APPLICATION FOR OSHPD SPECIAL SEISMIC CERTIFICATION PREAPPROVAL (OSP)

OFFICE USE ONLY	
APPLICATION #:	OSP – 0352 – 10

OSHPD Special Seismic Certification Preapproval (OSP)

Type: ☒ New ☐ Renewal

Manufacturer Information

Manufacturer: Titus HVAC (Air System Components)

Manufacturer's Technical Representative: Trenton Yarbrough

Mailing Address: 605 Shiloh Road, Plano TX 75074

Telephone: 972-212-4815 Email: tyarbrough@titus-hvac.com

Product Information

Product Name: Single Duct & Series Fan Powered

Product Type: Air Terminal Units

Product Model Number: Single Duct (PESV, EESV, AESV, DESV) & Series Fan Powered (PTFS, ATFS, DTFS, PTFS-A, ATFS-A, DTFS-A, PTFS-G, ATFS-G, DTFS-G, PTFS-F, ATFS-F, DTFS-F)
(List all unique product identification numbers and/or part numbers)

General Description: Suspended cataloged terminal units. 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: Rigidly suspended units & Vibration Isolated suspended units, restrained with seismic cable kits.

Applicant Information

Applicant Company Name: The VMC Group

Contact Person: John Giuliano

Mailing Address: 113 Main Street, Bloomingdale, NJ 07403

Telephone: 973-838-1780 Email: john.giuliano@thevmcgroup.com

I hereby agree to reimburse the Office of Statewide Health Planning and Development review fees in accordance with the California Administrative Code, 2013.

Signature of Applicant: Date: 8/8/13

Title: President Company Name: The VMC Group

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

Company Name: The VMC Group

Name: Kenneth Tarlow California License Number: SE2851

Mailing Address: 113 Main St, Bloomingdale, NJ 07403

Telephone: 973-838-1780 Email: ken.tarlow@thevmcgroup.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

Contact Name: Wesley Neighbour

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

Telephone: 510-665-3409 Email: wdn@berkeley.com

Seismic Parameters

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

Design Basis of Equipment or Components (F_p/W_p) = 4.50 (Vibration Isolated Suspended) or 1.5 (Rigid Suspended)

S_{DS} (Design spectral response acceleration at short period, g) = 2.00

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

R_p (Equipment or component response modification factor) = 2.0 (Vibration Isolated Suspended) or 6.0 (Rigid Suspended)

Ω_0 (System overstrength factor) = 2.5

I_p (Importance factor) = 1.5

z/h (Height factor ratio) = 1.0

Equipment or Component Natural Frequencies (Hz) = See Attachments

Overall dimensions and weight (or range thereof) = See Attachments

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, 2010: ☐ 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, 2019

Signature: _____ Date: 3/3/2014

Print Name: M. R. Karim Title: SHFR

Special Seismic Certification Valid Up to : S_{DS} (g) = 2.0 z/h = 1.0

Condition of Approval (if applicable): _____

Titus Air Terminal Units
Certified Product Table

Table 1 - Cabinet Sizes

Product Family	Model	Unit Size	Inlet Size (in)	Height (in)	Width (in)	Max Depth (in)	Max Weight (lbs)	Mounting Configuration: Suspended w/ Isolators	Mounting Configuration: Suspended Rigidly	S_{DS}	z/h	UUT
Series Fan Powered	TFS-A	A	6	10.5	48	21	120	X	X	2.00	1.00	1
	TFS & TFS-F	B	6	16	43	37	180	X	X	2.00	1.00	2
			8	16	43	37	180	X	X	2.00	1.00	interpolated
			10	16	43	37	180	X	X	2.00	1.00	interpolated
			12	16	43	37	180	X	X	2.00	1.00	3
		C	6	16	43	37	185	X	X	2.00	1.00	interpolated
			8	16	43	37	185	X	X	2.00	1.00	interpolated
			10	16	43	37	185	X	X	2.00	1.00	interpolated
			12	16	43	37	185	X	X	2.00	1.00	interpolated
		D	10	20	47.5	39	260	X	X	2.00	1.00	interpolated
			12	20	47.5	39	260	X	X	2.00	1.00	interpolated
			14	20	47.5	39	260	X	X	2.00	1.00	interpolated
			16	20	47.5	39	260	X	X	2.00	1.00	interpolated
		E	12	20	47.5	39	260	X	X	2.00	1.00	4
			14	20	47.5	39	260	X	X	2.00	1.00	interpolated
			16	20	47.5	39	260	X	X	2.00	1.00	5
	TFS-G	G	16	18	52	39	240	X	X	2.00	1.00	extrapolated
Single Duct	ESV	na	4	8	15.5	12	23	X	X	2.00	1.00	extrapolated
			5	8	15.5	12	23	X	X	2.00	1.00	extrapolated
			6	8	15.5	12	23	X	X	2.00	1.00	extrapolated
			7	10	15.5	12	25	X	X	2.00	1.00	extrapolated
			8	10	15.5	12	25	X	X	2.00	1.00	6
			9	12.5	15.5	14	30	X	X	2.00	1.00	interpolated
			10	12.5	15.5	14	30	X	X	2.00	1.00	interpolated
			12	15	16	15.5	35	X	X	2.00	1.00	interpolated
			14	17.5	20	15.5	35	X	X	2.00	1.00	interpolated
			16	18	24	15.5	47	X	X	2.00	1.00	interpolated
			24x16	18	38	15.5	74	X	X	2.00	1.00	7

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Titus Air Terminal Units
Certified Product Subcomponent Tables

Table 2 - Certified External Sheeting

EXTERIOR Wall/Roof/Floor Panel Material	Thickness	UUT
Galvanized Carbon Steel	20 ga	1,2,3,4,5,6,7

Table 3 - Certified Liners

Material	UUT
No Liner	extrapolated
Standard 1/2"	1, 6
1"	2
Steriloc	3
Ultraloc	7
FibreFree	interpolated
EcoShield 1"	interpolated
EcoShield Foil 1/2"	interpolated
EcoShield Foil 1"	interpolated
EcoShield 1/2"	4, 5

Table 4a - Certified Hydronic Coils

	Height (in)	Width (in)	MFR	Model Number	UUT
Dimensions	10"	12"	Great American Coil	W4-1087	6
	10"	18-1/2"		interpolated	interpolated
	12 1/2"	20-1/2"		W4-7165	2
	12 1/2"	20-1/2"		interpolated	interpolated
	17-1/2"	25"		W4-1372	4
	17-1/2"	25"		interpolated	interpolated
	18"	38"		W4-1080	7

Table 4b - Certified Hydronic Coil Options

		UUT
Casing Material	Galvanized Carbon Steel	2,4,6,7
Tube Material	Copper	2,4,6,7
Tube Outer Diameter	0.5"	2,4,6,7
Tube Wall Thickness	0.032"	2,4,6,7
Fin Material	Aluminum	2,4,6,7
Fin Thickness	0.0045"	2,4,6,7
Fin Pitch	10	2,4,6,7
	12	extrapolated
Pipe Qty	2	2,4,6,7
Tube Rows	1	2, 6
	2	4, 7
	3	extrapolated
	4	extrapolated
Header Material	Copper	2,4,6,7

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Titus Air Terminal Units
Certified Product Subcomponent Tables

Table 5 - Fan Motor

Model	Phase	Rating [HP]	Voltage Rating	Weight	MFR	UUT
PSC	single	1/10	120, 208/240, 277	8.2	Regal Beloit	1 (208/240)
PSC	single	1/6	120, 208/240, 277	8.4	Regal Beloit	3 (277)
PSC	single	1/4	120, 208/240, 277	10.4	Regal Beloit	interpolated
ECM	single	1/3	120, 208/240, 277	10.4	Regal Beloit	2 (277)
PSC	single	1/3	120, 208/240, 277	12.2	Regal Beloit	interpolated
ECM	single	1/3	120, 208/240, 277	10.4	Regal Beloit	interpolated
ECM	single	1/2	120, 208/240, 277	12.2	Regal Beloit	interpolated
PSC	single	3/4	120, 208/240, 277	17.2	Regal Beloit	4 (120)
ECM	single	3/4	120, 208/240, 277	13.2	Regal Beloit	5 (277)

Table 6 - Housed Fans (Direct Drive) - All Manufactured by Lau Fans

	HP	0.10	0.17	0.25	0.33	0.50	0.75	UUT
	Motor Weight	8.2	8.4	10.4	12.2	12.2	17.2	
Fan Size (Dia - Width)		DD9-4A 12.8X12.5X6.8						1
Fan Weight		8.2						
Fan Size (Dia - Width)					DD9-4A 12.8X12.5X6.8			2
Fan Weight					8.2			
Fan Size (Dia - Width)			DD9-4A 12.8X12.5X6.8					3
Fan Weight			8.2					
Fan Size (Dia - Width)				DD10-4A 17.4X16.6X6.81	DD10-4A 17.4X16.6X6.81			interpolated
Fan Weight				9.5	9.5			
Fan Size (Dia - Width)					DD10-8A 17.4X16.6X10.5	DD10-8A 17.4X16.6X10.5		interpolated
Fan Weight					14.6	14.6		
Fan Size (Dia - Width)							DD10-10A 17.4X16.6X13.1	4,5
Fan Weight							17.8	

Wheel Material	UUT
Galvanized Carbon Steel	1,2,3,4,5

Housing Material	UUT
Galvanized Carbon Steel	1,2,3,4,5

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Titus Air Terminal Units
Certified Product Subcomponent Tables

Table 7a - Certified Flat Filter Racks

Type	Quantity	Frame Material Options	Dimensions [in]		MFR	UUT
			Width	Height		
Side Load	1	Galvanized Carbon Steel	16	10	KOCH/ FLANDERS	1
Side Load	1	Galvanized Carbon Steel	16	14		2,3
Side Load	1	Galvanized Carbon Steel	14	18		4,5

Table 7b - Flat Filter Media Options

Type	Filter Material	MFR	UUT
DISPOSABLE	FIBERGLASS	KOCH/FLANDERS	1, 2, 3, 4, 5

Table 8 - Certified Electric Heat

Code	Model Availability	Electric Coil				MFR	UUT
		Voltage	Phase	Stage	kW Range		
E11	TFS / TFS-F / ESV	120	1	1	0.5 - 13.0	Titus	Extrapolated
E12	TFS / TFS-F / ESV	120	1	2	0.5 - 13.0	Titus	Extrapolated
E13	TFS / TFS-F / ESV	120	1	3	0.5 - 13.0	Titus	Extrapolated
E21	TFS / TFS-F / ESV	208	1	1	0.5 - 13.0	Titus	Extrapolated
E22	TFS / TFS-F / ESV	208	1	2	0.5 - 13.0	Titus	Extrapolated
E23	**TFS** / TFS-F / ESV	208	1	3	0.5 - 13.0	Titus	1
E31	TFS / TFS-F / **ESV**	240	1	1	0.5 - 13.0	Titus	6
E32	TFS / TFS-F / ESV	240	1	2	0.5 - 13.0	Titus	Interpolated
E33	TFS / TFS-F / ESV	240	1	3	0.5 - 13.0	Titus	Interpolated
E41	**TFS** / TFS-F / ESV	277	1	1	0.5 - 13.0	Titus	5
E42	TFS / TFS-F / ESV	277	1	2	0.5 - 13.0	Titus	Interpolated
E43	**TFS** / TFS-F / ESV	277	1	3	0.5 - 13.0	Titus	3
E61	TFS / TFS-F / ESV	208	3	1	0.5 - 18.0	Titus	Interpolated
E62	TFS / TFS-F / ESV	208	3	2	0.5 - 18.0	Titus	Interpolated
E63	TFS / TFS-F / ESV	208	3	3	0.5 - 18.0	Titus	Interpolated
E71	TFS / TFS-F / ESV	240	3	1	0.5 - 18.0	Titus	Interpolated
E72	TFS / TFS-F / ESV	240	3	2	0.5 - 18.0	Titus	Interpolated
E73	TFS / TFS-F / ESV	240	3	3	0.5 - 18.0	Titus	Interpolated
E91	TFS / TFS-F / ESV	480	3	1	0.5 - 36.0	Titus	Interpolated
E92	TFS / TFS-F / ESV	480	3	2	0.5 - 36.0	Titus	Interpolated
E93	TFS / TFS-F / **ESV**	480	3	3	0.5 - 36.0	Titus	7

Notes
1) All heaters are sized in increments of 0.5 kW
2) SCR heat option also certified
2) UUT-01 was 4 kW
3) UUT-03 was 4 kW
4) UUT-05 was 11 kW SCR
5) UUT-06 was 7 kW
6) UUT-07 was 35 kW

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Titus Air Terminal Units
Certified Product Subcomponent Tables

Table 9 - Certified Controls

Type	Model Number	Height [in]	Width [in]	Depth [in]	Voltage	MFR	UUT
Pneumatic (actuator)	MCP-8031	4.25 dia	4.25 dia	5.5	N/A	Krueter/Titus	3, 6
Pneumatic (controller)	CSC-3004	3.5 dia	3.5 dia	4	N/A	Krueter/Titus	3
Pneumatic (controller)	CSC-3017	3.5	4.25	2	N/A	Krueter/Titus	6
Digital (controller / actuator)	BAC-8005-03	6.5	4.25	2.25	24	Titus	1,2,4,5,7

Table 10 - Certified Disconnect

Type	Model Number	Height [in]	Width [in]	Depth [in]	Amperes	Voltage	MFR	UUT
Non-fusable, 3 poles	ABBOTPN63EP	2.89	2.07	3.25	30 - 60	600	ABB	1, 2, 3, 4, 5

Table 11 - Certified Fusing

Type	Height [in]	Width [in]	Depth [in]	Amperes	Voltage	MFR	UUT
KLK, Fast Acting, Line Fuse	0.41	0.41	1.5	8	600	Little fuse	1
KLK, Fast Acting, Line Fuse	0.41	0.41	1.5	16	600	Little fuse	2
KLK, Fast Acting, Line Fuse	0.41	0.41	1.5	24	600	Little fuse	3
KLK, Fast Acting, Line Fuse	0.41	0.41	1.5	32	600	Little fuse	4
KLK, Fast Acting, Line Fuse	0.41	0.41	1.5	40	600	Little fuse	5

Table 12 - Certified Contactors

Type	Model Number	Height [in]	Width [in]	Depth [in]	HP	Voltage	MFR	UUT
Magnetic	3100-20Q334	2.44	1.63	3.25	11/16	277/480V	Hartland Cntrls	1
Magnetic	3100-20T334	2.44	1.63	3.25	11	120V	Hartland Cntrls	2,4,5
Magnetic	3100-20U334	2.44	1.63	3.25	11/16	277/480V	Hartland Cntrls	3

Table 13 - Certified Transformers

Type	Model Number	Height [in]	Width [in]	Depth [in]	VA	Voltage	MFR	UUT
AirCore Class 2	HCT-01D0BB06132	3.125	2.125	3.5	.07 or 50VA	120/24V	Hartland Cntrls	extrapolated
AirCore Class 2	HCT-03D0BB06132	3.125	2.125	3.5	.07 or 50VA	277/24V	Hartland Cntrls	3,5
AirCore Class 2	HCT-04D0BB06132	3.125	2.125	3.5	.07 or 50VA	480/24V	Hartland Cntrls	7
AirCore Class 2	HCT-09D0BB06132	3.125	2.125	3.5	.07 or 50VA	208/240/24V	Hartland Cntrls	1,6
AirCore Class 2	HCT-60D0BB06132	3.125	2.125	3.5	.07 or 50VA	24V/24V	Hartland Cntrls	1,6
AirCore Class 2	HCT-01J2BB07132	3.125	2.125	3.5	75VA	120/24V	Hartland Cntrls	1,6
AirCore Class 2	HCT-03J2BB07132	3.125	2.125	3.5	75VA	277/24V	Hartland Cntrls	1,6
AirCore Class 2	HCT-04J2BB07132	3.125	2.125	3.5	75VA	480/24V	Hartland Cntrls	1,6
AirCore Class 2	HCT-09J2BB07132	3.125	2.125	3.5	75VA	208/240/24V	Hartland Cntrls	1,6

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Titus Air Terminal Units
Certified Product Subcomponent Tables

Table 14 - Certified Relays

Type	Height [in]	Width [in]	Depth [in]	HP	Voltage	MFR	UUT
SPST	2.37	2.1	2.1	0.75	277V	Hartland Cntrls	1, 2, 3, 4, 5

Table 15 - Certified Airflow Switches

Type	Height [in]	Width [in]	Depth [in]	HP	Voltage	MFR	UUT
ElectroPneumatic	2.94	3.25	6.12	5.6	277V	Cleveland Controls	1,2,3,4,5,6,7

Table 16 - Certified Inductors

HP	Amperes	Voltage	MFR	Model Number	UUT
1/3	12	120 - 208/277	Tyco (Products Unlimited)	6673A	2
1/2	5.9	120 - 208/277	Tyco (Products Unlimited)	6683A	interpolated
3/4	5.5	120 - 208/277	Tyco (Products Unlimited)	7226	5
1	3	120 - 208/277	Tyco (Products Unlimited)	7227	extrapolated

Note: Used with ECM Motors only.

Table 17 - Certified Dampers

Unit Size	Height	Width	Qty	MFG	UUT
A06	5.875 dia	5.875 dia	1	Titus	1
B06	5.875 dia	5.875 dia	1		2
B12	11.875 dia	11.875 dia	1		3
E12	11.875 dia	11.875 dia	1		4
E16	15.875 dia	15.875 dia	1		5
8	7.875 dia	7.875 dia	1		6
24 X 16 (40)	16	24	1	Ruskin	7

Damper Material		UUT
Frame	Blades	
N/A	Galvanized Carbon Steel	1,2,3,4,5,6
Aluminum	Aluminum	7

Actuator MFR	UUT
ref table 9	1,2,3,4,5,6,7

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UUT #1a

Manufacturer: Titus

Model Series: TFS-A Unit A Size 6"

Cabinet Construction Summary:

Base:	20 Gauge galvanized carbon steel
Walls:	20 Gauge galvanized carbon steel
Roof:	20 Gauge galvanized carbon steel

Component Summary:

Item	Dimensions				Lowest Natural Frequency		
	Depth	Width	Height	Weight	F-B	S-S	V
Cabinet (Standard 1/2" Liner)	21"	48"	10.5"	100 lbs	na	na	na
Fan (DD9-4A)							
Filter (Fiberglass)							
Electric Heat (4kw, 3 stage)							
Control (Digital)							
Disconnect (Non Fusable, 3 Pole)							
Fuses (KLK, Fast Acting, Line Fuse)							
Contactors (Magnetic)							
Transformer (AirCore Class 2)							
Relays (SPST)							
Airflow Switch (Electro Pneumatic)							
Damper (5.875" dia, Galv Carbon Steel)							
Fan Speed Control (Adjustable SCR)							
Inlet Sensor							
Control Enclosure (NEMA 1)							

Seismic Test Parameters:

Qualification Method	Sds	z/h	Ip	Aflx-H	Arig-H	Aflx-V	Arig-V
ICC-ES AC156	2.00	1.0	1.5	3.20	2.40	1.33	0.53

Pre/Post Shake Functionality Test Results:

Pre:	PASSED
Post:	All units were filled with contents and maintained structural integrity.

UUT Mounting Description:

Vibration Isolated Suspended unit on (4) 1/2" ASTM-A307 rods, with VMC HRSA Vibration Isolator Hangers, (4) SB-250 (1/4") Seismic Cable Kits and (3 per rod) SRBC-1 Rod Stiffening Clamps. SB-250's are attached to structure using 5/8" hardware. SRBC-1s are fastened to L1x1x1/4 ASTM-A36 angle.

UUT #1b

Manufacturer: Titus

Model Series: TFS-A Unit A Size 6"

Cabinet Construction Summary:

Base:	20 Gauge galvanized carbon steel
Walls:	20 Gauge galvanized carbon steel
Roof:	20 Gauge galvanized carbon steel

Component Summary:

Item	Dimensions				Lowest Natural Frequency		
	Depth	Width	Height	Weight	F-B	S-S	V
Cabinet (Standard 1/2" Liner)	21"	48"	10.5"	100 lbs	na	na	na
Fan (DD9-4A)							
Filter (Fiberglass)							
Electric Heat (4kw, 3 stage)							
Control (Digital)							
Disconnect (Non Fusable, 3 Pole)							
Fuses (KLK, Fast Acting, Line Fuse)							
Contactors (Magnetic)							
Transformer (AirCore Class 2)							
Relays (SPST)							
Airflow Switch (Electro Pneumatic)							
Damper (5.875" dia, Galv Carbon Steel)							
Fan Speed Control (Adjustable SCR)							
Inlet Sensor							
Control Enclosure (NEMA 1)							

Seismic Test Parameters:

Qualification Method	Sds	z/h	Ip	Aflx-H	Arig-H	Aflx-V	Arig-V
ICC-ES AC156	2.00	1.0	1.5	3.20	2.40	1.33	0.53

Pre/Post Shake Functionality Test Results:

Pre:	PASSED
Post:	All units were filled with contents and maintained structural integrity.

UUT Mounting Description:

Rigidly Suspended unit on (4) 1/2" ASTM-A307 rods, with (4) SB-250 (1/4") Seismic Cable Kits and (3 per rod) SRBC-1 Rod Stiffening Clamps. SB-250's are attached to structure using 5/8" hardware. SRBC-1s are fastened to L1x1x1/4 ASTM-A36 angle.

UUT #2a

Manufacturer: Titus

Model Series: TFS Unit B Size 6"

Cabinet Construction Summary:

Base:	20 Gauge galvanized carbon steel
Walls:	20 Gauge galvanized carbon steel
Roof:	20 Gauge galvanized carbon steel

Component Summary:

Item	Dimensions				Lowest Natural Frequency		
	Depth	Width	Height	Weight	F-B	S-S	V
Cabinet (1" Liner)	37"	43"	16"	210 lbs	na	na	na
Coil (Hydronic)							
Fan (DD9-4A)							
Filter (Fiberglass)							
Control (Digital)							
Disconnect (Non Fusable, 3 Pole)							
Fuses (KLK, Fast Acting, Line Fuse)							
Contactors (Magnetic)							
Relays (SPST)							
Airflow Switch (Electro Pneumatic)							
Inductor (1/3hp, 12A)							
Damper (5.875" dia, Galv Carbon Steel)							
Fan Speed Control (Adjustable SCR)							
Inlet Sensor							
Control Enclosure (NEMA 1)							

Seismic Test Parameters:

Qualification Method	Sds	z/h	Ip	Aflx-H	Arig-H	Aflx-V	Arig-V
ICC-ES AC156	2.00	1.0	1.5	3.20	2.40	1.33	0.53

Pre/Post Shake Functionality Test Results:

Pre:	PASSED
Post:	All units were filled with contents and maintained structural integrity.

UUT Mounting Description:

Vibration Isolated Suspended unit on (4) 3/8" ASTM-A307 rods, with VMC HRSA Vibration Isolator Hangers, (4) SB-250 (1/4") Seismic Cable Kits and (3 per rod) SRBC-1 Rod Stiffening Clamps. SB-250's are attached to structure using 5/8" hardware. SRBC-1s are fastened to L1x1x1/4 ASTM-A36 angle.

UUT #2b

Manufacturer: Titus

Model Series: TFS Unit B Size 6"

Cabinet Construction Summary:

Base:	20 Gauge galvanized carbon steel
Walls:	20 Gauge galvanized carbon steel
Roof:	20 Gauge galvanized carbon steel

Component Summary:

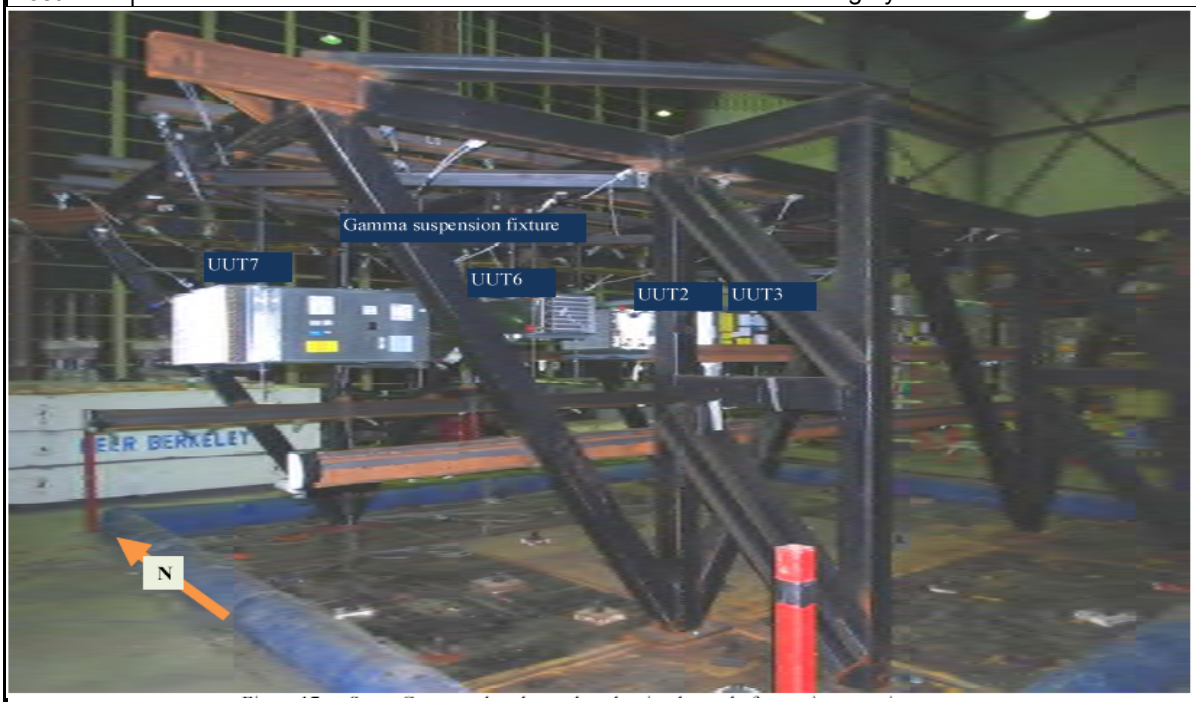
Item	Dimensions				Lowest Natural Frequency		
	Depth	Width	Height	Weight	F-B	S-S	V
Cabinet (1" Liner)	37"	43"	16"	210 lbs	na	na	na
Coil (Hydronic)							
Fan (DD9-4A)							
Filter (Fiberglass)							
Control (Digital)							
Disconnect (Non Fusable, 3 Pole)							
Fuses (KLK, Fast Acting, Line Fuse)							
Contactors (Magnetic)							
Relays (SPST)							
Airflow Switch (Electro Pneumatic)							
Inductor (1/3hp, 12A)							
Damper (5.875" dia, Galv Carbon Steel)							
Fan Speed Control (Adjustable SCR)							
Inlet Sensor							
Control Enclosure (NEMA 1)							

Seismic Test Parameters:

Qualification Method	Sds	z/h	Ip	Aflx-H	Arig-H	Aflx-V	Arig-V
ICC-ES AC156	2.00	1.0	1.5	3.20	2.40	1.33	0.53

Pre/Post Shake Functionality Test Results:

Pre:	PASSED
Post:	All units were filled with contents and maintained structural integrity.



UUT Mounting Description:

Rigidly Suspended unit on (4) 3/8" ASTM-A307 rods, with (4) SB-250 (1/4") Seismic Cable Kits and (3 per rod) SRBC-1 Rod Stiffening Clamps. SB-250's are attached to structure using 5/8" hardware. SRBC-1s are fastened to L1x1x1/4 ASTM-A36 angle.

UUT #3a

Manufacturer: Titus

Model Series: TFS Unit B Size 12"

Cabinet Construction Summary:

Base:	20 Gauge galvanized carbon steel
Walls:	20 Gauge galvanized carbon steel
Roof:	20 Gauge galvanized carbon steel

Component Summary:

Item	Dimensions				Lowest Natural Frequency		
	Depth	Width	Height	Weight	F-B	S-S	V
Cabinet (Steriloc Liner)	37"	43"	16"	200 lbs	na	na	na
Fan (DD9-4A)							
Filter (Fiberglass)							
Electric Heat (4kw, 3 stage)							
Control (Pneumatic)							
Disconnect (Non Fusable, 3 Pole)							
Fuses (KLK, Fast Acting, Line Fuse)							
Contactors (Magnetic)							
Transformer (AirCore Class 2)							
Relays (SPST)							
Airflow Switch (Electro Pneumatic)							
Damper (11.875" dia, Galv Carbon Steel)							
Fan Speed Control (Adjustable SCR)							
Inlet Sensor							
Control Enclosure (NEMA 1)							

Seismic Test Parameters:

Qualification Method	Sds	z/h	Ip	Aflx-H	Arig-H	Aflx-V	Arig-V
ICC-ES AC156	2.00	1.0	1.5	3.20	2.40	1.33	0.53

Pre/Post Shake Functionality Test Results:

Pre:	PASSED
Post:	All units were filled with contents and maintained structural integrity.

UUT Mounting Description:

Vibration Isolated Suspended unit on (4) 3/8" ASTM-A307 rods, with VMC HRSA Vibration Isolator Hangers, (4) SB-250 (1/4") Seismic Cable Kits and (3 per rod) SRBC-1 Rod Stiffening Clamps. SB-250's are attached to structure using 5/8" hardware. SRBC-1s are fastened to L1x1x1/4 ASTM-A36 angle.

UUT #3b

Manufacturer: Titus

Model Series: TFS Unit B Size 12"

Cabinet Construction Summary:

Base:	20 Gauge galvanized carbon steel
Walls:	20 Gauge galvanized carbon steel
Roof:	20 Gauge galvanized carbon steel

Component Summary:

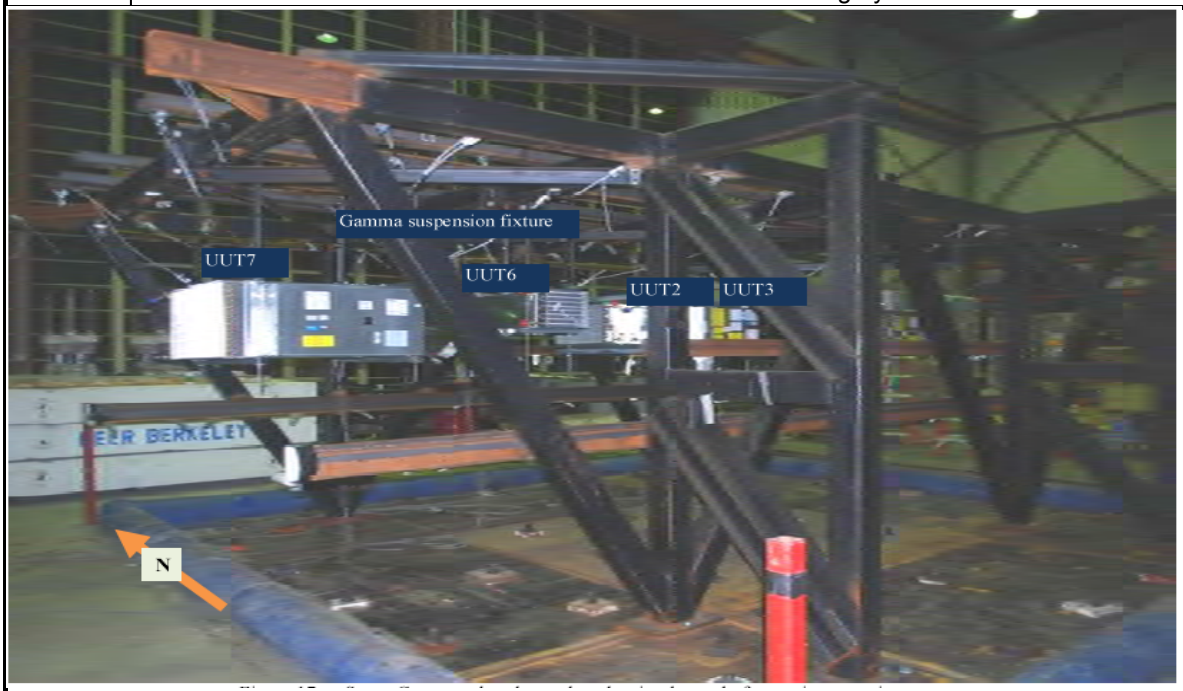
Item	Dimensions				Lowest Natural Frequency		
	Depth	Width	Height	Weight	F-B	S-S	V
Cabinet (Steriloc Liner)	37"	43"	16"	200 lbs	na	na	na
Fan (DD9-4A)							
Filter (Fiberglass)							
Electric Heat (4kw, 3 stage)							
Control (Pneumatic)							
Disconnect (Non Fusable, 3 Pole)							
Fuses (KLK, Fast Acting, Line Fuse)							
Contactors (Magnetic)							
Transformer (AirCore Class 2)							
Relays (SPST)							
Airflow Switch (Electro Pneumatic)							
Damper (11.875" dia, Galv Carbon Steel)							
Fan Speed Control (Adjustable SCR)							
Inlet Sensor							
Control Enclosure (NEMA 1)							

Seismic Test Parameters:

Qualification Method	Sds	z/h	Ip	Aflx-H	Arig-H	Aflx-V	Arig-V
ICC-ES AC156	2.00	1.0	1.5	3.20	2.40	1.33	0.53

Pre/Post Shake Functionality Test Results:

Pre:	PASSED
Post:	All units were filled with contents and maintained structural integrity.



UUT Mounting Description:

Rigidly Suspended unit on (4) 3/8" ASTM-A307 rods, with (4) SB-250 (1/4") Seismic Cable Kits and (3 per rod) SRBC-1 Rod Stiffening Clamps. SB-250's are attached to structure using 5/8" hardware. SRBC-1s are fastened to L1x1x1/4 ASTM-A36 angle.

UUT #4a

Manufacturer: Titus

Model Series: TFS Unit E Size 12"

Cabinet Construction Summary:

Base:	20 Gauge galvanized carbon steel
Walls:	20 Gauge galvanized carbon steel
Roof:	20 Gauge galvanized carbon steel

Component Summary:

Item	Dimensions				Lowest Natural Frequency		
	Depth	Width	Height	Weight	F-B	S-S	V
Cabinet (EcoShield 1/2" Liner)	39"	47.5"	20"	285 lbs	na	na	na
Coil (Hydronic)							
Fan (DD10-10A)							
Filter (Fiberglass)							
Control (Digital)							
Disconnect (Non Fusable, 3 Pole)							
Fuses (KLK, Fast Acting, Line Fuse)							
Contactors (Magnetic)							
Relays (SPST)							
Airflow Switch (Electro Pneumatic)							
Damper (11.875" dia, Galv Carbon Steel)							
Fan Speed Control (Adjustable SCR)							
Inlet Sensor							
Control Enclosure (NEMA 1)							

Seismic Test Parameters:

Qualification Method	Sds	z/h	Ip	Aflx-H	Arig-H	Aflx-V	Arig-V
ICC-ES AC156	2.00	1.0	1.5	3.20	2.40	1.33	0.53

Pre/Post Shake Functionality Test Results:

Pre:	PASSED
Post:	All units were filled with contents and maintained structural integrity.

UUT Mounting Description:

Vibration Isolated Suspended unit on (4) 1/2" ASTM-A307 rods, with VMC HRSA Vibration Isolator Hangers, (4) SB-250 (1/4") Seismic Cable Kits and (3 per rod) SRBC-1 Rod Stiffening Clamps. SB-250's are attached to structure using 5/8" hardware. SRBC-1s are fastened to L1x1x1/4 ASTM-A36 angle.

UUT #4b

Manufacturer: Titus

Model Series: TFS Unit E Size 12"

Cabinet Construction Summary:

Base:	20 Gauge galvanized carbon steel
Walls:	20 Gauge galvanized carbon steel
Roof:	20 Gauge galvanized carbon steel

Component Summary:

Item	Dimensions				Lowest Natural Frequency		
	Depth	Width	Height	Weight	F-B	S-S	V
Cabinet (EcoShield 1/2" Liner)	39"	47.5"	20"	285 lbs	na	na	na
Coil (Hydronic)							
Fan (DD10-10A)							
Filter (Fiberglass)							
Control (Digital)							
Disconnect (Non Fusable, 3 Pole)							
Fuses (KLK, Fast Acting, Line Fuse)							
Contactors (Magnetic)							
Relays (SPST)							
Airflow Switch (Electro Pneumatic)							
Damper (11.875" dia, Galv Carbon Steel)							
Fan Speed Control (Adjustable SCR)							
Inlet Sensor							
Control Enclosure (NEMA 1)							

Seismic Test Parameters:

Qualification Method	Sds	z/h	Ip	Aflx-H	Arig-H	Aflx-V	Arig-V
ICC-ES AC156	2.00	1.0	1.5	3.20	2.40	1.33	0.53

Pre/Post Shake Functionality Test Results:

Pre:	PASSED
Post:	All units were filled with contents and maintained structural integrity.

UUT Mounting Description:

Rigidly Suspended unit on (4) 1/2" ASTM-A307 rods, with (4) SB-250 (1/4") Seismic Cable Kits and (3 per rod) SRBC-1 Rod Stiffening Clamps. SB-250's are attached to structure using 5/8" hardware. SRBC-1s are fastened to L1x1x1/4 ASTM-A36 angle.

UUT #5a

Manufacturer: Titus

Model Series: TFS Unit E Size 16"

Cabinet Construction Summary:

Base:	20 Gauge galvanized carbon steel
Walls:	20 Gauge galvanized carbon steel
Roof:	20 Gauge galvanized carbon steel

Component Summary:

Item	Dimensions				Lowest Natural Frequency		
	Depth	Width	Height	Weight	F-B	S-S	V
Cabinet (EcoShield 1/2" Liner)	39"	47.5"	20"	240 lbs	na	na	na
Fan (DD10-10A)							
Filter (Fiberglass)							
Electric Heat (11kw, 1 stage)							
Control (Digital)							
Disconnect (Non Fusable, 3 Pole)							
Fuses (KLK, Fast Acting, Line Fuse)							
Contactors (Magnetic)							
Transformer (AirCore Class 2)							
Relays (SPST)							
Airflow Switch (Electro Pneumatic)							
Inductor (3/4hp, 5.5A)							
Damper (11.875" dia, Galv Carbon Steel)							
Fan Speed Control (Adjustable SCR)							
Inlet Sensor							
Control Enclosure (NEMA 1)							

Seismic Test Parameters:

Qualification Method	Sds	z/h	Ip	Aflx-H	Arig-H	Aflx-V	Arig-V
ICC-ES AC156	2.00	1.0	1.5	3.20	2.40	1.33	0.53

Pre/Post Shake Functionality Test Results:

Pre:	PASSED
Post:	All units were filled with contents and maintained structural integrity.

UUT Mounting Description:

Vibration Isolated Suspended unit on (4) 1/2" ASTM-A307 rods, with VMC HRSA Vibration Isolator Hangers, (4) SB-250 (1/4") Seismic Cable Kits and (3 per rod) SRBC-1 Rod Stiffening Clamps. SB-250's are attached to structure using 5/8" hardware. SRBC-1s are fastened to L1x1x1/4 ASTM-A36 angle.

UUT #5b

Manufacturer: Titus

Model Series: TFS Unit E Size 16"

Cabinet Construction Summary:

Base:	20 Gauge galvanized carbon steel
Walls:	20 Gauge galvanized carbon steel
Roof:	20 Gauge galvanized carbon steel

Component Summary:

Item	Dimensions				Lowest Natural Frequency		
	Depth	Width	Height	Weight	F-B	S-S	V
Cabinet (EcoShield 1/2" Liner)	39"	47.5"	20"	240 lbs	na	na	na
Fan (DD10-10A)							
Filter (Fiberglass)							
Electric Heat (11kw, 1 stage)							
Control (Digital)							
Disconnect (Non Fusable, 3 Pole)							
Fuses (KLK, Fast Acting, Line Fuse)							
Contactors (Magnetic)							
Transformer (AirCore Class 2)							
Relays (SPST)							
Airflow Switch (Electro Pneumatic)							
Inductor (3/4hp, 5.5A)							
Damper (11.875" dia, Galv Carbon Steel)							
Fan Speed Control (Adjustable SCR)							
Inlet Sensor							
Control Enclosure (NEMA 1)							

Seismic Test Parameters:

Qualification Method	Sds	z/h	Ip	Aflx-H	Arig-H	Aflx-V	Arig-V
ICC-ES AC156	2.00	1.0	1.5	3.20	2.40	1.33	0.53

Pre/Post Shake Functionality Test Results:

Pre:	PASSED
Post:	All units were filled with contents and maintained structural integrity.

UUT Mounting Description:

Rigidly Suspended unit on (4) 1/2" ASTM-A307 rods, with (4) SB-250 (1/4") Seismic Cable Kits and (3 per rod) SRBC-1 Rod Stiffening Clamps. SB-250's are attached to structure using 5/8" hardware. SRBC-1s are fastened to L1x1x1/4 ASTM-A36 angle.

UUT #6a

Manufacturer: Titus

Model Series: ESV Size 8"

Cabinet Construction Summary:

Base:	20 Gauge galvanized carbon steel
Walls:	20 Gauge galvanized carbon steel
Roof:	20 Gauge galvanized carbon steel

Component Summary:

Item	Dimensions				Lowest Natural Frequency		
	Depth	Width	Height	Weight	F-B	S-S	V
Cabinet (Standard 1/2" Liner)	12"	15.5"	10"	60 lbs	na	na	na
Coil (Hydronic)							
Electric Heat (7kw, 1 stage)							
Control (Pneumatic)							
Transformer (Air Core Class 2)							
Airflow Switch (Electro Pneumatic)							
Damper (7.875" dia Galv Carbon Steel)							
Inlet Sensor							
Sound Attenuator (Integral)							
Control Enclosure (NEMA 1)							

Seismic Test Parameters:

Qualification Method	Sds	z/h	Ip	Aflx-H	Arig-H	Aflx-V	Arig-V
ICC-ES AC156	2.00	1.0	1.5	3.20	2.40	1.33	0.53

Pre/Post Shake Functionality Test Results:

Pre:	PASSED
Post:	All units were filled with contents and maintained structural integrity.

UUT Mounting Description:

Vibration Isolated Suspended unit on (4) 3/8" ASTM-A307 rods, with VMC HRSA Vibration Isolator Hangers, (4) SB-250 (1/4") Seismic Cable Kits and (3 per rod) SRBC-1 Rod Stiffening Clamps. SB-250's are attached to structure using 5/8" hardware. SRBC-1s are fastened to L1x1x1/4 ASTM-A36 angle.

UUT #6b

Manufacturer: Titus

Model Series: ESV Size 8"

Cabinet Construction Summary:

Base:	20 Gauge galvanized carbon steel
Walls:	20 Gauge galvanized carbon steel
Roof:	20 Gauge galvanized carbon steel

Component Summary:

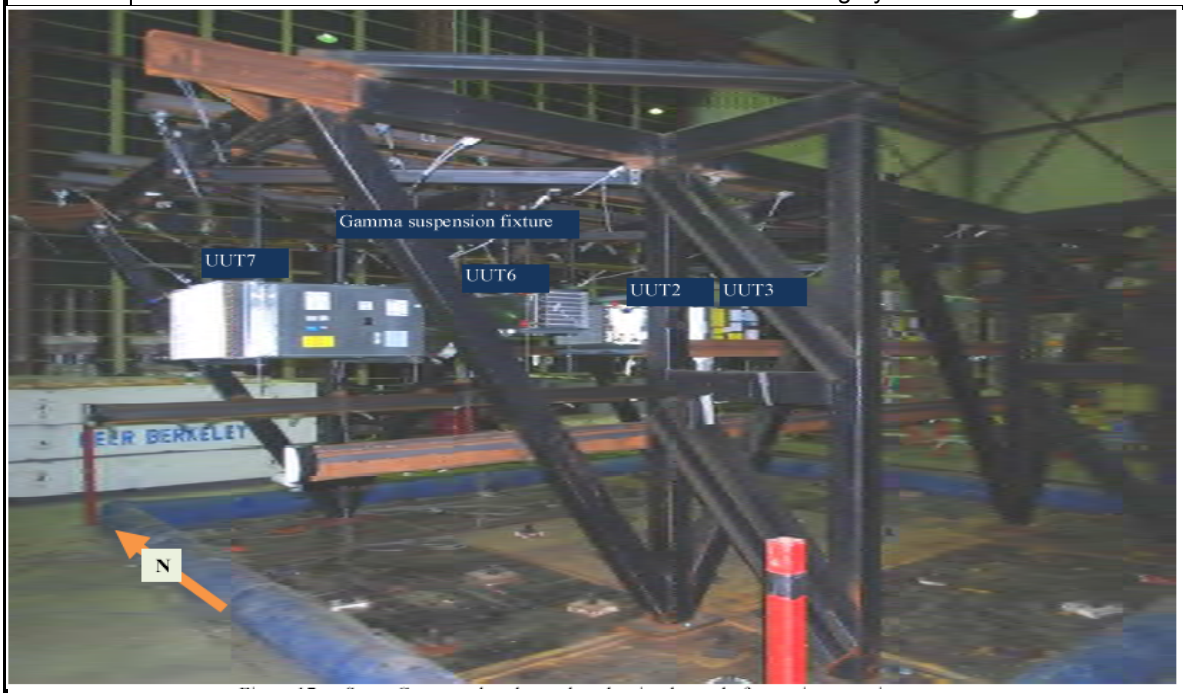
Item	Dimensions				Lowest Natural Frequency		
	Depth	Width	Height	Weight	F-B	S-S	V
Cabinet (Standard 1/2" Liner)	12"	15.5"	10"	60 lbs	na	na	na
Coil (Hydronic)							
Electric Heat (7kw, 1 stage)							
Control (Pneumatic)							
Transformer (Air Core Class 2)							
Airflow Switch (Electro Pneumatic)							
Damper (7.875" dia Galv Carbon Steel)							
Inlet Sensor							
Sound Attenuator (Integral)							
Control Enclosure (NEMA 1)							

Seismic Test Parameters:

Qualification Method	Sds	z/h	Ip	Aflx-H	Arig-H	Aflx-V	Arig-V
ICC-ES AC156	2.00	1.0	1.5	3.20	2.40	1.33	0.53

Pre/Post Shake Functionality Test Results:

Pre:	PASSED
Post:	All units were filled with contents and maintained structural integrity.



UUT Mounting Description:

Rigidly Suspended unit on (4) 3/8" ASTM-A307 rods, with (4) SB-250 (1/4") Seismic Cable Kits and (3 per rod) SRBC-1 Rod Stiffening Clamps. SB-250's are attached to structure using 5/8" hardware. SRBC-1s are fastened to L1x1x1/4 ASTM-A36 angle.

UUT #7a

Manufacturer: Titus

Model Series: ESV Size 24"x16"

Cabinet Construction Summary:

Base:	20 Gauge galvanized carbon steel
Walls:	20 Gauge galvanized carbon steel
Roof:	20 Gauge galvanized carbon steel

Component Summary:

Item	Dimensions				Lowest Natural Frequency		
	Depth	Width	Height	Weight	F-B	S-S	V
Cabinet (Ultraloc Liner)	15.5"	38"	18"	250 lbs	na	na	na
Coil (Hydronic)							
Electric Heat (35kw, 3 stage)							
Control (Digital)							
Transformer (Air Core Class 2)							
Airflow Switch (Electro Pneumatic)							
Damper (16"H x 24"W, Aluminum)							
Sound Attenuator (Integral)							
Inlet Sensor							
Control Enclosure (NEMA 1)							

Seismic Test Parameters:

Qualification Method	Sds	z/h	Ip	Aflx-H	Arig-H	Aflx-V	Arig-V
ICC-ES AC156	2.00	1.0	1.5	3.20	2.40	1.33	0.53

Pre/Post Shake Functionality Test Results:

Pre:	PASSED
Post:	All units were filled with contents and maintained structural integrity.

UUT Mounting Description:

Vibration Isolated Suspended unit on (4) 3/8" ASTM-A307 rods, with VMC HRSA Vibration Isolator Hangers, (4) SB-250 (1/4") Seismic Cable Kits and (3 per rod) SRBC-1 Rod Stiffening Clamps. SB-250's are attached to structure using 5/8" hardware. SRBC-1s are fastened to L1x1x1/4 ASTM-A36 angle.

UUT #7b

Manufacturer: Titus

Model Series: ESV Size 24"x16"

Cabinet Construction Summary:

Base:	20 Gauge galvanized carbon steel
Walls:	20 Gauge galvanized carbon steel
Roof:	20 Gauge galvanized carbon steel

Component Summary:

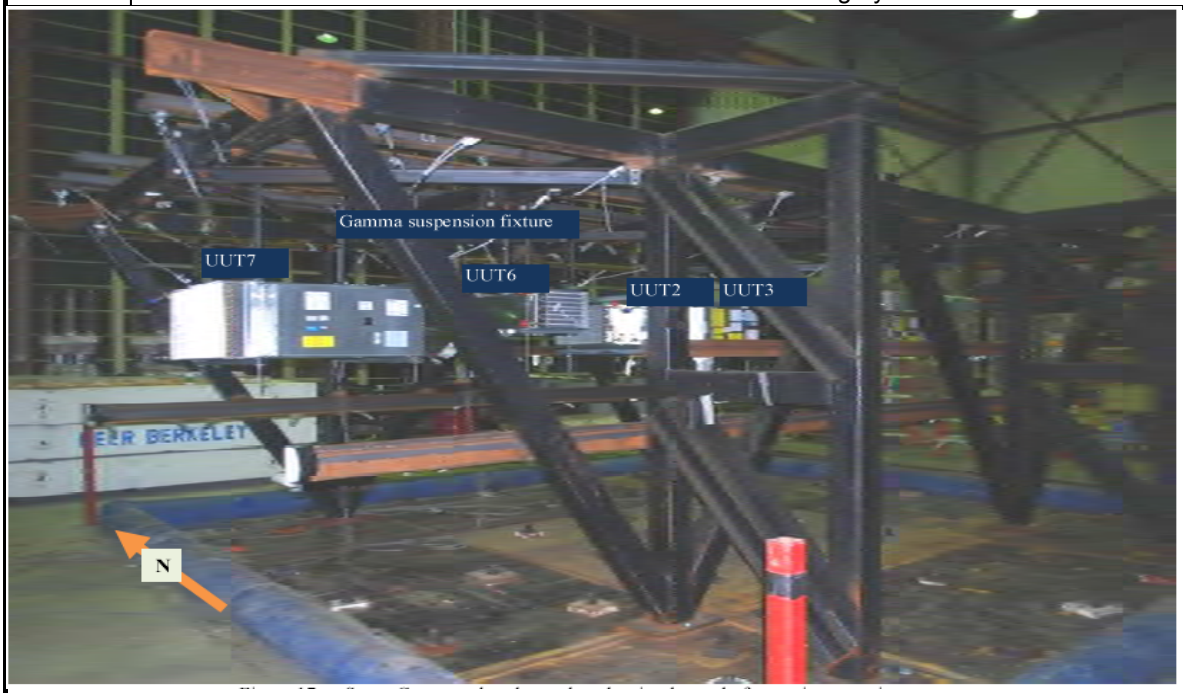
Item	Dimensions				Lowest Natural Frequency		
	Depth	Width	Height	Weight	F-B	S-S	V
Cabinet (Ultraloc Liner)	15.5"	38"	18"	250 lbs	na	na	na
Coil (Hydronic)							
Electric Heat (35kw, 3 stage)							
Control (Digital)							
Transformer (Air Core Class 2)							
Airflow Switch (Electro Pneumatic)							
Damper (16"H x 24"W, Aluminum)							
Sound Attenuator (Integral)							
Inlet Sensor							
Control Enclosure (NEMA 1)							

Seismic Test Parameters:

Qualification Method	Sds	z/h	Ip	Aflx-H	Arig-H	Aflx-V	Arig-V
ICC-ES AC156	2.00	1.0	1.5	3.20	2.40	1.33	0.53

Pre/Post Shake Functionality Test Results:

Pre:	PASSED
Post:	All units were filled with contents and maintained structural integrity.



UUT Mounting Description:

Rigidly Suspended unit on (4) 3/8" ASTM-A307 rods, with (4) SB-250 (1/4") Seismic Cable Kits and (3 per rod) SRBC-1 Rod Stiffening Clamps. SB-250's are attached to structure using 5/8" hardware. SRBC-1s are fastened to L1x1x1/4 ASTM-A36 angle.