



**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

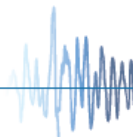
Telephone: (208) 342-5898 Ext. 115 Email: tsoppe@wegai.com

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): \_\_\_\_\_

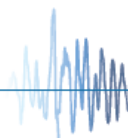
**Testing Laboratory**

Company Name: UC Berkeley-PEER

Contact Name: Clément Barthès

Mailing Address: 1301 S. 46<sup>th</sup> 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

$\Omega_0$  (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) = \_\_\_\_\_

$\Omega_0$  (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

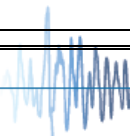
Print Name: M. R. Karim Title: SHFR

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

Condition of Approval (if applicable): \_\_\_\_\_

\_\_\_\_\_

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## 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:**

<sup>1)</sup> 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.

<sup>2)</sup> 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:**

<sup>1)</sup> 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.

<sup>2)</sup> 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 <sup>0</sup> /PPG/7WR	77H119W100	3Hp	230/460	267	UUT-2A, UUT-2B, UUT-3A
TTXL-xx1950 TTXR-xx1950	57.5/6-6/29 <sup>0</sup> /PPG/7WR	77H112W104H2	5Hp	230/460	294	UUT-2A, UUT-2B, UUT-3A
TTXL-xx1975 TTXR-xx1975	57.5/8-8/29 <sup>0</sup> /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

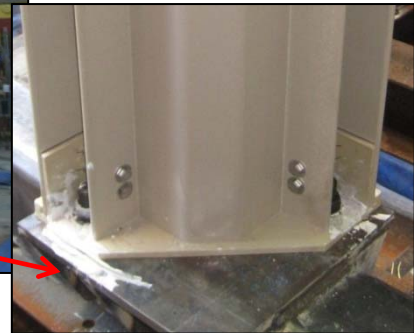
**SEISMIC TEST PARAMETERS (Tested 05-19-2012)**

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

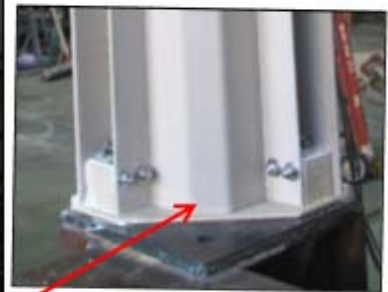
Note: The unit was full of contents, including simulated water weight, during testing and remained functional before and after the ICC-ES AC156 test. The unit maintained structural integrity during and after the ICC-ES AC156 Test.

**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.