Announcement in SAM.gov

SPECIAL NOTICE: Bureau of Diplomatic Security
Notice to Active Anti-Ram Barrier Manufacturers

The U.S. Department of State, Bureau of Diplomatic Security (DS) utilizes security anti-ram perimeter barriers at diplomatic facilities overseas. It is incumbent upon these barriers to meet certain physical security performance requirements for which there is no substitute. It is also important to keep the DS-Approved List of Anti-Ram Barriers (hereafter "*Approved List*") current with respect to barriers offered and available for purchase from manufacturers, so the list remains relevant to the Department. It is important for manufacturers to demonstrate their understanding of the Department of State's requirements for these barriers and to market their barriers' performance ratings appropriately. The DS offices which directly manage the Approved List are the Countermeasures Physical Security Program, Physical Security Division, Research and Development Branch (DS/PSD/RD) in coordination with the Facilities Security Technical Security Branch (DS/FSE/TDB). The purpose of this notice is three-fold, and a timeline is included for these three items (1-3).

Background and Test Standards: On December 31, 2008, the Department of State sunsetted crash testing under the *SD-STD-02.01* (pub. 2003 by the Department of State) test standard in favor of testing under the *ASTM International F2656, Standard Test Method for Crash Testing of Vehicle Security Barriers* (updated periodically by ASTM International). K ratings were only issued *by* DS itself (not by testing laboratories) and *only* through testing coordinated closely with the Department of State *prior to* the sunsetting of *SD-STD-02.01*. From Section 1.1 of *SD-STD-02.01*: "Only the Bureau of Diplomatic Security may determine and assign certification ratings for anti-ram barriers."

Item 1) Any manufacturer who still manufactures active anti-ram barrier(s) and intends for their previously approved barrier(s) to *remain* on the Approved List must contact DS/PSD/RD *before* April 30, 2024 in writing with the following information: a) clearly state which barrier(s) the manufacturer wishes to remain on the Approved List along with their model number(s) and min./max. dimensions, b) best manufacturer Points of Contact (POCs) information including email

address(es) and cell number(s) of the best POC, and c) a mailing address including the complete company name. A phone call is not sufficient to meet this requirement. A lack of response will be interpreted as the manufacturer's intent for their barrier(s) to be *removed* from the Approved List.

Item 2) DS/PSD/RD advises all anti-ram barrier manufacturers to inspect and update their websites and marketing material concerning *SD-STD-02.01* K rating language *before* the end of FY2024 (September 30, 2024) and submit verification to DS/PSD/RD for any *SD-STD-02.01* K ratings claimed prior to this deadline. If a manufacturer claims their barrier has an *SD-STD-02.01* K rating, then the manufacturer shall provide an electronic copy of a valid test report to the Department of State so that the Department can verify those claims. Any barrier design that originated and thus underwent validation crash testing *after* December 31, 2008, could *not have been* issued a K rating. Additionally, an *ASTM F2656* P1 M-level test and rating *cannot* be converted to a K rating. Hybrid labeling that combines *SD-STD-02.01* ratings and *ASTM F2656* ratings is incorrect. A manufacturer's continued use of incorrect labeling for a barrier's rating on their material (either in print or online) shall be sufficient cause for DS/PSD/RD to remove all of that manufacturer's barriers from the Approved List. Even if the mislabeling is done unintentionally, it shows a concerning lack of manufacturer's understanding of security barrier requirements and qualifications in addition to creating the potential to misdirect consumers.

Item 3) Because the Department of State stopped using *SD-STD-02.01* at the end of Calendar Year (CY) 2008, and because *ASTM F2656* has been the established and prevailing standard since its inaugural publication by ASTM International on August 1, 2007, manufacturers of any active barriers on the Approved List must provide DS/PSD/RD with documentation of a valid test report performed in accordance with *ASTM F2656* at an accredited testing facility with a rating of "P1 penetration not greater than one meter" for the "M level, medium-duty truck" by the end of CY 2026 (December 31, 2026). **The version of the *ASTM F2656* test standard used for this validation crash testing should be the version which was current on the date of testing.** The manufacturer should send all correspondence to DS/PSD/RD pertinent to this requirement *before* this firm deadline. DS/PSD/RD believes this timeline provides the manufacturer the largest and most generous degree of flexibility to schedule testing if needed while still being reasonable towards the Department of State's physical security requirements.

General questions regarding this announcement should also be addressed to **dspsprd@state.gov** with "Active Anti-Ram Barrier Compliance" in the Subject Line.

Sources:

1. SAM.gov. *Special Notice: U.S. Department of State, Bureau of Diplomatic Security Releases Guidance on Anti-Ram Barrier Performance Ratings*. Notice ID "DOS_Barrier_Notice." https://sam.gov/opp/f4dae1089e304171aa2567e185033813/view. Published October 15, 2021.
2. U.S. Department of State, Bureau of Diplomatic Security, Physical Security Division. *SD-STD-02.01: Test Method for Vehicle Crash Testing of Perimeter Barriers and Gates*. Revision A. Published March 2003.

TAB 1

Special Notice: *U.S. Department of State, Bureau of Diplomatic Security Releases Guidance on Anti-Ram Barrier Performance Ratings*. Notice ID "DOS Barrier Notice." SAM.gov. Published October 15, 2021.

United States Department of State

Washington, D.C. 20520

October 15, 2021

SPECIAL NOTICE:
U.S. Department of State, Bureau of Diplomatic Security Releases Guidance on Anti-Ram Barrier Performance Ratings

Abstract – This notice provides clarification to avoid improper labeling of barriers as "K-rated" and/or "DOS-rated." U.S. Department of State barrier ratings (a.k.a. "K ratings") and *ASTM F2656* barrier ratings are separate; passing a given test standard does not grant a rating or the presumption of a rating under another. "K ratings" extend only to the barrier model that was tested, and holding an *ASTM F2656* rating does not convey the ability to market a barrier as "K-rated." If a system holds an *ASTM F2656* rating, do not report the ASTM rating without including the ASTM version (standard year), vehicle type (e.g. 'M'), impact speed, and penetration rating (e.g. "P1").

Background and Issue – The U.S. Department of State (DOS), Bureau of Diplomatic Security (DS) has a long-standing program to review anti-ram barriers. Barriers that satisfy all Department requirements are placed on the DS-Approved Barriers List. maintained by the Physical Security Research and Development Section (DS/PSD/RD). The Department's performance requirements and thus the acceptable ratings have evolved over time. Due to the program having such a long history – over thirty years – confusion has arisen over what is and is not a "rated barrier" per the U.S. Department of State.

What follows is a brief timeline of the various standards (see *Figure 1*), performance ratings and meanings (see *Table 1*), equivalency information, and marketing guidance, to inform barrier purchasers (both government and commercial) and barrier manufacturers and marketers.

Note: Other government agencies' barrier requirements, such as the Department of Defense's Approved Barriers List, are outside the scope of this notice. Other Department of State perimeter barrier requirements besides the as-tested physical security performance of anti-ram barriers, such as their installation, operation, maintenance and repair, lifecycle, and safety, are also outside the scope of this notice.

Figure 1 Timeline for Anti-Ram Testing Standards Honored by U.S. Department of State

Table 1 Ratings Honored by U.S. Department of State

Test Standard	Rating	Meaning	Valid Test Date Range
SD-STD-2.01	K4-L3 K8-L3 K12-L3	Medium-duty truck* and cargo are stopped although vehicle partial penetration and/or barrier deflection of up to 3 feet are permitted	April 1985 thru March 2003
SD-STD-02.01 Revision A	K4 K8 K12	Dynamic penetration of medium-duty truck* limited to one (1) meter beyond pre-impact inside edge of barrier for 30, 40, or 50 mph respectively	March 2003 thru December 2008
ASTM F2656-07	M30 P1 M40 P1 M50 P1	Dynamic penetration of medium-duty truck* limited to one (1) meter beyond the pre-test protected face of the barrier for 30, 40, or 50 mph respectively	August 2007 thru February 2017
ASTM F2656-15	M30 P1 M40 P1 M50 P1	Dynamic penetration of medium-duty truck* limited to one (1) meter beyond the pre-test protected face of the barrier for 30, 40, or 50 mph respectively	June 2015 thru June 2018
ASTM F2656-18a	M30 P1 M40 P1 M50 P1	Dynamic penetration of medium-duty truck* limited to one (1) meter beyond the pre-test protected face of the barrier for 30, 40, or 50 mph respectively	June 2018 thru April 2020
ASTM F2656-20	M30 P1 M40 P1 M50 P1	Dynamic penetration of medium-duty truck* limited to one (1) meter beyond the pre-test attack face of the barrier for 30, 40, or 50 mph respectively	April 2020 thru present

**Table 1 Note:* *Test vehicle reference point for penetration measurement is front edge of cargo bed for SD-STD-02-01 Rev. A. For ASTM F2656-20, test vehicle reference point is the leading lower vertical edge of the cargo bed. This is in keeping with the rationale that an explosive-laden attack vehicle would be carrying the explosives in the truck's cargo area. The test truck has been a diesel truck with a gross vehicle weight of 15,000 lb.*

K-Ratings – There is no true equivalency between the *SD-STD-02.01 and ASTM F2656 tests.* For ratings issued under the *SD-STD-02.01 (1985)* and *SD-STD-02.01 Revision A (2003)*, each test was conducted with DS oversight. Unless a manufacturer's barrier was tested under the *SD-STD-02.01* (or *Rev. A* of the same) during the applicable test date window per *Table 1*, and the manufacturer has a test report and a DS certification letter documenting such, a rating under *SD-STD-02.01* (or *Rev. A* of the same) such as "K4" cannot be claimed. If a barrier holds a valid *ASTM F2656* rating, that alone is not sufficient to market the barrier as "K-rated." Further, K ratings extend only to the barrier model that was tested. If the manufacturer has an updated model, the rating does not automatically convey.

Providing ASTM Ratings – For ratings issued under the *ASTM F2656*, a rating without an impact condition designation and a penetration rating is meaningless. Impact conditions are covered in *ASTM F2656-20 Table 1 Impact Condition Designations* (i.e. 'M' designation) and penetration ratings are covered in *ASTM F2656-20 Table 2 Penetration Ratings* (i.e. "P1" penetration). ASTM ratings must have an 'M' designation and a "P1" penetration to be satisfactory for U.S. Department of State overseas applications. *ASTM F2656-20 Section 10.1.6 Evaluation* states, "*The ASTM classification shall include the standard year, vehicle type, impact speed, and penetration rating. Reporting or claiming an ASTM classification such as an M50 without a penetration rating is not a valid ASTM classification*." Although prior versions of the *ASTM F2656* do not require this, providing part but not all of the rating information in marketing materials, e.g. stating only that something is "M50" without providing the 'P' classification, is inherently misleading and should thus be avoided.

Compliance – Compliance with this Notice is mandatory for all manufacturers who wish to have their anti-ram products on the Department of State DS-Approved Barrier List.

Conclusion –Barriers should not be marketed as "K4," "K8," or "K12" unless they earned those ratings in accordance with *Table 1* and have appropriate supporting documentation. If a barrier was tested under the older *SD-STD-02.01 (1985)* standard, because stating only the 'K' part of the rating without the 'L' portion is inherently confusing, the entire rating must be stated, e.g. "K4 L-3." For barriers tested only under the *ASTM F2656 standard*, do not state any equivalency to 'K' ratings. If a barrier has an *ASTM F2656* rating, for consideration for Department of State applications overseas, provide the entire qualification, including the standard year, vehicle type, impact speed, and penetration rating, e.g. "*ASTM F2656-20 M50 P1*."

An official website of the United States government Here's how you know

Update: Planned Maintenance Schedule Show Details
Jul 29, 2021

Recognize and Avoid Phishing Emails Show Details
Aug 25, 2020

See All Alerts

Contract Opportunity
General Information
Classification
Description
Attachments/Links
Contact Information
History

Follow

Notice to Anti-Ram Barrier Manufacturers

ACTIVE

Contract Opportunity

Notice ID
DOS_Barrier_Notice

Related Notice

Department/Ind. Agency
STATE, DEPARTMENT OF
Sub-tier
STATE, DEPARTMENT OF
Office
ACQUISITIONS - AQM MOMENTUM

General Information

Contract Opportunity Type: Special Notice (Original)
All Dates/Times are: (UTC-04:00) EASTERN STANDARD TIME, NEW YORK, USA
Original Published Date: Oct 18, 2021 02:37 pm EDT
Original Response Date:
Inactive Policy: Manual
Original Inactive Date: Dec 01, 2021
Initiative:

- None

Classification

Original Set Aside:
Product Service Code:
NAICS Code:

Place of Performance:

Description

This is a special notice for Anti-Ram Barrier Manufacturers due to an increase in misleading certification ratings verbiage on manufacturer websites and promotional literature.

Please see attached PDF for clear guidance on what the Department of State certifies and the appropriate way to convey anti-ram ratings.

Attachments/Links

Download All Attachments/Links

Attachments

Document	File Size	Access	Updated Date
Notice for Anti Ram Ratings v8.pdf	407 KB	**Public**	Oct 18, 2021

Contact Information

Contracting Office Address

US DEPT OF STATE, 2201 C ST NW
WASHINGTON , DC 20520
USA

Primary Point of Contact

Sara Marron
marronsm2@state.gov

Secondary Point of Contact

Katherine Vultaggio
vultaggiokl@state.gov

History

Feedback

Our Website

About This Site

Our Community

Release Notes

System Alerts

Policies

Privacy Policy

Disclaimers

Freedom of Information Act

Accessibility

Our Partners

Acquisition.gov

USASpending.gov

Grants.gov

More Partners

Customer Service

Help

Check Registration

Federal Service Desk

External Resources

Contact

GSA General Services Administration

This is a U.S. General Services Administration Federal Government computer system that is **"FOR OFFICIAL USE ONLY."** This system is subject to monitoring. Individuals found performing unauthorized activities are subject to disciplinary action including criminal prosecution.

Link on SAM.gov:

https://sam.gov/opp/f4dae1089e304171aa2567e185033813/view

TAB 2

U.S. Department of State, Bureau of Diplomatic Security, Physical Security Division. ***SD- STD-02.01:*** *Test Method for Vehicle Crash Testing of Perimeter Barriers and Gates*. Revision A. Published March 2003.

SD-STD-02.01, Revision A
March 2003

(Supercedes all earlier versions of
SD-STD-02.01 in its entirety)

CERTIFICATION STANDARD

Test Method for Vehicle Crash Testing of Perimeter Barriers and Gates

Physical Security Division
Office of Physical Security Programs
Bureau of Diplomatic Security
U.S. Department of State
Washington, D.C. 20520-1403

SD-STD-02.01, Revision A, March 2003

Test Method for Vehicle Crash Testing of Perimeter Barriers and Gates

This standard is issued by the U.S. Department of State, Bureau of Diplomatic Security, Office of Physical Security Programs, Physical Security Division, SA-14, Washington, D.C. 20520-1403. Copies of this Standard may be obtained from this office. Revision A replaces SD-STD-02.01, April 1985, in its entirety.

1. Scope

1.1. Only the Bureau of Diplomatic Security may determine and assign certification ratings for anti-ram barriers. The test method described herein provides specified levels of vehicle impact resistance required by the U.S. Department of State (DOS) Bureau of Diplomatic Security (DS) to select appropriate perimeter barriers and gates for use at DOS facilities. Many test parameters are standardized to arrive at a single vehicle type and mass, enhance test realism and replication, and produce consistent rating designations.

1.2. Compliance with these rating designations establishes a measure of performance, but does not render any perimeter barrier or gate invulnerable to vehicle penetration. Caution should be exercised in interpreting test findings and projecting results to other hypothetical conditions. Developers and user agencies are encouraged to continue beyond these test conditions and address specific or unusual site conditions as needed.

1.3. Product/design certification under this Standard only addresses the ability of the barrier to withstand the impact of the test vehicle. It does not represent an endorsement of the product/design or address its operational suitability.

2. Referenced Documents

2.1. "Specification for Vehicle Crash Test of Perimeter Barriers and Gates," SD-STD-02.01, Physical Security Division, U.S. Department of State, April 1985.

3. Background

3.1. Since this Standard was first published in 1985, the frequency and scale of terrorist attacks have increased. Global incidents and testing manifest a need for updated vehicle configuration and performance prerequisites, and more stringent penetration limitations.

3.2. *Updated vehicle characteristics*:

3.2.1. This revised Standard continues to use medium duty trucks as test vehicles. They carry a credible payload to threaten diplomatic facilities. Smaller vehicles than the medium duty category are limited in cargo weight and volume; they are also less likely to succeed in ramming barriers designed for medium duty trucks due to their smaller mass, lower height, and frame construction. Larger, heavy duty trucks are more conspicuous, more difficult to operate, need longer distances to accelerate, and, if carrying larger charge weights consistent with their capacity, do not need to ram given typical setbacks.

3.2.2. Newer medium duty trucks have dimensional changes, such as rail height, that impact barrier effectiveness. A critical factor in barrier effectiveness is whether the engine is gasoline or diesel. This revision requires anti-ram testing with diesel powered trucks, which have associated vehicle characteristics that distinguish their dynamic response from gasoline engines.

3.2.3. Payload attachment has also been interpreted inconsistently in testing to date. This includes unrealistic welding of cargo to the truck rails, creating fully rigid interactive elements with the barrier. This revision requires firm attachment to a cargo bed to ensure the cargo realistically transfers its kinetic energy to the impact process.

3.2.4. Vehicle speed is a primary factor since kinetic energy is a function of the square of the velocity ($KE = \frac{1}{2} mv^2$). 50 kph (30 mph) is achievable in most urban area conditions and vehicle accessible perimeter areas will be protected at least to this minimum nominal impact speed. Urban terrain makes speeds greater than 80 kph (50 mph) difficult to achieve for a medium duty truck. The sensitivity of vehicle impact energy to velocity warrants a mid-

range speed of 65 kph (40 mph) barrier for many perimeter sectors.

3.3. *Penetration limitations*:

3.3.1. Previous penetration measurements were from the *outside* of the perimeter barrier. This differs from the Overseas Policy Board (OSPB) defined setback measured from *inside* the perimeter barrier. For consistency, the new penetration definition is measured from inside the perimeter barrier.

3.3.2. Vehicle penetration distance was previously measured at the leading edge of the vehicle, which can result in conditions where the truck may have penetrated, yet the cargo may not have crossed the perimeter. Cargo bed penetration is the relevant parameter; therefore, the new criteria for penetration measurement is at the leading edge of the cargo bed.

3.3.3. New construction must have a minimum 30 meter setback; the structure is designed for blast protection at this setback. If greater or lessor setback is available, the blast design is adjusted accordingly.

3.3.4. Most existing facilities have setback significantly less than 30 meters.

3.3.5. For both new construction and existing facilities, permissible penetration must be extremely limited. At pressure levels DOS must protect against, one meter of penetration into 30 meters setback increases blast loading approximately 9%. As penetration increases, pressure increases dramatic: at 3 meters, blast pressure increases approximately 33%; at 6 meters, 80%. Previous penetration categories extending 6 and 15 meters (20 and 50 feet) exceed realistic allowance at most sites. Therefore, acceptable penetration of the cargo bed is now limited to one meter or less.

4. Terminology

4.1. *Perimeter barrier*: A gate, bollard, wall, fence, planter, other structure, or natural topographic feature which provides protection against vehicle entrance to the compound. The perimeter is typically the outermost area over which the post has control and is normally defined by the property line.

4.2. *Bollard*: Vertical barrier, usually steel, concrete, or combination of steel and concrete, used to channel or restrict vehicular traffic.

4.3. *Setback (standoff)*: Distance from the inside edge of a barrier to the nearest surface of the building being protected.

4.4. *Penetration distance*: Distance from the pre-impact, inside edge of a barrier to the leading edge of the vehicle cargo bed.

4.5. *Pass/fail standard*: To pass, the front edge of the vehicle cargo bed must not penetrate more than one meter from the pre-impact, inside edge of a barrier. Penetration greater than one meter fails.

4.6. *Rated anti-ram barrier*: A DS-approved perimeter barrier that does not exceed the defined penetration level for a 6,800 kg (15,000 lb) gross weight vehicle traveling perpendicular to the barrier at nominal speeds of 80 kph (50 mph), 65 kph (40 mph), or 50 kph (30 mph).

5. Summary of Test Method

5.1. A set of drawings and specifications for a proposed barrier or gate must be submitted to DS/PSP/PSD for review. Upon modification, if required, and acceptance by DS, the proposed barrier or gate is scheduled, in coordination with a DS technical representative, for evaluation at a DS-approved facility. DS reserves the right to have a representative present to witness all testing. Test article construction and test preparations are made in accordance with this Standard.

5.2. One of three nominal impact speeds is chosen by the vendor for rating certification. Following pre-test documentation, the test is conducted at the chosen speed, using a test vehicle and ballast conforming to specifications. Dynamic test data is recorded using the approved methods.

5.3. If impact conditions are within acceptable limits for a valid test, barrier performance is documented and a pass/fail rating is recommended. Following DS approval, acceptable barriers are added to the DOS-certified list with the DS-approved rating.

6. Significance and Use

6.1. DOS diplomatic facilities use “vehicle impact-rated barriers” from DOS-certified lists for perimeter protection worldwide.

6.3. When dynamic testing is required, DS test procedures in this Standard permit performance evaluation of a perimeter barrier or gate to certify its level of protection against vehicle attack.

6.2. The authority to determine the appropriateness of using technical analyses or computer modeling in lieu of dynamic testing for new designs and design changes lies solely with DS/PSP/PSD.

7. Test Criteria

7.1. *Impact performance*

7.1.1. The level of impact kinetic energy a barrier is proposed to withstand must first be established. This level is then compared with the kinetic energy levels shown in Table 1 to determine

the desired test impact speed. Actual test speed must be within the permissible speed range to receive the condition designation. The amount of vehicle cargo bed penetration of the test article at impact speed determines whether the test article receives a pass or fail rating at that condition designation.

Table 1. Impact condition designations for a gross vehicle weight (GVW) of 6,800 kg (15,000 lbs)

Nominal impact speed	Permissible impact speed range	Kinetic energy	Desig-nation
80 kph *50 mph*	75.0-above kph *47.0-56.9 mph*	1,695,000 J *1,250,000 ft-lb*	K12
65 kph *40 mph*	60.1-75.0 kph *38.0-46.9 mph*	1,085,000 J *800,000 ft-lb*	K8
50 kph *30 mph*	45.0-60.0 kph *28.0-37.9 mph*	610,000 J *450,000 ft-lb*	K4

7.2. *Test site*

7.2.1. Tests must be at DOS-approved test facilities. These facilities have adequate space to accelerate test vehicles to the desired impact velocity; level, unobstructed impact regions; and no curbs, dikes, or ditches in front of the installation except where test conditions specify such features.

7.2.2. For test articles embedded in soil, including concrete footings, the soil should be low-cohesive, well-graded crushed stone or broken gravel of a particle size distribution comparable to Table 2. Soil depth should be at least the foundation depth and 1.5 times embedment depth behind the installation or 0.6 meters (2 feet), whichever is greater up to a maximum of 6 feet. Soil should be compacted to a density of not less than 90 percent maximum dry density.

Table 2. Recommended soil foundation material

Sieve Size	Mass Percent Passing
50.0 mm (2 in.)	100
25.0 mm (1 in.)	75-95
9.5 mm (3/8 in.)	40-75
4.75 mm (No. 4)	30-60
2.00 mm (No. 10)	20-45
0.425 mm (No. 40)	15-30
0.075 mm (No. 200)	5-20

7.3. *Test article*

7.3.1. Test article materials and construction drawings must be provided to DS for review a minimum of 14 days in advance. The barrier shall then be constructed and erected in a manner representative of the proposed actual service installation and conform to manufacturer or designer specifications and drawings. Deviations from fabrication, specification, or erection details must be delineated in the test report.

7.4. *Test vehicle*

7.4.1. The test vehicle shall be a medium duty truck with diesel engine, tested at a gross vehicle weight of 6,800 kg (15,000 lbs), ± 90 kg (200 lbs). U.S. medium duty trucks, which have gross vehicle weight typically ranging from 6,350 kg (14,001 lbs) to 11,800 kg (26,000 lbs).

7.4.2. Illustrative U.S. manufactured medium duty trucks are shown in Table 3.

Table 3. Typical U.S. medium duty trucks

Make	Model	GVW
Ford	F650	8,846 – 11,800 kg *19,501 – 26,000 lbs*
Ford	F700	11,113 – 13,835 kg *24,500 – 30,500 lbs*
Chevrolet	C6500	9,525 – 11,800 kg *21,001 – 26,000 lbs*
Freightliner	FL60	8,165 – 12,020 kg *18,000 – 26,500 lbs*
International	4700 DT466E	6,125 – 11,800 kg *13,500 – 26,000 lbs*
International	1652	9,750 – 12,700 kg *21,500 – 28,000 lbs*

7.4.3. Table 3 is not all-inclusive; comparable vehicles may be acceptable as a test vehicle. A description of the proposed test vehicle, whether from Table 3 or an alternative vehicle must be submitted to DS for review along with the drawings and specifications of the test article. Early coordination is encouraged, especially regarding acceptability of the proposed test vehicle.

7.4.4. The essential features for test vehicle selection are that it:

7.4.4.1. Be “medium duty”.

7.4.4.2. Have a diesel engine.

7.4.4.3. Be structurally sound (no major rust or structural weakness).

7.4.4.4. Have a standard, commercial bed.

7.4.4.5. Have an unmodified bumper.

7.4.4.6. Not have any structural additions or modifications which may enhance test performance.

7.4.5. Ballast attachment has been revised to provide greater realism, and consistency in performance evaluation. Ballast material will no longer be dense materials such as steel or concrete,

firmly anchored or welded to the truck rails; ballast shall be sand- or soil-filled, 208 liter (55-gallon) steel drums securely attached to the vehicle cargo bed, as described in Section 9.

8. Apparatus (data acquisition methods)

8.1. Appendices A and B describe parameters to be measured before, during, and after collision, including measurement tolerances and techniques.

8.2. Pre-test data acquisition shall document the as built, untested barrier and test vehicle configuration. Documentation includes as-tested specifications and drawings, measurements and photography.

8.3. During the test, vehicle impact speed and impact point must be measured. Video documentation, with perpendicular (profile), overhead, and oblique views, are also to be made.

8.4 Vehicle acceleration is to be measured near center of mass. Kinematics, barrier displacements, and strains may be important when a barrier needs modification or redesign; this data may be collected during testing, at the option of the client.

8.5. After the test, barrier deformation, vehicle penetration depth, and damage of both test article and vehicle shall be documented with measurements, data recordings, and photography. Other parameters peculiar to a barrier may entail additional documentation. For instance, a gate may be shown to be operational after the collision, even though this is not a requirement of this standard.

9. Test Preparation

9.1. *Test article*

9.1.1. Each device, assembly, or structure used in a barrier is to be identified and documented by engineering drawings and specifications.

9.1.1.1 All proprietary information shall be clearly indicated in the document. *All such information provided to State Department personnel will be safeguarded and will not be disclosed to unauthorized personnel.*

9.1.1.2 Each sheet shall include the barrier title/description, drawing number, and date and shall be submitted in 8½"x11" (215x280mm) format. Each drawing shall identify the barrier in exact detail. Assembly drawings shall show the arrangement, locations, and dimensions of all components.

9.1.1.3 Specifications for materials used, location and type of all welds, and size and spacing of all rebar, shall be included in the documents.

9.1.2. Standard commercial materials used in construction will conform to configuration and performance standards established for the material by appropriate industrial specifications, e.g., American Society of Testing Material, American Iron and Steel Institute, Society of Automotive Engineers, or manufacturer's assembly specifications.

9.1.3. Non-standard materials or devices used in configurations not otherwise controlled by recognized industrial or manufacturer specifications will be accompanied by full disclosure drawings and specifications.

9.2. *Test article installation*

9.2.1. For gates, adjacent structures used to support the gate and resist induced forces during the crash test must be specified and documented.

9.2.2. The length of a barrier test article, excluding terminals and anchors, shall be at least three times the width in which deformation is predicted, but not less than 6 meters (20 feet). These include walls, fences, and bollards.

9.2.3. A freestanding barrier, such as a portable concrete barrier or planter, which depends on frictional resistance between it and the ground to resist movement, shall be tested on the same general type of ground or pavement surface where it will be used. The type of pavement surface, as well as end anchorage used, shall be reported.

9.2.4. Other test articles or vehicle arrest devices such as pits may be evaluated by this test standard provided they have adequate descriptions, drawings, and specifications.

9.3. *Test vehicle*

9.3.1. The test vehicle will be configured with an open flat bed and unmodified commercial bumper. Gross weight of the test vehicle shall be 6,800 kg (15,000 lbs), ± 90 kg (200 lbs). All necessary ballast (cargo) to bring the vehicle to test mass shall be **firmly** attached to the cargo bed of the vehicle and visible for performance assessment during impact.

9.3.2. Attachment must ensure that the cargo remains intact upon impact until it has transferred its kinetic energy to the impact process. Ballast will be standard, round, "open top" (removable top, secured with ring and nut/bolt, or level-lock mechanism), 208 liter (55-gallon), metal drums filled with sand or soil. 208 liter drums are typically 610 mm (24 inches) in diameter and 883 mm (34 ¾ inches) outside height. (ISO "containerizable" steel drums may also be used. These are 595 mm (23 7/16 inches) with the same inside diameter as the standard 55-gallon drum.) Photos of a typical test vehicle configuration and ballast attachment using 10,000 pound capacity cargo straps are shown in Figures 1 and 2.

9.3.3. A test vehicle drawing is in Appendix B, showing dimensions and properties to be

measured and recorded prior to testing. Similar attachment techniques that firmly secure the cargo may be proposed, but such variations must be submitted pre-test to the DS technical representative for review.

Figure 1.
Typical test vehicle configuration, side view

Figure 2.
Typical ballast attachment, rear view

10. Test Procedure

10.1. *Compliance*

10.1.1. DS reserves the right to have a representative present to witness all testing and requires a minimum of 14 days advance notice from the Facility Test Director for this purpose.

10.1.2. Once a test article is committed to testing for the purpose of obtaining an official DS rating, a report of all testing conducted on the device or assembly is to be provided to DS regardless of the outcome. Test documentation indicating compliance with the vehicle impact resistance requirements and test results will be submitted to DS/PSP/PSD by the testing facility.

10.2. *Pre-test submissions*

10.2.1. The contractor will provide a test plan consisting of drawings and specifications of the device, assembly or structure to be tested, configuration disclosure documentation, description of the proposed test vehicle, and proposed impact conditions to the DS technical representative at least 14 days in advance of testing.

10.3. *Impact conditions*

10.3.1. The method of vehicle guidance prior to impact is optional, providing the guidance system or its components do not effect significant changes in the vehicle dynamics during and immediately after collision. The test vehicle may be pushed, towed, or self-powered to the programmed speed. If pushed or towed, the prime mover shall be disengaged prior to impact.

10.3.2. The test vehicle shall approach and impact the test article at 90 degrees, ±3 degrees. Vehicle impact shall be centered on the most vulnerable section or part of the test article. The DS technical representative must review the proposed impact point prior to the test. Actual impact point shall be within ± 300 mm (1 foot) of this target.

10.3.3. Actual vehicle impact speed must be within the permissible range shown in Table 1 to receive the designated condition level at the intended nominal speed. Tests with vehicle impact speed outside this range are not valid for the rating assignment, but may be rated by DS at the appropriate lower speed category.

10.4. *Evaluation of performance level*

10.4.1. For new construction and existing facilities, ultimate dynamic performance objectives severely limit permissible penetration ***Revision A requires measurement of the extent to which the front edge of the test vehicle cargo bed penetrates or vaults over the system***.

10.4.2. ***The new DS performance criteria limits penetration of the front edge of the cargo bed to one meter beyond the pre-impact, inside edge of the barrier***. Cargo bed penetration even may be negative if the leading edge does not reach the barrier.

10.5. *Rating assignment and certification*

10.5.1. If the front edge of the cargo bed does not penetrate greater than one meter beyond the pre-impact, inside edge of the barrier, a pass rating is assigned at the appropriate speed designation, K12 (80 kph), K8 (65 kph), or K4 (50 kph), from Table 1.

11. Test Report

11.1. The Test Report, prepared by the DS-approved testing facility, shall include, but not be limited to, the following sections:

11.1.1. *Identification*: Name, address, and contact data of testing organization, responsible personnel, test facility location, and test date.

11.1.2. *Barrier description*: Describe as-built test article, including photographs, engineering drawings, material specifications, and reference to

design revisions from any earlier tests. Describe special fabrication and installation procedures (such as heat treatment, weldments, bolt tension, galvanizing in critical stressed areas, etc.) that may influence dynamic behavior. Include drawings and specifications for recommended design changes.

11.1.3. *Test vehicle description:* Describe vehicle (make, model, year, engine type, tire size, test weight, condition, bed and ballast configuration). Provide measurements in the format at Appendix B.

11.1.4 *Test procedure*: Describe test facility and associated equipment, data acquisition systems, and procedures used in calibrating and processing data. Include soil properties and other conditions applicable to barrier performance.

11.1.5. *Findings*: Use format shown in Table 4. Include video with before-and-after documentary coverage of test article and vehicle, high-speed data views of the impact (overhead, perpendicular (profile), and oblique), and title block for each identifying test and test conditions.

11.1.6. *Evaluation*: Discuss dynamic performance of test article (structural adequacy, vehicle trajectory, penetration). Provide conclusions regarding acceptability of dynamic performance and recommend rating.

12. Retest and Design Modifications

12.1. *Re-testing*

12.1.1. Failure of any assembly or device to demonstrate full compliance with the requirements of this Standard does not preclude the modification and resubmission of that assembly design for re-testing. Any re-testing will be conducted in accordance with all requirements in this Standard.

12.2. *Design modifications*

12.2.1. All modified material accepted by DS shall bear an addendum to the model number which clearly identifies it as a revised configuration differing from previous modifications.

12.2.2. Once satisfactory vehicle impact resistance has been demonstrated and a barrier rating assigned, no design or material change may be made without prior approval of the DS, which may require complete or partial re-testing.

13. Keywords

14.1. anti-ram; perimeter; crash testing; barriers; gates; bollards; walls; fences; planters

Table 4. Report Format

Item	Description	Format
Still photography	Vehicle and barrier installation, before and after test	Photographs (jpeg, tiff, or bitmap)
Movie during test	Sequence (4-8 frames minimum) during impact (overhead, side, and oblique)	Video (VHS)/CD/ photographs
Vehicle acceleration	Lateral and longitudinal; filtered (SAE J211, Class 180)	Plots (ordinate 50g; Abscissa 300ms) (Dplot or ascii)
Dynamic strain	Strain gage data from critical barrier/gate points	Plots (ordinate 500 μ in/in; Abscissa 100 ms) (Dplot or ascii)
Strain gages	Drawing showing strain gage locations	Drawing (pdf or MS Word)
Permanent deformation	Profile of deformation	Table (Excel)
Dynamic deformation	Maximum deformation of test article	Text (MS Word)
Damage estimate	Barrier length, elements or components required to restore installation	Text, drawings, and/or photos (same formats as above)

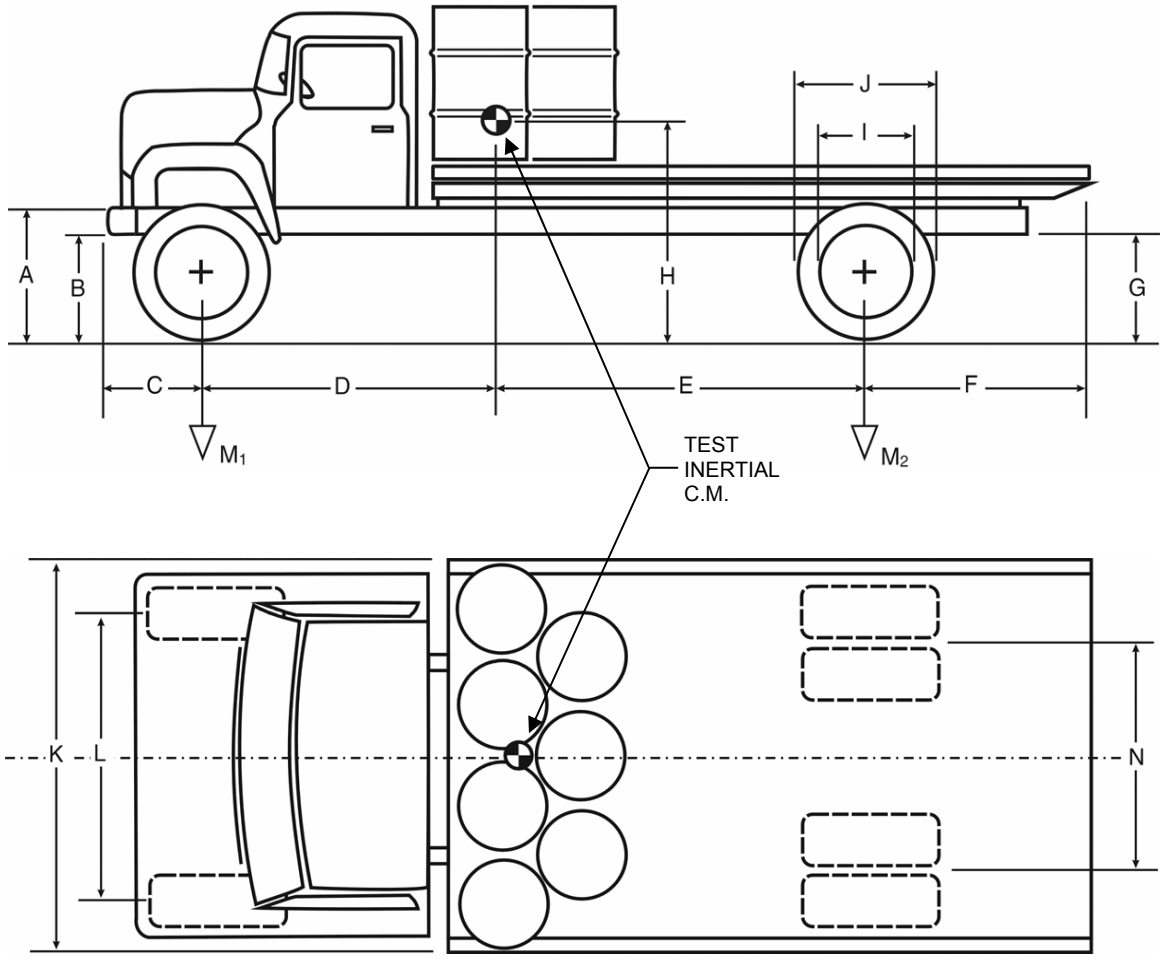
Appendix A. Data acquisition methods

Phase	Parameter	Measurement Tolerances	Acceptable Techniques	Remarks
Pretest	Test article installation	± 6 mm (± 1/4 in)	General surveying equipment, photography	Post spacing, rail heights, alignment, orientation, etc., are critical items
	Mass of vehicle and onboard elements	±2% of items but not more than ± 90 kg (± 200 lb)	Commercial scales	Mass distribution of vehicle as tested.
	Geometry of vehicle	± 6 mm (± 1/4 in)	Common scales	See Appendix B for critical items
Test	Impact speed	± 0.32 kph (± 0.2 mph)	(a) Contact switches (b) High-speed cine (c) Radar (d) Fifth wheel	Minimum film speed of 120 mps (400 fps) Speed measured during vehicle approach at a maximum 4.6 m (15 ft) from point of impact
	Vehicle accelerations	±1g	(a) Accelerometers designed for high-"g" service	Lateral and longitudinal (and preferably vertical) accelerometers attached to a common mounting block and the block attached to the vehicle structure on vehicle centerline at center of vehicle gross weight distribution (longitudinal). A second set of accelerometers is a desirable option. Complete data system responsive to 0-min. 500 Hz signal. Raw data recorded and maintained as permanent record. Data may be filtered for visual presentation.
			(b) High-speed cameras (To be used only as a backup or secondary system due to uncertainty in data processing attributed to a double differentiation calculation)	Minimum film speed of 120 mps (400 fps). Internal or external timing device: stationary references located in field of view of at least two cameras positioned 90 degrees apart. Layout and coordinates of references, camera positions, and impact point should be reported. Two vehicle references are to be located on the vehicle roof, one positioned directly above the vehicle center of mass and the second 1.5 m (5 ft) to the rear. Instant of impact should be denoted by a flash unit placed in view of data camera. The instant of impact should also be recorded on magnetic tape.
	Vehicle trajectory, and roll, pitch and yaw	± 0.3 m (± 1.0 ft) ±0.5 deg	High-speed cameras	Minimum film speed of 60 mps (200 fps). Overhead and end views of installation preferred.
	Test article dynamic deformation.	± 24 mm (1 in)	High-speed cameras	Overhead camera view; minimum film speed of 60 mps (200 fps)
Post test	Test article permanent deformation/final position.	6 mm (1/4 in)	General surveying equipment	Location of significant debris reported.
	Test article/vehicle damage/final position.	(not applicable)	Visual inspection	Standard photographs should be shown in report.

Appendix B. Test Vehicle with dimensions and properties to be measured and recorded.

DATE: _____ TEST NO.: _____ VIN NO.: _____ MAKE: _____

MODEL: _____ YEAR: _____ ODOMETER: _____ TIRE SIZE: _____



GEOMETRY (cm)

A _____ B _____ C _____ D _____ E _____ F _____ G _____

H _____ I _____ J _____ K _____ L _____ N _____

MASS DISTRIBUTION (kg)

LF _____ RF _____ LR _____ RR _____

MASS (kg)	CURB	TEST INERTIAL
M_1	_____	_____
M_2	_____	_____
M_{Total}	_____	_____