

**TECHNICAL
BRIEF**

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Product Specification

ArmorZone™ Portable Water-Filled Steel Longitudinal Barrier

I. General

The ArmorZone™ system is a Longitudinal Barrier with integral Crash Cushion, made up of 2m long units, in accordance with the definitions of the Manual for Assessing Safety Hardware (MASH) and the National Cooperative Highway Research Program Report 350 (NCHRP 350), respectively. The ArmorZone™ system has been tested and performs in an acceptable manner in accordance with the guidelines of MASH as a longitudinal barrier and NCHRP 350 as a gating, non-redirective crash cushion at Test Level 2 (70 km/h).

II. Performance

The ArmorZone™ barrier is designed to redirect an errant vehicle in accordance with MASH guidelines for Longitudinal Barriers. The system is designed to provide positive work zone barrier protection to temporary construction sites and other miscellaneous roadside activities. When installed in accordance with the manufacturers' instructions, the ArmorZone™ barrier is capable of redirecting a 5,000 lb (2270 kg) pickup truck impacting the system at 70 km/h (43.5 mph) and 25 degrees and an 1800 lb (820 kg) compact vehicle impacting the barrier at 70 km/h (43.5 mph) and 20 degrees.

- A. When properly installed according to the manufacturer's recommendations, the ArmorZone™ barrier shall be able to meet the recommended structural adequacy, occupant risk, and vehicle trajectory criteria set forth in MASH for Test Level 2 (70 km/h) Longitudinal Barriers (MASH TL-2). The MASH TL-2 Test Matrix (with NCHRP 350 lightweight car test substituted for 2-10) includes the following conditions:
1. An 820 kg vehicle impacting at 20 degrees on a 164ft (50m) installation. The CIP was 46ft (14m) from the downstream end and all units were filled with water and free standing. (Test 2-10)
 2. A 2270 kg vehicle impacting at 25 degrees on a 164ft (50m) installation. The CIP was 75ft (23m) from the downstream end and all units were filled with water and free standing. (Test 2-11)

The ArmorZone™ crash cushion is designed to shield the end of an ArmorZone barrier and allows the impacting vehicle to safely gate through the system as per the NCHRP 350 guidelines for gating, non-redirective Crash Cushions. When installed correctly, the ArmorZone™ crash cushion is capable of safely stopping and controlling a 4,400 lb (2000kg) pickup truck and an 1800lb (820kg) compact vehicle impacting the crash cushion at 70 km/h (43.5 mph) either head on or at an angle up to 15 degrees.

- B. When properly installed according to the manufacturer's recommendations, the ArmorZone™ crash cushion shall be able to meet the recommended structural adequacy, occupant risk, and vehicle trajectory criteria set forth in NCHRP 350 for Test Level 2 (70 km/h) Crash Cushions (NCHRP 350 TL-2). The NCHRP 350 TL-2 Test Matrix includes the following conditions:
1. An 820 kg vehicle impacting head on and quarter offset on the nose of the installation. The first unit is the non-water filled 'special' unit which is then connected to a series of water filled 'standard' units. (Test 2-40)
 2. A 2000 kg vehicle impacting head on and centered on the nose of the installation. The first unit is the non-water filled 'special' unit which is then connected to a series of water filled 'standard' units. (Test 2-41)
 3. A 2000 kg vehicle impacting at 15 degrees and centered on the nose of the installation. The first unit is the non-water filled 'special' unit which is then connected to a series of water filled 'standard' units. (Test 2-43)
 4. A 2000 kg vehicle impacting at 20 degrees on the side of the installation at the CIP. All units are 'standard' and joined together with the connecting pin. All the units were free standing and the end units are not anchored in anyway. (Test 2-44)
 - a. The impact velocity of a hypothetical front seat passenger against the vehicle interior, as calculated from the longitudinal vehicle acceleration and 600 mm [23 5/8 in] forward displacement, and the lateral vehicle acceleration and 300 mm [12 in] lateral vehicle displacement, shall be less than 12 m/s (39.3 ft/s). The highest 10 ms average vehicle acceleration in the longitudinal and lateral directions subsequent to the instant of hypothetical occupant impact shall be less than 20 g's.
 - b. Detached debris shall not show potential for penetrating the vehicle occupant compartment or present a hazard to other traffic, pedestrians, or workers in a work zone. The vehicle shall remain upright during and after the collision although moderate roll, pitch, and yaw may occur.

III. Description of System

- A. The ArmorZone™ system shall be made up of the following components and the units shall be fabricated from materials conforming to the following specifications:

1. An ArmorZone™ system consists of a series of roto molded one piece HDPE units joined together using steel connector pins. The barrier units must be filled as required with water and if required, the empty crash cushion ‘special’ unit is connected to the last of the barrier units.
 - a. The barrier and crash cushion units shall be manufactured from the unique blend of HDPE as per manufacturers’ specification.
 - b. All steel structural components (connecting pin and longitudinal internal bar) shall be fabricated from mild steel in conformance with ASTM A-36 specifications or equivalent. These components shall be hot dipped galvanized per ASTM-123.
- B. The ArmorZone™ unit is approximately 450 mm (18 in) wide and 860 mm (34 in) tall.
- C. An ArmorZone™ barrier ‘standard’ unit weights approximately 58kg (128 lb).
- D. An ArmorZone™ crash cushion ‘special’ unit weights approximately 50kg (110 lb).
- E. The ArmorZone™ system units shall be installed in accordance with the manufacturers’ instructions.

IV. Application of Safety Appurtenances

Highway safety appurtenances should be applied to hazardous sites in accordance with the guidelines and recommendations in the American Association of State Highway Transportation Officials (AASHTO), “Roadside Design Guide”, and other Federal Highway Administration and State Department of Transportation requirements. Placement of the ArmorZone™ system must comply with these specifications and guidelines as well as those of the manufacturer.