

QuadGuard® CEN
GENERAL SPECIFICATIONS

I. GENERAL

All QuadGuard CEN Systems shall be designed, and manufactured, in accordance with the European Construction Products Directive, by Energy Absorption Systems, Inc., of Chicago, Illinois.

II. DESCRIPTION OF SYSTEM

A. General

The QuadGuard CEN System shall consist of energy absorbing cartridges surrounded by a framework of steel Quad-Beam™ guardrail which will telescope rearward during head-on impacts. The QuadGuard CEN System shall have a center monorail, which will resist lateral movement during side angle impacts, and a backup, which will resist movement during head-on impacts. The nose assembly shall consist of a flexible nose wrap and does not contain an energy-absorbing cartridge. Transitions are available and may be required depending on site conditions.

B. Component Descriptions

1. A bay describes a section of the QuadGuard CEN System consisting of an energy absorbing cartridge or bumper assemblies, a diaphragm, two fender panels and fasteners.
 - a. Except for the first and second bays, which contain bumper assemblies and are closest to the nose, each bay shall contain Type E energy absorbing cartridges. The outside of each cartridge shall be fabricated from weather resistant plastic. The actual quantity of each shall be determined by the system design speed. Refer to the product design manual for more information.
 - b. The diaphragms shall be made from 10 gauge, steel Quad-beam sections. Two support legs shall be welded to the Quad-Beam. Ski-shaped plates shall be welded to the bottom of the support legs. The

diaphragms shall be designed to lock onto and be guided by a ground-mounted, center monorail support structure.

- c. The fender panels shall be fabricated from 10 gauge Quad-Beam sections. The rear of each fender panel (the panel end furthest from the nose of the assembled system) shall be tapered to help maximize performance during wrong-way, redirective impacts. Each fender panel shall be drilled and slotted in accordance with the manufacturer's specification so that when assembled in the field, the front end (the end closest to the nose of the assembled system) shall be bolted to a diaphragm or hinge plate (depending on the width of the system) by means of 5/8" bolts. The rear of each Quad-Beam fender panel shall overlap the next rearward fender panel and be connected to the diaphragm or the hinge plate of the next bay by means of a bolt, and a "mushroom" washer. The bolt and the boss of the mushroom washer fit through the horizontal slot of the fender panel. This permits the movement, front to rear, of one set of fender panels relative to the panels in the underlying, next rearward bay. For QuadGuard CEN Systems with a backup width greater than 915mm (36"), the mushroom bolt assembly is held in place by a compression spring, which allows limited separation of the fender panels during an impact.
2. The monorail support structure shall be made of steel and be anchored, per manufacturer's instructions, to a specified rigid surface. The monorail shall prevent lateral movement, vertical movement and overturning of the diaphragms during design impacts.
3. The nose section shall contain a nose cover fabricated from a flexible belt and is not counted as a bay. The nose belt shall attach to the front diaphragm. Standard nose colors shall be gray, yellow, or black.
4. The backup structure shall be made of steel and be attached to an integral tension strut framework. It shall be available in nominal widths of 610mm(24"), 760mm (30"), 915mm (36"), 1.75m (69"), and 2.3m (90").

5. Several transition panels are available as required by site conditions including: Quad-Beam™ to Concrete Safety Barriers, Quad-Beam to Thrie-Beam, Quad-Beam to W-Beam, Quad-Beam to End Shoe (for attachment to vertical concrete walls). Contact Energy Absorption Systems, Inc. for specific applications.

C. Material Specifications

1. All structural steel elements shall be fabricated from the specified steel. After fabrication, all metal work shall be galvanized in accordance with design specifications. All welding shall be done by or under the direction of a certified welder.
2. All plastic materials in the QuadGuard CEN Systems shall be new. All materials shall be of high quality and conform to applicable Material Specifications.
3. All bolts, nuts, and washers shall be galvanized. All bolts, nuts, and washers shall be Commercial Quality "American National Standard," unless otherwise specified.

III. PERFORMANCE CRITERIA

- A. The QuadGuard CEN systems shall be capable of meeting the performance criteria stipulated in EN 1317:2000, for velocity classes of 110 km/h, 100 km/h, and 80 km/h, for vehicles weighing between 900kg and 1500kg. A properly installed and maintained QuadGuard CEN System is capable of performing its functions of stopping or containing and redirecting the test vehicles to the EN 1317:2000 requirements.

IV. TEST CRITERIA

The following full-scale crash tests have been conducted on the QuadGuard CEN System, and in each test all evaluation criteria specified in EN 1317:2000 were met. Properly installed and maintained, the QuadGuard CEN System is capable of performing its functions of stopping or containing and redirecting impacting vehicles in accordance with EN 1317:2000 for the impact conditions listed in Table 1. The impact conditions tested are intended to represent a wide range of in-service impact conditions, but do not encompass all possible in-service impact conditions.

Table 1 -- SUMMARY OF QUADGUARD CEN TESTS

Performance Level	EN 1317 Test No.	Vehicle Mass (kg)	Impact speed (km/h)	Impact Angle & Impact Point
110	Parent model at minimum taper/width-- QI2408Y			
	TC 1.1.100	900	100	0 deg, head-on, center
	TC 1.3.110	1500	110	0 deg, head-on, center
	TC 2.1.100	900	100	0 deg, 1/4 vehicle offset
	TC 3.3.110	1500	110	15 deg, nose (center)
	TC 4.3.110	1500	110	15 deg, redirect at L/3
	TC 5.3.110	1500	110	165 deg, redirect at L/2
	Maximum taper/width model -- QI9008Y			
	TC 1.1.100	900	100	0 deg, head-on, center
TC 4.3.110	1500	110	15 deg, redirect at L/3	
100	Minimum taper/width model -- QI2406Y			
	TC 1.2.100	1300	100	0 deg, head-on, center
	Maximum taper/width model -- QI9006Y			
TC 4.2.100	1300	100	15 deg, redirect at L/3	
80	Minimum taper/width model -- QI2405Y			
	TC 1.2.80	1300	80	0 deg, head-on, center
	Maximum taper/width model -- QI9005Y			
TC 4.2.80	1300	80	15 deg, redirect at L/3	

V. DESIGN AND SELECTION CRITERIA

- A. Placement of systems shall conform to the appropriate European regulations.
- B. Installation of the QuadGuard CEN systems shall be accomplished in accordance with the recommendations of Energy Absorption Systems, Inc.