APPLICATION FOR OSHPD SPECIAL SEISMIC CERTIFICATION PREAPPROVAL (OSP)

OFFICE USE ONLY

APPLICATION #: OSP-0412

OSHPD Special Seismic Certification Preapproval (OSP)

Type: ☐ New ☒ Renewal

Manufacturer Information

Manufacturer: Caterpillar, Inc

Manufacturer's Technical Representative: Joseph Gorski

Mailing Address: 560 Rehoboth Rd., Griffin, GA 30224

Telephone: (770) 233-5887 Email: Gorski_Joseph@cat.com

Product Information

Product Name: Emergency and Standby Power Systems

Product Type: Generators

Product Model Number: C27/C32/3512/3516/C175

General Description: Diesel Powered Generators & Control Panels

Mounting Description: Several – See UUT Sheets, Generators: Off tank - Spring vibration isolated. On tank - Internally spring vibration isolated; Control Panels: Rigid wall mounted (UUT's 8 & 9)

Tested Seismic Enhancements: None

Applicant Information

Applicant Company Name: TRU Compliance, by Structural Integrity Associates, Inc.

Contact Person: Galen Reid

Mailing Address: 5215 Hellyer Ave Suite 210, San Jose, CA 95138

Telephone: (844) 878-0200 Email: greid@structint.com

Title: Manager, TRU Compliance

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

Company Name: STRUCTURAL INTEGRITY ASSOCIATES, INC.

Name: Andrew Coughlin California License Number: S6082

Mailing Address: 5215 Hellyer Ave, Suite 101, San Jose, CA 95138-1025

Telephone: (844) 878-0200 Email: acoughlin@structint.com

Certification Method

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

☐ Other (Please Specify):

Testing Laboratory

Company Name: U.S. ARMY ENGINEER RESEARCH AND DEVELOPMENT CENTER, CONSTRUCTION ENGINEERING RESEARCH LABORATORY (CERL)

Contact Person: Jim Wilcoski

Mailing Address: 2902 Newmark Dr., Champaign IL 61822-1076

Telephone: (217) 373-6763 Email: james.wilcoski@usace.army.mil

Company Name: ENVIRONMENTAL TESTING LABORATORIES, INC. (ETL)

Contact Person: Jeremy Lange

Mailing Address: 11034 Indian Trail, Dallas TX 75229-3513

Telephone: (972) 247-9657 Email: Jeremy@etldallas.com

Company Name: UNIVERSITY OF CALIFORNIA, BERKELEY (PEER)

Contact Person: Nate Knight

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

Telephone: (510) 655-2135 Email: peer_center@berkeley.edu

Seismic Parameters

Design Basis of Equipment or Components (F_p/W_p) =	4.50 (Genset: SDS=2.00 @ z/h=1); 2.40 (Genset: SDS=3.20 @ z/h=0); 1.50 (Ctrl Panels: SDS=2.00 @ z/h=1); 1.44 (Ctrl Panel: SDS=3.20 @ z/h=0)
S_{DS} (Design spectral response acceleration at short period, g) =	2.00 (z/h = 1); 3.20 (z/h = 0)
a_p (Amplification factor) =	2.5
R_p (Response modification factor) =	2.0 (Gensets Isolated); 6.0 (Control panels - UUT's 8 & 9)
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

OSHPD Approval (For Office Use Only) **- Approval Expires on 12/31/2025**

Date: 9/24/2020

Name: Timothy Piland Title: Senior Structural Engineer

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

Condition of Approval (if applicable):

SPECIAL SEISMIC CERTIFICATION
CERTIFIED COMPONENT MATRIX

2000661-CR-001-R1

TRU COMPLIANCE

Manufacturer: Caterpillar Inc.
Model Line: C27/C32/3512/3516/C175 Generator Set

TABLE 1

Certified Product Construction Summary:
Carbon steel base. Carbon steel enclosure(C27/C32). Carbon steel UL-142 fuel tank.

Certified Options Summary:
C27 & C32 available with and without fuel tank (1000 gal. or 2000 gal.) and enclosure. C175-16 available with and without radiator.

Mounting Configuration:
On fuel tank: base mounted - rigid with internal isolation. Off fuel tank: base mounted - isolated
Note: Installed mounting configuration must be of similar configuration and equivalent strength and stiffness to those tested.

Building Code: CBC 2019 ***Seismic Certification Limits:*** S_{DS}= ***2.0 g*** ***z/h=1.0*** S_{DS}= ***3.2 g*** ***z/h=0.0*** I_P= ***1.5***

Model Line	Model	Dimensions (in)			Weight (lb)	Notes	UUT
		Depth	Width	Height			
C27 (≤800 kW)	Open – Min. package	163.1	72.0	87.0	14050		Interp.
	Open – Max. package	172.0	84.0	86.0	14050		Interp.
	Enclosed – No tank	300.0	100.0	111.9	22827		Interp.
	Enclosed – 1000 gal.	300.0	100.0	127.0	36400		1
	Enclosed - 2000 gal.	300.0	100.0	136.0	43660		Interp.
C32 (≤1250 kW)	Open – Min. package	166.7	79.1	85.0	18200		Interp.
	Open – Max. package	190.0	88.0	119.0	18540		10
	Enclosed – No tank	300.0	100.0	111.9	25300		Interp.
	Enclosed – 1000 gal.	300.0	100.0	127.0	38806		Interp.
	Enclosed - 2000 gal.	300.0	100.0	136.0	46130		2
3512 (≤1250 kW)	Min. package	199.0	77.8	93.2	34620		Interp.
	Max. package	212.6	81.6	93.2	34620		Interp.
3512B (≤1500 kW)	Max. package	231.0	78.0	93.0	33204		Interp.
3512B-HD (≤1500 kW)	Max. package	231.0	78.0	93.0	33689		Interp.
3512C (≤1500 kW)	Max. package	233.1	89.8	110.0	38688		Interp.
3512C-HD (≤1750 kW)	Max. package	243.2	89.8	110.0	40660		Interp.
3516 (≤1600 kW)	Min. package	232.9	90.0	93.2	41796		Interp.
	Max. package	246.0	90.0	93.2	41796		Interp.
3516B (≤2250 kW)	Max. package	275.0	102.0	98.0	39666		Interp.
3516B-HD (≤2000 kW)	Max. package	272.0	90.0	98.0	39913		Interp.
3516C (≤2000 kW)	Min. package	253.3	93.7	116.5	44708		Interp.
	Max. package	271.9	93.7	116.5	44708		Interp.
3516C-HD (≤2500 kW)	Min. package	257.3	100.9	123.2	43139		12
	Max. package	277.3	120.2	108.9	44175		3

SPECIAL SEISMIC CERTIFICATION
CERTIFIED COMPONENT MATRIX

2000661-CR-001-R1

TRU COMPLIANCE

Manufacturer: Caterpillar Inc.
Model Line: C27/C32/3512/3516/C175 Generator Set

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Certified Options Summary:
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Mounting Configuration:
On fuel tank: base mounted - rigid with internal isolation. Off fuel tank: base mounted - isolated
Note: Installed mounting configuration must be of similar configuration and equivalent strength and stiffness to those tested.

Building Code: CBC 2019 ***Seismic Certification Limits:*** S_{DS}= ***2.0 g*** ***z/h=1.0*** S_{DS}= ***3.2 g*** ***z/h=0.0*** I_P= ***1.5***

Model Line	Model	Dimensions (in)			Weight (lb)	Notes	UUT
		Depth	Width	Height			
3516E (≤2750 kW)	Max. package	324.0	104.0	128.0	51000		11
C175-16 (≤3100 kW)	Min. package	300.8	108.5	130.2	61192		Interp.
	Max. package	307.4	113.8	134.3	61192		4

SPECIAL SEISMIC CERTIFICATION
CERTIFIED COMPONENT MATRIX

2000661-CR-001-R1

TRU COMPLIANCE

Manufacturer: Caterpillar Inc.
Model Line: C27/C32/3512/3516/C175 Generator Set

TABLE 2

Certified Product Construction Summary:
Carbon steel enclosure

Certified Options Summary:
ICE Box: Small or Large Display

Mounting Configuration:
Wall mounted - rigid or equipment mounted
Note: Installed mounting configuration must be of similar configuration and equivalent strength and stiffness to those tested.

Building Code: CBC 2019 ***Seismic Certification Limits:*** S_{DS}= ***2.0 g*** ***z/h=1.0*** S_{DS}= ***3.2 g*** ***z/h=0.0*** I_P= ***1.5***

Model Line	Model	Dimensions (in)			Weight (lb)	Notes	UUT
		Depth	Width	Height			
ICE Control Panel w/ EMCP 4 Controller (Caterpillar)	ICE - Small Display	16	24	18	105	UUT 6 on equipment UUT 8 wall mount	6,8
	ICE - Large Display	16	24	18	110	UUT 7 on equipment UUT 9 wall mount	7,9

SPECIAL SEISMIC CERTIFICATION
CERTIFIED SUBCOMPONENT MATRIX

2000661-CR-001-R1

TRU COMPLIANCE

Manufacturer: Caterpillar Inc. ***Table Description:*** Standard Components

Model Line: C27/C32/3512/3516/C175 Generator Set

TABLE 3

Building Code: CBC 2019, IBC 2018 ***Seismic Certification Limits:*** S_{DS} = 2.0 g z/h = 1.0 S_{DS} = 3.2 g z/h = 0.0 I_P = 1.5

Component Type	Manufacturer	Model	Description	Notes	UUT
Radiator	AKG	25.5SF		939 lbs	1
		27.5SF		1,433 lbs	2
	Young Touchstone	44SF		6,356 lbs	Interp.
		50SF		7,535 lbs	Interp.
		56SF		8,008 lbs	3
		64SF		8,645 lbs	Interp.
		73SF		9,324 lbs	Interp.
		84SF		12,400 lbs	4
	Modine	25SF		1,774 lbs	10
	Caterpillar Inc.	A59	Caterpillar designed with Modine coolers	4,758 lbs	Interp.
		A68	Caterpillar designed with Modine coolers	5,102 lbs	12
		69SF	Caterpillar designed with Modine coolers	8,884 lbs	Interp.
		81SF	Caterpillar designed with Modine coolers	9,965 lbs	11
Generator	Leroy-Somer	1200 Frame		5,155 lbs	1
		1400 Frame		7,277 lbs	2,10
		1600 Frame		10,496 lbs	Interp.
		1800 Frame		12,924 lbs	Interp.
		2700 Frame		16,178 lbs	Interp.
		3000 Frame		20,043 lbs	3,4,11,12

SPECIAL SEISMIC CERTIFICATION
CERTIFIED SUBCOMPONENT MATRIX

2000661-CR-001-R1

TRU COMPLIANCE

Manufacturer: Caterpillar Inc.
Model Line: C27/C32/3512/3516/C175 Generator Set
Table Description: Electronics and Controls

TABLE 4

Building Code: CBC 2019, IBC 2018
Seismic Certification Limits: S_{DS} = 2.0 g z/h = 1.0; S_{DS} = 3.2 g z/h = 0.0; I_P = 1.5

Component Type	Manufacturer	Model	Description	Notes	UUT
Global Design Box w/ EMCP 4 Controller	Caterpillar	Base	Global Design Box controller		1,2
		Side extension box	Side extension for Global Design Box		1,2
		Rear extension box	Rear extension for Global Design Box		2
Molded Case Circuit Breaker	Schneider	NSJ Frame (600A max)	600A max, 14lbs		Interp.
		L Frame (600A max)	600A max, 14lbs		Interp.
		P Frame (1,200A max)	1,200A max, 32lbs		1
		R Frame (3,000A max)	3,000A max, 52lbs		7
		NT Frame (5,000A max)	5,000A max		2,7
ICE Box	Caterpillar	Base	ICE Box controller		6,7
		Side extension box	Side extension box for ICE Box	UUT: Qty (2)	7
		Rear extension box	Rear extension box for ICE Box	UUT: Qty (1)	6
		ICE box - small display	ICE Control Panel w/ EMCP 4 Controller	On equipment or remote mount	6,8
		ICE box - large display	ICE Control Panel w/ EMCP 4 Controller	On equipment or remote mount	7,9,10

SPECIAL SEISMIC CERTIFICATION
CERTIFIED SUBCOMPONENT MATRIX

2000661-CR-001-R1

TRU COMPLIANCE

Manufacturer: Caterpillar Inc.
Model Line: C27/C32/3512/3516/C175 Generator Set

Table Description: Optional Components

TABLE 5

Building Code: CBC 2019, IBC 2018

Seismic Certification Limits: S_{DS} = 2.0 g z/h = 1.0; S_{DS} = 3.2 g z/h = 0.0; I_P = 1.5

Component Type	Manufacturer	Model	Description	Notes	UUT
Silencer	Miratech	3972005	Exhaust silencer		1
	Silex	3906968	Exhaust silencer		2
Space Heater	Berko	HUHAA	480V 3-phase heater		1,2
Louvers	Ruskin	396-5818	Motorized louver		1,2
Jacket Water Heater	Hotstart	CSM Hotflow - 9kW	9KW Coolant preheater		1,2,3
		CSM Hotflow - 12kW	12KW Coolant preheater		4
Electrical Panel	Square D	QO Load Center	Electrical panel enclosure		1,2
Battery Charger	Stored Energy Sys.	NRG 24	Genset engine start battery charger		1,2

UNIT UNDER TEST (UUT) SUMMARY SHEET

2000661-CR-0011R1

Manufacturer: Caterpillar Inc.

Model Line: C27/C32/3512/3516/C175 Generator Set

UUT	Unit Description	Report Number	Testing Laboratory	S_{DS}	z/h	I_P
1	C27 Generator Set - Enclosed w/ 1000 Gal. Tank	2013-0764-TR-001	ERDC-CERL	2.0	1.0	1.5
				3.2	0.0	
2	C32 Generator Set - Enclosed w/ 2000 Gal. Tank	2013-0764-TR-001	ERDC-CERL	2.0	1.0	1.5
				3.2	0.0	
3	3516C HD Generator Set	2013-0764-TR-001	ERDC-CERL	2.0	1.0	1.5
				3.2	0.0	
4	C175-16 Generator Set	2013-0764-TR-001	ERDC-CERL	2.0	1.0	1.5
				3.2	0.0	
6	ICE Box - min	14175	ETL	2.0	1.0	1.5
				3.2	0.0	
7	ICE Box - max	14175	ETL	2.0	1.0	1.5
				3.2	0.0	
8	ICE Box 1	14175	ETL	2.0	1.0	1.5
				3.2	0.0	
9	ICE Box 2	14175	ETL	2.0	1.0	1.5
				3.2	0.0	
10	C32 - Generator Set	1700630-TR-001	PEER	2.0	1.0	1.5
				3.2	0.0	
11	3516E - Generator Set	1700630-TR-001	PEER	2.0	1.0	1.5
				3.2	0.0	
12	3516C - Generator Set	1900323-TR-001	ERDC-CERL	2.09	1.0	1.5
				3.34	0.0	

Notes:

UNIT UNDER TEST (UUT) SUMMARY SHEET

2000661-CR-001-R1

UUT 1

Manufacturer: Caterpillar Inc.
Model Line: C27/C32/3512/3516/C175 Generator Set
Model Number: C27 Generator Set – Enclosed w/ 1000 Gal. Tank ***Serial Number:*** N/A

Product Construction Summary:
Carbon steel enclosure, carbon steel base, carbon steel UL-142 fuel tank.

Options/Subcomponent Summary:
C27 generator set with AKG radiator, Caterpillar engine, Leroy-Somer alternator, and Caterpillar Global Design Box w/ EMCP 4 controller.

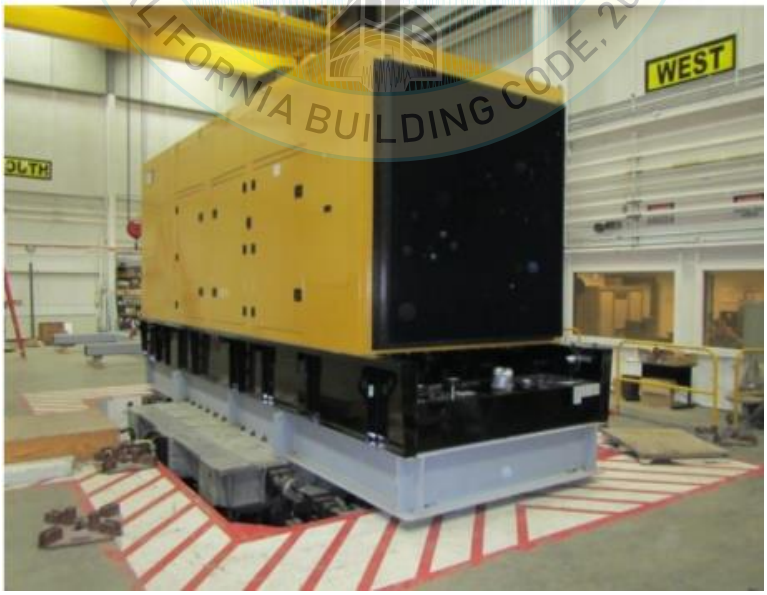
UUT Properties

Weight (lb)	Dimension (in)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
36,400	300	100	127	4.6	4.0	8.0

UUT Highest Passed Seismic Run Information

Building Code	Test Criteria	S_{DS} (g)	z/h	I_P	A_{FLX-H} (g)	A_{RIG-H} (g)	A_{FLX-V} (g)	A_{RIG-V} (g)
CBC 2019	ICC-ES AC156 (2010)	2.0	1.0	1.5	3.2	2.4	2.13	0.85
		3.2	0.0					

Test Mounting Details:



Unit is mounted to test fixture using (16) 3/4" Grade 8 bolts and is internally isolated with (6) M4SSH-57K-400 spring isolators. (24) 5/8" Grade 8 bolts are used to mount the isolators to the fuel tank.
Unit maintained structural integrity and remained functional per manufacturer requirement after shake table test.
Contents were included in testing per operating conditions.

UNIT UNDER TEST (UUT) SUMMARY SHEET

2000661-CR-001-R1

UUT 2

Manufacturer: Caterpillar Inc.
Model Line: C27/C32/3512/3516/C175 Generator Set
Model Number: C32 Generator Set – Enclosed w/ 2000 Gal. Tank ***Serial Number:*** N/A

Product Construction Summary:
Carbon steel enclosure, carbon steel base, carbon steel UL-142 fuel tank.

Options/Subcomponent Summary:
C32 generator set with AKG radiator, Caterpillar engine, Leroy-Somer alternator, and Caterpillar Global Design Box w/ EMCP 4 controller.

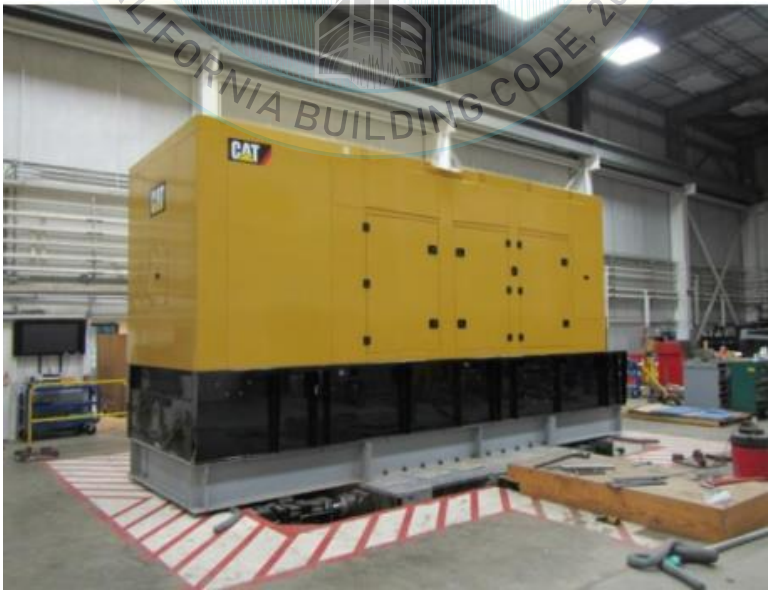
UUT Properties

Weight (lb)	Dimension (in)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
46,130	300	100	136	4.3	3.8	8.0

UUT Highest Passed Seismic Run Information

Building Code	Test Criteria	S_{DS} (g)	z/h	I_P	A_{FLX-H} (g)	A_{RIG-H} (g)	A_{FLX-V} (g)	A_{RIG-V} (g)
CBC 2019	ICC-ES AC156 (2010)	2.0	1.0	1.5	3.2	2.4	2.13	0.85
		3.2	0.0					

Test Mounting Details:



Unit is mounted to test fixture using (16) 3/4" Grade 8 bolts and is internally isolated with (6) M4SSH-57K-400 spring isolators. (24) 5/8" Grade 8 bolts are used to mount the isolators to the fuel tank.
Unit maintained structural integrity and remained functional per manufacturer requirement after shake table test.
Contents were included in testing per operating conditions.

UNIT UNDER TEST (UUT) SUMMARY SHEET

2000661-CR-001-R1

UUT 3

Manufacturer: Caterpillar Inc.
Model Line: C27/C32/3512/3516/C175 Generator Set
Model Number: 3516C HD Generator Set ***Serial Number:*** N/A

Product Construction Summary:
Carbon steel base

Options/Subcomponent Summary:
3516C HD generator set with Young Touchstone radiator, Caterpillar engine, Leroy-Somer alternator, and Caterpillar High Voltage Box w/ EMCP 4 controller.

UUT Properties

Weight (lb)	Dimension (in)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
44,175	277	120	109	3.7	3.9	8.2

UUT Highest Passed Seismic Run Information

Building Code	Test Criteria	S_{DS} (g)	z/h	I_P	A_{FLX-H} (g)	A_{RIG-H} (g)	A_{FLX-V} (g)	A_{RIG-V} (g)
CBC 2019	ICC-ES AC156 (2010)	2.0	1.0	1.5	3.2	2.4	2.13	0.85
		3.2	0.0					

Test Mounting Details:

Unit is mounted to test fixture using (16) VMC M2SSH-1E spring isolators. (64) 3/4" Grade 8 bolts are used to mount the isolators to the test fixture.
Unit maintained structural integrity and remained functional per manufacturer requirement after shake table test.
Contents were included in testing per operating conditions.

UNIT UNDER TEST (UUT) SUMMARY SHEET

2000661-CR-001-R1

UUT 4

Manufacturer: Caterpillar Inc.
Model Line: C27/C32/3512/3516/C175 Generator Set
Model Number: C175-16 Generator Set ***Serial Number:*** N/A

Product Construction Summary:
Carbon steel base.

Options/Subcomponent Summary:
C175-16 generator set with Young Touchstone radiator, Caterpillar engine, Leroy-Somer alternator, and Caterpillar High Voltage Box w/ EMCP 4 controller.

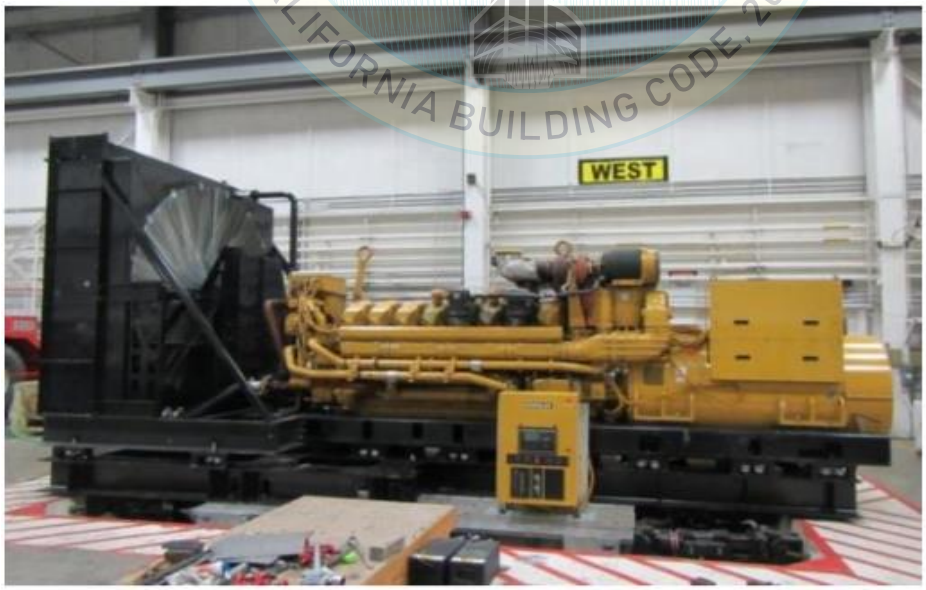
UUT Properties

Weight (lb)	Dimension (in)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
61,192	307	114	134	3.5	3.3	7.7

UUT Highest Passed Seismic Run Information

Building Code	Test Criteria	S_{DS} (g)	z/h	I_P	A_{FLX-H} (g)	A_{RIG-H} (g)	A_{FLX-V} (g)	A_{RIG-V} (g)
CBC 2019	ICC-ES AC156 (2010)	2.0	1.0	1.5	3.2	2.4	2.13	0.85
		3.2	0.0					

Test Mounting Details:



Unit is mounted to test fixture using (18) VMC M2SSH-1E spring isolators. (72) 3/4" Grade 8 bolts are used to mount the isolators to the test fixture.
Unit maintained structural integrity and remained functional per manufacturer requirement after shake table test.
Contents were included in testing per operating conditions.

UNIT UNDER TEST (UUT) SUMMARY SHEET

2000661-CR-001-R1

UUT 6

Manufacturer: Caterpillar Inc.
Model Line: C27/C32/3512/3516/C175 Generator Set
Model Number: ICE Box - min ***Serial Number:*** N/A

Product Construction Summary:
Carbon steel enclosure.

Options/Subcomponent Summary:
Small display

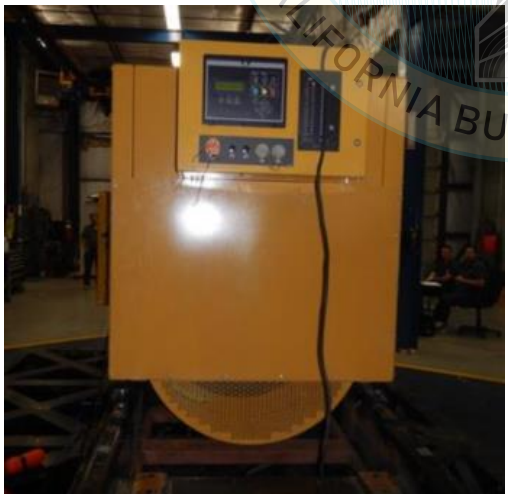
UUT Properties

Weight (lb)	Dimension (in)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
4001	45	37	66	3.2	3.2	7.1

UUT Highest Passed Seismic Run Information

Building Code	Test Criteria	S_{DS} (g)	z/h	I_P	A_{FLX-H} (g)	A_{RIG-H} (g)	A_{FLX-V} (g)	A_{RIG-V} (g)
CBC 2019	ICC-ES AC156 (2010)	2.0	1.0	1.5	3.2	2.4	2.13	0.85
		3.2	0.0					

Test Mounting Details:



[1] Weight is of UUT and the equipment mounting skid.
Equipment mounted - Rigid and isolated. Rigid: The equipment skid was mounted using (6) 3/4" Grade 8 bolts. Isolated: The equipment skid was mounted to (6) Mason SSLFH-C-1750 isolators using (1) 5/8" Grade 8 bolt each. The isolators were mounted to the table using (2) 5/8" Grade 8 bolts each.
Unit maintained structural integrity and remained functional per manufacturer requirement after shake table test.
Contents were included in testing per operating conditions.

UNIT UNDER TEST (UUT) SUMMARY SHEET

2000661-CR-001-R1

UUT 7

Manufacturer: Caterpillar Inc.
Model Line: C27/C32/3512/3516/C175 Generator Set
Model Number: ICE Box - Max ***Serial Number:*** N/A

Product Construction Summary:
Carbon steel enclosure.

Options/Subcomponent Summary:
(2) side extension boxes. (1) rear extension box. Large display

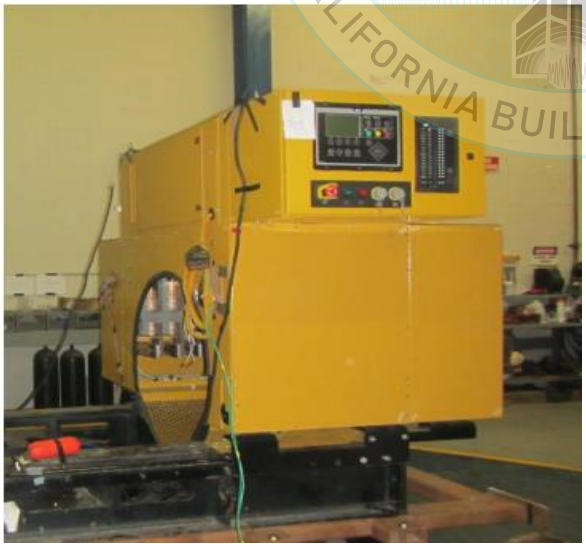
UUT Properties

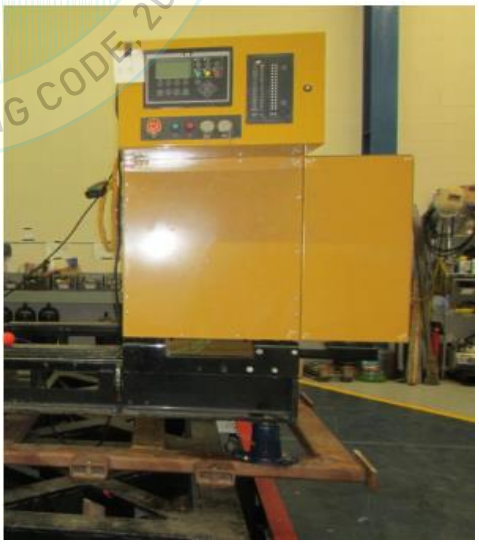
Weight (lb)	Dimension (in)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
1,500	45	84	66	3.2	3.2	4.9

UUT Highest Passed Seismic Run Information

Building Code	Test Criteria	S_{DS} (g)	z/h	I_P	A_{FLX-H} (g)	A_{RIG-H} (g)	A_{FLX-V} (g)	A_{RIG-V} (g)
CBC 2019	ICC-ES AC156 (2010)	2.0	1.0	1.5	3.2	2.4	2.13	0.85
		3.2	0.0					

Test Mounting Details:





Equipment mounted - Rigid and isolated. Rigid: The equipment skid was mounted using (6) 3/4" Grade 8 bolts. Isolated: The equipment skid was mounted to (6) Mason SSLFH-C-1750 isolators using (1) 5/8" Grade 8 bolt each. The isolators were mounted to the table using (2) 5/8" Grade 8 bolts each.
Unit maintained structural integrity and remained functional per manufacturer requirement after shake table test.
Contents were included in testing per operating conditions.

UNIT UNDER TEST (UUT) SUMMARY SHEET

2000661-CR-001-R1

UUT 8

Manufacturer: Caterpillar Inc.
Model Line: C27/C32/3512/3516/C175 Generator Set
Model Number: ICE Box 1 ***Serial Number:*** N/A

Product Construction Summary:
Carbon steel enclosure.

Options/Subcomponent Summary:
Small display.

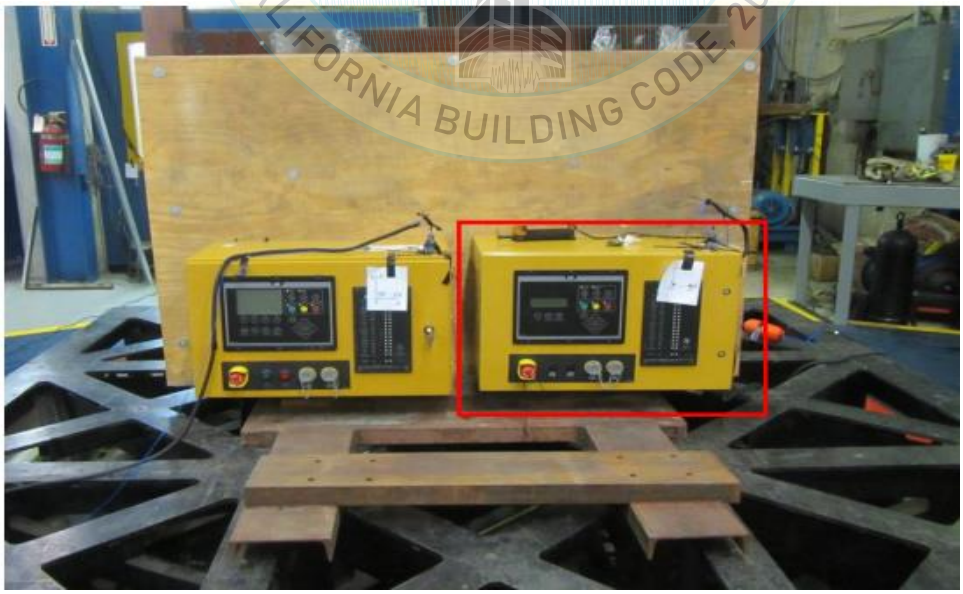
UUT Properties

Weight (lb)	Dimension (in)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
105	16	28	18	N/A	N/A	N/A

UUT Highest Passed Seismic Run Information

Building Code	Test Criteria	S_{DS} (g)	z/h	I_P	A_{FLX-H} (g)	A_{RIG-H} (g)	A_{FLX-V} (g)	A_{RIG-V} (g)
CBC 2019	ICC-ES AC156 (2010)	2.0	1.0	1.5	3.2	2.4	2.13	0.85
		3.2	0.0					

Test Mounting Details:



The UUT was rigid wall mounted using (12) 1/4" lag screws.
Unit maintained structural integrity and remained functional per manufacturer requirement after shake table test.
Contents were included in testing per operating conditions.

UNIT UNDER TEST (UUT) SUMMARY SHEET

2000661-CR-001-R1

UUT 9

Manufacturer: Caterpillar Inc.
Model Line: C27/C32/3512/3516/C175 Generator Set
Model Number: ICE Box 2 ***Serial Number:*** N/A

Product Construction Summary:
Carbon steel enclosure.

Options/Subcomponent Summary:
Large display.

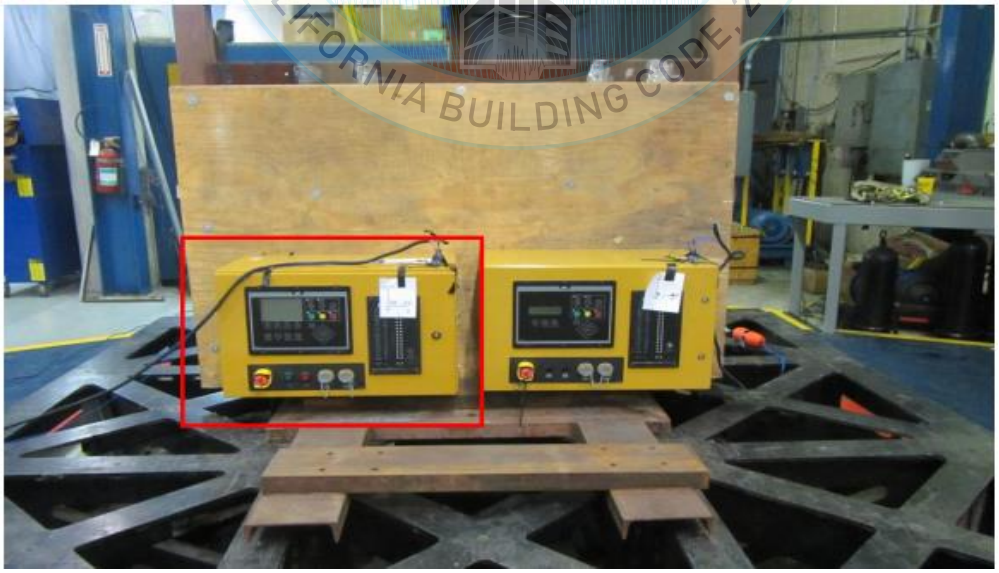
UUT Properties

Weight (lb)	Dimension (in)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
110	16	28	18	N/A	N/A	N/A

UUT Highest Passed Seismic Run Information

Building Code	Test Criteria	S_{DS} (g)	z/h	I_P	A_{FLX-H} (g)	A_{RIG-H} (g)	A_{FLX-V} (g)	A_{RIG-V} (g)
CBC 2019	ICC-ES AC156 (2010)	2.0	1.0	1.5	3.2	2.4	2.13	0.85
		3.2	0.0					

Test Mounting Details:



The UUT was rigid wall mounted using (12) 1/4" lag screws.
Unit maintained structural integrity and remained functional per manufacturer requirement after shake table test.
Contents were included in testing per operating conditions.

UNIT UNDER TEST (UUT) SUMMARY SHEET

2000661-CR-001-R1

UUT 10

Manufacturer: Caterpillar Inc.
Model Line: C27/C32/3512/3516/C175 Generator Set
Model Number: C32 - Generator Set ***Serial Number:*** N/A

Product Construction Summary:
Carbon steel base.

Options/Subcomponent Summary:
C32 generator set with Modine radiator, Leroy-Somer Generator, ICE Box w/large display

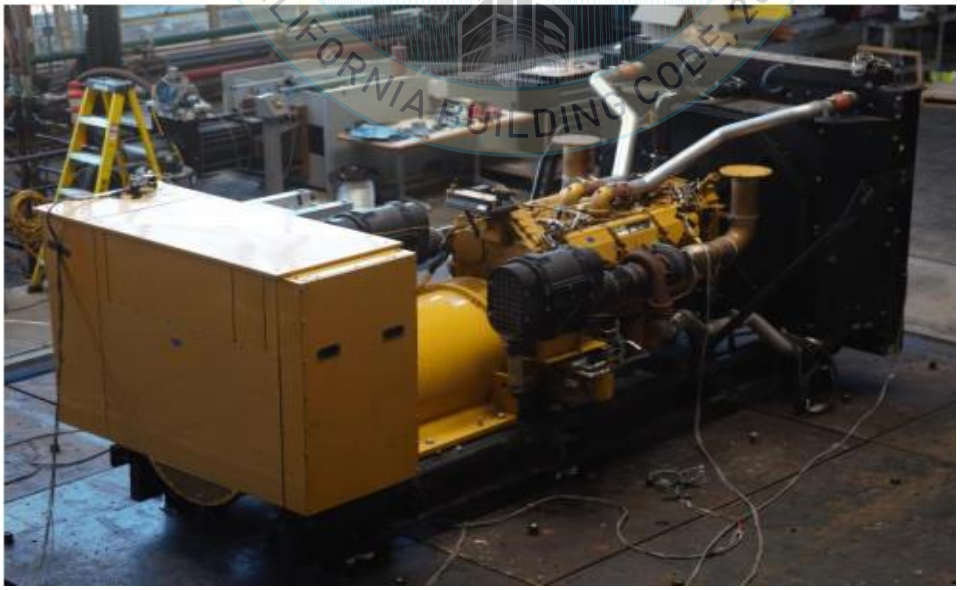
UUT Properties

Weight (lb)	Dimension (in)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
18,540	190	88	119	2.9	2.0	4.5

UUT Highest Passed Seismic Run Information

Building Code	Test Criteria	S_{DS} (g)	z/h	I_P	A_{FLX-H} (g)	A_{RIG-H} (g)	A_{FLX-V} (g)	A_{RIG-V} (g)
CBC 2019	ICC-ES AC156 (2010)	2.0	1.0	1.5	3.2	2.4	2.13	0.85
		3.2	0.0					

Test Mounting Details:



Unit is mounted to test fixture using (6) VMC M2SSH-1E 5150 spring isolators (and included hardware). (12) 3/4" Grade 8 bolts are used to mount the isolators to the test fixture.
Unit maintained structural integrity and remained functional per manufacturer requirement after shake table test.
Contents were included in testing per operating conditions.

UNIT UNDER TEST (UUT) SUMMARY SHEET

2000661-CR-001-R1

UUT 11

Manufacturer: Caterpillar Inc.
Model Line: C27/C32/3512/3516/C175 Generator Set
Model Number: 3516E - Generator Set ***Serial Number:*** N/A

Product Construction Summary:
Carbon steel base.

Options/Subcomponent Summary:
3516E generator set with Modine radiator, Leroy-Somer Generator.

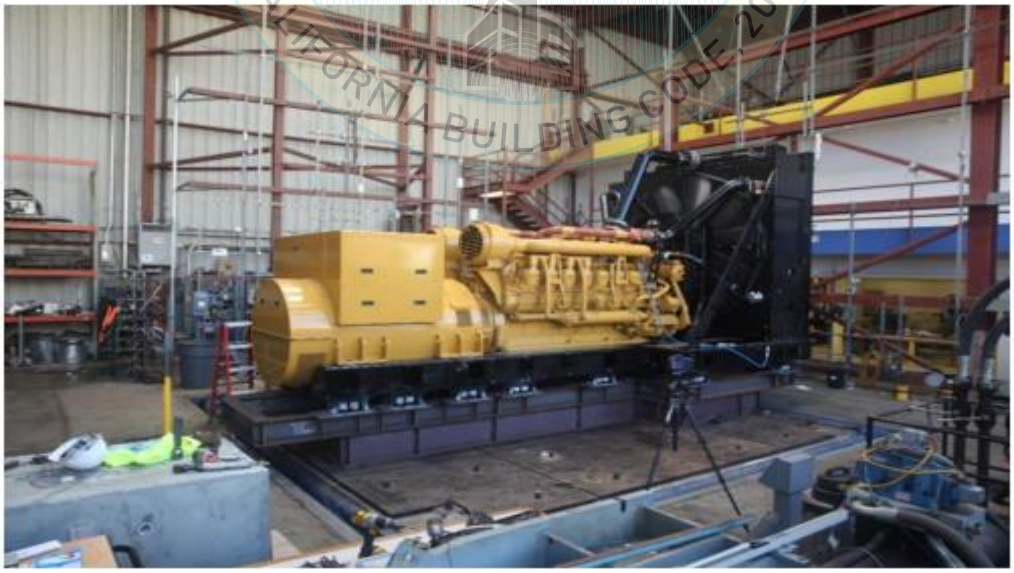
UUT Properties

Weight (lb)	Dimension (in)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
51,000	324	104	128	3.0	2.3	4.2

UUT Highest Passed Seismic Run Information

Building Code	Test Criteria	S_{DS} (g)	z/h	I_P	A_{FLX-H} (g)	A_{RIG-H} (g)	A_{FLX-V} (g)	A_{RIG-V} (g)
CBC 2019	ICC-ES AC156 (2010)	2.0	1.0	1.5	3.2	2.4	2.13	0.85
		3.2	0.0					

Test Mounting Details:



Unit is mounted to test fixture using (14) VMC M2SSH-1E 5150 spring isolators (and included hardware). The isolators were welded to the test fixture using (3) 1" long 5/16" fillet welds along the long sides, and a 5/16" fillet weld along the entire length of the short sides.
Unit maintained structural integrity and remained functional per manufacturer requirement after shake table test.
Contents were included in testing per operating conditions.

UNIT UNDER TEST (UUT) SUMMARY SHEET

2000661-CR-001-R1

UUT 12

Manufacturer: Caterpillar Inc.
Model Line: C27/C32/3512/3516/C175 Generator Set
Model Number: 3516C - Generator Set ***Serial Number:*** N/A

Product Construction Summary:
Carbon steel base.

Options/Subcomponent Summary:
3516C generator set with Caterpillar designed radiator(size A68, Modine coolers), Caterpillar engine and Leroy-Somer alternator.

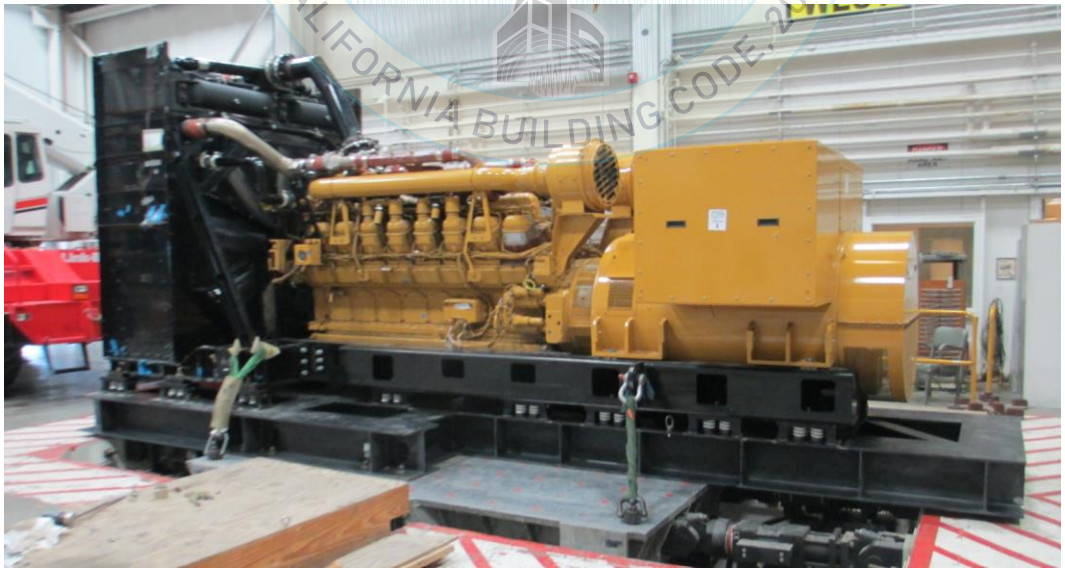
UUT Properties

Weight (lb)	Dimension (in)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
43,139	257.3	100.9	123.2	3.3	3.3	5.6

UUT Highest Passed Seismic Run Information

Building Code	Test Criteria	S_{DS} (g)	z/h	I_P	A_{FLX-H} (g)	A_{RIG-H} (g)	A_{FLX-V} (g)	A_{RIG-V} (g)
CBC 2019	ICC-ES AC156 (2018)	2.09	1.0	1.5	3.34	2.50	2.22	0.89
		3.34	0.0					

Test Mounting Details:



Unit is mounted to test fixture using (10) VMC M2SSH-1E 6500 spring isolators (with included hardware and added flat washer / under engine and alternator) and (6) VMC M2SSH-1E 5150 spring isolators (with included hardware and added flat washer / under radiator). The isolators were welded to the test fixture using (3) 2" long 5/16" fillet welds along the long sides, and a 5/16" fillet weld along the entire length of the short sides. Unit maintained structural integrity and remained functional per manufacturer requirement after shake table test. Contents were included in testing per operating conditions.