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Project No. B1376.01

Mr. Keith E. Carney
Vice President of Engineering & Quality Assurance
MIDDLE ATLANTIC PRODUCTS
North Corporate Drive
Riverdale, New Jersey 07457, U.S.A.

Subject: *Seismic Certification of the SCRK and SCQRK Series Enclosures installed with Seismic Anchoring Kit*

Sent via electronic mail to kcarney@middleatlantic.com

Dear Mr. Carney:

Based on testing conducted at the Middle Atlantic Products, Inc. New Jersey facility on February 28, 2005 through March 3, 2005 and observed by HPA Engineers, P.C. (HPA), the following statements can be made about the subject rack enclosure series.

The SCRK Series enclosure listed in Table 1 was tested statically to verify lateral seismic adequacy. The enclosure selected for testing represents the footprint (defined by the width and depth of the enclosure) for the models within the SCRK and SCQRK Series. In addition, the enclosure tested is the tallest in the series and represents the worst seismic load case for the given footprint. The enclosure frame and anchorage details for each footprint within the series are identical, regardless of height. Therefore, the testing results for the tallest enclosures are applicable to all of the enclosures with equal or lesser height with the same footprint.

The enclosure tested was loaded with a series of rack-mounted weights that were positioned such that 50% of their total weight was placed in the bottom third of the enclosure rack, 25% in the middle third, and 25% in the top third. The loaded enclosure was anchored to an inclining test frame with the appropriate seismic anchorage kit and slowly tipped to a target angle to simulate lateral seismic loading. At maximum inclination, the enclosure was observed for any signs of distress or extreme deformations, and overall enclosure drift was measured. The enclosure was measured again after testing to estimate final drift. Removal of the rack-mounted weights was observed to assess the ease of their removal. The enclosure was tested both in the front-to-back and side-to-side directions. A summary of the lateral seismic test results are provided in Table 1. Photographs of the SCRK Series enclosure tested at maximum inclination is included in Attachment A of this letter.

At maximum inclination, the enclosures listed in Table 1 did not show any signs of significant distress. No visible permanent deformations were observed for the tested enclosure after the test load was removed. The maximum drift ratio measured was 1.84% of the enclosure height during the application of maximum lateral load in the side-to-side direction. After removal of the load, the corresponding maximum permanent enclosure drift was 0.42%. No difficulty was encountered removing the rack components form any of the tested enclosures following testing. However, for essential equipment, the intent of most building construction codes is to provide reasonable assurance that equipment required to function after an earthquake will be operable. While the measured drifts do not compromise the structural integrity of the enclosure, the effect of the deformation on the operability of essential equipment mounted in the rack enclosure is unknown.

Based on the test results, HPA concludes that SCRK and SCQRK Series enclosures have sufficient seismic adequacy to support the content capacities listed in Table 2 for the various building construction codes considered. These seismic capacities are appropriate for all models within the series with the same footprint as those tested, with the same or lower height. The building codes selected for consideration include the 1997 Uniform Building Code (UBC), the 2001 California Building Code (CBC), the 2000 International Building Code (IBC), the 2003 IBC, the 2002 edition of ASCE Standard 7 (ASCE 7-02), as well as the 2003 edition of the National Fire Prevention Association Building Construction and Safety Code (NFPA 5000). These are the primary building codes that govern construction in the most earthquake-prone regions of the country. The seismic content capacities provided in Table 2 are generic in nature to cover all possible installations. These capacities are based on project locations with the highest level of seismicity and top floor or rooftop installations, where amplification of seismic shaking is greatest. As such, enclosures installed at sites with less seismicity or on lower floors may have content capacities greater than those provided.

Table 2 provides a listing of acceptable capacities for enclosures installed at locations with the highest seismicity (UBC & CBC – Zone 4, C_a=0.44; IBC, ASCE 7, & NFPA 5000 – S_{DS}=2.56g). Two categories of acceptable capacities are provided; one for “high-importance” installations and the other for standard installations. The “high-importance” category applies to installations within Essential facilities as defined in the UBC and CBC as well as for installations within Seismic Use Group III facilities as defined in the IBC, ASCE 7, and NFPA 5000. These installations are generally for facilities where reasonable operation of the facility and/or certain equipment items following an earthquake is desired. The design for these “high-importance” installations use an importance factor (I_p) of 1.5. The other category shown in Table 2 is for standard or for all other installations where the building codes generally assign an importance factor of one.

Please note that the observations and conclusions noted herein are applicable only to the SCRK and SCQRK Series enclosures when anchored using the appropriate seismic brackets provided by Middle Atlantic Products. Selection and installation of rack enclosure anchor bolts are the responsibility of the end user and are not addressed in this evaluation. Any changes to

the enclosure design, fabrication, materials, and anchorage may invalidate these observations and conclusions.

If you have any questions or comments regarding the contents of this letter, feel free to contact me directly.

Very truly yours,
HPA ENGINEERS, P.C.

William. M. Bruin, P.E.
Senior Engineer

Table 1
SUMMARY OF RACK ENCLOSURE TESTING RESULTS

Enclosure[1]	Lateral Test Load[2] (pounds)	Enclosure Drift @ Maximum Inclination (% of Enclosure Height)		Enclosure Drift After Testing (% of Enclosure Height)		Were Weights Easily Removed following Testing?
		Front-Back	Side-Side	Front-Back	Side-Side	
SCRK-4427	1,254	0.71%	1.84%	0.07%	0.42%	Yes

[1] The tallest of the SCRK Series enclosures represented the worst seismic load case for a given footprint (defined by the width and depth of the enclosure). The basic footprint of the SCRK-4427, SCRK-1327, and SCQRK-1327 enclosures are identical structurally.

[2] Lateral test load based on enclosure weight, weight of contents, and test inclination. This is equivalent to code seismic base shear.

Table 2
SEISMIC CERTIFIED CONTENT CAPACITY OF THE SCRK AND SCQRK SERIES RACK ENCLOSURES (pounds)[1,2,3]

Enclosure[5]	High-Importance Installations[4]		Standard Installations	
	1997 UBC 2001 CBC	2000 IBC 2003 IBC ASCE 7-02 2003 Ed. NFPA 5000	1997 UBC 2001 CBC	2000 IBC 2003 IBC ASCE 7-02 2003 Ed. NFPA 5000
SCRK-XX27	796	867	1,271	1,377
SCQRK-XX27	796	867	1,271	1,377

[1] Capacities provided are for enclosures anchored using the appropriate seismic brackets provided by Middle Atlantic Products. Selection and installation of enclosure rack anchor bolts are the responsibility of the end user and are not addressed in this evaluation.

[2] Capacities provided are applicable when 50% of the enclosure contents are positioned in the bottom third of rack, 25% in the middle third, and 25% in the top third.

[3] Capacities provided are based on worst case seismicity (UBC & CBC – Zone 4, C_a=0.44; IBC, ASCE 7, & NFPA 5000 – S_{DS}=2.56g) and top floor or rooftop installation. Additional capacity may be available based on site-specific evaluation.

[4] High-Importance Installations include those within UBC and CBC Essential facilities or IBC, ASCE 7, and NFPA 5000 Seismic Use Group III facilities. For all codes, the Importance factor (I_p) is 1.5.

[5] Capacities provided are for all enclosure heights for the models listed and includes enclosures with suffixes that designate non-structural options such as the removal of the rear door (models listed with the LRD suffix).