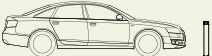



Security-Rated Bollards Guide

					
Threat Level	Low	Low	Moderate	High	High
Security Rating	S10-P1	SC30-P1	M30-P1/K4*	M40-P1/K8*	M50-P1/K12*
Minimum Bollard Diameter	6"	6"	9.25"	11.5"	11.5"
ASTM Standard	F3016/F3016M – 19	F2656/F2656M – 20	F2656/F2656M – 20	F2656/F2656M – 20	F2656/F2656M – 20
Vehicle Impact Rating	S10	SC30	M30	M40	M50
Vehicle Impact Speed	10 mph	30 mph	30 mph	40 mph	50 mph
Vehicle (Payload) Weight	5,000 lbs	2,430 lbs	15,000 lbs	15,000 lbs	15,000 lbs
Penetration Rating	P1	P1	P1	P1	P1
Penetration Distance	< 0.3 meter (1')	< 1 meter (3.3')	< 1 meter (3.3')	< 1 meter (3.3')	< 1 meter (3.3')
Bollard Recommended Spacing	Cores are independently rated, with a recommended 40" – 60" center-to-center spacing to prevent vehicle access				
Embedded Security Core (in-ground depth)	24"	24"	36"	36"	42"
Deep Set Foundation Requirement	48" x 18" x 36"	30" x 30" x 48"	56" x 56" x 60"	60" x 60" x 60"	72" x 72" x 60"
Shallow Mount Foundation Requirement	N/A	48" x 48" x 13.25"	60" x 72" x 16"	Contact	60" x 84" x 17.25"
Concrete Requirements	Minimum 28-day compressive strength of 5,000 psi & provide 6% (+/- 1.5%) air entrainment				
Minimum Soil Bearing Capacity	3,000 psf	2,000 psf	2,000 psf	2,000 psf	2,000 psf
Compatible F+S Bollards	Series 600: Helio, Knight, Light Column		Series 900: Cyrca, Helio	Series 1200: Helio	Series 1200: Helio

Forms+Surfaces' security bollards have been tested using a Finite Element Analysis (FEA) by a professional engineering consultant. FEA is a software-based tool commonly used in the automotive industry and used extensively for crash test simulations. All of our bollards with a security solution option were tested and passed a very demanding set of impact criteria. Tests were performed using a bollard set in permanent concrete footings and struck by a vehicle at a 90-degree impact.

*While K-ratings were once commonly used, the U.S. Department of Defense (DoD) has since transitioned to the M30, M40, and M50 designations as the most current and accurate standards for anti-ram vehicle barrier performance.