



**DEPARTMENT OF HEALTH CARE ACCESS AND INFORMATION
FACILITIES DEVELOPMENT DIVISION**

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

OFFICE USE ONLY

APPLICATION #: OSP-0534

HCAI Special Seismic Certification Preapproval (OSP)

Type: New Renewal

Manufacturer Information

Manufacturer: Termaco

Manufacturer's Technical Representative: Carl Tremblay

Mailing Address: 325 Boul. Industriel, Saint-Jean-Sur-Richelieu, QC J3B 7M3

Telephone: (450) 346-6871

Email: ctremblay@termaco.com

Product Information

Product Name: UPS and Batteries

Product Type: Batteries

Product Model Number: See Certified Product Table attached

General Description: Battery & landing cabinets. Mohammad Karim

Mounting Description: Rigid, Floor Mounted

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

Applicant Information

Applicant Company Name: Dynamic Certification Laboratories

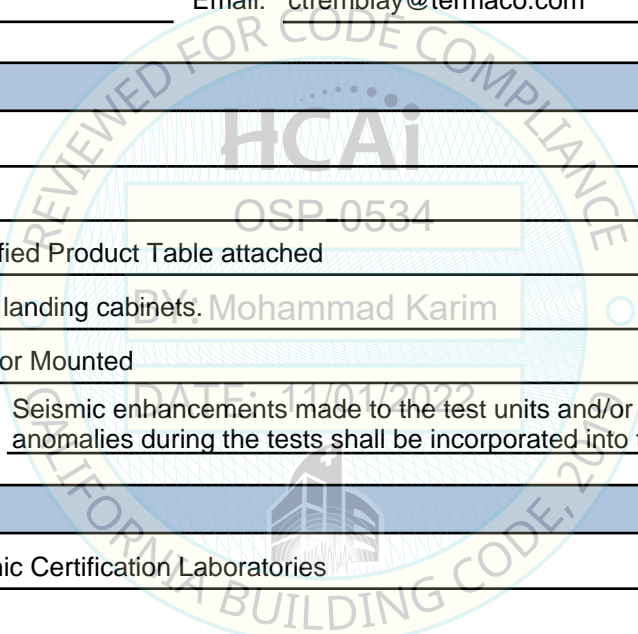
Contact Person: Kelly Laplace

Mailing Address: 1315 Greg Pkwy # 109, Sparks, NV 89431

Telephone: (775) 358-5085

Email: kelly@shaketest.com

Title: Business Manager





**DEPARTMENT OF HEALTH CARE ACCESS AND INFORMATION
FACILITIES DEVELOPMENT DIVISION**

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

Company Name: THE VMC GROUP

Name: Kenneth Tarlow California License Number: S2851

Mailing Address: 980 9th Street, 16th Floor, Sacramento, CA 95814

Telephone: (832) 627-2214 Email: ken.tarlow@thevmcgroup.com

Certification Method

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

Other (Please Specify): _____

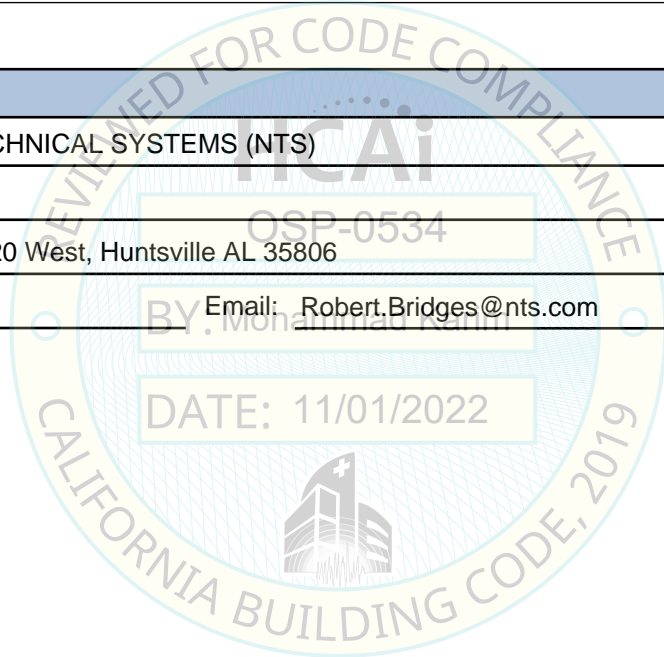
Testing Laboratory

Company Name: NATIONAL TECHNICAL SYSTEMS (NTS)

Contact Person: Robert Bridges

Mailing Address: 7800 Highway 20 West, Huntsville AL 35806

Telephone: (256) 837-4411 Email: Robert.Bridges@nts.com





**DEPARTMENT OF HEALTH CARE ACCESS AND INFORMATION
FACILITIES DEVELOPMENT DIVISION**

Seismic Parameters

Design Basis of Equipment or Components (F_p/W_p) = 1.50

SDS (Design spectral response acceleration at short period, g) = 2.00

a_p (Amplification factor) = 2.5

R_p (Response modification factor) = 6.0

Ω_0 (System overstrength factor) = 2.0

I_p (Importance factor) = 1.5

z/h (Height ratio factor) = 1

Natural frequencies (Hz) = See Attachment

Overall dimensions and weight = See Attachment

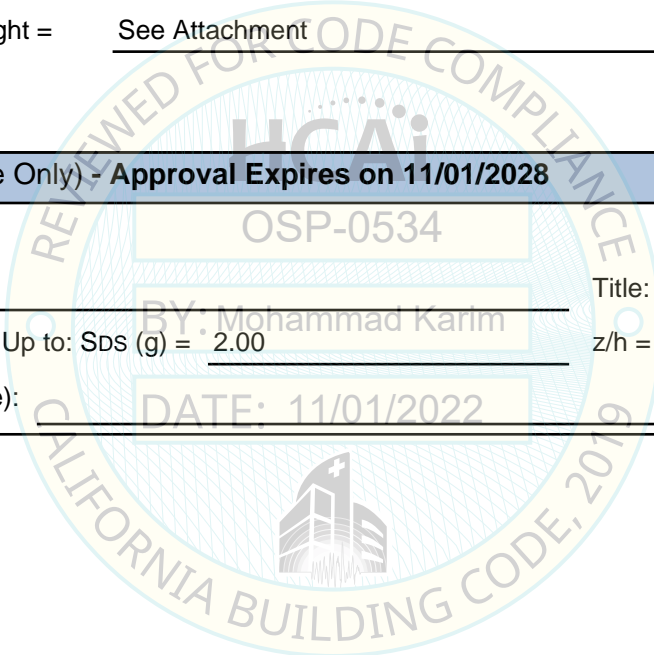
HCAI Approval (For Office Use Only) - Approval Expires on 11/01/2028

Date: 11/1/2022

Name: Mohammad Karim Title: Supervisor, Health Facilities

Special Seismic Certification Valid Up to: SDS (g) = 2.00 z/h = 1

Condition of Approval (if applicable): DATE: 11/01/2022



Special Seismic Certification
Table 1 - Certified Components



DCL Project Number: 89379-2201
Manufacturer: Termaco
Product Line: TCR Battery Cabinets and TCL Landing Cabinets
Mounting Description: Rigid Floor Mounted
Certified Seismic Level: S₀₅=2.00g, z/h=1.0

Battery Cabinets							
Model	Battery Cabinet Specs	Dimensions (in)			Max Weight (lb)	Notes	UUT
		Depth	Width	Height			
TCR-CS-408RB-S06-150-CD100	150A w/ 100Ah Enersys & C&D batteries	31.5	30.1	82.7	1280	1-5	UUT-2A
TCR-CS-408RB-S06-150-CD100	150A w/ 100Ah Enersys & C&D batteries (w/ floating hinges)	31.5	30.1	82.7	1280	1-5	UUT-2B
TCR-CS-408RB-S06-150-EN100	150A w/ 100Ah Enersys batteries	31.5	30.1	82.7	1280	1-4	Interpolated
TCR-CS-408RB-S06-150-CD100	150A w/ 100Ah C&D batteries	31.5	30.1	82.7	1400	1-4	Interpolated
TCR-CS-408RB-S06-150-EN150	150A w/ 150Ah Enersys batteries	31.5	30.1	82.7	1750	1-4	Interpolated
TCR-CS-408RB-S06-150-CD150	150A w/ 150Ah C&D batteries	31.5	30.1	82.7	1600	1-4	Interpolated
TCR-CS-408RB-S06-150-EN205	150A w/ 210Ah Enersys batteries	31.5	30.1	82.7	2100	1-4	Interpolated
TCR-CS-408RB-S06-150-CD210	150A w/ 210Ah C&D batteries	31.5	30.1	82.7	2000	1-4	Interpolated
TCR-CS-408RB-S05-150-EN300	150A w/ 300Ah Enersys batteries	31.5	30.1	82.7	2700	1-4	Interpolated
TCR-CS-408RB-S05-150-CD300	150A w/ 300Ah C&D batteries	31.5	30.1	82.7	2650	1-4	Interpolated
TCR-CS-408RB-S06-200-EN205	200A w/ 210Ah Enersys batteries	31.5	30.1	82.7	2100	1-4	Interpolated
TCR-CS-408RB-S06-200-CD210	200A w/ 210Ah C&D batteries	31.5	30.1	82.7	2000	1-4	Interpolated
TCR-CS-408RB-S05-200-EN300	200A w/ 300Ah Enersys batteries	31.5	30.1	82.7	2700	1-4	Interpolated
TCR-CS-408RB-S05-200-CD300	200A w/ 300Ah C&D batteries	31.5	30.1	82.7	2650	1-4	Interpolated
TCR-CS-408RB-S05-200-EN540	200A w/ 540Ah Enersys batteries	31.5	30.1	82.7	4160	1-4	Interpolated
TCR-CS-408RB-S05-200-CD540	200A w/ 540Ah C&D batteries	31.5	30.1	82.7	4000	1-4	Interpolated
TCR-CS-408RB-S05-300-EN300	300A w/ 300Ah Enersys batteries	31.5	30.1	82.7	2700	1-4	Interpolated
TCR-CS-408RB-S05-300-CD300	300A w/ 300Ah C&D batteries	31.5	30.1	82.7	2650	1-4	Interpolated
TCR-CS-408RB-S05-300-EN540	300A w/ 540Ah Enersys batteries	31.5	30.1	82.7	4160	1-4	Interpolated
TCR-CS-408RB-S05-300-CD540	300A w/ 540Ah C&D batteries	31.5	30.1	82.7	4000	1-4	Interpolated
TCR-CS-408RB-S05-400-EN300	400A w/ 300Ah Enersys batteries	31.5	30.1	82.7	2700	1-4	Interpolated
TCR-CS-408RB-S05-400-CD300	400A w/ 300Ah C&D batteries	31.5	30.1	82.7	2650	1-4	Interpolated
TCR-CS-408RB-S05-400-EN540	400A w/ 540Ah Enersys batteries	31.5	30.1	82.7	4160	1-4	Interpolated
TCR-CS-408RB-S05-400-CD540	400A w/ 540Ah C&D batteries	31.5	30.1	82.7	3975	1-4	Interpolated
TCR-CS-408RB-S05-400-EN540	400A w/ 540Ah Enersys & C&D Batteries	31.5	39.4	82.7	4160	1-5	UUT-1

Landing Cabinets							
Model	Landing Cabinet Specs	Dimensions (in)			Max Weight (lb)	Notes	UUT
		Depth	Width	Height			
TCL-HS-2-20-1000-A-1778	1000A busbar and fuses, full harness	32.7	20	45	370	1-3	UUT-4
TCL-HS-X-18-1000-B-Y, TCL-HS-X-20-1000-B-Y, TCL-HS-X-18-1400-B-Y, TCL-HS-X-20-1400-B-Y, TCL-HS-X-18-1800-B-Y, TCL-HS-X-20-1800-B-Y, TCL-HS-X-18-2000-B-Y, TCL-HS-X-20-2000-B-Y	1000A, 1400A, 1800A, and 2000A bus bar and fuses, full harness	32.7	18-20	45-78.7	370-676	1-3, 6, 7	Interpolated
TCL-CS-4-20-2000-S02-1778	2000A busbar and fuses, full harness	32.7	20	77.5	676	1-3	UUT-5
TCL-HS-X-18-3000-B-Y, TCL-HS-X-20-3000-B-Y, TCL-HS-X-18-3500-B-Y, TCL-HS-X-20-3500-B-Y, TCL-HS-X-18-4000-B-Y, TCL-HS-X-20-4000-B-Y	3000A, 3500A, and 4000A busbar and fuses, full harness	32.7	18-20	45-78.7	676-875	1-3, 6, 7	Interpolated
TCL-HS-4-18-4000-B-1778	4000A busbar and fuses, full harness	32.7	18	78.7	738	1-3	UUT-3

- Notes:
- All enclosures are manufactured by Termaco.
 - All enclosures consist of 16ga cold-formed carbon steel (CFS) panels on a 10ga CFS frame and are NEMA-1 rated.
 - All enclosures are rigidly mounted to the floor.
 - All battery cabinets can optionally be refitted with floating hinges. SDS rating does not change.
 - Tested battery cabinets were modified to include Enersys and C&D batteries. The total number of batteries and A-h rating remained the same.
 - "X" = Height Category 2, 3, or 4
 - "Y" = 0891 or 1778. Version 0891 is delivered without fuses; version 1778 includes fuses.

Special Seismic Certification
Table 2 - Certified Subcomponents



DCL Project Number: 89379-2201
 Certified Seismic Level: $S_{DS}=2.00g$, $z/h=1.0$

Busbars				
Model	Manufacturer	Material ¹	Weight (lb)	UUT
LAN-CS-410RB-B-ANGLE-1000	Termaco	Copper	3.5	UUT-4
LAN-CS-410RB-B-1000F	Termaco	Copper	20.3	UUT-4
LAN-CS-410RB-B-1000	Termaco	Copper	9.6	Interpolated
LAN-CS-410RB-B-2000F	Termaco	Copper	36.0	UUT-5
LAN-CS-410RB-B-2000	Termaco	Copper	16.7	Interpolated
LAN-CS-410RB-B-3000F	Termaco	Copper	70.3	Interpolated
LAN-CS-410RB-B-3000	Termaco	Copper	31.9	Interpolated
LAN-CS-410RB-B-4000	Termaco	Copper	31.9	Interpolated
LAN-CS-410RB-B-4000F	Termaco	Copper	76.0	UUT-3
LAN-CS-410RB-B-ANGLE-2000	Termaco	Copper	5.9	UUT-3
Fuses				
Model	Manufacturer	Material	Weight (lb)	UUT
A4BQ1000	Mersen	Copper	4.6	UUT-4
A4BQ1200	Mersen	Copper	4.6	Interpolated
A4BQ1350	Mersen	Copper	6.6	Interpolated
A4BQ1400	Mersen	Copper	6.6	Interpolated
A4BQ1500	Mersen	Copper	6.6	Interpolated
A4BQ1600	Mersen	Copper	6.6	Interpolated
A4BQ1800	Mersen	Copper	8.8	Interpolated
A4BQ1900	Mersen	Copper	8.8	Interpolated
A4BQ2000	Mersen	Copper	8.8	UUT-5
A4BQ2500	Mersen	Copper	15.3	Interpolated
A4BQ2501	Mersen	Copper	19.3	Interpolated
A4BQ3000	Mersen	Copper	19.3	Interpolated
A4BQ3500	Mersen	Copper	25.0	Interpolated
A4BQ3800	Mersen	Copper	25.0	Interpolated
A4BQ4000	Mersen	Copper	25.0	UUT-3

Notes:
 1. Busbars are C110 copper and conform to ASTM B133/B187

Special Seismic Certification
Table 2 - Certified Subcomponents (Continued)



DCL Project Number: 89379-2201
 Certified Seismic Level: $S_{DS}=2.00g$, $z/h=1.0$

Batteries				
Model	Manufacturer	Material	Weight (lb)	UUT
UPS12-100MR	C&D	Mixture of Lead, Acid and Plastic	21.0	UUT-2A, UUT-2B
UPS12-150MR	C&D	Mixture of Lead, Acid and Plastic	27.3	Interpolated
UPS12-210MR	C&D	Mixture of Lead, Acid and Plastic	40.0	Interpolated
UPS12-300MR	C&D	Mixture of Lead, Acid and Plastic	58.4	Interpolated
UPS12-350MR	C&D	Mixture of Lead, Acid and Plastic	67.4	Interpolated
UPS12-400MR	C&D	Mixture of Lead, Acid and Plastic	75.8	Interpolated
UPS12-490MR	C&D	Mixture of Lead, Acid and Plastic	100.0	Interpolated
UPS12-540MR	C&D	Mixture of Lead, Acid and Plastic	100.0	UUT-1
12HX100	Energys	Mixture of Lead, Acid and Plastic	22.0	UUT-2A, UUT-2B
12HX150	Energys	Mixture of Lead, Acid and Plastic	32.0	Interpolated
12HX205	Energys	Mixture of Lead, Acid and Plastic	43.0	Interpolated
12HX300	Energys	Mixture of Lead, Acid and Plastic	60.0	Interpolated
12HX330	Energys	Mixture of Lead, Acid and Plastic	71.0	Interpolated
12HX400	Energys	Mixture of Lead, Acid and Plastic	80.0	Interpolated
12HX505	Energys	Mixture of Lead, Acid and Plastic	103.0	Interpolated
12HX540	Energys	Mixture of Lead, Acid and Plastic	106.0	UUT-1
Breakers				
Model ¹ [Amp Rating]	Manufacturer	Material	Weight (lb)	UUT
JLL37150D81AASO [150A]	Square D	Mixture of Steel, Copper and Plastic	5.3	UUT-2A, UUT-2B
JLL37200D82AASO [200A]	Square D	Mixture of Steel, Copper and Plastic	5.3	Interpolated
LLL37030D27AASO [300A]	Square D	Mixture of Steel, Copper and Plastic	13.2	Interpolated
LLL37040D30AASO [400A]	Square D	Mixture of Steel, Copper and Plastic	13.2	UUT-1

Note:
 1. JLL* and LLL* are identical in supplier and material and similar in construction and configuration

Special Seismic Certification
Table 3 - Tested Units

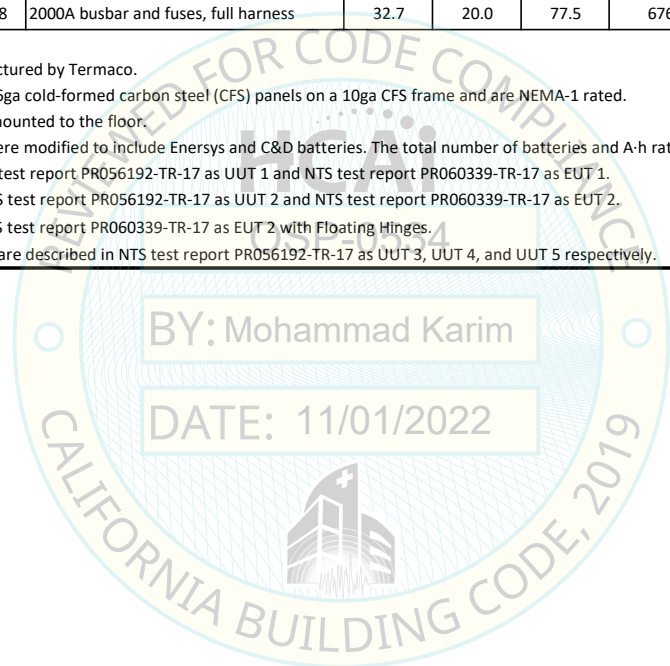


DCL Project Number: 89379-2201
Manufacturer: Termaco
Product Line: TCR Battery Cabinets and TCL Landing Cabinets
Mounting Description: Rigid Floor Mounted
Certified Seismic Level: $S_{DS}=2.00g$, $z/h=1.0$

Model	Cabinet Specs	Dimensions (in)			Weight (lb)	Notes	UUT
		Depth	Width	Height			
TCR-CS-408RB-S05-400-EN540	400A w/ 540Ah Enersys & C&D Batteries	31.5	39.4	82.7	4160	1-5	UUT-1
TCR-CS-408RB-S06-150-CD100	150A w/ 100Ah Enersys & C&D batteries	31.5	30.1	82.7	1280	1-4,6	UUT-2A
TCR-CS-408RB-S06-150-CD100	150A w/ 100Ah Enersys & C&D batteries (w/ floating hinges)	31.5	30.1	82.7	1280	1-4,7	UUT-2B
TCL-HS-4-18-4000-B-1778	4000A busbar and fuses, full harness	32.7	18.0	78.7	738	1-3,8	UUT-3
TCL-HS-2-20-1000-A-1778	1000A busbar and fuses, full harness	32.7	20.0	45	370	1-3,8	UUT-4
TCL-CS-4-20-2000-S02-1778	2000A busbar and fuses, full harness	32.7	20.0	77.5	676	1-3,8	UUT-5

Notes:

- All enclosures are manufactured by Termaco.
- All enclosures consist of 16ga cold-formed carbon steel (CFS) panels on a 10ga CFS frame and are NEMA-1 rated.
- All enclosures are rigidly mounted to the floor.
- Tested battery cabinets were modified to include Enersys and C&D batteries. The total number of batteries and A-h rating remained the same.
- UUT-1 is described in NTS test report PR056192-TR-17 as UUT 1 and NTS test report PR060339-TR-17 as EUT 1.
- UUT-2A is described in NTS test report PR056192-TR-17 as UUT 2 and NTS test report PR060339-TR-17 as EUT 2.
- UUT-2B is described in NTS test report PR060339-TR-17 as EUT 2 with Floating Hinges.
- UUT-3, UUT-4, and UUT-5 are described in NTS test report PR056192-TR-17 as UUT 3, UUT 4, and UUT 5 respectively.



UUT-1**NTS Reports PR056192-TR-17 and PR060339-TR-17
UNIT UNDER TEST (UUT) Summary Sheet****DCL Project Number:** 89379-2201**Manufacturer:** Termaco**Product Line:** TCR Battery Cabinets & TCL Landing Cabinets**Model Number:** TCR-CS-408RB-S05-400-EN540**Product Construction Summary:**

10 gauge cold form steel frame, 16 gauge cold form steel side panels and doors.

Options / Component Summary:

C&D UPS12-540MR Batteries, Enersys 12Hx540 Batteries, Square D LLL37040D30AASO 400A Breaker

Note: The UUT was operational before and after shaking. The structural integrity of the component attachment system and force-resisting systems was maintained.**UUT Properties**

Operating Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
4,160	31.5	39.4	82.7	6.5	7.1	>33

Seismic Test Parameters

Building Code	Test Criteria	Sds (g)	z/h	Ip	Aflx-H (g)	Arig-H (g)	Aflx-V (g)	Arig-V (g)
CBC 2022	ICC-ES AC156	2.00	1.0	1.5	3.20	2.40	1.33	0.53

Unit Mounting Description:

Rigid base mounted using (6)-1/2" grade 5 bolts.



Overall view of UUT-1

UUT-2A

NTS Reports PR056192-TR-17 and PR060339-TR-17

UNIT UNDER TEST (UUT) Summary Sheet

DCL Project Number: 89379-2201

Manufacturer: Termaco**Product Line:** TCR Battery Cabinets & TCL Landing Cabinets**Model Number:** TCR-CS-408RB-S06-150-CD100**Product Construction Summary:**

10 gauge cold form steel frame, 16 gauge cold form steel side panels and doors.

Options / Component Summary:

C&D UPS12-100MR Batteries, Enersys 12HX100 Batteries, Square D JLL37150D81AASO 150A Breaker

Note: The UUT was operational before and after shaking. The structural integrity of the component attachment system and force-resisting systems was maintained.**UUT Properties**

Operating Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
1,280	31.5	30.1	82.7	7.0	13.0	32.0

Seismic Test Parameters

Building Code	Test Criteria	Sds (g)	z/h	Ip	Aflx-H (g)	Arig-H (g)	Aflx-V (g)	Arig-V (g)
CBC 2022	ICC-ES AC156	2.00	1.0	1.5	3.20	2.40	1.33	0.53

Unit Mounting Description:

Rigid base mounted using (6)-1/2" grade 5 bolts.



Overall view of UUT-2A

UUT-2B**NTS Report PR060339-TR-17****UNIT UNDER TEST (UUT) Summary Sheet**

DCL Project Number: 89379-2201

Manufacturer: Termaco

Product Line: TCR Battery Cabinets & TCL Landing Cabinets

Model Number: TCR-CS-408RB-S06-150-CD100

Product Construction Summary:

10 gauge cold form steel frame, 16 gauge cold form steel side panels and doors.

Options / Component Summary:

C&D UPS12-100MR Batteries, Enersys 12HX100 Batteries, Square D JLL37150D81AASO 150A Breaker

Note: The UUT was operational before and after shaking. The structural integrity of the component attachment system and force-resisting systems was maintained.

UUT Properties

Operating Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
1,280	31.5	30.1	82.7	7.0	13.0	32.0

Seismic Test Parameters

Building Code	Test Criteria	Sds (g)	z/h	Ip	Aflx-H (g)	Arig-H (g)	Aflx-V (g)	Arig-V (g)
CBC 2022	ICC-ES AC156	2.00	1.0	1.5	3.20	2.40	1.33	0.53

Unit Mounting Description:

Rigid base mounted using (6)-1/2" grade 5 bolts.



Overall view of UUT-2B

UUT-3

NTS Report PR056192-TR-17

UNIT UNDER TEST (UUT) Summary Sheet



DCL Project Number: 89379-2201

Manufacturer: Termaco

Product Line: TCR Battery Cabinets & TCL Landing Cabinets

Model Number: TCL-HS-4-18-4000-B-1778

Product Construction Summary:

10 gauge cold form steel frame, 16 gauge cold form steel side panels and doors.

Options / Component Summary:

Copper LAN-CS-410RB-B-4000F Busbar, Copper LAN-CS-410RB-B-ANGLE-2000 Busbar, Mersen A4BQ4000 Fuses

Note: The UUT was operational before and after shaking. The structural integrity of the component attachment system and force-resisting systems was maintained.

UUT Properties

Operating Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
738	32.7	18.0	78.7	15.0	8.2	>33.3

Seismic Test Parameters

Building Code	Test Criteria	Sds (g)	z/h	Ip	Aflx-H (g)	Arig-H (g)	Aflx-V (g)	Arig-V (g)
CBC 2022	ICC-ES AC156	2.00	1.0	1.5	3.20	2.40	1.33	0.53

Unit Mounting Description:

Rigid base mounted using (6)-1/2" grade 5 bolts.



Overall view of UUT-3

UUT-4
NTS Report PR056192-TR-17
UNIT UNDER TEST (UUT) Summary Sheet



DCL Project Number: 89379-2201

Manufacturer: Termaco

Product Line: TCR Battery Cabinets & TCL Landing Cabinets

Model Number: TCL-HS-2-20-1000-A-1778

Product Construction Summary:

10 gauge cold form steel frame, 16 gauge cold form steel side panels and doors.

Options / Component Summary:

Copper LAN-CS-410RB-B-1000F Busbar, Copper LAN-CS-410RB-B-ANGLE-1000 Busbar, Mersen A4BQ1000 Fuses

Note: The UUT was operational before and after shaking. The structural integrity of the component attachment system and force-resisting systems was maintained.

UUT Properties

Operating Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
370	32.2	20.0	45.0	15.0	8.2	>33.3

Seismic Test Parameters

Building Code	Test Criteria	Sds (g)	z/h	Ip	Aflx-H (g)	Arig-H (g)	Aflx-V (g)	Arig-V (g)
CBC 2022	ICC-ES AC156	2.00	1.0	1.5	3.20	2.40	1.33	0.53

Unit Mounting Description:

Rigid base mounted using (6)-1/2" grade 5 bolts.



Overall view of UUT-4

UUT-5

NTS Report PR056192-TR-17

UNIT UNDER TEST (UUT) Summary Sheet



DCL
DYNAMIC
CERTIFICATION
LABORATORIES, LLC

DCL Project Number: 89379-2201

Manufacturer: Termaco

Product Line: TCR Battery Cabinets & TCL Landing Cabinets

Model Number: GVPB2000A

Product Construction Summary:

10 gauge cold form steel frame, 16 gauge cold form steel side panels and doors.

Options / Component Summary:

Copper LAN-CS-410RB-B-2000F Busbar, Mersen A4BQ2000 Fuses

Note: The UUT was operational before and after shaking. The structural integrity of the component attachment system and force-resisting systems was maintained.

UUT Properties

Operating Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
676	32.7	20.0	77.5	17.0	17.0	>33.3

Seismic Test Parameters

Building Code	Test Criteria	Sds (g)	z/h	Ip	Aflx-H (g)	Arig-H (g)	Aflx-V (g)	Arig-V (g)
CBC 2022	ICC-ES AC156	2.00	1.0	1.5	3.20	2.40	1.33	0.53

Unit Mounting Description:

Rigid base mounted using (6)-1/2" grade 5 bolts.



Overall view of UUT-5