Part Number | HP | VOLTS | Weight (lbs) | Representative UUT |
|----------------------------|-----------------------------------|--------------------------|-------|---------|--------------|--|
| TTXL-xx1930 TTXR-xx1930 | 57.5/3-6/30 ⁰ /PPG/7WR | 77H119W100 | 3Hp | 230/460 | 267 | UUT-2A, UUT-2B, UUT-3A |
| TTXL-xx1950 TTXR-xx1950 | 57.5/6-6/29 ⁰ /PPG/7WR | 77H112W104H2 | 5Hp | 230/460 | 294 | UUT-2A, UUT-2B, UUT-3A |
| TTXL-xx1975 TTXR-xx1975 | 57.5/8-8/29 ⁰ /PPG/7WR | 77H112W094 | 7.5Hp | 230/460 | 303 | UUT1-A, UUT-1B, UUT-2A, 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-2A, 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 | UUT1-A, UUT-1B, UUT-2A, UUT-2B, UUT-3A |
| DE-080 | Drift Eliminator / Plastic PVC / Brentwood | 12" | 36" | 5.5" | 3.7 | UUT1-A, UUT-1B, UUT-2A, 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 | UUT1-A, UUT-1B, UUT-2A, 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 | UUT1-A, UUT-1B, UUT-2A, 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-2A, UUT-2B, UUT-3A |
| 12" SCH40 Pipe | Top tower water pipe / PVC / Generic | 12" | 40 | Varies | Varies | UUT-2A, UUT-2B, UUT-3A |

**TOWER TECH TTXL SERIES COOLING TOWERS
CERTIFIED SUBCOMPONENT MATRIX**



ROTARY DISCONNECT

| 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 | UUT1-A, UUT-1B, UUT-2A, UUT-2B, UUT-3A |
| Cross Basin | Middle basin / Creative Pultrusions, Inc. | Pultruded 33.25" x 9.25" x 0.25" | 64" or 124" | na | UUT1-A, UUT-1B, UUT-2A, UUT-2B, UUT-3A |
| Top Wall | Side walls / Creative Pultrusions, Inc. | Pultruded 43.25" x 0.25" | 64" - 340" | na | UUT1-A, UUT-1B, UUT-2A, UUT-2B, UUT-3A |
| Mid Wall | Side walls / Creative Pultrusions, Inc. | Pultruded 47.25" x 0.25" | 64" - 340" | na | UUT1-A, UUT-1B, UUT-2A, UUT-2B, UUT-3A |
| Leg | Leg columns / Creative Pultrusions, Inc. | Pultruded 15" x 15" x 0.375" | 15" - 100" | na | UUT1-A, UUT-1B, UUT-2A, 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 | UUT1-A, UUT-1B, UUT-2A, UUT-2B, UUT-3A |

Notes:

Structural frames are pultruded Fiber Reinforced Polymer (FRP) with a minimum Lengthwise (LW) tensile strength of 35ksi @ 77°F and a minimum Crosswise (CW) tensile strength of 15ksi @ 77°F.

UUT-1A

**UNIT UNDER TEST (UUT)
SUMMARY SHEET**



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.

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 Frequency (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 2013 / ICC-ES AC156 | 2.40 | 0.0 | 1.5 | 2.40 | 0.96 | 1.60 | 0.64 |
| | 1.50 | 1.0 | 1.5 | 2.40 | 1.80 | 1.00 | 0.41 |

Note: The unit was full of contents, including simulated water weight, during testing and remained functional 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**

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.

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 Frequency (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 2013 / ICC-ES AC156 | 2.50 | 1.0 | 1.5 | 4.00 | 3.00 | 1.67 | 0.67 |

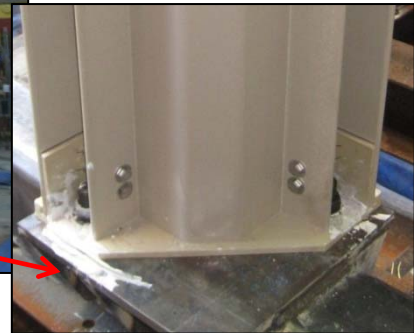
Note: The unit was full of contents, including simulated water weight, during testing and remained functional before and after the ICC-ES AC156 test. The unit maintained structural integrity during and after the ICC-ES AC156 Test.

UUT-2B

**UNIT UNDER TEST (UUT)
SUMMARY SHEET**



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.

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 Frequency (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 2013 / ICC-ES AC156 | 2.30 | 0.0 | 1.5 | 2.30 | 0.92 | 1.53 | 0.62 |
| | 1.35 | 1.0 | 1.5 | 2.16 | 1.62 | 0.90 | 0.36 |

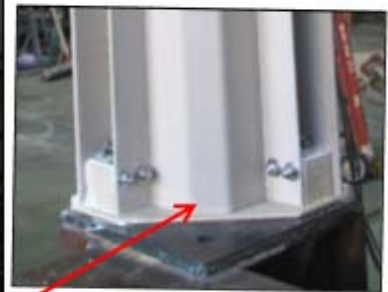
Note: The unit was full of contents, including simulated water weight, during testing and remained functional before and after the ICC-ES AC156 test. The unit maintained structural integrity during and after the ICC-ES AC156 Test.

UUT-3A

**UNIT UNDER TEST (UUT)
SUMMARY SHEET**



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.

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 Frequency (Hz) | | |
|-------------|---------------------|-------|--------|------------------------|------|------|
| | Width | Depth | Height | Short | Long | V |
| 23,400 | 84 | 168 | 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 2013 / ICC-ES AC156 | 2.00 | 0.0 | 1.5 | 2.00 | 0.80 | 1.34 | 0.54 |
| | 1.25 | 1.0 | 1.5 | 2.00 | 1.50 | 0.84 | 0.34 |

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