



**General Information**

Test Agency ..... Texas A&M Transportation Institute (TTI)  
 Test Standard Test No. .... ASTM F3016-14 S20  
 Test No. .... 690900-BLD3  
 Date ..... 2018-08-09

**Test Article**

Type ..... Low-Speed Bollard  
 Name ..... CT 6-inch (Modified) Bollard  
 Material or Key Elements . 6-inch schedule 40 pipe protruding  
 36 inches above ground level in a sleeve  
 embedded in a reinforced concrete  
 foundation 36 inches deep, 24 inches wide,  
 and 96 inches long

**Soil/Foundation Type**

..... 3-inch thick reinforced concrete area slab  
 cast on a 6-inch layer of compacted road  
 base, on top of a 39-inch thick layer of  
 washed sand.

**Test Vehicle**

Type ..... Low-Speed Bogie  
 Designation ..... Surrogate (S)  
 Model ..... ASTM F3016-14 Bogie  
 Test Inertial Mass ..... 5020 lb

**Impact Conditions**

Speed ..... 19.7 mi/h  
 Angle ..... 91.5°

**Occupant Risk Values**

Longitudinal OIV ..... 28.9 ft/s  
 Lateral OIV ..... 0.3 ft/s  
 Longitudinal Ridedown ..... 3.8 g  
 Lateral Ridedown ..... 1.0 g

**Max. 0.050-s Average**

Longitudinal ..... -8.7 g  
 Lateral ..... 0.5 g  
 Vertical ..... -1.2 g

**Debris Field** ..... No debris

**Final Rest of Bogie** ..... 32 inches rebound

**Dynamic Bogie Nose Crush** ..... 20.3 inches

**Rotation/Translation of Bollard  
 (static after impact)** ..... 19°

**Horizontal Movement of  
 Foundation** ..... None

**Uplift of Foundation** ..... None

**Dynamic Penetration of Bollard** . 13.4 inches

**Dynamic Penetration of Bogie...** 6.3 inches

**Maximum Dynamic Penetration** . 13.4 inches

**Penetration Rating** ..... S20/P2

**Figure 5.8. Summary of Results for ASTM F3016-14 test S20 on CT 6-inch (Modified) Bollard.**