



PILOMAT
MASTERSHIP IN RETRACTILE TECHNOLOGY

**CRASH TEST
K12 RATING
AMERICAN CERTIFICATION
SD-SDT-02.01 STANDARD**

CERTIFICATION

Crash Test - K12 Rating
American Certification - SD-SDT-02.01 Standard
Performed at the Texas Transportation Institute
The Texas A&M University System, Texas U.S.A.



K12/900A Automatic hydraulic anti-terrorism bollards with built-in pump



275/K12 900A

- Ø 275 mm / h 900 mm
- 2.000.000 joules
- 700.000 joules



DOS K12 TESTING AND EVALUATION OF PILOMAT RETRACTABLE BOLLARDS

by

Dean C. Alberson, P.E.
Research Engineer

Wanda L. Menges
Research Specialist

and

Rebecca R. Haug
Assistant Research Specialist

Contract No.: P2007009
Project/Test No.: 401761-TES1
Test Date: 05-18-2007

Sponsored by
TIF Electronica S.R.L., Pilomat Division

June 2007

**TEXAS TRANSPORTATION INSTITUTE
THE TEXAS A&M UNIVERSITY SYSTEM
COLLEGE STATION, TEXAS 77843**

1. Report No.		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle DOS K12 TESTING OF THE PILOMAT RETRACTABLE BOLLARDS				5. Report Date June 2007	
				6. Performing Organization Code	
7. Author(s) Dean C. Alberson, Wanda L. Menges, and Rebecca R. Haug				8. Performing Organization Report No. 401761-TES1	
9. Performing Organization Name and Address Texas Transportation Institute The Texas A&M University System College Station, Texas 77843-3135				10. Work Unit No. (TRAIS)	
				11. Contract or Grant No. P2007009	
12. Sponsoring Agency Name and Address TIF Electronica S.R.L. Pilomat Division 24020 Gorle (BG) Itay – Via Roma, 9/11				13. Type of Report and Period Covered Test Report: September 2006 – May 2007	
				14. Sponsoring Agency Code	
15. Supplementary Notes Research Study Title: Crash Testing of Retractable Bollards Name of Contacting Representative: Toffetti Bruno/Silvia Ravasio					
16. Abstract <p>The objective of this test is to determine if the Pilomat retractable bollards is capable of arresting a 6810 kg (15,000 lb) truck traveling at 80 km/h (50 mi/h) with 1.0 m (3.3 ft) of vehicle partial penetration and/or deflection. The impact point into the Pilomat retractable bollards was selected by the United States Department of State, Bureau of Diplomatic Security, Physical Security Division, which was determined to be with the centerline of the vehicle aligned with the centerline of the center bollard.</p> <p>The Pilomat retractable bollard system tested for this project consisted of three 271 mm (10.7 in) diameter steel bollards spaced approximately 1186 mm(46.75) inches on centers. The bollards were approximately 900 mm (35.4 in) in height in the deployed position. The bollards were anchored in a reinforced concrete foundation that measured approximately 3700 mm x 2500 mm (145.7 in x 98.4 in) in plan. The thickness of the concrete foundation was approximately 700 mm (27.6 in) thick. Compacted crushed limestone gravel was placed beneath the concrete foundation and extended below the retractable bollard casing.</p> <p>The front of the cargo bed did penetrate 14.4 m (47.4 ft) beyond the inside edge of the Pilomat retractable bollards. According to the results of the full-scale crash test, the Pilomat retractable bollards, as configured for this test, meet the requirements for Condition Designation K12/L1 in accordance April 1985 standard, <i>SD-STD-02.01, Test Method for Vehicle Crash Testing of Perimeter Barriers and Gates.</i></p>					
17. Key Words anti-ram; perimeter; crash testing; barriers; gates; bollards; walls; fences; homeland security			18. Distribution Statement Copyrighted. Not to be copied or reprinted without consent from TIF Electronica S.R.L..		
19. Security Classif.(of this report) Unclassified		20. Security Classif.(of this page) Unclassified		21. No. of Pages	22. Price

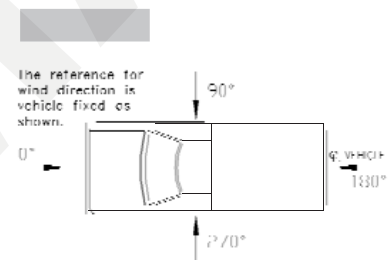
CRASH TEST 401761-TEST1 (SD-STD-02.01 CONDITION DESIGNATION K12)

Test Vehicle

A 1997 Ford F-800 single-unit flat bed truck, shown in figure 4 and 5, was used for the crash test. Test inertia weight of the vehicle was 6845 kg (15,090 lb). The height to the lower edge of the vehicle front bumper was 40 cm (15.75 inches), and the height to the upper edge of the front bumper was 72 cm (28.25 inches). Figure 10 in appendix B gives additional dimensions and information on the vehicle. The vehicle was directed into the installation using the cable reverse tow and guidance system, and was released to be free-wheeling and unrestrained just prior to impact.

Weather Conditions

The crash test was performed the morning of May 18, 2007. Weather conditions at the time of testing were: Wind Speed: 13-24 km/h (8-15 mi/h); Wind Direction: 280 degrees with respect to the vehicle (vehicle was traveling in a southerly direction); Temperature: 26°C (78°F); Relative Humidity: 37 percent.



Impact Description

The 1997 Ford F-800 single-unit flat bed truck, traveling at an impact speed of 80.7 km/h (50.1 mi/h), impacted the Pilomat retractable bollards at an impact angle of 92.0 degrees. The centerline of the vehicle was aligned with the centerline of the center bollard. Shortly after impact, the center bollard began to move rearward, and at 0.022 s after impact, the hood began to separate from the truck. The front axle contacted the center bollard at 0.044 s, and the axle separated from the truck at 0.105 s. By 0.208 s, the truck became totally airborne and began to ride over the bollards. The left rear tire contacted the left bollard at 0.441 s, and the bollard reached maximum rearward deflection of 45 mm (1.8 inches) at 0.468 s, when the tire from the front axle contacted the inside face of the bollard stopping rearward motion. As the vehicle exited the view of the overhead camera at 0.473 s, the vehicle was traveling at a speed of 34.7 km/h (21.6 mi/h) and an exit angle of 96.0 degrees. At 0.992 s, the rear of the vehicle reached its highest pitch and began to travel downward. The vehicle subsequently came to rest with the front of the cargo bed 14.4 m (47.4 ft) beyond the inside edge of the bollards. Appendix C, figures 11 and 12, show sequential photographs of the test period.

SUMMARY AND CONCLUSIONS

ASSESSMENT OF TEST RESULT

Target impact speed for this *ST-STD-02.01. Revision A* Condition Designation K12 test was 75.0 Km/h (47.0 mi/h) or above, and the actual impact speed was 80.7 Km/h (50.1 mi/h). The 1997 Ford F-800 single-unit flat bed truck impacted the barrier at 92.0 degrees, with the centerline of the vehicle aligned with the centerline of the center Pilomat retractable bollards. The cargo remained onboard the vehicle; however, the vehicle penetrated the bollard. The front of the cargo bed penetrated beyond the inside edge of the bollards, and came to rest 14.4 m (47.4 ft) beyond the inside edge of the Pilomat retractable bollards.

CONCLUSIONS

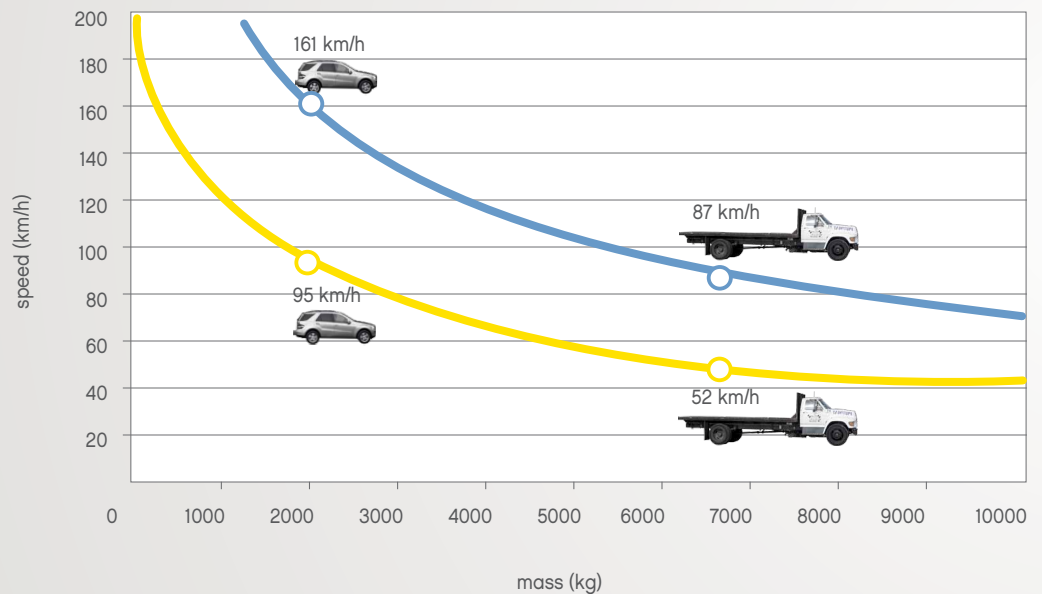
Penetration levels detailed in the April 1985 *SD-STD-02.01 Test Method for Vehicle Crash Testing of Perimeter Barriers and Gates* are still being accepted by other branches of the Armed forces for use facilities where adequate distance permits additional penetration past the Barrier. (2) Table 2 present the penetration criterion for the April 1985 *SD-STD-02.01*.

In accordance with April 1985 *SD-STD-02.01 Test Method for Vehicle Crash Testing of Perimeter Barriers and Gates*, the Pilomat retractable bollards meet the penetration Requirements for Condition Designation K12/L1, which permits penetration of up to 15.2 m (50 ft).

275/H12 900A	
MOVING CYLINDER	FE 510 STEEL (IRON)
MOVING CYLINDER NOMINAL DIAMETER	275 mm
MOVING CYLINDER HEIGHT	900 mm
MOVING CYLINDER FE 510 STEEL THICKNESS	25 mm
MOVING CYLINDER FE 510 STEEL FINISH	POLYESTER POWDER PAINT – STANDARD GREY ANTHRACITE
OTHER MOVING CYLINDER FINISH	RIBS ON CYLINDER SURFACE - 316 AISI STAINLESS STEEL BRUSHED COVERING 1,5 mm
REFLECTING ADHESIVE STRIP	YES - HEIGHT 55 mm
RISING SPEED	22 cm/sec
LOWERING SPEED	22 cm/sec
MANUAL EMERGENCY LOWERING	YES (VERSION WITH RELEASE NO 220 = AUTOMATIC LOWERING)
CONNECTION LINE TO CONTROL UNIT	STANDARD 10 m (MAXIMUM LENGTH: 80 m)
HYDRAULIC PUMP	BUILT-IN INTO THE PILOMAT
PROTECTION CLASS	IP 67
TYPE OF USE	INTENSIVE - LIFE AVERAGE 2.000.000 MOVEMENTS - 2.000 MOVEMENTS/DAY
IMPACT RESISTANCE (WITHOUT DEFORMATION)	700.000 J
BREAKOUT RESISTANCE	2.000.000 J
OPERATING TEMPERATURE	- 40°C + 70°C (FOR LOW TEMPERATURES SEE HEATING RESISTANCE)
NOMINAL PILOMAT WEIGHT (WITHOUT PIT)	545 kg
NOMINAL WEIGHT OF STANDARD PIT	295 kg

PILOMAT 275/K12 900A

- 2.000.000 JOULES
- 700.000 JOULES



BREAKOUT RESISTANCE

The resistance to breakage at a given threshold applies to the impact of a vehicle causing the Pilomat permanent damage in its active and structural mechanisms. The Pilomat, although damaged, provides the vehicle stop within a metre from the point of collision.

IMPACT RESISTANCE

Resistance to impact at a given threshold indicates that the impact of a vehicle does not cause the PILOMAT blocking or damage to the structural and action mechanisms. The Pilomat's continued functionality and safety are guaranteed.



CRASH TEST



follow us
on facebook



100% MADE IN ITALY



PILOMAT s.r.l.

Via Zanica 17/p, 24050 Grassobbio (BG) Italy

Tel. +39.035.29.72.20 , Fax +39.035.29.70.94

pilomat@pilomat.com www.pilomat.com